

**ESCIENCE  
ASSOCIATES  
(PTY) LTD**

# **ASSMANG (PTY) LTD BLACK ROCK MINE OPERATIONS, HOTAZEL, NORTHERN CAPE:**



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## **BASIC ASSESSMENT REPORT**

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**22 July 2019**

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# **BASIC ASSESSMENT REPORT:**

## **ASSMANG (PTY) LTD BLACK ROCK MINE OPERATIONS, HOTAZEL, NORTHERN CAPE**

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**22 July 2019**

## **EXECUTIVE SUMMARY**

Assmang Black Rock Mining Operations (BRMO) (hereafter referred to as BRMO) has appointed EScience Associates (Pty) Ltd. (hereafter referred to as EScience), as an independent Environmental Assessment Practitioner (EAP), to undertake an Environmental Impact Assessment (EIA) in support of environmental permitting applications for the proposed construction of a 2.5ML process water reservoir at their Gloria plant in the Northern Cape, approximately 80km north west of Kuruman and 10km west of Hotazel.

The Gloria site is located within the Joe Morolong Local Municipality and the John Taolo Gaetsewe District Municipality in the Northern Cape Province. The nearest populated areas are Hotazel and Black Rock village located approximately 5 km South East and 9km North west of the Gloria site respectively. The larger more significant town of Kuruman is located approximately 80km south east of the site, respectively. The site forms part of Ward 4 of the Joe Morolong Local Municipality.

### **NEED AND DESIRABILITY**

BRMO proposes to upgrade the water storage infrastructure at Gloria Mine to enable more efficient production including more efficient use and water at the site. The development:

- Will reduce the potential for contamination of water by increasing buffer capacity.
- Will reduce water consumption per tonne of ore processed by improving water management and reducing water loss.
- Reduced water being lost to evaporation.
- May reduce long term dependence on water from the Vaal Gamagara Pipeline due to improved water management.
- Facilitate optimal dewatering of underground operations thus improve operational safety.
- Will reduce potential for process stoppages due to insufficient storage or reticulation capacity.
- Furthermore, this project supports the ultimate need and desirability of the greater BRMO; where the activities being applied for are supportive of the mining operations undertaken.

The proposed development will be undertaken within the existing disturbed footprint and thus there will be no clearing of undisturbed land. The expansion will continue to contribute towards the fiscus and employment within the area.

The expansion affords the potential for improvement in cost of production reduced potential for process stoppages or constrictions and thus contributes towards BRMO remaining a competitive entity in the market.

### **LEGISLATIVE CONTEXT**

The table below refers to the legislation that is applicable to this basic assessment. The proposed construction of a new 2.5ML process water reservoir requires environmental

authorisation in terms of NEMA S24(1). Accordingly, an amendment of the existing, or a new, Water Use Licence is required per S22 of the National Water Act (Act 36 of 1998).

Table 1-1: Listed Activities applicable to the Mine	
GNR 983 of 2014 as amended by GN 327 of 2017	
<b>Activity No. 34:</b>	The expansion of existing facilities or infrastructure for any process or activity where such expansion will result in the need for a permit or licence or an amended permit or licence in terms of national or provincial legislation governing the release of emissions, effluent or pollution, excluding—
(i)	where the facility, infrastructure, process or activity is included in the list of waste management activities published in terms of section 19 of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) in which case the National Environmental Management: Waste Act, 2008 applies;
(ii)	the expansion of existing facilities or infrastructure for the treatment of effluent, wastewater, polluted water or sewage where the capacity will be increased by less than 15 000 cubic metres per day; or
(iii)	the expansion is directly related to aquaculture facilities or infrastructure where the wastewater discharge capacity will be increased by 50 cubic meters or less per day.;

A Water Use Licence (WUL) is required for the proposed activities. The Competent Authority responsible for issuing the WUL is the Department of Water and Sanitation (DWS). The competent authority for the environmental authorisation is the Department of Mineral Resources.

The operation of the proposed activity may not commence prior to obtaining an environmental authorisation in terms of Section 24(1) of the National Environmental Management Act (NEMA) (Act 107 of 1998). Additionally, NEMA requires applicants to consider, investigate, assess, and report the potential environmental impact of these activities. The requirements for the investigation, assessment and communication of potential environmental impacts are contained in the so-called NEMA EIA regulations, GN. R 982 of 14 December 2014.

## PUBLIC PARTICIPATION

The public and stakeholder participation process to date has entailed the following:

- Advertising of the proposed decommissioning and associated BA process in the Kalahari Bulletin on the 22<sup>nd</sup> of March 2019 and in the Kathu Gazette on the 22<sup>nd</sup> of March 2019. The adverts indicated where the written comments may be directed to and who to contact in order to be registered as an IAP.
- Placement of site notices at a place conspicuous to the public at the BRMO entrance, Gloria Mine Entrance and the Black Rock Shopping Centre.
- Pre-identification and notification to Interested and Affected Parties based on the existing list of the mines registered IAPs including neighbouring landowners and occupiers, the ward councillor, the local municipality, the district municipality, the provincial environmental authority, and other stakeholders.

The following is to be conducted through the distribution of the Basic Assessment Report to registered interested and affected parties including:

1. owners and occupiers of the of the land adjacent to the site where the activity is or is to be undertaken,
2. the municipal councillor of the ward,
3. the local municipality,
4. the district municipality,
5. the provincial environmental authority,
6. any other party required by the competent authority

Refer to subsequent items for their relevant appendices:

- Proof of Newspaper advertisements (Refer to Appendix 2.2: Newspaper Advertisements)
- Proof of site notices (Refer to Appendix 2: Public Participation Appendix 2.1: Site Notices)
- List of identified IAPs (Refer to Appendix 2.3: Proof of Distribution to IAPS)

## SUMMARY OF IMPACTS AND MITIGATION MEASURES

The table below presents the summary of potential impacts that have been identified and assessed in accordance with the requirements of the EIA regulations during the basic assessment process to determine the significance thereof.

Phase	Impact	Without Mitigation	With Mitigation
Construction	Waste	Low	Negligible
	Ground and Surface Water Contamination	Negligible	Negligible
	Soil	Negligible	Negligible
	Air Quality	Low	Negligible
	Noise	Low	Negligible
	Biodiversity	Negligible	Negligible
	Socio-economic	Low (Positive)	Not Applicable
Operation	Ground and Surface Water Contamination	Low	Negligible
	Soil	Negligible	Negligible
	Socio-economic	Low (Positive)	Not Applicable
	Noise	Low	Negligible
Decommissioning	Waste	Low	Negligible
	Ground and Surface Water Contamination	Negligible	Negligible
	Air Quality	Low	Negligible
	Noise	Low	Negligible

## CONCLUSION

In cognisance of the low significance of potential impacts, and the long terms environmental and socio-economic benefits of the projects, it is recommended that the proposed activities be authorised.

The development is anticipated to enable more efficient production including more efficient use of electricity and water at the site including:

- Reduce the potential for contamination to water.
- Reduced water being lost to evaporation
- Less dependent on water from the Vaal Gamagara Pipeline
- Reduce water consumption per tonne of ore processed.
- Increased underground operational safety as a result of mine dewatering
- Furthermore, this project supports the ultimate need and desirability of the greater BRMO; where the activities being applied for are supportive of the mining operations undertaken.

The proposed reservoir will be undertaken within the existing disturbed footprint and thus there will be no clearing of undisturbed land. The expansion will continue to contribute towards the fiscus and employment within the area.

The expansion affords the potential reductions for improvement in cost of production and thus contributes towards BRMO remaining a competitive entity in the market.

## **PERIOD OF VALIDITY OF THE ENVIRONMENTAL AUTHORISATION**

The environmental authorisation, should it be issued, will be required for 2 years in order to facilitate that planning and commencement of construction of the relevant infrastructure be undertaken within practical timeframes.

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## ABBREVIATIONS

<b>BRMO</b>	Black Rock Mine Operations
<b>DEA</b>	Department of Environmental Affairs
<b>DMR</b>	Department of Mineral Resources
<b>DWA</b>	Department of Water Affairs (now DWS)
<b>DWS</b>	Department of Water and Sanitation
<b>EAP</b>	Environmental Assessment Practitioner
<b>ECO</b>	Environmental Control Officer
<b>EIA</b>	Environmental Impact Assessment
<b>Environmental Specialist</b>	Project/Site Manager
<b>EO</b>	Environmental Officer
<b>HDPE</b>	High Density Polyethylene
<b>LED</b>	Local Economic Development
<b>Mn</b>	Manganese
<b>MPRDA</b>	Minerals and Petroleum Resources Development Act
<b>Mtpa</b>	Million tonnes per annum
<b>NCDENC</b>	Northern Cape Department of Environment and Nature Conservation
<b>NCR</b>	Non-conformance Reporting
<b>NEMA</b>	National Environmental Management Act, No. 107 of 1998 NEMA EIA
<b>NEMAQA</b>	National Environment Management: Air Quality Act, No. 39 of 2004
<b>PM</b>	Particulate matter
<b>RDL</b>	Red Data Listed
<b>Regulations</b>	Regulations GN R.453, R.454, 455 and R.456 (18 June 2010), as amended. promulgated in terms of Section 24(5) read with Section 44, and Sections 24 and 24D of the National Environmental Management Act, 1998
<b>ROM</b>	Run of Mine

# Basic Assessment Report Requirements

Table 1-3: Scope of assessment and contents of basic assessment report requirements (GN R.982 2017)		
details of	the EAP who prepared the report; and	Refer to Table 1-3, Table 1-4
	the expertise of the EAP, including a curriculum vitae	Refer to Appendix 1: EAP Curriculum Vitae
the location of the activity, including	the 21digit Surveyor General code of each cadastral land parcel	Refer to Table 1-5: BRMO Mining Rights, Surface Rights and Title Deed Description Relevant to this application.
	where available, the physical address and farm name	Refer to Table 1-5: BRMO Mining Rights, Surface Rights and Title Deed Description Relevant to this application.
	where the required information in items (i) and (ii) is not available, the coordinates of the boundary of the property or properties	Refer to Figure 1-2: Location of Assmang Black Rock Mine Operations (BRMO).
a plan which locates the proposed activity or activities applied for as well as associated structures and infrastructure at an appropriate scale; or, if it is	a linear activity, a description and coordinates of the corridor in which the proposed activity or activities is to be undertaken; or	Not applicable
	on land where the property has not been defined, the coordinates within which the activity is to be undertaken	Refer to Figure 2-1
a description of the scope of the proposed activity, including	all listed and specified activities triggered and being applied for; and a description of the activities to be undertaken including associated structures and infrastructure	Refer to Heading 2.2
a description of the policy and legislative context within which the development is proposed including	an identification of all legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks, and instruments that are applicable to this activity and have been considered in the preparation of the report	Refer to Heading 4
	how the proposed activity complies with and responds to the legislation and policy context, plans, guidelines, tools frameworks, and instruments	Refer to Heading 4
a motivation for the need and desirability for the proposed development including the need and desirability of the activity in the context of the preferred location		Refer to Heading 3
a motivation for the preferred site, activity and technology alternative		Refer to Heading 6.7
	details of all the alternatives considered	Refer to Heading 2.3

a full description of the process followed to reach the proposed preferred alternative within the site, including (refer to Heading 2):	details of the public participation process undertaken in terms of regulation 41 of the Regulations, including copies of the supporting documents and inputs	Refer to Heading 7
	a summary of the issues raised by interested and affected parties, and an indication of the manner in which the issues were incorporated, or the reasons for not including them	Refer to Heading 7.3
	the environmental attributes associated with the alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects;	Refer to Heading 2.3
	the impacts and risks identified for each alternative, including the nature, significance, consequence, extent, duration and probability of the impacts, including the degree to which these impacts	Refer to Heading 2.3
	the methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks associated with the alternatives	Refer to Heading 6
	positive and negative impacts that the proposed activity and alternatives will have on the environment and on the community that may be affected focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects	Refer to Heading 6.5
	the possible mitigation measures that could be applied and level of residual risk	Refer to headings below for mitigation management: 6.5.1.1.1, 6.5.1.2.1, 6.5.1.3.1, 6.5.1.4.1 6.5.2.1.1, 6.5.2.2.1, 6.5.2.3.1, 6.5.3.1.2, 6.5.3.2.3, 6.5.3.3.3 and 6.5.3.4.2
	the outcome of the site selection matrix	Refer to Heading 2.4
	if no alternatives, including alternative locations for the activity were investigated, the motivation for not considering such; and	Not applicable
	a concluding statement indicating the preferred alternatives, including preferred location of the activity	Refer to Heading 2.4
a full description of the process undertaken to identify, assess and rank the impacts the activity will impose on the preferred location through the life of the activity, including	a description of all environmental issues and risks that were identified during the environmental impact assessment process; and	Refer to Heading 6.6.1
	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	
an assessment of each identified potentially significant impact and risk, including	<ul style="list-style-type: none"> <li>i. cumulative impacts;</li> <li>ii. the nature, significance and consequences of the impact and risk;</li> <li>iii. the extent and duration of the impact and risk;</li> <li>iv. the probability of the impact and risk occurring;</li> <li>v. the degree to which the impact and risk can be reversed;</li> <li>vi. the degree to which the impact and risk may cause irreplaceable loss of resources; and the degree to which the impact and risk can be avoided, managed or mitigated</li> </ul>	Refer to Heading 6.5
where applicable, a summary of the findings and impact management measures identified in any specialist report complying with Appendix 6 to these Regulations and an indication as to how these findings and recommendations have been included in the final report		Refer to Heading 6.6.1
an <b>environmental impact statement</b> which contains	<ul style="list-style-type: none"> <li>i. a summary of the key findings of the environmental impact assessment;</li> <li>ii. a map at an appropriate scale which superimposes the proposed activity and its associated structures and infrastructure on the environmental sensitivities of the preferred site indicating any areas that should be avoided, including buffers (); and</li> <li>iii. a summary of the positive and negative impacts and risks of the proposed activity and identified alternatives;</li> </ul>	Refer to Figure 5-5
based on the assessment, and where applicable, <b>impact management measures</b> from specialist reports, the recording of the proposed impact management objectives, and the impact management outcomes for the development for inclusion in the EMPr		Refer to Appendix 3: Environmental Management Programme (EMPr).
any aspects which were <b>conditional to the findings of the assessment</b> either by the		

EAP or specialist which are to be included as conditions of authorisation		
a description of any <b>assumptions, uncertainties, and gaps</b> in <b>knowledge</b> which relate to the assessment and mitigation measures proposed;		Refer to Heading 10
a <b>reasoned opinion</b> as to whether the <b>proposed activity</b> should or should not be <b>authorised</b> , and if the opinion is that it should be authorised, any conditions that should be made in respect of that authorisation;		Refer to Heading 10
where the <b>proposed activity</b> does not include <b>operational aspects</b> , the <b>period</b> for which the <b>environmental authorisation</b> is required, the <b>date</b> on which the <b>activity</b> will be <b>concluded</b> , and the post construction monitoring requirements finalised;		Refer to Heading 10
an <b>undertaking under oath or affirmation</b> by the <b>EAP</b> in relation to	<ul style="list-style-type: none"> <li>i. the <b>correctness</b> of the information provided in the reports;</li> <li>ii. the <b>inclusion of comments</b> and inputs from <b>stakeholders</b> and <b>I&amp;APs</b>;</li> <li>iii. the <b>inclusion of inputs</b> and <b>recommendations</b> from the <b>specialist reports</b> where relevant; and</li> <li>iv. any information provided by the <b>EAP</b> to <b>interested</b> and <b>affected parties</b> and any <b>responses</b> by the <b>EAP</b> to <b>comments</b> or inputs made by <b>interested</b> and affected parties; and</li> </ul>	Refer to Heading 11
where <b>applicable, details</b> of any <b>financial provisions</b> for the <b>rehabilitation, closure, and ongoing</b> post <b>decommissioning</b> management of negative environmental impacts		Refer to Appendix 5: Financial Provision/Rehabilitation Quantum and Appendix 6: Closure and rehabilitation plan.
any <b>specific information</b> that may be required by the <b>competent authority</b> ; and		Currently not applicable
any other matters required in terms of <b>section 24(4)(a)</b> and <b>(b)</b> of the Act.		



# 1 INTRODUCTION

Assmang (Pty) Ltd mines manganese ore in the Black Rock area of the Kalahari, in the Northern Cape Province. The ore is mined from the Kalahari Manganese field. The Black Rock Mine Operations (BRMO) are approximately 80 kilometres (km) north-west of the town of Kuruman, in close proximity to the town of Hotazel.

In 1940, Assmang acquired a manganese ore outcrop on a small hillock known as Black Rock. Several large properties underlain by ore were subsequently found and acquired. Manganese ore mining operations were extended and today include 3 underground mining complexes:

- Gloria (commissioned in 1975) and producing medium grade carbonated ore
- Nchwaning II and Nchwaning III (commissioned in 1981 and 2004 respectively) and producing high grade oxide ore.

The proposed development at the Gloria mine are the subject of this environmental impact assessment process.

The manganese ores of the Kalahari Manganese field are contained within sediments of the Hotazel Formation of the Griqualand West Sequence, a subdivision of the Proterozoic Transvaal Supergroup. The manganese ore bodies exhibit a complex mineralogy and more than 200 mineral species have been identified to date. The hydrothermal upgrading has resulted in a zoning of the orebody with regard to fault positions.

Distal areas exhibit more original and low-grade kutnohorite and braunite assemblages, while areas immediately adjacent to faults exhibit a very high-grade hausmannite ore. The intermediate areas exhibit a very complex mineralogy, which includes bixbyite, braunite and jacobsite amongst a host of other manganese-bearing minerals.

A similar type of zoning also exists in the vertical sense. At the top and bottom contacts, it is common to have high iron (Fe) and low manganese (Mn) contents while the reverse is true towards the centre of the seam. This vertical zoning has given rise to a mining practice where only the centre portion of the seam is being mined. At the Gloria Mine the intensity of faulting is much less, which also explains the lower grade.

Two manganese seams are presently mined. The No. 1 seam is up to 6 metres (m) in thickness and approximately 400 m underground at Nchwaning II and 200 m underground at Gloria. No 2 seam is situated above No 1 seam and is accessed via the Nchwaning II mining infrastructure.

## 1.1 ASSMANG (PTY) LIMITED

Assmang (Pty) Ltd is jointly owned by African Rainbow Minerals Limited (ARM) and Assore Limited, and currently has three independently operating divisions based on three respective commodities – chrome, manganese and iron ore (Figure 1-1). Assmang's Manganese Division consists of the Nchwaning II, Nchwaning III and Gloria manganese mines in the Northern Cape, as well as the ferromanganese works at Cato Ridge in Kwazulu-Natal.

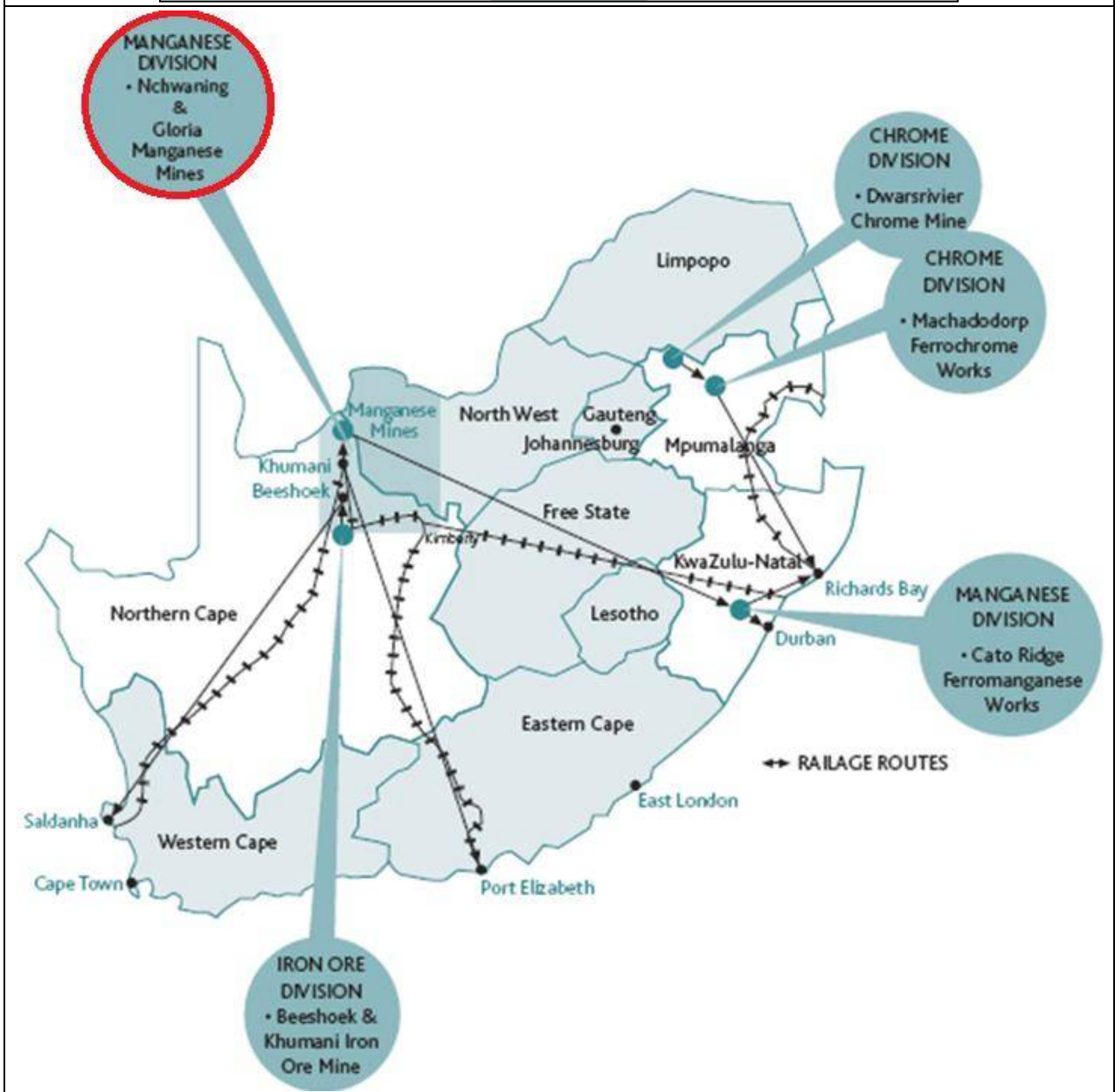
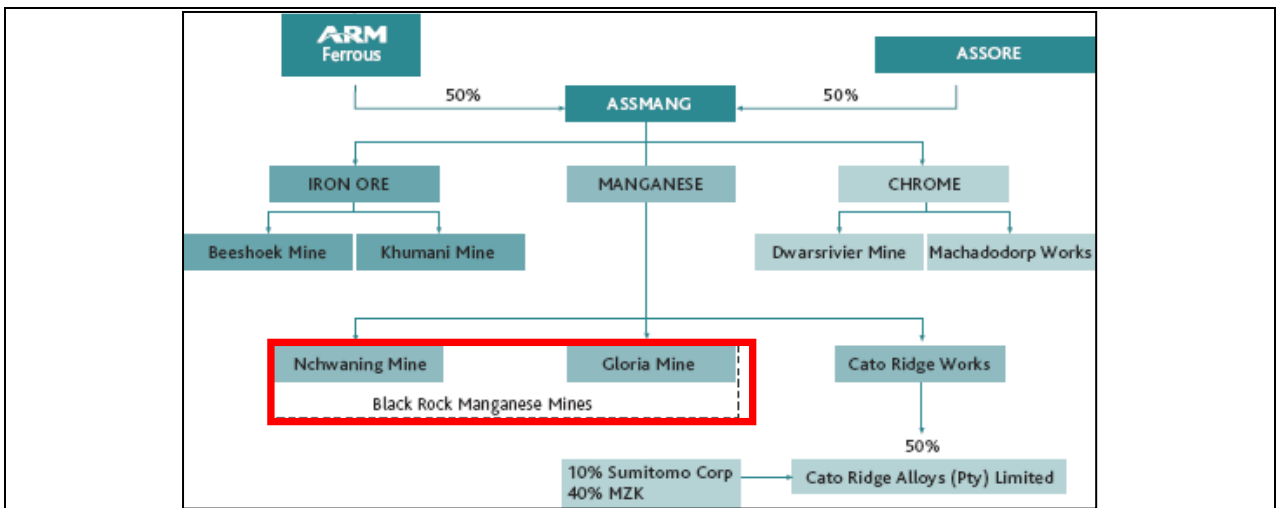
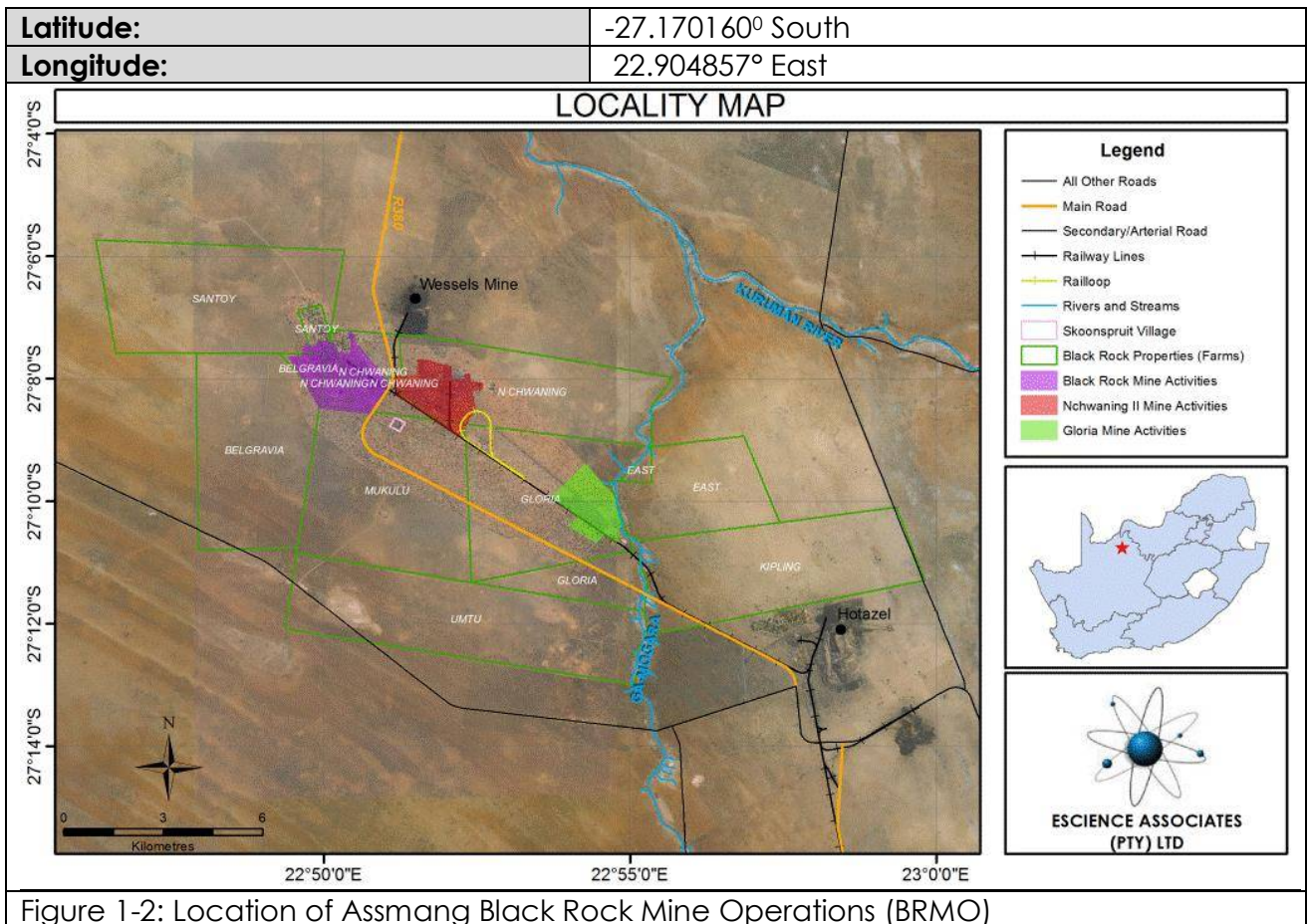


Figure 1-1: Overview of Assmang (Pty) Ltd South African Operations

## 1.2 REGIONAL LOCATION

BRMO is situated in the Northern Cape Province approximately 80 km north-west of the town of Kuruman and 12 kilometres north-west of Hotazel. BRMO falls within the jurisdiction of the John Taolo Gaetsewe District Municipality.



## 1.3 ADMINISTRATIVE INFORMATION

The following section and associated set of tables, provides pertinent administrative information pertaining to BRMO, associated mine lease area, as well as the environmental assessment practitioner who developed the Basic Assessment addendum (Table 1-1 to Table 1-6).

Table 1-1: Name and Address of Mine	
Owner and Name of Mine	Assmang (Pty) Limited, Black Rock Mine Operations
Company Registration	1935/007343/06
Physical Address	Black Rock Mine Operations, Santoy, Northern Cape
Postal Address	PO Box 187 Santoy 8491
Telephone	(053) 751 5201
Fax	(053) 751 5251
Senior General Manager	Pierre Becker

Table 1-2: Details of Acting Environmental Specialist
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Name	Tshifhiwa Ravele
Physical Address	Main Offices Black Rock Mine Operations, Santoy, Northern Cape
Postal Address	PO Box 187 Santoy 8491
Telephone	(053) 751 5302
Fax	(053) 751 5251
Email	tshifhiwar@brmo.co.za

Table 1-3: Details of EAP	
Name of Company	EScience Associates (Pty) Ltd.
Contact Person	Mr. Abdul Ebrahim
Postal Address	PO Box 2950 Saxonwold 2132 JHB
Physical Address	9 Victoria Street Oaklands 2192 JHB
Telephone	(011) 718 6380
Fax	072 268 1119
Email	abdul@escience.co.za
Qualifications	Certified EAP, BEng Honours Environmental Engineering
Curriculum Vitae	Refer to Appendix 1: EAP Curriculum Vitae

Table 1-4: Details of the EAPs		
Name	Qualification	Experience
Abdul Ebrahim	BEng (Hons) Environmental Engineering Certified EAP Member of the Engineering Council of South Africa	18 Years
James Pugin	MSc Archaeology BSc (Hons) Archaeology BA Geography and Archaeology	3 Years

Table 1-5: BRMO Mining Rights, Surface Rights and Title Deed Description Relevant to this application.					
Mine	Farm Name	Title Deed	Surface and Mining Rights	SG 21 Key	
Gloria	Ptn. 1 Gloria 226	No. 506 of 1966	Assmang (Pty) Ltd	C0410000000026600001	

Table 1-6: Project Applicable Servitudes Relevant to this application.		
Mine	Servitude Type	Servitude No.
Gloria	Rail	K38/83S
Gloria	Water pipeline (Sedibeng Water Vaal-Gamagara Supply)	K36/1978S

## **1.4 LAND TENURE AND ADJACENT LAND USE**

Assmang (Pty) Ltd holds both the surface- and mining rights over the properties encompassing the greater BRMO and its constituent mining operations (i.e. Black Rock, Nchwaning and Gloria Mines). The region surrounding BRMO is dominated by mining, industrial and agricultural (extensive livestock production systems) land uses. Land in the immediate vicinity of BRMO that is not used for mining/industrial purposes, is utilised for extensive livestock farming (i.e. sheep, goats, and cattle) and game farming (Refer to Figure 1-3).

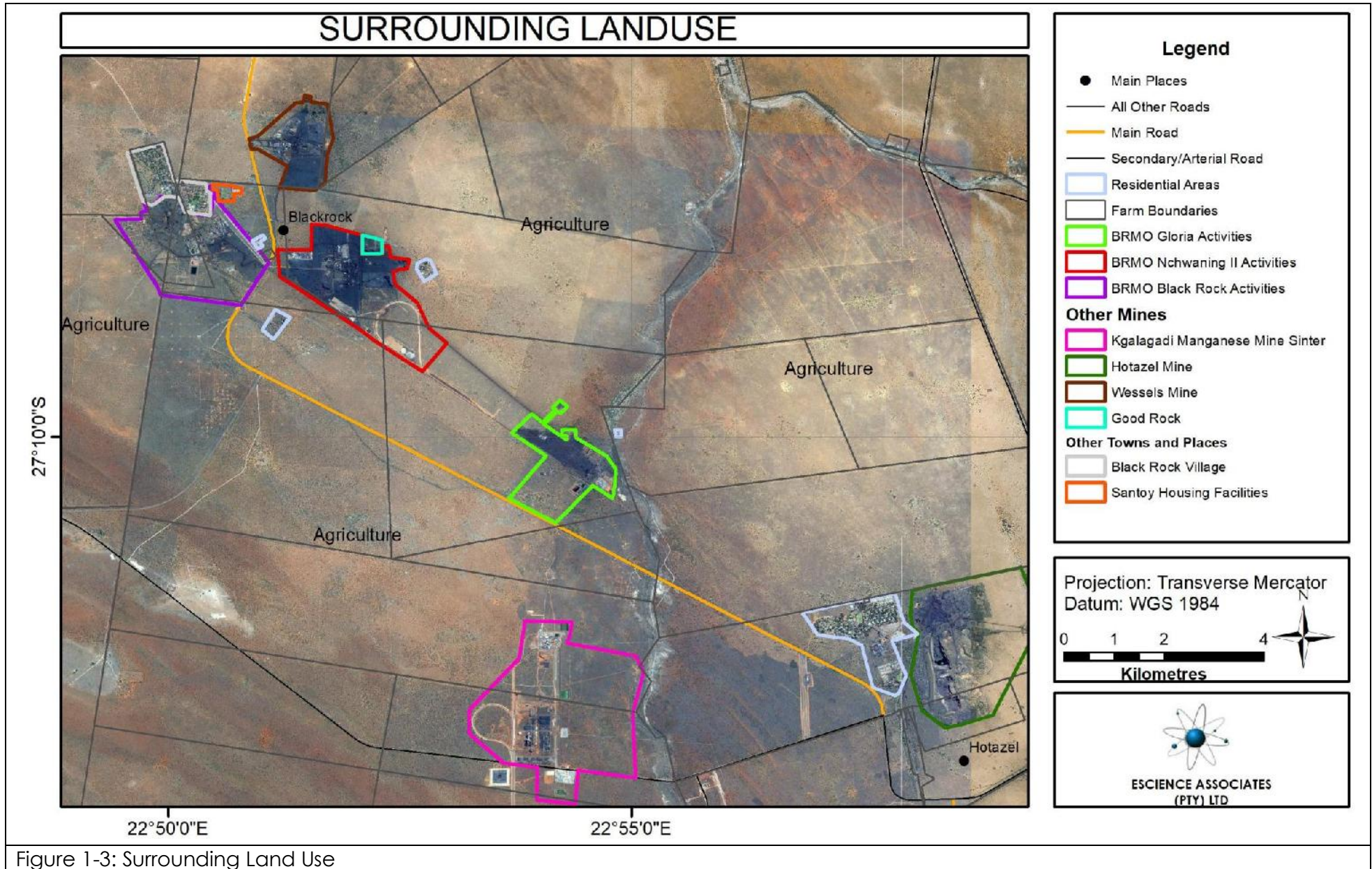


Figure 1-3: Surrounding Land Use

## **2 DESCRIPTION OF PROCESS**

### **2.1 BACKGROUND**

The general descriptions herein are intended to convey a broad understanding of the facilities and activities associated with the Gloria mine. These descriptions are not exhaustive. It should be noted that infrastructure typical of such mining activities is encountered on the site which may not be covered in specific detail herein. These facilities and infrastructure are subject to repairs, general maintenance and upgrading in accordance with standard practices, and thus will be altered from time to time. Such infrastructure is within the footprint of existing, historical, and/or authorised activities.

#### **2.1.1 GLORIA MINE**

Ore is mined at Gloria using underground bord and pillar methods, making use of trackless machines and underground conveyer systems. The thickness of the mined seams in conjunction with underground crushing ensures that waste rock is not unnecessarily brought to surface. At surface, the ore is crushed, and separated into various grades which are stockpiled in preparation for transport off the site. Transport is via rail and road. Operations at Gloria were commissioned in 1975. Gloria complex is comprised of several mining and mining related activities, including:

- Offices, administration, and support facilities
- Engineering services and facilities
- Underground mining access shafts, vent shafts and related infrastructure;
- Ore Processing Plant;
- Ore (including fines) storage and laydown areas;
- Stacking, reclaiming and loading facilities for transportation of ore;
- Current and historical tailings facilities;
- Contractor laydown areas;
- Waste storage and separation facilities;
- Salvage Yards;
- Potable water and process water storage and management facilities;
- A sewage treatment plant;
- Sub-stations and electrical works;
- Bulk fuel storage and refuelling station;
- Explosives magazines;
- Unpaved and paved roads connecting the above and other BRMO operations;
- Other ancillaries typical of such a mining operation.

##### **2.1.1.1 Underground Activities**

Ore is drilled, blasted, and crushed underground before being conveyed to the processing facilities on the surface. Operations underground consist mainly of:

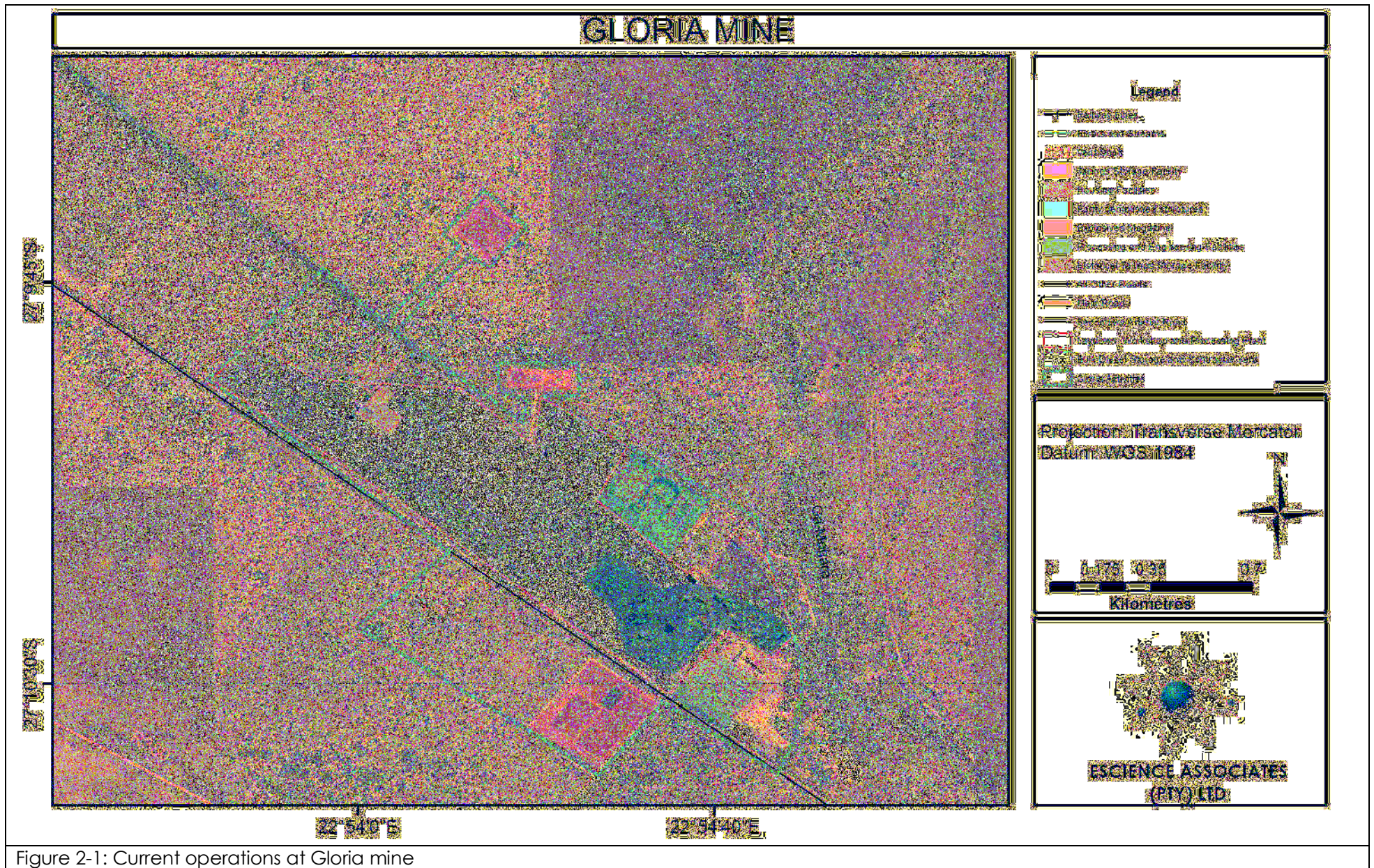
- Drilling
- Blasting

- Crushing
- Handling and loading of ore

Facilities underground include, *inter alia*:

- Water storage and reticulation systems
- Engineering and support facilities
- Fuel storage facilities and re-fuelling bays





## **2.2 SCOPE OF THE PROPOSED ACTIVITIES**

The proposed process water storage capacity expansion at Gloria Mine entails the construction of an additional 2.5ML process water reservoir. Process water from the tailing's management, underground abstraction, and other process water sources is collected in existing process water reservoirs and will be augmented by the installation of a new 2.5ML reservoir to increase storage and buffer capacity.

The proposed upgrade will be undertaken within the existing disturbed footprint of the Gloria mine operations at Black Rock. Basic layout options are illustrated in Figure 2-2. Notably the final location will be confirmed by final detailed design considerations but will be within the existing disturbed footprint and will be in proximity to the locations indicated in Figure 2-2.

# LOCATION AND LAYOUT ALTERNATIVES

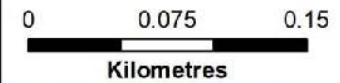


## Legend

- Main Road
- Secondary/Arterial Road
- Gloria Mine Boundary

## Reservoir Layout Alternatives

- Preferred Location and Layout
- Alternative Location and Layout



Projection: Transverse Mercator  
Datum: WGS 1984



Figure 2-2: Proposed Activities (Preferred Layout)

## 2.3 ALTERNATIVES CONSIDERED

The EIA regulations require that alternatives be considered. The regulations define “alternatives”, in relation to a proposed activity, means different means of meeting the general purpose and requirements of the activity, which may include alternatives to the

- (a) property on which or location where the activity is proposed to be undertaken;
  - (b) type of activity to be undertaken;
  - (c) design or layout of the activity;
  - (d) technology to be used in the activity; or
  - (e) operational aspects of the activity;
- and includes the option of not implementing the activity;

A summary of alternatives considered is set out in Table 2-1.

Table 2-1: Breakdown of considerations of alternatives	
Property or location alternatives	<p>The proposed installation is inherently concerned with the Gloria mine activities. Therefore, this cannot practically be located on a different property, nor would that be desirable in comparison to using the already disturbed Gloria footprint.</p> <p>However, alternative locations within the disturbed footprint have been considered. There difference in environmental impact for the different locations is negligible due to the nature of the proposed installation as well as the nature of the area of installation which is all disturbed to approximately the same degree.</p>
Type of activity	<p>The proposed additional 2.5ML process water reservoir will augment the existing infrastructure at Gloria mine. This will improve the mines water management. No reasonable and feasible activity type alternatives have been identified, although various technology alternatives have been identified as set out below.</p>
Design or layout of activity	<p>Layout alternatives have been considered. These are illustrated in Figure 2-2.</p>
Technology of activity	<p>Various technology alternatives have been considered in respect of the storage of process water and potable water. These include the storage of water within the following: concrete reservoirs, metal reservoirs, or lined earth reservoirs.</p>
Operational aspects of activity	<p>The water storage facilities will be operated on a continuous basis.</p>
Not implementing activity “No-Go Alternative”	<p>The possibility of not implementing the expansion is an alternative that has been considered, however, based on the life of mine, the expansion is deemed necessary for the continued operation of the mine.</p>

### **2.3.1 LOCATION AND LAYOUT ALTERNATIVES**

The proposed development is planned to take place within the disturbed area of the current extent of the Gloria Mine boundary. Figure 2-2 illustrates the envelopes for various location and layout alternatives considered.

### **2.3.2 TECHNOLOGY ALTERNATIVES**

The proposed expansion of water storage facilities has triggered the requirement for Environmental Authorisation. Various technology alternatives have been considered in respect of the storage of process water and potable water. These include the storage of water within the following:

- Alternative 1: Reinforced Concrete Reservoirs,
- Alternative 2: Steel Tanks
- Alternative 3: Lined Earth Reservoirs.

Alternative 1 and 2 have similar advantages and disadvantages. Both these options can be built to a high specification of safety and longevity. Both options do not require any excavation of other than that required to establish a compacted footprint for foundations. Concrete facilities require sand and aggregate for producing concrete. Both require minimal maintenance to maintain their integrity.

The use of lined earth dams presents a more significant potential risk in respect of the possibility of liner leakage. This is much less likely with steel or concrete containment facilities. A lined earth dam also requires excavation of soil and aggregate to build the facility in much larger volumes than would be required for a concrete facility. Inspections and maintenance of the lining, which is typically HPDE plastic, exceed those required for the other alternatives.

Alternatives 1 and 2 are thus the preferred alternatives. The final selection will be undertaken during design.

### **2.3.3 NO-GO ALTERNATIVE**

The no-go option refers to the alternative of the proposed development not going ahead at all. The baseline status quo is maintained in this case. In this case, this would mean the continued use of the current aging infrastructure without the benefits of improved storage and buffer capacity.

## **2.4 SITE SELECTION MATRIX**

Using a first principles approach, it is possible to compare location alternatives and undertake a site selection based on:

1. Environmental impacts
2. Socio-economic impacts and constraints
3. Design and operating constraints
4. Capital and running cost considerations

The scores in the adjacent columns, for each alternative, indicate whether the outcome is positive or negative for each aspect/criterion considered:

- +1** indicates a net benefit or significant advantage over the other alternatives
- 1** indicates a net deterioration or significant disadvantage relative to the other alternatives
- 0** neutrality.

A cumulative sum at the bottom of the table indicates the net outcome of all considerations.

Table 2-2: Breakdown of considerations of alternatives					
Consideration	Location 1	Score	Location 2	Score	
Clearing of undisturbed land	No clearing required	+1	No clearing required	+1	
Removal of indigenous vegetation	No removal required	+1	No removal required	+1	
Energy usage for pumping of water	Closer to existing water infrastructure thus less energy required for water reticulation	+1	Further from existing infrastructure thus more energy required for water reticulation	-1	
Visual impact	Within existing mine activities. No change to aesthetic profile expected.	0	Within existing mine activities. No change to aesthetic profile expected.	0	
Noise	Within existing mine activities, no change to noise profile expected.	0	Within existing mine activities, no change to noise profile expected.	0	
Logistics – distance to other infrastructure	Closer to existing water infrastructure	+1	Further from existing infrastructure	-1	
Installation Cost	Lower costs relating to joining existing water supply infrastructure.	+1	Higher costs relating to joining existing water supply infrastructure.	-1	
Running cost	Lower running cost due to lower energy requirements	+1	Higher running cost due to higher energy requirements	-1	
Proximity to access road	Area adjacent to access road	+1	Area infringes on access road	-1	
<b>Outcome</b>	<b>Location 1</b>	<b>+7</b>	<b>Location 2</b>	<b>-3</b>	

### 2.4.1 MOTIVATION FOR PREFERRED SITE LOCATION

Based on the comparison criteria considered, it is clear that the preferred location is the more desirable location in respect of the environmental and other considerations. Although neither of the options is fatally flawed, and the preliminary anticipated environmental impact is similar, a direct comparison of the clearly indicates which option should be the preferred option.

### **3 NEED AND DESIRABILITY**

BRMO proposes to upgrade the water storage infrastructure at Gloria Mine to enable more efficient production including more efficient use and water at the site. The development:

- Will reduce the potential for contamination of water by increasing buffer capacity.
- Will reduce water consumption per tonne of ore processed by improving water management and reducing water loss.
- Reduced water being lost to evaporation.
- May reduce long term dependence on water from the Vaal Gamagara Pipeline due to improved water management.
- Facilitate optimal dewatering of underground operations thus improve operational safety.
- Will reduce potential for process stoppages due to insufficient storage or reticulation capacity.
- Furthermore, this project supports the ultimate need and desirability of the greater BRMO; where the activities being applied for are supportive of the mining operations undertaken.

The proposed development will be undertaken within the existing disturbed footprint and thus there will be no clearing of undisturbed land. The expansion will continue to contribute towards the fiscus and employment within the area.

The expansion affords the potential for improvement in cost of production reduced potential for process stoppages or constrictions and thus contributes towards BRMO remaining a competitive entity in the market.

#### **3.1 MUNICIPAL SPATIAL DEVELOPMENT FRAMEWORK**

BRMO is located within the Gamagara Mining Corridor as identified in the John Taolo Gaetsewe spatial development framework (SDF). According to the SDF the Gamagara Mining Corridor that is currently loosely demarcated as an area stretching from Danielskuil and Postmasburg in the south to Hotazel and Moshaweng in the north, was identified as the area where a lack of infrastructure provision is causing serious constraints in the growth of the mining industry as well as limiting the economic development of the area.

The Gamagara Development Corridor is part of the Strategic Integrated Projects (SIPs). The SIPs are a product of the National Infrastructure Projects (NIP). The NIP was initiated to provide a background on cabinet's decision to establish a body to integrate and coordinate the long-term infra-structure build known as the Presidential Infrastructure Coordinating Council (PICC). The PICC presents the spatial mapping of infrastructure gaps which analyses future population growth, projected economic growth and areas of the country which are not served with water, electricity, roads, sanitation and communication.

Based on this work, eighteen (18) Strategic Integrated Projects (SIPs) have been developed and approved to support economic development and address service delivery in the poorest provinces.

The Gamagara Development Corridor constitutes the SIP 3 (South-Eastern node & corridor development – Increase manganese rail capacity in the Northern Cape and SIP 5 (Saldanha-Northern Cape development corridor - Expansion of iron ore mining production and beneficiation).

It is therefore clear that the sustainable operation and expansion of the BRMO's activities are desirable in terms of both the municipal SDF as well as the national SIPs. The proposed water management upgrade supports the continued competitive and efficient operation of BRMO.



## 4 POLICY AND LEGISLATIVE CONTEXT

This section summarises relevant environmental legislation applicable to the proposed installation.

### 4.1 MINERAL AND PETROLEUM RESOURCES DEVELOPMENT ACT (ACT 28 OF 2002)

BRMO has a new order mining right issued in terms of the MPRDA. The right covers all current operations including the Gloria mine. No amendments are required to the mining right for the proposed Gloria construction of the reservoir.

### 4.2 NATIONAL ENVIRONMENTAL MANAGEMENT ACT (ACT 107 OF 1998)

The National Environmental Management Act (NEMA), 1998 (Act 107 of 1998, as amended) is South Africa's overarching environmental legislation, and contains a comprehensive legal framework to give effect to the environmental rights contained in section 24 of The Constitution. Section 2 of NEMA contains environmental principles that form the legal foundation for sustainable environmental management in South Africa.

#### 4.2.1 EIA & ENVIRONMENTAL AUTHORISATION

NEMA introduces the principle of integrated environmental management that is achieved through the environmental assessment process in Section 24, which stipulates that certain identified activities may not commence without an Environmental Authorisation from the competent authority, in this case. Section 24(1) of NEMA requires applicants to consider, investigate, assess and report the potential environmental impact of these activities. The requirements for the investigation, assessment and communication of potential environmental impacts are contained in the so-called EIA regulations (currently GN. R 982:2014 amended by GN. R 326:2017).

The listed activity relevant to the proposed construction is presented in Table 4-1.

Table 4-1: Listed Activities applicable to the Mine GN. R 983 of 2014 as amended by GN 327 of 2017
<p><b>Activity No. 34:</b> The expansion of existing facilities or infrastructure for any process or activity where such expansion will result in the need for a permit or licence or an amended permit or licence in terms of national or provincial legislation governing the release of emissions, effluent or pollution, excluding—</p> <ul style="list-style-type: none"><li>(iv) where the facility, infrastructure, process or activity is included in the list of waste management activities published in terms of section 19 of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) in which case the National Environmental Management: Waste Act, 2008 applies;</li><li>(v) the expansion of existing facilities or infrastructure for the treatment of effluent, wastewater, polluted water or sewage where the capacity will be increased by less than 15 000 cubic metres per day; or</li><li>(vi) the expansion is directly related to aquaculture facilities or infrastructure where the wastewater discharge capacity will be increased by 50 cubic meters or less per day.;</li></ul> <p><b>REASON:</b> The proposed expansion of process water storage capacity at the site requires an amendment of the existing, or a new, Water Use Licence per S22 of the National Water Act (Act 36 of 1998).</p>

## **4.2.2 DUTY OF CARE**

NEMA also places a duty of care on all persons who may cause significant pollution or degradation of the environment. Specifically, Section 28 of the Act states:

*"28 (1) Every person who causes, has caused or may cause significant pollution or degradation of the environment must take reasonable measures to prevent such pollution or degradation from occurring, continuing or recurring, or, in so far as such harm to the environment is authorised by law or cannot reasonably be avoided or stopped, to minimise and rectify such pollution or degradation of the environment.*

*(2) Without limiting the generality of the duty in subsection (1), the persons on whom subsection (1) imposes an obligation to take reasonable measures, include an owner of land or premises, a person in control of land or premises or a person who has a right to use the land or premises on which or in which-*

- (a) any activity or process is or was performed or undertaken; or*
- (b) any other situation exists, which causes, has caused or is likely to cause significant pollution or degradation of the environment.*

*(3) The measures required in terms of subsection (1) may include measures to-*

- (a) investigate, assess and evaluate the impact on the environment;*
- (b) inform and educate employees about the environmental risks of their work and the manner in which their tasks must be performed in order to avoid causing significant pollution or degradation of the environment;*
- (c) cease, modify or control any act, activity or process causing the pollution or degradation;*
- (d) contain or prevent the movement of pollutants or the causant of degradation;*
- (e) eliminate any source of the pollution or degradation; or*
- (f) remedy the effects of the pollution or degradation."*

Consequently, BRMO must take "reasonable steps" to prevent pollution or degradation of the environment which may result from the existing or proposed mining and related activities. These reasonable steps include the investigation and evaluation of the potential impact and identification of means to prevent an unacceptable impact on the environment, and to contain or minimise potential impacts where they cannot be eliminated.

## **4.3 NATIONAL ENVIRONMENTAL MANAGEMENT: WASTE ACT, 2008 (ACT 59 OF 2008)**

The NEM: WA defines 'Waste' as

*"(a) any substance, material or object, that is unwanted, rejected, abandoned, discarded or disposed of, or that is intended or required to be discarded or disposed of, by the holder of that substance, material or object, whether or not such substance,*

material or object can be re-used, recycled or recovered and includes all wastes as defined in Schedule 3 to this Act; or

(b) any other substance, material or object that is not included in Schedule 3 that may be defined as a waste by the Minister by notice in the Gazette, but any waste or portion of waste, referred to in paragraphs (a) and (b), ceases to be a waste-

(i) once an application for its re-use, recycling or recovery has been approved or, after such approval, once it is, or has been re-used, recycled or recovered;

(ii) where approval is not required, once a waste is, or has been re-used, recycled or recovered;

(vii) where the Minister has, in terms of section 74, exempted any waste or a portion of waste generated by a particular process from the definition of waste; or,

(viii) where the Minister has, in the prescribed manner, excluded any waste stream or a portion of a waste stream from the definition of waste."

S16 of the Act is of particular relevance to this application relate to the proposed upgrade project and requires as follows:

"(1) A holder of waste must, within the holder's power, take all reasonable measures to-

(a) avoid the generation of waste and where such generation cannot be avoided, to minimise the toxicity and amounts of waste that are generated;

(b) reduce, re-use, recycle and recover waste;

(c) where waste must be disposed of, ensure that the waste is treated and disposed of in an environmentally sound manner;

(d) manage the waste in such a manner that it does not endanger health or the environment or cause a nuisance through noise, odour or visual impacts;

(e) prevent any employee or any person under his or her supervision from contravening this Act; and

(f) prevent the waste from being used for any unauthorised purpose.

(3) The measures contemplated in this section may include measures to-

(a) investigate, assess and evaluate the impact of the waste in question on health or the environment;

(b) cease, modify or control any act or process causing the pollution, environmental degradation or harm to health;

(c) comply with any norm or standard or prescribed management practice;

(d) eliminate any source of pollution or environmental degradation; and

(e) remedy the effects of the pollution or environmental degradation."

The provisions for waste management will be of particular significance during the construction and closure phases. No activities requiring a Waste Management Licence have been identified with respect to the proposed upgrade.

## 4.4 AIR QUALITY

Air Quality Management in South Africa has undergone significant changes regarding amendments in Air Quality legislation. With the introduction of the National Environmental Air Quality Act (NEMAQA) (Act 39 of 2004), there has been a shift in Air Quality Management from a sourced based and best practicable means (BPM) approach under the Air Pollution Prevention Act (APPA), Act 45 of 1965) to an ambient air quality management approach whereby responsibilities for air quality management have been devolved down from the national level to the local authority level (district and metropolitan municipalities).

Further to the “duty of care” previously discussed in terms of NEMA, NEMAQA defines air pollution as:

*““air pollution” means any change in the composition of the air caused by smoke, soot, dust (including fly-ash), cinders, solid particles of any kind, gases, fumes, aerosols and odorous substances;”*

NEMAQA is effects-based legislation, with the result that activities that result in atmospheric emissions are to be managed through the setting of environmental health based ambient air quality standards. Facilities with potential impacts on air quality should ideally be assessed not only in terms of its individual contribution, but in terms of its additive contribution to baseline ambient air quality i.e. cumulative effects must be considered.

### 4.4.1 DUSTFALL AND DUST CONTROL REGULATIONS

Section 32 states that the Minister, or MEC, may prescribe measures relating to dust control; these have been published in terms of National Dust Control Regulations GN. R 827 2013. GN. R 827:2013, prescribe general measures for the control of dust in all areas. Dustfall standards for acceptable dustfall rates are given in Table 4-2 for residential and non-residential areas. The regulations also provide a method to be used for measuring dustfall rate and guidelines for locating sampling points. The method to be used is AST D1739:1970, or an equivalent method approved by any internationally recognised body.

Restriction Areas	Dustfall rate (D) (mg/m <sup>2</sup> /day, 30-days average)	Permitted frequency of exceeding fall rate
Residential area	D <600	Two within a year, not sequential months
Non-residential area	600 < D <1200	Two within a year, not sequential months

These regulations are of particular relevance to the construction and decommissioning activities for the proposed construction of the reservoir. This is when potentially significant dust may be generated.

### 4.4.2 NATIONAL NORMS AND STANDARDS

According to S9 of NEMAQA:

*“(1) The Minister, by notice in the Gazette-*

*Assmang (Pty) Ltd - Black Rock Mining Operations –Basic Assessment Report*

(a) must identify substances or mixtures of substances in ambient air which through ambient concentrations, bioaccumulation, deposition or in any other way, present a threat to health, well-being or the environment or which the Minister reasonably believes present such a threat; and

(b) must, in respect of each of those substances or mixtures of substances, establish national standards for ambient air quality, including the permissible amount or concentration of each such substance or mixture of substances in ambient air; ..."

The Minister of Water and Environmental Affairs published limits for ambient air quality in Government Notice № 1210 of 24 December 2009, in terms of S9(1) of NEMAQA, as shown in Table 4-3.

Pollutant	Averaging period	Concentration ( $\mu\text{g}/\text{m}^3$ )	Permissible FOE*
PM <sub>10</sub>	24-hours	75	4
	Annual	40	0
NO <sub>2</sub>	1-hour	200	88
	Annual	40	0
SO <sub>2</sub>	10-min (running)	500	526
	1-hour	350	88
	24-hours	125	4
	Annual	50	0
CO	1-hour	30	88
	8-hours (running) <sup>^</sup>	10	11
Pb	Annual	0.5	0
* FOE – Permitted Frequency of Exceedance in occurrences per year			
<sup>^</sup> Calculated on 1-Hourly averages.			

The Ministry of Water and Environmental Affairs further published limits for PM<sub>2.5</sub> on the 29<sup>th</sup> June 2012, in terms of S9(1) of NEMAQA, as shown in Table 4-4.

Pollutant	Averaging period	Conc. $\mu\text{g}/\text{m}^3$	Permissible FOE*	Compliance date
PM <sub>2.5</sub>	24-hours	<b>60</b>	<b>4</b>	<b>immediate</b>
		40	4	01 January 2016
		25	4	01 January 2030
	Annual	25	0	immediate
		20	0	01 January 2016
		15	0	01 January 2030
* FOE – Permitted Frequency of Exceedance in occurrences per year				

BRMO is required to ensure that the impacts from their proposed development does not result in an impact on ambient air quality exceeding these standards. Given the nature of the proposed activities, it is not foreseen that the emissions related thereto would potentially result in exceedance of these standards.

## 4.5 WATER USE

The National Water Act (NWA), 1998 (Act 36 of 1998), aims to manage national water resources in order to achieve sustainable use of water for the benefit of all water users. This requires that the quality of water resources is protected, and integrated management of water resources takes place.

### 4.5.1 WATER USE LICENCE

In terms of the National Water Act, Act No. 36 of 1998 (NWA) a water use licence is required for:

- (a) taking water from a water resource;*
- (b) storing water;*
- (c) impeding or diverting the flow of water in a watercourse;*
- (d) engaging in a stream flow reduction activity contemplated in section 36;*
- (e) engaging in a controlled activity identified as such in section 37 (1) or declared under section 38 (1);*
- (f) discharging waste or water containing waste into a water resource through a pipe, canal, sewer, sea outfall or other conduit;*
- (g) disposing of waste in a manner which may detrimentally impact on a water resource;*
- (h) disposing in any manner of water which contains waste from, or which has been heated in, any industrial or power generation process;*
- (i) altering the bed, banks, course or characteristics of a watercourse;*
- (j) removing, discharging or disposing of water found underground if it is necessary for the efficient continuation of an activity or for the safety of people;*  
*and*
- (k) using water for recreational purposes.*

The relevant water uses for the proposed reservoir are as follows:

- 21 (b) storing water;
- 21 (g) disposing of waste in a manner which may detrimentally impact on a water resource;

Other provisions of the NWA have been considered, specifically relating to Part 4 (Section 19), which deals with pollution prevention, in particular situations where pollution of a water resource occurs or might occur as a result of activities on land. A person who owns, controls, occupies or uses the land in question is responsible for taking measures to prevent pollution of water resources. If these measures are not taken, the catchment management agency concerned may itself do whatever is necessary to prevent the pollution or to remedy its effects, and to recover all reasonable costs from the persons responsible for the pollution.

#### **4.5.2 GN. R. 704 – REGULATION OF MINE WATER MANAGEMENT**

Regulation 704 of 4 June 1999 was promulgated under the NWA with the primary goal of ensuring water resource protection from inadequate mine water management. The requirements of GN.R. 704 must be seen as the minimum requirements to fulfil the above stated goal and apply to BRMO's activities.

Notably the proposed activities are well outside the 1:100yr flood lines of, and in excess of 100m from, the Gamagara river.

#### **4.6 BIODIVERSITY**

Legislation of potential significance to BRMO's operations includes:

- National Forests Act (Act No. 84 of 1998)
- Conservation of Agricultural Resources Act (Act 43 of 1983)
- National Environmental Management: Biodiversity Act (Act 10 of 2004)

The proposed activities will be undertaken wholly within the disturbed footprint of the Gloria mine. Consequently, the potential for biodiversity impacts and the regulation thereof are of limited significance to the proposed reservoir.

#### **4.7 HERITAGE**

The NHRA aims to promote good management of the national estate, and to enable and encourage communities to nurture and conserve their legacy so that it may be bequeathed to future generations.

The Act protects as cultural heritage resources such as:

- a. Archaeological artefacts, rock structures, structures and sites older than 100 years;
- b. Ethnographic art objects (e.g. prehistoric rock art) and ethnography;
- c. Objects of decorative and visual arts;
- d. Military objects, structures and sites older than 75 years;
- e. Historical objects, structures and sites older than 60 years;
- f. Proclaimed heritage sites;
- g. Graveyards and graves older than 60 years;
- h. Meteorites and fossils; and
- i. Objects, structures and sites of scientific or technological value.

A Heritage Impact Assessment (HIA) is the process to be followed in order to determine whether any heritage resources are located within the area of interest, in particular as per S38(1) any development categorised as:

*(a) the construction of a road, wall, powerline, pipeline, canal or other similar form of linear development or barrier exceeding 300m in length;*

*(b) the construction of a bridge or similar structure exceeding 50m in length;*

*(c) any development or other activity which will change the character of a site -*

*(i) exceeding 5 000m<sup>2</sup> in extent; or*

*(ii) involving three or more existing erven or subdivisions thereof; or.*

*(iii) involving three or more erven or divisions thereof which have been consolidated within the past five years; or*

*(iv) the costs of which will exceed a sum set in terms of regulations by SAHRA or a provincial heritage resources authority;*

*(d) the re-zoning of a site exceeding 10 000m<sup>2</sup> in extent; or*

*(e) any other category of development provided for in regulations by SAHRA or a provincial heritage resources authority,*

*Any person intending to undertake the above must at the very earliest stages of initiating such a development, notify the responsible heritage resources authority and furnish it with details regarding the location, nature and extent of the proposed development.*

The responsible heritage resources authority must, within 14 days of receipt of the notification indicate whether submit an impact assessment report and specify the information to be contained in the report.

The responsible heritage resources authority must then decide:

*(a) whether or not the development may proceed;*

*(b) any limitations or conditions to be applied to the development;*

*(c) what general protections in terms of this Act apply, and what formal protections may be applied, to such heritage resources;*

*(d) whether compensatory action is required in respect of any heritage resources damaged or destroyed as a result of the development; and*

*(e) whether the appointment of specialists is required as a condition of approval of the proposal.*

However, according S38(8) the above does not apply where environmental impact assessment is required, provided that the consenting authority must ensure that the evaluation fulfils the requirements of the relevant heritage resources authority in terms of subsection (3), and any comments and recommendations of the relevant heritage resources authority with regard to such development have been taken into account prior to the granting of the consent.

#### **4.7.1.1 Structures**

Section 34 (1) of the NHRA states that no person may demolish any structure or part thereof which is older than 60 years without a permit issued by the relevant provincial heritage resources authority; where a structure means 'any building, works, device or other facility made by people and which is fixed to land, and includes any fixtures, fittings and equipment associated therewith'.

Alter means 'any action affecting the structure, appearance or physical properties of a place or object, whether by way of structural or other works, by painting, plastering or the decoration or any other means.



#### **4.7.1.2 Archaeology, palaeontology and meteorites**

Section 35(4) of the Act deals with archaeology, palaeontology and meteorites. The Act states that *no person may, without a permit issued by the responsible heritage resources authority (national or provincial):*

- a) *Destroy, damage, excavate, alter, deface or otherwise disturb any archaeological or paleontological site or any meteorite;*
- b) *Destroy, damage, excavate, remove from its original position, collect or own any archaeological or paleontological material or object or any meteorite;*
- c) *Trade in, sell for private gain, export or attempt to export from the Republic any category of archaeological or paleontological material or object, or any meteorite;*
- d) *Bring onto or use at an archaeological or paleontological site any excavation equipment or any equipment that assists in the detection or recovery of metals or archaeological and paleontological material or objects, or use such equipment for the recovery of meteorites; or*
- e) *Alter or demolish any structure or part of a structure which is older than 60 years as protected.*

The above mentioned may only be disturbed or moved by an archaeologist, after receiving a permit from the South African Heritage Resources Agency (SAHRA). In order to demolish such a site or structure, a destruction permit from SAHRA will also be needed.

#### **4.7.1.3 Burial Grounds and Graves:**

According to section 36 (3) (a) *No person may, without a permit issued by South African Heritage Resources Agency (SAHRA) or a provincial heritage resources authority:*

- a) *destroy, damage, alter, exhume or remove from its original position or otherwise disturb the grave of a victim of conflict, or any burial ground or part thereof which contains such graves;*
- b) *destroy, damage, alter, exhume, remove from its original position or otherwise disturb any grave or burial ground older than 60 years which is situated outside a formal cemetery administered by a local authority; or*
- c) *bring onto or use at a burial ground or grave referred to in paragraph (a) or (b) any excavation equipment, or any equipment which assists in the detection or recovery of metals.*

## **4.8 NOISE**

The Noise Control Regulations (R 154 GG 13717 of 10 January 1992) promulgated in terms of ECA, defines:

- *Nuisance noise, as "any sound which disturbs or impairs or may disturb or impair the convenience or peace of any person"*
- *Disturbing noise, as "any noise level which exceeds the zone sound level or, if no zone sound level has been designated, a noise level which exceeds the ambient sound level at the same measuring point by 7 dBA or more".*

Regulation 4 states 'No person shall make, produce or cause a disturbing noise, or allow it to be made, produced or caused by any person, machine, device or apparatus or any combination thereof.' In addition, Section 28 of NEMA imposes a 'duty of care' on every person who may cause significant pollution to prevent such pollution or

degradation from occurring, continuing or recurring, or, in so far as such harm to the environment is authorised by law or cannot reasonably be avoided or stopped, to minimise and rectify such pollution or degradation of the environment.

## **5 DESCRIPTION OF THE RECEIVING ENVIRONMENT**

The area affected is currently within the existing surface activities of the mine and therefore is classified as disturbed land. There is no natural vegetation or undisturbed area within the footprint of the proposed development.

The area of interest is adjacent to the existing surface activities of the mine. The area consists of disturbed land. The area is classified as having natural/indigenous vegetation. The site is **not** located on a shallow water table, dolomitic, sinkhole, or doline areas, seasonally wet soils, unstable rocky slopes or steep slopes with loose soil, dispersive soils, soils with high clay content and or an area sensitive to erosion.

### **5.1 PHYSICAL**

#### **5.1.1 CLIMATE**

There are no South African Weather stations (SAWS) in the region. As such data for Kuruman is used to provide an overview of the climatology of the area. Kuruman is approximately 65km south east of the BRMO operations. The meteorological conditions at this site may not be exactly representative of meteorological conditions at the site, however they are expected to be representative of the general conditions of the region.

#### **5.1.2 WIND**

The observed wind direction and wind speed are dominantly from the north northwest with an average wind speed of 4.1m/s (for the windier months of the year, July to January) (Figure 5-1). The length of the colour-coded line in the wind roses is proportional to the frequency of occurrence of wind blowing from that direction. Wind speed classes are also colour coded and the length of each class/category is proportional to the frequency of occurrence of wind speed.

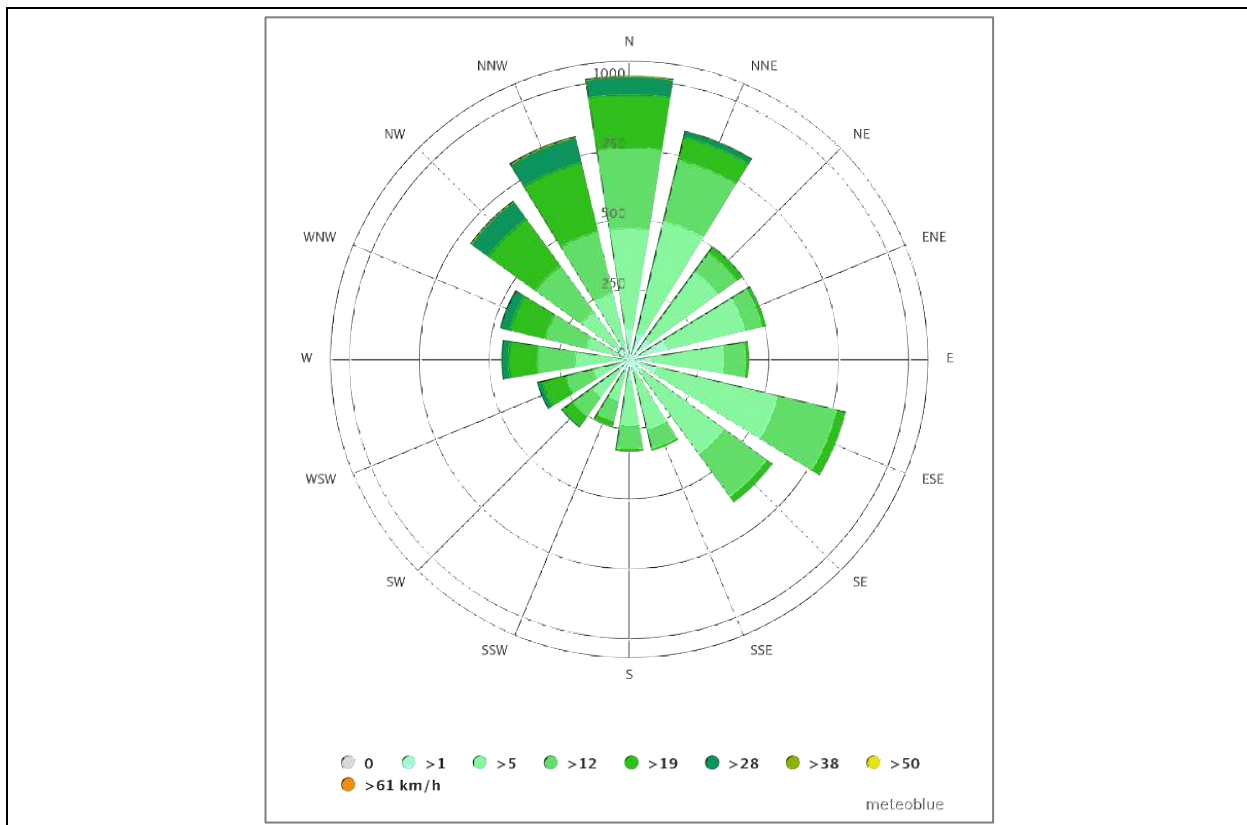


Figure 5-1: Annual wind rose for Kuruman (right) (<https://www.meteoblue.com>)

### 5.1.3 RAINFALL AND TEMPERATURE

Rainfall occurs predominantly in summer and autumn (Dec – Apr) while the least amount of rain falls in the months of winter (May – Sep). The maximum daily temperature occurs in January/December whilst the minimum daily temperature occurs in July/August for Kuruman. The maximum daily temperature occurs in January whilst the minimum daily temperature occurs in July/August (Figure 5-2). Temperatures are high in summer months, with a maximum temperature of around 32°C for Kuruman. Winter temperatures do drop below freezing, however the average minimum temperature for Kuruman is 1°C.

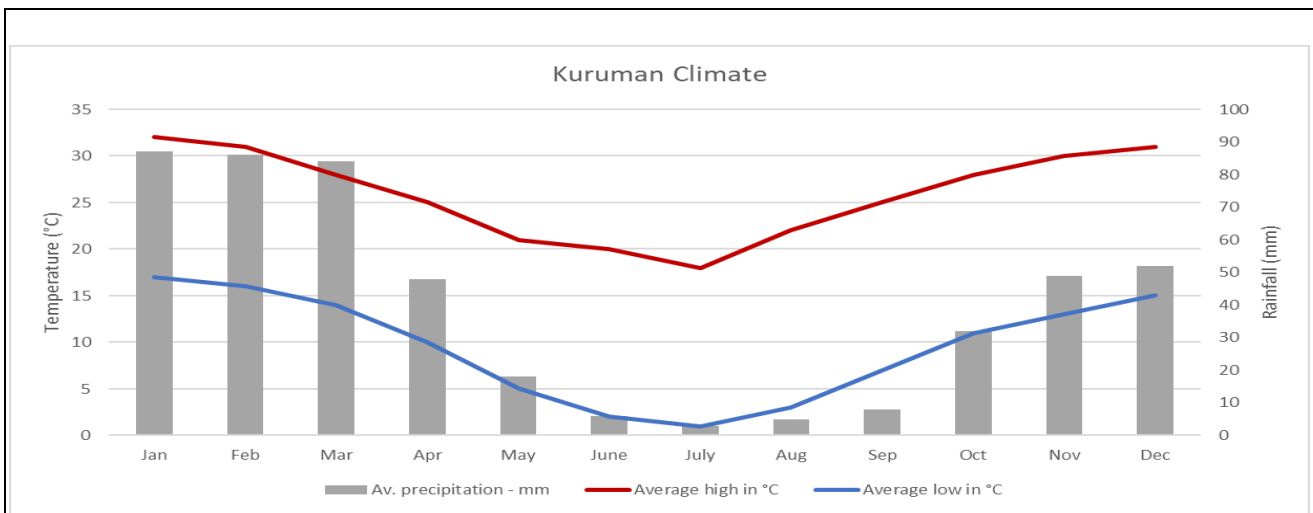


Figure 5-2: Monthly average temperature and rainfall for Kuruman (<https://www.climatedata.eu>)

#### 5.1.4 EVAPORATION AND CLIMATIC WATER BALANCE

The region is arid with relatively high evaporation rates and low rainfall. Although site specific data is not available, the mean annual precipitation versus evaporation rates can be estimated from mean rates from other stations in the area.

Average monthly rainfall and evaporation data for the area was obtained the following stations:

- Kuruman Station (D4E004), approximately 65 km south east.
- Olifantshoek station (D4E002), approximately 85 km north west.

The average monthly and annual data is summarised in Table 5-1.

Month	Kuruman-D4E004		Olifantshoek-D4E002	
	Rainfall (mm)	Evaporation (mm)	Rainfall (mm)	Evaporation (mm)
January	26.4	236.3	19	234.9
Feb	45.1	243.6	27.4	266.6
March	44.9	272.7	32.7	293.2
April	85.6	259	59.6	276.1
May	82.9	208.4	52.1	221.6
June	86.5	161.3	63.3	191.9
July	45.1	122.3	33.4	139.8
August	21.5	113.2	14.1	105.3
September	7.4	82.5	5.3	79.8
October	2.8	99.1	3.2	90.7
November	9.8	131.2	5.5	132.6
December	7.9	188.5	5.8	180.3
<b>Annual</b>	<b>465.9</b>	<b>2118.1</b>	<b>321.4</b>	<b>2212.8</b>
<b>Water Balance*</b>	<b>-1652</b>		<b>-1891</b>	

\* The climatic water balance is calculated as total rainfall - total evaporation.

It is clear from the above that there is a significantly negative climatic water balance for the area. This is significant for the site as it implies that there is limited potential for infiltration and leaching of material disposed, and significant potential for loss of water through evaporation.

#### 5.1.5 SURFACE WATER, TOPOGRAPHY, AND WETLAND/RIPARIAN ZONES

The gradient of the site is flat, and the landform associated with the site is plain. (Refer to Figure 5-4). Notably the Gamagara river runs to the east of the site, however there are no apparent drainage channels to the river. The Gamagara River and its associated wetland/riparian features (including a 32 m buffer zone) can be considered as an ecologically sensitive area in relation to the proposed development activities (Figure

5-3). The proposed activities will be well outside of this area, located approximately 500m west of the Gamagara River.

According to a previous hydrological assessment undertaken at BRMO (African Environmental Development, report number AED0201/2011) site is located in the arid and endorheic Kalahari Basin, it does not have any true surface water, although there are a few areas where quarries have intercepted the water table below a dry streambed and this water was considered to be surface water (with certain reservations). The study further demonstrated that the area where the mine is located is very flat with low slopes and that in general, hardly any actual surface run-off would enter the Gamagara River. If, indeed surface run-off did reach the river, it would rapidly be absorbed by the riverbed and become part of the groundwater environment. Due to the endorheic nature of the Kalahari Basin, any contamination of groundwater would simply remain there for an extremely long time. This places an extended responsibility on BRMO and the other mines operating in this area, as negligent actions on the part of the mines, leading to contamination of groundwater could be responsible for this contamination lingering in the groundwater for potentially millions of years.



Figure 5-3: Gamagara River Wetland Delineation

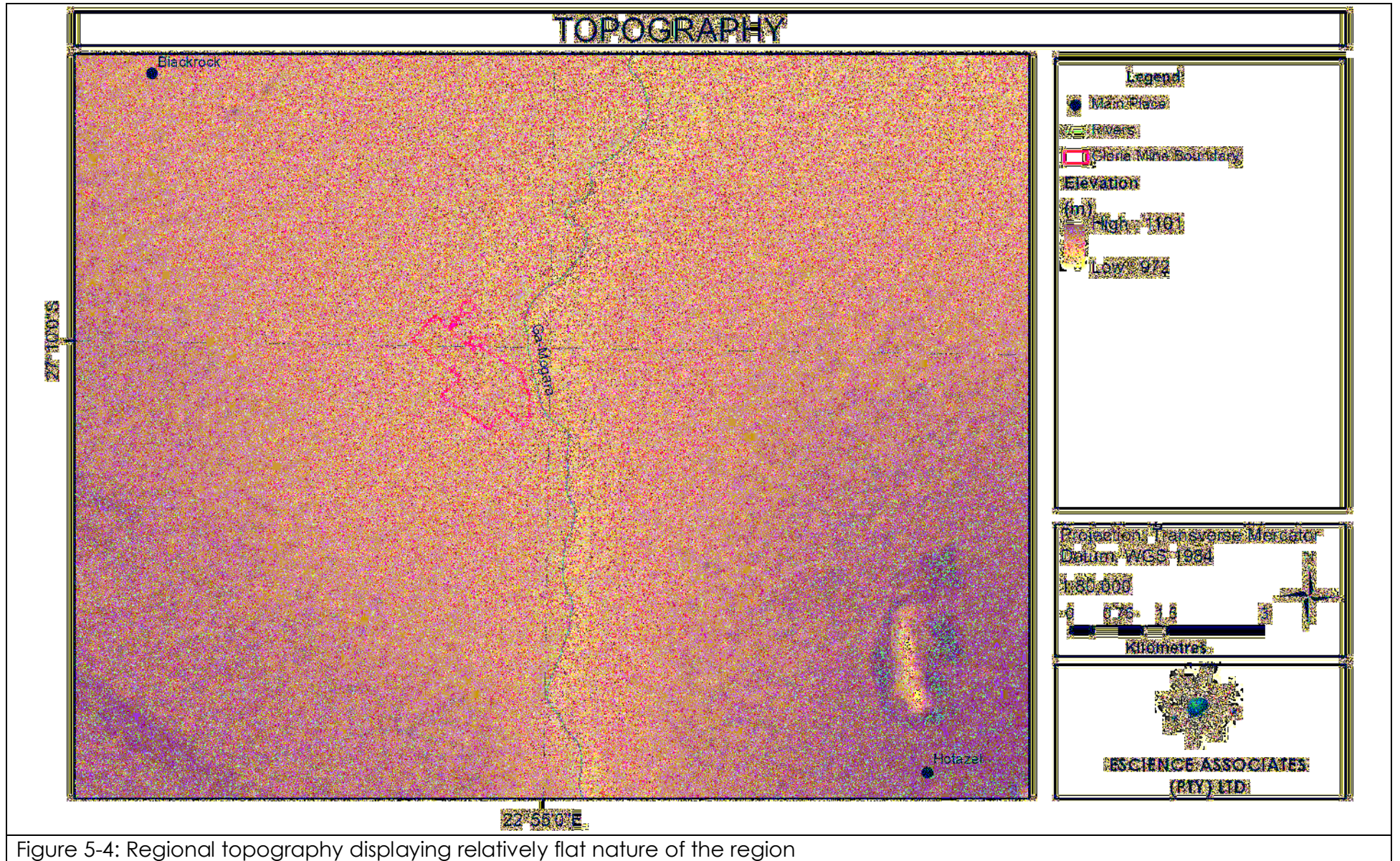


Figure 5-4: Regional topography displaying relatively flat nature of the region

### 5.1.6 GROUNDWATER

Various specialist hydrogeological assessments have been undertaken at BRMO. These include (Geo Pollution Technologies, Report Reference Number: EBR-10-320, Envass report GEO- REP-107-08-19)). The site is underlain by the Kalahari formation. This formation at BRMO consists of a top layer of aeolian sands followed by calcrete of tertiary age. If weathered, the calcareous sands have the favourable characteristics of porosity and permeability. There is limited surface runoff in the Kalahari area (high infiltration rates during precipitation). Due to high porosity and permeability of the Kalahari sands, the calcrete deposit below the top layer of Kalahari sands acts like a "sponge".

The arithmetic average depth of the water levels below surface in the boreholes found at BRMO is 69.6 mbgl with a maximum depth of 110 m below surface. If the depth of the Kalahari formation is considered with the water levels found in the hydrocensus it can be concluded that the farmers tap their water from this weathered/fractured calcrete aquifer. The average recharge values assigned to calcrete is  $\pm 10\%$  of the mean annual precipitations. The water quality from the boreholes sampled is generally good. Considering the geology and hydro-geological characteristics of the site (i.e. the calcrete aquifer used by the surrounding farming communities, as well as boreholes visited during the hydrocensus and used for general farming), the aquifer should be regarded as "Major aquifer system", based on the following:

- Public supply and other purposes: The aquifer play a major role in the livelihood of the farming community surrounding BRMO; and
- Water quality: The water quality is good.

A groundwater specialist deemed there to be a low risk for the users found in the hydrocensus to be impacted by either dewatering, or contaminated groundwater originating from the larger BRMO operations.

### 5.1.7 SOIL

A soil survey was undertaken to assess soil characteristics at BRMO and establish how and to what depth topsoil should be removed to prepare the area, how the removed soil should be stored and treated when reused to remediate the disturbed area after mine closure (Report: Soil Survey and Soil Management Program for the Black Rock Mine Operations Concerning Establishing A New Sinter Plant and Shaft Complex- Prof Claassens 2011). The area around Black Rock, in the vicinity where the mining operations are undertaken, consists mainly of Kalahari sand. Kalahari sand is typically homogenously very deep apart from certain areas which are under laid by calcrete.

Soil fertility is low as is typical of sandy soils. The area for establishment of the proposed sinter plant complex and mine expansion was surveyed by auguring. Apart from the soil on the farm Perth, the soils in the area surveyed were deep yellowish-red sandy soils.

Due to a very low organic content, it was concluded that no specific recommendation on how deep the topsoil should be excavated to prepare the area is necessary. Due to the texture of the soil and the size distribution it will not tend to compact while it is stockpiled thus no special arrangements are necessary for stockpiling.

Although the soil is not very fertile, the stockpiled soils can be used as such to reclaim the disturbed area at mine closure. No fertilizer programme is recommended because it is assumed that the disturbed areas will be re-vegetated with natural grasses which are adapted to the local environment.

The proposed project is wholly contained within disturbed areas. Should there be a requirement to remove soil for construction then this material may be stockpiled in accordance with BRMO topsoil stockpile procedure.

## 5.2 BIOLOGICAL

As previously mentioned, the proposed location within the mine is currently disturbed therefore the proposed reservoir is not expected to appreciably affect surrounding ecosystems. There is no biodiversity of significance within the footprint of the proposed activities. This section however summarises the biodiversity context of the surrounding areas.

The surrounding area as depicted by the threatened ecosystems database within Figure 5-5. The entire area is described as lightly threatened; however, proposed installation area is demarcated as mining/disturbed land.

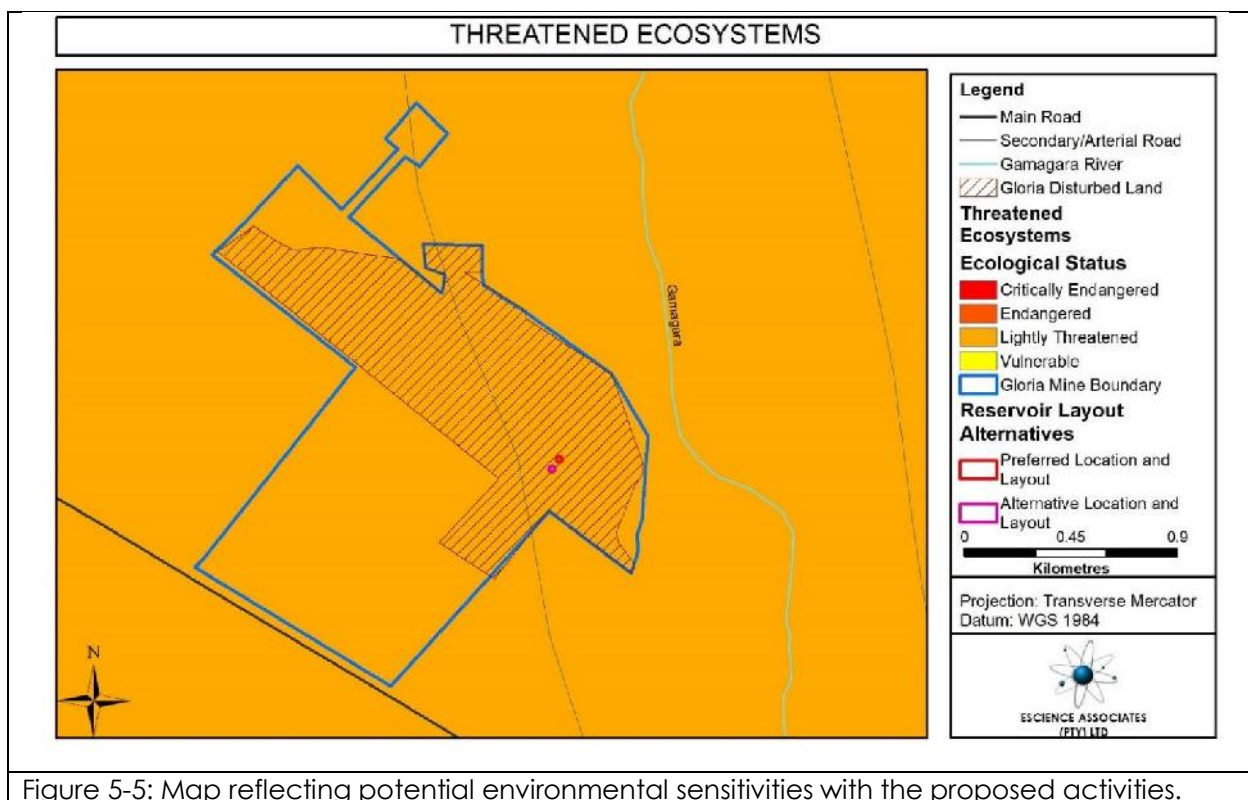


Figure 5-5: Map reflecting potential environmental sensitivities with the proposed activities.

### 5.2.1 BIODIVERSITY

BRMO is located within the Savanna biome and more specifically within the Eastern Kalahari Bushveld Bioregion with some incursion into Kalahari Duneveld, according to a biodiversity assessment undertaken by Scientific Aquatic Services (Report Reference: SAS 211022 dated in May 2011, refer to Figure 5-6). The site consists of transformed land (current and legacy mining and related infrastructure), open veld (presently used rented



to farmers who graze livestock), the Belgravia Game Farm (the only on-site area presently considered of increased sensitivity), and limited riparian habitat (related to the Ga Magara River).

The proposed activities all fall within the existing transformed land of Gloria mine surfaces activities.

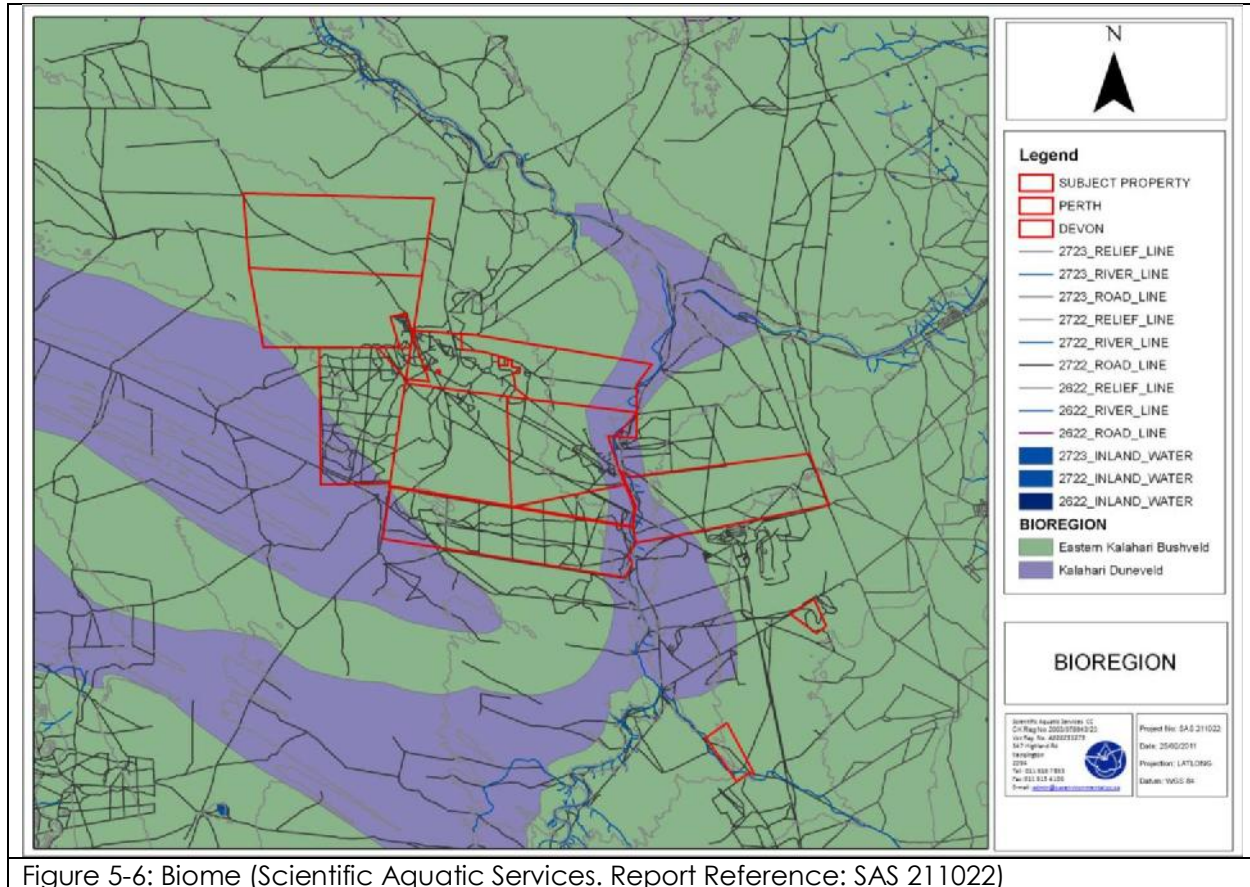


Figure 5-6: Biome (Scientific Aquatic Services, Report Reference: SAS 211022)

### 5.2.2 FLORAL DIVERSITY

BRMO properties falls within the Kalahari Thornveld and Shrub Bushveld veld type, Kathu Bushveld vegetation type and partly in the Gordonia Duneveld vegetation type. Several red data listed (RDL)/protected floral species are documented within the BRMO boundaries, as shown in Table 5-2. The proposed activities however all fall within the existing transformed land of Gloria mine surfaces activities. The site consists of compacted floors overlain with manganese ore and is largely devoid of flora.

Table 5-2: Protected Floral Species Identified on Site



Scientific Name	Common Name	Regulation
<i>Acacia Erioloba</i> (now <i>Vachellia Erioloba</i> )	Camel Thorn	National Forests Act (1998) - Department of Agriculture, Forestry and Fisheries
<i>Acacia Haematoxylon</i> (now <i>Vachellia Haematoxylon</i> )	Grey Camel Thorn	
<i>Boscia albitrunca</i>	Shepherd's Tree	
<i>Ammocaris Coranica</i>	Karoo Lily	Schedule 4 Environmental and Conservation Ordinance No. 19 (1974) - Northern Cape Department of Environment and Nature Conservation
<i>Harpogophytum Procumbens</i>	Devil's Claw	
<i>Babiana Hypogaea</i>	Bobbejaanuintjie	
<i>Boophane Disticha</i>	Bushman's poison bulb	

### **5.2.3 FAUNAL DIVERSITY**

The proposed activities all fall within the existing transformed land of Gloria mine surfaces activities. The site consists of compacted floors overlain with manganese ore. There is no evidence of significant faunal activities within the proposed site.

For the greater BRMO, evidence of the Common Duiker, White-tailed Mongoose, Suricate and Scrub Hare have been noted within the BRMO property boundaries. Field signs (diggings) of Porcupine have also been noted. The old Black Rock mine works could provide suitable habitat for bats, of which there are several threatened species in the Northern Cape. Numerous bird species are observed on the site. Various reptiles including lizards, skinks, snakes and tortoises are noted or expected within the site. The Ga Magara River may also host amphibians. Numerous invertebrates also inhabit the area.

Likely species categorised as threatened, include African White-backed Vulture, Cape Griffon/Cape vulture, European Roller, Ruppell's horseshoe bat, Geoffrey's horseshoe bat, and Darlings horseshoe bat. Red Data Sensitivity Index Score assessment of the property provided a moderate score of 37%, indicating low to medium importance to RDL faunal species conservation within the region.

## **5.3 SOCIO-ECONOMIC**

The proposed reservoir will have limited if any direct social and economic benefits to the area, with the exception of maintaining the sustainable operation of the mine by improving its efficiency and competitiveness. Further social attributes that may typically be affected would include noise, traffic, light pollution, but these will be unchanged.

Improved water management and potential long term reduced reliance on water from the Vaal-Gamagara supply may be of benefit to improved water security.

## **5.4 HERITAGE AND CULTURAL**

### **5.4.1 PALEONTOLOGICAL**

The area of the proposed development is underlain by Cenozoic Kalahari Group and the underlying Griqualand West Basin rocks, Transvaal Supergroup. The Cenozoic group according to Partridge et al., (2006) is one the most widespread bodies containing terrestrial sediments in southern Africa.

The fossil assemblages that occur within the Kalahari are low in diversity as classified by SAHRIS and are generally comprised with the terrestrial plant and animals. The assemblages include bivalves, diatoms, gastropod shells, Ostracods and trace fossils. Additionally, late Cenozoic calcrete may contain bones, horns or even teeth in some cases. Other remains identified include tortoises, crocodiles and amphibians.

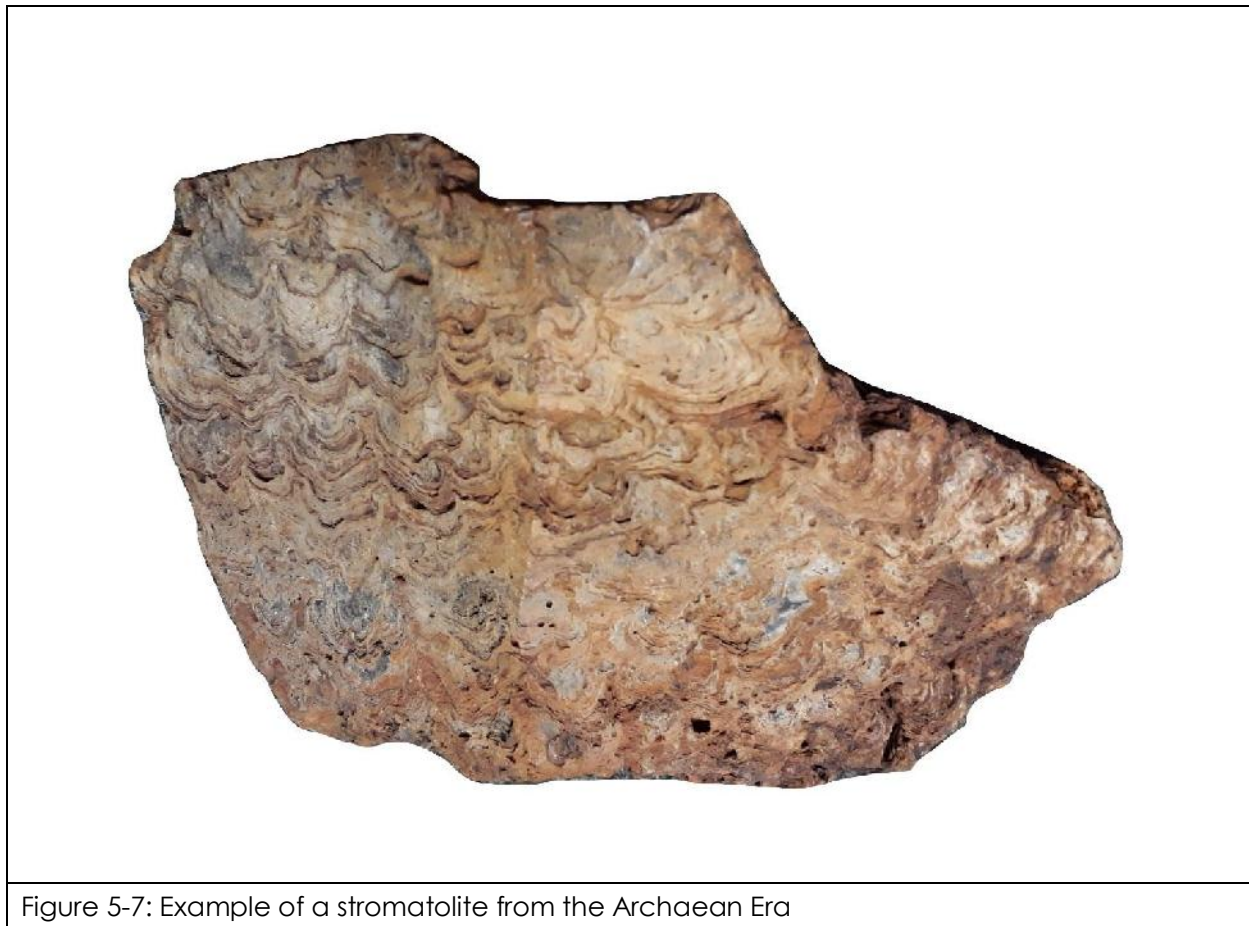


Figure 5-7: Example of a stromatolite from the Archaean Era

Stromatolites or algal growth structures from the dolomites of the Transvaal supergroup are discussed within the Paleontological Impact Assessment as these can be located and identified within the Kalahari Group (refer to Figure 5-7). Almond and Peter (2009) tabulated a list of potential assemblages (refer to Table 5-3) that can be located within the Kalahari and Griqualand West Supergroup.

Table 5-3: Fossil heritage relevant to the Kalahari Group and Griqualand West Super Group (Almond and Peter 2009 as adapted by Butler 2019)

Subgroup/ sequence	Group	Formation	Fossil Heritage	Comment
Tertiary- Quaternary	Kalahari		Terrestrial organisms	Trace fossils, ostracods, bivalves, gastropod shells, diatoms, bones horn corns, mammalian teeth, Tortoise shells
Griqualand West Super Group	Campbell	Ghaapplato (Vgh)	Stromatolites	Cyanobacterial microfossils are present
	Griquastad	Asbestos Hills	Stromatolites	Cynanobacterial microfossils are present

A paleontological specialist undertook an assessment of the proposed site and concluded The proposed water reservoir at Gloria Mine, Black Rock, Hotazel, Northern Cape is completely underlain by the Cenozoic Kalahari Group as well underlying Griqualand West Basin rocks, Transvaal Supergroup. According to the PalaeoMap of South African Heritage Resources Information System, the Palaeontological Sensitivity of the Kalahari Group is low and the Griqualand West rocks of the Transvaal Supergroup are moderate.

This development is recommended for exemption from further Palaeontological studies as the proposed development is smaller than 600 m<sup>2</sup>. Refer to Appendix 4.2.

### 5.4.2 ARCHAEOLOGICAL

A heritage impact assessment was undertaken in 2011 (Archaeos Culture & Cultural report ASBR 2011) which employed literature review, field surveys, review of oral histories. A total of 14 sites with a Stone Age origin were recorded during a specialist archaeological field survey of the Gamagara river basin as illustrated in Figure 5-8. It is, however, envisaged that many more sites could still be uncovered in the area, with fairly dense grass cover in certain areas, as well as red Aeolian sand dunes, rendering them invisible at the time of the study.

The Stone Age sites, as well as the stone tools recorded in the area are similar to the those identified by Kusel in 2009. The sites are characterized by scatters of flakes, cores and more formal tools (Early Stone Age to Middle/Late Stone Age), situated in erosion dongas and quarries, as well as in calcrete formations overlain by red (Aeolian) sand dunes (Figure 5-9). In certain areas the red sand dunes are being eroded (wind erosion), exposing the calcretes and Stone Age artefacts.

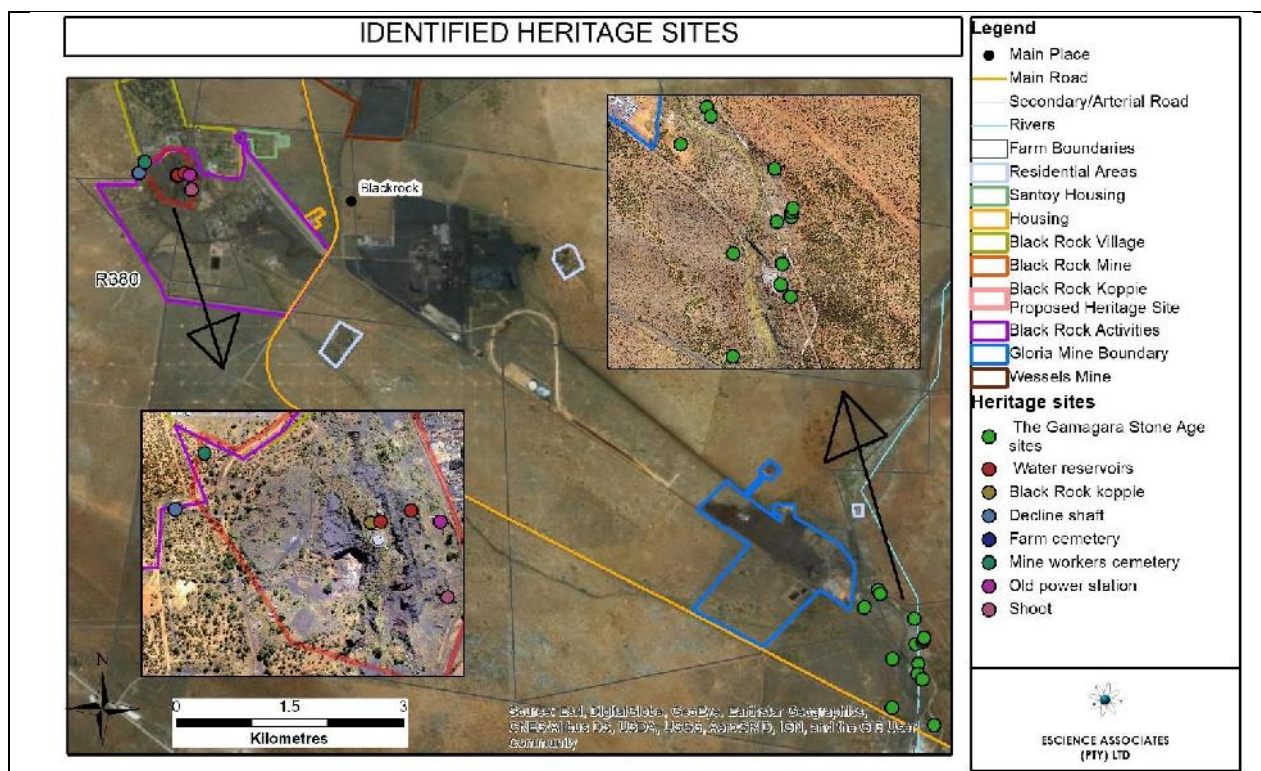


Figure 5-8: Identified archaeological sites



Figure 5-9: Photographic examples of ESA and MSA tools recorded in the Gamagara River

Additionally, further investigation into the area has been undertaken in the past year as sites such as the historical mining activities have been proposed as national heritage site by BRMO and Prof van Vollenhoven. Archaeological sites such as the Black Rock Koppie, mine workers cemetery, old mining infrastructure and stone age sites have all been noted within the proposed heritage management plan for BRMO (refer to Figure 5-8). The BRMO heritage management plan has been established to govern and assist with the management procedures related to archaeological and paleontological heritage.

The area of concern does not intersect with identified sites of archaeological significance. An assessment was undertaken by a heritage specialist which opines that the project may be exempted from doing a Heritage Impact Assessment (HIA). The following is applicable:

- The proposed development is within an area already entirely disturbed by mining activities.
- An HIA was conducted in 2009 as well as between 2014 and 2016 in the wider area and although sites were identified these are not to be impacted on.
- There are no natural vegetation on the site.

The specialist recommends that the developer should however note that due to the nature of archaeological material, such sites, objects or features, as well as graves and burials may be uncovered during construction activities on site. In such a case work should cease immediately and an archaeologist should be contacted as a matter of urgency to assess such occurrences. Refer to Appendix 4.3.

## 5.5 CURRENT LAND USE

The proposed reservoir at Gloria is in support of the continuation of an existing facility. All the alternatives fall within existing mining land use.

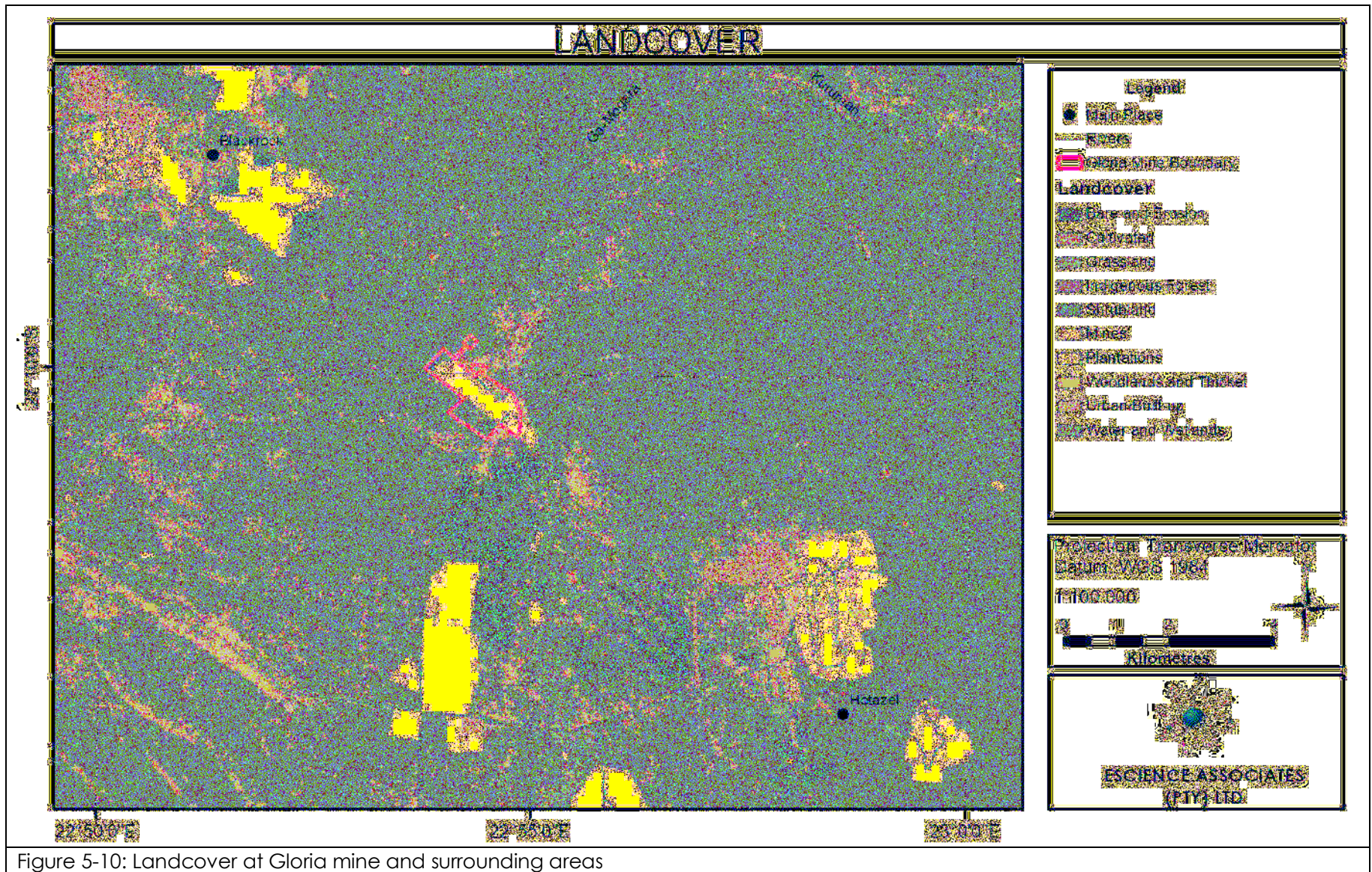


Figure 5-10: Landcover at Gloria mine and surrounding areas

## 6 METHODOLOGY USED TO DETERMINE IMPACTS

The following criteria and methodology are proposed to determine the significance of environmental impacts that may result from the facility.

### 6.1 TYPE/NATURE OF IMPACTS

Potential environmental impacts may either have a positive or negative effect on the environment, and can in general be categorised as follows:

a. Direct/Primary Impacts

Primary impacts are caused directly due to the activity and generally occur at the same time and at the place of the activity.

b. Indirect/Secondary Impacts

Secondary impacts induce changes that may occur as a result of the activity. These types of impacts include all the potential impacts that do not manifest immediately when the activity is undertaken.

c. Cumulative Impacts

Cumulative impacts are those that result from the incremental impact of the activity on common resources when added to the impacts of the other past, present or reasonably foreseeable future activities. Cumulative impacts can occur from the collective impacts of individual minor actions over a period of time and can include both direct and indirect impacts.

### 6.2 DETERMINING SIGNIFICANCE

The following criteria were used to determine the significance of an impact. The scores associated with each of the levels within each criterion are indicated in brackets after each description [like this].

#### 6.2.1 NATURE

Nature (N) considers whether the impact is:

- Positive [- ¼]
- Negative [+1].

#### 6.2.2 EXTENT

Extent (E) considers whether the impact will occur:

- On site [1]
- Locally: within the vicinity of the site [2]
- Regionally: within the local municipality [3]
- Provincially: across the province [4]
- Nationally or internationally [5].

#### 6.2.3 DURATION

Duration (D) considers whether the impact will be:

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- very short term: a matter of days or less [1]
- Short term: a matter of weeks to months [2]
- Medium term: up to a year or two [3]
- Long term: up to 10 years [4]
- Very long term: 10 years or longer [5].

#### **6.2.4 INTENSITY**

Intensity (I) considers whether the impact will be:

- Negligible: there is an impact on the environment, but it is negligible, having no discernible effect [1]
- Minor: the impact alters the environment in such a way that the natural processes or functions are hardly affected; the system does however, become more sensitive to other impacts [2]
- Moderate: the environment is altered, but function and process continue, albeit in a modified way; the system is stressed but manages to continue, although not with the same strength as before [3]
- Major: the disturbance to the environment is enough to disrupt functions or processes, resulting in reduced diversity; the system has been damaged and is no longer what it used to be, but there are still remaining functions; the system will probably decline further without positive intervention [4]
- Severe: the disturbance to the environment destroys certain aspects and damages all others; the system is totally out of balance and will collapse without major intervention or rehabilitation [5].

#### **6.2.5 PROBABILITY**

Probability (P) considers whether the impact will be:

- Unlikely: the possibility of the impact occurring is very low, due either to the circumstances, design or experience [1]
- Likely: there is a possibility that the impact will occur, to the extent that provisions must be made for it [2]
- Very likely: the impact will probably occur, but it is not certain [3]
- Definite: the impact will occur regardless of any prevention plans, and only mitigation can be used to manage the impact [4].

#### **6.2.6 MITIGATION OR ENHANCEMENT**

Mitigation (M) is about eliminating, minimising or compensating for negative impacts, whereas enhancement (H) magnifies project benefits. This factor considers whether –

- A negative impact can be mitigated:
- Unmitigated: no mitigation is possible or planned [1]
- Slightly mitigated: a small reduction in the impact is likely [2]
- Moderately mitigated: the impact can be substantially mitigated, but the residual impact is still noticeable or significant (relative to the original impact) [3]
- Well mitigated: the impact can be mostly mitigated, and the residual impact is negligible or minor [4]

A positive impact can be enhanced:

- Unenhanced: no enhancement is possible or planned [1]
- Slightly enhanced: a small enhancement in the benefit is possible [2]

- Moderately enhanced: a noticeable enhancement is possible, which will increase the quantity or quality of the benefit in a significant way [3]
- Well enhanced: the benefit can be substantially enhanced to reach a far greater number of receptors or recipients and/or be of a much higher quality than the original benefit [4].

### 6.3 CALCULATING IMPACT SIGNIFICANCE

The table below summarises the scoring for all the criteria.

CRITERION	SCORES					
	- ¼	1	2	3	4	5
<b>N-nature</b>	positive	negative	-	-	-	-
<b>E-extent</b>	-	site	local	municipal	provincial	national
<b>D-duration</b>	-	very short	short	moderate	long	very long
<b>I-intensity</b>	-	negligible	minor	moderate	major	severe
<b>P-probability</b>	-	unlikely	likely	Very likely	definite	-
<b>M-mitigation</b>	-	none	slight	moderate	good	-
<b>H-enhancement</b>	-	none	slight	moderate	good	-
<b>R-reversibility</b>	-	none	slight	moderate	good	-

Impact significance is a net result of all the above criteria. The formula proposed to calculate impact significance (S) is:

- For a negative impact:  $S = N \times (E+D) \times I \times P \div \frac{1}{2}(M+R)$ ; and
- For a positive impact:  $S = N \times (E+D) \times I \times P \times (H)$ .

Negative impacts score from 2 to 200. Positive impacts score from - ½ to -200.

### 6.4 UNDERSTANDING IMPACT SIGNIFICANCE

The following is a guide to interpreting the final scores of an impact (for negative impacts):

Final score (S)	Impact significance	
0 – 10	Negligible	The impact should result in no appreciable damage to the environment, except where it has the opportunity to contribute to cumulative impacts
10 – 20	Low	The impact will be noticeable but should be localized or occur over a limited time period and not cause permanent or unacceptable changes; it should be addressed in an EMP and managed appropriately.
20 – 50	Moderate	The impact is significant and will affect the integrity of the environment; effort must be made to mitigate and reverse this impact; in addition, the project benefits must be shown to outweigh the impact.
50 – 100	High	The impact will affect the environment to such an extent that permanent damage is likely, and recovery will be slow and difficult; the impact is unacceptable without real mitigation or reversal plans; project benefits must be proven to be very substantial; the approval of the project will be in jeopardy if this impact cannot be addressed.
100 – 200	severe	The impact will result in large, permanent and severe impacts, such as, sterilising of essential environmental resources, local species extinctions, eco-system collapse; project alternatives that are substantially different should be considered, otherwise the project should not be approved.

## 6.5 ASSESSMENT OF POTENTIALLY SIGNIFICANT IMPACTS

It is important to note that the development will take place in the existing disturbed footprint of the Gloria mine, and that the alternatives considered are all within this footprint means that the impact assessment for the various alternatives is largely the same. Therefore, a single impact assessment has been presented herein to avoid unnecessary duplication.

### 6.5.1 CONSTRUCTION PHASE

This relates to the establishment of the proposed facilities, and consists in the main of:

- removal of existing surface materials, which comprises primarily of low-grade ore.
- Levelling and compacting of the sand below.
- Construction of the reservoir

#### 6.5.1.1 Waste Generation, Storage, and Disposal

Nominal volumes of construction and installation waste will be generated during the establishment of the proposed activities and associated infrastructure. The waste will predominantly comprise of building rubble, packaging and fabrication waste/s. Steel and electric cabling waste is also expected from installation. It is likely that most, if not all, of the waste generated would be non-hazardous/general waste. All non-hazardous wastes which are cannot be recycled will disposed of to the existing licenced BRMO landfill. Recyclable wastes will be recycled where they cannot be re-used at BRMO. Waste will be stored in sealed bins and skips prior to transfer to the landfill.

Hazardous wastes will be stored in bunded facilities prior to being transported to the BRMO hazardous waste transfer facility for collection and disposal by waste disposal contractors at licenced disposal facilities. Hazardous waste will mainly consist of used oil. Minor amounts of hazardous wastes are expected to be generate.

Note: Impacts of onsite waste storage on soil and ground water quality are assessed under 'soil and ground water quality

<b>Nature (N)</b>	Potential negative impact on water resource quality	1
<b>Extent (E)</b>	Site: These activities will all occur within BRMO. BRMO operates a licensed general landfill that will receive all unrecyclable general waste.	1
<b>Duration (D)</b>	Long term: Waste will be permanently placed in landfill. Besides the landfill, impact on soil and water is only expected in the event of incorrect storage or transportation of waste.	4
<b>Intensity (I)</b>	Negligible: Natural processes or functions are not expected to be appreciably affected. Contaminants that have very limited possibility of entering groundwater and would be in small quantities and of limited risk.	1
<b>Probability (P)</b>	very Likely: The potential for incorrect storage of waste without proper mitigation and management in place is high.	4

<b>Mitigation (M)</b>	Can be well mitigated: Providing adequate waste storage skips and bins, which will largely eliminate the potential for soil and groundwater contamination. Disposal will be to the licenced BRMO landfill.		4
<b>Reversibility (R)</b>	Slightly reversible: Groundwater remediation is possible but is a lengthy and costly process.		3
<b>Significance Rating without Mitigation - Negative Impact (S)</b>	$N \times (E+D) \times I \times P \div \frac{1}{2}(M+R)$	<b>Low</b>	10
<b>Significance Rating with Mitigation - Negative Impact (S)</b>	$N \times (E+D) \times I \times P \div \frac{1}{2}(M+R)$	<b>Negligible</b>	6

#### 6.5.1.1.1 Mitigation/Management

The contractors will be required to manage waste in accordance with BRMO's waste management procedure, and BRMO's Spill Management and Specifications for Bund Walls Procedure. Construction personnel will be trained in accordance with BRMO's waste management procedure.

Construction waste which can be practically recycled will be sorted and stored for that purpose. In general, the National Norms and Standards for Storage of Waste will provide a guideline for waste storage. Hazardous waste will be stored in banded facilities built in accordance with BRMO's bund specification procedure prior to transfer to the hazardous waste transfer facility or collection by a suitable service provider for recycling or disposal.

#### 6.5.1.2 Soil, Surface Water, and Groundwater Quality

The inappropriate storage, management and handling of waste, fuel or lubricants during the construction period could result in potentially negative impacts on soil and groundwater quality; where contaminants from spillages or inadequate storage of such could enter the soil, surface water, and groundwater environment, through the infiltration of contaminated surface run-off. Poorly managed construction vehicle maintenance procedures and wash bays too may impact negatively on groundwater quality. Contamination of this nature, associated with the construction phase of a project of this magnitude, would typically be hydrocarbon based (i.e. petrol, diesel and oil leaks and spillages to bare soil surfaces). Given the climate of the area, small hydrocarbon spills are expected to be adsorbed by soil and thus are not expected to migrate significantly. Thus, should readily be cleaned up by removal of the affected soil. Temporary concrete batching plants can also impact negatively on groundwater resource quality if inadequately managed.

Table 6-4: Impacts on groundwater and surface water quality (Construction)		
<b>Nature (N)</b>	Negative impact on water resource quality	1
<b>Extent (E)</b>	Locally: Localised to the site and immediate surrounds.	2

Table 6-4: Impacts on groundwater and surface water quality (Construction)		
<b>Duration (D)</b>	Long term: Only if a plume enters groundwater will it be a long process to remediate contaminated groundwater.	4
<b>Intensity (I)</b>	Minor: Natural processes or functions are not expected to be appreciably affected mainly due to the low quantities.	2
<b>Probability (P)</b>	Unlikely: The probability of a significant spill taking place during construction is low. The probability of significant contamination from waste materials is also low as the majority of wastes are not hazardous. Hazardous waste such used oil and lubricants will in any case be stored in sealed drums/containers.	1
<b>Mitigation (M)</b>	Well mitigated: Providing adequate bunded facilities, for storage will largely reduce the potential for soil and groundwater contamination.	4
<b>Reversibility (R)</b>	Slightly reversible: Groundwater remediation is possible but is a lengthy and costly process.	2
<b>Significance Rating without Mitigation - Negative Impact (S)</b>	$N \times (E+D) \times I \times P \div \frac{1}{2}(M+R)$	<b>Negligible</b> 8
<b>Significance Rating with Mitigation - Negative Impact (S)</b>	$N \times (E+D) \times I \times P \div \frac{1}{2}(M+R)$	<b>Negligible</b> 4

Table 6-5: Impacts on soil (Construction)		
<b>Nature (N)</b>	Direct Negative impact on the site	1
<b>Extent (E)</b>	On site	1
<b>Duration (D)</b>	Short term: Potential impact addressed immediately	2
<b>Intensity (I)</b>	Minor: Natural processes or functions are not expected to be appreciably affected	2
<b>Probability (P)</b>	Unlikely: The probability of a significant spill taking place during construction is low. The probability of significant contamination from waste materials is also low as the majority of wastes are not hazardous. Hazardous waste such used oil and lubricants will in any case be stored in sealed drums/containers.	1
<b>Mitigation (M)</b>	Well mitigated: Providing adequate bunded facilities, for storage will largely reduce the potential for contamination. There are many measures that can be implemented in order to prevent soil and groundwater contamination.	4

Table 6-5: Impacts on soil (Construction)		
<b>Reversibility (R)</b>	Moderately reversible: the impact requires that effort is taken immediately after the impact	3
<b>Significance Rating without Mitigation - Negative Impact (S)</b>	$N \times (E+D) \times I \times P \div \frac{1}{2}(M+R)$	<b>Negligible</b> 3
<b>Significance Rating with Mitigation - Negative Impact (S)</b>	$N \times (E+D) \times I \times P \div \frac{1}{2}(M+R)$	<b>Negligible</b> 1.7

#### 6.5.1.2.1 Mitigation/Management

The remediation of significantly contaminated groundwater can be a long, arduous and costly process. Any such remediation efforts may also be likely to leave significant residual contamination, despite any such remediation attempts (dependant on the nature and extent of the contamination itself). As such, the applicant's management actions should focus on the prevention of any such potential hydrocarbon contamination, rather than post impact remediation thereof. A comprehensive range of effective, proven, mitigation measures will be implemented in this regard, which are in principle as follows:

- All hazardous substances to be stored within appropriately sized, impermeable, bund walls built in accordance with the BRMO bund specifications;
- Hazardous substances spill kits to be readily available at all points where hazardous substances will be stored and/or transferred;
- Vehicle and plant servicing to only take place in dedicated service yards on impermeable surfaces coupled with appropriate 'dirty' water containment systems/sumps and oil/water separators; and
- Drip trays to be appropriately placed under vehicles and plant that over-night on bare soil surfaces.
- Where hydrocarbon spills occur, the soil is to be removed for treatment or disposal as soon as practical.

The contractors will be required to manage hazardous materials in accordance with BRMO's Hazardous Chemical Substances Procedure, and BRMO's Spill Management and Specifications for Bund Walls Procedure. Construction personnel will be trained in accordance with procedures.

Construction waste which can be practically recycled will be sorted and stored for that purpose. In general, the National Norms and Standards for Storage of Waste will provide a guideline for waste storage. Hazardous waste will be stored in banded facilities built in accordance with BRMO's bund specification procedure prior to transfer to the hazardous waste transfer facility or collection by a suitable service provider for recycling or disposal.

#### 6.5.1.3 Air quality – Dust Generation

During construction, the undertaking of ground preparation and civil works may lead to the generation of vehicle and wind entrained dust. Although the impact is likely to be localised to the site due the size of the area to be worked, dust suppression techniques such as wetting roads, or application of dust palliatives, may be required. Other emissions

during construction, such as construction vehicle and machinery exhausts are not anticipated to be significant.

The impact will be of a low intensity and isolated to the site and its immediate surrounds. Effective mitigation, in the form of accepted dust suppression techniques, can be applied, but will not likely mitigate the potential occurrence of the impact in its entirety.

<b>Nature (N)</b>	Negative impact on ambient air quality.		1
<b>Extent (E)</b>	Locally: Localised to the site and immediate surrounds		2
<b>Duration (D)</b>	Short term: Construction phase (conservatively anticipated for up to 6 months)		2
<b>Intensity (I)</b>	Minor: Natural processes or functions will hardly be affected		2
<b>Probability (P)</b>	Likely: There is a possibility that the impact will occur, to the extent that provisions must be made for it [2]		2
<b>Mitigation (M)</b>	Well mitigated: Effective dust suppression methods readily available		4
<b>Reversibility (R)</b>	Irreversible: Not practical to reverse the impact once it has occurred		1
<b>Significance Rating without Mitigation - Negative Impact (S)</b>	$N \times (E+D) \times I \times P \div \frac{1}{2}(R)$	<b>Low</b>	16
<b>Significance Rating with Mitigation - Negative Impact (S)</b>	$N \times (E+D) \times I \times P \div \frac{1}{2}(M+R)$	<b>Negligible</b>	6.4

#### 6.5.1.3.1 Mitigation/Management

BRMO will institute effective dust suppression measures on all un-surfaced access roads for the duration of the construction phase. Compliance thereto will be measures against the National Dust Control Regulations (GN. R 827 2013) and associated thresholds.

#### 6.5.1.4 Noise

The following activities will generate noise during the construction phase of the proposed plant and roads:

- Earthmoving equipment at the foot-print area (if required);
- Levelling and compacting the installation area;
- Hauling of construction materials to, and waste materials from, the specific area;
- Building and installation activities during construction

Noise during installation and assembly of proposed infrastructure and equipment is expected to have no significant impact outside of the site provided that the recommended mitigatory measures are implemented. In the context of existing noise profile of the site and surrounds noise from construction is not expected to have a significant impact.

Table 6-7: Noise impacts (Construction)			
<b>Nature (N)</b>	Negative impact on site		1
<b>Extent (E)</b>	On site: Localised to the site		1
<b>Duration (D)</b>	Short term: Construction phase (conservatively anticipated for up to 6 months)		2
<b>Intensity (I)</b>	Minor: The facility is within a mining area and there are no nearby noise receptors outside of the facility		2
<b>Probability (P)</b>	Likely: It is likely that noise will be generated to an extent that mitigation measures should be considered		2
<b>Mitigation (M)</b>	Well mitigated: To be limited to normal working hours, in accordance with locally applicable by-laws.		4
<b>Reversibility (R)</b>	Irreversible: The status quo will return to the previous status quo upon completion of construction.		1
<b>Significance Rating without Mitigation - Negative Impact (S)</b>	$N \times (E+D) \times I \times P \div \frac{1}{2}(R)$	<b>Low</b>	12
<b>Significance Rating with Mitigation - Negative Impact (S)</b>	$N \times (E+D) \times I \times P \div \frac{1}{2}(M+R)$	<b>Negligible</b>	4.8

#### 6.5.1.4.1 Mitigation/Management

Construction related activities should be limited to normal working hours.

#### 6.5.1.5 Biodiversity

The entire set of proposed activities will be undertaken within an existing disturbed footprint. All the alternative layouts and locations considered are within the Gloria mine surface activities footprint. There will be no clearing of natural vegetation.

Table 6-8: Impacts on biodiversity (Construction)- Alternative		
<b>Nature (N)</b>	Negative impact on vegetation	1
<b>Extent (E)</b>	Existing Site only. No new disturbed areas.	1
<b>Duration (D)</b>	Very long term. The mine has a predicted lifespan past 2038.	5



<b>Intensity (I)</b>	Negligible: No new disturbed areas.		1
<b>Probability (P)</b>	Likely: The probability of a clearance is likely if alternative 2 is selected as the preferred location.		1
<b>Mitigation (M)</b>	None. Mitigation not required.		1
<b>Reversibility (R)</b>	Reversible: Site will be rehabilitated to upon decommissioning based on the existing mine wide EMPr for BRMO, and the EMPr developed as part of this Basic Assessment.		4
<b>Significance Rating without Mitigation - Negative Impact (S)</b>	$N \times (E+D) \times I \times P \div \frac{1}{2}(M+R)$	<b>Negligible</b>	2.4
<b>Significance Rating with Mitigation - Negative Impact (S)</b>	$N \times (E+D) \times I \times P \div \frac{1}{2}(M+R)$	<b>Negligible</b>	2.4

#### 6.5.1.6 Socioeconomics

During construction, there may be employment created for the construction industry. However, the scale of the project is such that contractors are likely to use existing employees. There will however be socio economic benefits related to the supply of materials and support necessary for the construction process.

The impact will be of a minor intensity and is expected to have a municipal extent. Effective enhancement, in the form of the proponent making a concerted effort to employ workers from the surrounding areas, can be applied where it is practical.

<b>Nature (N)</b>	Positive impact on job creation.		-0.25
<b>Extent (E)</b>	Local: Expected to have an impact beyond the vicinity of the site.		2
<b>Duration (D)</b>	The duration of the construction will be short term		2
<b>Intensity (I)</b>	Minor: The number of jobs created will not be large and these jobs will be temporary. It is likely that contractors with existing employees will largely be used.		2
<b>Probability (P)</b>	Likely: Impact will likely occur		2
<b>Enhancement (H)</b>	Moderate enhancement, in the form of the proponent making a concerted effort to employ workers from the surrounding areas, can be applied.		3
<b>Significance Rating -Positive Impact (S)</b>	$N \times (E+D) \times I \times P \times (H).$	<b>Low</b>	-12

### **6.5.1.6.1 Enhancement**

Effective enhancement, in the form of the proponent making a concerted effort to employ workers from the surrounding areas, can be applied where practical.

## **6.5.2 OPERATIONAL PHASE**

The operational phase of the project encompasses all those aspects associated with the proposed facility, including:

- Pumping of water to and from the reservoir.
- The storage process water.
- Inspections, maintenance and repairs where applicable.

The aforementioned operational activities have the potential to impact in respect of one or more of the following aspects:

- Soil, Surface Water, and Groundwater quality;
- Noise;
- Socioeconomics;
- Generation and disposal waste;
- Improved energy consumption; and,
- Improved water consumption.

### **6.5.2.1 Soil, Surface Water, and Groundwater Quality**

The inappropriate storage, management and handling of waste, and lubricants from maintenance activities during the operational phase could result in potentially negative impacts on soil and groundwater quality; where contaminants from spillages or inadequate storage of such could enter the soil, surface water, and groundwater environment, through the infiltration of contaminated surface run-off. BRMO has existing facilities for the storage of these materials in concrete bunded areas.

The reservoir will be designed and constructed by competent engineers and is not expected to be likely to fail under typical operational conditions. The failure of the facility would result in the release of process water. The existing approved mine wide EMPr includes a geohydrological study that indicates that the risk of ground water contamination from the entire mines' operations including unlined tailings facilities is negligible. This is a result of the negative climactic water balance in combination with the significant depths to groundwater, in the order of 30 to 100 mbgl, as well the typical composition of process water as monitored at the site. Given the scale of the storage facilities (2 500 m<sup>3</sup>) in comparison to those assessed for the site wide report (well over 50 000m<sup>3</sup>) it can reasonably be deduced that the impact of failure of the process water storage facility, as unlikely as it is, would not have a significant impact (Refer to Appendix 4: Specialist Studies

#### **APPENDIX 4.1: GEOHYDROLOGICAL ASSESSMENT**

- APPENDIX 4.2: PALEONTOLOGICAL IMPACT ASSESSMENT
- APPENDIX 4.3: LETTER OF HERITAGE IMPACT ASSESSMENT EXEMPTION REQUEST

- Appendix 4.1: Geohydrological Assessment).

Table 6-10: Impacts on groundwater and surface water quality (Operation)		
<b>Nature (N)</b>	Direct Negative impact on the site	1
<b>Extent (E)</b>	On site	1
<b>Duration (D)</b>	Short term: Potential impact addressed immediately	2
<b>Intensity (I)</b>	Negligible: Natural processes or functions are not expected to be appreciably affected	1
<b>Probability (P)</b>	Likely: The probability of a significant spill taking place during operation is likely. The probability of significant contamination from waste materials is however low as the process water is contaminated with substances that are contained naturally and already impact the water quality of the region.	2
<b>Mitigation (M)</b>	Well mitigated: Providing adequate bunded facilities, for storage will largely reduce the potential for contamination. There are many measures that can be implemented in order to prevent soil and groundwater contamination.	4
<b>Reversibility (R)</b>	Moderately reversible: the impact requires that effort is taken immediately after the impact	3
<b>Significance Rating without Mitigation - Negative Impact (S)</b>	$N \times (E+D) \times I \times P \div \frac{1}{2}(R)$	<b>Negligible</b>
<b>Significance Rating with Mitigation - Negative Impact (S)</b>	$N \times (E+D) \times I \times P \div \frac{1}{2}(M+R)$	<b>Negligible</b>
		3
		1.7

Table 6-11: Impacts on soil (Operation)		
<b>Nature (N)</b>	Direct Negative impact on the site	1
<b>Extent (E)</b>	On site	1
<b>Duration (D)</b>	Short term: Potential impact addressed immediately	2
<b>Intensity (I)</b>	Minor: Natural processes or functions are not expected to be appreciably affected	1
<b>Probability (P)</b>	Low: The probability of significant contamination from these materials is low due to the small quantities and infrequent uses associated with the operational phase.	2
<b>Mitigation (M)</b>	Well mitigated: The potential for these impacts can largely be prevented by the recommended mitigatory measures that follow.	4
<b>Reversibility (R)</b>	Moderately reversible: the impact requires that effort is taken immediately after the impact	3

Table 6-11: Impacts on soil (Operation)			
<b>Significance Rating without Mitigation - Negative Impact (S)</b>	$N \times (E+D) \times I \times P \div \frac{1}{2}(M+R)$	<b>Negligible</b>	3
<b>Significance Rating with Mitigation - Negative Impact (S)</b>	$N \times (E+D) \times I \times P \div \frac{1}{2}(M+R)$	<b>Negligible</b>	1.7

#### 6.5.2.1.1 Mitigation/Management

A comprehensive range of effective, proven, mitigation measures will be implemented in this regard, which are in principle as follows:

- BRMO's waste management procedure will continue to be implemented.
- All hazardous substances to be stored within appropriately sized, impermeable, bund walls built in accordance with the BRMO bund specifications;
- Hazardous substances spill kits to be readily available at all points where hazardous substances will be stored and/or transferred (e.g. refuelling points);
- Vehicle and plant servicing to only take place at the mines' service workshops on impermeable surfaces coupled with appropriate 'dirty' water containment systems/sumps and oil/water separators; and
- Drip trays to be appropriately placed under vehicles and plant that over-night on bare soil surfaces.
- Where hydrocarbon spills occur, the soil is to be removed for treatment or disposal as soon as practical.

#### 6.5.2.2 Air Quality

No emissions of potential significance are expected during the operational phase.

Table 6-12: Impacts on Air Quality (Operation)			
<b>Nature (N)</b>	Negative impact on ambient air quality.		1
<b>Extent (E)</b>	Site: Within the site		1
<b>Duration (D)</b>	Long term: these impacts (if they occur) will occur as long as the mine is in operation.		5
<b>Intensity (I)</b>	Negligible: Natural processes or functions are not expected to be appreciably affected.		1
<b>Probability (P)</b>	Unlikely: No emissions of potential significance are expected during the operational.		1
<b>Mitigation (M)</b>	No potentially significant emissions are expected thus no practical mitigation has been identified.		1
<b>Reversibility (R)</b>	Reversible: The status quo will return to the previous status quo upon cessation of operation.		4
<b>Significance Rating without Mitigation - Negative Impact (S)</b>	$N \times (E+D) \times I \times P \div \frac{1}{2}(M+R)$	<b>Negligible</b>	4
<b>Significance Rating with Mitigation - Negative Impact (S)</b>	$N \times (E+D) \times I \times P \div \frac{1}{2}(M+R)$	<b>Negligible</b>	4

### 6.5.2.2.1 Mitigation/Management

No potentially significant emissions are expected thus no mitigation is required.

### 6.5.2.3 Noise

No noise potentially significant noise will be generated during operation, with the possible exception of operation of water pumps, and occasional maintenance procedures.

Table 6-13: Noise impacts (Operation)		
<b>Nature (N)</b>	Negative impact.	1
<b>Extent (E)</b>	Site: Localised to the site.	1
<b>Duration (D)</b>	Long term: these impacts will occur as long as the mine is in operation.	5
<b>Intensity (I)</b>	Negligible: Natural processes or functions are not expected to be appreciably affected.	1
<b>Probability (P)</b>	Likely: The water pumps will produce noise.	2
<b>Mitigation (M)</b>	Moderate: The installation of new pumps and maintenance procedures will maintain noise at low levels.	3
<b>Reversibility (R)</b>	Reversible: The status quo will return to the previous status quo upon cessation of operation.	1
<b>Significance Rating without Mitigation - Negative Impact (S)</b>	$N \times (E+D) \times I \times P \div \frac{1}{2}(M+R)$	<b>Low</b> 12
<b>Significance Rating with Mitigation - Negative Impact (S)</b>	$N \times (E+D) \times I \times P \div \frac{1}{2}(M+R)$	<b>Negligible</b> 8

### 6.5.2.3.1 Mitigation/Management

Routine maintenance must be undertaken to ensure that there is no unnecessary generation of noise.

### 6.5.2.4 Biodiversity

The entire set of proposed activities will be undertaken within existing disturbed footprint. All the alternative layouts and locations considered are within the Gloria mine surface activities footprint. There will be no clearing of natural vegetation. The proposed reservoir will replace the existing plant, thus there is expected to be no change in biodiversity impact at the site.

Table 6-14: Impacts on biodiversity (Operation)		
<b>Nature (N)</b>	Negative impact on vegetation	1
<b>Extent (E)</b>	Existing Site only. No new disturbed areas.	1
<b>Duration (D)</b>	Very long term. The mine has a predicted lifespan past 2038.	5
<b>Intensity (I)</b>	Negligible: No new disturbed areas.	1

<b>Probability (P)</b>	Unlikely: The probability of vegetation clearance is unlikely as the site is already disturbed and there is no indigenous vegetation where the sites are proposed.		1
<b>Mitigation (M)</b>	None. Mitigation not required.		1
<b>Reversibility (R)</b>	Reversible: Site will be rehabilitated to upon decommissioning based on the existing mine wide EMPr for BRMO, and the EMPr developed as part of this Basic Assessment.		4
<b>Significance Rating without Mitigation - Negative Impact (S)</b>	$N \times (E+D) \times I \times P \div \frac{1}{2}(M+R)$	<b>Negligible</b>	2.4
<b>Significance Rating with Mitigation - Negative Impact (S)</b>	$N \times (E+D) \times I \times P \div \frac{1}{2}(M+R)$	<b>Negligible</b>	2.4

### 6.5.2.5 Socioeconomics

The proposed reservoir will result in improvement in product quality and costs of production and thus contributes towards BRMO remaining a competitive entity in the market, and therefore contributes towards security of jobs and contribution to the local and national economy and fiscus.

<b>Nature (N)</b>	Positive impact on job creation		-0.25
<b>Extent (E)</b>	Municipal		3
<b>Duration (D)</b>	Very long term: applicable for the life of the mine.		5
<b>Intensity (I)</b>	Minor: This will largely be a maintenance of current contributions.		2
<b>Probability (P)</b>	Definite		4
<b>Enhancement (H)</b>	Unenhanced: continuation of existing processes		1
<b>Significance Rating - Positive Impact (S)</b>	$N \times (E+D) \times I \times P \times (H).$	<b>Low (Positive)</b>	-16

#### 6.5.2.5.1 Enhancement

Effective enhancement, in the form of the proponent making a concerted effort to employ workers from the surrounding areas, can be applied where practical.

### 6.5.3 DECOMMISSIONING PHASE

The decommissioning of the ore processing plant is expected to entail the dismantling and/or demolishing of the reservoir and as such the impacts expected from this phase of the project are assumed to be the same as the impacts analysed under the

construction phase, apart from waste generation. Notably the decommissioning will require Environmental Authorisation and will form part of the larger plant decommissioning. The environmental characteristics of the area may change significantly in the time depending on development, future mining and agricultural activities. It is assumed that the area will be returned to arable grazing land use upon closure and rehabilitation of the site, which is capable of at least supporting an extensive livestock production system.

### 6.5.3.1 Waste generation, Handling and Disposal

Decommissioning waste will largely consist of structural material such as concrete and steel. It is expected that most, if not all, of the waste generated would be non-hazardous/general waste. The generation of such waste could indirectly impact on the operational lifespan of a waste disposal facility, through the permanent occupation of remaining available airspace at such a facility. However, this general waste will be disposed of at the BRMO landfill at Black Rock Mine. The materials that can be recycled will be recycled whereas the non-recyclables will be disposed of by a licenced contractor.

#### 6.5.3.1.1 Impact Discussion & Significance Assessment

Waste which is disposed of will have impact at a municipal extent. The intensity of the impact will, however, be low relative to cumulative local and regional waste generation volumes.

Table 6-16: Impacts of Waste Generation (Decommissioning)			
<b>Nature (N)</b>	Indirect negative impact on landfill airspace availability.		1
<b>Extent (E)</b>	Municipal: Use of airspace that would otherwise be available to other users in the municipality		3
<b>Duration (D)</b>	Very long term – Waste will be permanently placed in landfill		5
<b>Intensity (I)</b>	Negligible: The anticipated impact will be negligible, with a very little effect on relative airspace availability.		1
<b>Probability (P)</b>	Definite: The generation of waste during the decommissioning phase is largely unavoidable (the amount generated can, however, be managed)		4
<b>Mitigation (M)</b>	Well mitigated: A small reduction in the volumes of waste generated can likely be affected during decommissioning. However, a significant portion of this waste can be re-used and/or recycled.		4
<b>Reversibility (R)</b>	Moderately reversible through reuse, recovery and/or recycling initiatives: Where the impact relates to contribution to landfill, any measure implemented to reuse, recover, or recycle such waste would constitute the reversal of the impact		3
<b>Significance Rating without Mitigation - Negative Impact (S)</b>	$N \times (E+D) \times I \times P \div \frac{1}{2}(R)$	<b>Low</b>	16
<b>Significance Rating with Mitigation - Negative Impact (S)</b>	$N \times (E+D) \times I \times P \div \frac{1}{2}(M+R)$	<b>Negligible</b>	9

### 6.5.3.1.2 Mitigation/Management

Demolition waste which can be practically recycled will be sorted and stored for that purpose. In general, the National Norms and Standards for Storage of Waste will provide a guideline for waste storage. All general non-recyclable waste will be disposed of at Black Rock landfill. Hazardous waste will be stored temporarily at the Black Rock Hazardous Waste Transfer Station prior to collection by a suitably licensed waste disposal contractor. Temporary waste storage areas will be sited under the guidance of site environmental personnel prior to the start of decommissioning activities. Appointed personnel will be trained in their correct use and the site will be regularly inspected to ensure that they are being appropriately managed.

### 6.5.3.2 Soil, Surface Water, and Groundwater Quality

#### 6.5.3.2.1 Introduction

The inappropriate storage, management and handling of waste, fuel or lubricants during this period could result in potentially negative impacts on soil and groundwater quality; where contaminants from spillages or inadequate storage of such could enter the soil, surface water, and groundwater environment, through the infiltration of contaminated surface run-off. Poorly managed vehicle maintenance procedures and wash bays may impact negatively on groundwater quality. Contamination of this nature, associated with the decommissioning phase of a project of this magnitude, would typically be hydrocarbon based (i.e. petrol, diesel and oil leaks and spillages to bare soil surfaces). Small hydrocarbon spills are expected to be adsorbed to clays and organic material in the soil and thus are not expected to migrate significantly and can thus easily be cleaned up by removal of the affected soil.

All activities will be within the existing stormwater management area thus any contaminated run-off will report to the stormwater management system. The system encompasses the entire production boundary and all run-off is captured in a set of storm water ponds. The stormwater management system will be decommissioned after all other activities have been completed.

Groundwater contamination is likely to be restricted to the confines of the site. Mitigation by ensuring that adequate bunded facilities are in place for storage of waste, fuels, lubricants and vehicle maintenance will largely eliminate the potential for soil and groundwater contamination.

#### 6.5.3.2.2 Impact Discussion & Significance Assessment - Groundwater and Surface Water

<b>Nature (N)</b>	Negative impact on water resource quality	1
<b>Extent (E)</b>	Locally: Localised to the site and immediate surrounds	2
<b>Duration (D)</b>	Long term: Only if a plume enters groundwater will it be a long process to remediate contaminated groundwater. Surface water will be captured in the stormwater management system.	4
<b>Intensity (I)</b>	Minor: Natural processes or functions are not expected to be appreciably affected. Contaminants that have a possibility of entering groundwater are small	2
<b>Probability (P)</b>	Unlikely: The probability of a significant spill taking place during decommissioning is low. The probability of significant	1



Table 6-17: Impacts on groundwater and surface water quality (Decommissioning)		
	contamination from waste materials is also low as the majority of wastes are not hazardous. Hazardous waste such used oil and lubricants will in any case be stored in sealed drums/containers.	
<b>Mitigation (M)</b>	Well mitigated: Providing adequate bunded facilities, for storage will largely reduce the potential for soil and groundwater contamination.	4
<b>Reversibility (R)</b>	Slightly reversible: Groundwater remediation is possible but is a lengthy and costly process.	2
<b>Significance Rating without Mitigation - Negative Impact (S)</b>	$N \times (E+D) \times I \times P \div \frac{1}{2}(R)$	<b>Negligible</b> 8
<b>Significance Rating with Mitigation - Negative Impact (S)</b>	$N \times (E+D) \times I \times P \div \frac{1}{2}(M+R)$	<b>Negligible</b> 4

### 6.5.3.2.3 Mitigation/Management

The remediation of significantly contaminated groundwater can be a long, arduous and costly process. Any such remediation efforts may also be likely leave significant residual contamination, despite any such remediation attempts (dependant on the nature and extent of the contamination itself). As such, the proponent's management actions should focus on the prevention of any such potential hydrocarbon contamination, rather than post impact remediation thereof. A comprehensive range of effective, proven, mitigation measures will be implemented in this regard, which are in principle as follows:

- All hazardous substances to be stored within appropriately sized, impermeable, bund walls;
- Hazardous substances spill kits to be readily available at all points where hazardous substances will be stored and/or transferred (e.g. refuelling points);
- Vehicle and machinery servicing to only take place in dedicated service yards on impermeable surfaces coupled with appropriate 'dirty' water containment systems/sumps and oil/water separators; and
- Drip trays to be appropriately placed under vehicles and plant that over-night on bare soil surfaces.

Contractors will also be required to provide a method statement in respect of how they propose to manage storage of fuel and lubricants, waste storage, concrete batching, and vehicle maintenance areas to minimise the potential for groundwater pollution. Such method statements would need to be signed off by competent site environmental personnel or environmental control officer (ECO), prior to the start of construction activities.

### 6.5.3.3 Air quality – Dust Generation

#### 6.5.3.3.1 Introduction

During decommissioning, the removal of civil works and rubble, may lead to the generation of vehicle and wind entrained dust. The use of earthmoving machinery to recontour the footprint in preparation for rehabilitation may also generate dust. Although the impact is likely to be localised to the site due the size of the area to be worked, dust suppression techniques such as wetting roads, or application of dust palliatives, may be

required. Other emissions during decommissioning, such as construction vehicle and machinery exhausts are not anticipated to be significant.

### 6.5.3.3.2 Impact Discussion & Significance Assessment

The impact will be of a low intensity and isolated to the site and its immediate surrounds. Effective mitigation, in the form of accepted dust suppression techniques, can be applied, but will not likely mitigate the potential occurrence of the impact in its entirety.

<b>Nature (N)</b>	Negative impact on ambient air quality.	1
<b>Extent (E)</b>	Locally: Localised to the site and immediate surrounds	2
<b>Duration (D)</b>	Short term: Decommissioning phase (conservatively anticipated for up to 6 months)	2
<b>Intensity (I)</b>	Minor: Natural processes or functions will hardly be affected	2
<b>Probability (P)</b>	Likely: There is a possibility that the impact will occur, to the extent that provisions must be made for it [2]	2
<b>Mitigation (M)</b>	Well mitigated: Effective dust suppression methods readily available	4
<b>Reversibility (R)</b>	Irreversible: Not practical to reverse the impact once it has occurred	1
<b>Significance Rating without Mitigation - Negative Impact (S)</b>	$N \times (E+D) \times I \times P \div \frac{1}{2}(R)$ <b>Low</b>	16
<b>Significance Rating with Mitigation - Negative Impact (S)</b>	$N \times (E+D) \times I \times P \div \frac{1}{2}(M+R)$ <b>Negligible</b>	6.4

### 6.5.3.3.3 Mitigation/Management

The Proponent will institute effective dust suppression measures on all un-surfaced access roads for the duration of the decommissioning phase. Compliance thereto will be measures against draft dust control standards (SANS1929:2005 – ‘industrial’) and associated thresholds.

### 6.5.3.4 Noise

The following activities will generate noise during the decommissioning phase of the proposed plant and roads:

- Demolition activities for the removal of the concrete structures.
- Removal and transportation of rubble from the footprint area;
- Earthmoving used to contour and prepare the footprint area for rehabilitation;

#### 6.5.3.4.1 Impact Discussion & Significance Assessment

Noise during installation and assembly of proposed infrastructure and equipment is expected to have no significant impact outside of the site provided that the recommended mitigatory measures are implemented.

Table 6-19: Noise impacts (Construction)			
<b>Nature (N)</b>	Negative impact on site		1
<b>Extent (E)</b>	On site: Localised to the site		1
<b>Duration (D)</b>	Short term: Construction phase (conservatively anticipated for up to 6 months)		2
<b>Intensity (I)</b>	Minor: The facility is within a mining area and there are no nearby noise receptors outside of the facility		2
<b>Probability (P)</b>	Likely: It is likely that noise will be generated to an extent that mitigation measures should be considered		2
<b>Mitigation (M)</b>	Well mitigated: To be limited to normal working hours, in accordance with locally applicable by-laws.		4
<b>Reversibility (R)</b>	Irreversible: The status quo will return to the previous status quo upon completion of construction.		1
<b>Significance Rating without Mitigation - Negative Impact (S)</b>	$N \times (E+D) \times I \times P \div \frac{1}{2}(R)$	<b>Low</b>	12
<b>Significance Rating with Mitigation - Negative Impact (S)</b>	$N \times (E+D) \times I \times P \div \frac{1}{2}(M+R)$	<b>Negligible</b>	4.8

#### 6.5.3.4.2 Mitigation/Management

Decommissioning related activities should be limited to normal working hours, in accordance with locally applicable by-laws.

## 6.6 NO-GO ALTERNATIVE

The no-go option refers to the alternative of the proposed development not going ahead at all. The baseline status quo is maintained in this case. In this case, this would mean not installing the proposed reservoir.

The no-go alternative will result in the elimination of the numerous desirable facets of the proposed reservoir, namely:

- Reduced potential for contamination of water.
- Potentially reduce long term dependence on water from the Vaal Gamagara Pipeline
- Reduce water consumption per tonne of ore processed by improving water management and reducing water loss.
- Reduce potential for process stoppages due to insufficient storage capacity

- Facilitate optimal dewatering of underground operations thus improve operational safety.
- Economic sustainability of the mine within a competitive market.

The no-go alternative presents no substantive advantages in comparison to the proposed upgrade of the plant, with the exception of the elimination of the construction and closure impacts. These impacts are generally low, and short term. The benefits of the proposed reservoir will continue for the remaining life of the mine. The mining right is valid to 2038, however ore reserves are predicted to outlast the mining right. Thus, the benefits are long term.

Given the above, it is clear that the no-go alternative should not be the preferred alternative.

### 6.6.1 SUMMARY OF FINDINGS AND ENVIRONMENTAL IMPACTS

A summary of the impact assessment is present in Table 6-20. It is clear that the impacts of the proposed reservoir, with mitigation are all anticipated to be low or negligible.

Phase	Impact	Without Mitigation	With Mitigation
Construction	Waste	Low	Negligible
	Ground and Surface Water Contamination	Negligible	Negligible
	Soil	Negligible	Negligible
	Air Quality	Low	Negligible
	Noise	Low	Negligible
	Biodiversity	Negligible	Negligible
	Socio-economic	Low (Positive)	Not Applicable
Operation	Ground and Surface Water Contamination	Low	Negligible
	Soil	Negligible	Negligible
	Socio-economic	Low (Positive)	Not Applicable
	Noise	Low	Negligible
Decommissioning	Waste	Low	Negligible
	Ground and Surface Water Contamination	Negligible	Negligible
	Air Quality	Low	Negligible
	Noise	Low	Negligible

### 6.7 SELECTION AND MOTIVATION FOR THE PREFERRED ALTERNATIVE

As noted previously, the nature of the proposed development and the fact that this development will take place in the existing disturbed footprint of the Gloria mine, and

that the alternatives considered are all within this footprint means that the impact assessment for the various alternatives is largely the same. The selection the preferred alternative is thus largely a matter of minimising the potential impact, design complexity, and cost of the proposed upgrade.

Accordingly, the preferred alternative layout, as presented in Figure 2-2 presents the optimal outcome.

In respect of technology options, the use of steel tanks or concrete reservoirs is preferable to the option of earth dams in the main due to the higher reliability and longevity of the steel tanks and concrete reservoirs.

As such, the preferred location and site plan is outlined within Figure 6-1.

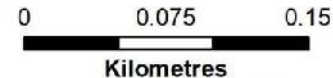
# LOCATION AND LAYOUT ALTERNATIVES



- Legend**
- Main Road
  - Secondary/Arterial Road
  - Gloria Mine Boundary

**Reservoir Layout Alternatives**

- Preferred Location and Layout
- Alternative Location and Layout



Projection: Transverse Mercator  
Datum: WGS 1984



Figure 6-1: Proposed activities

## 6.7.1 IMPACT MANAGEMENT MEASURES FROM SPECIALIST STUDIES

### 6.7.1.1 Paleontological Impact Assessment

The recommendation from the Paleontological impact assessment (Butler 2019:9) is inserted below:

*The proposed water reservoir at Gloria Mine, Black Rock, Hotazel, Northern Cape is completely underlain by the Cenozoic Kalahari Group as well underlying Griqualand West Basin rocks, Transvaal Supergroup. According to the PalaeoMap of South African Heritage Resources Information System, the Palaeontological Sensitivity of the Kalahari Group is low, and the Griqualand West rocks of the Transvaal Supergroup are moderate.*

*This development is recommended for exemption from further Palaeontological studies as the proposed development is smaller than 600 m<sup>2</sup>.*

Refer to Appendix 4.2: Paleontological Impact Assessment for the entire report.

### 6.7.1.2 Heritage Impact Assessment

A letter of heritage impact assessment exemption request from the Heritage specialist (van Vollenhoven 2019:5) has been inserted below:

*Due to the mentioned factors, the chances therefore of finding any heritage related features are indeed extremely slim. It is therefore believed that an additional Heritage Impact Assessment (HIA) is not needed for this project and any of the alternatives can be used. This letter serves as an exemption request to the relevant heritage authority.*

*The developer should however note that due to the nature of archaeological material, such sites, objects or features, as well as graves and burials may be uncovered during construction activities on site. In such a case work should cease immediately and an archaeologist should be contacted as a matter of urgency to assess such occurrences.*

**Recommendation: That the development be exempted from doing an HIA.**

Refer to Appendix 4.3: Letter of Heritage Impact Assessment Exemption Request for

### 6.7.1.3 Groundwater Impact Assessment

## 6.7.2 CONDITIONAL FINDINGS TO BE INCLUDED AS CONDITIONS OF AUTHORISATION

It is recommended that the proposed activities be undertaken in accordance with the EMPr as appended hereto as Appendix 3: Environmental Management Programme (EMPr). Additionally, in the event that any archaeological or paleontological finds occur, construction shall halt and await the input from a specialist.

### **6.7.3 DESCRIPTION OF ASSUMPTIONS, UNCERTAINTIES AND GAPS IN KNOWLEDGE**

Given the nature and scale of the project, there are no significant gaps in knowledge or major assumptions that have been made.

## **7 PUBLIC PARTICIPATION**

### **7.1 INTRODUCTION**

Public participation provides the opportunity for interested and affected parties (IAPs) to participate in the Environmental Authorisation process on an informed basis, and to ensure that their concerns are considered during the environmental impact assessment process. In so doing, a sense of ownership of the project is vested in both the project proponent and interested or affected parties. The Public Participation Process is aimed at achieving the following:

- Provide opportunities for IAPs to obtain information about the expected environmental impacts of the proposed development.
- Establish a formal platform for IAPs to raise queries and give input regarding the environmental impact of the project.
- Utilise the opportunity to formulate ways for reducing or mitigating any negative environmental impacts of the project, and for enhancing its benefits.
- Enable the applicant to consider the needs, preferences and values of IAPs in their decisions.
- Ensure transparency and accountability in decision-making.

The public participation process to date is discussed below. Refer to Appendix 2: Public Participation for further detail, which includes:

- Proof of Newspaper advertisements;
- Proof of site notices;
- List of identified IAPs

### **7.2 STAKEHOLDER NOTIFICATION**

The public and stakeholder participation process to date has entailed the following:

- Advertising of the proposed decommissioning and associated BA process in the Kalahari Bulletin on the 22<sup>nd</sup> of March 2019 and in the Kathu Gazette on the 22<sup>nd</sup> of March 2019. The adverts indicated where the written comments may be directed to and who to contact in order to be registered as an IAP.
- Placement of site notices at a place conspicuous to the public at the BRMO entrance, Gloria Mine Entrance and the Black Rock Shopping Centre.
- Pre-identification and notification to Interested and Affected Parties based on the existing list of the mines registered IAPs including neighbouring landowners and occupiers, the ward councillor, the local municipality, the district municipality, the provincial environmental authority, and other stakeholders.



The following is to be conducted through the distribution of the Basic Assessment Report to registered interested and affected parties including:

7. owners and occupiers of the of the land adjacent to the site where the activity is or is to be undertaken,
8. the municipal councillor of the ward,
9. the local municipality,
10. the district municipality,
11. the provincial environmental authority,
12. any other party required by the competent authority

Refer to subsequent items for their relevant appendices:

- Proof of Newspaper advertisements (Refer to Appendix 2.2: Newspaper Advertisements)
- Proof of site notices (Refer to Appendix 2: Public Participation Appendix 2.1: Site Notices)
- List of identified IAPs (Refer to Appendix 2.3: Proof of Distribution to IAPS)

### **7.3 SUMMARY OF ISSUES RAISED BY IAP'S**

The comments and responses that were received during the public participation process have been attached as Appendix 2.4: Comments received during Public Participation.

## **8 FINANCIAL PROVISIONS**

BRMO must comply with the regulations pertaining to the financial provision for prospecting, exploration, mining or production operations, promulgated in GN.R. 1147 On 20 November 2015, under the National Environmental Management Act (Act 107 of 1998).

The required provision has been calculated and is presented in Appendix 5: Financial Provision/Rehabilitation Quantum.

## **9 CONDITIONAL REQUIREMENTS**

The upgrade of the Gloria Ore processing infrastructure is subject to the enforcement of the Environmental Management Programme. Notably this EMPr has been developed in alignment with the site wide EMPr as approved for the entire mine operations.

## **10 CONCLUSION**

In cognisance of the low significance of potential impacts, and the long terms environmental and socio-economic benefits of the projects, it is recommended that the proposed activities be authorised.

The development is anticipated to enable more efficient production including more efficient use of electricity and water at the site including:

- Reduce the potential for contamination to water.
- Reduced water being lost to evaporation
- Less dependent on water from the Vaal Gamagara Pipeline
- Reduce water consumption per tonne of ore processed.
- Increased underground operational safety as a result of mine dewatering
- Furthermore, this project supports the ultimate need and desirability of the greater BRMO; where the activities being applied for are supportive of the mining operations undertaken.

The proposed reservoir will be undertaken within the existing disturbed footprint and thus there will be no clearing of undisturbed land. The expansion will continue to contribute towards the fiscus and employment within the area.

The expansion affords the potential reductions for improvement in cost of production and thus contributes towards BRMO remaining a competitive entity in the market.

## **10.1 PERIOD OF VALIDITY OF THE ENVIRONMENTAL AUTHORISATION**

The environmental authorisation, should it be issued, will be required for 2 years in order to facilitate that planning and commencement of construction of the relevant infrastructure be undertaken within practical timeframes.

## 11 DECLARATION BY EAP

EScience Associates (Pty) Ltd, as the Environmental Assessment Practitioner, led by Abdul Ebrahim hereby affirms that:

- The information herein is true and correct to the best of our knowledge;
- The EAP has kept a register of all interested and affected parties that participated in a public participation process;
- The EAP has ensured that information containing all relevant facts in respect of the application is distributed or made available to interested and affected parties and the public and that participation by interested and affected parties has been facilitated in such a manner that all interested and affected parties have been provided with a reasonable opportunity to participate and to provide comments on documents that are produced to support the application;
- The EAP has included all comments and inputs made by stakeholders and interested and affected parties as well as the competent authority. Responses to comments are appended to this Environmental Impact Report.

Abdul Ebrahim

NAME OF EAP

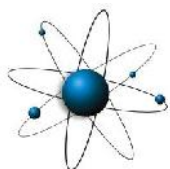


SIGNATURE OF EAP

22 July 2019

DATE

# APPENDIX 1: EAP CURRICULUM VITAE



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**Curriculum Vitae:**

**Abdul**  
**Ebrahim**

**Surname:** Ebrahim  
**Name:** Abdul  
**Date of birth:** 07 December 1977  
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#### Abstract

Abdul Ebrahim is a director of EScience Associates, an environmental consultancy specialising in waste and waste recovery, effluent, atmospheric emissions and air quality, as well as cleaner and renewable energy. EScience Associates caters for a diversity of industries and economic sectors and has forged strong relationships with other specialists, and specialist agencies, allowing the company to deal with complex and contentious environmental problems.

Abdul Ebrahim holds a BEng (Hons) in both Mechanical and Environmental Engineering disciplines. He specialises in air quality management, hazardous waste management and cleaner production, as well as their related environmental authorisation and licensing processes. His work experience includes numerous environmental impact assessments, cleaner production, waste recover-recuse-recycling, hazardous waste management assessments, and air quality impact management projects in power generation, manufacturing, minerals processing, and mining industries. His interests range from atmospheric modelling and wind energy, to the beneficial use of industrial wastes and effluents.

He is a certified Environmental Assessment Practitioner (EAP) and member of amongst other professional organisations: Engineering Council of South Africa (ECSA), and the National Association of Clean Air (NACA).

Abdul has provided Honours level lecturing at the University of Pretoria, UNISA, Cape Town University of Technology and various private training institutions in the fields of Environmental Compliance Enforcement, Environmental Impact Assessment, Cleaner Production and Air Quality Management since 2005.

His work experience includes:

- Waste management (classification, handling, storage, and disposal requirements, development of waste minimisation treatment & recycling strategies);
- Air quality management and Air Quality Management Plan development (industrial, household fuel burning, biomass burning and waste burning emissions modelling and inventorisation, development of emissions abatement and management strategies; meteorological and air quality modelling and impact assessment);
- Environmental Authorisation, Waste Management Licensing, Atmospheric Emissions Licensing, Mine Environmental Management Programme development, and their relating environmental impact assessment and stakeholder engagement processes.
- Development of specialist training courses (including EIA Administration and Review, Environmental Enforcement, Environmental Compliance Achievement for Industry).
- Environmental Due Diligence – due diligence assessment to inform purchase or ownership transfer of existing going concerns or proposed new establishments.

Abdul has over 15 years post graduate experience of which four years are in industry, and the remainder in consulting.

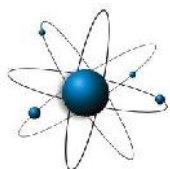
#### Education

**BEng (Hons) Mechanical Engineering**  
**BEng (Hons) Environmental Engineering**

#### Languages

**English** (excellent speaking and writing)

Limited French and Portuguese



### **Experience**

Personal work experience includes:

- Cleaner and renewable energy strategy development, plan and project development;
- Technical and environmental due diligence – industrial and energy projects
- Waste management (classification, handling, storage, and disposal requirements;
- Development of waste minimisation treatment & recycling strategies);
- Air quality management and emissions inventorying, development of abatement and management strategies;
- Environmental Impact Assessment and Permitting
- Development and dissemination of specialist training for government and the private sector at NQF level 7 (honours degree).

Abdul's work experience in a wide diversity of economic sectors and industries and provides him with a good understanding of both small scale and large scale impacts of waste and pollution, as well as keeping up to date with various management alternatives available and their individual advantages and disadvantages, both locally and internationally implemented and pilot scale. Various waste streams have been dealt with to determine the most applicable disposal methods and impacts on the environment, from various industries:

- Metallurgical processes
- Power generation
- Food processing
- Waste recovery, reuse, and recycling and waste to energy
- Mining
- Cement manufacturing
- General Commercial – General waste management from various industries

### **Professional Registration**

Environmental Assessment Practitioner (EAP)  
Engineering Council of South Africa (ECSA)

### **Hourly Rate**

### **Nature of expertise offered**

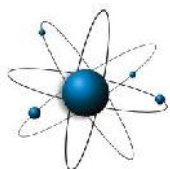
- Ability to interpret and analyse technical material on wide range of subjects
- Engineering expertise in energy, waste, air quality and multi-disciplinary subjects
- Ability to undertake technology feasibility studies, technical and financial due diligence
- Understanding of the green economy and technologies, ICT and agricultural and agro-processing sectors
- Ability to undertake a market research and investigation into the industry
- Proposal evaluation expertise

### **Experience and relevant projects**

#### **1. AIR QUALITY MANAGEMENT:**

##### **1.1 Government & Regulatory**

- Vaal Triangle Air-shed Priority Area - Air Quality Management Plan review, development of emissions inventory and Ambient Air Quality Impact Assessment.
- Highveld Priority Area Air Quality Management Plan – development of emissions inventory, and mitigation strategies.
  - Reference: Dr Thulile Mdluli



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**9 Victoria Road, Oaklands**  
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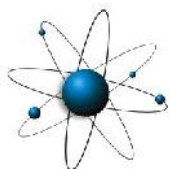
**Curriculum Vitae:**

**Abdul**  
**Ebrahim**

- Tel: 012 310 3436
- Email : tmdluli@environment.gov.za
- Ekurhuleni Metropolitan Municipality - Development of an Air Quality Management Plan (AQMP)
  - Reference: Mr Edmund van Wyk
  - Tel: 011 999 2470
  - Email: Edmund.vWyk@ekurhuleni.gov.za
- Nkangala District Municipality - Development of an Air Quality Management Plan (AQMP)
  - Reference: Mr Vusi Mahlangu
  - Tel: 013 249 2164
  - Email: Mahlangumv@nkangaladm.gov.za
- North West Province - development of provincial emissions inventory (PM, NO<sub>x</sub>, SO<sub>2</sub> etc)
- Development of National Air Quality Officers Companion Guide for the Republic of South Africa
- Development of the atmospheric emissions licensing department for Nkangala District Municipality
- EThekweni Municipality (Durban) - Greenhouse gas emissions quantification
- Newcastle Local Municipality - Development of an Air Quality Management Plan (AQMP)
  - Reference: Mr Phelelani Ntshingila
  - Tel: 034 328 3300
  - Phelelani.Ntshingila@newcastle.gov.za

## **1.2 Industrial and Mining**

- A large variety of major industrial and mining operation across the Highveld and Vaal Triangle as part of Highveld Priority Area and Vaal Triangle Air-shed Priority Area AQMP projects.
- Lanxess CISA Chrome Chemicals Plant Expansion, CO<sub>2</sub> generation, Power Generation and hazardous waste treatment and recovery
- Samancor Chrome Proposed Chrome Chemicals plant
- Karbochem (Synthetic Rubber Manufacture) proposed Power Generation Plant
- PPC Cement Slurry Cement Plant Expansion
- PPC Cement Jupiter Cement Plant Expansion
- PPC Cement PE Cement Plant Expansion
- PPC Cement Dwaalboom waste heat recovery
- PPC Cement De Hoek, PE, Slurry, and Dwaalboom postponement applications
- Afrisam Cement - Dudfield Environmental Management Programme update.
- ClinX Medical Waste Incineration plant expansion
- Goedemoed organic waste incineration
- AWPP pyrolysis of organic waste
- Interwaste Waste Recovery, Waste to Energy and Waste Incineration plant
- Eskom power generation emissions off-setting
- Hayes Lemmerz SA Aluminium Wheel Manufacturing
- Evraz Highveld Steel and Vanadium proposed Powered Generation - Furnace Off-Gases
- Assmang Ferrochrome and Ferromanganese plants Powered Generation - Furnace Off-Gases
- Resource Generation Proposed Boikarabelo Power Station – coal fired
- Weir Minerals Africa (Isando, Alrode and Heavy Bay Foundries)
- Goedemoed Prison proposed Waste incineration and Landfill
- Consolidated Wire Industries Expansion
- Sylvania Proposed Open Cast PGE Mine and Processing Plant
- Assmang Black Rock proposed manganese mine expansion and sinter plant
- Assmang machadodorp proposed smelter plant expansion and cross-over to manganese



- Dwarsrivier Chrome Mine
- Nkwe proposed Platinum Mine
- Agricultural Research Commission hazardous and infectious waste incineration
- Sephaku Aganang proposed use of AFR's in cement manufacture
- Idwala Phalaborwa atmospheric emission licence for magnetite drying
- Mandini Wealth (Pty) Ltd Air quality health risk assessment
- Johnson Tiles a Division of Norcros Sa (Pty) Ltd Air quality health risk assessment
- Lanxess CISA (Pty) Ltd Air quality health risk assessment

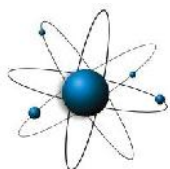
## **2. WASTE CLASSIFICATION, HAZARD RISK ASSESSMENT AND MANAGEMENT**

- Weir Minerals Africa
- Heavy Bay foundry Port Elizabeth
- Lafarge Gypsum
- Consolidated Wire Industries
- BPB Gypsum
- PG Bison melamine plant
- ABBW Electrical manufacturing plant
- CBI copper and fibre optical cable manufacture
- Holcim Cement
- Lanxess Chrome Chemicals
- Assmang Chrome
- Assmang Manganese
- Hayes Lemmerz SA Aluminium Wheel Manufacturing
- Auto industrial group (Pty) Ltd
- CBI Electrical
- Various metal ore mines

## **3. ENVIRONMENTAL IMPACT ASSESSMENT:**

- Highveld Steel furnace off-gas power generation
- Lanxess CISA chrome chemicals plant development
- Samancor chrome chemicals plant development
- Heric Ferrochrome power generation from furnace off-gases
- Kanhym Biogas project
- Turfontein Race Course night racing
- Alumicor secondary aluminium recovery rotary salt furnaces
- Hays Lemmerz Aluminium smelters, furnace and alloy die casting
- Plettenburg Polo Estates
- PG Bison Decorative Panels
- British Aerospace Land Based OMC Systems
- BPB Gypsum phosphogypsum plant
- Extrupet HPDE and PET recycling plants
- Assmang BRMO
- Assmang Machadodorp
- Interwaste waste recovery and waste to energy plants
- PPC Cement
- ClinX Healthcare Risk Waste Management



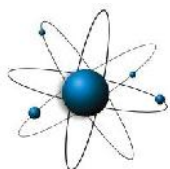


**4. ENVIRONMENTAL LEGAL COMPLIANCE ASSESSMENT & RECTIFICATION PLANNING:**

- SASOL Synfuels
- NATCOS Petrochem
- Dwarsrivier Chrome Mine
- Angloplatinum Base Metals Recovery
- Samancor Hotazel Manganese Mines
- PG Bison (Pty) Ltd MDF manufacturing
- Samancor Manganese Division Samancor Metalloys Meyerton
- Holcim SA (Pty) Ltd Cement Plants:
  - DUDFIELD
  - ULCO
  - ROODEPOORT
- Natal Portland Cement Plants:
  - NEWCASTLE
- Consolidated Wire Industries
- South African Airways (Pty) Ltd Technical Division
- TWK forestry strategic environmental legal compliance assessment
- Inergy Automotive Systems(Pty) Ltd
- Consolidated Wire Industries
- Mittal Steel Vereeniging and Dunswart plants – specialist assistance to DEAT environmental management inspectors
- Assmang Black Rock Mining Operations
- ClinX Medical Waste Management
- Extrupet PET and HDEP recycling plants
- Scaw Metals High Chromium Ball Plant
- Unilever waste recovery, recycling, and zero waste-to-landfill
- Numerous waste recycling facilities
- Oilflow
- The Smart Company
- Darkling Industrial Metals CC
- Unilever waste recovery, recycling, and zero waste-to-landfill
- Central Waste
- AT Packaging
- EWaste Africa
- Mpact Recycling
- Wasteplan
- Fine Metals
- Living Earth
- Industrial Plastic Recyclers
- SA Paper Mills
- Interwaste
- Matchem
- TGS
- Verigreen
- SB Boxes
- Drumpal
- Oscars Meat
- FOSECO South Africa (Pty) Ltd
- 

**5. GREENHOUSE GAS Quantifications and Assessments**

- PPC Riebeeck



- Lafarge Lichtenburg
- Ilangabi Investments 12 (Pty) Ltd
- Lanxess CISA (Pty) Ltd

**6. CLEANER PRODUCTION AUDITS, WASTE TO ENERGY, ENERGY RECOVERY, WASTE RECOVERY AND RELATED PROJECTS:**

- Tuffy Plastics
- Proplas plastics
- WHS Distribution
- Premier Foods Pretoria Wheat Mill
- Alfred Nzou municipality
- Lanxess chrome chemicals residue recovery
- Karbochem power generation ash to bricks project
- Cement kilns alternative fuels and raw materials assessment for South Africa
- Kanhym Estates Biogas Generation from piggery effluent
- British American Tobacco:
- Tobacco Processors Zimbabwe
- Souza Cruz Brazil

**7. ENVIRONMENTAL MANAGEMENT SYSTEM DEVELOPMENT & IMPLEMENTATION:**

- British American Tobacco (full system development from scratch – ISO 14001 and ISO 9001)
  - Weir Minerals Aspects Identification, Rating, Assessment and Development of EMPs
  - Lafarge Gypsum Aspects Identification, Rating, Assessment and Development of EMPs
  - Environmental Aspects Identification, rating and formulation of EMPs for Samancor Metalloys Meyerton
  - Environmental Aspects Identification, rating and formulation of EMPs for DMS Powders.
  - Holcim Slagment development & implementation of EMS components including waste and air quality management
  - Holcim Roodepoort development & implementation of EMS components including waste and air quality management
  - Consolidated Wire Industries Environmental Aspects Identification, rating and formulation of EMPs and operational control procedures.
  - Samancor Metalloys Ferro Silicon Manganese and FerroSilicon production
  - DMS FeSi dense media production

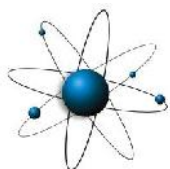
**8. ISO14001 AUDITING:**

- Debswana Orapa and Letlhakane Mines
- Ingwe Colliery
- Arnot Colliery
- FOSECO South Africa (Pty) Ltd
- Lafarge Gypsum
- CWI

**9. SPECIALIST TRAINING COURSE DEVELOPMENT & PRESENTATION**

- 2011 Training of Atmospheric Emissions Licensing Authorities – air quality management, emissions quantification, regulation and enforcement.
- 2007-2015 Training of Authorities for EIA review and permitting

Responsible for development of NEMA EIA Review Course and Administrators EIA Review Manual, theoretical and practical training material, and training of Government Officials responsible for EIA Review - responsible for the whole



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**Curriculum Vitae:**

**Abdul**  
**Ebrahim**

manual other than Law applicable to EIA Review. As at May 2013 approximately 1000 officials from National, Provincial and Local Government.

- 2005&6 Bridging Training for Environmental Management Inspectors and Enforcement  
ESA was part of a consortium selected to develop and conduct the EMI Training. More than 2000 officials and university students have completed the training.

- University Of Pretoria Specialist Lecturer
  - Environmental Legal Compliance inspections and investigations (RSA)
  - Environmental Legal Compliance achievement (RSA)
  - Environmental Legal Compliance inspections and investigations (Africa)

- University Of South Africa Specialist Lecturer
  - Environmental Legal Compliance inspections and investigations (RSA)

- Training for industry and mining

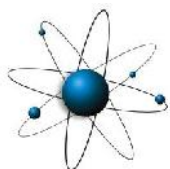
Development and presentation of training material for environmental impact identification and management in terms of South African environmental law for the SABS and other training institutions.

#### **10. SOIL AND GROUNDWATER CONTAMINATION ASSESSMENT:**

- Weir Heavy Bay Foundry
- Lafarge Gypsum
- Kanhym Estates
- SABAT (Pty) Ltd Johannesburg – investigation of heavy metal contamination of soils and groundwater
- Chemiphos SA (Pty) Ltd – investigation of phosphate and heavy metal contamination of soils and groundwater
- Castrol Lubricants Zimbabwe

#### **11. ENVIRONMENTAL DUE DILIGENCE AUDITS, INCLUDING ASSESSMENT OF ENVIRONMENTAL AND CLOSURE LIABILITY:**

- Determination and quantification of financial provision for the environmental rehabilitation and closure requirements of smelting operations for Highveld Steel & Vanadium operations:
  - HIGHVELD IRON AND STEEL WORKS
  - VANCHEM
  - TRANSALLOYS
  - RAND CARBIDE
  - MAPOCHS MINE
- Determination and quantification of financial provision for the environmental rehabilitation and closure requirements of smelting operations for TransAlloys
- Determination and quantification of financial provision for the environmental rehabilitation and closure requirements of mining operations for Samancor Chrome:



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**Curriculum Vitae:**

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**Ebrahim**

- MIDDELBURG FERROCHROME
- FERROMETALS
- TUBATSE FERROCHROME
- WESTERN CHROME MINES
- EASTERN CHROME MINES
- Determination of critical environmental liability associated with the purchase of Xmeco Foundry by Weir Minerals Africa, and subsequent legal compliance achievement programme

**12.**

#### **Possible timelines to commit to the assignment**

- Available for assignments over the next two years
- Not available during the December holiday period - from 15 December until 3 January – due to company's closure for the festive season

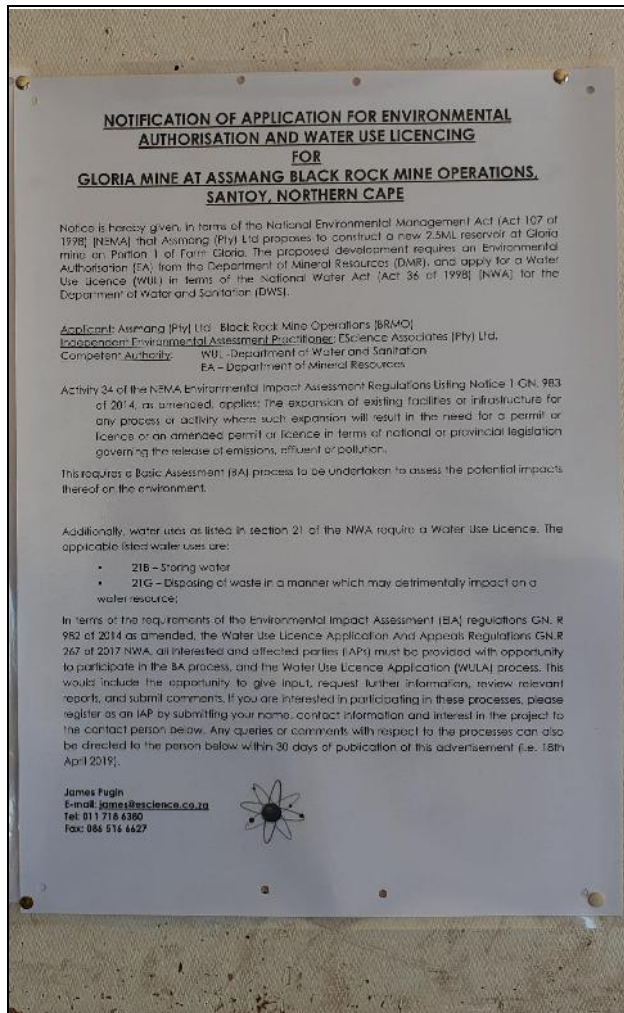
## **APPENDIX 2: PUBLIC PARTICIPATION**

### **APPENDIX 2.1: SITE NOTICES**

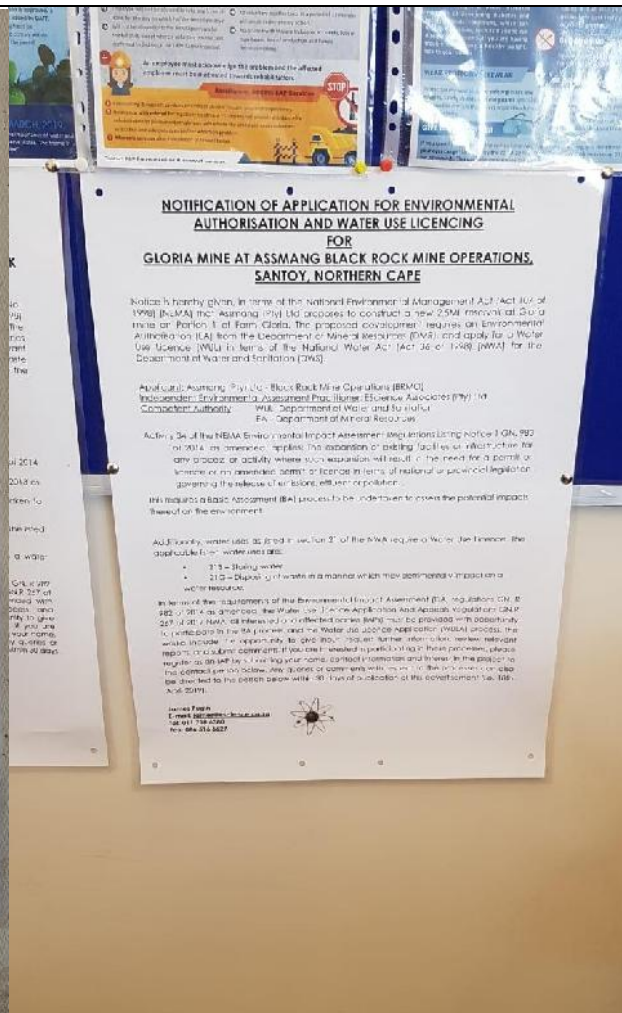
## APPENDIX 2.1: SITE NOTICES



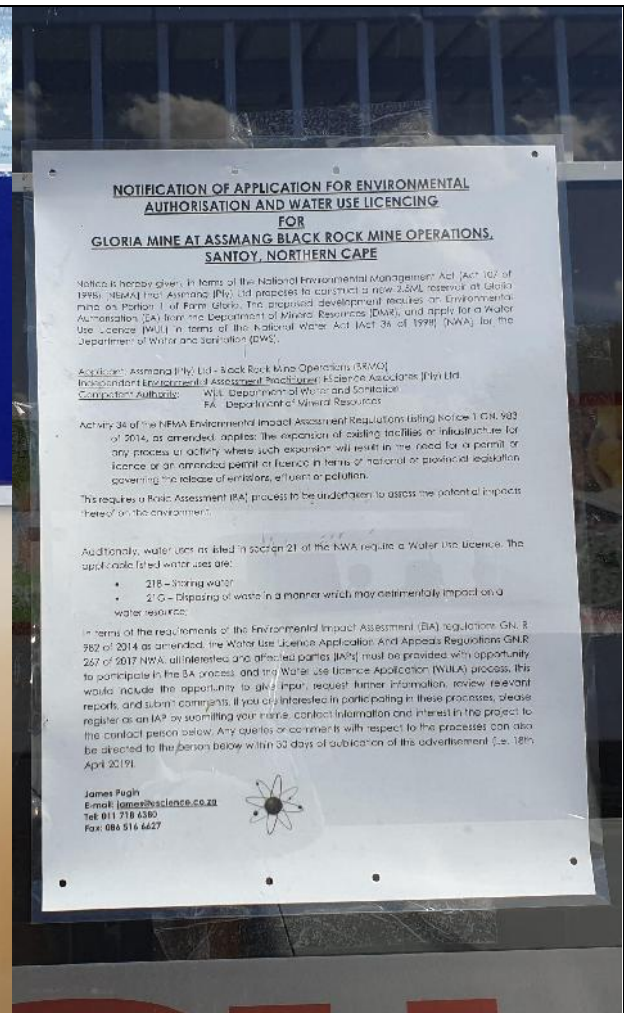
Site notices at different locations (A-Gloria Mine, B-BRMO Entrance, C-Santoy Shops)



A)



B)



C)

Site notices at different locations (A-Gloria Mine, B-BRMO Reception, C-Black Rock Superette)

## **APPENDIX 2.2: NEWSPAPER ADVERTISEMENTS**





BOOYSEN BORE DRILLING COMPANY PTY LTD

**VACANCIES: MECHANIC/MILL WRIGHT AND AUTO ELECTRICIAN KATHU BRANCH**

Booyesen Bore Drilling Company (Pty) Ltd is looking for the services of qualified diesel mechanics, millwright and an auto electrician.

**Skill, qualification and experience requirements**

- Relevant qualification and proof of apprenticeship
- Red Seal
- Access card of Sishen Mine will be an added advantage
- Sound knowledge of compressors and hydraulics will be an added advantage.
- Minimum five years' relevant experience
- Valid Code 08 driver's licence is essential

**Salary and benefits:**

Other benefits applicable

**Closing date:** 16:00 - Friday 29 March 2019. No late applications will be accepted.

Candidates can e-mail all information including a detailed CV (with covering letter) and certified copies of qualifications training via e-mail to Tina Nel -admin@booyesen.bore.co.za  
Only shortlisted applicants will receive further correspondence. If you have not received a response within three weeks of the closing date, please regard your application as unsuccessful.  
Incomplete applications will not be considered.

X1VAVRHS-KA210319

**Stuur só wenke:** Wat wil jy in die *Kalahari Bulletin* lees? Politiek, nuus, sportnuus of kultuurnuus? Miskien stories oor interessante mense, of dalk die ekonomie? Dit is vir die *Kalahari Bulletin* belangrik om aan lesers te bied wat hulle wil lees. Stuur wenke oor nuusgebeure in en om Upington, Kuruman en Kathu na lecrecia.prins@volksblad.com.



**VAKANTE BETREKING**

Voltydse pos is beskikbaar vir 'n  
**VERKOOPSVERTEENWOORDIGER ('Sales Rep')**  
Applikant moet beskik oor die volgende:

- Goeie menseverhoudings • Ondervinding in mynbousektor • Geldige rybewys • Afrikaans en Engels magtig • Kompeterende salaris

**Addisionele inligting:**

Volledige CV met verwysings moet ingedien word by:  
**IST HADCO (PTY) LTD, INDUSTRIËLE GEBIED  
KURUMAN**  
E-pos na: info@hadco.co.za

Vir verdere inligting kontak IST Hadco: 053 712 0893.  
Sluitingsdatum: 31 Maart 2019

X1VAVML9-KA210319

# Patrolie betrek talle

AfriForum se buurtwagte in die Kalahari-distrik het op 8 Maart van 18:00 tot 06:00 aan 'n nasionale patrolie deelgeneem.

Die Kuruman-, Kathu-, Upington-, Keimoes- en Springbok-buurtwag was in samewerking met 13 ander veiligheidsinstansies, onder meer gemeenskapspoliëeringsforums en sekuriteitsmaatskappye, en die polisie by die nasionale patrolie betrokke. Ongeveer 170 patroleers in 89 voertuie het meer as 2 366 km in 498 uur afgelê.

Gonda Louw, AfriForum se distriks-koördineerder vir die Kalahari, sê AfriForum doen hierdie nasionale patrollsies om sigbaarheid en samewerking te verbeter, asook om veiligheid in gemeenskappe te verseker.

"AfriForum doen 'n beroep op gemeenskappe om betrokke te raak en om self hul veiligheid te prioriseer. Ons kan nie op die staat alleen staatmaak om na ons veiligheid om te sien nie. Raak by enige plaaslike veiligheidsinstelling in jou omgewing betrokke en word deel van die oplossing," sê Louw.

**NOTIFICATION OF APPLICATION FOR WASTE MANAGEMENT LICENCE, WATER USE LICENCE AND ENVIRONMENTAL AUTHORISATION**

**FOR  
PROPOSED SUPER FINES STORAGE FACILITY AT THE ASSMANG BLACK ROCK MINE OPERATIONS, SANTOY, NORTHERN CAPE.**

Notice is hereby given, in terms of the National Environmental Management: Waste Act (Act No. 59 of 2008) [NEM:WA], and the National Environmental Management Act (Act 107 of 1998) [NEMA] and National Water Act (Act 36 of 1998) [NWA] that Assmang (Pty)Ltd is applying for the relevant environmental management licences, for the establishment of a new super fines storage facility on portion 1 of the farm Gloria 266 near Hotazel, Northern Cape. The relevant licences include applications to the Department of Mineral Resources (DMR), for a Waste Management Licence (WML) and Environmental Authorisation (EA), and an application to the Department of Water and Sanitation (DWS) for a Water Use Licence (WUL).

Applicant: Assmang (Pty) Ltd - Black Rock Mine Operations (BRMO)  
Independent Environmental Assessment Practitioner: EScience Associates (Pty) Ltd.  
Competent Authority: EA and WML - Department of Mineral Resources  
WUL - Department of Water and Sanitation

The proposed project includes activities identified in terms of:

- Listing Notice 1 and 2 of the 2014 NEMA EIA Regulations (GN. R983 and GN. R 984, of 2014 as amended); and,
- Category A and B, waste management activities as listed in NEM:WA GN. 921 of 2013 as amended, which require a Scoping and Environmental Impact Assessment process to be undertaken to assess the potential impacts thereof on the environment.

Additionally, water uses as listed in Section 21 of the NWA require a Water Use Licence. The listed water uses are:

- 21B - Storing water
- 21G - Disposing of waste in a manner which may detrimentally impact on a water resource;

In terms of the requirements of the Environmental Impact Assessment (EIA) regulations GN. R 982 of 2014 as amended, the Water Use Licence Application And Appeals Regulations GN.R 267 of 2017 NWA, and NEM:WA, all interested and affected parties (IAPs) must be provided with opportunity to participate in the Scoping and Environmental Impact Assessment process, and the Water Use Licence Application (WULA) process. This would include the opportunity to give input, request further information, review relevant reports, and submit comments. If you are interested in participating in these processes, please register as an IAP by submitting your name, contact information and interest in the project to the contact person below. Any queries or comments with respect to the processes can also be directed to the person below within 30 days of publication of this advertisement (i.e. 25 April 2019).

James Pugin  
E-mail: james@escience.co.za  
Tel.: 011 718 6380  
Fax: 086 516 6627



X1VB00Q1-KA210319

**NOTIFICATION OF APPLICATION FOR ENVIRONMENTAL AUTHORISATION AND WATER USE LICENCING**

**FOR  
GLORIA MINE AT ASSMANG BLACK ROCK MINE OPERATIONS, SANTOY, NORTHERN CAPE**

Notice is hereby given in terms of the National Environmental Management Act (Act 107 of 1998) [NEMA] that Assmang (Pty) Ltd proposes to construct a new 2.5ML reservoir at Gloria mine on Portion 1 of Farm Gloria. The proposed development requires an Environmental Authorisation (EA) from the Department of Mineral Resources (DMR), and apply for a Water Use Licence (WUL) in terms of the National Water Act (Act 36 of 1998) [NWA] for the Department of Water and Sanitation (DWS).

Applicant: Assmang (Pty) Ltd - Black Rock Mine Operations (BRMO)  
Independent Environmental Assessment Practitioner: EScience Associates (Pty) Ltd.  
Competent Authority: WUL -Department of Water and Sanitation  
EA - Department of Mineral Resources

Activity 34 of the NEMA Environmental Impact Assessment Regulations Listing Notice 1 GN. 983 of 2014, as amended, applies: The expansion of existing facilities or infrastructure for any process or activity where such expansion will result in the need for a permit or licence or an amended permit or licence in terms of national or provincial legislation governing the release of emissions, effluent or pollution.  
This requires a Basic Assessment (BA) process to be undertaken to assess the potential impacts thereof on the environment.

Additionally, water uses as listed in Section 21 of the NWA require a Water Use Licence. The applicable listed water uses are:

- 21B - Storing water
- 21G - Disposing of waste in a manner which may detrimentally impact on a water resource;

In terms of the requirements of the Environmental Impact Assessment (EIA) regulations GN. R 982 of 2014 as amended, the Water Use Licence Application And Appeals Regulations GN.R 267 of 2017 NWA, all interested and affected parties (IAPs) must be provided with opportunity to participate in the BA process, and the Water Use Licence Application (WULA) process. This will include the opportunity to give input, request further information, review relevant reports, and submit comments. If you are interested in participating in these processes, please register as an IAP by submitting your name, contact information and interest in the project to the contact person below. Any queries or comments with respect to the processes can also be directed to the person below within 30 days of publication of this advertisement (i.e. 25 April 2019).

James Pugin  
E-mail: james@escience.co.za  
Tel. 011 718 6380  
Fax: 086 516 6627



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**R50 000**  
Deal Assistance\*



2016 VW Polo Vivo GP 1.4 Trendline  
Deal Assistance: R20 000\*



2017 Kia Rio 1.2 5Dr  
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2017 Toyota Corolla Quest 1.6 A/T  
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# Lohattha community at loggerheads with SANDF

Victor Mulangisi

There is bad taste between the South African National Defence Force (SANDF) based at Lohattha and the local community over ownership.

This dispute came to the surface after one of the community members died around the area early this year and plans were afoot to bury him. The army did not take lightly to let a community member being buried within the premises they call home. On the same line of proprietorship, the resident community said that the deceased had to be buried in his home area, Lohattha.

Just to give a brief about Lohattha area. The place used to be home to Tswanas over fifty years ago and these people were evicted in a very cruel way during apartheid era around 1976 to pave way for the new Bophutatswana government and so blacks were to be on one side of the contentious area. The victims were scattered in some villages and some of them are in Bendel and Laxey, very dry, sandy and without water.

In 1978 a portion of Lohattha was deemed fit for military training where Lohattha Infantry Training Centre is situated because of its mountainous features. Gathlose and Maremane were some of the well-known villages in Lohattha. In 1996 in the reign of the new government under the former and late statesman Nelson Mandela, people wanted to go back to their land. The President intervened where a concessionary agreement was made, that a certain portion of land be used by the army while the issue of the return of these people was being strategically



EFF regional chairman in the NC, Penyo Ohentswe (red overall), in a meeting with community members situated around the Lohattha area.

considered. The terms and conditions agreed upon were never implemented leading to the prevailing stand-off.

The death of a community member early this year in the area has rekindled the commotion existing between the two parties and this time the courts had to be dragged into the wrangle for settlement and granting the right for the burial of the deceased in the area after the community took the initiative.

The SANDF lost the case with the accompanying costs accrued. The community then revealed, according to the EFF chairman Mr Penyo Ohentswe, that the mayor of Ga-Segonyana local municipality was approached by the estranged community to resolve the tension between the two feuding parties, how-

ever, this did not work out as was planned.

The EFF chairperson was approached by the same community and he visited Lohattha on March 05, 2019 as they disclosed that they are being harassed by the SANDF in the area granting them too many commandments of restrictions.

The EFF has escalated the matter to its top echelons of political office where Mr David Mhlongo who seats in the parliamentary committee of the defence force visited the community and has presented the matter to the relevant minister to resolve the dispute.

Apart from this community, the evicted communities in and around Kuruman have unpleasant feelings and memories about the Lohattha developments.

## POSTMASBURG Toekenning

Mimi Swart

Tydens 'n provinsiale onderwys toekenningsgeleentheid wat op 28 Februarie 2019 in die Horseshoe Motel in Kimberley plaasgevind het, het een van Ratang Thuto Hoërskool in Postmasburg se onderwyseresse, Beryl Motlonye, 'n toekenning ontvang as die beste Afrikaanse Eerste Addisionele Taal (EAT) onderwyser in die provinsie.

Uit die aard van die saak is Tswana die huistaal van die skool en die keuse is tussen Afrikaans en Engels as eerste addisionele taal by die

Regs : Beryl Motlonye van Ratang Thuto Hoërskool wat 'n toekenning as die beste Afrikaanse Eerste Addisionele Taal (EAT) onderwyser in die Noord-Kaap ontvang het.

skool. In gesprek met Beryl verstaan jy waarom hierdie toekenning haar te beurt geval het. Sy praat goeie Afrikaans wat so Noord-Kaaps is, soos die omgewing waarin ons ons bevind.

Onderwys is ook in haar gene aangesien haar oorlede pa, mnr Bob Motlonye, 'n skoolhoof by HTT Bidi Primêre Skool in Boichoko was.

Baie geluk aan Beryl, ook aan Ratang Thuto Hoërskool. Sulke prestasies plaas die skool en ons dorp op die kaart.



### NOTIFICATION OF APPLICATION FOR ENVIRONMENTAL AUTHORISATION AND WATER USE LICENCING FOR GLORIA MINE AT ASSMANG BLACK ROCK MINE OPERATIONS, SANTOY, NORTHERN CAPE

Notice is hereby given, in terms of the National Environmental Management Act (Act 107 of 1998) [NEMA] that Assmang (Pty) Ltd proposes to construct a new 2.5ML reservoir at Gloria mine on Portion 1 of Farm Gloria. The proposed development requires an Environmental Authorisation (EA) from the Department of Mineral Resources (DMR), and apply for a Water Use Licence (WUL) in terms of the National Water Act (Act 36 of 1998) [NWA] for the Department of Water and Sanitation (DWS).

**Applicant:** Assmang (Pty) Ltd - Black Rock Mine Operations (BRMO)  
**Independent Environmental Assessment Practitioner:** EScience Associates (Pty) Ltd.  
**Competent Authority:** WUL-Department of Water and Sanitation  
EA-Department of Mineral Resources

Activity 34 of the NEMA Environmental Impact Assessment Regulations Listing Notice 1 GN. 983 of 2014, as amended, applies. The expansion of existing facilities or infrastructure for any process or activity where such expansion will result in the need for a permit or licence or an amended permit or licence in terms of national or provincial legislation governing the release of emissions, effluent or pollution.

This requires a Basic Assessment (BA) process to be undertaken to assess the potential impacts thereof on the environment.

Additionally, water uses as listed in section 21 of the NWA require a Water Use Licence. The applicable listed water uses are:

- 21B - Storing water
- 21G - Disposing of waste in a manner which may detrimentally impact on a water resource;

In terms of the requirements of the Environmental Impact Assessment (EIA) regulations GN. R 982 of 2014 as amended, the Water Use Licence Application And Appeals Regulations GN R 267 of 2017 NWA, all interested and affected parties (IAPs) must be provided with opportunity to participate in the BA process, and the Water Use Licence Application (WULA) process. This would include the opportunity to give input, request further information, review relevant reports, and submit comments. If you are interested in participating in these processes, please register as an IAP by submitting your name, contact information and interest in the project to the contact person below. Any queries or comments with respect to the processes can also be directed to the person below within 30 days of publication of this advertisement (i.e. 25th April 2019).

**James Pugin**  
Email: james@escience.co.za  
Tel: 011 718 6830 • Fax: 0866 924 840 • Fax: 086 516 6627



### NOTIFICATION OF APPLICATION FOR WASTE MANAGEMENT LICENCE, WATER USE LICENCE & ENVIRONMENTAL AUTHORISATION FOR PROPOSED SUPER FINES STORAGE FACILITY AT THE ASSMANG BLACK ROCK MINE OPERATIONS, SANTOY, NORTHERN CAPE

Notice is hereby given, in terms of the National Environmental Management: Waste Act (Act No. 59 of 2008) [NEM:WA], and the National Environmental Management Act (Act 107 of 1998) [NEMA] and National Water Act (Act 36 of 1998) [NWA] that Assmang (Pty) Ltd is applying for the relevant environmental management licences, for the establishment of a new super fines storage facility on portion 1 of the farm Gloria 266 near Hotazel, Northern Cape. The relevant licences include applications to the Department of Mineral Resources (DMR), for a Waste Management Licence (WML) and Environmental Authorisation (EA), and an application to the Department of Water and Sanitation (DWS) for a Water Use Licence (WUL).

**Applicant:** Assmang (Pty) Ltd - Black Rock Mine Operations (BRMO)  
**Independent Environmental Assessment Practitioner:** EScience Associates (Pty) Ltd.  
**Competent Authority:** EA and WML - Department of Mineral Resources  
WUL - Department of Water and Sanitation

The proposed project includes activities identified in terms of:

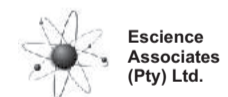
- Listing Notice 1 and 2 of the 2014 NEMA EIA Regulations (GN. R983 and GN. R 984, of 2014 as amended); and,
- Category A and B, waste management activities as listed in NEM:WA GN. 921 of 2013 as amended, which require a Scoping and Environmental Impact Assessment process to be undertaken to assess the potential impacts thereof on the environment.

Additionally, water uses as listed in section 21 of the NWA require a Water Use Licence. The listed water uses are:

- 21B - Storing water
- 21G - Disposing of waste in a manner which may detrimentally impact on a water resource;

In terms of the requirements of the Environmental Impact Assessment (EIA) regulations GN. R 982 of 2014 as amended, the Water Use Licence Application And Appeals Regulations GN R 267 of 2017 NWA, and NEM:WA, all interested and affected parties (IAPs) must be provided with opportunity to participate in the Scoping and Environmental Impact Assessment process, and the Water Use Licence Application (WULA) process. This would include the opportunity to give input, request further information, review relevant reports, and submit comments. If you are interested in participating in these processes, please register as an IAP by submitting your name, contact information and interest in the project to the contact person below. Any queries or comments with respect to the processes can also be directed to the person below within 30 days of publication of this advertisement (i.e. 25th April 2019)

**James Pugin**  
Email: james@escience.co.za  
Tel: 011 718 6830  
Fax: 0866 924 840 • Fax: 086 516 6627



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## **APPENDIX 2.3: PROOF OF DISTRIBUTION TO IAPS**

## Abdul Ebrahim

---

**From:** Abdul Ebrahim  
**Sent:** 04 June 2019 20:35  
**To:** info@taologatsewe.gov.za; gaborone@ga-segonyana.gov.za; bloomt@joemorolong.gov.za; Sylvia.Moholo@Dpw.Gov.Za; sunday.mabaso@dmr.gov.za; iabader@environment.gov.za; iris@tsamail.co.za; iris@tsamail.co.za; swarttj@taologatsewe.gov.za; rossouwj@taologatsewe.gov.za; khakhane@gmail.com; majolar@dwaf.gov.za; leburun@dwa.gov.za; dKgosi@ncpg.gov.za; phebia.m@gmail.com; psimpson@joemorolong.gov.za; maape@ga-segonyana.gov.za; simon@ga-segonyana.gov.za; MokhoantleL@dwa.gov.za; jmutyorauta@half.ncape.gov.za; nramuhulu@ncpg.gov.za; jacolinema@daff.gov.za; nhiggitt@sahra.org.za; mgalimberty@sahra.org.za; vanderwesthuizeng@taologatsewe.gov.za; nobelar@dwa.gov.za; MsimangoP@dws.gov.za  
**Cc:** Laurence Moorcroft  
**Subject:** ASGT: PPP Stakeholder Notification - Gloria Mine Water Reservoir Environmental Authorisation and Water Use Licence Applications

Dear Stakeholder,

Notice is hereby given, in terms of the National Environmental Management Act (Act 107 of 1998) [NEMA] that Assmang Limited proposes to expand operations at Gloria mine on Portion 1 of Farm Gloria through the construction of 2.5ML Process Water Reservoir. The proposed expansion requires an Environmental Authorisation and a Water Use Licence in terms of the National Water Act (Act 36 of 1998) [NWA].

Applicant: Assmang (Pty) Ltd - Black Rock Mine Operations

Environmental Assessment Practitioner: EScience Associates (Pty) Ltd.

Competent Authority: Department of Mineral Resources, and Department of Water and Sanitation

**Activity 34 (NEMA Environmental Impact Assessment Regulations Listing Notice 1 GN.R 983 of 2014 as amended)** applies: The expansion of existing facilities or infrastructure for any process or activity where such expansion will result in the need for a permit or licence or an amended permit or licence in terms of national or provincial legislation governing the release of emissions, effluent or pollution.

A Basic Assessment (BA) process is to be undertaken to assess the potential environmental impacts and inform the Environmental Authorisation process.

### **Water Uses to be applied for in terms of the National Water Act:**

21.b storing water

21.g disposing of waste in a manner which may detrimentally impact on a water resource.

This will be for the storage of process water in a 2.5ML reservoir.

The Environmental Impact Assessment regulations, and the Water Use Licence application regulations, require that all IAPs must be provided with opportunity to participate in the BA. This would include the opportunity to give input, review relevant reports, and submit comments or objections during the BA. Accordingly we herewith avail the basic assessment report to you for your review and comments.

For further information please contact the person below.

Please find the report available at the link below. Please forward any comments you may have on or before Monday 08 July 2019.

<https://www.dropbox.com/preview/ASGT%20Draft%20BAR%2020190604%20AE.pdf?role=personal>

Regards,

Abdul Ebrahim



**EScience Associates (Pty) Ltd**

E-mail: [abdul@escience.co.za](mailto:abdul@escience.co.za)

Cel: 072 268 1119

Tel: +27 (0)11 718 6380

Fax: 0866 924 840

Web: [www.escience.co.za](http://www.escience.co.za)

PO Box 2950, Saxonwold, 2132

9 Victoria Street, Oaklands, Johannesburg, 2192

VAT No: 473 025 4416

Reg No: 2009/014472/07

## Abdul Ebrahim

---

**From:** Abdul Ebrahim  
**Sent:** 04 June 2019 20:40  
**To:** avontuur@harpogo.co.za; cpeche@lantic.net; dpretorius@masterdrilling.com; Kgosietsile@kalagadi.co.za; jpleader@intekom.co.za; marillettevdw@brmo.co.za; zyde101@rocketmail.com; Ruan@infrasers.co.za; alan@kalagadi.co.za; stolsgawie@gmail.com; hotazel@gmail.com; eleanor\_L@live.com; wwalt@lantic.net; hotazel@gmail.com; hnseras@gmail.com; conniemashishi30@gmail.com  
**Cc:** Laurence Moorcroft  
**Subject:** ASGT: PPP Stakeholder Notification - Gloria Mine Water Reservoir Environmental Authorisation and Water Use Licence Applications

<b>Tracking:</b>	<b>Recipient</b>	<b>Delivery</b>
	avontuur@harpogo.co.za	
	cpeche@lantic.net	
	dpretorius@masterdrilling.com	
	Kgosietsile@kalagadi.co.za	
	jpleader@intekom.co.za	
	marillettevdw@brmo.co.za	
	zyde101@rocketmail.com	
	Ruan@infrasers.co.za	
	alan@kalagadi.co.za	
	stolsgawie@gmail.com	
	hotazel@gmail.com	
	eleanor_L@live.com	
	wwalt@lantic.net	
	hotazel@gmail.com	
	hnseras@gmail.com	
	conniemashishi30@gmail.com	
	Laurence Moorcroft	Delivered: 04 06 2019 20:40

Dear Stakeholder,

Notice is hereby given, in terms of the National Environmental Management Act (Act 107 of 1998) [NEMA] that Assmang Limited proposes to expand operations at Gloria mine on Portion 1 of Farm Gloria through the construction of 2.5ML Process Water Reservoir. The proposed expansion requires an Environmental Authorisation and a Water Use Licence in terms of the National Water Act (Act 36 of 1998) [NWA].

Applicant: Assmang (Pty) Ltd - Black Rock Mine Operations

Environmental Assessment Practitioner: EScience Associates (Pty) Ltd.

Competent Authority: Department of Mineral Resources, and Department of Water and Sanitation

**Activity 34 (NEMA Environmental Impact Assessment Regulations Listing Notice 1 GN.R 983 of 2014 as amended)** applies: The expansion of existing facilities or infrastructure for any process or activity

where such expansion will result in the need for a permit or licence or an amended permit or licence in terms of national or provincial legislation governing the release of emissions, effluent or pollution.

A Basic Assessment (BA) process is to be undertaken to assess the potential environmental impacts and inform the Environmental Authorisation process.

**Water Uses to be applied for in terms of the National Water Act:**

21.b storing water

21.g disposing of waste in a manner which may detrimentally impact on a water resource.

This will be for the storage of process water in a 2.5ML reservoir.

The Environmental Impact Assessment regulations, and the Water Use Licence application regulations, require that all IAPs must be provided with opportunity to participate in the BA. This would include the opportunity to give input, review relevant reports, and submit comments or objections during the BA. Accordingly we herewith avail the basic assessment report to you for your review and comments.

For further information please contact the person below.

Please find the report available at the link below. Please forward any comments you may have on or before Monday 08 July 2019.

<https://www.dropbox.com/preview/ASGT%20Draft%20BAR%2020190604%20AE.pdf?role=personal>

Regards,

Abdul Ebrahim



**EScience Associates (Pty) Ltd**

E-mail: [abdul@escience.co.za](mailto:abdul@escience.co.za)

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PO Box 2950, Saxonwold, 2132

9 Victoria Street, Oaklands, Johannesburg, 2192

VAT No: 473 025 4416

Reg No: 2009/014472/07

Title	First Name/s or Initial/s	Surname	Organisation
Commenting Authorities			
Dr.	Sebusho	Sipho	John Taolo Gaetsewe District Municipality (Municipal Manager)
Mr.	Gaborone	Eric	Ga-Segonyana Local Municipality (Municipal Manager)
Mr.	Tshepo	Bloom	Joe Morolong Local Municipality (Municipal Manager)
Mrs.	Sylvia	Moholo	Department of Public Works
Mr.	Sunday	Mabaso	Department of Mineral Resources (Regional Head: Environment)
Mr.	Abader	Ishaam	Deputy-Director General: Legal, Authorisations, Compliance & Enforcement, Department of Environmental Affairs
Ms.	K.I.	Jonathan-Makhoiole	John Taolo Gaetsewe District Munci.
Mr.	Sibongile	Lekiso	John Taolo Gaetsewe District Munci.
	J	Swartt	John Taolo Gaetsewe District Munci.
	J	Russouw	John Taolo Gaetsewe District Munci.
Mr.	Nozie	Mazwie	Water Affairs: Lower Vaal
Mr.	Neo	Leburu	Department of Water and Sanitation
Ms.	Dineo	Kgosi	NCDENC: Waste Management
Ms.	L.P	Segapo	John Taolo Gaetsewe District Munci.
Ms.	Phabelo	Simpson	Joe Morolong Local Municipality
Ms.	Pinky	Maape	Gasegonyana Local Municipality
		Simon	Gasegonyana Local Municipality
Ms.	Lerato	Mokhoantle	Department of Water and Sanitation
Mr.	Julius	Muyorautu	NCDENC: Environmental Quality
Ms.	Nditssheni	Ramuhulu	NCDENC: Impact Management
Mrs.	Jacoleen	Mans	Department of Agriculture, Forestry and Fisheries
	Natasha	Higgitt	SAHRA
Dr.	Mariagrazia	Galimberti	SAHRA
Mr .	Gerrie	Van der Westhuizen	John Taolo Gaetsewe District Municipality
Ms.	Lorraine	Nobelsa	Department of Water and Sanitation
	Philani	Msimango	Department of Water and Sanitation
Interested and Affected Parties			
Mr.	Gert	Olivier	Kudumane Farmers Union
Mrs.	Charlmarie	Peche-Kroeze	Barrange (Pty) Ltd
Mr.	Danie	Pretorius	Barrange Farm
Mr.	Kgosletsile	Gaonnwe	Kalagadi Manganese
Mr.	Jeff	Leader	Ntsimbitle mining (Pty) Ltd
Mrs.	Marillette	van der Walt	Neighbouring Landowner
Mr.	Teboho	Zide	Zyde Investments (Pty) Ltd.
Mr.	Ruan	Buhr	Infrasors
Mr.	E. R.	van Schalkwyk	Farmer - Iehating
Mr.	Alan	Roberts	Kalgadi Manganese
Mr.	Gawie	Stols	Farmer - Boerdraai
Mr.	Bobby	Reyneke	Neighbouring Farmer (landowner of Nchwaning 257 Portion O RE
Mr.	HJ	Lampbrecht	
Mr.	WP	van der Walt	
Mr.	JL	Reynecke	
Mr.	Francios	Erasmus	
Mr.	Maserame Conny(Connie)	Mashishi	
Mr	Marcel	Prinsloo	Family residing in Hotazel



## **APPENDIX 2.4: COMMENTS RECEIVED DURING PUBLIC PARTICIPATION**

ASSMANG (PTY) LTD - BLACK ROCK MINING OPERATIONS (PTY) LTD – PROPOSED 2.5ML PROCESS WATER RESERVOIR FOR GLORIA MINE, HOTAZEL, NORTHERN CAPE		
IAP Name	Comment	EAP Response
Natasha Higgitt (SAHRA) (Correspondence attached as Appendix 1)	<p><b>05 June 2019</b> Good morning,</p> <p>Please note that all development applications are processed via our online portal, the South African Heritage Resources Information System (SAHRIS) found at the following link: <a href="http://sahra.org.za/sahris/">http://sahra.org.za/sahris/</a>. We do not accept emailed, posted, hardcopy, faxed, website links or DropBox links as official submissions.</p> <p>Please create an application on SAHRIS and upload all documents pertaining to the Environmental Authorisation Application Process. As per section 38(8) of the National Heritage Resources Act, Act 25 of 1999 (NHRA), an assessment of heritage resources must form part of the process and the assessment must comply with section 38(3) of the NHRA.</p> <p>Once all documents including all appendices are uploaded to the case application, please ensure that the status of the case is changed from DRAFT to SUBMITTED. Please ensure that all documents produced as part of the EA process are submitted as part of the application, and are submitted to SAHRA at the beginning of the Public Review periods. Once all these documents have been uploaded, I will be able to issue an informed comment as per section 38(4) and 38(8) of the NHRA.</p> <p>Kind regards, Natasha Higgitt</p>	<p>Hello Natasha,</p> <p>Thank you for your prompt response. I have created the application. I have uploaded both the Archaeologist and Palaeontologist's report, as well the basic assessment report. Please let me know if anything further is required.</p> <p>Kind Regards,  Abdul Ebrahim</p>

Comments and Responses Report

ASSMANG (PTY) LTD - BLACK ROCK MINING OPERATIONS (PTY) LTD – PROPOSED 2.5ML PROCESS WATER RESERVOIR FOR GLORIA MINE, HOTAZEL, NORTHERN CAPE		
IAP Name	Comment	EAP Response
	<p><b><u>28 June 2019</u></b>                      Good afternoon,</p> <p>Please note that a Final Comment has been issued on SAHRIS Case ID 13928. Please see the link to the case:</p> <p><a href="https://sahris.sahra.org.za/cases/asgt-gloria-mine-water-reservoir-environmental-authorisation">https://sahris.sahra.org.za/cases/asgt-gloria-mine-water-reservoir-environmental-authorisation</a></p> <p>Kind regards,</p>	
<p>Marcel Prinsloo                      (Correspondence attached as Appendix 2)</p>	<p><b><u>29 March 2019</u></b></p> <p>Good day James,</p> <p>Trust you are well.</p> <p>Will you please register me as an interested and affected party for the Waste Management License, Water use License and Environmental Authorisation at Assmang regarding the new super fines storage facility.</p> <p>I have concerns with ground water quality.</p> <p>Kind regards,</p> <p>Marcel Prinsloo</p>	<p><b><u>29 March 2019</u></b></p> <p>Afternoon Marcel,</p> <p>Your interest in the projects are noted. Please provide the following details so that I can add you to our IAP database for future communications and for the distribution of reports.</p> <p>Regards,                      James Pugin</p>

Comments and Responses Report

ASSMANG (PTY) LTD - BLACK ROCK MINING OPERATIONS (PTY) LTD – PROPOSED 2.5ML PROCESS WATER RESERVOIR FOR GLORIA MINE, HOTAZEL, NORTHERN CAPE		
IAP Name	Comment	EAP Response
	<p><b><u>12 Jul 2019</u></b></p> <p>Hi Abdul,</p> <p>Thank you very much.</p> <p>Kind regards,</p> <p>Marcel Prinsloo</p>	<p><b><u>11 Jul 2019</u></b></p> <p>Dear Mr Prinsloo,</p> <p>As per our telephone discussion earlier, I herewith confirm that you have no comments or concerns in respect of the reservoir application. We will forward you the relevant reports for the proposed super fines storage facility when these are ready for review and commenting by interested and affected parties.</p> <p>Thank you for your participation.</p> <p>Regards,</p> <p>Abdul Ebrahim</p>

# APPENDIX 1

## James Pugin

---

**Subject:** RE: ASGT: Gloria Mine Water Reservoir Environmental Authorisation - Case ref NC-00152-MR/102

**From:** Natasha Higgitt <[nhiggitt@sahra.org.za](mailto:nhiggitt@sahra.org.za)>

**Sent:** 28 June 2019 12:13

**To:** Abdul Ebrahim <[abdul@escience.co.za](mailto:abdul@escience.co.za)>

**Subject:** RE: ASGT: Gloria Mine Water Reservoir Environmental Authorisation - Case ref NC-00152-MR/102

Good afternoon,

Please note that a Final Comment has been issued on SAHRIS Case ID 13928. Please see the link to the case:

<https://sahris.sahra.org.za/cases/asgt-gloria-mine-water-reservoir-environmental-authorisation>

Kind regards,

---

**From:** Abdul Ebrahim <[abdul@escience.co.za](mailto:abdul@escience.co.za)>

**Sent:** Thursday, June 27, 2019 3:48 PM

**To:** Natasha Higgitt <[nhiggitt@sahra.org.za](mailto:nhiggitt@sahra.org.za)>

**Subject:** RE: ASGT: Gloria Mine Water Reservoir Environmental Authorisation - Case ref NC-00152-MR/102

Thank you for the prompt feedback.

Regards,

Abdul Ebrahim



**ESscience Associates (Pty) Ltd**

E-mail: [abdul@escience.co.za](mailto:abdul@escience.co.za)

Cel: 072 268 1119

Tel: +27 (0)11 718 6380

Fax: 0866 924 840

---

**From:** Natasha Higgitt <[nhiggitt@sahra.org.za](mailto:nhiggitt@sahra.org.za)>

**Sent:** 27 June 2019 15:47

**To:** Abdul Ebrahim <[abdul@escience.co.za](mailto:abdul@escience.co.za)>

**Subject:** RE: ASGT: Gloria Mine Water Reservoir Environmental Authorisation - Case ref NC-00152-MR/102

Good afternoon,

My apologies for not informing you earlier. Our system (SAHRIS) was not operational for over a week and we could not access the cases to review them. There was a great deal of backlog, but I have reviewed the case and the comment is currently with my colleagues for internal review. I hope to issue the comment tomorrow as I will not be available from 1-9 July to work on cases.

I will inform you as soon as the comment is issued.

Kind regards,

---

**From:** Abdul Ebrahim <[abdul@escience.co.za](mailto:abdul@escience.co.za)>  
**Sent:** Thursday, June 27, 2019 3:43 PM  
**To:** Natasha Higgitt <[nhiggitt@sahra.org.za](mailto:nhiggitt@sahra.org.za)>  
**Subject:** RE: ASGT: Gloria Mine Water Reservoir Environmental Authorisation - Case ref NC-00152-MR/102

Hello Natasha,

I would like to follow up on the review. You mentioned that you would undertake the review during the week of 18<sup>th</sup> June. Please let me know if there is anything further required.

The comment period is still open to 08 July as per the requirements of the EIA regulations.

Regards,

Abdul Ebrahim



**EScience Associates (Pty) Ltd**  
E-mail: [abdul@escience.co.za](mailto:abdul@escience.co.za)  
Cel: 072 268 1119  
Tel: +27 (0)11 718 6380  
Fax: 0866 924 840

---

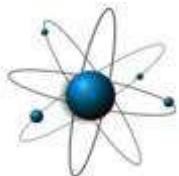
**From:** Abdul Ebrahim  
**Sent:** 05 June 2019 14:56  
**To:** Natasha Higgitt <[nhiggitt@sahra.org.za](mailto:nhiggitt@sahra.org.za)>  
**Subject:** RE: ASGT: Gloria Mine Water Reservoir Environmental Authorisation - Case ref NC-00152-MR/102

Hello Natasha,

I have linked the Archaeologist's report. Still getting to grips with the system. Thank you for your patience.

Regards,

Abdul Ebrahim



**EScience Associates (Pty) Ltd**  
E-mail: [abdul@escience.co.za](mailto:abdul@escience.co.za)  
Cel: 072 268 1119  
Tel: +27 (0)11 718 6380

Fax: 0866 924 840

---

**From:** Natasha Higgitt <[nhiggitt@sahra.org.za](mailto:nhiggitt@sahra.org.za)>  
**Sent:** 05 June 2019 14:12  
**To:** Abdul Ebrahim <[abdul@escience.co.za](mailto:abdul@escience.co.za)>  
**Subject:** RE: ASGT: Gloria Mine Water Reservoir Environmental Authorisation - Case ref NC-00152-MR/102

Good afternoon,

I have assigned myself to the case, however, I have noted that the Archaeologist report has not been submitted to the case. Please create a second heritage report and upload the archaeological report. Please inform me when this has been completed. I have scheduled to review your case during the week of the 18<sup>th</sup> June 2019. I will inform you once comments are issued.

Kind regards,

---

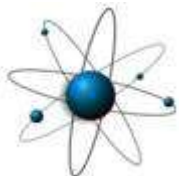
**From:** Abdul Ebrahim <[abdul@escience.co.za](mailto:abdul@escience.co.za)>  
**Sent:** Wednesday, June 05, 2019 1:01 PM  
**To:** Natasha Higgitt <[nhiggitt@sahra.org.za](mailto:nhiggitt@sahra.org.za)>  
**Subject:** RE: ASGT: Gloria Mine Water Reservoir Environmental Authorisation - Case ref NC-00152-MR/102

Hello Natasha,

Thank you for your prompt response. I have created the application. I have uploaded both the Archaeologist and Palaeontologist's report, as well the basic assessment report. Please let me know if anything further is required.

Kind Regards,

Abdul Ebrahim



**ESscience Associates (Pty) Ltd**

E-mail: [abdul@escience.co.za](mailto:abdul@escience.co.za)

Cel: 072 268 1119

Tel: +27 (0)11 718 6380

Fax: 0866 924 840

---

**From:** Natasha Higgitt <[nhiggitt@sahra.org.za](mailto:nhiggitt@sahra.org.za)>  
**Sent:** 05 June 2019 08:32  
**To:** Abdul Ebrahim <[abdul@escience.co.za](mailto:abdul@escience.co.za)>  
**Subject:** RE: ASGT: PPP Stakeholder Notification - Gloria Mine Water Reservoir Environmental Authorisation and Water Use Licence Applications

Good morning,

Please note that all development applications are processed via our online portal, the South African Heritage Resources Information System (SAHRIS) found at the following link: <http://sahra.org.za/sahris/>. We do not accept emailed, posted, hardcopy, faxed, website links or DropBox links as official submissions.



Please create an application on SAHRIS and upload all documents pertaining to the Environmental Authorisation Application Process. As per section 38(8) of the National Heritage Resources Act, Act 25 of 1999 (NHRA), an assessment of heritage resources must form part of the process and the assessment must comply with section 38(3) of the NHRA.

Once all documents including all appendices are uploaded to the case application, please ensure that the status of the case is changed from DRAFT to SUBMITTED. Please ensure that all documents produced as part of the EA process are submitted as part of the application, and are submitted to SAHRA at the beginning of the Public Review periods. Once all these documents have been uploaded, I will be able to issue an informed comment as per section 38(4) and 38(8) of the NHRA.

Kind regards,  
Natasha Higgitt

---

**From:** Abdul Ebrahim <[abdul@escience.co.za](mailto:abdul@escience.co.za)>

**Sent:** Tuesday, June 04, 2019 8:35 PM

**To:** [info@taologaetsewe.gov.za](mailto:info@taologaetsewe.gov.za); [gaborone@ga-segonyana.gov.za](mailto:gaborone@ga-segonyana.gov.za); [bloomt@joemorolong.gov.za](mailto:bloomt@joemorolong.gov.za); [Sylvia.Moholo@Dpw.Gov.Za](mailto:Sylvia.Moholo@Dpw.Gov.Za); [sunday.mabaso@dmr.gov.za](mailto:sunday.mabaso@dmr.gov.za); [jabader@environment.gov.za](mailto:jabader@environment.gov.za); [iris@tsamail.co.za](mailto:iris@tsamail.co.za); [iris@tsamail.co.za](mailto:iris@tsamail.co.za); [swarttj@taologaetsewe.gov.za](mailto:swarttj@taologaetsewe.gov.za); [rossouw@taologaetsewe.gov.za](mailto:rossouw@taologaetsewe.gov.za); [khakhane@gmail.com](mailto:khakhane@gmail.com); [majolar@dwaf.gov.za](mailto:majolar@dwaf.gov.za); [leburun@dwa.gov.za](mailto:leburun@dwa.gov.za); [dKgosi@ncpg.gov.za](mailto:dKgosi@ncpg.gov.za); [phebia.m@gmail.com](mailto:phebia.m@gmail.com); [psimpson@joemorolong.gov.za](mailto:psimpson@joemorolong.gov.za); [maape@ga-segonyana.gov.za](mailto:maape@ga-segonyana.gov.za); [simon@ga-segonyana.gov.za](mailto:simon@ga-segonyana.gov.za); [MokhoantleL@dwa.gov.za](mailto:MokhoantleL@dwa.gov.za); [jmutyorauta@half.ncape.gov.za](mailto:jmutyorauta@half.ncape.gov.za); [nramuhulu@ncpg.gov.za](mailto:nramuhulu@ncpg.gov.za); [jacolinema@daff.gov.za](mailto:jacolinema@daff.gov.za); Natasha Higgitt <[nhiggitt@sahra.org.za](mailto:nhiggitt@sahra.org.za)>; [mgalimberti@sahra.org.za](mailto:mgalimberti@sahra.org.za); [vanderwesthuizen@taologaetsewe.gov.za](mailto:vanderwesthuizen@taologaetsewe.gov.za); [nobelar@dwa.gov.za](mailto:nobelar@dwa.gov.za); [MsimangoP@dws.gov.za](mailto:MsimangoP@dws.gov.za)

**Cc:** Laurence Moorcroft <[laurence@escience.co.za](mailto:laurence@escience.co.za)>

**Subject:** ASGT: PPP Stakeholder Notification - Gloria Mine Water Reservoir Environmental Authorisation and Water Use Licence Applications

Dear Stakeholder,

Notice is hereby given, in terms of the National Environmental Management Act (Act 107 of 1998) [NEMA] that Assmang Limited proposes to expand operations at Gloria mine on Portion 1 of Farm Gloria through the construction of 2.5ML Process Water Reservoir. The proposed expansion requires an Environmental Authorisation and a Water Use Licence in terms of the National Water Act (Act 36 of 1998) [NWA].

Applicant: Assmang (Pty) Ltd - Black Rock Mine Operations

Environmental Assessment Practitioner: EScience Associates (Pty) Ltd.

Competent Authority: Department of Mineral Resources, and Department of Water and Sanitation

**Activity 34 (NEMA Environmental Impact Assessment Regulations Listing Notice 1 GN.R 983 of 2014 as amended)** applies: The expansion of existing facilities or infrastructure for any process or activity where such expansion will result in the need for a permit or licence or an amended permit or licence in terms of national or provincial legislation governing the release of emissions, effluent or pollution.

A Basic Assessment (BA) process is to be undertaken to assess the potential environmental impacts and inform the Environmental Authorisation process.

## Water Uses to be applied for in terms of the National Water Act:

- 21.b storing water
- 21.g disposing of waste in a manner which may detrimentally impact on a water resource.

This will be for the storage of process water in a 2.5ML reservoir.

The Environmental Impact Assessment regulations, and the Water Use Licence application regulations, require that all IAPs must be provided with opportunity to participate in the BA. This would include the opportunity to give input, review relevant reports, and submit comments or objections during the BA. Accordingly we herewith avail the basic assessment report to you for your review and comments.

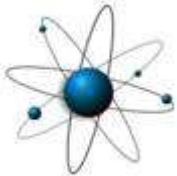
For further information please contact the person below.

Please find the report available at the link below. Please forward any comments you may have on or before Monday 08 July 2019.

<https://www.dropbox.com/preview/ASGT%20Draft%20BAR%2020190604%20AE.pdf?role=personal>

Regards,

Abdul Ebrahim



### **ESscience Associates (Pty) Ltd**

E-mail: [abdul@escience.co.za](mailto:abdul@escience.co.za)

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VAT No: 473 025 4416

Reg No: 2009/014472/07

### **Natasha Higgitt**

Heritage Officer: Archaeology, Palaeontology and Meteorites Unit

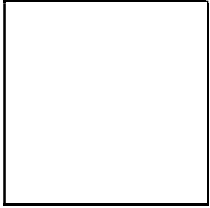
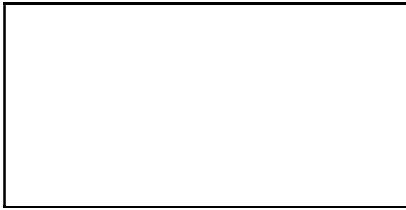
South African Heritage Resources Agency

- *A nation united through heritage* -

T: +27 21 462 4502/ 8660 | C:+27 82 507 0378 | F:+27 21 462 4509

E: [nhiggitt@sahra.org.za](mailto:nhiggitt@sahra.org.za) | 111 Harrington Street | Cape Town |

[www.sahra.org.za](http://www.sahra.org.za)



**Natasha Higgitt**

Heritage Officer: Archaeology, Palaeontology and Meteorites Unit

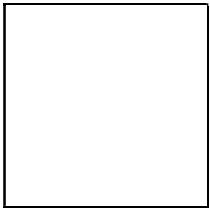
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T: +27 21 462 4502/ 8660| C:+27 82 507 0378| F:+27 21 462 4509

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**Natasha Higgitt**

Heritage Officer: Archaeology, Palaeontology and Meteorites Unit

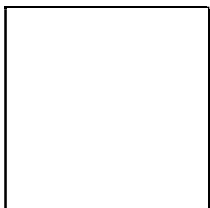
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**Natasha Higgitt**

Heritage Officer: Archaeology, Palaeontology and Meteorites Unit

South African Heritage Resources Agency

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[www.sahra.org.za](http://www.sahra.org.za)



## APPENDIX 2

## James Pugin

---

**From:** Marcel Prinsloo <mprinsloo953@gmail.com>  
**Sent:** Friday, 12 July 2019 07:18  
**To:** Abdul Ebrahim  
**Cc:** James Pugin  
**Subject:** Re: ASGT - Black Rock Environmental Authorisation Applications Stakeholder

Hi Abdul,

Thank you very much.

Kind regards,

Marcel Prinsloo

On Thu, 11 Jul 2019 at 17:07, Abdul Ebrahim <[abdul@escience.co.za](mailto:abdul@escience.co.za)> wrote:

Dear Mr Prinsloo,

As per our telephone discussion earlier, I herewith confirm that you have no comments or concerns in respect of the reservoir application. We will forward you the relevant reports for the proposed super fines storage facility when these are ready for review and commenting by interested and affected parties.

Thank you for your participation.

Regards,

Abdul Ebrahim



**EScience Associates (Pty) Ltd**

E-mail: [abdul@escience.co.za](mailto:abdul@escience.co.za)

Cel: 072 268 1119

Tel: +27 (0)11 718 6380

Fax: 0866 924 840

---

**From:** Abdul Ebrahim

**Sent:** 04 July 2019 12:09

**To:** 'mprinsloo953@gmail.com' <mprinsloo953@gmail.com>

**Cc:** James Pugin <james@escience.co.za>

**Subject:** RE: ASGT - Black Rock Environmental Authorisation Applications Stakeholder

Dear Mr Prinsloo,

Following our discussion earlier today, my understanding is that your parents reside in Hotazel and your main interest is in potential impact on groundwater.

As discussed there are two Environmental Authorisation processes underway:

1. A proposed super fines storage facility at Gloria mine. We have not yet finalised the scoping report for this, we will forward it to you and other registered interested and affected parties in due course.
2. A proposed process water reservoir at Gloria mine. The potential impact on groundwater is expected to be negligible, however you expressed that you would like to see the reports as well. the details thereof are below.

Assmang Limited proposes to expand operations at Gloria mine on Portion 1 of Farm Gloria through the construction of 2.5ML Process Water Reservoir. The proposed expansion requires an Environmental Authorisation and a Water Use Licence in terms of the National Water Act (Act 36 of 1998) [NWA]. Interested and affected parties must be given the opportunity to comment in terms of the National Environmental Management Act (Act 107 of 1998) [NEMA]. The following information is of relevance:

Applicant: Assmang (Pty) Ltd - Black Rock Mine Operations

Environmental Assessment Practitioner: EScience Associates (Pty) Ltd.

Competent Authority: Department of Mineral Resources, and Department of Water and Sanitation

**Activity 34 (NEMA Environmental Impact Assessment Regulations Listing Notice 1 GN.R 983 of 2014 as amended)** applies: The expansion of existing facilities or infrastructure for any process or activity where such expansion will result in the need for a permit or licence or an amended permit or licence in terms of national or provincial legislation governing the release of emissions, effluent or pollution.

A Basic Assessment (BA) process has been undertaken to assess the potential environmental impacts and inform the Environmental Authorisation process.

**Water Uses to be applied for in terms of the National Water Act:**

21.b storing water

21.g disposing of waste in a manner which may detrimentally impact on a water resource.

This will be for the storage of process water in a 2.5ML reservoir.

The Environmental Impact Assessment regulations, and the Water Use Licence application regulations, require that all IAPs must be provided with opportunity to participate in the BA. This would include the opportunity to give input, review relevant reports, and submit comments or objections during the BA. Accordingly we herewith avail the basic assessment report to you for your review and comments.

Please find the report attached without appendices due to the file size. A link is provided below as well for the report with the appendices. If possible please forward any comments you may have on or before Monday 08 July 2019, as this is the current target date for comments. However, the regulations stipulate that a 30 day comment period is applicable and thus you may comment accordingly within that timeframe.

<https://www.dropbox.com/preview/ASGT%20Draft%20BAR%2020190604%20AE.pdf?role=personal>

For further information please contact the person below.

Regards,

Abdul Ebrahim



**EScience Associates (Pty) Ltd**

E-mail: [abdul@escience.co.za](mailto:abdul@escience.co.za)

Cel: 072 268 1119

Tel: +27 (0)11 718 6380

Fax: 0866 924 840

---

**From:** James Pugin <[james@escience.co.za](mailto:james@escience.co.za)>

**Sent:** 03 July 2019 17:54

**To:** Abdul Ebrahim <[abdul@escience.co.za](mailto:abdul@escience.co.za)>

**Subject:** FW: ASGT PPP Mr M Prinsloo Communication



Hi Abdul,

For your information regarding the M Prinsloo being on the IAP database.

Regards,

James Pugin



**EScience Associates (Pty) Ltd**

E-mail: [james@escience.co.za](mailto:james@escience.co.za)

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PO Box 2950, Saxonwold, 2132

9 Victoria Street, Oaklands, Johannesburg, 2192

VAT No: 473 025 4416

Reg No: 2009/014472/07

---

**From:** James Pugin

**Sent:** Friday, 29 March 2019 15:05

**To:** Marcel Prinsloo <[mprinsloo953@gmail.com](mailto:mprinsloo953@gmail.com)>

**Subject:** RE: ASBA Application for Waste Management License, Water Use License and Environmental Authorisation at Assmang Black Rock Mining

Perfect, received.

Regards,

James Pugin



**EScience Associates (Pty) Ltd**

E-mail: [james@escience.co.za](mailto:james@escience.co.za)

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Fax: 0866 924 840

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PO Box 2950, Saxonwold, 2132

9 Victoria Street, Oaklands, Johannesburg, 2192

VAT No: 473 025 4416

Reg No: 2009/014472/07

**From:** Marcel Prinsloo <[mprinsloo953@gmail.com](mailto:mprinsloo953@gmail.com)>

**Sent:** Friday, 29 March 2019 2:58 PM

**To:** James Pugin <[james@escience.co.za](mailto:james@escience.co.za)>

**Subject:** Re: ASBA Application for Waste Management License, Water Use License and Environmental Authorisation at Assmang Black Rock Mining

Good day Games,

Thank you for the quick response. Please see below:

Title: Mr.

First Name/s or Initial/s: MM

Surname: Prinsloo

Organisation Address:

Electronic Mail: [mprinsloo953@gmail.com](mailto:mprinsloo953@gmail.com)

Electronic Mail (2):

Telephone: 0726413748

Facsimile:

On Fri, 29 Mar 2019 at 13:32, James Pugin <[james@escience.co.za](mailto:james@escience.co.za)> wrote:

Afternoon Marcel,

Your interest in the projects are noted. Please provide the following details so that I can add you to our IAP database for future communications and for the distribution of reports.

Title:

First Name/s or Initial/s:

Surname:

Organisation Address:

Electronic Mail:

Electronic Mail (2):

Telephone:

Facsimile:

Regards,

James Pugin



**EScience Associates (Pty) Ltd**

E-mail: [james@escience.co.za](mailto:james@escience.co.za)

Tel: 011 718 6380

Fax: 0866 924 840

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PO Box 2950, Saxonwold, 2132

9 Victoria Street, Oaklands, Johannesburg, 2192

VAT No: 473 025 4416

Reg No: 2009/014472/07

**From:** Marcel Prinsloo <[mprinsloo953@gmail.com](mailto:mprinsloo953@gmail.com)>

**Sent:** Friday, 29 March 2019 10:53 AM

**To:** James Pugin <[james@escience.co.za](mailto:james@escience.co.za)>

**Subject:** Application for Waste Management License, Water Use License and Environmental Authorisation at Assmang Black Rock Mining

Good day James,

Trust you are well.

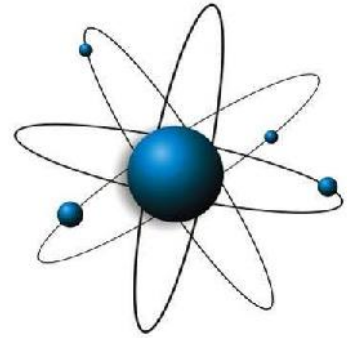
Will you please register me as an interested and affected party for the Waste Management License, Water use License and Environmental Authorisation at Assmang regarding the new super fines storage facility.

I have concerns with ground water quality.

Kind regards,

Marcel Prinsloo

## **APPENDIX 3: ENVIRONMENTAL MANAGEMENT PROGRAMME (EMPR)**



**ESCIENCE  
ASSOCIATES  
(PTY) LTD**

**ASSMANG (PTY) LTD BLACK  
ROCK MINE OPERATIONS,  
HOTAZEL, NORTHERN CAPE:**



BLACK ROCK MINE OPERATIONS

**ENVIRONMENTAL  
MANAGEMENT PROGRAMME**

**Department of Mineral Resources:  
Record Number: NC-00152-MR/102**

**15 MARCH 2019**

**POSTAL  
ADDRESS:**  
PO Box 2950  
Saxonwold  
2132

**PHYSICAL  
ADDRESS:**  
9 Victoria Street  
Oaklands  
Johannesburg  
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**FAX:**  
086 610 6703

**E-MAIL:**  
[info@escience.co.za](mailto:info@escience.co.za)

**WEBSITE:**  
[www.escience.co.za](http://www.escience.co.za)

# **ENVIRONMENTAL MANAGEMENT PROGRAMME**

## **ASSMANG (PTY) LTD BLACK ROCK MINE OPERATIONS, HOTAZEL, NORTHERN CAPE**

### **COMPILED BY EAP:**

EScience Associates  
PO Box 2950,  
Saxonwold, 2132  
9 Victoria Street,  
Oaklands, Johannesburg, 2192

Tel: (011) 718 6380  
Cell: 072 268 1119  
Fax: 0866 924 840  
E-mail: [abdul@escience.co.za](mailto:abdul@escience.co.za)

### **ON BEHALF OF APPLICANT:**

Assmang (Pty) Ltd – Black Rock Mine Operations  
PO Box 187  
Santoy  
Northern Cape  
8491

Tel: (053) 751 5555  
Fax: (053) 751 5251  
E-mail: [pierreb@brmo.co.za](mailto:pierreb@brmo.co.za)

**15 MARCH 2019**



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## ABBREVIATIONS

<b>Assmang</b>	Assmang (Pty) Ltd
<b>BRMO</b>	Black Rock Mine Operations
<b>CO</b>	Carbon monoxide
<b>CO<sub>2</sub></b>	Carbon dioxide
<b>DEA</b>	Department of Environmental Affairs
<b>DMR</b>	Department of Mineral Resources
<b>DWA</b>	Department of Water Affairs (now DWS)
<b>DWS</b>	Department of Water and Sanitation
<b>EAP</b>	Environmental Assessment Practitioner
<b>ECO</b>	Environmental Control Officer
<b>EO</b>	Environmental Officer
<b>EIA</b>	Environmental Impact Assessment
<b>HDPE</b>	High Density Polyethylene
<b>LED</b>	Local Economic Development
<b>Mn</b>	Manganese
<b>MPRDA</b>	Minerals and Petroleum Resources Development Act
<b>Mtpa</b>	Million tonnes per annum
<b>NCDENC</b>	Northern Cape Department of Environment and Nature Conservation
<b>NCR</b>	Non-conformance Reporting

<b>NEMA</b>	National Environmental Management Act, No. 107 of 1998 NEMA EIA
<b>NEMAQA</b>	National Environment Management: Air Quality Act, No. 39 of 2004
<b>NO<sub>x</sub></b>	Nitrogen oxides (NO & NO <sub>2</sub> )
<b>O<sub>2</sub></b>	Oxygen
<b>PM</b>	Particulate matter
<b>Environmental Specialist</b>	Project/Site Manager
<b>RDL</b>	Red Data Listed
<b>Regulations</b>	Regulations GN R.453, R.454, 455 and R.456 (18 June 2010), as amended. promulgated in terms of Section 24(5) read with Section 44, and Sections 24 and 24D of the National Environmental Management Act, 1998
<b>ROM</b>	Run of Mine
<b>TSF</b>	Tailings Storage Facility
<b>SO<sub>2</sub></b>	Sulphur dioxide
<b>'The mine'</b>	Includes Black Rock, Gloria and Nchwaning operations
<b>The Site</b>	Areas within the boundaries of BRMO's properties and under the control of BRMO, unless specified otherwise

# 1 INTRODUCTION

Assmang (Pty) Ltd mines manganese ore in the Black Rock area of the Kalahari, in the Northern Cape Province. The ore is mined from the Kalahari Manganese field. The Black Rock Mine Operations (BRMO) are approximately 80 kilometres (km) north-west of the town of Kuruman, in close proximity to the town of Hotazel.

In 1940, Assmang acquired a manganese ore outcrop on a small hillock known as Black Rock. Several large properties underlain by ore were subsequently found and acquired. Manganese ore mining operations were extended and today include 3 underground mining complexes:

- Gloria (commissioned in 1975) and producing medium grade carbonated ore
- Nchwaning II and Nchwaning III (commissioned in 1981 and 2004 respectively) and producing high grade oxide ore.

Proposed upgrades at the Gloria mine are the subject of this environmental impact assessment process.

The manganese ores of the Kalahari Manganese field are contained within sediments of the Hotazel Formation of the Griqualand West Sequence, a subdivision of the Proterozoic Transvaal Supergroup. The manganese ore bodies exhibit a complex mineralogy and more than 200 mineral species have been identified to date. The hydrothermal upgrading has resulted in a zoning of the orebody with regard to fault positions.

Distal areas exhibit more original and low-grade kutnohorite and braunite assemblages, while areas immediately adjacent to faults exhibit a very high-grade hausmannite ore. The intermediate areas exhibit a very complex mineralogy, which includes bixbyite, braunite and jacobsonite amongst a host of other manganese-bearing minerals.

A similar type of zoning also exists in the vertical sense. At the top and bottom contacts it is common to have high iron (Fe) and low manganese (Mn) contents while the reverse is true towards the centre of the seam. This vertical zoning has given rise to a mining practice where only the centre portion of the seam is being mined. At the Gloria Mine the intensity of faulting is much less, which also explains the lower grade.

Two manganese seams are presently mined. The No. 1 seam is up to 6 metres (m) in thickness and approximately 400 m underground at Nchwaning II and 200 m underground at Gloria. No 2 seam is situated above No 1 seam and is accessed via the Nchwaning II mining infrastructure.

## 1.1 ASSMANG (PTY) LIMITED

Assmang (Pty) Ltd is jointly owned by African Rainbow Minerals Limited (ARM) and Assore Limited, and currently has three independently operating divisions based on three respective commodities – chrome, manganese and iron ore (Figure 1-1). Assmang's Manganese Division consists of the Nchwaning II, Nchwaning III and Gloria manganese mines in the Northern Cape, as well as the ferromanganese works at Cato Ridge in Kwazulu-Natal.

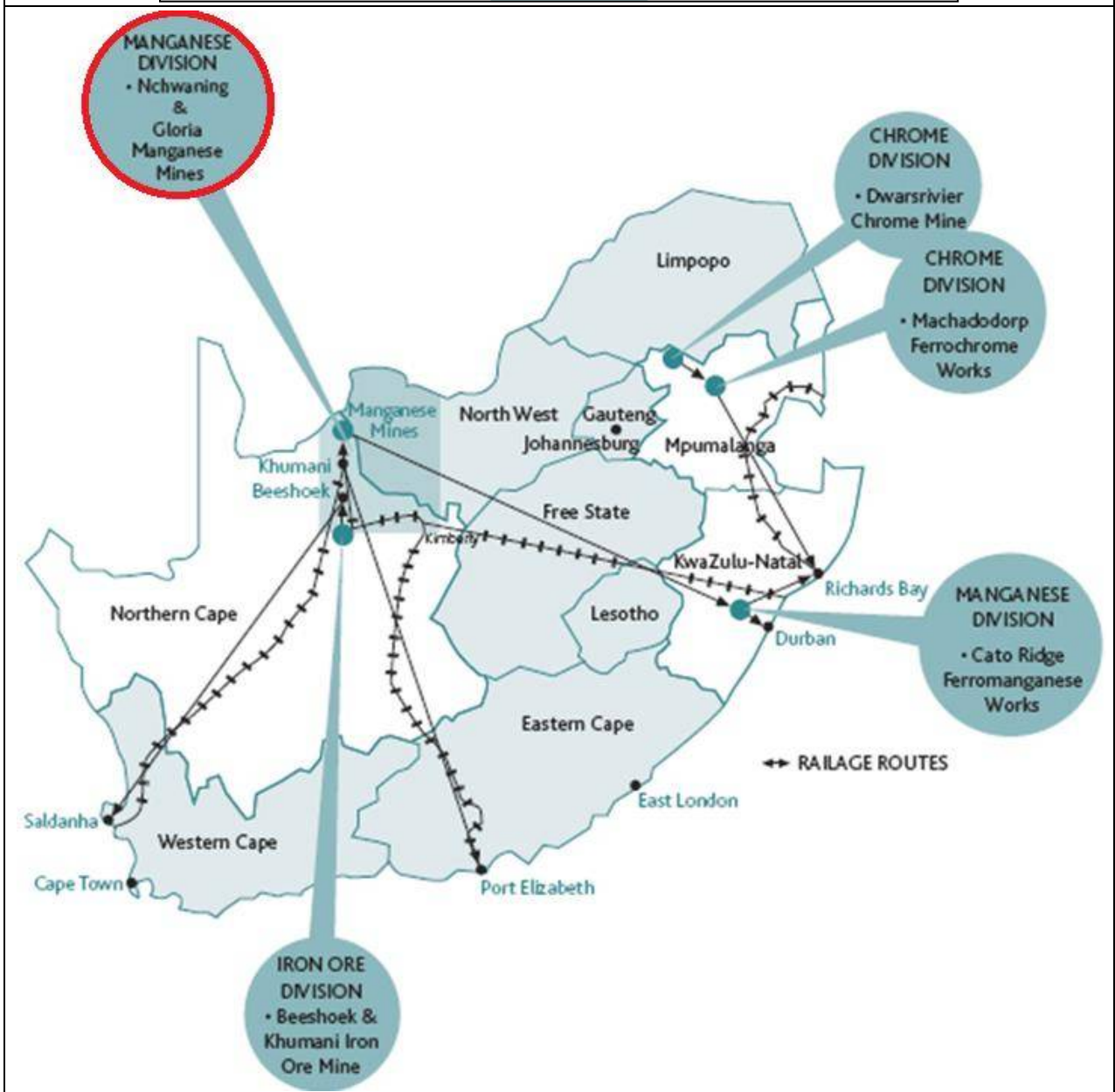
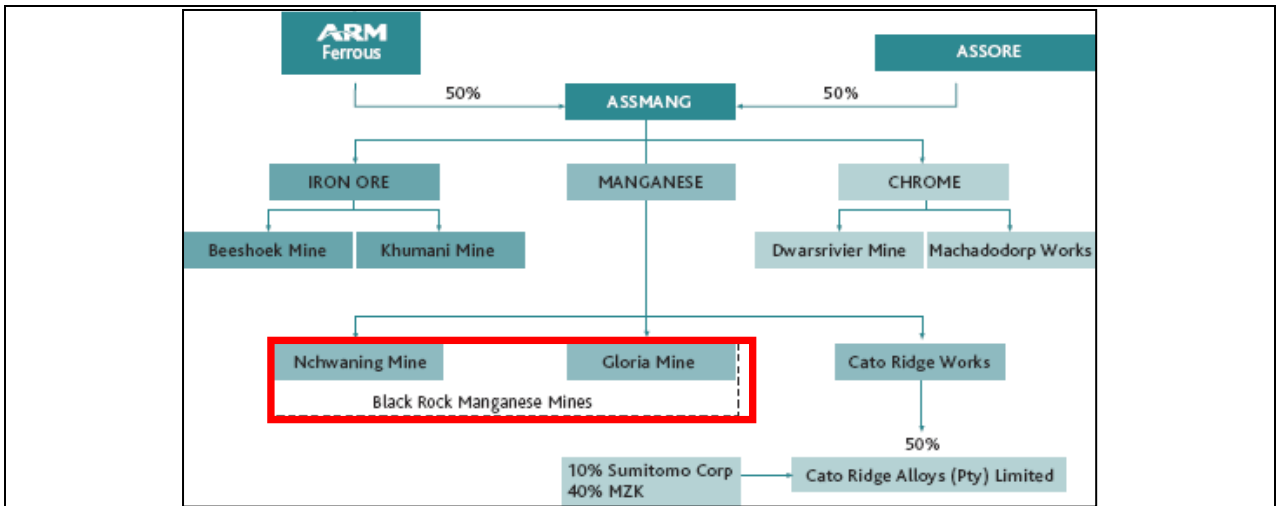
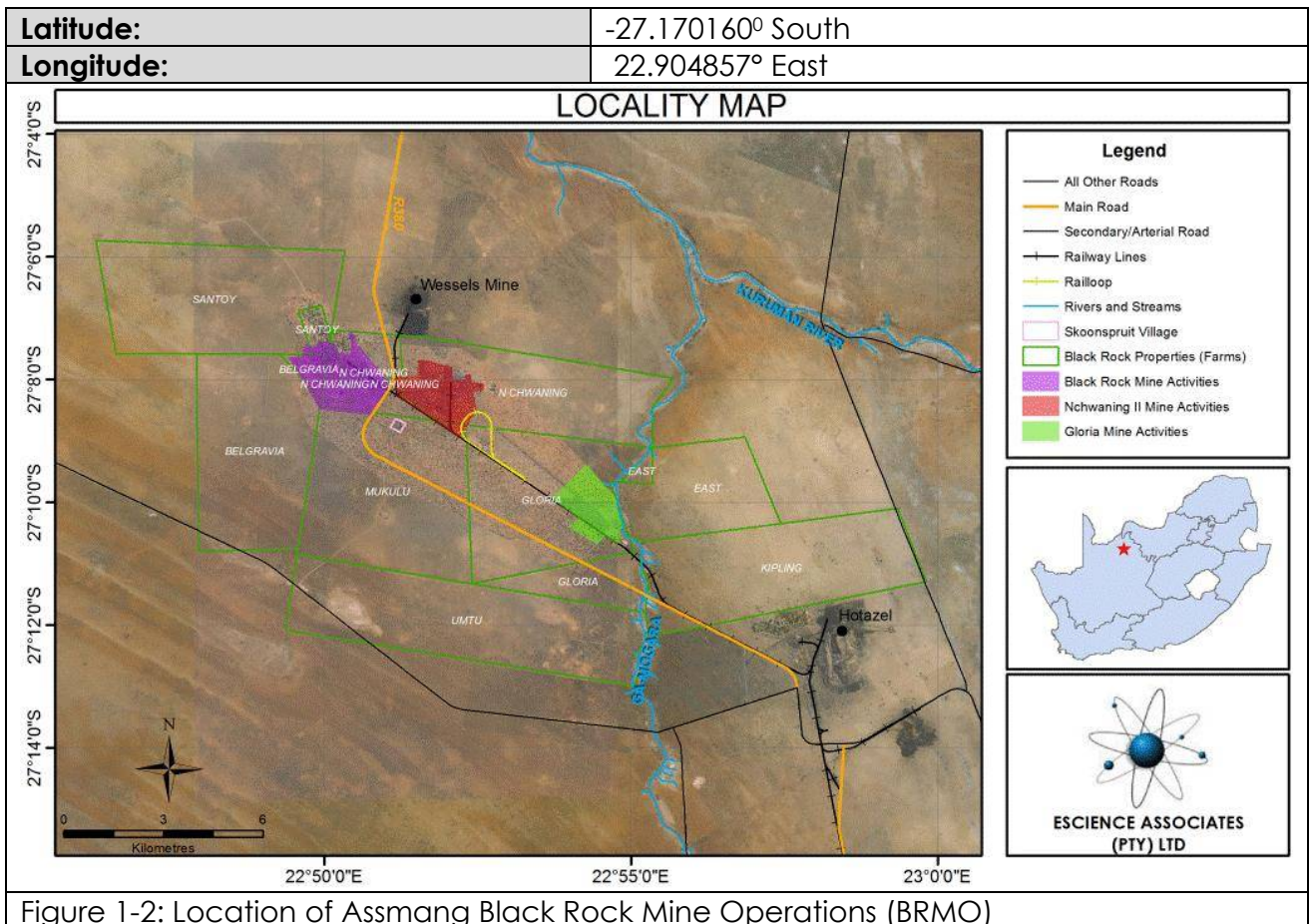


Figure 1-1: Overview of Assmang (Pty) Ltd South African Operations

## 1.2 REGIONAL LOCATION

BRMO is situated in the Northern Cape Province approximately 80 km north-west of the town of Kuruman and 12 kilometres north-west of Hotazel. BRMO falls within the jurisdiction of the John Taolo Gaetsewe District Municipality.



## 1.3 ADMINISTRATIVE INFORMATION

The following section and associated set of tables, provides pertinent administrative information pertaining to BRMO, associated mine lease area, as well as the environmental assessment practitioner who developed the Basic Assessment addendum (Table 1-1 to Table 1-5).

Table 1-1: Name and Address of Mine	
Owner and Name of Mine	Assmang (Pty) Limited, Black Rock Mine Operations
Company Registration	1935/007343/06
Physical Address	Black Rock Mine Operations, Santoy, Northern Cape
Postal Address	PO Box 187 Santoy 8491
Telephone	(053) 751 5201
Fax	(053) 751 5251
Senior General Manager	Pierre Becker

Table 1-2: Details of Acting Environmental Specialist
Assmang (Pty) Ltd - Black Rock Mining Operations – Gloria Expansion Environmental Management Programme
ESsCIENCE ASSOCIATES (PTY) LTD
Page 3

Name	Tshifhiwa Ravele
Physical Address	Main Offices Black Rock Mine Operations, Santoy, Northern Cape
Postal Address	PO Box 187 Santoy 8491
Telephone	(053) 751 5302
Fax	(053) 751 5251
Email	tshifhiwar@brmo.co.za

Table 1-3: Details of EAP	
Name of Company	EScience Associates (Pty) Ltd.
Contact Person	Mr. Abdul Ebrahim
Postal Address	PO Box 2950 Saxonwold 2132 JHB
Physical Address	9 Victoria Street Oaklands 2192 JHB
Telephone	(011) 718 6380
Fax	072 268 1119
Email	abdul@escience.co.za
Qualifications	Certified EAP, BEng Honours Environmental Engineering
Curriculum Vitae	Refer Appendix 1 of the basic assessment report

Table 1-4: BRMO Mining Rights, Surface Rights and Title Deed Description Relevant to this application.				
Mine	Farm Name	Title Deed	Surface and Mining Rights	SG 21 Key
Gloria	Ptn. 1 Gloria 226	No. 506 of 1966	Assmang (Pty) Ltd	C0410000000026600001

Table 1-5: Project Applicable Servitudes Relevant to this application.		
Mine	Servitude Type	Servitude No.
Gloria	Rail	K38/83S
Gloria	Water pipeline (Sedibeng Water Vaal-Gamagara Supply)	K36/1978S

## 1.4 LAND TENURE AND ADJACENT LAND USE

Assmang (Pty) Ltd holds both the surface- and mining rights over the properties encompassing the greater BRMO and its constituent mining operations (i.e. Black Rock, Nchwaning and Gloria Mines). The region surrounding BRMO is dominated by mining, industrial and agricultural (extensive livestock production systems) land uses. Land in the immediate vicinity of BRMO that is not used for mining/industrial purposes, is utilised for extensive livestock farming (i.e. sheep, goats, and cattle) and game farming (Refer to Figure 1-3).

# SURROUNDING LANDUSE

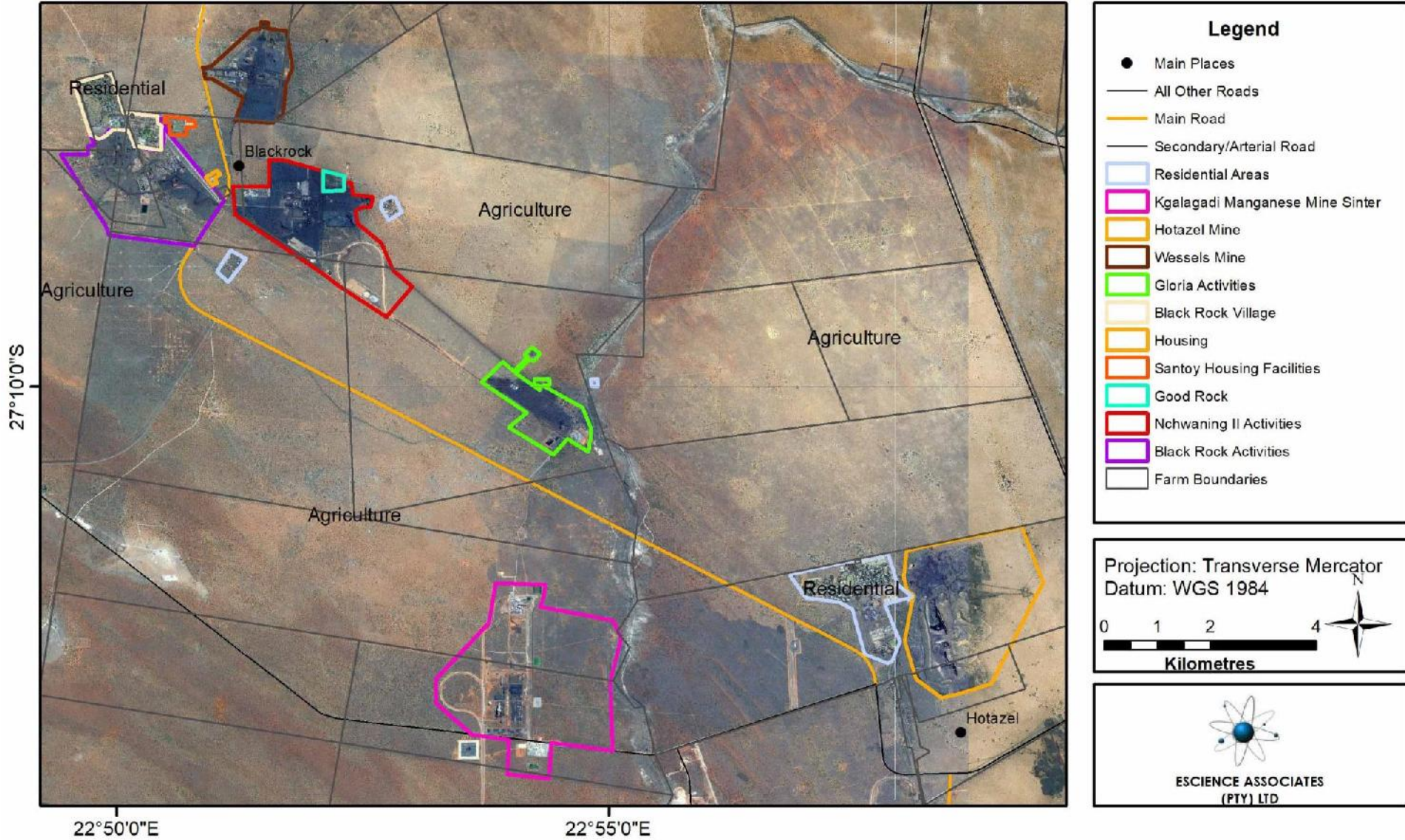


Figure 1-3: Surrounding Land Use



## **2 DESCRIPTION OF PROCESS**

### **2.1 BACKGROUND**

The general descriptions herein are intended to convey a broad understanding of the facilities and activities associated with the Gloria mine. These descriptions are not exhaustive. It should be noted that infrastructure typical of such mining activities is encountered on the site which may not be covered in specific detail herein. These facilities and infrastructure are subject to repairs, general maintenance and upgrading in accordance with standard practices, and thus will be altered from time to time. Such infrastructure is within the footprint of existing, historical, and/or authorised activities.

#### **2.1.1 GLORIA MINE**

Ore is mined at Gloria using underground bord and pillar methods, making use of trackless machines and underground conveyer systems. The thickness of the mined seams in conjunction with underground crushing ensures that waste rock is not unnecessarily brought to surface. At surface, the ore is crushed, and separated into various grades which are stockpiled in preparation for transport off the site. Transport is via rail and road. Operations at Gloria were commissioned in 1975. Gloria complex is comprised of several mining and mining related activities, including:

- Offices, administration, and support facilities
- Engineering services and facilities
- Underground mining access shafts, vent shafts and related infrastructure;
- Ore Processing Plant;
- Ore (including fines) storage and laydown areas;
- Stacking, reclaiming and loading facilities for transportation of ore;
- Current and historical tailings facilities;
- Contractor laydown areas;
- Waste storage and separation facilities;
- Salvage Yards;
- Potable water and process water storage and management facilities;
- A sewage treatment plant;
- Sub-stations and electrical works;
- Bulk fuel storage and refuelling station;
- Explosives magazines;
- Unpaved and paved roads connecting the above and other BRMO operations;
- Other ancillaries typical of such a mining operation.

##### **2.1.1.1 Underground Activities**

Ore is drilled, blasted, and crushed underground before being conveyed to the processing facilities on the surface. Operations underground consist mainly of:

- Drilling
- Blasting

- Crushing
- Handling and loading of ore

Facilities underground include, *inter alia*:

- Water storage and reticulation systems
- Engineering and support facilities
- Fuel storage facilities and re-fuelling bays

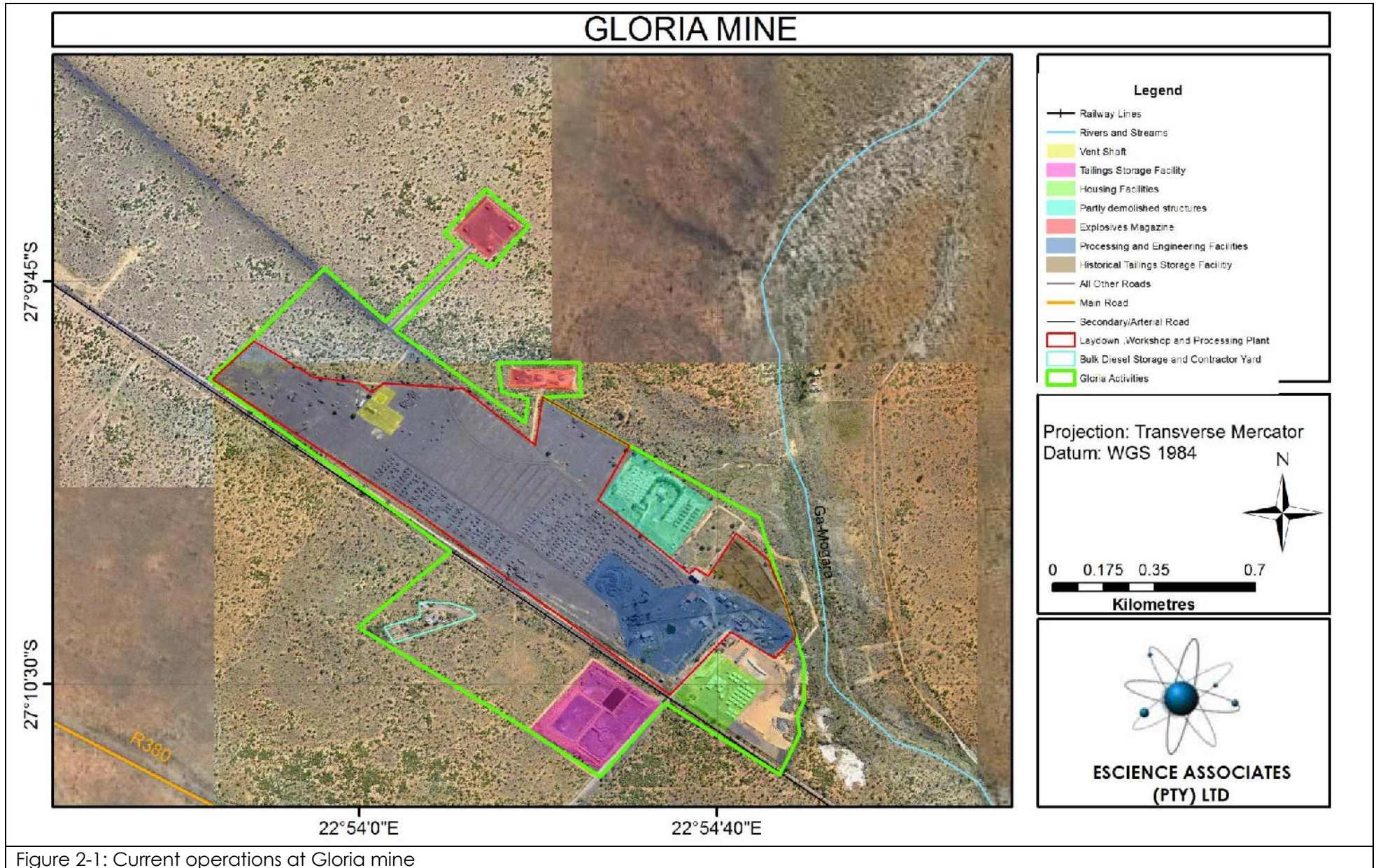


Figure 2-1: Current operations at Gloria mine

## **2.2 SCOPE OF THE PROPOSED ACTIVITIES**

The proposed process water storage capacity expansion at Gloria Mine entails the construction of an additional 2.5ML process water reservoir. Process water from the tailings management, underground abstraction, and other process water sources is collected in existing process water reservoirs and will be augmented by the installation of a new 2.5ML reservoir to increase storage and buffer capacity

The proposed upgrade will be undertaken within the existing disturbed footprint of the Gloria mine operations at Black Rock. Basic layout options are illustrated in Figure 2-2. Notably the final location will be confirmed by final detailed design considerations but will be within the existing disturbed footprint and will be in proximity to the locations indicated in Figure 2-2.

## LOCATION AND LAYOUT ALTERNATIVES



**Legend**

- Main Road
- Secondary/Arterial Road
- Gloria Mine Boundary

**Reservoir Layout Alternatives**

- Preferred Location and Layout
- Alternative Location and Layout

0      0.075      0.15  
  
 Kilometres

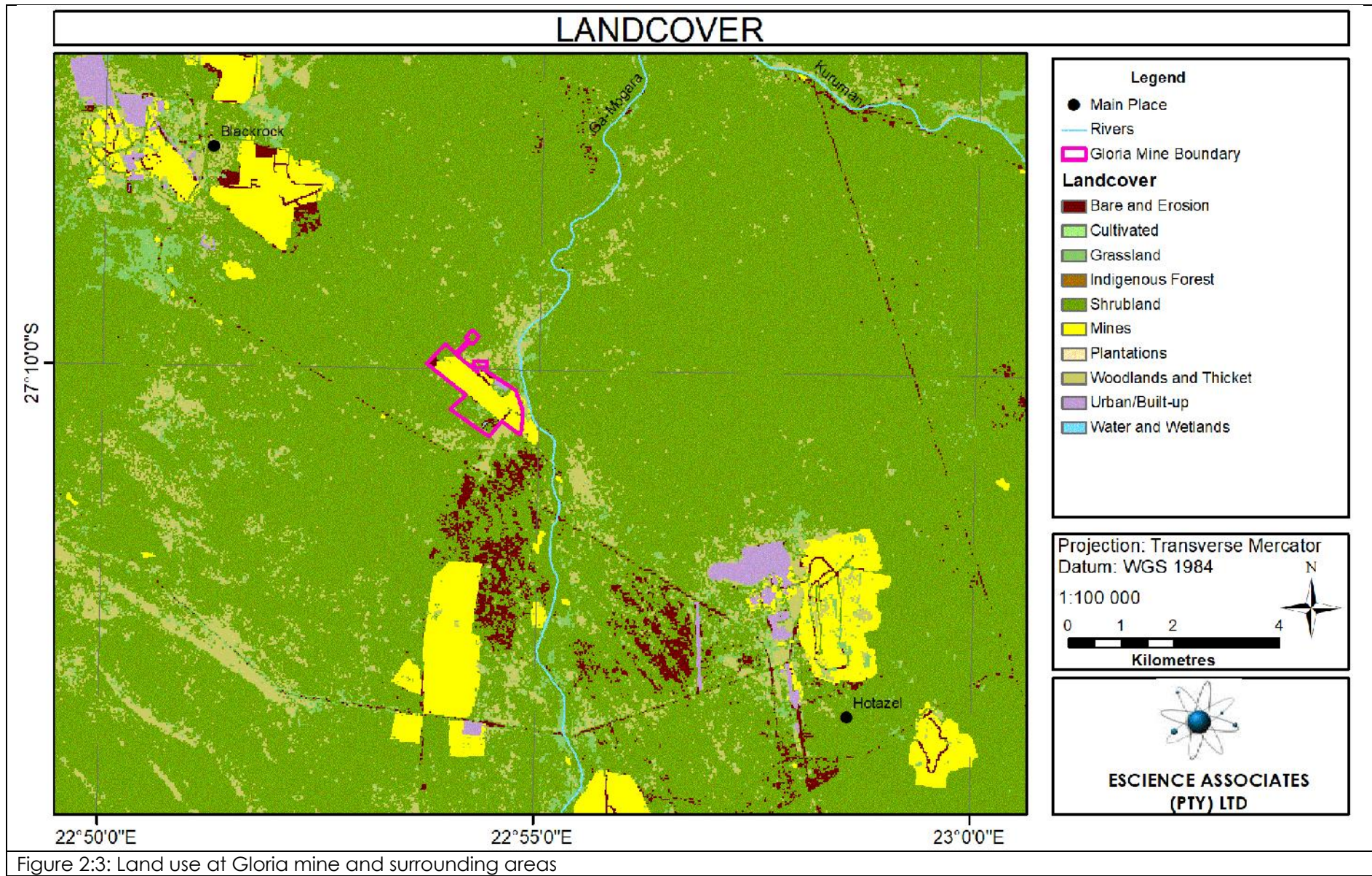
Projection: Transverse Mercator  
 Datum: WGS 1984

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 (PTY) LTD

Figure 2-2: Proposed Activities (Preferred Layout)

## **2.2.1 CURRENT LAND USE**

The proposed expansion of mining infrastructure at Gloria is a continuation of an existing facility. The proposed activity is set to upgrade/replace existing infrastructure within the disturbed footprint as depicted within the Gloria Mine boundary. The two alternatives fall within the Gloria boundary, however, alternative 1 falls within the mining areas, whereas, alternative 2 falls within shrubland (Refer to Figure 2:3).



### 3 ENVIRONMENTAL MANAGEMENT PROGRAMME

BRMO currently has an environmental authorisation for their existing EMPr that covers all mining operations at each of the three mines that include Black Rock, Nchwaning II and Gloria (Refer to Integrated Environmental Authorisation Ref No: NC 30/5/1/2/3/2/1/ (203) EM issued by the DMR). The proposed activities are not unique at the BRMO and similar activities are covered in the wider BRMO EMPr, therefore the currently authorised EMPr is used to form the basis of this EMPr. The EMPr listed within the ensuing sections is an extract of the current BRMO EMPr. This will enable Black Rock Mining Operations to continue operating with the current EMPr and will prevent fragmented EMPr's from governing different aspects at the mine.

#### 3.1 GENERAL REQUIREMENTS

Table 3-1: General Requirements					
Activity/Structure/Infrastructure	General requirements applicable to all phases of the authorised activities				
ASPECT	ACTIVITY or IMPACT	MANAGEMENT ACTIONS	TARGET	RESPONSIBILITY	TIME-FRAME/FREQUENCY
Access to EMPr and permits	Awareness of the requirements of the EMPr and environmental permits	A copy of this EMPr (or relevant sections of it), and relevant environmental permits must be kept at the areas where the activity will be undertaken. These must be made available for inspection by any employee or contractor who works or undertakes work at the site.	All persons must have practical access to the EMPr and environmental permits relevant to their work/activities.	Internal Environmental Officer	Continuous
Changing Circumstances	New legislation and updates of existing legislation	Where new legislation gazetted, or existing legislation is updated, and the new provisions are in conflict with the stipulations of the legislation, the legislation will take precedence unless otherwise indicated in the relevant transitional arrangements.	Compliance with current legislation at all times.	Environmental Specialist	Continuous
	Significant changes in planned or operational circumstances require that the EMPr be updated.	The competent authority must be informed of any significant changes to the activity descriptions, the proponent's details, or the EMPr.	The approved EMPr is kept up to date at all times	Environmental Specialist	Continuous



Table 3-1: General Requirements					
Activity/Structure/Infrastructure	General requirements applicable to all phases of the authorised activities				
ASPECT	ACTIVITY or IMPACT	MANAGEMENT ACTIONS	TARGET	RESPONSIBILITY	TIME-FRAME/FREQUENCY
Reporting and control of Environmental incidents	Reporting and control of Environmental incidents occurring on the site	<p>NEMA defines "incident" as an unexpected, sudden and uncontrolled release of a hazardous substance, including from a major emission, fire or explosion, that causes, has caused or may cause significant harm to the environment, human life or property;</p> <p>The NWA defines an emergency incident as any incident or accident in which a substance –</p> <p>(a) pollutes or has the potential to pollute a water resource; or</p> <p>(b) has, or is likely to have, a detrimental effect on a water resource.</p> <p>All incidents must be managed and reported as per the requirements of S30 of NEMA, and/or S20 of the NWA as applicable.</p>		Environmental Specialist	As soon as reasonably practicable after obtaining knowledge of the incident, Preferably within 24 hours.
Compliance Monitoring	Monitoring of Compliance with the EMPr	The Environmental Specialist shall ensure that quarterly monitoring of compliance with EMPr is undertaken and that the findings of compliance audits are addressed.	Compliance with EMPr is monitored and enforced.	Environmental Specialist	Quarterly

### 3.2 PRE-CONSTRUCTION, PLANNING AND DESIGN

Table 3-2: Mitigation for Pre-construction, Planning and Design Phase				
ASPECT	ACTIVITY or IMPACT	MANAGEMENT ACTIONS	RESPONSIBILITY	DATE/FREQUENCY
1. Project Planning & Design Phase				
1.1 Management (Set-up structures and procedures for implementation of EMPr)	Review and update the EMPr after detailed design has been completed	The EMPr must be reviewed after completion of detailed design. If necessary this EMPr must be updated to ensure that it is relevant to the detailed design of all applicable site structures, supporting infrastructure and activities.	Environmental Specialist	Once-off prior to commencement

Table 3-2: Mitigation for Pre-construction, Planning and Design Phase				
ASPECT	ACTIVITY or IMPACT	MANAGEMENT ACTIONS	RESPONSIBILITY	DATE/FREQUENCY
	Inform the competent authority	The competent authority must be informed of any significant changes to the project description or the EMPr	Internal Environmental Officer	As required
	Update the EMPr to be congruent with the requirements of the DMR EMPr approval, and other relevant environmental permits.	This EMPr must be updated to ensure that the conditions of relevant approvals, licences and authorisations issued for this project are not in conflict with the EMPr.	Environmental Specialist and Internal Environmental Officer	Biennial
	Appointment and duties of Environmental Control Officer	The project proponent must appoint an independent Environmental Control Officer who must audit compliance with the EMPr during the construction phase for mine expansion and the sinter plant complex.	Environmental Specialist	Once-off prior to commencement
	Management of staff and contractors	The EMPr must be made binding to contractors and should be included in tender documentation for the contract.	Environmental Specialist	Once-off before contractor appointments
The EMPr must be made readily available to the contractors, staff, as well as other relevant role-players associated with the project.		Environmental Specialist and Internal Environmental Officer	Continuous	
1.2 Training	Training of staff and contractors	Contractors and staff must be properly trained in all environmental aspects relating to their role in the project's construction and operation, as per requirements of the associated environmental awareness plan.	Internal Environmental Officer	Once-off prior to commencement & update as required
1.3 Legal Compliance	Environmental Authorisation	Obtain environmental authorisation, in terms of the National Environmental Management Act (107 of 1998), where activities listed in terms of Chapter 5 of the Act are triggered and not otherwise authorised.	Environmental Specialist with support of Internal Environmental Officer	Once-off as per requirements of the Act
1.4 Design specifications	Design processes and activities to meet requirements of the EMPr and environmental permits	Design engineers and contractors must be informed of the required minimum standards as may be stipulated in permits relevant to the processes and activities they are designing such that these can be incorporated in the design.	Environmental Specialist	Prior to commencement of design where relevant

### 3.3 CONSTRUCTION PHASE

Table 3-3: Construction Site Establishment and All Construction Activities					
Activity/Structure/Infrastructure	Establishment of temporary construction site facilities (Including administrative offices, ablution facilities, fuel storage, concrete/cement batching, vehicle workshops/wash bays, sleeping quarters and raw/construction material storage).				
ASPECT	ACTIVITY or IMPACT	MANAGEMENT ACTIONS	TARGET	RESPONSIBILITY	TIME-FRAME/FREQUENCY
Ambient air	Management of dust generation from unpaved surfaces subject to vehicle movement.	A dust palliative with at least 80% dust reduction efficiency must be applied to unpaved roads. Roads paved with low grade ore or aggregate shall be considered as being paved.	National dust outfall standards are complied with. National ambient air quality standards are complied with.	Production manager, Contractors	Application as necessary to meet target on an on-going basis, or as per the manufacturer's instructions where applicable.
	Burning of waste.	Waste shall not be burnt unless in a waste management facility, or other facility, licenced for that purpose. Evidence of lawful disposal all wastes streams generated must be maintained.	No unlawful burning of waste on the site.	All personnel and Contractors	Continuous
Surface water, soil and Ground water	Management of ablutions.	<p>Contractor/s must provide appropriate (capacity/effective containment of grey and black water), ablution/sanitary arrangements for employees, and maintain/service such for the duration of their site's activities in accordance with the MHSA as a minimum.</p> <p>Mobile facilities must be inspected on a daily basis for leaks and cleanliness, and emptied at frequency adequate to prevent overflow.</p> <p>Septic tank must be emptied at a frequency sufficient to prevent overflow. Caution must be taken to prevent leaks or spills during emptying of septic tanks. In the event of spill residue must be removed and the affected area must be treated with lime.</p>	No contact between black/grey water and site soils. No offensive odours emanating from ablution facilities.	Contractors	Once-off, with maintenance thereafter as per specification of the equipment/service provider

Table 3-3: Construction Site Establishment and All Construction Activities					
Activity/Structure/Infrastructure	Establishment of temporary construction site facilities (Including administrative offices, ablution facilities, fuel storage, concrete/cement batching, vehicle workshops/wash bays, sleeping quarters and raw/construction material storage).				
ASPECT	ACTIVITY or IMPACT	MANAGEMENT ACTIONS	TARGET	RESPONSIBILITY	TIME-FRAME/FREQUENCY
	Concrete batching activities	Concrete preparation (i.e. including mixing) and batching must take place on durable, impermeable, bunded surfaces	No contact between contaminated water, cement powder, or cement additives, and site soils.	Contractor	Continuous
		Run-off from preparation (i.e. including mixing) activities must be effectively contained and prevented from entering the natural environment (i.e. soils, surface water, and groundwater).	No contact between potentially contaminated run-off and site soils or surface water.	Contractor	Continuous
	Storage of fuel, oil and other hazardous chemical substances.	No underground (i.e. buried) fuel tanks may be established as part of the construction activities sites or anywhere else on site during construction, or operation.	No underground fuel tanks established on site	Proponent, Contractor	Continuous
		Bunded facilities must be compliant with specifications of the BRMO Spill Management and Specifications for Bund Walls procedure, as appended	Compliance with the BRMO bund specifications.	Engineering manager	Once-off
		Above ground fuel, or oil storage tanks, must be located within appropriately sized, impermeable, bunding that is constructed in accordance with BRMOs spill management procedure. Decanting must be undertaken within the bunded area or on an impermeable surface for this purpose.	All spillable hazardous substances stored in adequate bunds.	all persons storing and handling such substances	Continuous.
		Appropriate spill management kits must be kept and maintained on site wherever liquid hazardous materials are stored, and where refuelling and/or servicing of plant, vehicles and machinery takes place, in order to manage potential spillages effectively.	Spill management kits available on site and replenished as necessary.	All relevant supervisors	Continuous

Table 3-3: Construction Site Establishment and All Construction Activities					
Activity/Structure/Infrastructure	Establishment of temporary construction site facilities (Including administrative offices, ablution facilities, fuel storage, concrete/cement batching, vehicle workshops/wash bays, sleeping quarters and raw/construction material storage).				
ASPECT	ACTIVITY or IMPACT	MANAGEMENT ACTIONS	TARGET	RESPONSIBILITY	TIME-FRAME/FREQUENCY
		Training, in the use and maintenance of the abovementioned kits, as well as any contaminated waste products, must be provided to ALL staff either directly or indirectly involved in any of the activities identified above.	All relevant personnel trained. Records of training maintained.	All relevant supervisors	Once-off, with annual refresher training every year thereafter
		Hazardous chemical containers must be stored within appropriately constructed bunds. Inspection of containers' integrity must be undertaken regularly, and compromised containers must be replaced.	Bund wall capacity sized to at least 110% of the volume of the largest chemical container stored therein.	All relevant supervisors	Continuous.
		Sorbents and contaminated soil must be immediately collected and placed within a water-tight, skip/container for subsequent disposal or treatment at an appropriately licensed hazardous waste management facility.	Appropriate skips/containers on site. Contents removed to appropriate facility. Safe disposal records available.	All relevant supervisors. Internal Environmental Officer to keep records.	Continuous
	Undesirable impacts resulting from vehicle/plant workshops and wash bays	All servicing of plant and vehicles is to take place strictly within dedicated workshops within construction site/s, or otherwise off-site at appropriate maintenance facilities.	No servicing of plant or vehicles outside of dedicated workshop areas	Engineering Manager, Contractors	Continuous
		Furthermore, servicing and maintenance of plant and vehicles must take place on impermeable surfaces with appropriate measures in place to contain contaminated run-off. Impermeable surfaces must be maintained.	Impermeable, platforms established for the servicing of vehicles and plant within the construction site/s	Engineering Manager, Contractors	Continuous
		Where emergency/unplanned repairs are required during construction activities, or oil leaks are identified, suitable drip trays must be used to prevent contamination of soil and water.	Drip trays used for all leaks and in-situ repairs.	Engineering Manager, Contractors	

Table 3-3: Construction Site Establishment and All Construction Activities					
Activity/Structure/Infrastructure	Establishment of temporary construction site facilities (Including administrative offices, ablution facilities, fuel storage, concrete/cement batching, vehicle workshops/wash bays, sleeping quarters and raw/construction material storage).				
ASPECT	ACTIVITY or IMPACT	MANAGEMENT ACTIONS	TARGET	RESPONSIBILITY	TIME-FRAME/FREQUENCY
		Uncontaminated storm water run-off within the sites must be prevented from flowing through workshops and wash bays or any other contaminated areas.	Appropriate storm water management measures implemented, such that the generation of potentially contaminated surface water run-off is avoided	Engineering Manager, Contractors	Continuous
		Potentially contaminated water must be effectively diverted, contained and managed, such that no contaminants are ever in contact with site soils	No contact between potentially contaminated water and site soils or storm water systems	Engineering Manager, Contractors	Continuous
	Diminished ground water quality through poor waste management practices	Waste oil generated from vehicle workshops/drip trays must be immediately stored in sealable, water-tight, steel drums or containers within a bunded facility for subsequent removal from site for either recovery, or disposal thereof	Waste oil storage area/s appropriately bunded. Safe disposal/management certificates on record for all oil removed from site	Engineering Manager, Contractors	Once-off bund establishment. Continuous requirement for storage of waste oil.
		Waste oil storage areas may only be placed within relevant construction/contractor's sites, and BRMO workshop areas, before being moved to the BRMO hazardous waste storage area or direct removal by an appropriate waste removal or recycling company.	No waste oil storage outside of any dedicated contractor's sites, or BRMO workshop areas.	Engineering Manager, Contractors	Continuous
	Undesirable impacts due to inappropriate waste management	Sufficient, water-tight, skips/containers on site for the <u>separate</u> storage of general (including steel, rubble and other non-contaminated waste) and hazardous waste.	Sufficient skips provided for. No mixing of general and hazardous waste streams. No overflowing skips.	Engineering Manager, Contractors	Once-off
		Under no circumstances must waste be stored on site anywhere but in the appropriate skips/containers provided for such.	No waste storage or disposal on bare soil surfaces.	All	Continuous
		Waste skips/containers must be cleared when full, such that waste doesn't over-flow onto adjacent ground	No evidence of full, or over-flowing, waste skips/ins	Site supervisors.	Continuous

Table 3-3: Construction Site Establishment and All Construction Activities					
Activity/Structure/Infrastructure	Establishment of temporary construction site facilities (Including administrative offices, ablution facilities, fuel storage, concrete/cement batching, vehicle workshops/wash bays, sleeping quarters and raw/construction material storage).				
ASPECT	ACTIVITY or IMPACT	MANAGEMENT ACTIONS	TARGET	RESPONSIBILITY	TIME-FRAME/FREQUENCY
		Records of safe disposal must be obtained, and kept on file, for all waste removed from site; where the waste management facility/contractor used for such purposes must be appropriately licensed/permitted for such.	Records of safe disposal/management certificates kept on record	Internal Environmental Officer	Continuous
		The area supervisor is responsible for ensuring that wind-blown litter is collected from the sites on a daily basis.	No evidence of wind-blown litter. Records of daily collections/inspections kept on record.	Site supervisors, Internal Environmental Officer	Continuous
	Soil contamination through contact with waste material/s	Waste must not be temporarily stored on bare soil surfaces; <u>Except</u> where: <ul style="list-style-type: none"> <li>The waste is regarded as being 'inert' (e.g. waste bricks, uncontaminated steel scrap, etc.), in terms of the definition provided for in the National Environmental Management: Waste Act (59 of 2008);</li> <li>The waste will be removed from site within 30 days of the generation thereof; and</li> <li>No component of the waste is susceptible to dispersal by wind</li> </ul>	No contact between site soils and potential contaminants in construction waste/s	All	Continuous
		Skips/containers must, therefore, be clearly marked for purpose	Waste skips clearly marked for applicable waste types to be discarded therein	Site supervisors,	Once-off
		Safe disposal/management certificates must be obtained for all waste removed from site	Safe disposal/management certificates kept on record	Site supervisors, Internal Environmental Officer	Continuous, for every incidence of waste removal from site

Table 3-3: Construction Site Establishment and All Construction Activities					
Activity/Structure/Infrastructure	Establishment of temporary construction site facilities (Including administrative offices, ablution facilities, fuel storage, concrete/cement batching, vehicle workshops/wash bays, sleeping quarters and raw/construction material storage).				
ASPECT	ACTIVITY or IMPACT	MANAGEMENT ACTIONS	TARGET	RESPONSIBILITY	TIME-FRAME/FREQUENCY
		Waste may only be taken to appropriately licensed/permitted waste management facilities.	Proof of facility licensing and waste manifests kept on record	Site supervisors, Internal Environmental Officer	Continuous
		Waste skip/container collection and replenishment schedules must be developed and managed pro-actively by the supervisors, in order to ensure that no skips/containers are left full and/or over-flowing for any extended period of time and that there is always appropriate temporary waste storage capacity on site	Temporary waste storage capacity available to the contractor/s	Site supervisors, Internal Environmental Officer	Continuous. No skip left full on site for more than a week.
	Unsustainable use of natural resources and unnecessary landfill airspace utilisation	Contractors will be required to provide a method statement specific to waste minimisation, reuse, recovery and recycling, as well as temporary storage and disposal; where such plans would need to be signed off by competent site environmental personnel/environmental control officer (Environmental Control Officer) prior to the start of construction activities.	Approved method statement/s on record	Site supervisors,	Once-off, prior to commencement
Surface water	Surface storm water contamination through contact with waste material/s	Surface storm water run-off must not be able to flow through any waste storage areas. Nor should skips/containers, or waste storage areas, be positioned where surface water may pond or flow preferentially during rainfall events	No contact between construction waste and surface water	Site supervisors,	Continuous
Biodiversity	Reduced biodiversity due to construction site/s establishment in green-field areas	Construction sites may only be established within the anticipated development footprints of the proposed project. E.g. proposed product stockpile floors.	No vegetation cleared, that will not already require clearing as part of the approved project.	Project Manager	Once-off



Table 3-3: Construction Site Establishment and All Construction Activities					
Activity/Structure/Infrastructure	Establishment of temporary construction site facilities (Including administrative offices, ablution facilities, fuel storage, concrete/cement batching, vehicle workshops/wash bays, sleeping quarters and raw/construction material storage).				
ASPECT	ACTIVITY or IMPACT	MANAGEMENT ACTIONS	TARGET	RESPONSIBILITY	TIME-FRAME/FREQUENCY
	Poaching/killing of indigenous site fauna	The poaching, or killing, of indigenous site fauna is prohibited.	No harm to indigenous site fauna. Records kept on file of applicable training by contractor.	All Records kept by site supervisor or Internal Environmental Officer	Continuous. Once-off training, with annual refreshers every year thereafter
	Destruction of site flora through unauthorised 'harvesting' thereof	Under no circumstances are wood, or medicinal plants, to be 'harvested' without an appropriate permit or licence.	No destruction/'harvesting' indigenous site flora.	All Records kept by site supervisor or Internal Environmental Officer	Continuous. Once-off training, with annual refreshers every year thereafter

Table 3-3: Construction Site Establishment and All Construction Activities					
Activity/Structure/Infrastructure	Establishment of temporary construction site facilities (Including administrative offices, ablution facilities, fuel storage, concrete/cement batching, vehicle workshops/wash bays, sleeping quarters and raw/construction material storage).				
ASPECT	ACTIVITY or IMPACT	MANAGEMENT ACTIONS	TARGET	RESPONSIBILITY	TIME-FRAME/FREQUENCY
	Anthropogenic veld fires resulting in biodiversity loss	<p>If open fires (i.e. not contained in a brazier or equipment designed for that purpose), for the purposes of cooking, are to be tolerated within the construction site/s, the following conditions are to apply:</p> <ul style="list-style-type: none"> <li>• Must be well removed from fuel and hazardous material storage areas, in line with appropriate BRMO safety standards;</li> <li>• Must be well removed from indigenous vegetation (at least 15m);</li> <li>• Fire-extinguisher must be readily available;</li> <li>• Must be screened from wind with non-flammable material/s; and</li> <li>• Non-smouldering ash residues must be disposed of in general waste skip/s, or containers, on site.</li> </ul>	Well managed, clearly designated, area/s established for cooking fires.	Site supervisor	Continuous
	Infestation and propagation of alien invasive species	Contractors must ensure that alien invasive species within the bounds of their sites are managed in accordance with relevant provisions of the BRMO alien invasive species management plan.	No alien invasive floral species infestation within sites	Site supervisors	Continuous
		All relevant personnel and contractors to receive training in regard to the above requirements.	Copy of BRMO alien invasive species management plan provided to contractor/s. Records available of relevant training	Internal Environmental Officer	Once-off

Table 3-3: Construction Site Establishment and All Construction Activities					
Activity/Structure/Infrastructure	Establishment of temporary construction site facilities (Including administrative offices, ablution facilities, fuel storage, concrete/cement batching, vehicle workshops/wash bays, sleeping quarters and raw/construction material storage).				
ASPECT	ACTIVITY or IMPACT	MANAGEMENT ACTIONS	TARGET	RESPONSIBILITY	TIME-FRAME/FREQUENCY
Socio-economics	Social impacts stemming from an influx of contractors and associated employees.	Only contractor/s and his/her employees, or sub-contractors, may be housed within, or gain access to the construction site/s and housing facilities.	Controlled access to sites	Security manager, Contractor	Continuous
		Access by the contractor and his/her employees to adjacent farms (i.e. other than those falling within the ambit of the project) is strictly forbidden; unless otherwise agreed upon, in writing, by the relevant landowner/s.	No trespassing	Contractor	Continuous

Table 3-3: Construction Site Establishment and All Construction Activities					
Activity/Structure/Infrastructure	Establishment of temporary construction site facilities (Including administrative offices, ablution facilities, fuel storage, concrete/cement batching, vehicle workshops/wash bays, sleeping quarters and raw/construction material storage).				
ASPECT	ACTIVITY or IMPACT	MANAGEMENT ACTIONS	TARGET	RESPONSIBILITY	TIME-FRAME/FREQUENCY
		<p>The enhancement of benefits associated with the effects on employment lie in the potential to increase the employment opportunities for local communities in the JT Gaetsewe DM and supporting more jobs through the procurement of local goods than imported materials and inputs where feasible. In this context, the following should be considered, where possible:</p> <ul style="list-style-type: none"> <li>• Employ labour-intensive methods in construction, where economically feasible;</li> <li>• Employ local residents and communities, where possible;</li> <li>• Sub-contract to local construction companies (in the JT Gaetsewe DM), where feasible; and utilise local suppliers, where feasible.</li> </ul>	Maximum feasible procurement of local goods and services during the construction period	Project manager, Contractor	Continuous
		The negative impact on housing and service delivery provision pressures could be reduced by sourcing the majority of construction workers from local communities, thus reducing the need to bring new people into the local area.	Use of local labour sourced from the district to the greatest extent practical	Project manager, Contractor	Continuous
Topography	Soil erosion resulting from the creation of steep, unnatural, slopes	No slopes with gradient > 33° (i.e. 3H:1V) should be established on site; unless otherwise protected from erosion by appropriate storm water management measures, or slope stabilisation/re-vegetation	No visible erosion	Project Manager, Contractor	Continuous
Noise and Vibration	Increased ambient noise levels resulting from heavy vehicle operation during vegetation stripping	Vegetation and topsoil stripping to only be undertaken between 7:00am and 5:00pm.	No 'noisy' construction activities outside of stipulated work hours	Project Manager, Contractor	Continuous

Table 3-3: Construction Site Establishment and All Construction Activities					
Activity/Structure/Infrastructure	Establishment of temporary construction site facilities (Including administrative offices, ablution facilities, fuel storage, concrete/cement batching, vehicle workshops/wash bays, sleeping quarters and raw/construction material storage).				
ASPECT	ACTIVITY or IMPACT	MANAGEMENT ACTIONS	TARGET	RESPONSIBILITY	TIME-FRAME/FREQUENCY
		In terms of noise impact for various increases over the ambient, the National Noise Regulations define an increase of 7 dBA as “disturbing”. Noise levels during construction must, therefore, be kept within 7 dBA of the baseline data at sensitive receptors.	Once off baseline noise monitoring must be undertaken. Monitoring should be undertaken should a noise complaint be received.	Environmental Specialist	Continuous.
	Noise complaints	Should noise complaints be received then the source of the noise causing the disturbance must be investigated and measures to reduce the noise level must be considered and implemented. Subsequent follow-up with the complainant must be undertaken to confirm elimination of the problem.	Investigation within 1 week of complaint. Rectification with 2 weeks or as soon as practical.	Environmental Specialist	Continuous.
	Nuisance and potential property damage resulting from vibration and air over pressure increases associated with blasting	Ground level vibrations resulting from blasting activities should not exceed 10 m/s beyond the mine boundary	Compliance with USA Bureau of Mine Standards RU 8507	Project Manager	Continuous
		Air over pressure from blasting activities should not exceed 134 dB at the mine boundary	Compliance with USA Bureau of Mine Standards RU 8507	Project Manager	Continuous
		No surface blasting to take place during windy conditions	Compliance with USA Bureau of Mine Standards RU 8507	Project Manager	Continuous
		Ground level vibrations resulting from blasting activities should not exceed 10 m/s beyond the mine boundary	Compliance with USA Bureau of Mine Standards RU 8507	Proponent, Contractor	Continuous

Table 3-4: Civil- and Earthworks					
Activity/Structure/Infrastructure	Establishment of structural and infrastructural foundations/founding conditions and associated, operational, compacted working ‘floors’				
ASPECT	ACTIVITY or IMPACT	MANAGEMENT ACTIONS	TARGET	RESPONSIBILITY	TIME-FRAME/FREQUENCY
Topography	Soil erosion resulting from the creation of steep, unnatural, slopes	No slopes with gradient >33° (i.e. 3H:1V) should be established on site; unless otherwise protected from	No slopes >33°	Project Manager, Contractor	Continuous

Table 3-4: Civil- and Earthworks					
Activity/Structure/Infrastructure	Establishment of structural and infrastructural foundations/founding conditions and associated, operational, compacted working 'floors'				
ASPECT	ACTIVITY or IMPACT	MANAGEMENT ACTIONS	TARGET	RESPONSIBILITY	TIME-FRAME/FREQUENCY
		erosion by appropriate storm water management measures, or slope stabilisation/re-vegetation			
Surface water	Generation of contaminated surface storm water flows during the operational phase of the project	Provision must be for the diversion of 'clean' storm water run-off away from or around potentially contaminated working surfaces	Appropriate storm water management infrastructure installed on site	Project Manager	Once-off, prior to commencement of operational activities
		Provision must be made for the diversion, and appropriate containment of 'dirty' storm water run-off generated within potentially contaminated mine works areas.	Appropriate storm water management infrastructure installed on site	Project Manager	Once-off, prior to commencement of operational activities
		All 'dirty' storm water containment dams must be lined with a durable, impermeable, liner system as required in the BRMO IWWMP (e.g. HDPE liner), such that 'dirty/potentially contaminated' storm water is effectively contained for ultimate return to the process water circuit.	Appropriate storm water management infrastructure installed on site	Project Manager	Once-off, prior to commencement of operational activities
		All civil- and earth work must ensure that no surface ponding of storm water ultimately occurs at the operational mine works areas	No surface ponding of rain/storm water	Project Manager, Contractor	Once-off, prior to commencement of operational activities
Biodiversity	Biodiversity loss through destruction of natural habitat	Civil- and earth works may only proceed where vegetation- and topsoil stripping have been effected in compliance with the provisions of the EMPr	No extension of the development footprint beyond that approved in terms of this EMPr addendum	Project Manager, Contractor	Continuous

Table 3-5: Raw/Construction Material Stockpiles and Storage					
Activity/Structure/Infrastructure	Storage of raw/construction materials on site during the construction phase				
ASPECT	ACTIVITY or IMPACT	MANAGEMENT ACTIONS	TARGET	RESPONSIBILITY	TIME-FRAME/FREQUENCY
Topography	Alteration of site topography, such that preferential storm water flows, or sensitive ecological features, are disrupted/disturbed	Raw/construction material storage areas and stockpiles may not be established within 32 m of any prominent drainage lines on site. Nor within the buffer zone and delineated wetland/riparian zone of the Gamagara River, or within 100 m of the Gamagara river	No disturbances to prominent drainage lines. No construction activities within the Gamagara River and associated buffer zones (other than those authorised as part of railway bridge construction)	Project manager	Continuous
Biodiversity	Biodiversity loss through unnecessary habitat destruction	Raw/construction material storage may only take place within the development footprints of project structures and infrastructure, or designated construction site/s	No storage of materials in 'green-field' areas	Project Manager, Contractor	Continuous
Soils	Soil contamination through inappropriate storage of hazardous construction materials	Where daily quotas/stocks of hazardous materials are to be stored outside of the construction site/s, the materials must be stored such that there is no contact between the material and site soils	No soil contamination.	Project Manager, Contractor	Continuous

Table 3-6: Heritage and Palaeontology					
Activity/Structure/Infrastructure	The construction must comply with the conditions set out by SAHRA (South African Heritage Resource Agency)				
ASPECT	ACTIVITY or IMPACT	MANAGEMENT ACTIONS	TARGET	RESPONSIBILITY	TIME-FRAME/FREQUENCY

Training and Awareness	Intercepting of stromatolites	The developer and the ECO must be made aware of the possible presence of stromatolites in the pre-Kalahari Formations and if recorded a palaeontologist must be informed, and appropriate actions taken in the event of future mining of the stratigraphic units.	Ensure that stromatolites are identified and preserved	Environmental Specialist	Continuous
		The ECO should study the photographs of stromatolites to familiarise him/herself with these structures to be able to identify them should they come across them;	Ensure that stromatolites are identified and preserved	Environmental Specialist	Continuous
Heritage/ Archaeological Finds	Intercepting of archaeological sites	If any evidence of archaeological sites or remains (e.g. remnants of stone-made structures, indigenous ceramics, bones, stone artefacts, ostrich eggshell fragments, charcoal and ash concentrations), fossils or other categories of heritage resources are found during the proposed development, SAHRA APM Unit (Natasha Higgitt/Phillip Hine 021 462 5402) must be alerted.	Ensure that archaeological sites are identified and preserved	Environmental Specialist	Continuous
	Intercepting of burial grounds	If unmarked human burials are uncovered, the SAHRA Burial Grounds and Graves (BGG) Unit (Thingahangwi Tshivhase/Mimi Seetelo 012 320 8490), must be alerted immediately. A professional archaeologist or palaeontologist, depending on the nature of the finds, must be contracted as soon as possible to inspect the findings. If the newly discovered heritage resources prove to be of archaeological or palaeontological significance, a Phase 2 rescue operation may be required subject to permits issued by SAHRA;	Ensure that burial grounds are identified and preserved	Environmental Specialist	Continuous
Burial Grounds and Graves Located	If unmarked human burials are Uncovered	Contact SAHRA Burial Grounds and Graves (BGG) Unit (Thingahangwi Tshivhase/Mimi Seetelo 012 320 8490)	Upon discovery of burial sites or graves	Environmental Specialist	Immediately
Submission to SAHRA	Confirmation of SAHRA's requirements incorporated in EMPr	The Final EIR and EMPr must be submitted to SAHRA for record purposes;	Submission to SAHRA	EAP	Upon finalisation of EMPr



## 3.4 OPERATIONAL PHASE

Table 3-7: Operation of all authorised activities					
Activity/Structure/Infrastructure	Operation of all authorised activities				
ASPECT	ACTIVITY or IMPACT	MANAGEMENT ACTIONS	TARGET	RESPONSIBILITY	TIME-FRAME/FREQUENCY
Resource Preservation	Waste Minimisation and Recycling	Waste generated on the site must be separated at sources into recyclable categories and non-recyclables.	All waste generated is separated at source.	All	Continuous
		Waste must be recovered, recycled and reused to the greatest practical extent.	Maximum practical recovery, recycling and re-use of waste.	All	Continuous
	Water use optimisation	Water abstraction, use and disposal must be monitored and BRMO must set targets and implement plans for optimisation of water used per tonne of product.	Continuous improvement of water use.	Environmental Specialist, Engineering Manager and Production Manager.	Continuous, Annual review.
	Energy Management	Electricity and fuel use must be monitored and energy improvement plans must be developed and implemented for optimisation of energy used per tonne of product.	Continuous improvement in energy efficiency.	Environmental Specialist, Engineering Manager and Production Manager.	Continuous, Annual review.
Waste Management	Accumulation and Storage of Waste	All areas where waste is generated must have suitable receptacles for source accumulation of separated waste.	All waste is accumulated in appropriate receptacles	All supervisors	Continuous
		Waste must be stored in accordance with the requirements of the National Norms and Standards for storage of waste	Compliance with the norms and standards	Internal Environmental Officer	Continuous
		All waste that must be treated and/or disposed of, must be treated and/or disposed at suitably licenced facilities.	Treatment and/or disposal at licenced facilities	Internal Environmental Officer	Continuous
	BRMO Landfill	The landfill must be managed in accordance with its Waste Management Licence.	Compliance with WML	Internal Environmental Officer	Continuous
Air Quality	Degraded ambient air quality resulting from operations.	National limits for ambient air quality, in terms of those published in Government Notice No. 1210 of 24 December 2009, in terms of S9(1) of NEMAQA, must be met by the proponent	Compliance with National ambient air quality limits/standards	Environmental Specialist	Continuous

		Cumulative dust deposition target thresholds, in terms of SANS 1292, 2009/11/17, at the BRMO site boundary must be met	Less than 600 mg/m <sup>2</sup> /day at the BRMO Mine boundary – 30 day average	Environmental Specialist	Continuous
		Where the above standards are not met, the cause of this non-compliance must be investigated and subsequent corrective and preventative action must be implemented.	Causes for exceedances of the standards are determined and resolved.	Internal Environmental Officer to investigate.  Responsible departmental manager to resolve.	Continuous
	Management of dust generation from unpaved surfaces subject to vehicle movement.	A dust palliative with at least 80% dust reduction efficiency must be applied to unpaved roads. Roads paved with low grade ore or aggregate shall be considered as being paved.	National dust outfall standards are complied with. National ambient air quality standards are complied with.	Production manager,	Application as necessary to meet target on an on-going basis, or as per the manufacturer's instructions where applicable.
	Burning of waste.	Waste shall not be burnt unless in a waste management facility, or other facility, licenced for that purpose. Evidence of lawful disposal all wastes streams generated must be maintained.	No unlawful burning of waste on the site.	All personnel  Internal Environmental Officer to keep records.	Continuous
Surface Water, Soil and Ground Water	Storage of fuel, lubricants and other hazardous chemical substances.	Bunded facilities must be compliant with specifications of the BRMO Spill Management and Specifications for Bund Walls procedure, as appended	Compliance with the BRMO bund specifications.	Engineering manager	Once-off
		All liquid (including sludges and slurries) hazardous substances (including wastes) must be stored within bunded facilities and managed in accordance with BRMO procedure for management of hazardous substances as appended.	All spillable hazardous substances stored in adequate bunds.	All persons storing and handling such substances	Continuous.

		Appropriate spill management kits must be kept and maintained on site wherever liquid hazardous materials are stored, and where refuelling and/or servicing of plant, vehicles and machinery takes place, in order to manage potential spillages effectively.	Spill management kits available on site and replenished as necessary.	All relevant supervisors	Continuous
		Training, in the use and maintenance of the abovementioned kits, as well as any contaminated waste products, must be provided to ALL staff either directly or indirectly involved in any of the activities identified above.	All relevant personnel trained. Records of training maintained.	All relevant supervisors	Once-off, with annual refresher training every year thereafter
		Sorbents and contaminated soil must be immediately collected and placed within a water-tight, skip/container for subsequent disposal or treatment at an appropriately licensed hazardous waste management facility.	Appropriate skips/containers on site. Contents removed to appropriate facility. Safe disposal records available.	All relevant supervisors. Internal Environmental Officer to keep records.	Continuous
	Equipment storage and maintenance	All equipment (e.g. gear boxes, portable generators) which may leak oil, liquid fuels, or hazardous chemical substances must be located on impermeable bases which can contain leaks or must have appropriately sized drip trays.	No contamination of soil or surface water from leaking equipment.	Relevant Foremen and artisans	Continuous
	Separation of clean and dirty water	Where storm water flow paths are identified, storm water management infrastructure must be installed (i.e. cut-off trenches, diversion berms, silt traps, etc.).	Records kept of required inspections, as well as any maintenance applied	Engineering manager	
		Storm water management infrastructure must be regularly inspected and maintenance applied as necessary to ensure the efficient functioning thereof.	Records kept of required inspections, as well as any maintenance applied	Internal Environmental Officer – Inspections Engineering manager – Maintenance	Fort-nightly (October – March), monthly (April – September)

Noise	Increased ambient noise levels associated with operation	Noise caused by operations must not cause a nuisance. Any environmental noise complaints reported must be investigated and appropriate corrective and/or preventative action taken.	Compliance with SANS 10103 of 2008 and the ECA Noise regulations	Internal Environmental Officer – Investigation  Relevant department manager – corrective and preventative actions	Continuous
Biodiversity	Alien invasive species infestation and point of propagation, leading to biodiversity loss on site	The potential presence of alien invasive species on, and adjacent to the operational sites must be monitored and appropriately managed, in accordance with the BRMO alien invasive species management plan.	No evidence of alien invasive species occurrence within the vicinity of the TSF. Records kept of any remediation effected at the site (i.e. problematic species, nature of remedial efforts, date and party who effected remedial solution)	Internal Environmental Officer	Continuous
		The use of herbicides on site must be undertaken according to the BRMO environmental procedure for the use of herbicides, and in accordance with the manufacturers' instructions.	Compliance with applicable operational procedure	Environmental Specialist	Continuous
Preparation for Rehabilitation	Ensure adequacy of soil for rehabilitation	Current topsoil stockpile volumes at the time of updating the EMPr are insufficient for rehabilitation of the entire disturbed area. BRMO must therefore undertake an assessment of subsoils for use in rehabilitation and determine suitable procedures for successful use thereof if found to be possible.	Adequate soil resources for rehabilitation	Environmental Specialist	Within 1 year of EMPr approval.

### 3.5 CLOSURE AND REHABILITATION

Refer to the closure and rehabilitation phase for further detail on the closure plan.

Table 3-8: Demolition Site Establishment and Activities					
Activity/Structure/Infrastructure	Establishment of temporary site facilities (Including administrative offices, ablution facilities, fuel storage, concrete/cement batching, vehicle workshops/wash bays, sleeping quarters and raw/construction material storage).				
ASPECT	ACTIVITY or IMPACT	MANAGEMENT ACTIONS	TARGET	RESPONSIBILITY	TIME-FRAME/FREQUENCY
Ambient air	Management of dust generation from unpaved surfaces subject to vehicle movement.	A dust palliative with at least 80% dust reduction efficiency must be applied to unpaved roads. Roads paved with low grade ore or aggregate shall be considered as being paved.	National dust outfall standards are complied with. National ambient air quality standards are complied with.	Production manager, Contractors	Application as necessary to meet target on an on-going basis, or as per the manufacturer's instructions where applicable.
	Burning of waste.	Waste shall not be burnt unless in a waste management facility, or other facility, licenced for that purpose. Evidence of lawful disposal all wastes streams generated must be maintained.	No unlawful burning of waste on the site.	All personnel and Contractors	Continuous
Surface water, soil and Ground water	Management of ablutions.	<p>Contractor/s must provide appropriate (capacity/effective containment of grey and black water), ablution/sanitary arrangements for employees, and maintain/service such for the duration of their site's activities in accordance with the MHSA as a minimum.</p> <p>Mobile facilities must be inspected on a daily basis for leaks and cleanliness, and emptied at frequency adequate to prevent overflow.</p> <p>Septic tank must be emptied at a frequency sufficient to prevent overflow. Caution must be taken to prevent leaks or spills during emptying of septic tanks. In the event of spill residue must be removed and the affected area must be treated with lime.</p>	No contact between black/grey water and site soils. No offensive odours emanating from ablution facilities.	Contractors	Once-off, with maintenance thereafter as per specification of the equipment/service provider

Table 3-8: Demolition Site Establishment and Activities

Activity/Structure/Infrastructure	Establishment of temporary site facilities (Including administrative offices, ablution facilities, fuel storage, concrete/cement batching, vehicle workshops/wash bays, sleeping quarters and raw/construction material storage).				
ASPECT	ACTIVITY or IMPACT	MANAGEMENT ACTIONS	TARGET	RESPONSIBILITY	TIME-FRAME/FREQUENCY
	Concrete batching activities	Concrete preparation (i.e. including mixing) and batching must take place on durable, impermeable, bunded surfaces	No contact between contaminated water, cement powder, or cement additives, and site soils.	Contractor	Continuous
		Run-off from preparation (i.e. including mixing) activities must be effectively contained and prevented from entering the natural environment (i.e. soils, surface water, and groundwater).	No contact between potentially contaminated run-off and site soils or surface water.	Contractor	Continuous
	Storage of fuel, oil and other hazardous chemical substances.	No underground (i.e. buried) fuel tanks may be established as part of the construction activities sites or anywhere else on site during construction, or operation.	No underground fuel tanks established on site	Proponent, Contractor	Continuous
		Bunded facilities must be compliant with specifications of the BRMO Spill Management and Specifications for Bund Walls procedure, as appended	Compliance with the BRMO bund specifications.	Engineering manager	Once-off
		Above ground fuel, or oil storage tanks, must be located within appropriately sized, impermeable, bunding that is constructed in accordance with BRMOs spill management procedure. Decanting must be undertaken within the bunded area or on an impermeable surface for this purpose.	All spillable hazardous substances stored in adequate bunds.	all persons storing and handling such substances	Continuous.
		Appropriate spill management kits must be kept and maintained on site wherever liquid hazardous materials are stored, and where refuelling and/or servicing of plant, vehicles and machinery takes place, in order to manage potential spillages effectively.	Spill management kits available on site and replenished as necessary.	All relevant supervisors	Continuous
		Training, in the use and maintenance of the abovementioned kits, as well as any contaminated waste products, must be provided to ALL staff either directly or indirectly involved in any of the activities identified above.	All relevant personnel trained. Records of training maintained.	All relevant supervisors	Once-off, with annual refresher training every year thereafter

Table 3-8: Demolition Site Establishment and Activities

Activity/Structure/Infrastructure	Establishment of temporary site facilities (Including administrative offices, ablution facilities, fuel storage, concrete/cement batching, vehicle workshops/wash bays, sleeping quarters and raw/construction material storage).				
ASPECT	ACTIVITY or IMPACT	MANAGEMENT ACTIONS	TARGET	RESPONSIBILITY	TIME-FRAME/FREQUENCY
		Hazardous chemical containers must be stored within appropriately constructed bunds. Inspection of containers' integrity must be undertaken regularly, and compromised containers must be replaced.	Bund wall capacity sized to at least 110% of the volume of the largest chemical container stored therein.	All relevant supervisors	Continuous.
		Sorbents and contaminated soil must be immediately collected and placed within a water-tight, skip/container for subsequent disposal or treatment at an appropriately licensed hazardous waste management facility.	Appropriate skips/containers on site. Contents removed to appropriate facility. Safe disposal records available.	All relevant supervisors. Internal Environmental Officer to keep records.	Continuous
	Undesirable impacts resulting from vehicle/plant workshops and wash bays	All servicing of plant and vehicles is to take place strictly within dedicated workshops within construction site/s, or otherwise off-site at appropriate maintenance facilities.	No servicing of plant or vehicles outside of dedicated workshop areas	Engineering Manager, Contractors	Continuous
		Furthermore, servicing and maintenance of plant and vehicles must take place on impermeable surfaces with appropriate measures in place to contain contaminated run-off. Impermeable surfaces must be maintained.	Impermeable, platforms established for the servicing of vehicles and plant within the construction site/s	Engineering Manager, Contractors	Continuous
		Where emergency/unplanned repairs are required during construction activities, or oil leaks are identified, suitable drip trays must be used to prevent contamination of soil and water.	Drip trays used for all leaks and in-situ repairs.	Engineering Manager, Contractors	
		Uncontaminated storm water run-off within the sites must be prevented from flowing through workshops and wash bays or any other contaminated areas.	Appropriate storm water management measures implemented, such that the generation of potentially contaminated surface water run-off is avoided	Engineering Manager, Contractors	Continuous



Table 3-8: Demolition Site Establishment and Activities

Activity/Structure/Infrastructure	Establishment of temporary site facilities (Including administrative offices, ablution facilities, fuel storage, concrete/cement batching, vehicle workshops/wash bays, sleeping quarters and raw/construction material storage).				
ASPECT	ACTIVITY or IMPACT	MANAGEMENT ACTIONS	TARGET	RESPONSIBILITY	TIME-FRAME/FREQUENCY
	Diminished ground water quality through poor waste management practices	Potentially contaminated water must be effectively diverted, contained and managed, such that no contaminants are ever in contact with site soils	No contact between potentially contaminated water and site soils or storm water systems	Engineering Manager, Contractors	Continuous
		Waste oil generated from vehicle workshops/drip trays must be immediately stored in sealable, water-tight, steel drums or containers within a bunded facility for subsequent removal from site for either recovery, or disposal thereof	Waste oil storage area/s appropriately bunded. Safe disposal/management certificates on record for all oil removed from site	Engineering Manager, Contractors	Once-off bund establishment. Continuous requirement for storage of waste oil.
		Waste oil storage areas may only be placed within relevant construction/contractor's sites, and BRMO workshop areas, before being moved to the BRMO hazardous waste storage area or direct removal by an appropriate waste removal or recycling company.	No waste oil storage outside of any dedicated contractor's sites, or BRMO workshop areas.	Engineering Manager, Contractors	Continuous
	Undesirable impacts due to inappropriate waste management	Sufficient, water-tight, skips/containers on site for the <u>separate</u> storage of general (including steel, rubble and other non-contaminated waste) and hazardous waste.	Sufficient skips provided for. No mixing of general and hazardous waste streams. No overflowing skips.	Engineering Manager, Contractors	Once-off
		Under no circumstances must waste be stored on site anywhere but in the appropriate skips/containers provided for such.	No waste storage or disposal on bare soil surfaces.	All	Continuous
		Waste skips/containers must be cleared when full, such that waste doesn't over-flow onto adjacent ground	No evidence of full, or over-flowing, waste skips/ins	Site supervisors.	Continuous
		Records of safe disposal must be obtained, and kept on file, for all waste removed from site; where the waste management facility/contractor used for such purposes must be appropriately licensed/permitted for such.	Records of safe disposal/management certificates kept on record	Internal Environmental Officer	Continuous

Table 3-8: Demolition Site Establishment and Activities

Activity/Structure/Infrastructure	Establishment of temporary site facilities (Including administrative offices, ablution facilities, fuel storage, concrete/cement batching, vehicle workshops/wash bays, sleeping quarters and raw/construction material storage).				
ASPECT	ACTIVITY or IMPACT	MANAGEMENT ACTIONS	TARGET	RESPONSIBILITY	TIME-FRAME/FREQUENCY
		The area supervisor is responsible for ensuring that wind-blown litter is collected from the sites on a daily basis.	No evidence of wind-blown litter. Records of daily collections/inspections kept on record.	Site supervisors, Internal Environmental Officer	Continuous
	Soil contamination through contact with waste material/s	Waste must not be temporarily stored on bare soil surfaces; <u>Except</u> where: <ul style="list-style-type: none"> <li>• The waste is regarded as being 'inert' (e.g. waste bricks, uncontaminated steel scrap, etc.), in terms of the definition provided for in the National Environmental Management: Waste Act (59 of 2008);</li> <li>• The waste will be removed from site within 30 days of the generation thereof; and</li> <li>• No component of the waste is susceptible to dispersal by wind</li> </ul>	No contact between site soils and potential contaminants in construction waste/s	All	Continuous
		Skips/containers must, therefore, be clearly marked for purpose	Waste skips clearly marked for applicable waste types to be discarded therein	Site supervisors,	Once-off
		Safe disposal/management certificates must be obtained for all waste removed from site	Safe disposal/management certificates kept on record	Site supervisors, Internal Environmental Officer	Continuous, for every incidence of waste removal from site
		Waste may only be taken to appropriately licensed/permitted waste management facilities.	Proof of facility licensing and waste manifests kept on record	Site supervisors, Internal Environmental Officer	Continuous

Table 3-8: Demolition Site Establishment and Activities

Table 3-8: Demolition Site Establishment and Activities					
Activity/Structure/Infrastructure	Establishment of temporary site facilities (Including administrative offices, ablution facilities, fuel storage, concrete/cement batching, vehicle workshops/wash bays, sleeping quarters and raw/construction material storage).				
ASPECT	ACTIVITY or IMPACT	MANAGEMENT ACTIONS	TARGET	RESPONSIBILITY	TIME-FRAME/FREQUENCY
		Waste skip/container collection and replenishment schedules must be developed and managed pro-actively by the supervisors, in order to ensure that no skips/containers are left full and/or over-flowing for any extended period of time and that there is always appropriate temporary waste storage capacity on site	Temporary waste storage capacity available to the contractor/s	Site supervisors, Internal Environmental Officer	Continuous. No skip left full on site for more than a week.
	Unsustainable use of natural resources and unnecessary landfill airspace utilisation	Contractors will be required to provide a method statement specific to waste minimisation, reuse, recovery and recycling, as well as temporary storage and disposal; where such plans would need to be signed off by competent site environmental personnel/environmental control officer (Environmental Control Officer) prior to the start of construction activities.	Approved method statement/s on record	Site supervisors,	Once-off, prior to commencement
Surface water	Surface storm water contamination through contact with waste material/s	Surface storm water run-off must not be able to flow through any waste storage areas. Nor should skips/containers, or waste storage areas, be positioned where surface water may pond or flow preferentially during rainfall events	No contact between construction waste and surface water	Site supervisors,	Continuous
Biodiversity	Reduced biodiversity due to construction site/s establishment in green-field areas	Construction sites may only be established within the anticipated development footprints of the proposed project. E.g. proposed product stockpile floors.	No vegetation cleared, that will not already require clearing as part of the approved project.	Project Manager	Once-off
	Poaching/killing of indigenous site fauna	The poaching, or killing, of indigenous site fauna is prohibited.	No harm to indigenous site fauna. Records kept on file of applicable training by contractor.	All Records kept by site supervisor or Internal Environmental Officer	Continuous. Once-off training, with annual refreshers every year thereafter

Table 3-8: Demolition Site Establishment and Activities

Activity/Structure/Infrastructure	Establishment of temporary site facilities (Including administrative offices, ablution facilities, fuel storage, concrete/cement batching, vehicle workshops/wash bays, sleeping quarters and raw/construction material storage).				
ASPECT	ACTIVITY or IMPACT	MANAGEMENT ACTIONS	TARGET	RESPONSIBILITY	TIME-FRAME/FREQUENCY
	Destruction of site flora through unauthorised 'harvesting' thereof	Under no circumstances are wood, or medicinal plants, to be 'harvested' without an appropriate permit or licence.	No destruction/'harvesting' indigenous site flora.	All Records kept by site supervisor or Internal Environmental Officer	Continuous. Once-off training, with annual refreshers every year thereafter
	Anthropogenic veld fires resulting in biodiversity loss	<p>If open fires (i.e. not contained in a brazier or equipment designed for that purpose), for the purposes of cooking, are to be tolerated within the construction site/s, the following conditions are to apply:</p> <ul style="list-style-type: none"> <li>• Must be well removed from fuel and hazardous material storage areas, in line with appropriate BRMO safety standards;</li> <li>• Must be well removed from indigenous vegetation (at least 15m);</li> <li>• Fire-extinguisher must be readily available;</li> <li>• Must be screened from wind with non-flammable material/s; and</li> <li>• Non-smouldering ash residues must be disposed of in general waste skip/s, or containers, on site.</li> </ul>	Well managed, clearly designated, area/s established for cooking fires.	Site supervisor	Continuous
	Infestation and propagation of alien invasive species	Contractors must ensure that alien invasive species within the bounds of their sites are managed in accordance with relevant provisions of the BRMO alien invasive species management plan.	No alien invasive floral species infestation within sites	Site supervisors	Continuous

Table 3-8: Demolition Site Establishment and Activities

Activity/Structure/Infrastructure	Establishment of temporary site facilities (Including administrative offices, ablution facilities, fuel storage, concrete/cement batching, vehicle workshops/wash bays, sleeping quarters and raw/construction material storage).				
ASPECT	ACTIVITY or IMPACT	MANAGEMENT ACTIONS	TARGET	RESPONSIBILITY	TIME-FRAME/FREQUENCY
		All relevant personnel and contractors to receive training in regard to the above requirements.	Copy of BRMO alien invasive species management plan provided to contractor/s. Records available of relevant training	Internal Environmental Officer	Once-off
Socio-economics	Social impacts stemming from an influx of contractors and associated employees.	Only contractor/s and his/her employees, or sub-contractors, may be housed within, or gain access to the construction site/s and housing facilities.	Controlled access to sites	Security manager, Contractor	Continuous
		Access by the contractor and his/her employees to adjacent farms (i.e. other than those falling within the ambit of the project) is strictly forbidden; unless otherwise agreed upon, in writing, by the relevant landowner/s.	No trespassing	Contractor	Continuous

Table 3-8: Demolition Site Establishment and Activities

Activity/Structure/Infrastructure	Establishment of temporary site facilities (Including administrative offices, ablution facilities, fuel storage, concrete/cement batching, vehicle workshops/wash bays, sleeping quarters and raw/construction material storage).				
ASPECT	ACTIVITY or IMPACT	MANAGEMENT ACTIONS	TARGET	RESPONSIBILITY	TIME-FRAME/FREQUENCY
		<p>The enhancement of benefits associated with the effects on employment lie in the potential to increase the employment opportunities for local communities in the JT Gaetsewe DM and supporting more jobs through the procurement of local goods than imported materials and inputs where feasible. In this context, the following should be considered, where possible:</p> <ul style="list-style-type: none"> <li>• Employ labour-intensive methods in construction, where economically feasible;</li> <li>• Employ local residents and communities, where possible;</li> <li>• Sub-contract to local construction companies (in the JT Gaetsewe DM), where feasible; and utilise local suppliers, where feasible.</li> </ul>	Maximum feasible procurement of local goods and services during the construction period	Project manager, Contractor	Continuous
		The negative impact on housing and service delivery provision pressures could be reduced by sourcing the majority of construction workers from local communities, thus reducing the need to bring new people into the local area.	Use of local labour sourced from the district to the greatest extent practical	Project manager, Contractor	Continuous
Topography	Soil erosion resulting from the creation of steep, unnatural, slopes	No slopes with gradient > 33° (i.e. 3H:1V) should be established on site; unless otherwise protected from erosion by appropriate storm water management measures, or slope stabilisation/re-vegetation	No visible erosion	Project Manager, Contractor	Continuous

Table 3-8: Demolition Site Establishment and Activities

Activity/Structure/Infrastructure	Establishment of temporary site facilities (Including administrative offices, ablution facilities, fuel storage, concrete/cement batching, vehicle workshops/wash bays, sleeping quarters and raw/construction material storage).				
ASPECT	ACTIVITY or IMPACT	MANAGEMENT ACTIONS	TARGET	RESPONSIBILITY	TIME-FRAME/FREQUENCY
Noise and Vibration		In terms of noise impact for various increases over the ambient, the National Noise Regulations define an increase of 7 dBA as "disturbing". Noise levels during construction must, therefore, be kept within 7 dBA of the baseline data at sensitive receptors.	Once off baseline noise monitoring must be undertaken. Monitoring must be undertaken should a noise complaint be received.	Environmental Specialist	Continuous.
	Noise complaints	Should noise complaints be received then the source of the noise causing the disturbance must be investigated and measures to reduce the noise level must be considered and implemented. Subsequent follow-up with the complainant must be undertaken to confirm elimination of the problem.	Investigation within 1 week of complaint. Rectification with 2 weeks or as soon as practical.	Environmental Specialist	Continuous.
	Nuisance and potential property damage resulting from vibration and air over pressure increases associated with blasting	Ground level vibrations resulting from blasting activities should not exceed 10 m/s beyond the mine boundary	Compliance with USA Bureau of Mine Standards RU 8507	Project Manager	Continuous
		Air over pressure from blasting activities should not exceed 134 dB at the mine boundary	Compliance with USA Bureau of Mine Standards RU 8507	Project Manager	Continuous
		No surface blasting to take place during windy conditions	Compliance with USA Bureau of Mine Standards RU 8507	Project Manager	Continuous
		Ground level vibrations resulting from blasting activities should not exceed 10 m/s beyond the mine boundary	Compliance with USA Bureau of Mine Standards RU 8507	Proponent, Contractor	Continuous

## **4 ENVIRONMENTAL AWARENESS PLAN**

### **4.1 INTRODUCTION**

In terms of Section 39 (c) of the MPRDA, as well as Regulation 51 (b) (vi) of the Act, BRMO is required to submit an environmental awareness plan as part of the EMP addendum.

The environmental awareness plan must:

- Outline how employees will be informed of environmental risks; and
- State how employees will be able to prevent, reduce or remediate risks.

#### **4.1.1 SCOPE**

This environmental awareness plan sets out the mine's training procedures and objectives regarding environmental awareness. It is a stand-alone procedure, which serves to improve awareness, training and competency in the environmental field. It contains no detail on the actual training initiatives but rather serves to ensure that a responsible person is appointed to deal with and increase environmental awareness on the mine.

#### **4.1.2 RESPONSIBILITIES**

It should be the responsibility of the environmental manager, within the existing SHEQ Department at BRMO, to implement the environmental awareness plan. If necessary, assistance from others at the BRMO, or external support, will be used to conduct the training.

#### **4.1.3 OBJECTIVES**

The objectives as defined by ISO14001 are as follows:

Competence, Training and Awareness:

1. The organisation shall ensure that any person(s) performing tasks for it or on its behalf that have the potential to cause a significant environmental impact(s) identified by the organisation is (are) competent on the basis of appropriate education, training or experience, and shall retain associated records.
2. The organisation shall identify training needs associated with its environmental aspects and its environmental management system. It shall provide training or take other action to meet these needs, and shall retain associated records.
3. The organisation shall establish, implement and maintain a procedure(s) to make persons working for it or on its behalf aware of:
  - The importance of conformity with the environmental policy and procedures and with the requirements of the environmental management system.
  - The significant environmental aspects and related actual or potential impacts associated with their work, and the environmental benefits of improved personal performance.
  - Their roles and responsibilities in achieving conformity with the requirements of the environmental management system.
  - The potential consequences of departure from specified procedures.



#### **4.1.4 REVISION**

The responsible person will revise these environmental awareness procedures from time to time. The date of commencement of the revised procedure will always be indicated to prevent confusion.

### **4.2 ENVIRONMENTAL RISKS AND PRIORITIES**

#### **4.2.1 OBJECTIVES**

The following requirements of ISO14001 have bearing:

1. The organisation shall establish, implement and maintain a procedure(s) to identify potential emergency situations and potential accidents that can have an impact(s) on the environment and how it will respond to them.
2. The organisation shall respond to actual emergency situations and accidents and prevent or mitigate associated adverse environmental impacts.
3. The organisation shall periodically review and, where necessary, revise its emergency preparedness and response procedures, in particular, after the occurrence of accidents or emergency situations.
4. The organisation shall also periodically test such procedures where practicable.

#### **4.2.2 IDENTIFYING ENVIRONMENTAL RISKS**

Environmental risks must be identified and procedures must be set in place to deal with risks, which could include:

- Fires;
- Spills of hazardous substances, including explosions;
- Leaks or breaks of pipes or vessels, including dam overflows;
- Accidents, especially during adverse weather;
- Slow environmental degradation related to continuous poor housekeeping;
- Damage to heritage or environment; and
- Social issues, either complaints about poor environmental management, or direct employment type issues.

Many of these environmental risks have been identified in the EIA Report associated with the development of this EMPr addendum and therefore the risk assessment exercise will not be repeated here. Once the mitigation measures have been read in the EMPr chapter, it will be clear what training will assist with the prevention or reduction of each environmental risk.

### **4.3 INCREASING ENVIRONMENTAL AWARENESS**

#### **4.3.1 TRAINING NEEDS**

These shall be identified by:

- Management or staff through performance appraisal;
- At time of recruitment;
- In-task observation of performance;

- Additions to scope of work; and
- Changes to working procedures.

Training programmes and environmental awareness programmes will include:

- Environmental legislation and the BRMO EMS;
- Resource conservation, including recycling and cleaner production methods;
- Pollution prevention, including emergency procedures;
- General good house-keeping, storage and handling of chemicals;
- Spill prevention, clean-up and remediation;
- Ecological protection and nature conservation, including alien vegetation, protected trees; and
- Administrative procedures, such as reporting, data collection and input, sampling, etc.

The level of detail on these topics will depend upon the exposure of that person to the natural environment and the nature of their job. Contractors that are employed at BRMO must, prior to starting any work, complete the contractor's package. This package requires the contractor to perform SHEQ procedures, which include BRMO's SHEQ Policy, existing operational procedures and Incident Reporting. The contractor is required to brief and train all its employees on the BRMO SHEQ procedures prior to commencing with work. Training records must be available and auditable for auditing purposes.

Several different types of training programme can be developed, as follows:

- Induction training: for all new employees, aimed to acquaint the employee with the company, its rules and their new job; no employee may start work until they have completed the induction training;
- On-the-Job training: offered as needs be, but particularly as part of mentoring junior staff; to be largely conducted by supervisors and other senior staff;
- Internal training: may be similar to On-the-Job training, for topics such as machinery operation, but will be conducted as a discrete training event; other courses may also be offered such as First Aid. Outside service providers may be used, but training will take place on site;
- External training: can cover any topic, including leadership, life skills, management, etc. and should be aligned with the National Skills Strategy of the Department of Labour and the Mining Qualifications Authority;
- Educational assistance: this will encourage staff to study further, by possibly paying tuition and towards study materials, or allowing study leave; some payback system may be used for staff who fail, in order to provide motivation to pass and excel;
- Once training needs have been established it is up to the supervisor to notify the training department of the requirements. The training department will then identify pertinent and relevant courses (if not already done so by employee/supervisor) and schedule training accordingly. Identified and agreed training needs shall be included in budgets and processed as described below. Course attendance (other than at the internal induction courses) shall be scheduled on the basis of the scale of environmental risk; and

- Training expenses, including conferences and symposia should be checked and approved by the mine management. The training department shall complete a course authorisation form and ensure that the procedures are followed regarding course bookings, confirmations and payments. Planning of training for job specific training (done through training needs analysis) will be coordinated between the Training Superintendent and the relevant section heads. This will result in a training schedule for job specific training on the mine.

The trainee shall:

- Obtain approval from the mine management;
- Request training department to make official booking for him/her; and
- External training courses shall be assessed through:
  - Reports and recommendations of staff;
  - Recommendation by known competent external personnel; and
  - Review of course content, presenters, location and facilities by knowledgeable personnel.

### **4.3.2 EMS TRAINING**

All employees, current and new, and contractors will undergo induction, a part of which is environmental awareness training and includes the environmental policy of the mine. At the end of this training, personnel will be required to complete an awareness test and the level of awareness assessed by the training department. Re-testing, or re-induction, may be required. Computer Based Assessments can form part of this process.

All personnel performing tasks, which can cause significant or major environmental impacts, shall be competent on the basis of training, education and/or experience. This applies to, but is not limited to, supervisor level and above - i.e. operators, artisans.

#### **4.3.2.1 Type**

Awareness training must include the potential consequences of departure from specified operating procedures as well as significant environmental impacts, actual or potential, of their work activities. Training will be appropriate to the actual activity of individual employees.

#### **4.3.2.2 Evaluation**

Evaluation of awareness and competency training (implementation of training in the workplace) will be carried out by the environmental officers, section managers and staff in the training department. Senior management if required can also supplement the evaluation.

#### **4.3.2.3 Records**

The following records shall be maintained by the Training Department when relevant:

- Personnel qualifications;
- Training needs;
- Certificates;
- Licences;

- Training programmes/courses attended;
- Staff induction; and
- Performance appraisals (confidential).

## **4.4 ENVIRONMENTAL NON-COMPLIANCE**

Non-conformance is a term used for the ISO14001 EMS, whilst non-compliance typically relates to environmental law. Either way, these situations do occur and need to be dealt with suitably.

### **4.4.1 RESPONSE TO ENVIRONMENTAL NON-COMPLIANCE**

ISO14001 states that:

“The organisation shall establish, implement and maintain a procedure(s) for dealing with actual and potential non-conformity(ies) and for taking corrective action and preventative action”.

All employees and contractors must report non-compliances according to the EMS, which generally involves:

- Reporting to the supervisor of that area;
- Investigating the cause of the incident;
- Recording the incident;
- Reporting to authorities, if necessary;
- Ensuring remediation is done;
- Identifying corrective actions;
- Follow-up on corrective actions; and
- Drafting progress reports and keeping all records.





# mineral resources

Department:  
Mineral Resources  
**REPUBLIC OF SOUTH AFRICA**

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Tel: 053 807 1700/51 Fax: 053 832 5671 Email: [Eugene.Nkathholang@dmr.gov.za](mailto:Eugene.Nkathholang@dmr.gov.za), Ref: NC30/5/1/2/3/2/1/203mr

**From:** Mineral Regulation      **Enquiries:** P. E. Nkathholang

The Directors  
Assmang Limited  
P.O Box 187  
Santoy  
8491

Dear Sir/Madam

**APPROVAL OF APPLICATION FOR THE AMENDMENT OF AN ENVIRONMENTAL AUTHORISATION IN TERMS OF REGULATION 30 OF THE ENVIRONMENTAL IMPACT REGULATIONS, 2014 AS AMENDED, WITH REGARD TO A MINING RIGHT ISSUED TO ASSMANG LIMITED ON THE REMAINING EXTENT AND PORTION 1 OF THE FARM SANTOY NO. 230; REMAINING EXTENT AND PORTION 1 OF THE FARM BELGRAVIA NO. 246; REMAINING EXTENT AND PORTION 1, 2 AND 3 OF THE FARM NCHWANING NO. 267 AND PORTION AND PORTION 1 OF THE FARM GLORIA NO. 266, MAGISTERIAL DISTRICT OF KURUMAN.**


1. This office hereby acknowledges an updated Environmental Management Programme received on the 19 July 2016, and subsequent additional information as requested by the department on 06 October 2016.

2. The proposed amendments to the authorised Environmental Management Programme (EMPr) have been evaluated and after due consideration have been approved.
3. Factors considered include, inter alia:
  - a. The proposed amendments will not result in an increase of the authorised scope of activities.
  - b. The proposed amendments will result in a reduced environmental impact.
  - c. The public participation undertaken in which no stakeholders registered any concerns with the proposed amendments.
4. The approval is subject to the following conditions:
  - a. It is noted that the Black Rock Koppie is a potential heritage site in terms of the National Heritage Resources Act 25 of 1999. A heritage resources assessment must be undertaken and subsequent approval from the South African Heritage Resources Agency must be sought prior to any further development, or mining, of the Black Rock Koppie.
  - b. The management actions stipulated in the EMPr and supporting specialist studies must be implemented and adhered to.
  - c. All registered interested and affected parties must be informed of the approved amendment within 14 days of the date of the decision to the fact that an appeal may be lodged against the decision in terms of the National Appeals Regulations, if such appeal is available in the circumstances of the decision.
  - d. An annual environmental audit must be undertaken in accordance with regulation 34 of the Environmental Impact Assessment Regulations, 2014, as amended.
  - e. The EMPr must be included in all contract documentation for all phases of implementation.
  - f. A copy of this approval and the EMPr must be kept at the facility where the activities will be undertaken. These must be produced to any authorised official of the Department who requests to see them and must be made available for inspection by any employee or agent of the holder of the authorisation who works or undertakes work at the facility.

- g. The applicant shall remain responsible for the facility, and/or any of its impacts on the environment.
- h. The Department reserves the right to audit or inspect the Facility without prior notification at any time and frequency as may be determined by the Department.
- i. The applicant must make any relevant records or documentation available to the Department upon request.
- j. The License Holder must keep records of all monitoring results, nuisances and complaints regarding the authorised activities.

Your interest in the future of our environment is appreciated.

Yours faithfully

  
\_\_\_\_\_

**M.M. MALAPANE**

**ACTING CHIEF DIRECTOR: CENTRAL REGIONS**

**MINERAL REGULATION**

**DATE OF DECISION: 13.02.2018**



Approval of the EMPR

Approved in terms Regulation 25 of the Environmental Impact Assessment Regulations, 2014 as amended.

Signed at...*PRETORIA*...on...*13<sup>th</sup>*...Month...*FEBRUARY*.....20*18*

*U. H. Halapane*.....

Acting Chief Director

Region...*Central Regions*

## **APPENDIX 4: SPECIALIST STUDIES**

APPENDIX 4.1: GEOHYDROLOGICAL ASSESSMENT

APPENDIX 4.2: PALEONTOLOGICAL IMPACT ASSESSMENT

APPENDIX 4.3: LETTER OF HERITAGE IMPACT ASSESSMENT EXEMPTION REQUEST

APPENDIX 4.4: HERITAGE MANAGEMENT PLAN

## **APPENDIX 4.1: GEOHYDROLOGICAL ASSESSMENT**



**Geo Pollution Technologies Gauteng (Pty) Ltd**  
**Consulting Environmental Scientists**

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**Date: 7 November 2018**

**EScience Associates (Pty) Ltd**

**GPT Ref: GPT-Q-18-4555**

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Attention: Mr Abdul Ebrahim

**RETURN WATER DAM FOR THE PROPOSED EXPANSION OF THE NCHWANING II TAILINGS STORAGE FACILITY**

**1. INTRODUCTION**

In February 2017, Geo Pollution Technologies - Gauteng (Pty) Ltd conducted the following study:

- Groundwater assessment for liner feasibility for Black Rock Mine Operations, GPT Reference Number: EEESB-17-2127

The study aimed to prepare a risk-based assessment specifically to inform liner requirements for the proposed expansion of the Nchwaning II tailings storage facility. The risk assessment approach aims to describe and define the relationship between the cause (source) and the effect on the receptor, through the groundwater pathway. In the absence of any one of the three components, it can be concluded that groundwater risk does not exist (Framework for the Management of Contaminated Land, May 2010).

In November 2018, EScience requested that GPT investigate if a lined return water dam would alter the findings of the February 2017 study, which this letter will aim to address.

**2. PREVIOUS FINDINGS**

The results of the risk assessment are listed below by independently assessing the three components of the source-pathway-receptor model:

**1. Source**

The source of potential contamination is the *extension of the existing* tailings facility at the Nchwaning mine.

The results of the leach testing of tailings material indicate that the discard material has a low contamination potential. Only boron, barium, manganese and lead were found in a concentration above the lower Leachable Concentration Threshold (LCT) limits. However, these elements are not present in the groundwater in concentrations exceeding the LCT0 concentration (with the exception

of boron) thus indicating that the tailings are not currently leaching to the groundwater to any significant degree. Boron is a naturally occurring compound associated with manganese ore and can reach natural concentrations in the ore of 0.5 to 1.1% (Varentsov, 1996).

It is concluded that the source presents a low contamination risk at worst, and the concentration of contaminants in the groundwater is actually a reflection of what is already found naturally, as detected in groundwater hydraulically upgradient of the site.

## 2. Pathway

The pathway applicable to this study is unsaturated seepage through the Kalahari Formation to the groundwater below.

The groundwater level in the area is exceptionally deep. Average depth of water below surface was found to be about 60 metres below surface. At the site of the proposed tailings dam the groundwater is even deeper at an average of 73 metres (GPT03 and GPT04). At borehole GPT03 closest to the proposed tailings, the groundwater is at 100 metres below surface. This means that the vertical thickness of the unsaturated pathway below the tailings is at least 70 metres, but could well be as much as 100 m, which is immense. This also renders aquifer vulnerability very low.

During this very long pathway, there are at least three factors to consider:

- Time of travel. Recharge into the Kalahari Sands is very low, as little as 1 mm/year. Even taking extreme unsaturated flow conditions into account, the vertical velocity should not exceed 100 mm/a. It would thus take thousands of years for contamination to reach the permanent groundwater level. This slow transport velocity has also been illustrated by numerous tritium studies in the Kalahari (Xu Y., 2003).
- Diffusion during travel. During transport the water is constantly diffused by factors such as different path lengths and retardation, for instance. The result of this diffusion is that a contamination pulse will reach the subsurface groundwater as a spread out diffuse cloud. This will inevitably reduce the contamination levels by orders of magnitude, rendering the contribution to groundwater compounds immeasurably small.
- Temporary perching: The Kalahari sands and the calcrete/clay layers form a vertically and laterally complex network of flow and perching regimes. This temporary perching before infiltration is a prominent factor in retarding vertical flow, and increases diffusion and dilution of dissolved compounds.

## 3. Receptor(s)

Based on current available information, only proposed abstraction borehole BRMO - 23 is a possible sensitive receptor. BRMO is in the process of investigating abstraction at this point for domestic purposes. However, it has been shown in a previous investigation that the travel time to this borehole is at least five years and that the concentration will be reduced to only about 1% of the input concentration of chemical compounds that might reach the bottom of the unsaturated zone. It must thus be concluded that even if any contaminant should be able to reach the saturated aquifer, no sensitive receptors will be affected.

Taking into account that:

- The contribution of the new proposed tailings as a source of contamination is very unlikely and statistically insignificant;

- The pathway through the unsaturated zone is not a viable pathway on life-of-mine timescales, and is probably relatively impermeable to groundwater infiltration;
- No sensitive receptors are currently present in the area of mining; and,
- Based on a previous study, no environmental benefit is expected from installing a liner beneath a new tailing's facility adjacent to an unlined tailings facility;

It is concluded that the source-receptor linkage is incomplete in the mining area, and that *“(the) risk of seepage entering the groundwater environment and reaching receptors with no lining using existing leach results for Life of TSF, 20 years, 50 years and 100 years”* is indeed negligible.

### 3. RETURN WATER DAM

As the new return water dam will be lined no additional impacts are foreseen and is based on the following;

- The contribution of the new return water dam as a source of contamination is unlikely as the dam will be lined;
- The pathway through the unsaturated zone is not a viable pathway on life-of-mine timescales, and is probably relatively impermeable to groundwater infiltration;
- No sensitive receptors are currently present in the area of mining;

Kind regards,



---

(electronic signature)  
M. Burger; (MSc.,Pr.Sci.Nat)  
Professional Natural Scientist (No 400296/12)

#### **Geo Pollution Technologies - Gauteng (Pty) Ltd**

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## **APPENDIX 4.2: PALEONTOLOGICAL IMPACT ASSESSMENT**



# PGS HERITAGE

**PALAEONTOLOGICAL EXEMPTION LETTER OF THE PROPOSED 2.5ML PROCESS  
WATER RESERVOIR AT GLORIA MINE, BLACK ROCK, HOTAZEL, NORTHERN CAPE**

**Issue Date:** 05 May 2019  
**Revision No.:** v0.0  
**Client:** EScience Associates (Pty) Ltd  
**PGS Project No:** 394PIA

**PGS  
HERITAGE**



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Directors: HS Steyn, PD Birkholtz, W Fourie



## **Declaration of Independence**

I, Elize Butler, declare that –

General declaration:

- I act as the independent palaeontological specialist in this application
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting palaeontological impact assessments, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation;
- I will take into account, to the extent possible, the matters listed in section 38 of the NHRA when preparing the application and any report relating to the application;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- I will ensure that information containing all relevant facts in respect of the application is distributed or made available to interested and affected parties and the public and that participation by interested and affected parties is facilitated in such a manner that all interested and affected parties will be provided with a reasonable opportunity to participate and to provide comments on documents that are produced to support the application;
- I will provide the competent authority with access to all information at my disposal regarding the application, whether such information is favourable to the applicant or not
- All the particulars furnished by me in this form are true and correct;
- I will perform all other obligations as expected a palaeontological specialist in terms of the Act and the constitutions of my affiliated professional bodies; and
- I realise that a false declaration is an offence in terms of regulation 71 of the Regulations and is punishable in terms of section 24F of the NEMA.

## **Disclosure of Vested Interest**

I do not have and will not have any vested interest (either business, financial, personal or other) in the proposed activity proceeding other than remuneration for work performed in terms of the Regulations;

**PALAEONTOLOGICAL CONSULTANT:**

Banzai Environmental (Pty) Ltd

**CONTACT PERSON:**

Elize Butler



Tel: +27 844478759

Email: elizebutler002@gmail.com

**SIGNATURE:**



**ACKNOWLEDGEMENT OF RECEIPT**

<b>Report Title</b>	Palaeontological Exemption Letter of the proposed 2.5ml process water reservoir at Gloria Mine, Black Rock, Hotazel, Northern Cape		
<b>Control</b>	<b>Name</b>	<b>Signature</b>	<b>Designation</b>
<b>Author</b>	Elize Butler		Palaeontologist
<b>Reviewed</b>			Principal Heritage Specialist
<b>Client</b>	EScience Associates (Pty) Ltd		E.A.P.

**CLIENT:**

EScience Associates (Pty) Ltd.

**CONTACT PERSON:**

Abdul Ebrahim,

E-mail: [abdul@escience.co.za](mailto:abdul@escience.co.za),

Tel: +27 (0)11 718 6380

**SIGNATURE:**



## **EXECUTIVE SUMMARY**

Banzai Environmental was appointed by PGS Heritage (Pty) Ltd to conduct the Palaeontological Assessment for the proposed 2.5ml process water reservoir at Gloria Mine, Black Rock, Hotazel, Northern Cape.

**This is a recommended exemption from further Palaeontological studies as the proposed development is smaller than 600 m<sup>2</sup>.**

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## **TERMINOLOGY AND ABBREVIATIONS**

### **Archaeological resources**

This includes:

- material remains resulting from human activity which are in a state of disuse and are in or on land and which are older than 100 years including artefacts, human and hominid remains and artificial features and structures;
- rock art, being any form of painting, engraving or other graphic representation on a fixed rock surface or loose rock or stone, which was executed by human agency and which is older than 100 years, including any area within 10m of such representation;
- wrecks, being any vessel or aircraft, or any part thereof, which was wrecked in South Africa, whether on land, in the internal waters, the territorial waters or in the maritime culture zone of the republic as defined in the Maritimes Zones Act, and any cargo, debris or artefacts found or associated therewith, which is older than 60 years or which SAHRA considers to be worthy of conservation;
- features, structures and artefacts associated with military history which are older than 75 years and the site on which they are found.

### **Cultural significance**

This means aesthetic, architectural, historical, scientific, social, spiritual, linguistic or technological value or significance

### **Development**

This means any physical intervention, excavation, or action, other than those caused by natural forces, which may in the opinion of the heritage authority in any way result in a change to the nature, appearance or physical nature of a place or influence its stability and future well-being, including:

- construction, alteration, demolition, removal or change in use of a place or a structure at a place;
- carrying out any works on or over or under a place;
- subdivision or consolidation of land comprising a place, including the structures or airspace of a place;
- constructing or putting up for display signs or boards;
- any change to the natural or existing condition or topography of land; and
- any removal or destruction of trees, or removal of vegetation or topsoil

### **Early Stone Age**

The archaeology of the Stone Age between 700 000 and 2 500 000 years ago.

### **Fossil**

Mineralised bones of animals, shellfish, plants and marine animals. A trace fossil is the track or footprint of a fossil animal that is preserved in stone or consolidated sediment.

### **Heritage**

That which is inherited and forms part of the National Estate (historical places, objects, fossils as defined by the National Heritage Resources Act 25 of 1999).

### **Heritage resources**

This means any place or object of cultural significance and can include (but not limited to) as stated under Section 3 of the NHRA,

- places, buildings, structures and equipment of cultural significance;
- places to which oral traditions are attached or which are associated with living heritage;
- historical settlements and townscapes;
- landscapes and natural features of cultural significance;
- geological sites of scientific or cultural importance;
- archaeological and palaeontological sites;
- graves and burial grounds, and
- sites of significance relating to the history of slavery in South Africa;

### **Holocene**

The most recent geological time period which commenced 10 000 years ago.

### **Late Stone Age**

The archaeology of the last 30 000 years associated with fully modern people.

### **Late Iron Age (Early Farming Communities)**

The archaeology of the last 1000 years up to the 1800's, associated with iron-working and farming activities such as herding and agriculture.

### **Middle Stone Age**

The archaeology of the Stone Age between 30 000-300 000 years ago, associated with early modern humans.

### **Palaeontology**

Any fossilised remains or fossil trace of animals or plants which lived in the geological past, other than fossil fuels or fossiliferous rock intended for industrial use, and any site which contains such fossilised remains or trace.

<b>Abbreviations</b>	<b>Description</b>
AIA	Archaeological Impact Assessment

ASAPA	Association of South African Professional Archaeologists
CRM	Cultural Resource Management
DEA	Department of Environmental Affairs
ECO	Environmental Control Officer
EIA practitioner	Environmental Impact Assessment Practitioner
EIA	Environmental Impact Assessment
ESA	Early Stone Age
GPS	Global Positioning System
HIA	Heritage Impact Assessment
I&AP	Interested & Affected Party
LSA	Late Stone Age
LIA	Late Iron Age
MSA	Middle Stone Age
MIA	Middle Iron Age
NEMA	National Environmental Management Act
NHRA	National Heritage Resources Act
PHRA	Provincial Heritage Resources Authority
PSSA	Palaeontological Society of South Africa
SADC	Southern African Development Community
SAHRA	South African Heritage Resources Agency

## 1 INTRODUCTION

### 1.1. Scope of the Proposed Activities

The planned process water storage capacity extension at Gloria Mine requires the construction of an extra 2.5ML process water reservoir (Figure 1-3). Process water from the underground abstraction, tailings management, and other process water sources is assembled in present process water reservoirs and will be increased by the installation of a new 2.5ML reservoir to escalate storage and buffer capacity.

The planned upgrade will be inaugurated within the present disturbed footprint of the Gloria mine operations at Black Rock. The final location will be confirmed by detailed final design considerations but will be within the current disturbed footprint and will be in the vicinity to the locations showed in **Error! Reference source not found.**



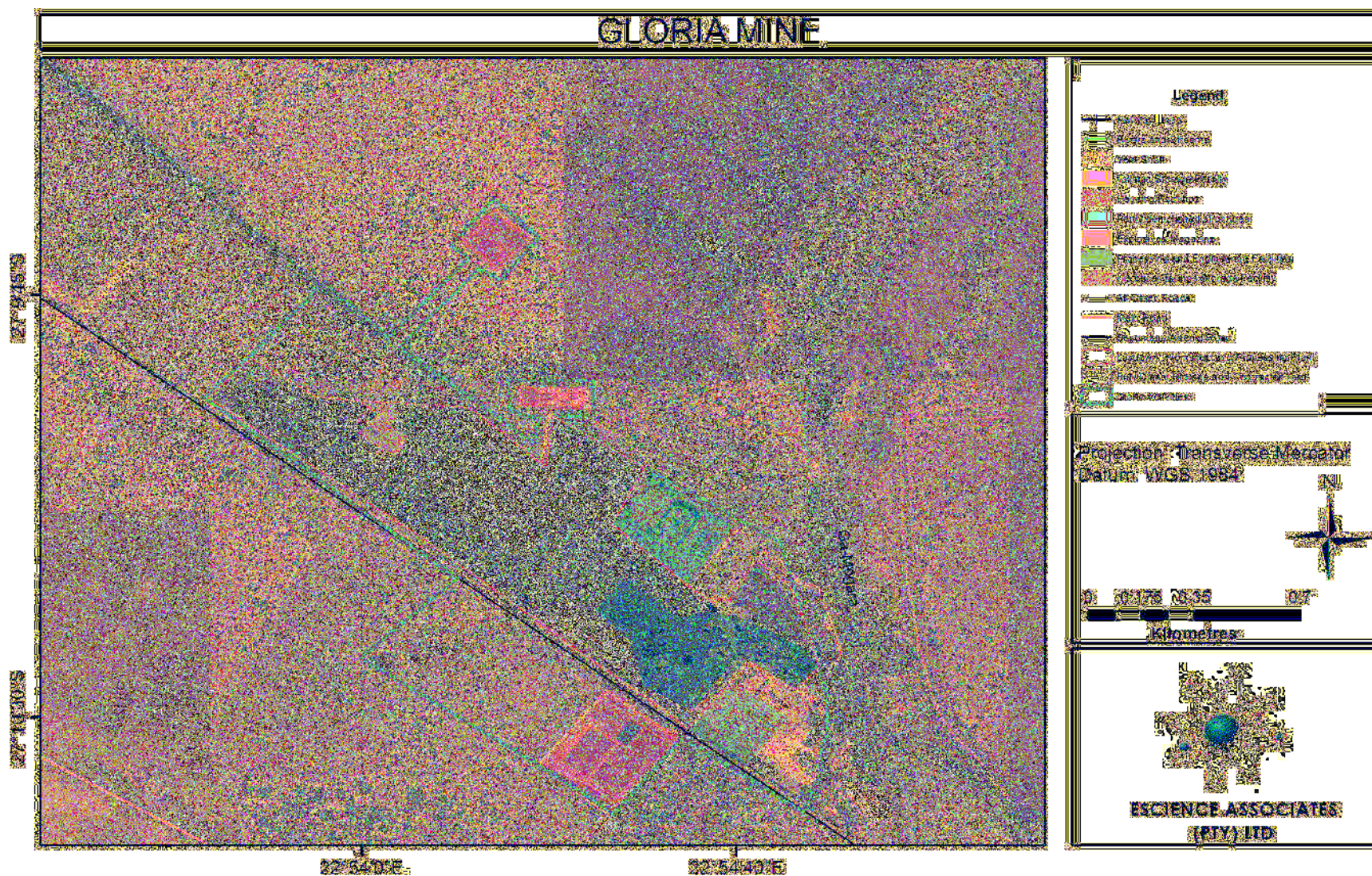


Figure 1: Current operations at Gloria mine

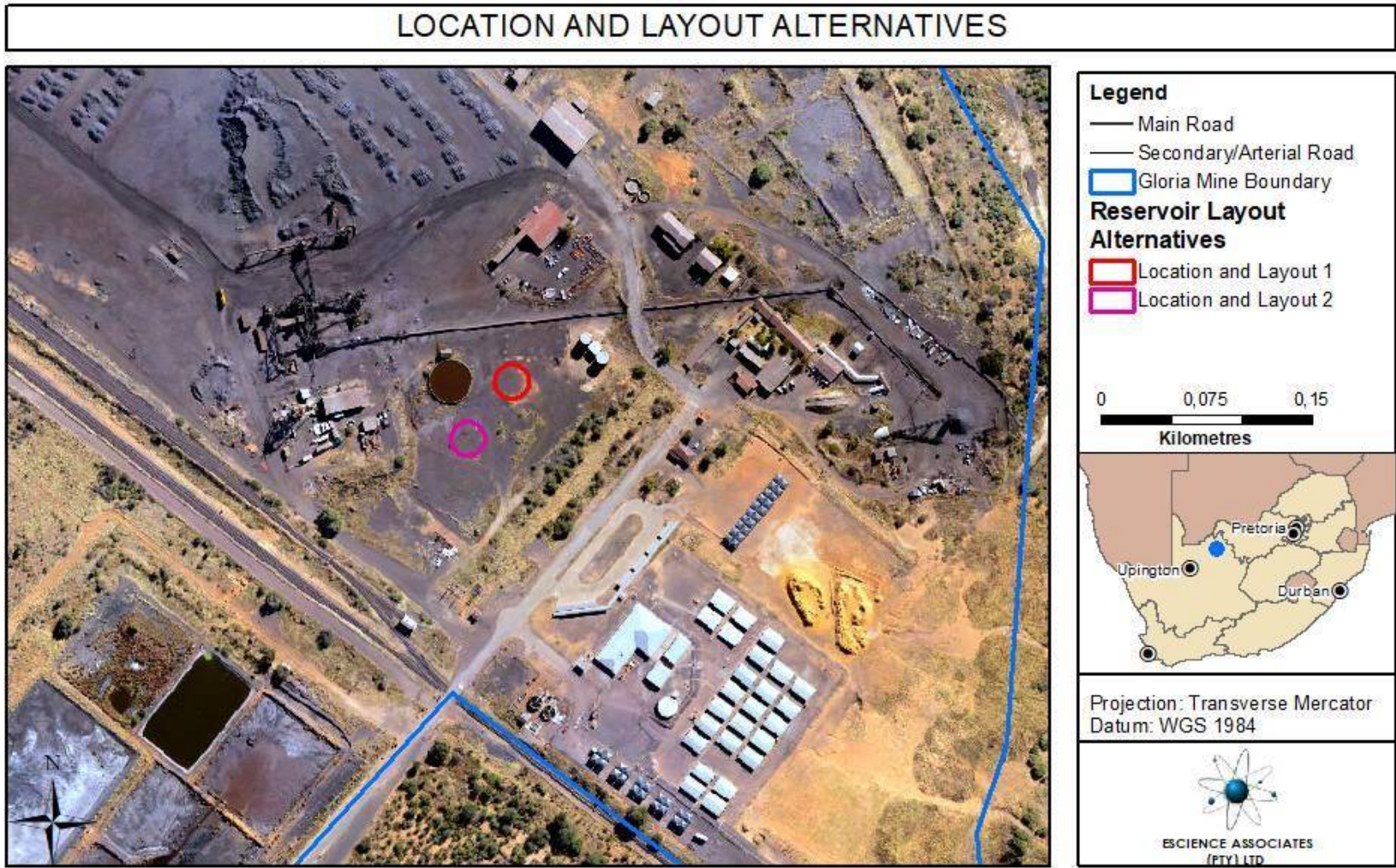


Figure 2: Proposed Activities

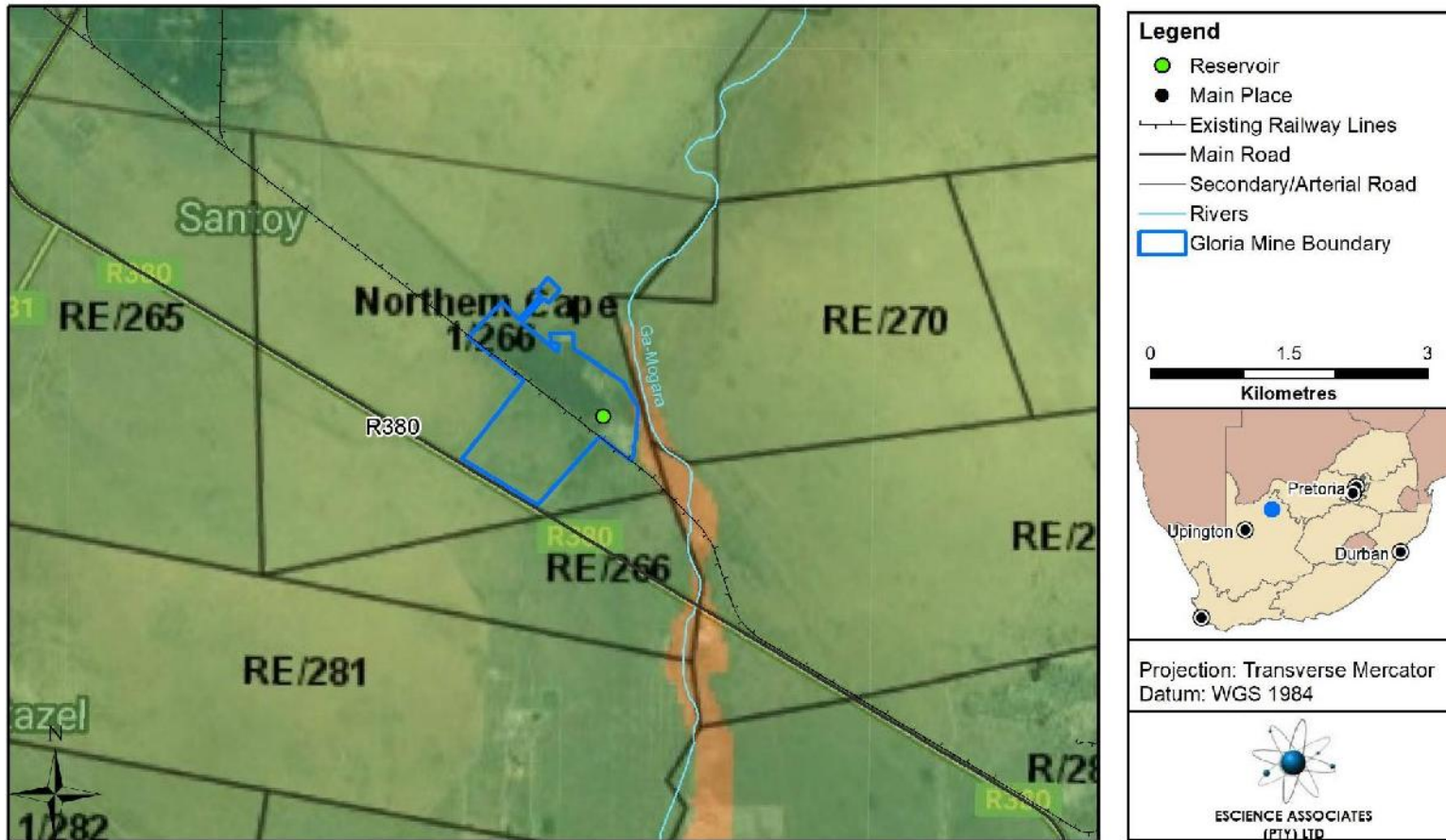


Figure 3: Locality map of the Gloria mine reservoir. Map modified from map provided by *EScience Associates (Pty) Ltd.*

## 2 QUALIFICATIONS AND EXPERIENCE OF THE AUTHOR

The author (Elize Butler) has an MSc in Palaeontology from the University of the Free State, Bloemfontein, South Africa. She has been working in Palaeontology for more than twenty-four years. She has extensive experience in locating, collecting and curating fossils, including exploration field trips in search of new localities in the Karoo Basin. She has been a member of the Palaeontological Society of South Africa for 12 years. She has been conducting PIAs since 2014.

## 3 LEGISLATION

### 3.1 National Heritage Resources Act (25 of 1999)

Cultural Heritage in South Africa, includes all heritage resources, is protected by the National Heritage Resources Act (Act 25 of 1999) (NHRA). Heritage resources as defined in Section 3 of the Act include **“all objects recovered from the soil or waters of South Africa, including archaeological and palaeontological objects and material, meteorites and rare geological specimens”**.

Palaeontological heritage is unique and non-renewable and is protected by the NHRA. Palaeontological resources may not be unearthed, moved, broken or destroyed by any development without prior assessment and without a permit from the relevant heritage resources authority as per section 35 of the NHRA.

This Palaeontological Desktop Assessment forms part of the Heritage Impact Assessment (HIA) and adhere to the conditions of the Act. According to **Section 38 (1)**, an HIA is required to assess any potential impacts to palaeontological heritage within the development footprint where:

- the construction of a road, wall, power line, pipeline, canal or other similar form of linear development or barrier exceeding 300 m in length;
- the construction of a bridge or similar structure exceeding 50 m in length;
- **any development or other activity which will change the character of a site— (exceeding 5 000 m<sup>2</sup> in extent; or**
- involving three or more existing erven or subdivisions thereof; or
- involving three or more erven or divisions thereof which have been consolidated within the past five years; or
- the costs of which will exceed a sum set in terms of regulations by SAHRA or a provincial heritage resources authority
- the re-zoning of a site exceeding 10 000 m<sup>2</sup> in extent;
- or any other category of development provided for in regulations by SAHRA or a Provincial heritage resources authority.

#### 4 GEOLOGICAL AND PALAEOLOGICAL HISTORY

The proposed water reservoir at Gloria Mine, Black Rock, Hotazel, Northern Cape is completely underlain by the Cenozoic Kalahari Group as well underlying Griqualand West Basin rocks, Transvaal Supergroup. According to the PalaeoMap of South African Heritage Resources Information System the Palaeontological Sensitivity of the Kalahari Group is low and the Griqualand West rocks of the Transvaal Supergroup is moderate.

The Cenozoic Kalahari Group is the most widespread body of terrestrial sediments in southern Africa. The Cenozoic sands and calcretes of the Kalahari Group range in thickness from a few metres to more than 180m (Partridge et al., 2006). The youngest formation of the Kalahari group is the Gordonia Formation which is generally termed Kalahari sand and comprises of red aeolian sands that covers most of the Kalahari Group sediments. The pan sediments of the area originated from the Gordonia Formation and contains white to brown fine grained silts, sands and clays. Some of the pans consist of clayey material mixed with evaporates that shows seasonal effects of shallow saline groundwaters. Quaternary alluvium, aeolian sands, surface limestone, silcrete, and terrace gravels are also included in the Kalahari Group (Kent 1980).

Partridge *et al.*, (2006) describes numerous types of superficial deposits of Late Cenozoic (Miocene to Pliocene to Recent) age throughout the Karoo Basin. Sands and gravel in the development footprint has a possible fluvial origin.

The fossil assemblages of the Kalahari are generally very low in diversity, and occur over a wide range and thus the palaeontological diversity of this Group is low (SAHRIS website). These fossils represent terrestrial plants and animals with a close resemblance to living forms. Fossil assemblages include bivalves, diatoms, gastropod shells, ostracods and trace fossils. The palaeontology of the Quaternary superficial deposits have been relatively neglected in the past. Late Cenozoic calcrete may comprise of bones, horn cores as well as mammalian teeth. Tortoise remains have also been uncovered as well as trace fossils which includes termite and insect's burrows and mammalian trackways. Amphibian and crocodile remains have been uncovered where the depositional settings in the past were wetter.

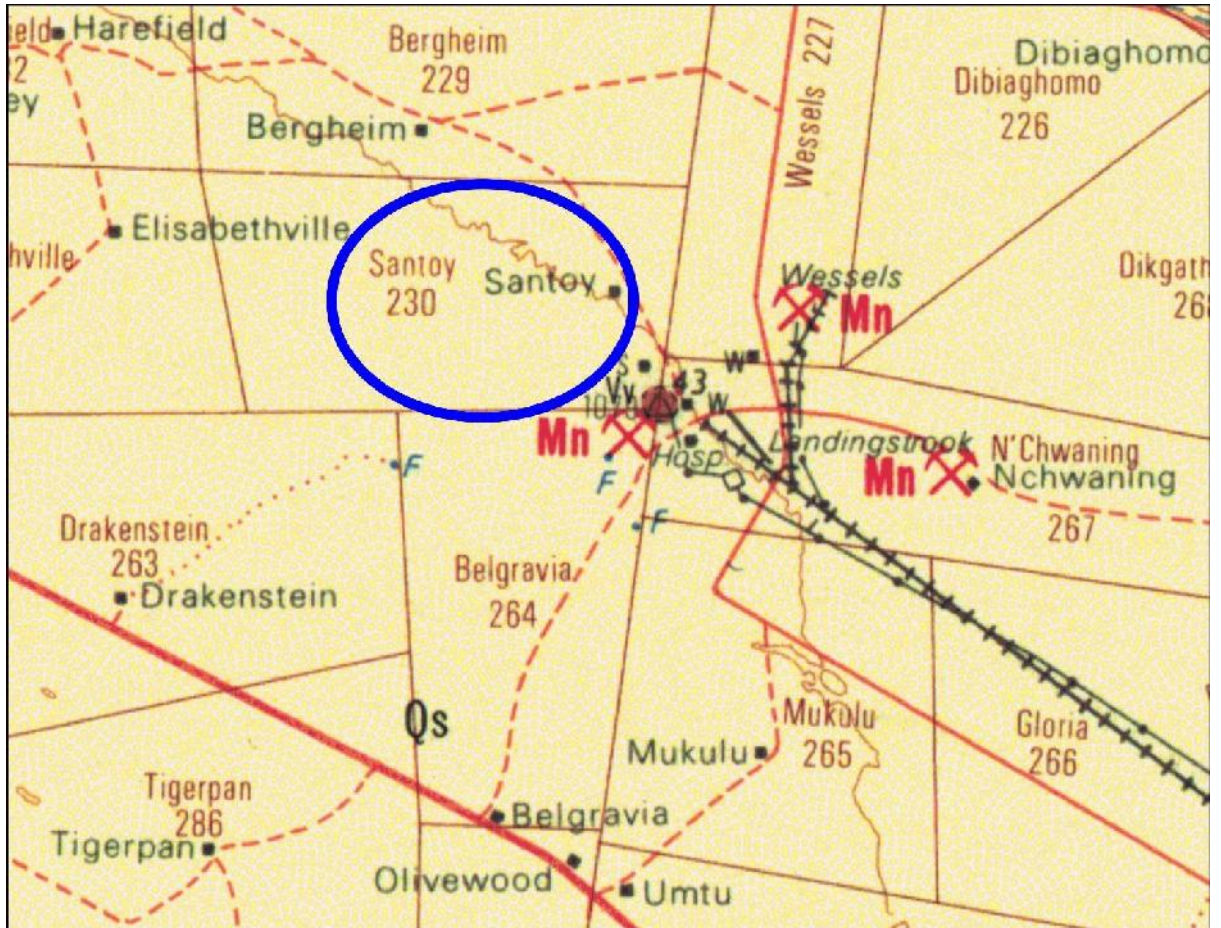


Figure 4: Extract of the 1:250 000 Kuruman geological map 2722 (Council for Geoscience, Pretoria) indicating the approximate position of the proposed Gloria reservoir (indicated in blue), in the John Taolo Gaetsewe District Municipality, Hotazel, Northern Cape.

**Legend to Map and short explanation.**

Qs – Red to flesh-coloured wind-blown sand (beige). Kalahari Group. Quaternary.  
 Mining activity                      Manganese

Hotazel is located in the **Griqualand West Basin**, Northern Cape Province which consists of clastic sediments as well as volcanic rocks, diamictites and banded iron formations (Table 1). Manganese deposits is present in the Hotazel Formation, upper Postmasburg Group (approximately 2222 Ma). The Vryburg Formation is the basal unit and overlies unconformably the granite and rocks of the Ventersdorp Supergroup. The Campbell Group overlies the Vryburg Formation and consists of the Schmidtsdrif Formation and the upper Ghaap Plateau Formation. The Griquatown Group is divided into two formations namely the Asbestos Hills and Koegas Formations. The Gamagara Formation follows and is positioned on the Maremane Anticline, and is overlain by the Makganyene Formation. The Cox Group comprises of the lower Ongeluk Formation and the upper Voëlwater Formation. The Ongeluk Formation was deposited under water and reaches a thickness of between 400 and 900 m. This Formation is basal and is mainly volcanic (Visser 1989). Manganese is present in the

upper Voëlwater Formation (Snyman 1996). According to Kent (1980) and Snyman (1996) Griqualand West Basin attains a maximum thickness of 4500 m.

Algal growth structures, also known as Stromatolites, are fossil structures described from the dolomites of the Transvaal Supergroup (Figure 3). Stromatolites are layered mounds, columns and sheet-like sedimentary rocks. These structures were originally formed by the growth of layer upon layer of cyanobacteria, a single-celled photosynthesizing microbe. Cyanobacteria are prokaryotic cells (simplest form of modern carbon-bases life). Stromatolites are first found in Precambrian rocks and are known as the earliest known fossils. The oxygen atmosphere that we depend on was generated by numerous cyanobacteria photosynthesizing during the Archaean and Proterozoic Era.



*Figure 5: Example of a well preserved stromatolite from the Archaean Era.*

Almond & Pether 2008, allocated a low significance to the Kalahari Group because fossil assemblages are generally rare and low in diversity and occur over a wide-ranging geographic area. In the past palaeontologists did not focus on Cenozoic superficial deposits although they sometimes comprise of significant fossil biotas. However, Groenewald and Groenewald (2014) allocated a high palaeontological sensitivity to the Cenozoic aged terrestrial organisms which are important indicators of palaeoenvironmental conditions.

Table 1: Generalised Stratigraphic Column and Associated Geology

Stratigraphy			Lithology	
Kalahari Formation (Qs and Q)			Clay, limestone and sand	
Transvaal Supergroup	Postmansburg Group	Voëlwater Subgroup	Hotazel Formation	Iron Formation
				Upper Mn ore body
				Middle Mn ore body
				Iron Formation
				Lower Mn ore body
				Mn-rich iron formation
			Iron Formation	
		Ongeluk Formation	Basaltic lava	

Table 2: Table modified from Palaeotechnical Report (Almond and Pether 2009).

Subgroup/sequence	Group	Formation	Fossil Heritage	Comment
Tertiary-Quaternary	Kalahari		Terrestrial organisms	Trace fossils, ostracods, bivalves, gastropod shells, diatoms, bones horn corals, mammalian teeth, Tortoise shells
Griqualand West Super Group	Campbell	Ghaapplato (Vgh)	Stromatolites	Cyanobacterial microfossils are present
	Griquastad	Asbestos Hills	Stromatolites	Cyanobacterial microfossils are present

## 5 GEOGRAPHICAL LOCATION OF THE SITE

The proposed development is about 12 kilometres north-west of Hotazel and approximately 80 km from Kuruman in the Northern Cape Province.

## 6 FINDINGS AND RECOMMENDATIONS

The proposed water reservoir at Gloria Mine, Black Rock, Hotazel, Northern Cape is completely underlain by the Cenozoic Kalahari Group as well underlying Griqualand West Basin rocks, Transvaal Supergroup. According to the PalaeoMap of South African Heritage Resources



Information System, the Palaeontological Sensitivity of the Kalahari Group is low and the Griqualand West rocks of the Transvaal Supergroup are moderate.

**This development is recommended for exemption from further Palaeontological studies as the proposed development is smaller than 600 m<sup>2</sup>.**

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## **APPENDIX 4.3: LETTER OF HERITAGE IMPACT ASSESSMENT EXEMPTION REQUEST**



15 March 2019

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**To whom it may concern**

**LETTER FOR HIA EXEMPTION REQUEST: PROPOSED ASSSSMANG BLACK ROCK MINING OPERATIONS (BRMO) ALTERATIONS TO THEIR GLORIA MINE PROCESS WATER MANAGEMENT SYSTEM, NORTHERN CAPE PROVINCE**

The above-mentioned project refers. Assmang's Black Rock Mining Operations (BRMO) proposes to make alterations to their Gloria Mine process water management system, which will consist in the main of:

- Construction of a 2.5ML process water reservoir at their Gloria Mine facility located near Hotazel, in the Northern Cape.
- Installation of related piping and water reticulation equipment.

Assmang (Pty) Ltd mines manganese ore in the Black Rock area of the Kalahari, in the Northern Cape Province. The Black Rock Mine Operations (BRMO) are approximately 80 kilometres (km) north-west of the town of Kuruman, in close proximity to the town of Hotazel. The proposed site for the 2.5ML reservoir is within the Gloria mine boundary, located on Portion 1 of the farm Gloria No. 226 (Figure 1-2).

The Reservoir will be approximately 30m in diameter. It will be constructed of concrete and steel. Piping from existing plant and infrastructure will be joined to the reservoir. The entire development will occur within the existing disturbed footprint of the Gloria mine surface processing plant and stockpiling area.

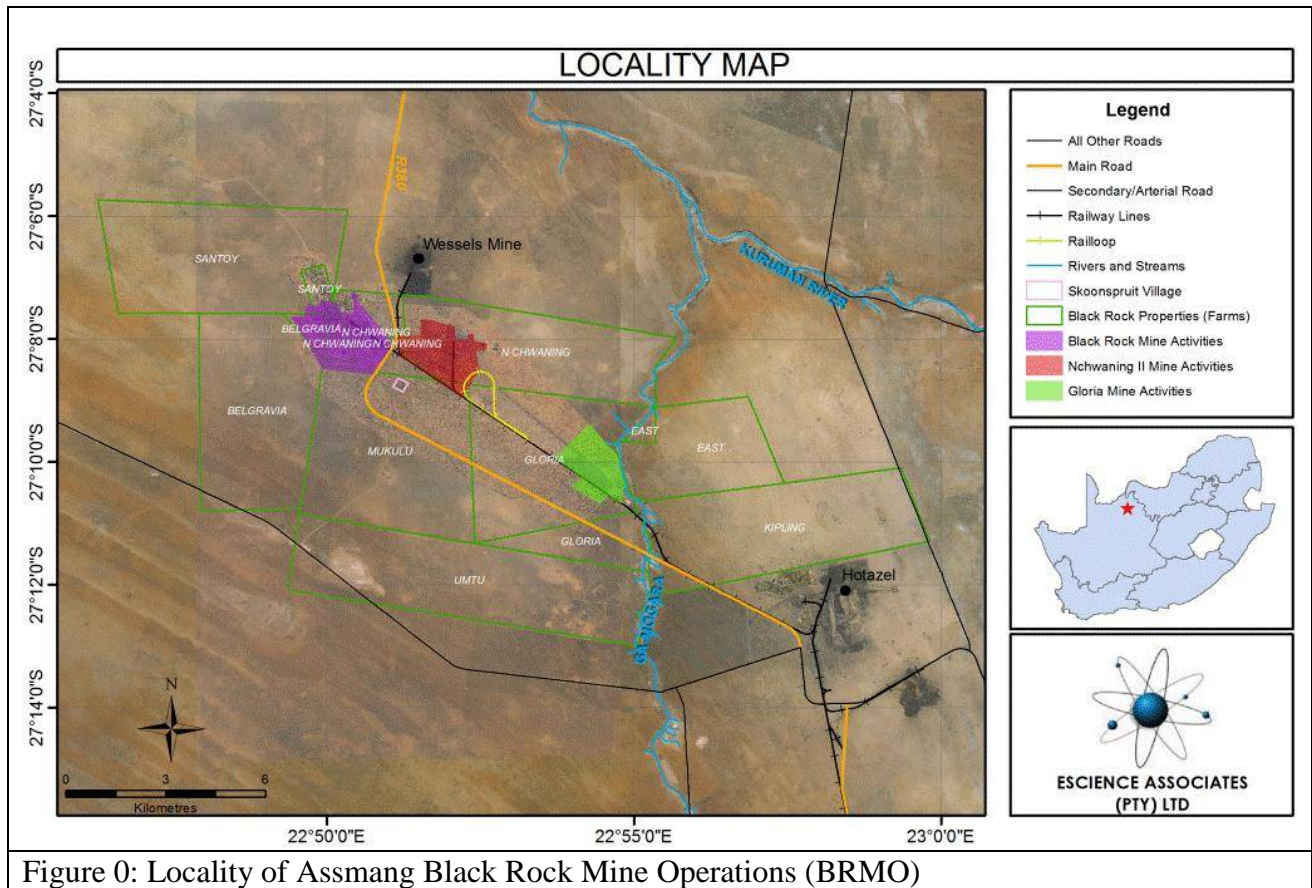


Figure 0: Locality of Assmang Black Rock Mine Operations (BRMO)

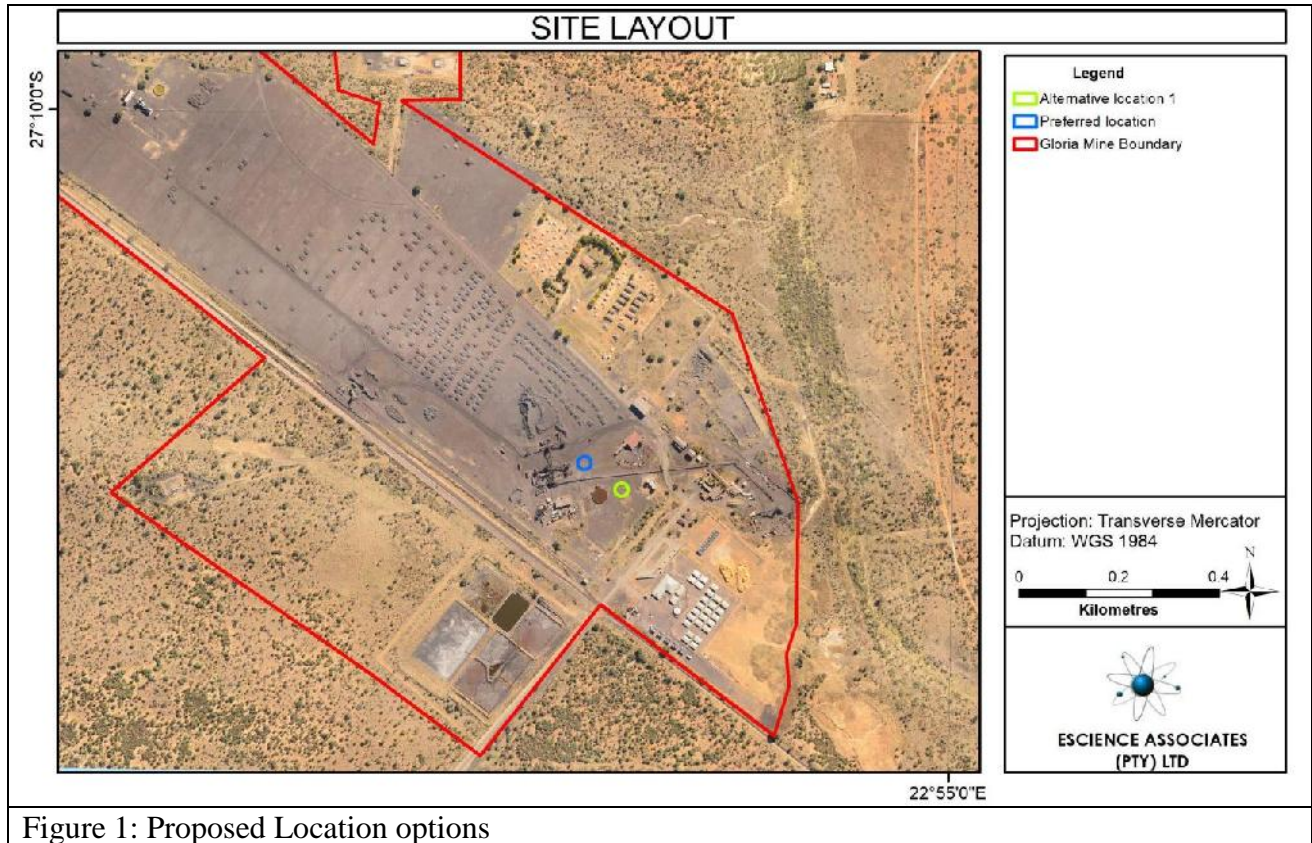


Figure 1: Proposed Location options

The site was visited on 11 March 2019 and the entire area was found to be disturbed (Figure 3-5). It also needs to be noted that an HIA had been done here in 2009 (Küsel<sup>1</sup>) as well as various reports by Van Vollenhoven between 2014 and 2016<sup>2</sup>. Although some Stone Age sites and two cemeteries were identified, these are outside of the perimeter of the proposed development.

It therefore is my opinion that the project may be exempted from doing a Heritage Impact Assessment (HIA). The following is applicable:

- The proposed development is within an area already entirely disturbed by mining activities.
- An HIA was conducted in 2009 as well as between 2014 and 2016 in the wider area and although sites were identified these are not to be impacted on.
- There are no natural vegetation on the site.

<sup>1</sup> Küsel, U.S. et.al. 2009. **Cultural Heritage Impact Assessment of Manganese Mining areas on the farms Belgravia, 264, Santoy 230, Gloria 226 and Nchwaning 267, at Black Rock, north of Kuruman, Kgalagadi District Municipality, Northern Cape Province.** (Unpublished report, African Heritage Consultants, Magalieskruin).

<sup>2</sup> See Archaetnos database.



**Figure 3: Google Earth view of the site indicating the disturbance.**



**Figure 4: General view of the impacted area.**





**Figure 5: View indicating the disturbance.**

Due to the mentioned factors, the chances therefore of finding any heritage related features are indeed extremely slim. It is therefore believed that an additional Heritage Impact Assessment (HIA) is not needed for this project and any of the alternatives can be used. This letter serves as an exemption request to the relevant heritage authority.

The developer should however note that due to the nature of archaeological material, such sites, objects or features, as well as graves and burials may be uncovered during construction activities on site. In such a case work should cease immediately and an archaeologist should be contacted as a matter of urgency to assess such occurrences.

**Recommendation:**

**That the development be exempted from doing an HIA.**

I trust that you will find this in order.

Yours faithfully

A handwritten signature in black ink on a light-colored background. The signature is cursive and appears to read 'Prof AC van Vollenhoven'.

Prof AC van Vollenhoven: Director

## **APPENDIX 4.4: HERITAGE MANAGEMENT PLAN**



Archaetnos Culture & Cultural  
Resource Consultants  
BK 98 09854/23

**A CULTURAL HERITAGE MANAGEMENT PLAN FOR THE BLACK  
ROCK KOPPIE AND OTHER HERITAGE SITES AT THE BLACK ROCK  
MINING OPERATIONS, NORTHERN CAPE PROVINCE**

**REPORT: AE01918V**

By:

**Prof. A.C. van Vollenhoven (L.Akad. SA)  
Accredited member of ASAPA  
Accredited member of SASCH**

**April 2019**

## SUMMARY

This document entails a cultural heritage resources management plan for the Black Rock koppie and other heritage sites/ features at the BRMO in the Northern Cape Province. The koppie is one of the oldests remaining mines in the area and the legacy of the earliest manganese mining activities in Southern Africa and therefore obtained cultural significance.

Management protocols are given. These are the basic conservation and preservation principles to be used in managing cultural resources. Recommendations made in the document are done within the parameters of the National Heritage Resources Act (25 of 1999).

The management plan is an open document meaning that it should be adapted and reassessed from time to time. A continuation period of at least five years is given. However any developments done before the expiry of the five-year period should be used to re-evaluate the impact on cultural resources and to make the necessary adaptations to the document. The five-year period ends in 2024.

## **CONTINUATION STRATEGY**

**IT IS IMPORTANT TO NOTE THAT A MANAGEMENT PLAN IS AN OPEN DOCUMENT. ACCORDINGLY IT CAN BE CHANGED CONSTANTLY WITHIN THE PARAMETERS OF CULTURAL HERITAGE RESOURCES MANAGEMENT.**

**THIS PARTICULAR MANAGEMENT PLAN SHOULD BE RELOOKED AT LEAST EVERY FIVE YEARS AND ALSO WHENEVER A SPECIFIC DEVELOPMENT IS PLANNED (WHICHEVER COMES FIRST). IN THE LATTER CASE THE IMPACT OF DEVELOPMENT ON THOSE CULTURAL HERITAGE RESOURCES IN THE EFFECTED AREA SHOULD BE RELOOKED AT. HOWEVER SUCH A DEVELOPMENT MAY HAVE A SECONDARY IMPACT ON OTHER CULTURAL RESOURCES AND THIS SHOULD ALSO BE ASSESSED.**

**THE PLAN SHOULD THEN BE ADAPTED IN ACCORDNACE WITH THOSE PLANS AND ANY DEVELOPMENTS IN THE TIME THAT LAPSED UP TO THAT PARTICULAR POINT IN TIME. ANY ADDITIONAL INFORMATION THAT WERE COLLECTED (FOR INSTANCE FROM RESEARCH) SHOULD ALSO BE USED TO RE-EVALUTE CULTURAL HERITAGE RESOURCES.**

**THIS MANAGEMENT PLAN SHOULD AT LEAST BE RE-EVALUATED IN THE YEAR 2024.**

**CURRICULUM VITAE**  
**Prof. Anton Carl van Vollenhoven**

**PERSONAL INFORMATION**

- Born: 20 January 1966, Pretoria, RSA
- Address: Archaetnos, PO Box 55, Groenkloof, 0027
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**TERTIARY EDUCATION**

- BA 1986, University of Pretoria
- BA (HONS) Archaeology 1988 (cum laude), University of Pretoria
- MA Archaeology 1992, University of Pretoria
- Post-Graduate Diploma in Museology 1993 (cum laude), University of Pretoria
- Diploma Tertiary Education 1993, University of Pretoria
- DPhil Archaeology 2001, University of Pretoria.
- MA Cultural History 1998 (cum laude), University of Stellenbosch
- Management Diploma 2007 (cum laude), Tshwane University of Technology
- DPhil History 2010, University of Stellenbosch

**EMPLOYMENT HISTORY**

- *1988-1991*: Fort Klapperkop Military Museum - Researcher
- *1991-1999*: National Cultural History Museum. Work as Archaeologist, as well as Curator/Manager of Pioneer Museum (1994-1997)
- *1999-2002*: City Council of Pretoria. Work as Curator: Fort Klapperkop Heritage Site and Acting Deputy Manager Museums and Heritage.
- *2002-2007*: City of Tshwane Metropolitan Municipality. Work as Deputy Manager Museums and Heritage.
- *August 2007* – present – Managing Director for Archaetnos Archaeologists.
- *1988-2003*: Part-time lecturer in Archaeology at the University of Pretoria and a part-time lecturer on Cultural Resources Management in the Department of History at the University of Pretoria.
- *2014-2015*: Part-time lecturer for the Honours degree in Museum Sciences in the Department of History and Heritage Studies at the University of Pretoria
- *Since 2015*: Extraordinary Professor of History at the Mahikeng campus of the Northwest University

**OTHER**

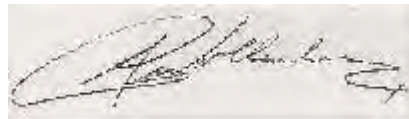
- Has published 79 articles in scientific and popular journals on archaeology and history.
- Has been the author and co-author of over 845 unpublished reports on cultural resources surveys and archaeological work.
- Has published books on the Military Fortifications of Pretoria and Heritage Guidelines.
- Contributed to a book on Mapungubwe.
- Has delivered more than 66 papers and lectures at national and international conferences.
- Member of SAHRA Council for 2003 – 2006.
- Member of the South African Academy for Science and Art.
- Member of Association for South African Professional Archaeologists.

- Member of the South African Society for Cultural History (Chairperson 2006-2008; 2012-2014).
- Has been editor for the SA Journal of Cultural History 2002-2004.
- Member of the Provincial Heritage Resources Agency, Gauteng's Council.
- Member of Provincial Heritage Resources Agency, Gauteng's HIA adjudication committee (Chairperson 2012-2019).

### **DECLARATION OF INDEPENDENCE**

I, Anton Carl van Vollenhoven from Archaetnos, hereby declare that I am an independent specialist within the field of heritage management. I have no interest in or have any relationship with anyone who is associated with the Black Rock Mining Operations.

Signed:



Date: 17 April 2019

### **LIST OF ACRONYMS:**

AIA – Archaeological Impact Assessment  
CMP – Cultural Management Plan  
EAP – Environmental Assessment Practitioner  
EIA – Environmental Impact Assessment  
HIA – Heritage Impact Assessment  
PIA – Palaeontological Impact Assessment  
SAHRA –South African Heritage Resources Agency

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# 1. INTRODUCTION

Archaetnos cc was appointed by EScience Associates (Pty) Ltd to compile a Cultural Heritage Management Plan (CMP) for the old mine workings at the Black Rock Mining Operations (BMRO). The plan is to be utilised as part of the motivation for the site to be declared as a heritage site. Such a plan is one of the prerequisites for the declaration of any site as a heritage site.

The declaration of heritage resources is guided by the National Heritage Resources Act (Act 25 of 1999), abbreviated as NHRA. This document serves as the Cultural Heritage Management Plan (CMP) in this regard and also gives the necessary motivation for declaration. It is believed that the Black Rock koppie qualify to be considered at least a provincial heritage resource. The CMP is in line with the conventions for the sustainable preservation, conservation and management of such cultural resources.

BRMO is situated in the Northern Cape Province approximately 80 km north-west of the town of Kuruman and 12 kilometres north-west of Hotazel. BRMO falls within the jurisdiction of the John Taolo Gaetsewe District Municipality (Figure 1-2).

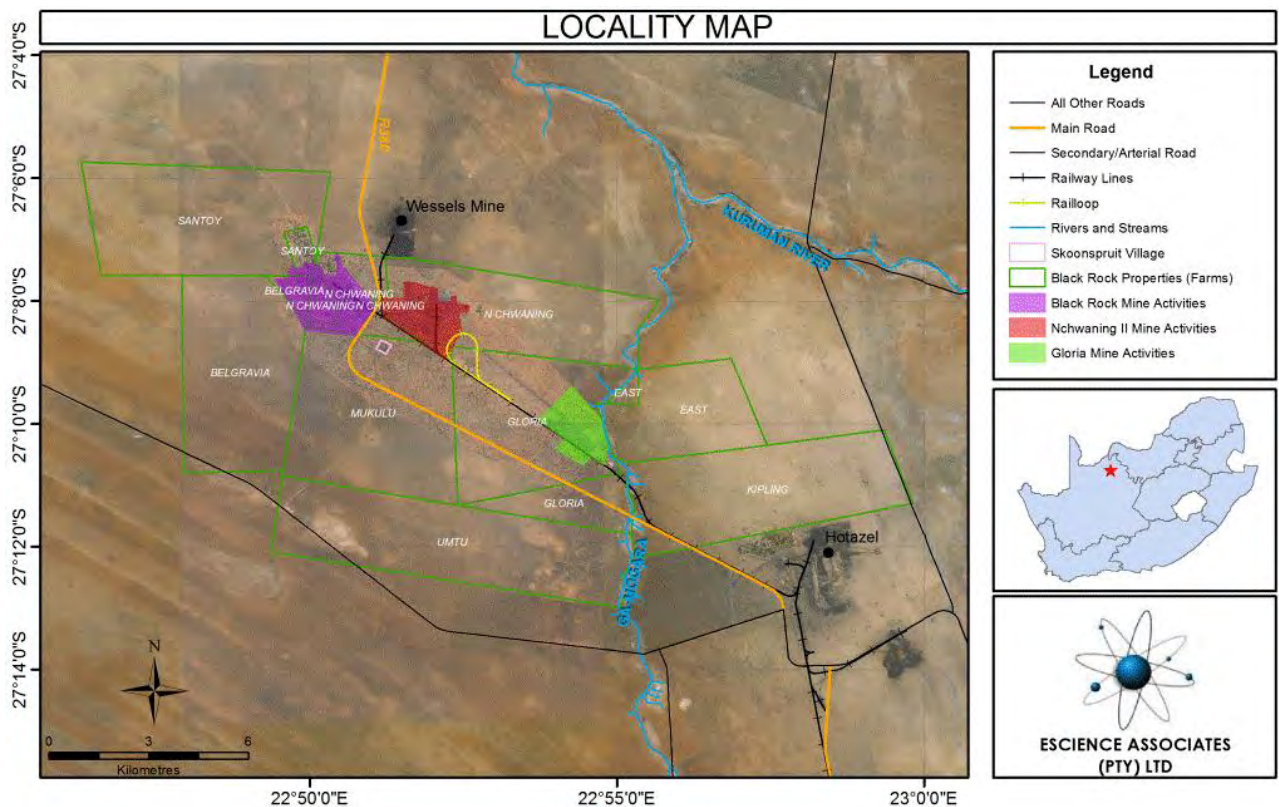


Figure 1: Location of the Black Rock Mine in the Northern Cape.



**Figure 2: Location of Black Rock in relation to Hotazel.**

## **2. TERMS OF REFERENCE**

The Terms of Reference for the study were to write a Cultural Heritage Resources Management Plan (CMP) for the Black Rock Koppie and other heritage sites on the property of the BRMO.

### **2.1 Aims**

The aim of the document is therefore to provide a basic management plan for the different sites of which the koppie is the most important. This influences the decisions made with relation to preservation, conservation and protection of these, which should be done within the parameters of international acceptable museological and cultural heritage management principles.

### **2.2 Motivation**

Black Rock koppie is regarded as being one of the oldest manganese mine workings in South Africa. As such it is deemed to be of particular cultural importance. The site is older than 60 years and therefore is regarded by the NHRA to be of heritage importance and should be dealt with in accordance to the NHRA.

Thus, a management plan is written, to serve as document for the protection of the mentioned site as well as other heritage sites on the property. It also will assist with the motivation for declaration. Such a plan will serve as basic guidelines for the utilisation and management of these sites and will enable the land owners (BRMO) to manage it as heritage resources.

The National Heritage Resources Act indicates the following as being part of the national estate:

- a. Places, buildings, structures and equipment of cultural significance
- b. Places to which oral traditions are attached or which are associated with living heritage
- c. Historical settlements and townscapes
- d. Landscapes and natural features of cultural significance
- e. Geological sites of scientific or cultural importance
- f. Archaeological and paleontological importance
- g. Graves and burial grounds
- h. Sites of significance relating to the history of slavery
- i. Movable objects (e.g. archaeological, paleontological, meteorites, geological specimens, military, ethnographic, books etc.)

Cultural resources are defined as all unique and non-renewable, intangible (spiritual) and material phenomena (natural or made by humans) that are associated with human (cultural) activities. This includes sites, structures, and artefacts to which an individual or group attaches some value with regard to its historic, archaeological, architectural, spiritual, and human (cultural) development (Van Vollenhoven 2018: 12).

It is clear that Black Rock koppie falls within this definition. It also is covered by the mentioned clause of the NHRA.

### **3. METHODOLOGY**

#### **3.1 Cultural Heritage Management**

The theory regarding cultural heritage management needs some explanation. Cultural resources management consist of three phases, but these may not all be applicable in every situation.

It starts with the survey of cultural heritage resources which is called a Phase 1 investigation. During this process possible impacts are identified, and mitigation measures lined out (Van Vollenhoven 1998: 54). Such studies were done at BRMO in the past (see Küsel et.al. 2009; Pelsler & Van Vollenhoven 2011; Van Vollenhoven 2019a).

A Phase 2 investigation is a detailed investigation of a specific cultural resource. This usually entails detailed documentation and research (Van Vollenhoven 1998: 49-52). Some background information on the history of Black Rock Koppie and other sites will be given. However, this will merely serve as broad indication of the cultural importance of these.

A Cultural Management Plan (CMP) is sometimes called Phase 3. However the three steps do not necessarily follow each other. For instance, sometimes after the phase 1 study, a management plan is drawn up without doing detailed research. This is something that can be done at a later stage and, if needed the management plan can be adapted after such a study (Van Vollenhoven 1998: 54).

The basic principles for Cultural Resources Management as outlined by Van Vollenhoven (2002: 10-13) were also applied in this management plan. These refer inter alia to the attention given to heritage legislation, the evaluation of resources by trained professionals and community participation. The management principles used in this management plan is also in accordance by those established by Van Vollenhoven (1998 & 2000). These principles include prescriptions for the content of management plans and are in line with the National Heritage Resources Act.

### **3.2 Research**

Basic information related to the history and importance of the Black Rock area is included. This is contextualized below. It included a literature research to obtain more background information on the history of the Jacaranda trees in the study area.

## **4. CONDITIONS & ASSUMPTIONS**

The following conditions and assumptions have a direct bearing on the site and the resulting report:

1. Cultural Resources are all non-physical and physical man-made occurrences, as well as natural occurrences associated with human activity. These include all sites, structure and artifacts of importance, either individually or in groups, in the history, architecture and archaeology of human (cultural) development. Graves and cemeteries are included in this. Also see list of terms (Appendix A).
2. The significance of the sites, structures and artifacts is determined by means of their historical, social, aesthetic, technological and scientific value in relation to their uniqueness, condition of preservation and research potential. The various aspects are not mutually exclusive, and the evaluation of any site is done with reference to any number of these aspects (see Appendix B).
3. Cultural significance is site-specific and relates to the content and context of the site. Sites with a high cultural significance are more important than any foreseeable future development and should therefore be preserved at all cost (see appendix C).
4. The latitude and longitude of any archaeological or historical site or feature, is to be treated as sensitive information and should not be disclosed to members of the public without proper plans in place to preserve and conserve these cultural heritage resources.
5. All recommendations are made with full cognizance of the relevant legislation.
6. A CMP entails recommendation as to the preservation, conservation, interpretation and utilization of cultural resources (Van Vollenhoven 1998: 54-55). Management can be done through five steps that are mutually inclusive and not necessarily chronological. These steps are in accordance with the Heritage Resources Paradigm as developed by Van Vollenhoven (2000) and which is embedded in the Contextual Paradigm in the

Archaeology (Annexure D). The steps are conservation/preservation, utilization, marketing, auditing and other action steps.

- Conservation and preservation

This refers to the criteria for keeping the historical character of a cultural resource intact. It entails the setting of criteria for the preservation of cultural resources. In this case it has been done by evaluating the historical, social, aesthetic, technological and scientific value of the resources in relation to their uniqueness, condition of preservation and research potential.

It also refers to the actions necessary for the preservation of these resources. Security measures are also included herewith. The last aspect here refers to the training of personnel in order for them to know how to deal with cultural heritage resources. The management guidelines and recommendations in this management plan will provide the basic training needed for this purpose.

- Utilization

This aspect refers to the sustainable utilization of cultural resources in order to also preserve it on the long term. The most important thing here which relates to the East Fort is the interpretation of the resource. Utilization may include an adapted (new), commercial or scientific use or a combination thereof.

- Marketing

This issue deals with the possibility to make cultural heritage resources accessible and useful for tourism purposes. It is important to realize that utilization will always be inferior to conservation and preservation principles. This is in line with the International Cultural Tourism Charter (ICOMOS, 1999).

- Auditing

Auditing refers to the peer review and evaluation of heritage reports and management plans. It also entails the frequent monitoring of management plans in order to determine whether the recommendations thereof are adhered to. For this purpose a continuation strategy has been included on page 3 of this document.

- Other action steps

These are general steps that the managing authority should implement in order to preserve and conserve cultural heritage resources while also maximizing the potential thereof. This should be done within the capacity and capabilities of the managing authority (in this case the BRMO), but it is important that the managing authority should take the necessary steps to improve its capacity and capabilities.

It includes measures to sensitize visitors and staff members to the importance of cultural heritage resources, training of personnel at institutions involved in cultural resources, forming partnerships with other institutions involved in cultural resources and obtaining the necessary funds to implement the management guidelines and recommendation of the management documents (in this case this management plan).

## **5. LEGISLATIVE REQUIREMENTS**

Aspects concerning the conservation of cultural resources are dealt with mainly in the National Heritage Resources Act (Act 25 of 1999).

### **5.1 The National Heritage Resources Act**

According to the above-mentioned act the following is protected as cultural heritage resources:

- a. Archaeological artifacts, structures and sites older than 100 years
- b. Ethnographic art objects (e.g. prehistoric rock art) and ethnography
- c. Objects of decorative and visual arts
- d. Military objects, structures and sites older than 75 years
- e. Historical objects, structures and sites older than 60 years
- f. Proclaimed heritage sites
- g. Grave yards and graves older than 60 years
- h. Meteorites and fossils
- i. Objects, structures and sites of scientific or technological value.

The national estate (see Appendix E) includes the following:

- a. Places, buildings, structures and equipment of cultural significance
- b. Places to which oral traditions are attached or which are associated with living heritage
- c. Historical settlements and townscapes
- d. Landscapes and natural features of cultural significance
- e. Geological sites of scientific or cultural importance
- f. Archaeological and palaeontological importance
- g. Graves and burial grounds
- h. Sites of significance relating to the history of slavery
- i. Movable objects (e.g. archaeological, palaeontological, meteorites, geological specimens, military, ethnographic, books etc.)

#### **Structures**

Section 34 (1) of the mentioned act states that no person may demolish any structure or part thereof which is older than 60 years without a permit issued by the relevant provincial heritage resources authority.

A structure means any building, works, device or other facility made by people and which is fixed to land, and includes any fixtures, fittings and equipment associated therewith.

Alter means any action affecting the structure, appearance or physical properties of a place or object, whether by way of structural or other works, by painting, plastering or the decoration or any other means.

### **Archaeology, palaeontology and meteorites**

Section 35(4) of this act deals with archaeology, palaeontology and meteorites. The act states that no person may, without a permit issued by the responsible heritage resources authority (national or provincial):

- a. destroy, damage, excavate, alter, deface or otherwise disturb any archaeological or palaeontological site or any meteorite;
- b. destroy, damage, excavate, remove from its original position, collect or own any archaeological or palaeontological material or object or any meteorite;
- c. trade in, sell for private gain, export or attempt to export from the Republic any category of archaeological or palaeontological material or object, or any meteorite; or
- d. bring onto or use at an archaeological or palaeontological site any excavation equipment or any equipment that assists in the detection or recovery of metals or archaeological and palaeontological material or objects, or use such equipment for the recovery of meteorites.
- e. alter or demolish any structure or part of a structure which is older than 60 years as protected.

The above mentioned may only be disturbed or moved by an archaeologist, after receiving a permit from the South African Heritage Resources Agency (SAHRA). In order to do research on such a site or structure, a permit from SAHRA will also be needed.

### **Human remains**

Graves and burial grounds are divided into the following:

- a. ancestral graves
- b. royal graves and graves of traditional leaders
- c. graves of victims of conflict
- d. graves designated by the Minister
- e. historical graves and cemeteries
- f. human remains

In terms of Section 36(3) of the National Heritage Resources Act, no person may, without a permit issued by the relevant heritage resources authority:

- a. destroy, damage, alter, exhume or remove from its original position or otherwise disturb the grave of a victim of conflict, or any burial ground or part thereof which contains such graves;



- b. destroy, damage, alter, exhume or remove from its original position or otherwise disturb any grave or burial ground older than 60 years which is situated outside a formal cemetery administered by a local authority; or
- c. bring onto or use at a burial ground or grave referred to in paragraph (a) or (b) any excavation, or any equipment which assists in the detection or recovery of metals.

Unidentified/unknown graves are also handled as older than 60 until proven otherwise.

Human remains that are less than 60 years old are subject to provisions of the Human Tissue Act (Act 65 of 1983) and to local regulations. Exhumation of graves must conform to the standards set out in the **Ordinance on Exhumations (Ordinance no. 12 of 1980)** (replacing the old Transvaal Ordinance no. 7 of 1925).

Permission must also be gained from the descendants (where known), the National Department of Health, Provincial Department of Health, Premier of the Province and local police. Furthermore, permission must also be gained from the various landowners (i.e. where the graves are located and where they are to be relocated) before exhumation can take place. Human remains can only be handled by a registered undertaker or an institution declared under the **National Health Act (Act 61 of 2003)**.

## **5.2 The National Environmental Management Act**

This act (Act 107 of 1998) states that a survey and evaluation of cultural resources must be done in areas where development projects, that will change the face of the environment, will be undertaken. The impact of the development on these resources should be determined and proposals for the mitigation thereof are made.

Environmental management should also take the cultural and social needs of people into account. Any disturbance of landscapes and sites that constitute the nation's cultural heritage should be avoided as far as possible and where this is not possible the disturbance should be minimized and remedied.

## **6. DESCRIPTION OF THE ENVIRONMENT**

The BRMO and Black Rock is found in a typical Kalahari landscape. It is surrounded by sand dunes. The Gamagara River, a non-perennial water course, runs through the area. Vegetation cover varies between open patches with minimal ground cover and more dense areas along the river (Figure 3). The area however does show some signs of disturbance due to a railway track, roads and other infrastructure and mining operations (Figure 4-5).



**Figure 3: General view along the Gamagara River in the BRMO.**



**Figure 4: General view taken from Black Rock koppie.**



**Figure 5: View of old mine workings at Black Rock koppie.**

## **7. DESCRIPTION OF THE CULTURAL RESOURCES**

The following cultural resources are found at BRMO:

- The Black Rock koppie
- Associated infrastructure
- Mine workers cemetery
- Farm cemetery
- Stone Age sites along the Gamagara River

### **7.1 Black Rock koppie – site no. 1**

The Black Rock koppie consists of a small hill which had been mined in the past (Figure 6). This is on the farm Santoy 230. The area is characterized by its black colour mainly emanating from the soil from mining activities. Old mining works are visible (Figure 7-9).

Other historical features found include some of the tools used during mining activities, such as coco pans, forks and shovels as well as the tracks for the cocopans. In the entire area one can find remains of structures and equipment used during the mining operations (Figure 10-16).

GPS: 27°07'34.4"S

22°49'59.6E (central co-ordinate of large site)



**Figure 6: Google Earth image of Black Rock koppie.**



**Figure 7: View of Black Rock koppie.**



**Figure 8: Entrance to the mine.**



**Figure 9: Another entrance to the mine.**



**Figure 10: Stone wall with white wash used as stabilization.**



**Figure 11: Cement slab.**



**Figure 12: Shovel.**



**Figure 13: Fork.**



**Figure 14: Section of coco pan track.**



**Figure 15: Undercarriage and other parts of a coco pan.**





**Figure 16: Coco Pans and other material.**

### **7.2 Associated infrastructure – part of site no. 1**

These features are also on the farm Santoy 230. Apart from what had been mentioned above, the following larger infrastructure of heritage significance (Figure 18) were noted:

- Water reservoirs
- Old power station
- Shoot
- Old decline shaft



**Figure 18: Associated infrastructure of heritage significance.**

- 1- Water reservoirs**
- 2- Water reservoir**
- 3- Power station**
- 4- Shoot**
- 5- Decline shaft**

- Water reservoirs (Figure 19-20)

GPS: Number 1 - 27°07'34.3"S; 22°50'00.4E

Number 2 - 27°07'33.4"S; 22°50'02.9E

These are older than 60 years but has been changed over the years.



**Figure 19: Water reservoirs on Black Rock koppie.**



**Figure 20: View of another reservoir at Black Rock koppie.**

- Old power station (Figure 21)

GPS: Number 3 - 27°07'34.3"S; 22°50'05.3E

It was likely built in the 1950's and is an ordinary example with now outstanding features or history associated thereto.



**Figure 21: Old power station.**

- Shoot (Figure 22-23)

GPS: Number 4 - 27°07'40.5"S; 22°50'05.9E

It likely is associated with the earliest mining at the site and is thus older than 60 years of age. It however is in a bad state of decay.



**Figure 22: Old shoot used for ore transfer from coco pans to trucks or wagons.**



**Figure 23: Coco pan tracks at the shoot.**

- Decline shaft (Figure 24)

GPS: Number 5 - 27°07'33.3"S; 22°49'43.5E

It likely is associated with a later mining stage at the site (1950's) but is still older than 60 years of age. It is in a good state.



**Figure 24: Old decline shaft.**

### **7.3 Mine workers cemetery – site no. 3**

The cemetery is located adjacent to the Black Rock koppie on the farm Santoy 230 (Figure 25-26). A number of 75 graves were counted, but it is possible that there may be more (Figure 27). The site has been fenced in by the mine.

Only one of the graves have legible information, namely grave no. 4. No name could be read, but the information indicates that the deceased came from the Hakeng village in Botswana, thus indicating that these are mine workers graves. No dates of death could be detected on any of the graves.

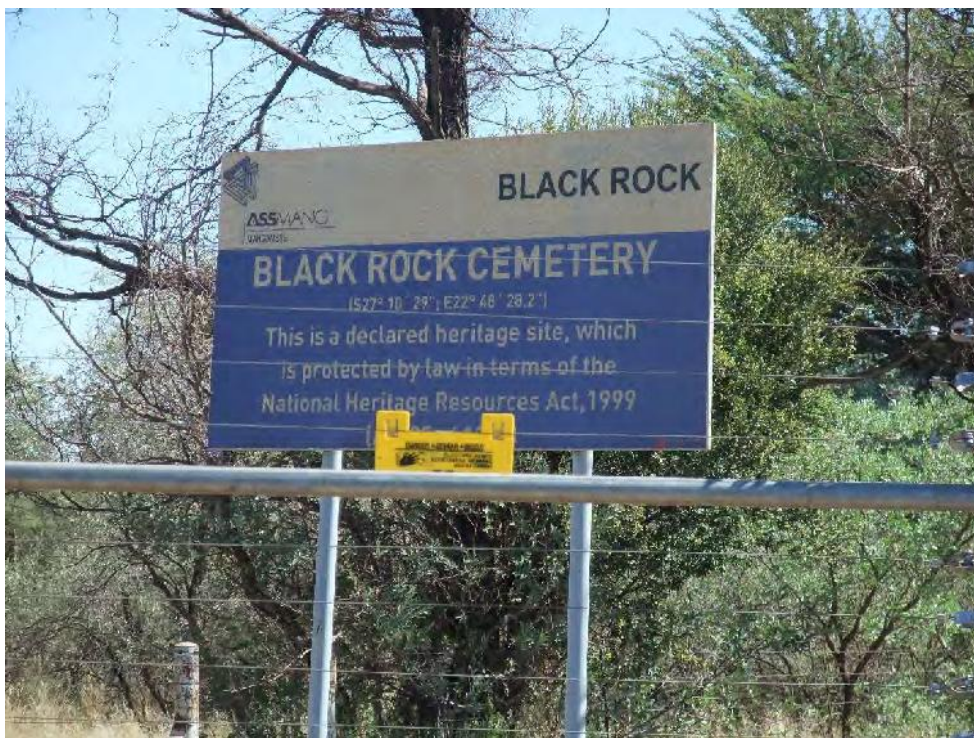
The graves are mostly stone packed, but a few are packed with cement bricks (see Appendix F and G). One is merely a low heap of soil indicating a possible grave. Only a few has headstones, made from stone. A few others have metal markers, but these are rusted and therefore no information could be detected.

It means that all the graves are categorized as heritage graves. It should thus be handled similar to graves older than 60 years.

GPS: 27°07'28.7"S  
22°49'45.9E



**Figure 25: Location of the mine workers cemetery.**



**Figure 26: Information sign at the Black Rock cemetery.**

SITE NO. 3 MINE WORKERS GRAVE SITE

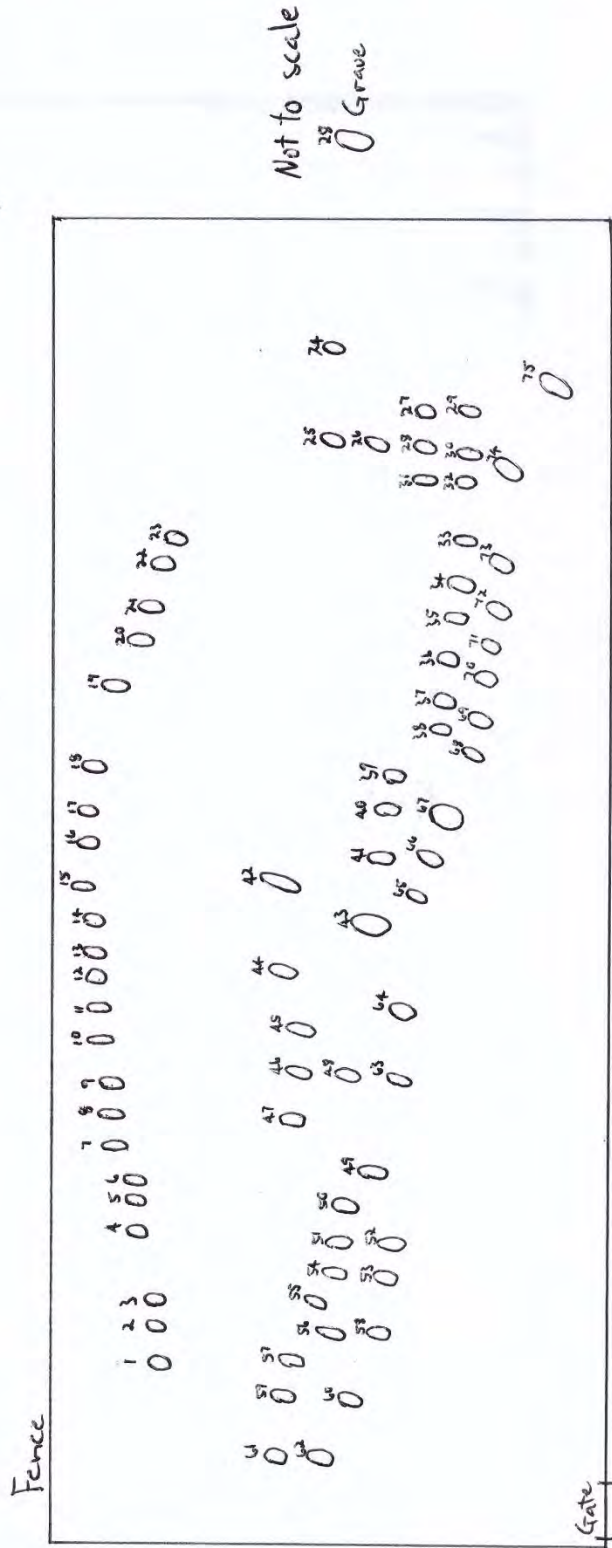


Figure 27: Plan of the Mine workers cemetery.



## 7.4 Farm cemetery – site no. 2

The cemetery is located on the farm Belgravia 264 and is thus reasonably far from the Black Rock koppie (Figure 28). A number of 3 graves were counted (Figure 29). The site has been fenced in by the mine.

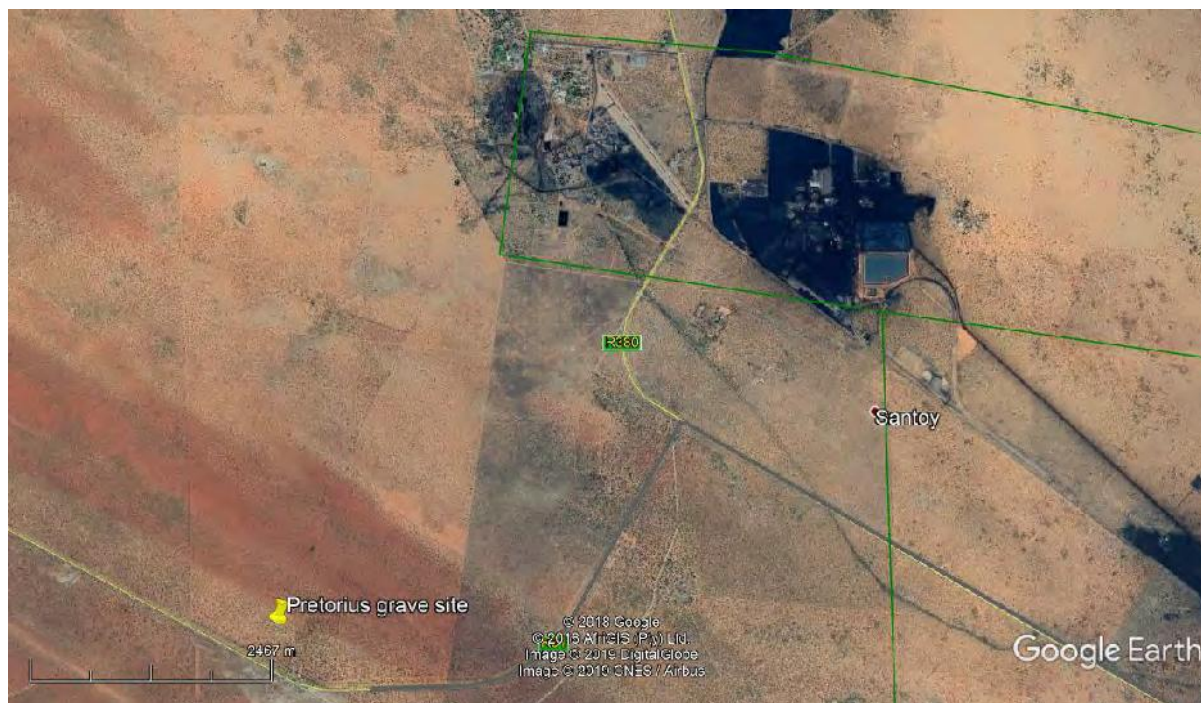
All three graves have legible information. These are the following:

1. Diederuk Johannes Pretorius, born 6 October 1892, died 7 March 1937
2. son Pretorius, born 13 September 1926, died 16 September 1926
3. Andries Petrus Pretorius

Grave 1 has a slate headstone and border. Grave 2 has a cement dressing and marble headstone of an angel which unfortunately has been broken. Grave 3 also has a cement dressing and a slate headstone (see Appendix H and I).

Two of the graves are thus heritage graves (older than 60 years) and one unknown as it has no date of death indicated. The latter should thus be handles as a heritage grave.

GPS: 27°10'29.0"S  
22°48'28.2E



**Figure 28: Location of the Pretorius cemetery.**

SITE NO. 2 PRETORIUS GRAVE SITE

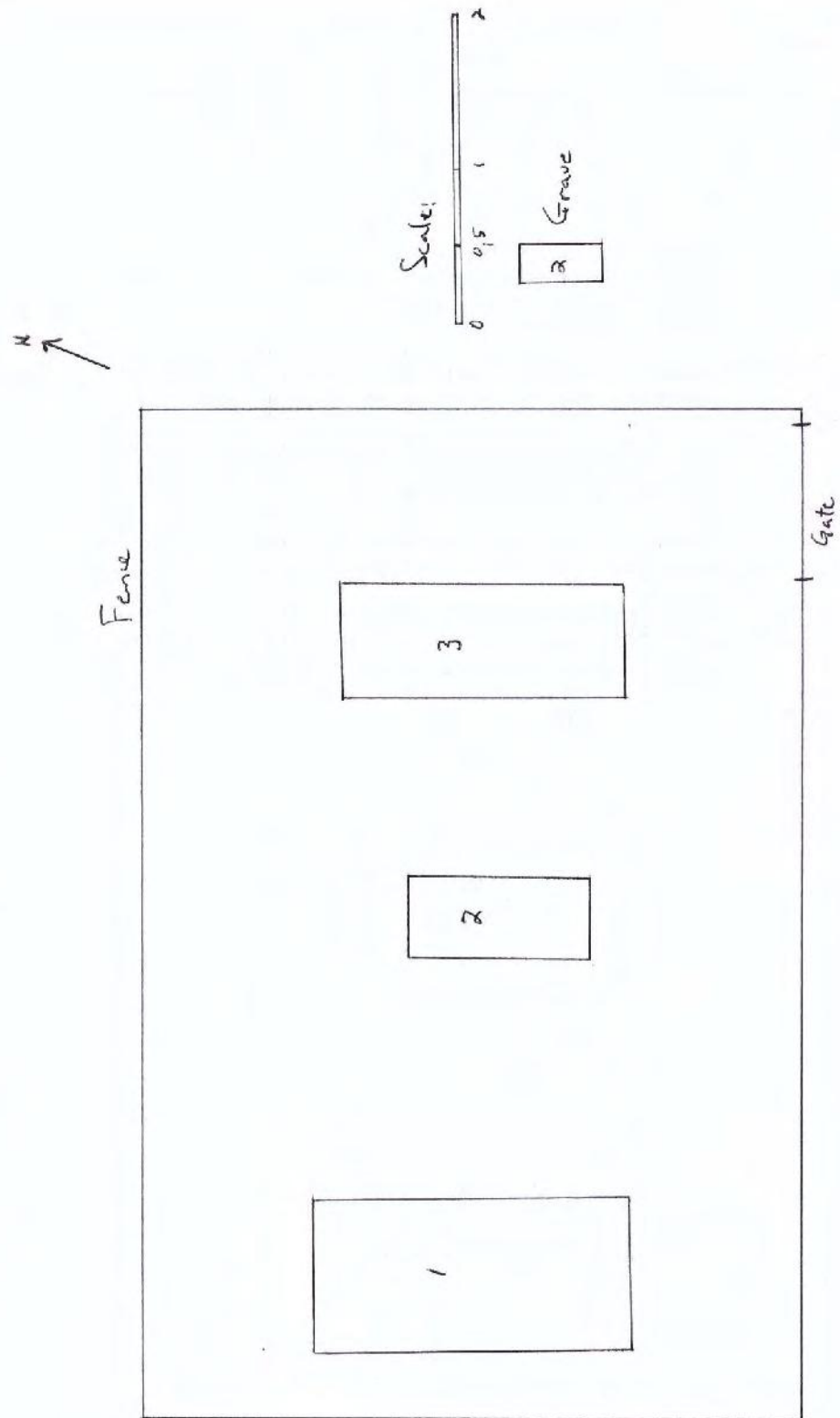


Figure 29: Plan of the Pretorius cemetery.

## 7.5 Stone Age sites along the Gamagara River – site no. 1-9<sup>1</sup>

These sites have been discussed in a previous report (Van Vollenhoven 2019b). The basic information is however repeated here in order to make this management plan an alone-standing document.

The relevant Stone Age sites were first identified by Küsel et.al. (2009) and Pelsler & Van Vollenhoven (2011). Küsel et.al. identified one site (Site no. 1) and Pelsler & Van Vollenhoven fourteen (Sites 2-15). Isolated stone tools were also identified during these surveys. Only sites 1 and 6-12 were deemed of high cultural significance by the respective previous studies. It was recommended that Sites 1 and 6 be mitigated in the event of a development in this area. SAHRA agreed to this in their comments both in 2013 and 2018.

After an assessment of these sites in 2019 (Van Vollenhoven 2019b) the sites were reduced to 9 (Figure 30) as some were combined and at least one did not exist anymore (Table 1).

**Table 1: Gamagara Stone Age sites**

Old number	New number	Cultural significance	Reference
1	1	Medium-high	Küsel et.al. 2009
2	13	Medium-high	Pelsler & Van Vollenhoven 2011
3	3 and 4	Low-medium	Pelsler & Van Vollenhoven 2011
4	15	Negligible	Pelsler & Van Vollenhoven 2011
5	5	Low-medium	Pelsler & Van Vollenhoven 2011
6	6 and 7	Low-medium	Pelsler & Van Vollenhoven 2011
7	14	Low-medium	Pelsler & Van Vollenhoven 2011
8	8	Low-medium	Pelsler & Van Vollenhoven 2011
9	9-12	Low-medium	Pelsler & Van Vollenhoven 2011

---

<sup>1</sup> These sites have been numbered before and therefore the numbers are kept. However to distinguish it from other sites, it should be referred to as Stone Age sites 1-9.



**Figure 30: The Gamagara Stone Age sites.**

GPS:

Site 1: S27°10'39.0" E22°54'53.6" (Figure 31)

Site 2: S27.18422 E22.92130

Site 3: S27.18362 E22.91820

S27.18539 E22.92119 (Figure 32)

Site 4: S27.18940 E22.91817

Site 5: S27.18605 E22.92180

Site 6: S27.17542 E22.91651

S27.17592 E22.91679 (Figure 33)

Site 7: S27.19146 E22.92320

Site 8: S27.17885 E22.92081

Site 9: S27.18185 E22.92095

S27.18157 E22.92185

S27.18129 E22.92189

S27.18110 E22.92196



**Figure 31: Various stone artefacts from Site no. 1.**



**Figure 32: Late Stone Age artefacts from Site no. 3.**



**Figure 33: Two hand axes from Site no. 6.**

## **8. HISTORICAL CONTEXT**

### **8.1 Stone Age**

In order to contextualise the sites information on the Stone Age in the Northern Cape is included. The Stone Age is the period in human history when lithic material was mainly used to produce tools (Coertze & Coertze 1996: 293). In South Africa the Stone Age can be divided in three periods. It is however important to note that dates are relative and only provide a broad framework for interpretation. The division for the Stone Age according to Korsman & Meyer (1999: 93-94) is as follows:

- Early Stone Age (ESA) 2 million – 150 000 years ago
- Middle Stone Age (MSA) 150 000 – 30 000 years ago
- Late Stone Age (LSA) 40 000 years ago – 1850 - A.D.

Stone Age sites are known to occur in the larger geographical area, including the well-known Wonderwerk Cave in the Kuruman Hills to the east, Tsantsabane, an ancient specularite working on the eastern side of Postmasburg, Doornfontein, another specularite working north of Beeshoek and a cluster of important Stone Age sites near Kathu. Additional specularite workings with associated Ceramic Later Stone Age material and older Fauresmith sites (early Middle Stone Age) are known from Lylefeld, Demaneng, Mashwening, King, Rust & Vrede, Paling, Gloucester and Mount Huxley to the north (Morris 2005: 3). Other known sites are the Doornlaagte Early Stone Age archaeological site close to Kimberley and a specularite mine close to Postmasburg (SAHRA database).

The onset of the Middle Stone Age coincided with a widespread demand for coloured or glittering minerals that arose at the time for still unknown reasons. The intensive collection of such substances soon exhausted surface exposures and led to the quest being extended underground and thus to the birth of mining practice. As mentioned, specularite was commonly mined in the Postmasburg area. In 1968 AK Boshier, working in collaboration with P Beaumont, found a number of underground specularite mines on Paling (De Jong 2010: 35). Stone and Iron Age communities mined specularite associated with iron ores for cosmetic purposes at Blinkklipkop, Paling, Gloucester and other farms (De Jong 2010: 41; Snyman 2000: 3).

Kruger (2014) identified three MSA sites close to the Kathu pan. These are regarded as being important due to it being within (and possibly part of) the significant larger Kathu Stone Age Complex. Van Vollenhoven (2017) has identified Late Stone Age artefacts at these sites.

Many Middle and Late Stone Age tools have been found by Archaetnos during surveys in the Northern Cape. These sites are located close to Griekwastad, Hotazel, Postmasburg and Kenhardt ([www.archaetnos.co.za](http://www.archaetnos.co.za)). On the farm Konkooksies 91 in the Pofadder district, five sites with Middle and Late Stone Age tools were identified (Pelser 2011). Sites were also identified close to Postmasburg on the farm Paling during an earlier survey (Pelser and Van Vollenhoven 2010: 12-17). On neighbouring farms some stone tools were identified (Fourie & Van der Walt 2006: 26-27). The environment here seems very similar to that at the study area, indicating that sites are most likely to be found within the proposed mining area.

Rock engraving (rock pecking) sites are known from Beeshoek and Bruce (Morris 2005: 3; Snyman 2000: 3). The latter are associated with the Late Stone Age.

The mentioned Late Stone Age sites are associated with the San people. Mitchell (2002: 126) indicates that the language group who occupied the Northern Cape is the /Auni-//Khomani and Eastern /Hoa. These people were hunters and gatherers which means that they would have moved around, leaving little trace of their existence.

## **8.2 Iron Age**

The Iron Age is the name given to the period of human history when metal was mainly used to produce metal artifacts (Coertze & Coertze 1996: 346). In South Africa it can be divided in two separate phases according to Van der Ryst & Meyer (1999: 96-98), namely:

Early Iron Age (EIA) 200 – 1000 A.D.

Late Iron Age (LIA) 1000 – 1850 A.D.

Huffman (2007: xiii) however indicates that a Middle Iron Age should be included. His dates, which now seem to be widely accepted in archaeological circles, are:

Early Iron Age (EIA) 250 – 900 A.D.

Middle Iron Age (MIA) 900 – 1300 A.D.

Late Iron Age (LIA) 1300 – 1840 A.D.

No Early or Middle Iron Age sites have been identified in the area of study. Iron Age people occupied the central and eastern parts of southern Africa from about 200 A.D., but the San and Khoi remained in the western and southern parts (Inskeep 1978: 126; see also Huffman 2007).

During the Late Iron Age (LIA), people stayed in extensive stonewalled settlements, such as the Thlaping capital Dithakong, 40 km north of Kuruman. Sotho-Tswana and Nguni societies, the descendants of the LIA mixed farming communities, found the region already sparsely inhabited by the Late Stone Age (LSA) Khoisan groups, the so-called 'first people'.

Most of them were eventually assimilated by LIA communities and only a few managed to survive, such as the Korana and Griqua. This period of contact is sometimes known as the Ceramic Late Stone Age and is represented by the Blinkklipkop specularite mine near Postmasburg and finds at the Kathu Pan (De Jong 2010: 36).

It is however known that Late Iron Age people did utilize the area further to the west, albeit briefly, as they did mine copper in the Northern Cape. This was much further to the west of the study area, closer to the Orange River (Inskeep 1978: 135). Iron Age people therefore probably did not settle in the study area.

### **8.3 Historical Age**

The historical age started with the first recorded oral histories in the area. It includes the moving into the area of people that were able to read and write. This era is sometimes called the Colonial era or the recent past.

Due to factors such as population growth and a decrease in mortality rates, more people inhabited the country during the recent historical past. Therefore and because less time has passed, much more cultural heritage resources from this era have been left on the landscape. It is important to note that all cultural resources older than 60 years are potentially regarded as part of the heritage and that detailed studies are needed in order to determine whether these indeed have cultural significance. Factors to be considered include aesthetic, scientific, cultural and religious value of such resources.

Factors such as population expansion, increasing pressure on natural resources, the emergence of power blocs, attempts to control trade and penetration by Griquas, Korana and white communities from the south-west resulted in a period of instability in Southern Africa that began in the late 18<sup>th</sup> century and effectively ended with the settlement of white farmers in the interior. This period, known as the *difaqane* or *Mfecane*, also affected the Northern Cape Province, although at a relatively late stage compared to the rest of Southern Africa. Here, the period of instability, beginning in the mid-1820s, was triggered by the incursion of displaced refugees associated with the Tlokwa, Fokeng, Hlakwana and Phuting tribal groups (De Jong 2010: 36).

The *Difaqane* coincided with the penetration of the interior of South Africa by white traders, hunters, explorers and missionaries. The first traders in the Northern Cape were PJ Truter's and William Somerville's journey of 1801, which reached Dithakong at Kuruman. They were again followed by Cowan, Donovan, Burchell and Campbell and resulted in the establishment of a London Mission Society station near Kuruman in 1817 by James Read (De Jong 2010:



36). During the 1870's William Sanderson, John Ryan and John Ludwig passed through the area close to Postmasburg (Snyman 2000: 3).

The Great Trek of the Boers from the Cape in 1836 brought large numbers of Voortrekkers up to the borders of large regions known as Bechuanaland and Griqualand West, thereby coming into conflict with many Tswana groups and also the missionaries of the London Mission Society. The conflict between Boer and Tswana communities escalated in the 1860s and 1870s when the Korana and Griqua communities became involved and later also the British government. The conflict mainly centered on land claims by various communities. For decades the western border of the Transvaal Boer republic was not fixed. Only through arbitration (the Keate Arbitration), triggered by the discovery of gold at Tati (1866) and diamonds at Hopetown (1867) was part of the western border finally determined in 1871. Ten years later, the Pretoria Convention fixed the entire western border, thereby finally excluding Bechuanaland and Griqualand West from Boer domination (De Jong 2010: 36).

Geographically, the study area is part of a region known as Griqualand West. At the end of the 18<sup>th</sup> century and the beginning of the 19<sup>th</sup> century Griqua tribes coming from the south settled in the region in order to escape encroachment of Afrikaner Trekboere who was active along the Orange River. They established the town of Klarwater, renamed Griquatown in 1813. After the discovery of diamonds in 1867 a serious dispute over the ownership of the diamond fields ensued, involving the Transvaal and Orange Free State Boer republics, Griqua, Korana and Thlaping communities and the Cape colonial government. In October 1871 the diamond fields were proclaimed British territory under the name Griqualand West. In 1879 it was annexed to the Cape Colony (De Jong 2010: 36).

The incorporation of Griqualand West into the Cape Colony promoted colonial settlement in the area from the 1880s. Government-owned land was surveyed and divided into farms, which were transferred to farmers. Surveyors were given the task of surveying and naming some of the many farms in this region. These farms were allocated to prospective farmers, but permanent settlement only started in the late 1920s and the first farmsteads were possibly built during this period (De Jong 2010: 36).

The Griqua town of Blinkklip (established in 1882), originally a mission station, was renamed Postmasburg in 1892 and became the centre of a magisterial district (Snyman 2000: 6). Another town, Olifantshoek, was established in the 1880s. The region remained sparsely populated until the advent of the 20<sup>th</sup> century, when cattle farming became popular (De Jong 2010: 36).

Known historical features in the area include farm buildings and graves. Buildings, including farm houses and outbuildings typical of the earliest white farmers of the area were identified during a previous survey in the larger geographical area. A few graves were also identified, but these are on adjacent farms (Van Vollenhoven 2012; Van Vollenhoven & Collins 2015; Fourie & Van der Walt 2006).

### ***The history of manganese mining in the Northern Cape***

The strata bound ore deposits of the Kalahari Manganese field represent the largest land bound sedimentary manganese deposits in the world and originated from a single episode of

manganese deposition about 2200 million years ago. A widespread hypothermal event occurred in the north western portion of the Kalahari Manganese field 1300 million years ago with temperatures reaching a maximum of 450 degrees centigrade in the Wessels, N'Chwaning and Black Rock areas. This event resulted in the upgrading of the Manganese-content of the ore and produced a wide range of rare minerals as well as mineral assemblages. Of the approximately 150 minerals, 10 have to date only been found in the Kalahari manganese field and a further 26 are found at four or fewer mineral localities worldwide (Küsel et.al. 2009: 3).

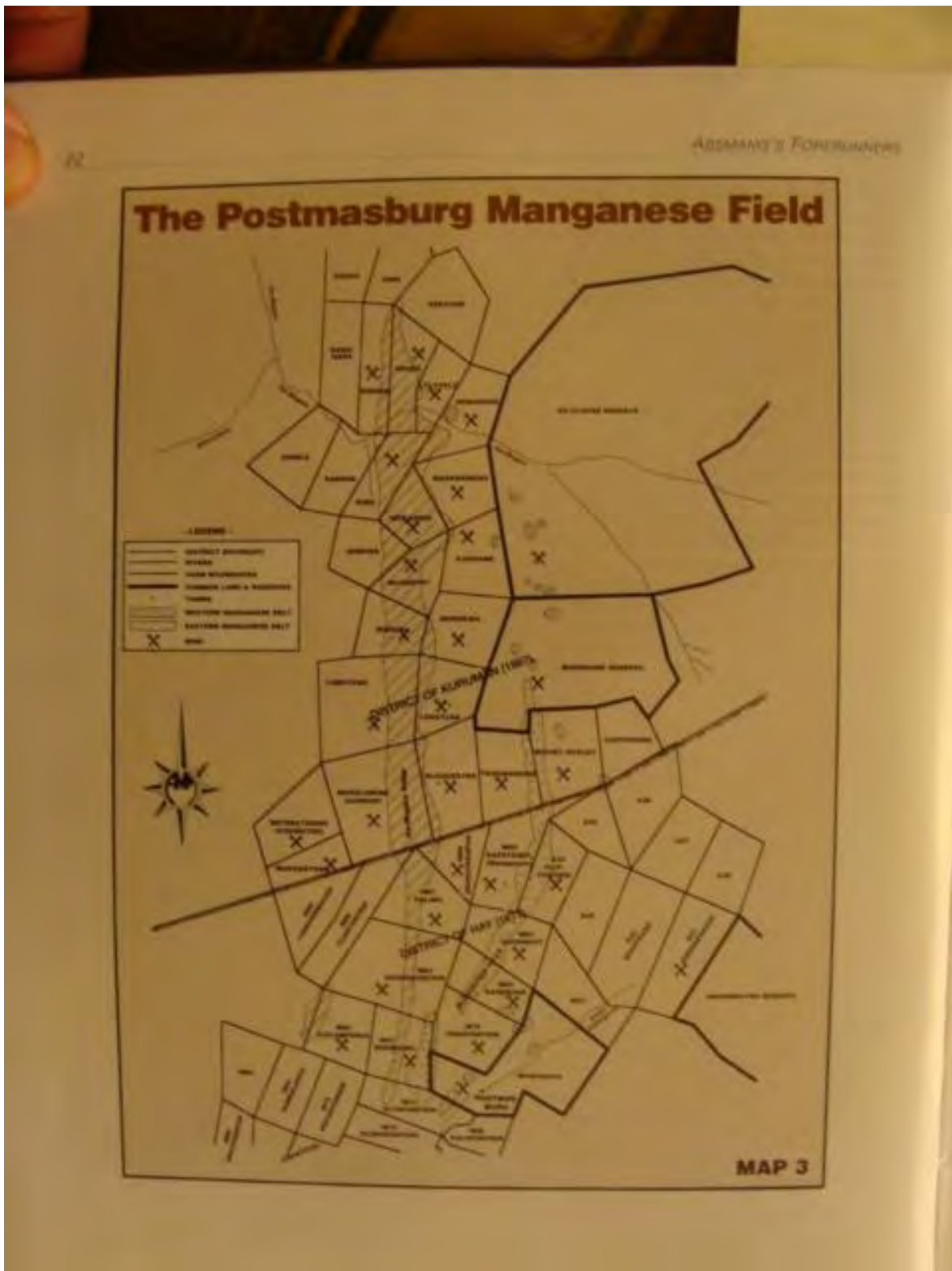
Geological exploration in the Northern Cape started as early as 1867. In 1876 John Mintern surveyed farm such as Beeshoek, Doornfontein, Driehoekspan and Paling (<https://assmang.co.za/history/>). Prospecting started in the Postmasburg area during 1882 and manganese was discovered here during 1886 (Snyman 2000: 6, 13). Henry George Brown, who was commissioned in 1888 by the government of British Bechuanaland to erect the first government buildings in Kuruman, became interested in the iron ores that were known from the Klipfontein Hills. While prospecting there in the late 19<sup>th</sup> century, he became the first person to identify manganese in what is today known as the Eastern Belt of the Postmasburg Manganese Field (De Jong 2010: 38).

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The first Geologist to have surveyed the Northern Cape was Dr AW Rogers of the Geological Commission of the Cape Colony in 1906. One of the features he noted was a small hill called Black Rock and reported on the presence of manganese ore at the base of the hill (Küsel et.al.: 2009: 3). Some sources indicate that it was in 1907 when Dr AW Jones and the Geological Commission of the Cape Colony identified manganese at Black Rock. The potential of these manganese deposits were now understood for the first time, but the lack of rail deterred investment (<https://assmang.co.za/history/>).

Captain Thomas Shone, who arrived in Postmasburg in 1919 to join the diggers following the discovery of diamonds at the town, discovered the manganese ores in the Western Belt during 1922-1924 (De Jong 2010: 38). In 1925 Shone and partners founded the Union Manganese Mines and Minerals Limited in order to secure mineral rights and exploit the ores (De Jong 2010: 38; Snyman 2000: 20). They bought several properties while obtaining the mineral leases for others (<https://assmang.co.za/history/>).

Prior to the discoveries by Brown and Shone, manganese was only mined in South Africa on a very small scale west of the present town of Magaliesburg and in the Western Cape. In 1926, Guido Sacco bought the farm and formed The Gloucester Manganese Mines (Postmasburg) Limited. The land was held for future development, as reasonable transportation facilities were not available at that time (De Jong 2010: 38; Snyman 2000: 20).



**Figure 34: The Postmasburg manganese fields (Snyman 2000: 22).**

Following the founding of their manganese mining company, Shone and his partners attempted to entice overseas investments but met with little success, because too little was known about

the economic viability of the deposits. The government then sent Dr AL Hall of the Geological Survey to conduct a detailed geological survey of the Postmasburg manganese deposits (Figure 34). He was the first person to map them along the entire length of the Gamagara Hills and to classify them scientifically as ferruginous manganese ores that were suited for the production of low-grade ferromanganese. His report (1926) was optimistic about the viability of the deposits but stated that lack of proper transport facilities would be a concern (De Jong 2010: 39; Snyman 2000: 21-23).

Shone's company established small prospect workings all along the Gamagara Hills on farms such as Beeshoek, Paling, Doornfontein and Magoloring. In 1926 a Postmasburg attorney, AJ Bester, started taking up options on the farms in the Klipfontein Hills and established a second mining company, South African Manganese Limited, the forerunner of SAMANCOR. Two years later Guido Sacco formed a third company, Gloucester Manganese Mines (Postmasburg) Limited. The land was held for future development, as reasonable transportation facilities were not available at that time (De Jong 2010: 39; Snyman 2000: 24).

The presence of manganese deposits in the Klipfontein Hills and observations made from prospecting trenches showed that the manganese ore bodies in the Western Belt were perhaps more irregular in shape than predicted by Hall. This resulted in the Geological Survey commissioning Dr Louis Nel to undertake a second survey in 1927-1929 to map the entire manganese field in detail. His results, published in 1929, laid the foundation for much of the present-day knowledge of the geology of the Postmasburg manganese field (De Jong 2010: 39; Snyman 2000: 24-25).

Mining by Union Manganese and South African Manganese started in earnest in 1927 in the Postmasburg field. Lack of proper transport facilities and the application of obsolete mining methods (everything was done by hand on a small scale) hampered progress. Manganese ores were collected from the open pits through a system of coco-pans and loaded on wagons (later trucks) that went to the Koopmansfontein railway station, about 100 km away (De Jong 2010: 40). In 1929 Shone registers the Manganese Corporation Ltd. Large scale production also started at Beeshoek during this year (<https://assmang.co.za/history/>).

The situation showed promises of being improved when the British Swiss International Corporation Limited provided capital for the construction of a railway line from Koopmansfontein to Postmasburg and Beeshoek in return for certain manganese mineral rights. A new joint company, The Manganese Corporation Limited, was formed and an agreement reached with the Minister of Railways and Harbours. The extended line to Beeshoek was opened in June 1930 and development of the ore bodies at Beeshoek, Doornfontein and Paling could take place. For this purpose, a narrow-gauge railway line was laid (De Jong 2010: 40; Snyman 2000: 29, 36).

However, the September 1929 crash on the New York Stock Exchange, followed by the Great Depression, brought all manganese mining operations to a halt, rendering the newly constructed Koopmansfontein / Beeshoek railway line dormant (De Jong 2010: 41). Mining at Beeshoek almost ceased during this time. However, during 1932 production increased again (Snyman 2000: 39-41).

May 1930 saw the launch of Ore & Metal Company Limited to import and export mineral concentrates, including manganese. The African Mining and Trust Company Limited were formed in December 1931 to acquire mineral rights and explore mineral deposits. In exchange for shares in African Mining and Trust, the founders transferred their entire Ore & Metal shareholding to the new company, while Guido Sacco transferred his Gloucester Manganese Mines shares. Thus, Ore & Metal and Gloucester Manganese Mines became subsidiaries of African Mining and Trust, now a wholly owned subsidiary of Assore Limited (previously The Associated Ore & Metal Corporation Limited), which was formed in 1950 (De Jong 2010: 41; Snyman 2000: 40).

During 1934 the South African Railways re-opened the railway line and extended it to Gloucester. In 1935 The Associated Manganese Mines of South Africa Limited ("Assmang") was formed. Anglovaal acquired all the mineral leases of the Manganese Corporation and these were ceded to Assmang, as were the shares of the Gloucester Manganese Mines Limited held by African Mining and Trust in exchange for shares in Assmang. The first shipment of manganese ore left Durban harbour in March 1936 and other shipments continued uninterruptedly (De Jong 2010: 41; Snyman 2000: 46-47).

In 1940 Associated Manganese Mines of South Africa acquired the manganese outcrop known as Black Rock and shortly afterwards started mining the deposit (Küsel et.al. 2009: 3). The mine was closed in 1945 due to a shortage of railway trucks to the Gloucester railhead and shipping capacity. After the Second World War, in 1948, several mines, including Black Rock reopened (<https://assmang.co.za/history/>).

During the 1950's Assmang obtained the rights for mining many other farms in the vicinity of Black Rock. In 1961 the rail extension from Sishen to Hotazel is completed and in 1962 ESKOM power reaches Beeshoek and Gloucester. This led to primitive mining methods giving way to industrial machinery. Assmang became the biggest exporter of iron ore in South Africa by 1970. The Belgravia mine is also opened in this year. This mine and Black rock was upgraded in 1975 with more mines being opened in the area (<https://assmang.co.za/history/>).

A recession in 1981 halted production although the raling increased to more than 1 Million tonnes. More mines are however opened, but in 1982-3 a severe recession in the steel industry led to the ceasing of production at Black Rock and other mines. From 1988 exports increased again. Further mines and associated industries were established by Assmang during the 1990's (<https://assmang.co.za/history/>). The Associated Manganese Mines of South Africa Limited changed its name to Assmang on 30 May 2001. It was reorganised into three divisions: Manganese, Chrome and Iron Ore (De Jong 2010: 41).

In 2004 Anglovaal restructured and form African Rainbow Minerals (ARM), the first Black Economic Empowerment (BEE) mining giant in South Africa. Further mines were opened in the area and the BKM project was started. The Black Rock Expansion Project commenced in 2014 aiming at increasing manganese output to 4.6 Million tons per annum (<https://assmang.co.za/history/>).

## **9. INTERNATIONAL CONVENTIONS FOR THE PROTECTION OF CULTURAL RESOURCES**

In preserving the heritage sites, five internationally accepted documents relating to the protection of cultural resources should be taken into consideration. These are:

- The Australian ICOMOS charter for places of cultural significance, also called the Burra charter, of November 1999.
- The Venice charter of January 1996.
- The Conservation plan: a guide to the preparation of conservation plans for places of European cultural significance by James Semple Kerr of Augustus 1985.
- The International Finance Corporations' performance standard for cultural heritage of 2012.
- Equator principles.

These are concerned with general policies for countries to ensure the effective and active measures for the protection, conservation and presentation of the cultural heritage. It aims to give the cultural heritage a function in the life of the community and to integrate the protection of that heritage into comprehensive planning programmes. Following the guidelines of these conventions, gives the correct guidance in dealing with the conservation and protection of cultural resources. It also is in line with SAHRA's guidelines for developing of plans as part of the management of heritage sites or places.

### **9.1 The Burra charter**

The Burra charter is concerned with the implementation of conservation to repair the cultural significance of a place. In article 2 of the document it is stated clearly that the aim of conservation is to repair the cultural significance of a place. It includes the protection, maintenance and future of such a place (ICOMOS 1999: 1). This idea is in line with the principles of heritage management. Factors that are taken into account for this purpose are the context of the ethical, historical, scientific and social value of a place (ICOMOS 1999).

Article 3 of the charter states that work on a heritage site should be done with caution in order to take into consideration the existing material, functions, associations and meaning of a site. It basically means that as much change as necessary, but as little as possible should be implemented (ICOMOS 1999: 1).

Article 4 of the Burra charter indicates that all disciplines which can potentially play a role in studying a place, should be used in the study thereof (ICOMOS 1999: 1). It means that anything that could give information should be used. In line with this, article 5 states that all aspects of the cultural significance of a place should be taken into consideration without emphasising any one to the detriment of the others.

It is this cultural significance which, according to article 6, is determining for the conservation policy of a place. The conservation policy is determining for the use, changes, protection and preservation of a historical site (ICOMOS 1999: 2).

The charter emphasises that even the condition of a place give ample reason for the preservation thereof in terms of cultural significance. Preservation includes the protection, maintenance and stabilisation of structures.

If not enough information is available of a previous state of the structure which may be used to recapture and emphasise its cultural significance, one may use the processes of restoration, reconstruction and adaptation of structures. However, the cultural significance of various periods should be taken into account (ICOMOS 1999: 2-3). Archaeological excavations is seen by the charter as an important method to collect information, either for restoration purposes or for the collection of scientific knowledge (ICOMOS 1999: 3-4).

In article 25 the charter indicates that the cultural significance of a place should be strengthened by supporting information such as photographs, drawings and material samples (ICOMOS 1999: 4). This clause is very important as it influences the methodology with regards to the research on places of cultural importance. It includes the documentation of sites by all means available and as completely as possible. It also includes the safekeeping and making available of this documentation and material.

The Burra charter also has an important influence on the way in which the cultural heritage is handled. Cultural significance is sometimes also referred to as heritage significance. The National Heritage Resources Act, 1999, refers to this in article 3(3). According to this, a place or object is regarded as part of the national estate when it has cultural significance for one of the following reasons:

1. The importance thereof for the community or in the history of South Africa;
2. If it is an unusual, rare or endangered aspect of the natural or cultural heritage of South Africa;
3. The potential thereof to reveal information that will be a contribution to the understanding of South Africa's natural or cultural heritage;
4. The importance thereof to reveal the most important characteristics of certain classes of South Africa's natural or cultural places or objects;
5. The importance thereof in having specific esthetical characteristics on which a community or cultural group place value;
6. The importance to contain a high value of creative or technical achievements in a specific time period;
7. The strong or special association of it with a specific community or cultural group for social, cultural or religious reasons;
8. The strong or special association thereof with the life and work of a person, a group or an organization of importance in the history of South Africa;
9. Places of meaning with relation to the history of slavery in South Africa (Act No. 25 of 1999: 15).

## **9.2 The Venice charter**

The Venice charter sees historical sites as the most important living witness of the past. The heritage is accordingly seen as the responsibility of today's generation and that it should be conserved in an authentic state (ICOMOS 1996: 1).

The articles of the Venice charter are more or less in agreement with those of the Burra charter. It means that the application of last mentioned supports the first and will contribute to the upkeep of international standards in the conservation, preservation and the restoration of historical places.

### **9.3 The Conservation plan of Kerr**

The conservation plan of Kerr is closely associated with the Burra charter. It gives an explanation of the use of the charter and the steps to be followed in the implementation of the conservation of a historical place. The process consists of two phases.

#### ***9.3.1 Phase 1***

The first phase deals with establishing cultural significance. It includes the collection of information (documents and physical), the analysis of the importance thereof, the assessment of this importance and the stating of the said importance (Kerr 1985: 2).

Assessment consists of the establishing of criteria for the determination of cultural significance, whilst the stating of the cultural importance is only an explanation thereof (Kerr 1985: 8, 12).

#### ***9.3.2 Phase 2***

The second phase consists of the conservation plan. Firstly, information should be collected. This includes four sectors namely:

- the needs of the client
- external needs
- requirements for the maintenance of the cultural significance and
- the physical condition of the place.

Hereafter a conservation management plan is developed, a conservation policy is stated and a strategy for the implementation of the conservation plan is rolled out (Kerr 1985: 2).

### **9.4 The International Finance Corporations' performance standard for cultural heritage**

This standard recognizes the importance of cultural heritage for current and future generations. It aims to ensure that clients protect cultural heritage in the course of their project activities.

This is done by clients abiding to the law and having heritage surveys done in order to identify and protect cultural heritage resources via field studies and the documentation of such resources. These need to be done by competent professionals (e.g. archaeologists and cultural historians). Possible chance finds, encountered during the project development, also needs to be managed by not disturbing it and by having it assessed by professionals.

Impacts on the cultural heritage should be minimized. This includes the possible maintenance of such sites in situ, or when impossible, the restoration of the functionality of the cultural heritage in a different location. When cultural historical and archaeological artifacts and structures need to be removed, this should be done by professionals and by abiding to the



applicable legislation. The removal of cultural heritage resources may however only be considered if there are no technically or financially feasible alternatives. In considering the removal of cultural resources, it should be outweighed by the benefits of the overall project to the affected communities. Again professionals should carry out the work and adhere to the best available techniques.

It is necessary to engage into consultation with affected communities. This entails that access to such communities should be granted to their cultural heritage if this is applicable. Compensation for the loss of cultural heritage should only be given in extra-ordinary circumstances.

Critical cultural heritage may not be impacted on. Professionals should be used to advise on the assessment and protection thereof. Utilization of cultural heritage resources should always be done in consultation with the affected communities in order to be consistent with their customs and traditions and to come to agreements with relation to possible equitable sharing of benefits from commercialization.

### **9.5 Equator principles**

The Equator principles mostly make use of the performance standards of the International Finance Corporation. In fact, it specifically states that the IFC Performance Standard 8, related to Cultural Heritage is applicable. It further indicates that impacts on cultural heritage should be assessed during development projects. It also provides a list of potential environmental and social issues to be addressed in the environmental and social assessment documentation. This list includes the following:

- assessment of the baseline environmental and social conditions
- consideration of feasible environmentally and socially preferable alternatives
- requirements under host country laws and regulations, applicable international treaties and agreements
- protection and conservation of biodiversity (including endangered species and sensitive ecosystems in modified, natural and Critical Habitats) and identification of legally protected areas
- sustainable management and use of renewable natural resources (including sustainable resource management through appropriate independent certification systems)
- use and management of dangerous substances
- major hazards assessment and management
- efficient production, delivery and use of energy
- pollution prevention and waste minimisation, pollution controls (liquid effluents and air emissions), and solid and chemical waste management
- viability of Project operations in view of reasonably foreseeable changing weather patterns/climatic conditions, together with adaptation opportunities
- cumulative impacts of existing Projects, the proposed Project, and anticipated future Projects
- respect of human rights by acting with due diligence to prevent, mitigate and manage adverse human rights impacts

- labour issues (including the four core labour standards), and occupational health and safety
- consultation and participation of affected parties in the design, review and implementation of the Project
- socio-economic impacts
- impacts on Affected Communities, and disadvantaged or vulnerable groups
- gender and disproportionate gender impacts
- land acquisition and involuntary resettlement
- impacts on indigenous peoples, and their unique cultural systems and values
- protection of cultural property and heritage
- protection of community health, safety and security (including risks, impacts and management of Project's use of security personnel)
- fire prevention and life safety

## 10. CULTURAL SIGNIFICANCE

Cultural significance is a core concept in the determination of the importance of a heritage site. It is of the utmost importance that the cultural significance of a place be understood before any decision can be made. In determining cultural significance, five criteria are considered to determine cultural significance (ICOMOS, 1964, 2013; Kerr, 1985):

- Cultural value
- Social value
- Historic value
- Scientific value
- Aesthetic value

It is general practice in cultural heritage management to make use of these five aspects to determine not only cultural significance, but accordingly whether a site, building, memorial or whatever cultural resource should be preserved and to what extent. In fact, the Burra Charter states that all of these aspects should be respected (ICOMOS, 2013). It implies that the 60-year clause in the National Heritage Act only becomes a trigger, after which *cultural significance* is used to determine whether something really is conservation-worthy.

### 8.1 Cultural Value

This refers to the value a heritage site holds for the community or for a section of the community. It is mainly based on the assessment of the other four values. Cultural significance is embodied in the place itself, its fabric, setting, use, associations, meanings, records, related places, and related objects (ICOMOS, 2013).

### 8.2 Social Value

Social value is seen as the most important factor in determining cultural significance. It refers to the embracement of qualities for which a place has become a focus of spiritual, political, national, or other cultural sentiments to a majority or minority group. The value is influenced

by factors such as how well known a site is, the state of preservation thereof, or the scientific importance thereof and is seen as the most important factor in determining cultural significance (Van Vollenhoven, 2003).

### **8.3 Historic Value**

This value recognises the contribution a place makes to our achievements and our knowledge of the past. The condition of the site is evaluated, and questions asked include whether it is a typical or well-preserved example of a specific style, whether it is unique or has unique characteristics, or if it can be associated with a specific important individual. Historic value is increased by a long contextual history and authenticity (Van Vollenhoven, 2003).

### **8.4 Scientific Value**

Scientific value refers to the potential of a place to provide knowledge. It is closely associated with rarity, quality and representativeness (Van Vollenhoven, 2003).

### **8.5 Aesthetic Value**

Aesthetic value has to do with beauty of design, ambience, association, and mood that a place possesses. It includes design, style, artistic development, and level of craftsmanship (Van Vollenhoven, 1998, 2003). Clearly this is of great importance when dealing with buildings, and therefore it sometimes is called the architectural value. The setting of a monument for instance, also forms part of the aesthetics value. Setting also refers to the space and the visual setting including views to and from the place, and may even include aspects such as smells and sounds, historical and contemporary relationships, e.g. activities, social and spiritual practices, and tangible and intangible associations with other places (ICOMOS, 2013).

The determination of *Cultural significance* is done by doing thorough research. This includes gathering documentary and oral evidence, as well as assessing physical evidence which are embedded in the subject being assessed (ICOMOS, 1985).

## **11. ASSESSMENT OF THE BLACK ROCK KOPPIE AND OTHER SITES AT BRMO**

Küsel et.al. (2009) has already indicated that the Black Rock koppie should be declared a national heritage site (Grade I). In lieu of this and in accordance with section 3(3) of the NHRA, the following tables (2-6) indicates the cultural significance of the Black Rock koppie and other sites discussed here:

**Cultural significance Table 2: Black Rock koppie**

A place is considered to be part of the national estate if it has cultural significance because of -	Applicable or not	Rating: 1 - Negligible/ 2 - Low/ 3 - Low-Medium 4 - Medium/ 5 - Medium-High/ 6 - High/ 7 - Very High	Motivation
Its importance in the community or pattern of South Africa's history	Y	H	Cultural, social and scientific significance related to mining history and early mining
Its possession of uncommon, rare, or endangered aspects of South Africa's natural or cultural history	Y	H	Scientific and historical significance related to early mining methods
Its potential to yield information that will contribute to an understanding of South Africa's natural or cultural heritage	Y	H	Scientific and historical significance related to the cultural heritage of early manganese mining
Its importance in demonstrating the principal characteristics of a particular class of South Africa's natural or cultural places or objects	N	-	
Its importance in exhibiting particular aesthetic characteristics valued by a community cultural group	N	-	
Its importance in demonstrating a high degree of creative or technical achievement at a particular period	Y	VH	Scientific significance related to early manganese mining
Its strong or special association with a particular community or cultural group for social, cultural or spiritual reasons	Y	L-M	Cultural, social and historical significance related to mine workers communities
Its strong or special association with the life or work of a person, group or organization of importance in the history of South Africa	Y	L-M	The history of ASSMANG as well as mining pioneers
Sites of significance relating to the history of slavery in South Africa	N	-	
<b>Reasoned assessment of significance using appropriate indicators outlined above:</b>		<b>5 – Medium-High</b>	

**Cultural significance Table 3: Associated features**

A place is considered to be part of the national estate if it has cultural significance because of -	Applicable or not	Rating: 1 - Negligible/ 2 - Low/ 3 - Low-Medium 4 - Medium/ 5 - Medium-High/ 6 - High/ 7 - Very High	Motivation
Its importance in the community or pattern of South Africa's history	Y	H	Cultural, social and scientific significance related to mining history and early mining
Its possession of uncommon, rare, or endangered aspects of South Africa's natural or cultural history	Y	H	Scientific and historical significance related to early mining methods
Its potential to yield information that will contribute to an understanding of South Africa's natural or cultural heritage	Y	H	Scientific and historical significance related to the cultural heritage of early manganese mining
Its importance in demonstrating the principal characteristics of a particular class of South Africa's natural or cultural places or objects	N	-	
Its importance in exhibiting particular aesthetic characteristics valued by a community cultural group	N	-	
Its importance in demonstrating a high degree of creative or technical achievement at a particular period	Y	VH	Scientific significance related to early manganese mining
Its strong or special association with a particular community or cultural group for social, cultural or spiritual reasons	Y	L-M	Cultural, social and historical significance related to mine workers communities
Its strong or special association with the life or work of a person, group or organization of importance in the history of South Africa	Y	L-M	The history of ASSMANG as well as mining pioneers
Sites of significance relating to the history of slavery in South Africa	N	-	
<b>Reasoned assessment of significance using appropriate indicators outlined above:</b>		<b>5 – Medium-High</b>	

**Cultural significance Table 4: Mine workers cemetery**

A place is considered to be part of the national estate if it has cultural significance because of -	Applicable or not	Rating: 1 - Negligible/ 2 - Low/ 3 - Low-Medium 4 - Medium/ 5 - Medium-High/ 6 - High/ 7 - Very High	Motivation
Its importance in the community or pattern of South Africa's history	Y	M	Cultural and social significance related to mining history and cultural practices
Its possession of uncommon, rare, or endangered aspects of South Africa's natural or cultural history	Y	H	Social, historical and cultural significance related to mine workers and cultural practices
Its potential to yield information that will contribute to an understanding of South Africa's natural or cultural heritage	Y	L	Social significance related to mine workers
Its importance in demonstrating the principal characteristics of a particular class of South Africa's natural or cultural places or objects	Y	VH	Social and cultural significance related to mine workers and burial practices
Its importance in exhibiting particular aesthetic characteristics valued by a community cultural group	N	-	
Its importance in demonstrating a high degree of creative or technical achievement at a particular period	N	-	
Its strong or special association with a particular community or cultural group for social, cultural or spiritual reasons	Y	VH	Cultural, social and historical significance related to mine workers communities
Its strong or special association with the life or work of a person, group or organization of importance in the history of South Africa	Y	VH	The history of mine workers
Sites of significance relating to the history of slavery in South Africa	N	-	
<b>Reasoned assessment of significance using appropriate indicators outlined above:</b>		<b>5,5 – High</b>	

**Cultural significance Table 5: Farm cemetery**

A place is considered to be part of the national estate if it has cultural significance because of -	Applicable or not	Rating: 1 - Negligible/ 2 - Low/ 3 - Low-Medium 4 - Medium/ 5 - Medium-High/ 6 - High/ 7 - Very High	Motivation
Its importance in the community or pattern of South Africa's history	Y	M	Cultural and social significance related to early white farming communities
Its possession of uncommon, rare, or endangered aspects of South Africa's natural or cultural history	Y	H	Social, historical and cultural significance related to early white farming communities
Its potential to yield information that will contribute to an understanding of South Africa's natural or cultural heritage	Y	L	Social significance related to early white farmers
Its importance in demonstrating the principal characteristics of a particular class of South Africa's natural or cultural places or objects	Y	VH	Social and cultural significance related to burial practices among early white farmers
Its importance in exhibiting particular aesthetic characteristics valued by a community cultural group	N	-	
Its importance in demonstrating a high degree of creative or technical achievement at a particular period	N	-	
Its strong or special association with a particular community or cultural group for social, cultural or spiritual reasons	Y	VH	Cultural, social and historical significance related to mine workers communities
Its strong or special association with the life or work of a person, group or organization of importance in the history of South Africa	Y	VH	The history of early white farmers
Sites of significance relating to the history of slavery in South Africa	N	-	
<b>Reasoned assessment of significance using appropriate indicators outlined above:</b>		<b>5,5 – High</b>	

**Cultural significance Table 6: Stone Age sites**

A place is considered to be part of the national estate if it has cultural significance because of -	Applicable or not	Rating: 1 - Negligible/ 2 - Low/ 3 - Low-Medium 4 - Medium/ 5 - Medium-High/ 6 - High/ 7 - Very High	Motivation
Its importance in the community or pattern of South Africa's history	Y	M	Cultural and historical significance related to Stone Age communities
Its possession of uncommon, rare, or endangered aspects of South Africa's natural or cultural history	Y	H	Historical and cultural significance related to Stone Age communities
Its potential to yield information that will contribute to an understanding of South Africa's natural or cultural heritage	Y	MH	Scientific and cultural significance related to Stone Age artefacts
Its importance in demonstrating the principal characteristics of a particular class of South Africa's natural or cultural places or objects	Y	M	Historical, scientific and cultural significance related to Stone Age technologies
Its importance in exhibiting particular aesthetic characteristics valued by a community cultural group	N	-	
Its importance in demonstrating a high degree of creative or technical achievement at a particular period	Y	H	Scientific, cultural and historical significance related to Stone Age technologies
Its strong or special association with a particular community or cultural group for social, cultural or spiritual reasons	N	-	
Its strong or special association with the life or work of a person, group or organization of importance in the history of South Africa	N	-	
Sites of significance relating to the history of slavery in South Africa	N	-	
<b>Reasoned assessment of significance using appropriate indicators outlined above:</b>		<b>5 – Medium-High</b>	



## 12. STATEMENT OF SIGNIFICANCE

*The Black Rock koppie on its own is the most important heritage feature discussed. On its own it is . It should thus be graded as a National Heritage site (Grade I)of high cultural significance, but coupled with other heritage features it increases in significance. It is a unique feature indicating the earliest manganese mining activities in Southern Africa, dating back to the 1940's.*

*Each of the associated features on its own may not have a similar significance, but as a collective, and in association with the Black Rock koppie, received a similar rating.*

*Graves are always regarded to be of High significance. The association of the mine workers cemetery with the Black Rock mining activities increase the cultural significance of the area. The farm cemetery does not link with the mining history and thus carries high significance on its own.*

*The Stone Age sites vary in significance (see Van Vollenhoven 2019b). However, as a collective it is of medium-high significance. It also does not link with the mining history.*

*Following the above historical context, the importance of the Black Rock koppie and other sites at BRMO can be stated as follows:*

- 1. Black Rock koppie is one of the earliest known manganese mines in Southern Africa. It should thus be graded as a National Heritage Site (Grade I).*
- 2. The site is in a reasonably good condition and various features related to the first mining activities here are still visible.*
- 3. The associated features should be seen as adding to the cultural significance and it should thus be included.*
- 4. Graves are always regarded as being of high significance. The mine workers cemetery however increases in significance due to its association and close location to the Black Rock kioppie.*
- 5. The farm graves are included in the management plan but should not be regarded as part of the site to be declared a heritage site.*
- 6. The Stone Age sites are of importance on its own, but also may not warrant to be part of an officially declared site.*



**Figure 35: Approximate area to be declared.**

### 13. MANAGEMENT PROTOCOLS

1. The Black Rock koppie, associated features and the mine workers cemetery is regarded as being of high cultural significance. It therefore needs to be protected at a national level. Thus an application is made for it to be declared a Grade I heritage site.
2. It should thus be maintained as a National Heritage site.
3. The declaration should be limited to an area indicated in Figure 35, which also includes a buffer zone of 20 m.
4. No development should be allowed within the declared area and buffer zone.
5. The heritage sites and all its components should be maintained, and further deterioration prevented as far as possible.
6. The power station building may be utilised as a site museum or interpretive centre.
7. A collection of mine related artefacts may be made on site to be included in such a museum. However, should a museum not be established it should be left *in situ*.
8. A collection of Stone Age material may also be placed in such a museum, again only if such a museum is established.
9. The collection of artefacts indicated below should be done by an archaeologist after obtaining the necessary permit from SAHRA.
10. Such a museum could interpret the site and history of the area, including the history of mining in the area. It could be used to the benefit of corporate or organized visitors to the mine.
11. By allowing the above the cultural historical integrity of the site will remain intact.
12. Should any developments that may have an impact on the site be planned, it should be re-evaluated within the context of this management plan and approved by the relevant heritage authority.

13. The farm graves are excluded from the declaration but will still need to be maintained by being fenced in, protected and maintained.
14. The Stone Age sites are also excluded but should be maintained. It would not be possible to fence these in, but an area of 100 m on both sides of the Gamagara River should be left untouched.

#### **14. SAFETY AND SECURITY**

The Black Rock koppie and two grave sites are already fenced in. A buffer zone of 20 m should be implemented. The sites should not be opened to the general public. The Black Rock koppie can be a dangerous area to visit. Any visits to site should be carefully controlled by the BRMO and visitors should adhere to health and safety regulations implemented by the mine. Thus, no uncontrolled visits should be allowed.

Visits from descendants to the cemeteries should be allowed, and if needed, controlled by the mine. These visitors need to adhere to the health, environment and safety protocol of the mine. Communication with regards to site visits will have to be done well in advance.

Visits to the Stone Age sites should only be allowed for researchers and only after the necessary arrangements have been made.

#### **15. EDUCATION AND COMMUNITY INVOLVEMENT**

If the site is opened for the public at least a notice should be placed at the site to explain its significance as well as give an indication that it may not be disturbed in any way. The involvement of the local community which may have an interest, such as the descendants of those buried in the grave yard, is important. These people may also have to be educated in this regard. It is however not recommended that the site be opened for uncontrolled public viewing.

The possibility of establishing a museum or interpretation centre has been mentioned above. This would serve the purpose of informing visitors about the history and legacy of the mine, without necessarily giving them access to the old mine itself. It could form a valuable tool for social responsibility and education from the mine towards the people of the area.

It is however important that personnel be informed about the site, its importance and how they should approach it. This should be included in the mine's induction programme.

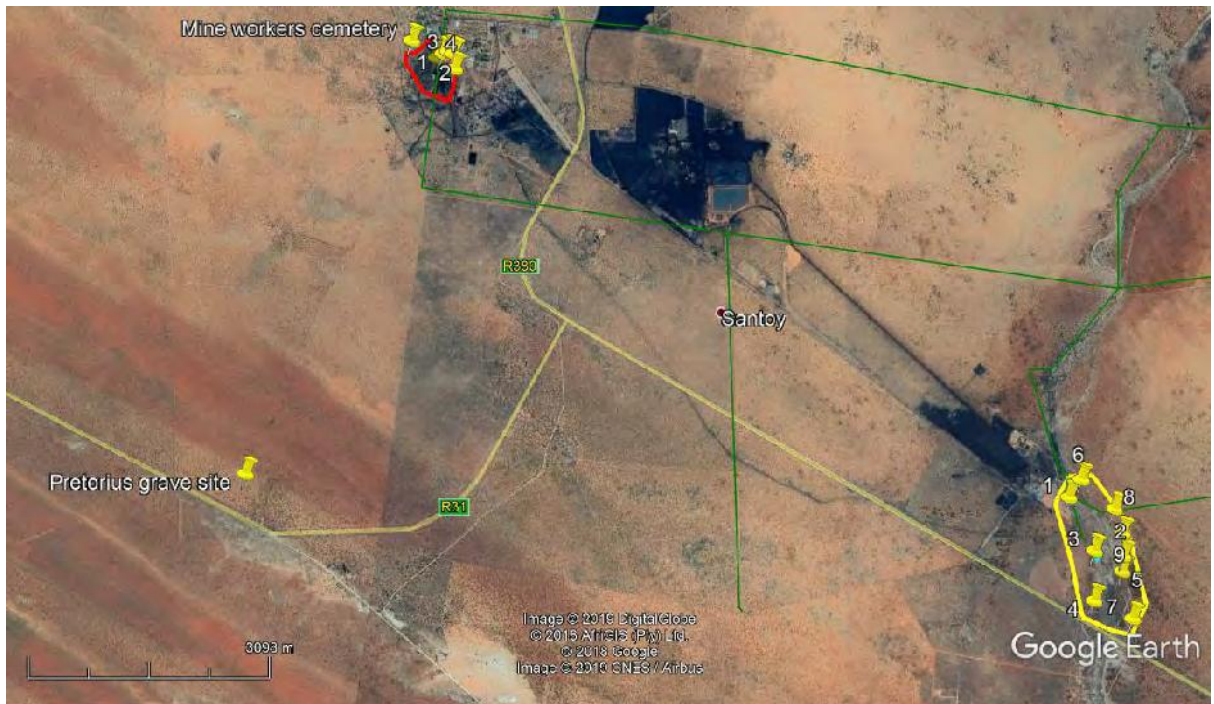
#### **16. IMPLEMENTATION STRATEGY**

1. The BRMO will become the custodians of the sites and should therefore ensure the correct implementation of thereof.
2. The SAHRA will remain the decision-making authority regarding any aspect concerning the heritage of the area.

## 17. CONCLUSIONS & RECOMMENDATIONS

In conclusion it is clear that the old Black Rock mine at Black Rock Koppie is a cultural heritage resource of importance and therefore needs to be conserved, preserved and protected in accordance with this management plan. The site includes various associated heritage features (Figure 36). The formally declared site should include the associated features discussed as well as the mine workers cemetery.

The farm cemetery and Stone Age sites along the Gamagara River (Figure 36) is to be excluded from the formal declaration, but nevertheless should be preserved in accordance with the general protection clauses in the National Heritage Resources Act (25 of 1999) as well as within the parameters of this management plan.



**Figure 36: Google Earth image indicating all the sites discussed in the report.**

The following is recommended:

1. That the necessary forms be filled out to have the site formally declared as a National Heritage site (Grade I).
2. That SAHRA approve the declaration of Black Rock koppie, associated features and the mine workers cemetery as a Grade I (national) heritage resource.
3. That SAHRA engage with the provincial heritage resources authority in the Northern Cape in this regard.

4. That SAHRA inform the BRMO of such a declaration and its implications (this management plan will serve this purpose).
5. That the above be communicated to all staff members of the BRMO and other possible concerned parties.

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## **Appendix A**

### **Definition of terms:**

Artifact:

Cultural object (made by humans).

Buffer Zone:

Means an area surrounding cultural heritage (see def. cultural heritage) which has restrictions placed on its use or where collaborative projects and programs are undertaken to afford additional protection to the site.

Conservation:

In relation to heritage resources, includes protection, maintenance, preservation and sustainable use of places or objects so as to safeguard their cultural significance as defined.

Co-management:

Managing in such a way as to take into account the needs and desires of stakeholders, neighbours and partners, and incorporating these into decision making through, amongst others, the promulgation of a local board.

Conservation:

All the processes used to maintain a place or object in order to keep its cultural significance. The process includes preservation, restoration, reconstruction and adaptation.

Contextual Paradigm:

A scientific approach which places importance on the total context as catalyst for cultural change and which specifically studies the symbolic role of the individual and immediate historical context.

Cultural Resource:

Any place or object of cultural significance (see Heritage Resource).



### Cultural Resource Management:

The utilization of management techniques to protect and develop cultural resources so that these become long term cultural heritage which of value to the general public (see Heritage Management).

### Cultural Significance:

Means aesthetic, architectural, historical, scientific, social, spiritual, linguistic or technological value or significance of a place or object for past, present and future humans.

### Feature:

A coincidental find of movable cultural objects (also see Knudson 1978: 20).

### Grade/Grading:

The South African heritage resource management system is based on grading, which provides for assigning the appropriate level of management responsibility to a heritage resource.

Grading is a step in the process towards a formal declaration, such as a declaration as a National Heritage Site, Provincial Heritage Site, or in the case of Grade 3 heritage resources the placing of a resource on the Register. It is not an end in itself, but a means of establishing an appropriate level of management in the process of formal protection. Grading may be carried out only by the responsible heritage resources authority or in the case of a Grade 3 heritage resource by the Local Authority. Any person may however make recommendations for grading. These are known as Field Ratings and usually accompany surveys and other reports.

### Heritage resource (Cultural):

Any place or object of cultural significance (see Cultural Resource).

### Heritage Resources Management Paradigm:

A scientific approach based on the Contextual paradigm but placing the emphasis on the cultural importance of archaeological (and historical) sites for the community.

### Heritage management (Cultural):

The utilization of management techniques to protect and develop cultural resources so that these become long term cultural heritage resources which are of value to the general public (see Cultural Resources Management).

#### Historic:

Means significant in history, belonging to the past; of what is important or famous in the past.

#### Historical:

Means belonging to the past or relating to the study of history.

#### Iron Age:

In archaeology, the Iron Age is the stage in the development of any people where the use of iron implements as tools and weapons is prominent. The adoption of this new material coincided with other changes in some past societies often including differing agricultural practices, religious beliefs and artistic styles, although this was not always the case.

#### Maintenance:

Means the continuous protective care of the fabric, contents and setting of a place. It does not involve physical alteration.

#### Management:

With reference to cultural heritage resources it includes preservation/ conservation, presentation and improvement of a place or object.

In relation to a protected area, includes control, protection, conservation, maintenance and rehabilitation of the protected area with due regard to the use and extraction of biological resources, community-based practices and benefit sharing activities in the area in a manner consistent with the Biodiversity Act as defined and required as per the National Environmental Management: Protected Areas Act, No. 57 of 2003.

#### Object:

Artifact (cultural object) (also see Knudson 1978: 20).

#### Partnership/s:

Means a co-operative and/or collaborative arrangement/s between the *Reserve* management and a third party that supports the achievement of the *Reserve* objectives.

#### Preservation:

Refers to protecting and maintaining the fabric of a place in its existing state and retarding deterioration or change and may include stabilization where necessary. Preservation is appropriate where the existing state of the fabric itself constitutes evidence of specific cultural significance, or where insufficient evidence is available to allow other conservation processes to be carried out.

#### Protection:

With reference to cultural heritage resources this includes the protection, maintenance, preservation and sustainable utilization of places or objects in order to maintain the cultural significance thereof.

#### Site:

A large place with extensive structures and related cultural objects. It can also be a large assemblage of cultural artifacts, found on a single location (also see Knudson 1978: 20). Also means any area of land, including land covered by water, and including any structures or objects thereon.

#### Stone Age:

The period encompasses the first widespread use of stone for the manufacture of tools and weapons in human evolution and the spread of humanity from the savannas of East Africa to the rest of the world. It ends with the development of agriculture, the domestication of certain animals and the smelting of copper ore to produce metal. It is termed *prehistoric*, since humanity had not yet started writing.

#### Structure:

A permanent building found in isolation or which forms a site in conjunction with other structures (also see Knudson 1978: 20). Also means any building, works, device or other facility made by people and which is fixed to land, and includes any fixtures, fittings and equipment associated therewith.

#### Sustainable:

In relation to the use of a biological resource, means the use of such resource in a way and at a rate that would not lead to its long-term decline; would not disrupt the ecological integrity of the ecosystem in which it occurs; and would ensure its continued use to meet the needs and

aspirations of present and future generations of people (as per National Environmental Management: Biodiversity Act, No. 10 of 2004).

## **Appendix B**

### **Definition of significance:**

Historic value:	Important in the community or pattern of history or has an association with the life or work of a person, group or organization of importance in history.
Aesthetic value:	Important in exhibiting particular aesthetic characteristics valued by a community or cultural group.
Scientific value:	Potential to yield information that will contribute to an understanding of natural or cultural history or is important in demonstrating a high degree of creative or technical achievement of a particular period
Social value:	Have a strong or special association with a particular community or cultural group for social, cultural or spiritual reasons.
Rarity:	Does it possess uncommon, rare or endangered aspects of natural or cultural heritage.
Representivity:	Important in demonstrating the principal characteristics of a particular class of natural or cultural places or object or a range of landscapes or environments characteristic of its class or of human activities (including way of life, philosophy, custom, process, land-use, function, design or technique) in the environment of the nation, province region or locality.

## **Appendix C**

### **Cultural significance:**

- Low            A cultural object being found out of context, not being part of a site or without any related feature/structure in its surroundings.
- Medium        Any site, structure or feature being regarded less important due to a number of factors, such as date and frequency. Also any important object found out of context.
- High            Any site, structure or feature regarded as important because of its age or uniqueness. Graves are always categorized as of a high importance. Also any important object found within a specific context.

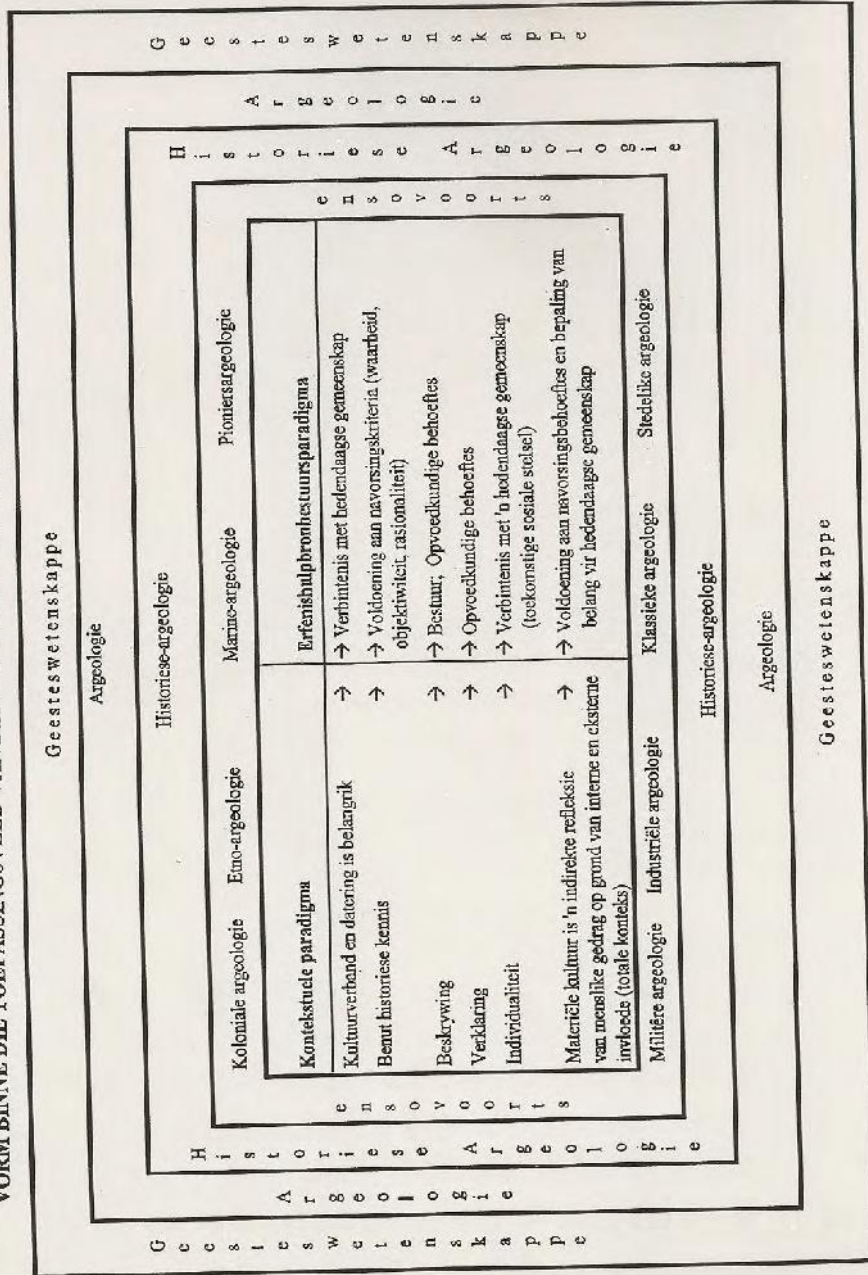
### **Heritage significance:**

- Grade I        Heritage resources with exceptional qualities to the extent that they are of national significance
- Grade II        Heritage resources with qualities giving it provincial or regional importance although it may form part of the national estate
- Grade III        Other heritage resources of local importance and therefore worthy of conservation

Appendix D

The Heritage Resources Paradigm (after Van Vollenhoven 2000: 555):

TABEL 10.4 'N UITBREIDING VAN DIE KONTEKSTUELE PARADIGMA OM DIE ERFENISULPBRONBESTUURS-PARADIGMA TE VORM BINNE DIE TOEPASSINGSVELD VAN DIE HISTORIESE ARGELOGIE



## **Appendix E**

### **Protection of heritage resources:**

#### - Formal protection

National heritage sites and Provincial heritage sites – grade I and II

Protected areas - an area surrounding a heritage site

Provisional protection – for a maximum period of two years

Heritage registers – listing grades II and III

Heritage areas – areas with more than one heritage site included

Heritage objects – e.g. archaeological, palaeontological, meteorites, geological specimens, visual art, military, numismatic, books, etc.

#### - General protection

Objects protected by the laws of foreign states

Structures – older than 60 years

Archaeology, palaeontology and meteorites

Burial grounds and graves

Public monuments and memorials



## **Appendix F**

**Grave documentation table: Site no. 3 – Mine workers cemetery**

### GRAVE DOCUMENTATION FORM

Site: Mine workers cemetery site no. 3

Farm name: Santoy 230

Province: Northern Cape

Grave no.	Position	Category	Grave dressing	Headstone	Inscription	Date of birth	Date of death	Sex	Associations	Remarks	Photo no's.
1	N-S	Unknown	Stone	No	-	-	-	Unknown			1690
2	N-S	Unknown	Cement bricks	Stone	-	-	-	Unknown	Bore core		1691
3	N-S	Unknown	Cement bricks	No	-	-	-	Unknown			1692
4	N-S	Unknown	Stone	No	Kekgethong ... Hakong village Molepolole Botswana	-	-	Unknown	Metal marker	Inscription on metal marker	1693 1694
5	N-S	Unknown	Stone	No	-	-	-	Unknown			1695
6	N-S	Unknown	Stone	No	-	-	-	Unknown	Metal marker	Illegible	1696
7	N-S	Unknown	Stone	No	-	-	-	Unknown	Metal marker	Illegible	1697
8	N-S	Unknown	Stone	No	-	-	-	Unknown			1698
9	N-S	Unknown	Stone	No	-	-	-	Unknown			1699
10	N-S	Unknown	Stone	No	-	-	-	Unknown			1700
11	N-S	Unknown	No	No	-	-	-	Unknown			1701
12	N-S	Unknown	No	No	-	-	-	Unknown			1702
13	N-S	Unknown	No	No	-	-	-	Unknown			1703
14	N-S	Unknown	No	No	-	-	-	Unknown			1704
15	N-S	Unknown	No	No	-	-	-	Unknown			1705
16	N-S	Unknown	No	No	-	-	-	Unknown			1706
17	N-S	Unknown	No	No	-	-	-	Unknown			1707

Grave no.	Position	Category	Grave dressing	Headstone	Inscription	Date of birth	Date of death	Sex	Associations	Remarks	Photo no's.
18	N-S	Unknown	No	No	-	-	-	Unknown			-
19	N-S	Unknown	No	No	-	-	-	Unknown			1708
20	N-S	Unknown	No	No	-	-	-	Unknown			1709
21	N-S	Unknown	No	No	-	-	-	Unknown			1710
22	N-S	Unknown	No	No	-	-	-	Unknown			1711
23	N-S	Unknown	Three stones	No	-	-		Unknown			1712
24	N-S	Unknown	Stone	No	-	-	-	Unknown			1713
25	N-S	Unknown	Stone	No	-	-	-	Unknown			1714
26	N-S	Unknown	Stone	No	-	-	-	Unknown			1715
27	N-S	Unknown	Stone	No	-	-	-	Unknown			1716
28	N-S	Unknown	Stone	No	-	-	-	Unknown			1717
29	N-S	Unknown	Stone	No	-	-	-	Unknown		Possibly part of former stone wall around cemetery	-
30	N-S	Unknown	Stone	No	-	-	-	Unknown			1718
31	N-S	Unknown	Stone	No	-	-	-	Unknown			1719
32	N-S	Unknown	Stone	No	-	-	-	Unknown			1720
33	N-S	Unknown	Stone	No	-	-	-	Unknown			1721
34	N-S	Unknown	Stone	No	-	-	-	Unknown			1722
35	N-S	Unknown	Stone	No	-	-	-	Unknown			1723
36	N-S	Unknown	Stone	No	-	-	-	Unknown			1724
37	N-S	Unknown	Stone	No	-	-	-	Unknown			1725
38	N-S	Unknown	Stone	No	-	-	-	Unknown			1726

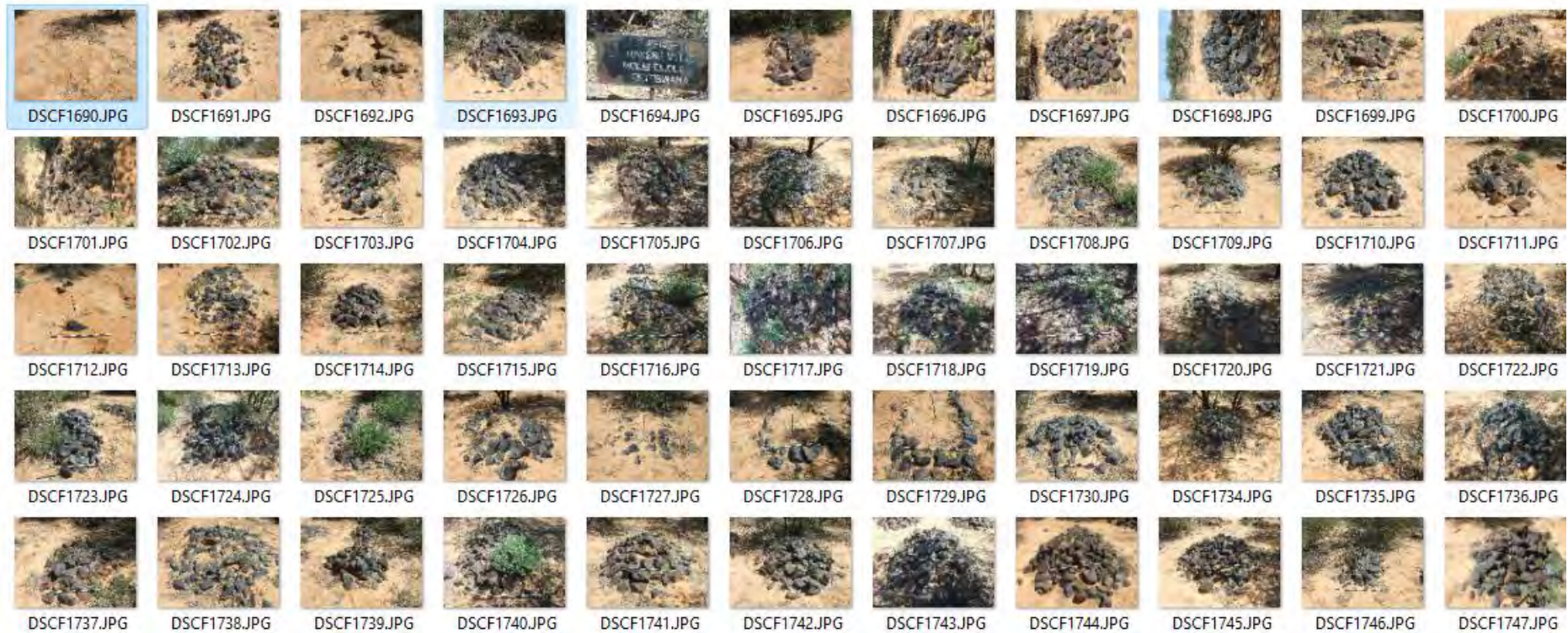
Grave no.	Position	Category	Grave dressing	Headstone	Inscription	Date of birth	Date of death	Sex	Associations	Remarks	Photo no's.
39	N-S	Unknown	Stone	No	-	-	-	Unknown			1727
40	N-S	Unknown	Stone	No	-	-	-	Unknown			1728
41	N-S	Unknown	Stone	No	-	-	-	Unknown			1729
42	N-S	Unknown	Stone	No	-	-	-	Unknown			1730
43	N-S	Unknown	Stone	No	-	-	-	Unknown			1734
44	N-S	Unknown	Stone	No	-	-	-	Unknown			1735
45	N-S	Unknown	Stone	No	-	-	-	Unknown			1736
46	N-S	Unknown	Stone	No	-	-	-	Unknown			1737
47	N-S	Unknown	Stone	No	-	-	-	Unknown			1738
48	N-S	Unknown	Stone	No	-	-	-	Unknown			1739
49	N-S	Unknown	Stone	No	-	-	-	Unknown			1740
50	N-S	Unknown	Stone	No	-	-	-	Unknown			1741
51	N-S	Unknown	Stone	No	-	-	-	Unknown			1742
52	N-S	Unknown	Stone	No	-	-	-	Unknown			1743
53	N-S	Unknown	Stone	No	-	-	-	Unknown			1744
54	N-S	Unknown	Stone	No	-	-	-	Unknown			1745
55	N-S	Unknown	Stone	No	-	-	-	Unknown			1746
56	N-S	Unknown	Stone	No	-	-	-	Unknown	Metal marker	Illegible	1747
57	N-S	Unknown	Stone	No	-	-	-	Unknown			1748
58	N-S	Unknown	Stone	No	-	-	-	Unknown	Metal marker	Illegible	1749
59	N-S	Unknown	Stone and cement bricks	No	-	-	-	Unknown			1751
60	N-S	Unknown	Stone	No	-	-	-	Unknown			1752
61	N-S	Unknown	Stone	No	-	-	-	Unknown			1753

Grave no.	Position	Category	Grave dressing	Headstone	Inscription	Date of birth	Date of death	Sex	Associations	Remarks	Photo no's.
62	N-S	Unknown	Stone and cement bricks	No	-	-	-	Unknown		Small grave – could possibly be that of a child	1754
63	N-S	Unknown	Stone	No	-	-	-	Unknown			1755
64	N-S	Unknown	Stone	No	-	-	-	Unknown		Very large grave and could be a double grave	1756
65	N-S	Unknown	Three stones	No	-	-	-	Unknown			1757
66	N-S	Unknown	One stone	No	-	-	-	Unknown			1758
67	N-S	Unknown	Stone	No	-	-	-	Unknown			1759
68	N-S	Unknown	Stone	No	-	-	-	Unknown	Small square made from wire on grave		1760 1761
69	N-S	Unknown	Stone	Stone	-	-	-	Unknown			1762
70	N-S	Unknown	Stone	No	-	-	-	Unknown			1763
71	N-S	Unknown	Stone	No	-	-	-	Unknown			1764
72	N-S	Unknown	Stone	No	-	-	-	Unknown			1765
73	N-S	Unknown	Stone	No	-	-	-	Unknown			1766
74	N-S	Unknown	Stone	No	-	-	-	Unknown			1767
75	N-S	Unknown	Stone	No	-	-	-	Unknown			1768

## Appendix G

### Photographs of individual graves at site no. 3

See attached folder for enlargements





DSCF1748.JPG



DSCF1749.JPG



DSCF1751.JPG



DSCF1752.JPG



DSCF1753.JPG



DSCF1754.JPG



DSCF1755.JPG



DSCF1756.JPG



DSCF1757.JPG



DSCF1758.JPG



DSCF1759.JPG



DSCF1760.JPG



DSCF1761.JPG



DSCF1762.JPG



DSCF1763.JPG



DSCF1764.JPG



DSCF1765.JPG



DSCF1766.JPG



DSCF1767.JPG



DSCF1768.JPG

**Appendix H**

**Grave documentation table: Site no. 2 – Farm cemetery**



## GRAVE DOCUMENTATION FORM

Site: Farm cemetery site no. 2

Farm name: Belgravia 264

Province: Northern Cape

Grave no.	Position	Category	Grave dressing	Headstone	Inscription	Date of birth	Date of death	Sex	Associations	Remarks	Photo no's.
1	N-S	Heritage	Slate border	Slate	Yes <sup>2</sup>	6/10/1892	7/03/1937	Male			1769
2	N-S	Heritage	Cement	Marble	Yes <sup>3</sup>	13/09/1926	16/09/1926	Male		Angel headstone is broken	WA0008
3	N-S	Unknown	Cement	Slate	Yes <sup>4</sup>	-	-	Male			WA0006

---

2 Ter nagedagtenis aan my eggenoot en ons pappie Diederuk Johannes Pretorius gebore 6 Oktober 1892 oorlede 7 Maart 1937 Psalm 16 v 4

3 Hier rus ons lieflying seuntjie Pretorius gebore 13 September oorlede 16 September 1926

4 Hier rus Andries Petrus Pretorius

## Appendix I

### Photographs of individual graves at site no. 2

See attached folder for enlargements



DSCF1769.JPG

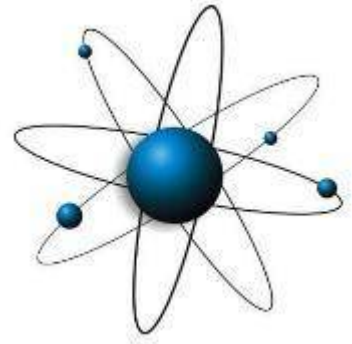


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A0006.jpg



IMG-20190416-W  
A0009.jpg

# **APPENDIX 5: FINANCIAL PROVISION/REHABILITATION QUANTUM**



**ESCIENCE  
ASSOCIATES  
(PTY) LTD**

# **PROPOSED GLORIA MINE RESERVOIR CONSTRUCTION**

## **ASSMANG (PTY) LTD BLACK ROCK MINE OPERATIONS, HOTAZEL, NORTHERN CAPE:**



**BLACK ROCK MINE OPERATIONS**

**POSTAL  
ADDRESS:**  
PO Box 2950  
Saxonwold  
2132

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ADDRESS:**  
9 Victoria Street  
Oaklands  
Johannesburg  
2192

**TEL:**  
+27 (0)11 718 6380

**FAX:**  
086 610 6703

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[info@escience.co.za](mailto:info@escience.co.za)

**WEBSITE:**  
[www.escience.co.za](http://www.escience.co.za)

## **CLOSURE AND REHABILITATION COSTING**

**4 June 2019**

# **CLOSURE AND REHABILITATION COSTING:**

## **PROPOSED GLORIA MINE RESERVOIR CONSTRUCTION - ASSMANG (PTY) LTD BLACK ROCK MINE OPERATIONS, HOTAZEL, NORTHERN CAPE**

### **COMPILED BY EAP:**

EScience Associates  
PO Box 2950,  
Saxonwold, 2132  
9 Victoria Street,  
Oaklands, Johannesburg, 2192

Tel: (011) 718 6380  
Cell: 072 268 1119  
Fax: 0866 924 840  
E-mail: [abdul@escience.co.za](mailto:abdul@escience.co.za)

### **ON BEHALF OF APPLICANT:**

Assmang (Pty) Ltd – Black Rock Mine Operations  
PO Box 187  
Santoy  
Northern Cape  
8491

Tel: (053) 751 5555  
Fax: (053) 751 5251  
E-mail: [pierre@brmo.co.za](mailto:pierre@brmo.co.za)

**4 June 2018**

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# 1 INTRODUCTION

Assmang (Pty) Ltd mines manganese ore in the Black Rock area of the Kalahari, in the Northern Cape Province. The ore is mined from the Kalahari Manganese field. The Black Rock Mine Operations (BRMO) are approximately 80 kilometres (km) north-west of the town of Kuruman, in proximity to the town of Hotazel.

In 1940, Assmang acquired a manganese ore outcrop on a small hillock known as Black Rock. Several large properties underlain by ore were subsequently found and acquired. Manganese ore mining operations were extended and today include 3 underground mining complexes:

- Gloria (commissioned in 1975) and producing medium grade carbonated ore
- Nchwaning II and Nchwaning III (commissioned in 1981 and 2004 respectively) and producing high grade oxide ore.

There are existing ore extraction and processing facilities in place at the Gloria and Nchwaning II mines. The original mining activities that were undertaken at Black Rock have ceased. No mining activities are currently taking place at the Black Rock Mine. However, the main offices and mine village are located there along with various supporting activities and infrastructure.

All of the above mentioned are catered for in the existing BRMO Final Rehabilitation Plan for 2017/2018, dated 04 June 2018.

The subject of this report is the proposed reservoir construction to be undertaken at the Gloria mine, which is the subject of an environmental impact assessment process as submitted to the Department of Mineral resources (DMR).

In terms of the Financial Provisioning Regulations (GN.R 1147 of 2015, as amended), the Minister responsible for mineral resources may only grant environmental authorisation in terms of the Act after compliance by the applicant with regulation 10 of the same. Regulation 10 requires that an applicant must ensure that a determination is made of the financial provision and the plans are submitted as part of the information submitted for consideration by the Minister responsible for mineral resources of an application for environmental authorisation, the associated environmental management programme and the associated right or permit in terms of the Mineral and Petroleum Resources Development Act, 2002; and provide proof of payment or arrangements to provide the financial provision prior to commencing with any prospecting, exploration, mining or production operations.

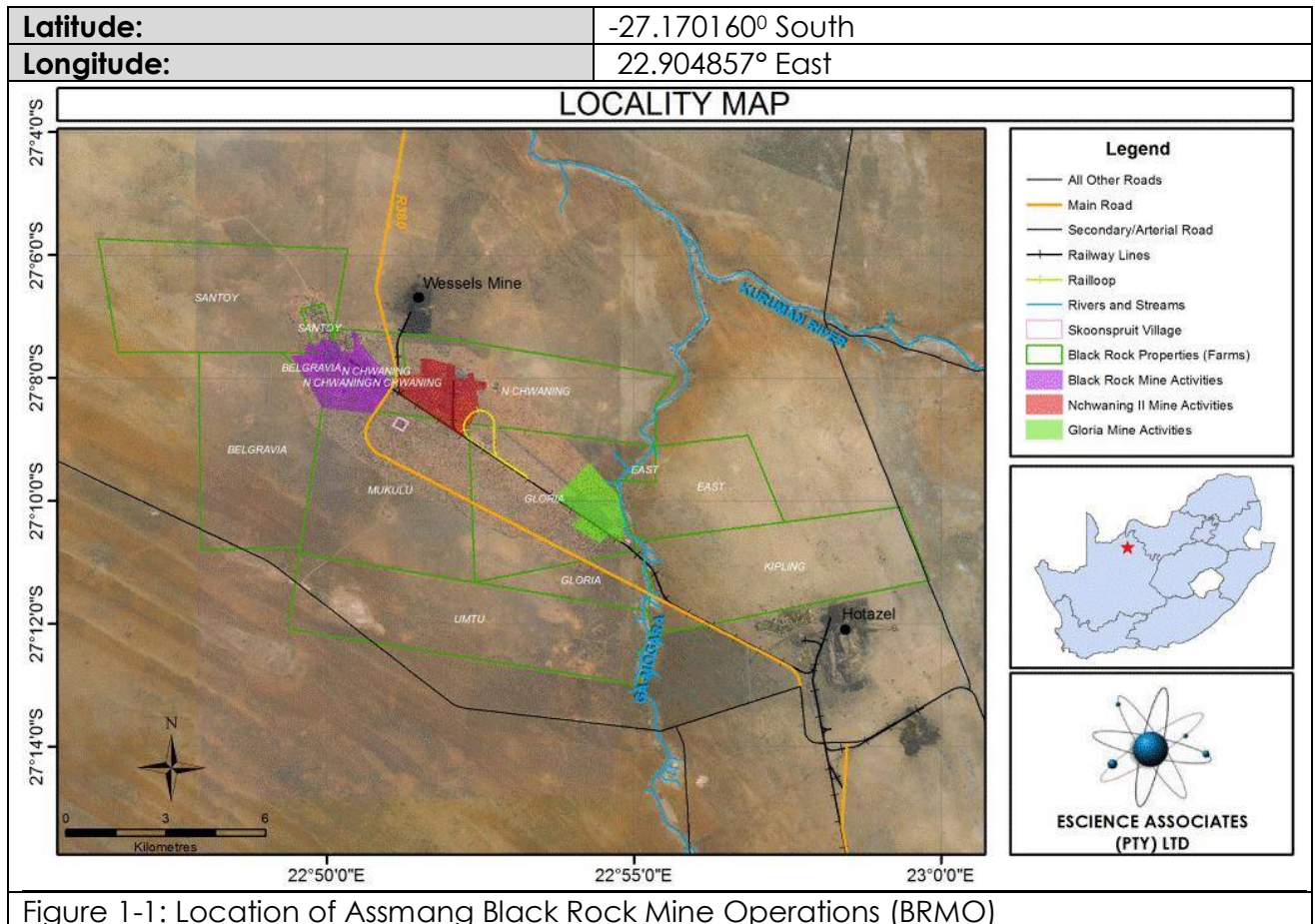
The purpose of this report is to provide the determined financial provisions as referred to above. Notably, the proposed construction has not commenced, and may not commence until an Environmental Authorisation is issued.

Importantly the annual revision of the greater BRMO rehabilitation plan and closure quantum must incorporate the proposed Gloria construction as implemented through final design and construction. This assessment is based on the design plans for the construction and has been prepared in cognisance of the greater BRMO plan.



## 1.1 REGIONAL LOCATION

BRMO is situated in the Northern Cape Province approximately 80 km north-west of the town of Kuruman and 12 kilometres north-west of Hotazel. BRMO falls within the jurisdiction of the John Taolo Gaetsewe District Municipality.



## 1.2 ADMINISTRATIVE INFORMATION

BRMO is owned by Assmang (Pty) Ltd. Assmang holds a converted new order Mining Right (Reference (NC)30/5/1/2/2/203 MRC) issued by the DMR. This includes Portion 1 of the farm Gloria no 266, amongst the other mining areas covered by BRMO.

The following section and associated set of tables, provides pertinent administrative information pertaining to BRMO, associated mine lease area, as well as the specialists who developed this closure costing (Table 1-1 to Table 1-5).

Table 1-1: Name and Address of Mine	
Mining Right Reference	(NC)30/5/1/2/2/203 MRC
Owner and Name of Mine	Assmang (Pty) Limited, Black Rock Mine Operations
Company Registration	1935/007343/06
Physical Address	Black Rock Mine Operations, Santoy, Northern Cape
Postal Address	PO Box 187, Santoy, Northern Cape, 8491
Telephone	(053) 751 5201
Fax	(053) 751 5251
Senior General Manager	Pierre Becker

Table 1-2: Details of Acting Environmental Specialist	
Name	Tshifhiwa Ravele
Physical Address	Main Offices Black Rock Mine Operations, Santoy, Northern Cape
Postal Address	PO Box 187, Santoy, Northern Cape, 8491
Telephone	(053) 751 5302
Fax	(053) 751 5251
Email	tshifhiwar@brmo.co.za

Table 1-3: Details of EAP	
Name of Company	EScience Associates (Pty) Ltd.
Contact Person	Mr. Abdul Ebrahim
Postal Address	PO Box 2950, Saxonwold, Johannesburg, 2132
Physical Address	9 Victoria Street, Oaklands, Johannesburg, 2192
Telephone	011 718 6380
Fax	072 268 1119
Email	abdul@escience.co.za
Qualifications	Certified EAP, BEng Honours Environmental Engineering
Curriculum Vitae	Refer Appendix 1

Table 1-4: Details of Project Engineer	
Contact Person	Ian Caldwell
Postal Address	DRA Minerals Park , 3 Inyanga Close, Sunninghill, 2157
Physical Address	DRA Minerals Park , 3 Inyanga Close, Sunninghill, 2157
Telephone	+27 (0) 011 587 0280
Email	<a href="mailto:Ian.Caldwell@arm.co.za">Ian.Caldwell@arm.co.za</a>
Qualifications	Pr. Eng, BEng Civil

Table 1-5: BRMO Mining Rights, Surface Rights and Title Deed Description Relevant to this application.				
Mine	Farm Name	Title Deed	Surface and Mining Rights	SG 21 Key
Gloria	Ptn. 1 Gloria 226	No. 506 of 1966	Assmang (Pty) Ltd	C04100000000026600001

### 1.3 LAND TENURE AND ADJACENT LAND USE

Assmang (Pty) Ltd holds both the surface- and mining rights over the properties encompassing the greater BRMO and its constituent mining operations (i.e. Black Rock, Nchwaning and Gloria Mines). The region surrounding BRMO largely consists of mining, industrial, and agricultural (mainly livestock production) land uses. Land in the immediate vicinity of BRMO that is not used for mining/industrial purposes, is utilised for livestock farming (i.e. sheep, goats, and cattle) and game farming. Refer to Figure 1-2 for a basic overview.

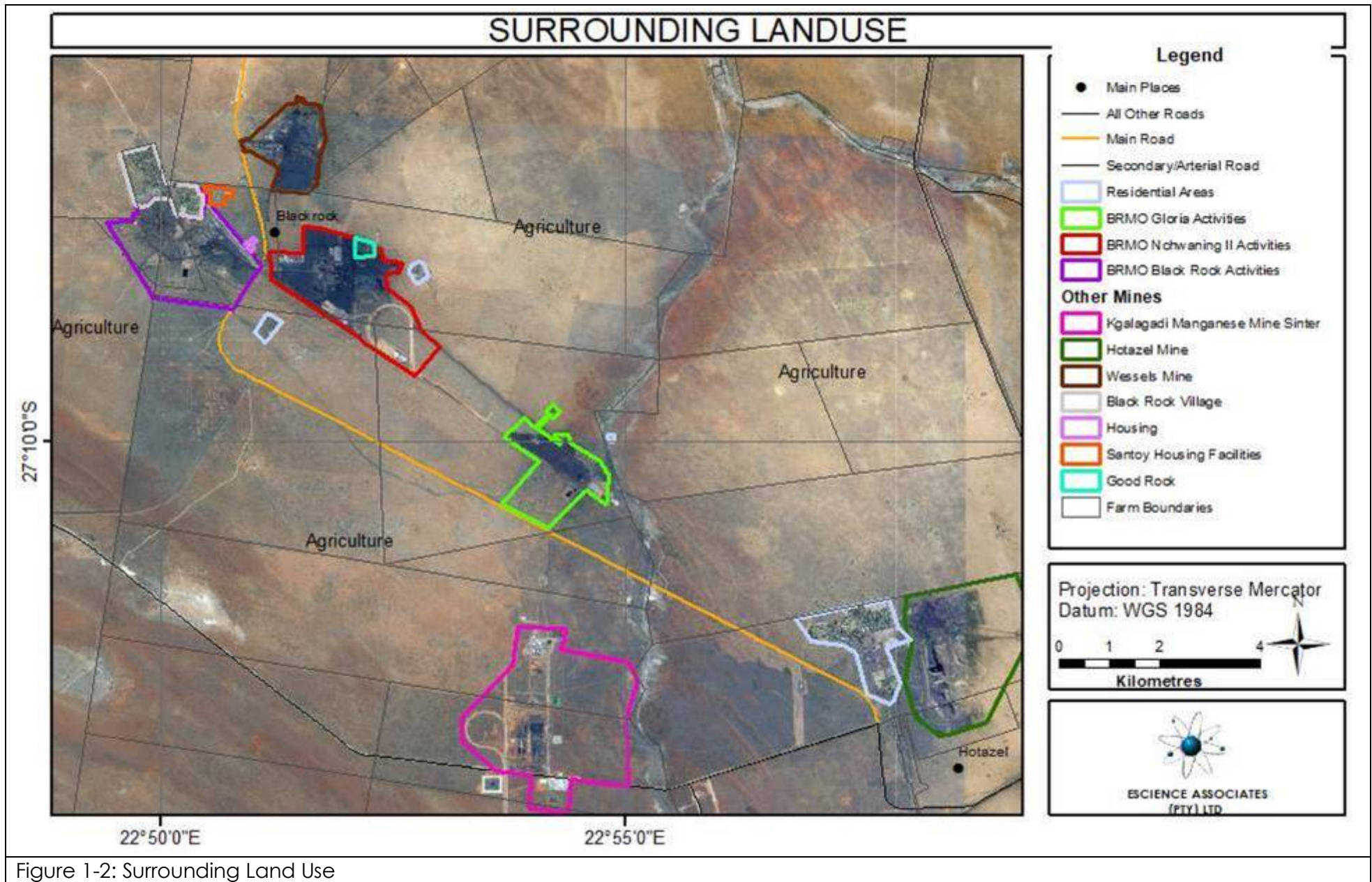


Figure 1-2: Surrounding Land Use

## **2 DESCRIPTION OF PROCESS**

### **2.1 BACKGROUND**

The general descriptions herein are intended to convey a broad understanding of the facilities and activities associated with the Gloria mine and proposed construction. These descriptions are not exhaustive. It should be noted that infrastructure typical of such mining activities is encountered on the site which may not be covered in specific detail herein. These facilities and infrastructure are subject to repairs, general maintenance and upgrading in accordance with standard practices, and thus will be altered from time to time. Such infrastructure is within the footprint of existing, historical, and/or authorised activities.

#### **2.1.1 EXISTING GLORIA MINE ACTIVITIES**

Ore is mined at Gloria using underground bord and pillar methods, making use of trackless machines and underground conveyer systems. The thickness of the mined seams in conjunction with underground crushing ensures that waste rock is not unnecessarily brought to surface. At surface, the ore is crushed, and separated into various grades which are stockpiled in preparation for transport off the site. Transport is via rail and road. Operations at Gloria were commissioned in 1975. Gloria complex is comprised of several mining and mining related activities, including:

- Offices, administration, and support facilities
- Engineering services and facilities
- Underground mining access shafts, vent shafts and related infrastructure;
- Ore Processing Plant;
- Ore (including fines) storage and laydown areas;
- Stacking, reclaiming and loading facilities for transportation of ore;
- Current and historical tailings facilities;
- Contractor laydown areas;
- Waste storage and separation facilities;
- Salvage Yards;
- Potable water and process water storage and management facilities;
- A sewage treatment plant;
- Sub-stations and electrical works;
- Bulk fuel storage and refuelling station;
- Explosives magazines;
- Unpaved and paved roads connecting the above and other BRMO operations;
- Other ancillaries typical of such a mining operation.

##### **2.1.1.1 Underground Activities**

Ore is drilled, blasted, and crushed underground before being conveyed to the processing facilities on the surface. Operations underground consist mainly of:

- Drilling

- Blasting
- Crushing
- Handling and loading of ore

Facilities underground include, *inter alia*:

- Water storage and reticulation systems
- Engineering and support facilities
- Fuel storage facilities and re-fuelling bays

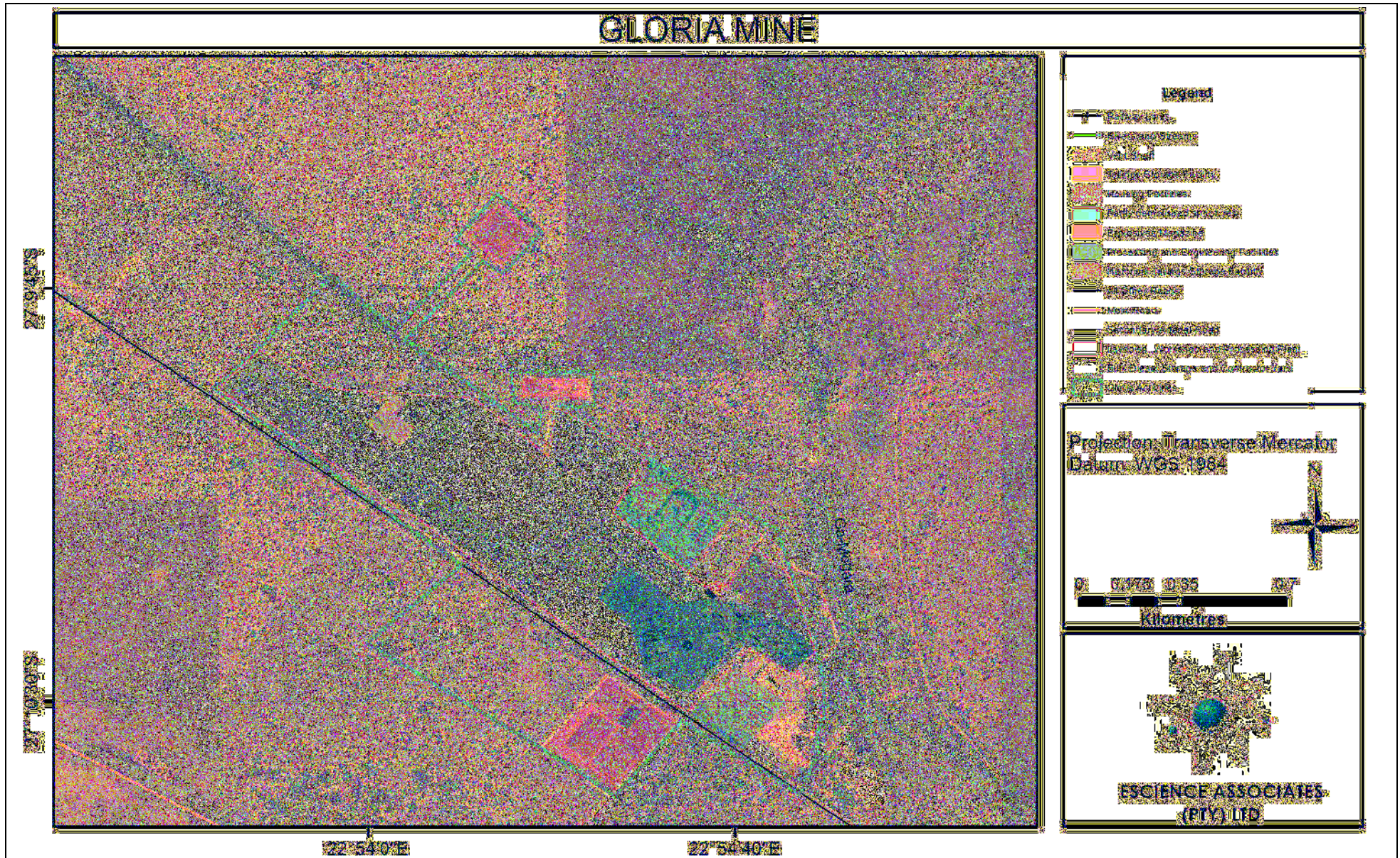


Figure 2-1: Current operations at Gloria mine

## **2.2 SCOPE OF THE PROPOSED ACTIVITIES**

The proposed process water storage capacity expansion at Gloria Mine entails the construction of an additional 2.5ML process water reservoir. Process water from the tailing's management, underground abstraction, and other process water sources is collected in existing process water reservoirs and will be augmented by the installation of a new 2.5ML reservoir to increase storage and buffer capacity.

The proposed construction will be undertaken within the existing disturbed footprint of the Gloria mine operations at Black Rock. Basic layout options are illustrated in Figure 2-2. Notably the final location will be confirmed by final detailed design considerations but will be within the existing disturbed footprint and will be in proximity to the locations indicated in Figure 2-2.

# LOCATION AND LAYOUT ALTERNATIVES

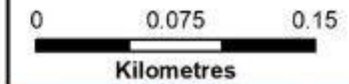


## Legend

- Main Road
- Secondary/Arterial Road
- Gloria Mine Boundary

## Reservoir Layout Alternatives

- Preferred Location and Layout
- Alternative Location and Layout



Projection: Transverse Mercator  
Datum: WGS 1984



Figure 2-2: Proposed Activities (Preferred Layout)



## 2.3 DESCRIPTION OF THE RECEIVING ENVIRONMENT

The area of interest is adjacent to the existing surface activities of the mine. The area land consists of disturbed land. The area is classified as having natural/indigenous vegetation. The site is **not** located on a shallow water table, dolomitic, sinkhole, or doline areas, seasonally wet soils, unstable rocky slopes or steep slopes with loose soil, dispersive soils, soils with high clay content and or an area sensitive to erosion.

A general description of the area is presented here in order to provide context as contemplated in the Environmental Impact Report. The site is wholly within the disturbed Gloria footprint of current surface operations.

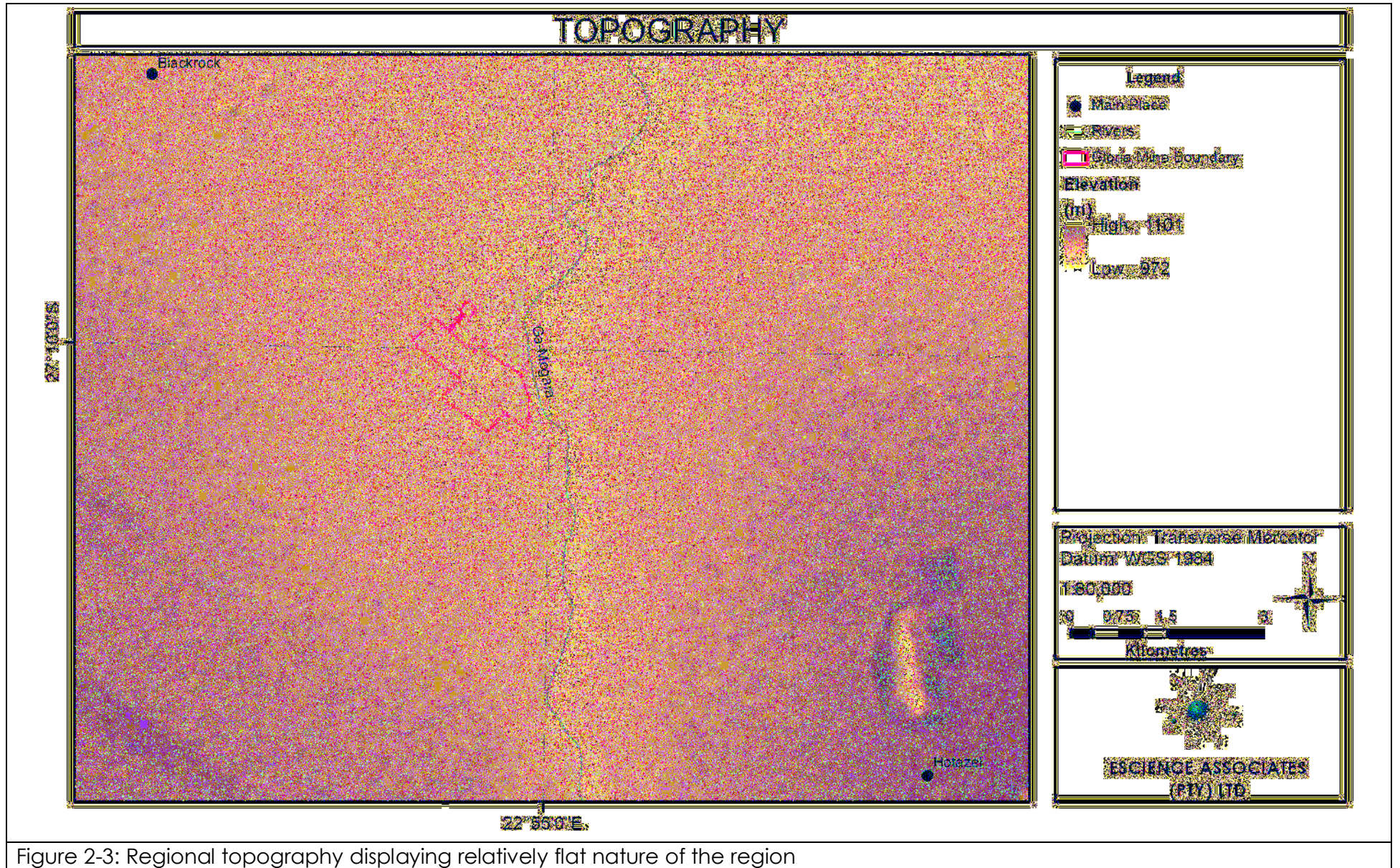
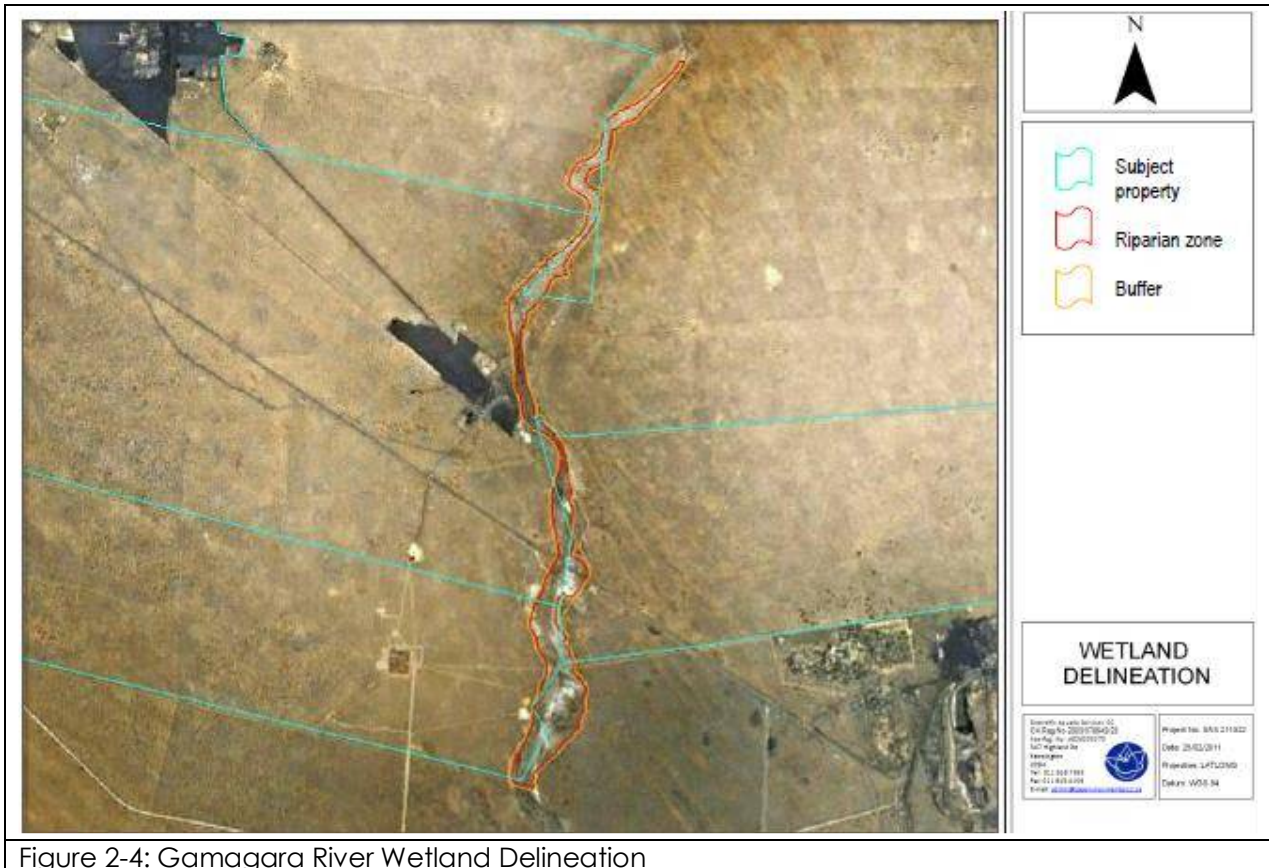


Figure 2-3: Regional topography displaying relatively flat nature of the region

## 2.3.1 PHYSICAL

### 2.3.1.1 Wetland/Riparian Zones

The Gamagara River and its associated wetland/riparian features (including a 32 m buffer zone) can be considered as an ecologically sensitive area in relation to the proposed development activities (Figure 2-4). The proposed activities will be well outside of this area.



### 2.3.1.2 Groundwater

According to a specialist hydrogeological assessment of the site (Geo Pollution Technologies, Report Reference Number: EBR-10-320). The site is underlain by the Kalahari formation. This formation at BRMO consists of a top layer of aeolian sands followed by calcrete of tertiary age. If weathered, the calcareous sands have the favourable characteristics of porosity and permeability. There is limited surface runoff in the Kalahari area (high infiltration rates during precipitation). Due to high porosity and permeability of the Kalahari sands, the calcrete deposit below the top layer of Kalahari sands acts like a "sponge".

The arithmetic average depth of the water levels below surface in the boreholes found at BRMO is 69.6 mbgl with a maximum depth of 110 m below surface. If the depth of the Kalahari formation is considered with the water levels found in the hydrocensus it can be concluded that the farmers tap their water from this weathered/fractured calcrete aquifer. The average recharge values assigned to calcrete is  $\pm 10\%$  of the mean annual precipitations. The water quality from the boreholes sampled is generally good. Considering the geology and hydro-geological characteristics of the site (i.e. the

calcrete aquifer used by the surrounding farming communities, as well as boreholes visited during the hydrocensus and used for general farming), the aquifer should be regarded as “Major aquifer system”, based on the following:

- Public supply and other purposes: The aquifer plays a major role in the livelihood of the farming community surrounding BRMO; and
- Water quality: The water quality is good.

A groundwater specialist deemed there to be a low risk for the users found in the hydrocensus to be impacted by either dewatering, or contaminated groundwater originating from the larger BRMO operations. The proposed construction will be of negligible contribution thereto.

### **2.3.1.3 Soil**

A soil survey was undertaken to assess soil characteristics and establish how and to what depth topsoil should be removed to prepare the area, how the removed soil should be stored and treated when reused to remediate the disturbed area after mine closure (Report: Soil Survey and Soil Management Program for the Black Rock Mine Operations Concerning Establishing A New Sinter Plant and Shaft Complex- Prof Claassens 2011). The area around Black Rock, in the vicinity where the mining operations are undertaken, consists mainly of Kalahari sand. Kalahari sand is typically homogenously very deep with the exception of certain areas which are under laid by calcrete.

Soil fertility is low as is typical of sandy soils. The area for establishment of the proposed sinter plant complex and mine expansion was surveyed by auguring. Apart from the soil on the farm Perth, the soils in the area surveyed were deep yellowish-red sandy soils.

Due to a very low organic content, it was concluded that no specific recommendation on how deep the topsoil should be excavated to prepare the area is necessary. Due to the texture of the soil and the size distribution it will not tend to compact while it is stockpiled thus no special arrangements are necessary for stockpiling. A further assessment undertaken by Professor Claassens (Investigation Into The Properties Of Subsoil For Potential Use As Reclamation Material For Mine Rehabilitation At Black Rock Mine Operations – 2017) concluded that subsoil could be effectively used for revegetation with appropriate management.

The proposed project is wholly contained within disturbed areas. Should there be a requirement to remove topsoil soil for construction then this material may be stockpiled in accordance with BRMO topsoil stockpile procedure. During the rehabilitation phase, and in cognisance of limited topsoil stockpiles at BRMO, in situ subsoil may be used.

## **2.3.2 BIOLOGICAL**

As previously mentioned, the proposed location within the mine is currently disturbed therefore the proposed reservoir is not expected to appreciably affect surrounding ecosystems. There is no biodiversity of significance within the footprint of the proposed activities. This section however summarises the biodiversity context of the surrounding areas.

The surrounding area as depicted by the threatened ecosystems database within Figure 2-5. The entire area is described as lightly threatened however as seen within, the area is outlined as disturbed as mining/disturbed.

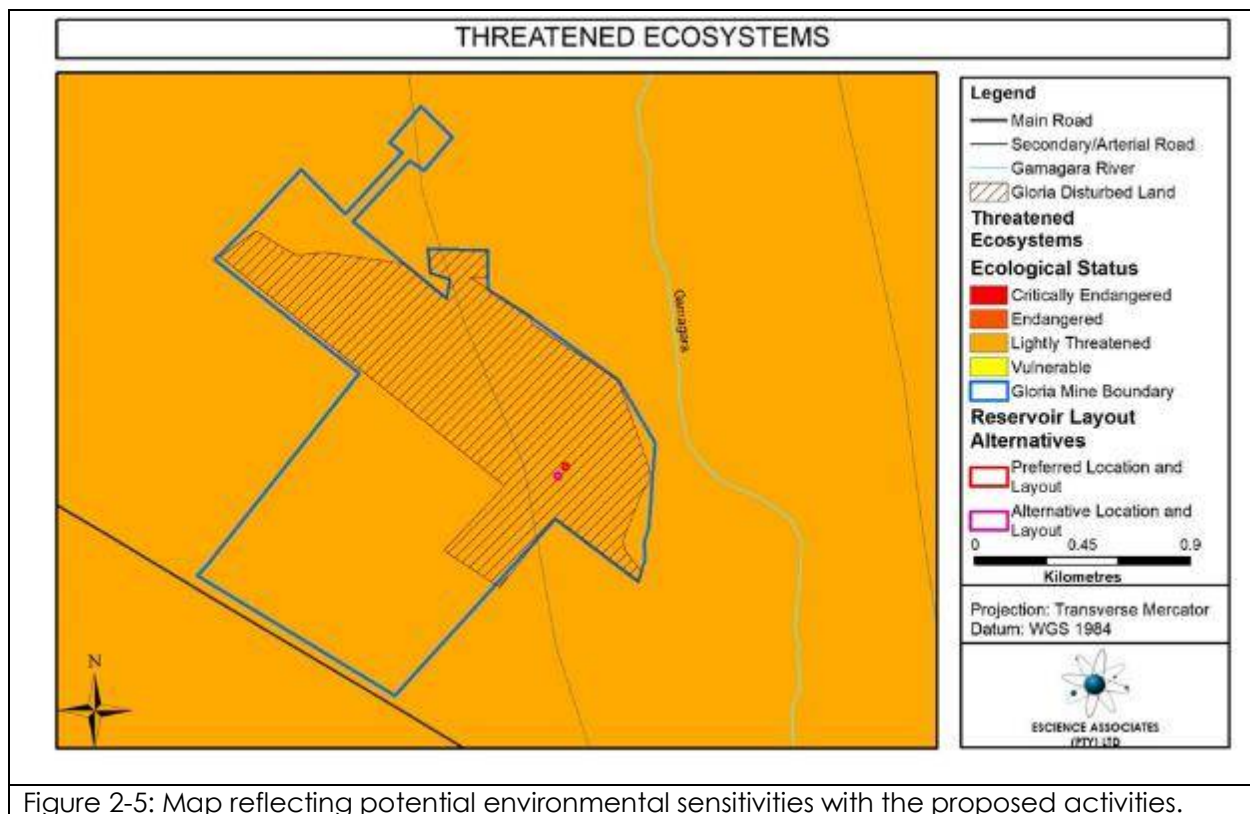


Figure 2-5: Map reflecting potential environmental sensitivities with the proposed activities.

### 2.3.2.1 Biodiversity

BRMO is located within the Savanna biome and more specifically within the Eastern Kalahari Bushveld Bioregion with some incursion into Kalahari Duneveld, according to a biodiversity assessment undertaken by Scientific Aquatic Services (Report Reference: SAS 211022 dated in May 2011, refer to Figure 2-6). The BRMO site consists of transformed land (current and legacy mining and related infrastructure), open veld (presently used rented to farmers who graze livestock), the Belgravia Game Farm (the only on-site area presently considered of increased sensitivity), and limited riparian habitat (related to the Ga Magara River).

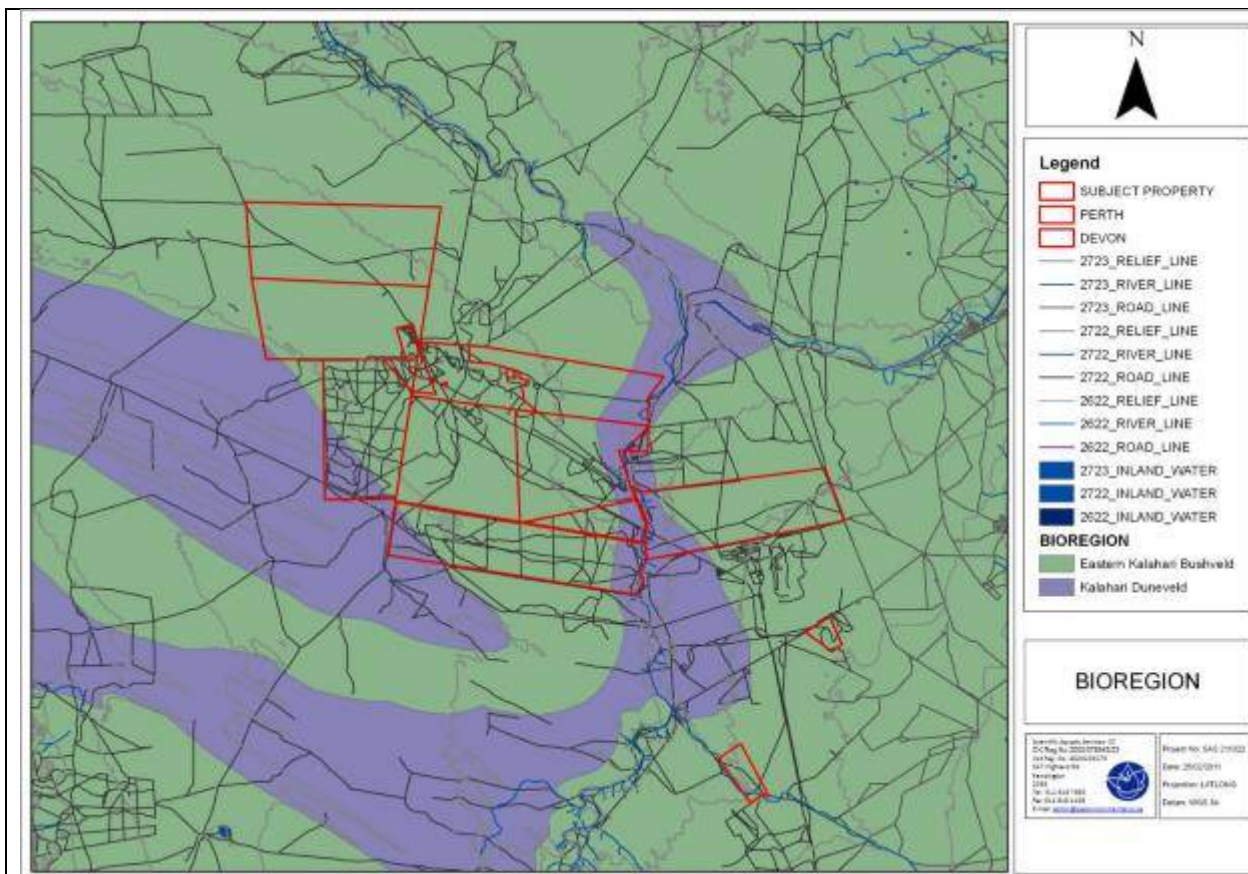


Figure 2-6: Biome (Scientific Aquatic Services, Report Reference: SAS 211022)

### 2.3.2.2 Floral Diversity

When the boundary of the assessment site is superimposed on the vegetation types of the surrounding area, it is evident that the subject property falls within the Kalahari Thornveld and Shrub Bushveld veld type, Kathu Bushveld vegetation type and partly in the Gordonia Duneveld vegetation type.

Several red data listed (RDL)/protected floral species are documented within the site, as shown in Table 2-1. The species identified are expected throughout the site. None of the listed species may be cut, removed, relocated, or destroyed without permits having been issued by the relevant competent authorities, in terms of the legislation listed in Table 2-1.

Table 2-1: Protected Floral Species Identified on Site		
Scientific Name	Common Name	Regulation
<i>Acacia Erioloba</i> (now <i>Vachellia Erioloba</i> )	Camel Thorn	National Forests Act (1998) - Department of Agriculture, Forestry and Fisheries
<i>Acacia Haemotoxylon</i> (now <i>Vachellia Haemotoxylon</i> )	Grey Camel Thorn	
<i>Boscia albitrunca</i>	Shepherd's Tree	
<i>Ammocaris Coranica</i>	Karoo Lily	Schedule 4 Environmental and Conservation Ordinance No. 19 (1974) – Northern Cape Department
<i>Harpogophytum Procumbens</i>	Devil's Claw	
<i>Babiana Hypogaea</i>	Bobbejaanuintjie	

<i>Boophane Disticha</i>	Bushman's poison bulb	of Environment and Nature Conservation
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### 2.3.2.3 Faunal Diversity

Evidence of the Common Duiker, Whitetailed Mongoose, Suricate and Scrub Hare have been noted within the BRMO site. Field signs (diggings) of Porcupine have also been noted. The old Black Rock mine works could provide suitable habitat for bats, of which there are several threatened species in the Northern Cape. Numerous bird species are observed on the site. Various reptiles including lizards, skinks, snakes and tortoises are noted or expected within the site. The Ga Magara River may also host amphibians. Numerous invertebrates also inhabit the site.

Likely species categorised as threatened, include African White-backed Vulture, Cape Griffon/Cape vulture, European Roller, Ruppell's horseshoe bat, Geoffrey's horseshoe bat, and Darlings horseshoe bat. Red Data Sensitivity Index Score assessment of the property provided a moderate score of 37%, indicating low to medium importance to RDL faunal species conservation within the region.

### 2.3.3 SOCIO-ECONOMIC

As noted in the overall BRMO rehabilitation plan, the BRMO falls within the John Taolo (JT) Gaetsewe District Municipality (DM), formerly Kgalagadi DM, that is one of the five districts of the Northern Cape Province of South Africa. It is located in the Joe Morolong Local Municipality.

The JT Gaetsewe DM, comprises of 179 863 people and 45 040 households, thus representing 16.4% of the provincial population. Over the last decade, the size of the municipality from the population perspective has been growing at the same rate as the average growth rate observed in the rest of the Province; however, it is half the rate observed in that of the country. Given the historical trend, it was estimated that by 2025, the South African population could reach 54.7 million people, whilst the JT Gaetsewe DM's population would grow only by about 6 000 people.

Households residing in the JT Gaetsewe DM have relatively the same level of income as the average household in the Northern Cape Province, but it is significantly lower than the average household income in South Africa. This means that the Northern Cape and the JT Gaetsewe DM households do not have the same level of access to economic opportunities as the rest of South Africa.

The labour market in the primary study area comprises of 33 684 employed and 15 763 unemployed people. It has a smaller labour participation rate (47.5%) than in South Africa but significantly lower participation rate than in the Northern Cape, which explains a lower average household income earned by JT Gaetsewe DM household versus South African households. The unemployment rate in JT Gaetsewe DM is higher than in any of the analysed areas. This, however, could be explained in terms of employment generation and the low labour participation rate. These discouraged job seekers are not considered to be economically active and are not included in the calculation of the unemployment rate. Therefore, the actual unemployment rates are deceiving and do not reflect the actual need to create new employment opportunities for people in the primary study area, as well as the rest of the country.

Since 1996, the performance of the JT Gaetsewe DM's economy was growing on average at a faster rate than that of the country or the Province. Since 1999, however, the JT Gaetsewe DM's economy has been struggling when the Rand depreciated, experiencing a negative growth rate far below that of economies in the Northern Cape or South Africa. The JT Gaetsewe DM's economy is very sensitive to the changes on the global and regional arenas, due to the dependency of the mining sectors; its territory sector though is relatively developed but since it is reliant on the derived demand and the local disposable income, any changes in the mining sector's employment situation would have spin offs (positive or negative) in the tertiary sector.

The situation with housing and service delivery in the area varies. On one hand, the access to formal dwelling in the District is better than that in the rest of the country. However, it appears that influx of people of the last few years increase the size of informal dwellings. With respect to water and sanitation, the area shows a typical rural and per-urban profile with a significant portion of households having access to water outside their dwellings and using pit toilets.

The proposed reservoir will have limited if any direct social and economic benefits to the area, with the exception of maintaining the sustainable operation of the mine by improving its efficiency and competitiveness. Further social attributes that may typically be affected would include noise, traffic, light pollution, but these will be unchanged.

Improved water management and potential long term reduced reliance on water from the Vaal-Gamagara supply may be of benefit to improved water security.

#### **2.3.4 HERITAGE AND CULTURAL**

As the sites are within a disturbed area, the likelihood of cultural artefacts occurring within this disturbed area is highly unlikely. Heritage specialist (Prof AC Van Vollenhoven) concluded that due to the mentioned factors, the chances therefore of finding any heritage related features are indeed extremely slim. It is therefore believed that an additional Heritage Impact Assessment (HIA) is not needed for this project. A heritage impact assessment exemption request was submitted to SAHRA and accepted accordingly.

A paleontological specialist undertook an assessment of the proposed site and concluded that the proposed water reservoir at Gloria Mine, Black Rock, Hotazel, Northern Cape is completely underlain by the Cenozoic Kalahari Group as well underlying Griqualand West Basin rocks, Transvaal Supergroup. According to the PalaeoMap of South African Heritage Resources Information System, the Palaeontological Sensitivity of the Kalahari Group is low, and the Griqualand West rocks of the Transvaal Supergroup are moderate.

This development is recommended for exemption from further Palaeontological studies as the proposed development is smaller than 600 m<sup>2</sup>. As referred to in the basic assessment report Appendix 4.2.



### 2.3.5 CURRENT LAND USE

The proposed activities at Gloria are a continuation of an existing facility. All the alternatives fall within existing mining land use.

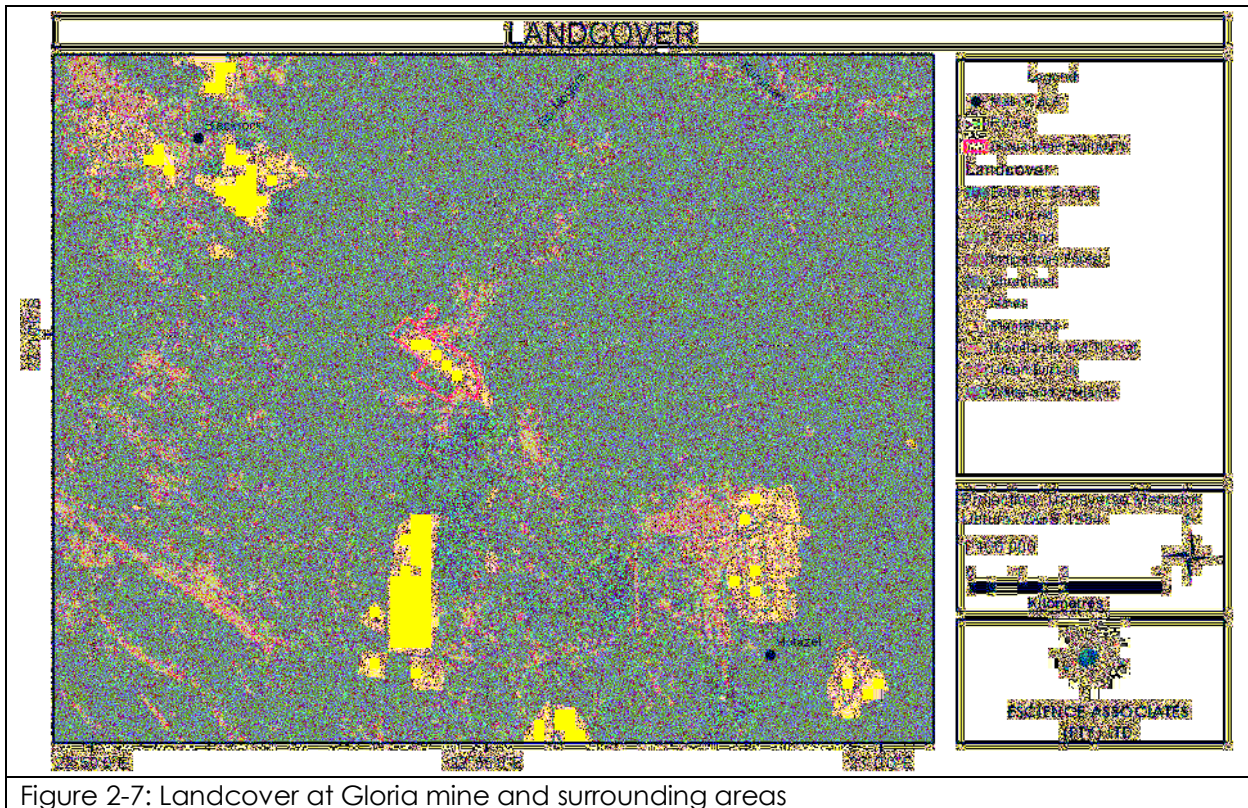


Figure 2-7: Landcover at Gloria mine and surrounding areas

### **3 POLICY AND LEGISLATIVE CONTEXT**

The section summarises relevant environmental legislation specifically applicable to the financial provision for the proposed construction.

#### **3.1 MINERAL AND PETROLEUM RESOURCES DEVELOPMENT ACT (ACT 28 OF 2002)**

BRMO has a new order mining right issued in terms of the MPRDA. The right covers all current operations including the Gloria mine. No amendments are required to the mining right for the proposed Gloria construction of the reservoir.

#### **3.2 NATIONAL ENVIRONMENTAL MANAGEMENT ACT (ACT 107 OF 1998)**

The National Environmental Management Act (NEMA), 1998 (Act 107 of 1998, as amended) is South Africa's overarching environmental legislation, and contains a comprehensive legal framework to give effect to the environmental rights contained in section 24 of The Constitution. Section 2 of NEMA contains environmental principles that form the legal foundation for sustainable environmental management in South Africa.

##### **3.2.1 FINANCIAL PROVISIONING REGULATIONS**

Regulations pertaining to the financial provision for prospecting, exploration, mining or production operations were promulgated in GN.R 1147 of 2015. The most recent amended version of which is GN.R 542 of 2018.

The regulations stipulate the requirements for determining financial provision for the costs associated with the undertaking of management, rehabilitation and remediation of environmental impacts from prospecting, exploration, mining or production operations through the lifespan of such operations and latent or residual environmental impacts that may become known in the future.

They require the applicant to determine and make financial provision to guarantee the availability of sufficient funds to undertake rehabilitation and remediation of the adverse environmental impacts of prospecting, exploration, mining or production operations, to the satisfaction of the Minister responsible for mineral resources, for the following scope:

- (a) rehabilitation and remediation;
- (b) decommissioning and closure activities at the end of prospecting, exploration, mining or production operations; and
- (c) remediation and management of latent or residual environmental impacts which may become known in future, including the pumping and treatment of polluted or extraneous water.

Notably, the financial provision liability associated with annual rehabilitation, final closure or latent or residual environmental impacts may not be deferred against assets at mine closure or mine infrastructure salvage value.

## 4 CLOSURE AND REHABILITATION PLAN

The proposed activities will occur within the existing BRMO footprint, specifically the Gloria mine footprint. It is notable that this closure and rehabilitation plan is derived from the existing approved EMPr plan for the entire site.

The complete plan as submitted with basic assessment report is attached as Appendix 6. Herein is a summary of the items relevant to the proposed activities only for the Gloria mine construction.

The rehabilitation of the proposed activities, if considered in isolation of the rest of the mine activities will consist in the main of removing the proposed structures, digging out foundations, followed by soil ripping, levelling, and revegetation where applicable. Post rehabilitation maintenance would consist in the main of ensuring that the vegetation becomes established and self-sustaining.

### 4.1 PRINCIPLES OF REHABILITATION

The following principles should be followed during the planning, implementation and post-implementation phases of the rehabilitation process:

- Define and agree upon end-goals for the rehabilitation process, such as land-use, rehabilitation objectives, areas to be rehabilitated, etc.;
- Prevent and continually manage the propagation and establishment of alien and invasive species;
- As far as is practical, implement concurrent rehabilitation in order to limit degradation of soil biota;
- Limit the footprint area of the disturbing activity in order to minimise environmental damage;
- Rehabilitation earthworks should aim to reshape the disturbed areas to represent the area prior to disturbance (with the exception of the two opencast voids) and to present a safe, functional and sustainable environment;
- Visual impacts of rehabilitated areas must be minimised by recreating natural landforms and ensuring that reshaped areas are visually suited to surrounding landscapes;
- Natural landforms such as drainage lines, undulating areas and ridges, which have been damaged during activities, must be restored;
- Implement erosion control measures to prevent the loss of topsoil;
- Rip and aerate all compacted soils in order to facilitate plant establishment and growth;
- Re-vegetate all disturbed areas with suitable vegetation cover and methods;
- After completion of activities ensure that the site is safe for use by the intended land users and remove all activity equipment; and
- Implement a monitoring plan to determine the efficacy of the rehabilitation exercise (this should be a long-term monitoring program).

## 4.2 REHABILITATION OBJECTIVES

The rural/agricultural nature of the mine, and the aridity of the area, limits the range of potentially feasible end land-use alternatives available to BRMO at the end of life of the mine.

The overall environmental objectives of mine closure are proposed as follows:

- To rehabilitate the disturbed areas to arable grazing land capable of at least supporting an extensive livestock production system;
- To restore the pre-development topography to the greatest extent that is practical and feasible at closure;
- To restore the site biodiversity and ecological system functioning to as close as practically possible to pre-development conditions;
- To ensure that the site is made safe
- To ensure that final site shaping allows for free drainage of rainwater and the prevention of erosion;
- To ensure that the pollution generating potential of residue deposits and residue stockpiles is addressed through appropriate capping and closure thereof, where applicable; and
- To ensure that there are no significant residual impacts on the underlying calcrete aquifer.
- To ensure that significant entrainment of particulate matter is prevented through adequate land cover and shaping where necessary.

The rehabilitated mine should not pose any significant direct, indirect or residual risks to either human health and livelihoods, or environmental quality, over the short-, medium- or long-term post closure and rehabilitation thereof.

## 4.3 RE-VEGETATION

The areas to be re-vegetated would be relatively flat after levelling.

- A grass mixture of species endemic (particularly important to ensure that grasses are non-invasive) within the area, such as *Aristida meridionalis*, *Centropodia glauca*, *Stipagrostis ciliata*, *Eragrostis lehmanniana* and *Schmidtia pappophoroides*, should be utilised in the seeding process;
- The seed mixture should be incorporated into a mulch which includes fertiliser and germination acceleration agents;
- The seed mulch should then be used to fill the "Hessian socks";
- The seeded areas should then be irrigated; and
- Weekly monitoring should take place in order to ascertain the efficacy of the seeding and to repair any areas where gullies or rills are forming.

#### **4.4 MAINTENANCE DURING REHABILITATION**

The nature and extent of the proposed activities is such that if they are rehabilitated in isolation of the total mine rehabilitation then the maintenance required would consist in the main of ensuring that the vegetation becomes established and self-sustaining.

- Regular application of fertiliser should take place in order to ensure efficient establishment of vegetation cover until such time as sufficient organic matter is being produced by the established grasses to allow for self-sustaining growth;
- Alien invasive species must be removed and controlled to ensure that they do not become established.

#### **4.5 ESTABLISHMENT OF NATURAL KATHU BUSHVELD AND GORDONIA DUNEVELD ON THE REHABILITATED AREAS**

- Once sufficient basal cover has been established, the introduction of species representative of the applicable vegetation types must commence;
- Introduction of these species should commence through the stages of natural floral succession [i.e. Pioneer species (grasses, herbaceous species), Secondary species (grasses, small shrubs, and small trees) and Climax state (larger shrubs, large trees)];
- This process will also occur naturally as seeds from the neighbouring areas are introduced and germinate;
- Certain tree species with special mention of *Acacia erioloba*, *Acacia haematoxylon* and *Boscia albitrunca* can be selectively introduced, however consideration will need to be given to rooting depths and soil stability as well as the ability of the trees to establish on the subject area;
- The primary goal is to achieve a stable, climax state, representative of the vegetation types where the ecological function of the plant community is tolerant of most environmental conditions it encounters.

#### **4.6 MAINTENANCE OF REHABILITATED AREAS**

All areas must be maintained for a period of 5 years after formal rehabilitation ceases. During maintenance, the following should be done:

- Clearing of alien and invasive plants to allow native and indigenous plants to out-compete invasives and take a strong hold in the area;
- Watering of larger trees that were planted during rehabilitation to allow for these trees to establish adequately;
- Patching/fixing (if necessary) of any areas that have eroded since rehabilitation;
- If initial seeding was not completely effective, then re-application may be required in such areas. The application of hydro-seed should be at the discretion of the hydro-seeding specialist;
- Maintain water run-off areas so as to prevent erosion;
- Encourage growth of plants and grasses by cordoning off, fertilising and watering areas that have struggled to take root or re-vegetate; and

## 4.7 AREAS AND ACTIVITIES TO BE REHABILITATED

The relevant extent of requiring 'general surface rehabilitation' at BRMO is as per the layout shown in Figure 2-2.

## 4.8 REHABILITATION PLAN

The rehabilitation must meet the stated end land-use objectives, must comply with the following broad sequentially implemented phases of rehabilitation. Note that only phase 1 will apply if the proposed activities are removed out of context of rehabilitation of the larger Gloria mine activities, this would apply for example if the facilities are to be demolished or replaced while the Gloria mine or portions of the mine continue to operate such that the disturbed footprint is not to be rehabilitated in order to continue with the mine's activities.

- Phase 1: Removal of all surface structures and infrastructure, as well as buried service infrastructure that may act to impede subsequent phases of rehabilitation;
- Phase 2: Preparation and amelioration of structural and infrastructural development footprints for further rehabilitation;
- Phase 3: Sequential replacement of stockpiled top- and treatment of sub-soil where topsoil is lacking, to mimic pre-mining soil profiles;
- Phase 4: Initial hydro-seeding of prepared areas to establish basal cover for subsequent rehabilitation;
- Phase 5: Initial maintenance and monitoring of basal cover;
- Phase 6: Establishment of Central Sandy Bushveld tree species once sufficient basal cover is achieved; and
- Phase 7: On-going monitoring and maintenance.

Table 4-1 below provides further detail as to the actions that need to be taken by BRMO for each of the respective phases of surface rehabilitation.

Table 4-1: Requirements for General Surface Rehabilitation				
No.	Management/Monitoring Measures	Target	Responsible party(ies)	* Time-frames/ Frequency
Preparation and Initiation				
A1	Notify the Minister of Environmental Affairs of intended cessation of mining activities and rehabilitation in accordance with S33 of NEM:AQA if applicable. Note that this would only be applicable closure of the entire mine.	Minister notified	Internal Environmental Officer	5 years prior to cessation.
A2	Appoint a project manager to oversee the process	Project manager appointed	Mine manager	Once-off prior to commencement of closure
A3	Appoint specialists as required for the rehabilitation process	Environmental specialists appointed	Internal Environmental Officer (with support of project manager)	Once-off
A4	Identify any protected species that may require permitting prior to disturbing.	Required biodiversity permits in place.	Environmental Specialist	Prior to commencement.
A5	If any archaeological artefacts of potential significance are identified at any stage, work must cease and SAHRA must be notified for instruction on how to proceed.	No destruction or disturbance of potentially significant artefacts	Environmental Specialist	On going
PHASE 1: Removal of Surface Structures and Infrastructure				
1.1	All surface structures, infrastructure and 'hard surfaces' ( <i>inter alia</i> , redundant surfaced roads, parking and paved areas) are to be demolished and removed from the disturbed mine footprint; unless an alternative/continued use for any such items is agreed upon, in writing, with the Department of Mineral Resources (DMR).	Surface rights area cleared of all mining related structures and infrastructure.	Project Manager	Once-off

Table 4-1: Requirements for General Surface Rehabilitation				
No.	Management/Monitoring Measures	Target	Responsible party(ies)	* Time-frames/ Frequency
1.2	The foundations of removed structures and infrastructure are to be removed to a depth of at least 0.5m below ground level.	No remaining sub-surface structures that may impede further phases of rehabilitation, or the ultimate root penetration of re-introduced plant and tree species.	Project Manager	Once-off
1.3	The soils beneath any structures used for the bulk storage of hazardous substances (i.e. bulk fuel and oil storage facilities, oil-water separators/sumps), must be made subject to a hydrocarbon contamination screening exercise undertaken by a suitably qualified, independent, professional.	Documented proof of contamination assessments on record. Compliance with any further recommendations from appointed specialist prior to further rehabilitation of contaminated site(s).	Internal Environmental Officer	Once-off
1.4	On-going alien and invasive floral species control is required through all phases of rehabilitation.	No establishment and propagation of 'undesirable' plant species over rehabilitation sites.	Internal Environmental Officer	On-going. Monthly inspections; unless otherwise expressly stated for subsequent phases of rehabilitation
PHASE 2: Preparation of underlying soils for further phases of rehabilitation				
2.1	Exposed, compacted, soil surfaces must be ripped to a depth of at least 0.5 m to allow for adequate aeration and plant root penetration.	No topsoil replacement on compacted underlying soil horizons.	Project Manager	Once-off
2.2	Pre-mining topography should be reasonably restored through shaping, such that the topography of rehabilitated areas will ultimately be commensurate with that of adjacent, non-disturbed areas.	No evidence of significant alteration to 'natural', pre-mining, surface drainage and topographical regime.	Project Manager	On-going



Table 4-1: Requirements for General Surface Rehabilitation				
No.	Management/Monitoring Measures	Target	Responsible party(ies)	* Time-frames/ Frequency
2.3	Care should be taken in choosing a method/machinery to implement 2.2 above, such that ripped soils are not re-compacted through efforts to appropriately shape the disturbed sites.	No topsoil replacement to compacted underlying soil horizons.	Project Manager	Once-off
2.4	Vehicular access to rehabilitation sites from this phase of rehabilitation onward should be limited to vehicles/machinery expressly required for the sound implementation of this plan.	No <i>ad hoc</i> , unauthorised, vehicular movements over rehabilitation sites.	Project Manager	On-going
PHASE 3: Topsoil/growth substrate replacement/preparation				
3.1	As far as available stockpile volumes allow, topsoil should be replaced in the appropriate order to a consistent depth of at least 20cm across areas prepared in terms of phase 2. Where topsoil is insufficient, subsoil must be treated in accordance with the specification of the soil specialist to meet rehabilitation objectives.	Topsoil replacement implemented prior to further efforts to re-introduce basal cover. Even surface, free from surface ponding of water.	Internal Environmental Officer	Once-off
3.2	Topsoil should be screened, as necessary, to remove any foreign objects, rocks, etc., prior to the replacement thereof.	Replacement of topsoil that is fit for purpose, and which does not impede BRMO from achieving the stated end-use objectives for the site.	Project Manager	On-going
3.3	Topsoil, and modified subsoil should at least meet the following physical and chemical profile required for successful rehabilitation:	Replacement of topsoil that is fit for purpose, and which does not impede BRMO from achieving the stated end-use objectives for the site.	Project Manager, soil scientist	Once-off
3.4	Any areas with slope $\geq 3^\circ$ should be inspected weekly for signs of topsoil erosion following the replacement thereof, and appropriate action taken to curb any problematic areas.	Records of weekly 'erosion inspections. No topsoil erosion following replacement.	Internal Environmental Officer	Monitor weekly, address erosion within 48 hours

Table 4-1: Requirements for General Surface Rehabilitation				
No.	Management/Monitoring Measures	Target	Responsible party(ies)	* Time-frames/ Frequency
3.5	Care should be taken during topsoil replacement to minimise the extent to which vehicle movement over replaced topsoil may act to compact these surfaces.	No significant compaction of soil surfaces prior to commencement of re-seeding (phase 4)	Project Manager	On-going
PHASE 4: Re-seeding for basal cover establishment				
4.1	A mixture of endemic vegetation known to be non-invasive within the area, should be utilised in the re-seeding process for the re-introduction of basal cover over rehabilitation sites.	Establishment of basal cover commensurate with the indigenous floral communities of the pre-mining site, such that would also allow BRMO to meet the stated land-use objectives for the site.	Project Manager	Once-off
4.2	BRMO should investigate the commercial availability of seed stocks of the aforementioned grass species; and if not commercially available, BRMO must implement a seed harvesting programme from undisturbed areas of the surface rights area (in conjunction with a competent specialist).	Sufficient available seed stock on hand to effect rehabilitation that meets the stated land-use objective for the site.	Proponent, specialist	Proof of commercial availability within 3 months of the EMP approval, or seed harvesting programme commencement within 12 months.
4.3	Seeding, or any other suitable means of re-introducing basal cover, should be planned and implemented in conjunction with the professional inputs and services of a competent contractor, with experience in such undertakings.	Optimal establishment of basal cover that will ensure that BRMO achieves the stated end-use objectives for the site.	Internal Environmental Officer	Once-off appointment with on-going management thereafter
4.4	Re-seeding should commence within 14 days of topsoil replacement, and areas should be free of alien and invasive plants.	Records kept of topsoil replacement and re-seeding dates for all rehabilitation sites.	Internal Environmental Officer	Within 30 days of topsoil replacement

Table 4-1: Requirements for General Surface Rehabilitation				
No.	Management/Monitoring Measures	Target	Responsible party(ies)	* Time-frames/ Frequency
4.5	The potential requirements for the irrigation and fertilisation of seeded areas, is to be done according to the recommendations and specifications of the specialist contractor appointed for this work.	Optimised efficacy of efforts to establish appropriate basal cover over rehabilitated areas.	Internal Environmental Officer	Once-off
4.6	No grazing on rehabilitated areas is to occur within three years of phase 4 completion.	<ul style="list-style-type: none"> <li>• Documented records of dates upon which re-seeding was effected;</li> <li>• Establishment of robust basal cover prior to introducing grazing herbivores; and</li> <li>• BRMO to meet stated end land-use objectives for the site</li> </ul>	Project Manager	3 years from re-seeding
PHASE 5: Intermediary monitoring and maintenance of basal cover				
5.1	Weekly monitoring should take place in order to ascertain the efficacy of the seeding, and to repair any areas where gullies or rills are forming. Appropriate interventions to be adopted where basal cover establishment fails.	Documented records of weekly inspections. Basal cover establishment commensurate with adjacent undisturbed areas over the mine surface rights areas (i.e. % cover relative to exposed soil surfaces).	Internal Environmental Officer, ecologist	Weekly monitoring until adequate basal cover establishment has been confirmed by an ecological specialist
5.2	Regular application of fertiliser, under the guidance of a suitably qualified soil scientist, should take place in order to ensure efficient establishment of vegetation cover until such time as sufficient organic matter is being produced by the established grasses to allow for self-sustaining growth.	Basal cover establishment commensurate with adjacent undisturbed areas over the mine surface rights areas (i.e. % cover relative to exposed soil surfaces).	Internal Environmental Officer, soil scientist	On-going, as per specialist recommendations

Table 4-1: Requirements for General Surface Rehabilitation				
No.	Management/Monitoring Measures	Target	Responsible party(ies)	* Time-frames/ Frequency
5.3	If re-seeding for basal cover establishment was not effective during 1st application, a second application of hydro-seed mixture may have to be applied in certain areas. The application of hydro-seed should be at the discretion of the specialist contractor.	Basal cover establishment commensurate with adjacent undisturbed areas over the surface rights areas (i.e. % cover relative to exposed soil surfaces).	Internal Environmental Officer, rehabilitation contractor	As necessary, per specialist recommendations
<b>PHASE 6: Establishment of Central Sandy Bushveld</b>				
6.1	Once sufficient basal cover has been established, the introduction of species representative of the applicable vegetation types over the site may commence.	Establishment of stable, climax state, plant communities on rehabilitated areas.	Internal Environmental Officer	On-going
6.2	Introduction of these species should commence through the stages of natural succession (i.e. Pioneer species (grasses, herbaceous species), Secondary species (grasses, small shrubs, and small trees) and Climax state (larger shrubs, large trees).	Establishment of stable, climax-state, plant communities on rehabilitated areas.	Internal Environmental Officer	On-going
6.3	The potential requirements for the irrigation and fertilisation of re-introduced floral species, is to be done according to the recommendations and specifications of the specialist contractor appointed for this work.	Effective establishment and growth of introduced floral species.	Internal Environmental Officer and Project Manager	On-going.
<b>PHASE 7: On-going monitoring, maintenance and aftercare</b>				
7.1	Monitoring and maintenance (as necessary) of phase 6 implementation is to be effected for at least five years following the completion of active species re-introduction to the site.	<ul style="list-style-type: none"> <li>• At least 90%, sustainable, establishment of re-introduced plants/trees; and</li> <li>• 'Ecological' objectives for site closure met.</li> </ul>	Internal Environmental Officer	On-going, Monthly inspections for at least two years; every 6 months thereafter if efforts to rehabilitate are proving effective.
<b>GENERAL PROVISIONS</b>				

Table 4-1: Requirements for General Surface Rehabilitation				
No.	Management/Monitoring Measures	Target	Responsible party(ies)	* Time-frames/ Frequency
8.1	External, independent, 'Mine Rehabilitation' compliance audits must be undertaken by a competent auditor for all areas where rehabilitation is being implemented at the mine.  Audit to at least document compliance with this plan, as well as any other relevant provisions of the EMP revision approval by the DMR.	Full compliance with the provisions for mine site rehabilitation.	Internal Environmental Officer	Every 6 months for as long as any rehabilitation (concurrent and/or closure) is being undertaken at the site
8.2	BRMO should comply with all relevant environmental legal provisions concerning protected floral species, in executing any relevant provision of this plan.	Full legal compliance for the duration of rehabilitation efforts.	Internal Environmental Officer	On-going

\* All required actions to be implemented and completed within reasonable, practical, time-frames; unless time-frames otherwise expressly stated.

#### **4.8.1 BUILDINGS AND INFRASTRUCTURE**

Brick buildings and infrastructure serving as offices, workshops, etc. can be put to beneficial use upon closure of the mine, and thus should not be removed if there is an adequate use for these buildings post-closure. This “adequate use” should be determined before final closure and rehabilitation measures are formally implemented.

If, however, any agreement is reached with the community and or any other organization to take over the occupation of one (1) or more buildings, then a formal agreement to that extent needs to be entered into and signed by all parties concerned. The DMR also needs to be alerted to this fact, and adequate legal arrangements need to be made in this regard. If various parties cannot reach agreement on the adequate use for these buildings, then these buildings too need to be demolished. All temporary buildings (pre-fabricated buildings) should be removed and their footprints rehabilitated.

## **5 CLOSURE COST QUANTIFICATION**

The closure costing was estimated based on the closure and rehabilitation of those areas and activities specific to the proposed construction. Given that the construction will be integral to the mine, it is recommended that the closure costing be integrated into the larger mine rehabilitation quantum upon completion of detailed design and construction.

### **5.1 METHODOLOGY**

The closure costing was undertaken based on the engineering design of the proposed facilities and the related bill of quantities. The costing assumes that all proposed structures and activities will be removed in accordance with the stipulations of the Section 4 of this report.

Costing was undertaken by a competent quantity surveyor and project engineer based on current project experience with the construction and decommissioning activities undertaken at the mine as part of the recent authorised mine expansion from 2013 to 2019, and on-going upgrades to the Gloria mine facilities.

### **5.2 COSTING**

Note that the costing is for the entire set of proposed structures. Given the scale of the proposed construction, a breakdown for each individual type of structure or operational has not been undertaken as would typically be applied to larger scale developments.

**Table 5-1: Dismantling Of Conveyors, Steel Support Structures, Piping, Civil Works, And Rehabilitation Of Gloria Surface Plant**

	Unit	Quantity	Rate	Total	Remarks
<b>1. Fixed P&amp;G cost</b>					
Site Offices	N/A	1	R 60 000.00	R 60 000.00	Supply, deliver and establish
Temporary Services	N/A	1	R 10 000.00	R 10 000.00	Water and electricity free-issued
Accommodation	N/A	1	R 30 000.00	R 30 000.00	For senior staff only
Transportation	N/A	1	R -	R -	Contractor owned busses
Establishment of plant and equipment	N/A	1	R 350 000.00	R 350 000.00	All equipment as stated in item 2 below
Medicals and induction	N/A	1	R 250 000.00	R 250 000.00	1 week to on-board
Seeds	N/A	1			Already included for
Bonds/ Guarantees	N/A	1	R 30 000.00	R 30 000.00	
				<b><u>R 730 000.00</u></b>	
<b>Time Related P&amp;G costs</b>					
<b>2. Plant and Equipment</b>					
					Wet rate
160t Mobile Crane	days	0	R 15 000.00	R -	Rate for reference only, cost integrated into item 4.
60t crane	days	0	R 9 000.00	R -	Rate for reference only, cost integrated into item 4.
10t truck ( 2 off)	days	0	R 4 800.00	R -	Rate for reference only, cost integrated into item 4.
Manitou	days	0	R 3 700.00	R -	Rate for reference only, cost integrated into item 4.
Dust suppression truck	days	0	R 3 000.00	R -	Rate for reference only, cost integrated into item 4.
Transportation of employees from work to home	days	0	R 2 700.00	R -	Rate for reference only, cost integrated into item 4.
Excavator	days	0	R 7 000.00	R -	Rate for reference only, cost integrated into item 4.
Dozer	days	0	R 7 800.00	R -	Rate for reference only, cost integrated into item 4.
				<b><u>R -</u></b>	
<b>3. Personnel</b>					
Site Manager	days	0	R 6 000.00	R -	Rate for reference only, cost integrated into item 4.
Site Foreman	days	0	R 4 000.00	R -	Rate for reference only, cost integrated into item 4.



**Table 5-1: Dismantling Of Conveyors, Steel Support Structures, Piping, Civil Works, And Rehabilitation Of Gloria Surface Plant**

	Unit	Quantity	Rate	Total	Remarks
Safety Officer	days	0	R 4 000.00	R -	Rate for reference only, cost integrated into item 4.
Rigger (2 off)	days	0	R 2 000.00	R -	Rate for reference only, cost integrated into item 4.
Electrician	days	0	R 2 000.00	R -	Rate for reference only, cost integrated into item 4.
Boilermaker ( 3 off)	days	0	R 2 000.00	R -	Rate for reference only, cost integrated into item 4.
Fitter	days	0	R 2 000.00	R -	Rate for reference only, cost integrated into item 4.
General workers (10 off)	days	0	R 1 300.00	R -	Rate for reference only, cost integrated into item 4.
Equipment operators	days	0	R 2 000.00	R -	Rate for reference only, cost integrated into item 4.
				<u>R -</u>	
<b>4. Closure and Rehabilitation Activities</b>			<b>All Inclusive rate</b>		
Demolishing of civils	m3	950	R 1 400.00	R 1 330 000	10 days actual work
Demolishing of structural steel	t	5	R 1 200.00	R 6 000	1 day's actual work
Demolishing of platework	t	0	R 1 200.00	R -	
Earthworks	m3	5 000	R175.00	R 875 000	Cut to fill rate, incl 2km free haul
Ripping and levelling	m3	2 100	R30.00	R 63 000	Rip and Compact Rate
Seeding	kg	TBC	R -		Already included for in the existing quantum
				<u><b>R 2 274 000.00</b></u>	
<b>5. Maintenance and Aftercare</b>					
Included in existing BRMO Closure Provisions					
<b>SUB-TOTAL</b>				<b>R 3 004 000.00</b>	
<b>6. Management and Administration</b>					
Contingency	10%			R 300 400.00	

<b>Table 5-1: Dismantling Of Conveyors, Steel Support Structures, Piping, Civil Works, And Rehabilitation Of Gloria Surface Plant</b>					
	<b>Unit</b>	<b>Quantity</b>	<b>Rate</b>	<b>Total</b>	<b>Remarks</b>
Escalation	6%			R 180 240.00	
<b>TOTAL</b>				<b>R 3 484 640.00</b>	

## **APPENDIX 6: CLOSURE PLAN:GLORIA RESERVOIR**

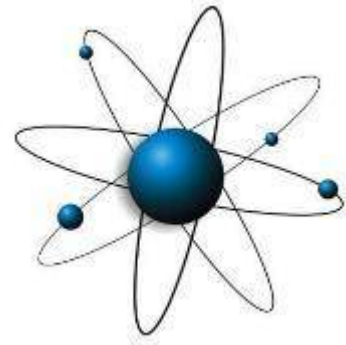
**ASSMANG (PTY) LTD BLACK  
ROCK MINE OPERATIONS,  
HOTAZEL, NORTHERN CAPE:**



BLACK ROCK MINE OPERATIONS

**CLOSURE PLAN: GLORIA  
RESERVOIR**

**22 MAY 2018**



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# 1 CLOSURE AND REHABILITATION PHASE

This Closure and rehabilitation plan is an excerpt from wider Black Rock Mining Operations approved EMPr adapted for this application. The BRMO rehabilitation plan provides details as to how site rehabilitation (whether this is concurrent with on-going operations, or at mine closure) should be undertaken, with step by step break-down of disturbed areas to be rehabilitated, when those areas should be rehabilitated, as well as a description of the actual rehabilitation measures to be implemented.

This excerpt has been adapted for the scope of the application. Notably the larger mine rehabilitation plan will be periodically updated and will encompass the proposed activities that are the subject of this application. In this case this closure plan may be rendered redundant and the greater mine rehabilitation plan would apply.

## 1.1 ADMINISTRATIVE INFORMATION

The following section and associated set of tables, provides pertinent administrative information pertaining to BRMO, associated mine lease area, as well as the environmental assessment practitioner who developed the Basic Assessment addendum (Table 1-1 to Table 1-5).

Table 1-1: Name and Address of Mine	
Owner and Name of Mine	Assmang (Pty) Limited, Black Rock Mine Operations
Company Registration	1935/007343/06
Physical Address	Black Rock Mine Operations, Santoy, Northern Cape
Postal Address	PO Box 187 Santoy 8491
Telephone	(053) 751 5201
Fax	(053) 751 5251
Senior General Manager	Pierre Becker

Table 1-2: Details of Acting Environmental Specialist	
Name	Tshifhiwa Ravele
Physical Address	Main Offices Black Rock Mine Operations, Santoy, Northern Cape
Postal Address	PO Box 187 Santoy 8491
Telephone	(053) 751 5302
Fax	(053) 751 5251
Email	tshifhiwar@brmo.co.za

Table 1-3: Details of EAP	
Name of Company	EScience Associates (Pty) Ltd.
Contact Person	Mr. Abdul Ebrahim
Postal Address	PO Box 2950 Saxonwold 2132 JHB
Physical Address	9 Victoria Street Oaklands 2192 JHB

Telephone	(011) 718 6380
Fax	072 268 1119
Email	abdul@escience.co.za
Qualifications	Certified EAP, BEng Honours Environmental Engineering
Curriculum Vitae	Refer Appendix 1 of Basic Assessment Report

Table 1-4: BRMO Mining Rights, Surface Rights and Title Deed Description Relevant to this application.				
Mine	Farm Name	Title Deed	Surface and Mining Rights	SG 21 Key
Gloria	Ptn. 1 Gloria 226	No. 506 of 1966	Assmang (Pty) Ltd	C0410000000026600001

Table 1-5: Project Applicable Servitudes Relevant to this application.		
Mine	Servitude Type	Servitude No.
Gloria	Rail	K38/83S
Gloria	Water pipeline (Sedibeng Water Vaal-Gamagara Supply)	K36/1978S

## 1.2 PRINCIPLES OF REHABILITATION

The following principles should be followed during the planning, implementation and post-implementation phases of the rehabilitation process:

- Define and agree upon end-goals for the rehabilitation process, such as land-use, rehabilitation objectives, areas to be rehabilitated, etc.;
- Prevent and continually manage the propagation and establishment of alien and invasive species;
- As far as is practical, implement concurrent rehabilitation in order to limit degradation of soil biota;
- Limit the footprint area of the disturbing activity in order to minimise environmental damage;
- Rehabilitation earthworks should aim to reshape the disturbed areas to represent the area prior to disturbance (with the exception of the two opencast voids) and to present a safe, functional and sustainable environment;
- Visual impacts of rehabilitated areas must be minimised by recreating natural landforms and ensuring that reshaped areas are visually suited to surrounding landscapes;
- Natural landforms such as drainage lines, undulating areas and ridges, which have been damaged during activities, must be restored;
- Implement erosion control measures to prevent the loss of topsoil;
- Rip and aerate all compacted soils in order to facilitate plant establishment and growth;
- Re-vegetate all disturbed areas with suitable vegetation cover and methods;
- After completion of activities ensure that the site is safe for use by the intended land users and remove all activity equipment; and
- Implement a monitoring plan to determine the efficacy of the rehabilitation exercise (this should be a long-term monitoring program).

### 1.3 REHABILITATION OBJECTIVES

The rural/agricultural nature of the mine, and the aridity of the area, limits the range of potentially feasible end land-use alternatives available to BRMO at the end of life of the mine.

The overall environmental objectives of mine closure are proposed as follows:

- To rehabilitate the disturbed areas to arable grazing land capable of at least supporting an extensive livestock production system;
- To restore the pre-development topography to the greatest extent that is practical and feasible at closure;
- To restore the site biodiversity and ecological system functioning to as close as practically possible to pre-development conditions;
- To ensure that the site is made safe; where such entails:
  - Remediation of contaminated land;
  - Effective sealing-off of shafts and declines; and
  - Effective removal and decommissioning of redundant structures and infrastructure;
  - Effective closure of the general landfill site; and,
  - Effective closure of the tailings facilities should they be in existence at the time of closure.
- To ensure that final site shaping allows for free drainage of rain water and the prevention of erosion;
- To ensure that the pollution generating potential of residue deposits and residue stockpiles is addressed through appropriate capping and closure thereof, where applicable; and
- To ensure that there are no significant residual impacts on the underlying calcrete aquifer.
- To ensure that significant entrainment of particulate matter is prevented through adequate land cover and shaping where necessary.

The rehabilitated mine should not pose any significant direct, indirect or residual risks to either human health and livelihoods, or environmental quality, over the short-, medium- or long-term post closure and rehabilitation thereof.

### 1.4 RE-VEGETATION

- A grass mixture of species endemic (particularly important to ensure that grasses are non-invasive) within the area, such as *Aristida meridionalis*, *Centropodia glauca*, *Stipagrostis ciliata*, *Eragrostis lehmanniana* and *Schmidtia pappophoroides*, should be utilised in the seeding process;
- The seed mixture should be incorporated into a mulch which includes fertiliser and germination acceleration agents;
- The seed mulch should then be used to fill the “Hessian socks”;
- The seeded areas should then be irrigated; and



- Weekly monitoring should take place in order to ascertain the efficacy of the seeding and to repair any areas where gullies or rills are forming.

## 1.5 MAINTENANCE

- Along the crest of steep gradients a 1 m high Hessian screen should be placed around the facility to assist with the trapping of seeds and to protect the crest from wind erosion;
- Regular application of fertiliser should take place in order to ensure efficient establishment of vegetation cover until such time as sufficient organic matter is being produced by the established grasses to allow for self-sustaining growth;
- The process of 'Unification' can be utilised to ensure a constant supply of organic compost (fertiliser). This entails the establishment of a compost heap, where cleared indigenous organic matter is stored and allowed to break down naturally to the point of resembling garden compost; and
- Care must be taken to ensure that only indigenous plant matter is utilised for this process, as the presence of alien invaders may cause the establishment of invader plant communities in the rehabilitated areas.

## 1.6 ESTABLISHMENT OF NATURAL KATHU BUSHVELD AND GORDONIA DUNEVELD ON THE REHABILITATED AREAS

- Once sufficient basal cover has been established, the introduction of species representative of the applicable vegetation types must commence;
- Introduction of these species should commence through the stages of natural floral succession [i.e. Pioneer species (grasses, herbaceous species), Secondary species (grasses, small shrubs, and small trees) and Climax state (larger shrubs, large trees)];
- This process will also occur naturally as seeds from the neighbouring areas are introduced and germinate;
- Certain tree species with special mention of *Acacia erioloba*, *Acacia haematoxylon* and *Boscia albitrunca* can be selectively introduced, however consideration will need to be given to rooting depths and soil stability as well as the ability of the trees to establish on the subject area;
- A test area should be designated to test possible tree species to be introduced for their ability to grow in different substrates. This should commence immediately in order to allow informed decision making once rehabilitation commences; and
- The primary goal is to achieve a stable, climax state, representative of the vegetation types where the ecological function of the plant community is tolerant of most environmental conditions it encounters.

## 1.7 MAINTENANCE OF REHABILITATED AREAS

All areas must be maintained for a period of 5 years after formal rehabilitation ceases. During maintenance, the following should be done:

- Clearing of alien and invasive plants to allow native and indigenous plants to out-compete invasives and take a strong hold in the area;
- Watering of larger trees that were planted during rehabilitation to allow for these trees to establish adequately;
- Patching/fixing (if necessary) of any areas that have eroded since rehabilitation;
- If hydro-seeding was not effective during 1<sup>st</sup> application, a second application of hydro-seed mixture may have to be applied in certain areas. The application of hydro-seed should be at the discretion of the hydro-seeding specialist;
- Maintain water run-off areas so as to not increase chances of further potential erosion;
- Encourage growth of plants and grasses by cordoning off, fertilising and watering areas that have struggled to take root or re-vegetate; and
- Areas of high importance (i.e. slopes and riparian areas) should be more vigorously maintained, fertilized and watered during maintenance.

## **1.8 AREAS AND ACTIVITIES TO BE REHABILITATED**

In general terms, the rehabilitation requirements for the area of disturbance will be relatively homogenous.

## **1.9 EXTENT OF REQUIRED 'GENERAL SURFACE REHABILITATION'**

Upon removal of the proposed structures general surface rehabilitation will apply. The relevant extent of requiring 'general surface rehabilitation' at BRMO is as per Figure 1-1 that follows. The requisite requirements for 'general surface rehabilitation' are discussed in the sections that follow.

# LOCATION AND LAYOUT ALTERNATIVES



**Legend**

- Main Road
- Secondary/Arterial Road
- Gloria Mine Boundary

**Reservoir Layout Alternatives**

- Preferred Location and Layout
- Alternative Location and Layout

0 0.075 0.15  
Kilometres

Projection: Transverse Mercator  
Datum: WGS 1984

ESCIENCE ASSOCIATES  
(PTY) LTD

Figure 1-1: Aerial overview of all areas/activities requiring rehabilitation

## 1.10 DEMOLITION AND GENERAL SURFACE REHABILITATION

The rehabilitation must meet the stated end land-use objectives, must comply with the following broad sequentially implemented phases of rehabilitation. Note that only phase 1 will apply if the proposed activities are removed out of context of rehabilitation of the larger Gloria mine activities, this would apply for example if the facilities are to be demolished or replaced while the Gloria mine or portions of the mine continue to operate such that the disturbed footprint is not to be rehabilitated in order to continue with the mine's activities.

The reservoir and associated infrastructure must first be demolished and removed. Following demolition and removal the 'general surface rehabilitation' of degraded/disturbed mine areas to meet the stated end land-use objectives, must comply with the following broad sequentially implemented phases of rehabilitation:

- Phase 1: Removal of all surface structures and infrastructure, as well as buried service infrastructure that may act to impede subsequent phases of rehabilitation;
- Phase 2: Preparation and amelioration of structural and infrastructural development footprints for further rehabilitation;
- Phase 3: Sequential replacement of stockpiled top- and treatment of sub-soil where topsoil is lacking, to mimic pre-mining soil profiles;
- Phase 4: Initial hydro-seeding of prepared areas to establish basal cover for subsequent rehabilitation;
- Phase 5: Initial maintenance and monitoring of basal cover;
- Phase 6: Establishment of Central Sandy Bushveld tree species once sufficient basal cover is achieved; and
- Phase 7: On-going monitoring and maintenance.

Table 1-6: Demolition and Removal				
No.	Management/Monitoring Measures	Target	Responsible party(ies)	Time-frames
1.1	Any items of economically salvageable or recyclable value (e.g. steel, electrical cabling etc.) must be identified and marked for salvaging.	Minimise disposal, and maximise recycling.	Engineering Manager & Environmental Specialist	Within one year of declared redundancy
1.2	Structures to be demolished must be inspected to identify if there are any red data or protected species which require removal or relocation prior to disposal.  Permits for removal must be obtained prior to removal if they are required (e.g. removal of camel thorn and grey camel thorn trees).	Conservation of protected species.	Environmental Specialist	Prior to demolition
1.3	All structures must be demolished and removed.	No structures or residue remaining	Engineering Manager	Within one year of declared redundancy
1.4	All foundations must be excavated and removed to a depth of 0.5m below ground level where applicable.	No sub surface residues remaining	Engineering Manager	Within one year of declared redundancy
1.5	Potentially contaminated soil must be removed for treatment or disposal at an appropriately licenced facility.	No contaminated soil on the site	Engineering Manager & Environmental Specialist	Within one year of declared redundancy
1.6	Shape to contours of natural surrounds, Rip to 500 m, and scarify compacted soil.	Soil is loosened and aerated for plant growth. No steep slopes or areas for water ponding.	Engineering Manager	Within 2 weeks of removal of structures
1.7	Cover exposed surfaces with topsoil and revegetate.	All surfaces vegetated	Environmental Specialist	Within 2 weeks of previous step.
1.8	Monitor and manage rehabilitated area in accordance with alien and invasives management procedure.	Indigenous vegetation fully colonises the site.	Environmental Specialist	On going
1.9	Any areas with slope $\geq 3^\circ$ should be inspected for signs of topsoil erosion following the replacement thereof, and appropriate action taken to curb any problematic areas. This to be undertaken until vegetation is permanently established.	Records of weekly erosion inspections. No topsoil erosion following replacement.	Environmental Specialist	After rainfall events and weekly during rainy season.

Table 1-7: Requirements for General Surface Rehabilitation				
No.	Management/Monitoring Measures	Target	Responsible party(ies)	* Time-frames/ Frequency
Preparation and Initiation				
A1	Notify the Minister of Environmental Affairs of intended cessation of mining activities and rehabilitation in accordance with S33 of NEM:AQA, if applicable.	Minister notified	Internal Environmental Officer	5 years prior to cessation.
A2	Appoint a project manager to oversee the process	Project manager appointed	Mine manager	Once-off prior to commencement of closure
A3	Appoint specialists as required for the rehabilitation process	Environmental specialists appointed	Internal Environmental Officer (with support of project manager)	Once-off
A4	Asbestos roofs and materials containing asbestos must be identified and removed by a person competent to do so. Asbestos waste must be disposed of to an appropriately licenced facility.	All asbestos waste to be disposed of appropriately. No contamination of other materials.	Engineering Manager & Environmental Specialist	Prior to demolition
A5	Identify any protected species that may require permitting prior to disturbing.	Required biodiversity permits in place.	Environmental Specialist	Prior to commencement.
A6	If any archaeological artefacts of potential significance are identified at any stage, work must cease and SAHRA must be notified for instruction on how to proceed.	No destruction or disturbance of potentially significant artefacts	Environmental Specialist	On going
PHASE 1: Removal of Surface Structures and Infrastructure				
1.1	All surface structures, infrastructure and 'hard surfaces' ( <i>inter alia</i> , redundant surfaced roads, parking and paved areas) are to be demolished and removed from the disturbed mine footprint; unless an alternative/continued use for any such items is agreed upon, in writing, with the Department of Mineral Resources (DMR).	Surface rights area cleared of all mining related structures and infrastructure.	Project Manager	Once-off
1.2	The foundations of removed structures and infrastructure are to be removed to a depth of at least 0.5m below ground level.	No remaining sub-surface structures that may impede further phases of rehabilitation, or the ultimate root penetration of re-introduced plant and tree species.	Project Manager	Once-off

Table 1-7: Requirements for General Surface Rehabilitation				
No.	Management/Monitoring Measures	Target	Responsible party(ies)	* Time-frames/ Frequency
1.3	On-going alien and invasive floral species control is required through all phases of rehabilitation.	No establishment and propagation of 'undesirable' plant species over rehabilitation sites.	Internal Environmental Officer	On-going. Monthly inspections; unless otherwise expressly stated for subsequent phases of rehabilitation
PHASE 2: Preparation of underlying soils for further phases of rehabilitation				
2.1	Exposed, compacted, soil surfaces must be ripped to a depth of at least 0.5 m to allow for adequate aeration and plant root penetration.	No topsoil replacement on compacted underlying soil horizons.	Project Manager	Once-off
2.2	Pre-mining topography should be reasonably restored through shaping, such that the topography of rehabilitated areas will ultimately be commensurate with that of adjacent, non-disturbed areas, with the exception of tailings facilities if they are to remain. Consultation with a hydrologist may be required to eliminate potential for prevent erosion.	No evidence of significant alteration to 'natural', pre-mining, surface drainage and topographical regime.	Project Manager	On-going
2.4	Care should be taken in choosing a method/machinery to implement 2.2 above, such that ripped soils are not re-compacted through efforts to appropriately shape the disturbed sites.	No topsoil replacement to compacted underlying soil horizons.	Project Manager	Once-off
2.5	Unless other activities at the mine are still operational, vehicular access to rehabilitation sites from this phase of rehabilitation onward should be limited to vehicles/machinery expressly required for the sound implementation of this plan.	No <i>ad hoc</i> , unauthorised, vehicular movements over rehabilitation sites.	Project Manager	On-going
PHASE 3: Topsoil/growth substrate replacement/preparation				
3.1	As far as available stockpile volumes allow, topsoil should be replaced in the appropriate order to a consistent depth of at least 20cm across areas prepared in terms of phase 2. Where topsoil is insufficient, subsoil must be treated in accordance with the specification of the soil specialist to meet rehabilitation objectives.	Topsoil replacement implemented prior to further efforts to re-introduce basal cover. Even surface, free from surface ponding of water.	Internal Environmental Officer	Once-off
3.2	Topsoil should be screened, as necessary, to remove any foreign objects, rocks, etc., prior to the replacement thereof.	Replacement of topsoil that is fit for purpose, and which does not	Project Manager	On-going

Table 1-7: Requirements for General Surface Rehabilitation				
No.	Management/Monitoring Measures	Target	Responsible party(ies)	* Time-frames/ Frequency
		impede BRMO from achieving the stated end-use objectives for the site.		
3.3	Topsoil, and modified subsoil should at least meet the following physical and chemical profile required for successful rehabilitation:	Replacement of topsoil that is fit for purpose, and which does not impede BRMO from achieving the stated end-use objectives for the site.	Project Manager, soil scientist	Once-off
3.4	Any areas with slope $\geq 3^\circ$ should be inspected weekly for signs of topsoil erosion following the replacement thereof, and appropriate action taken to curb any problematic areas.	Records of weekly 'erosion inspections'. No topsoil erosion following replacement.	Internal Environmental Officer	Monitor weekly, address erosion within 48 hours
3.5	Care should be taken during topsoil replacement to minimise the extent to which vehicle movement over replaced topsoil may act to compact these surfaces.	No significant compaction of soil surfaces prior to commencement of re-seeding (phase 4)	Project Manager	On-going
<b>PHASE 4: Re-seeding for basal cover establishment</b>				
4.1	A mixture of endemic vegetation known to be non-invasive within the area, should be utilised in the re-seeding process for the re-introduction of basal cover over rehabilitation sites.	Establishment of basal cover commensurate with the indigenous floral communities of the pre-mining site, such that would also allow BRMO to meet the stated land-use objectives for the site.	Project Manager	Once-off
4.2	BRMO should investigate the commercial availability of seed stocks of the aforementioned grass species; and if not commercially available, BRMO must implement a seed harvesting programme from undisturbed areas of the surface rights area (in conjunction with a competent specialist).	Sufficient available seed stock on hand to effect rehabilitation that meets the stated land-use objective for the site.	Proponent, specialist	Proof of commercial availability within 3 months of the EMP approval, or seed harvesting programme commencement within 12 months.



Table 1-7: Requirements for General Surface Rehabilitation				
No.	Management/Monitoring Measures	Target	Responsible party(ies)	* Time-frames/ Frequency
4.3	Seeding, or any other suitable means of re-introducing basal cover, should be planned and implemented in conjunction with the professional inputs and services of a competent contractor, with experience in such undertakings.	Optimal establishment of basal cover that will ensure that BRMO achieves the stated end-use objectives for the site.	Internal Environmental Officer	Once-off appointment with on-going management thereafter
4.4	Re-seeding should commence within 14 days of topsoil replacement, and areas should be free of alien and invasive plants.	Records kept of topsoil replacement and re-seeding dates for all rehabilitation sites.	Internal Environmental Officer	Within 30 days of topsoil replacement
4.5	The potential requirements for the irrigation and fertilisation of seeded areas, is to be done according to the recommendations and specifications of the specialist contractor appointed for this work.	Optimised efficacy of efforts to establish appropriate basal cover over rehabilitated areas.	Internal Environmental Officer	Once-off
4.6	No grazing on rehabilitated areas is to occur within three years of phase 4 completion.	<ul style="list-style-type: none"> <li>• Documented records of dates upon which re-seeding was effected;</li> <li>• Establishment of robust basal cover prior to introducing grazing herbivores; and</li> <li>• BRMO to meet stated end land-use objectives for the site</li> </ul>	Project Manager	3 years from re-seeding
<b>PHASE 5: Intermediary monitoring and maintenance of basal cover</b>				
5.1	Weekly monitoring should take place in order to ascertain the efficacy of the seeding, and to repair any areas where gullies or rills are forming. Appropriate interventions to be adopted where basal cover establishment fails.	Documented records of weekly inspections. Basal cover establishment commensurate with adjacent undisturbed areas over the mine surface rights areas (i.e. % cover relative to exposed soil surfaces).	Internal Environmental Officer, ecologist	Weekly monitoring until adequate basal cover establishment has been confirmed by an ecological specialist
5.2	Regular application of fertiliser, under the guidance of a suitably qualified soil scientist, should take place in order to ensure efficient establishment of vegetation cover until such time as sufficient organic matter is being produced by the established grasses to allow for self-sustaining growth.	Basal cover establishment commensurate with adjacent undisturbed areas over the mine surface rights areas (i.e. % cover relative to exposed soil surfaces).	Internal Environmental Officer, soil scientist	On-going, as per specialist recommendations

Table 1-7: Requirements for General Surface Rehabilitation				
No.	Management/Monitoring Measures	Target	Responsible party(ies)	* Time-frames/ Frequency
5.3	If re-seeding for basal cover establishment was not effective during 1st application, a second application of hydro-seed mixture may have to be applied in certain areas. The application of hydro-seed should be at the discretion of the specialist contractor.	Basal cover establishment commensurate with adjacent undisturbed areas over the surface rights areas (i.e. % cover relative to exposed soil surfaces).	Internal Environmental Officer, rehabilitation contractor	As necessary, per specialist recommendations
<b>PHASE 6: Establishment of Central Sandy Bushveld</b>				
6.1	Once sufficient basal cover has been established, the introduction of species representative of the applicable vegetation types over the site may commence.	Establishment of stable, climax state, plant communities on rehabilitated areas.	Internal Environmental Officer	On-going
6.2	Introduction of these species should commence through the stages of natural succession (i.e. Pioneer species (grasses, herbaceous species), Secondary species (grasses, small shrubs, and small trees) and Climax state (larger shrubs, large trees).	Establishment of stable, climax-state, plant communities on rehabilitated areas.	Internal Environmental Officer	On-going
6.3	The potential requirements for the irrigation and fertilisation of re-introduced floral species, is to be done according to the recommendations and specifications of the specialist contractor appointed for this work.	Effective establishment and growth of introduced floral species.	Internal Environmental Officer and Project Manager	On-going.
<b>PHASE 7: On-going monitoring, maintenance and aftercare</b>				
7.1	Monitoring and maintenance (as necessary) of phase 6 implementation is to be effected for at least five years following the completion of active species re-introduction to the site.	<ul style="list-style-type: none"> <li>At least 90%, sustainable, establishment of re-introduced plants/trees; and</li> <li>'Ecological' objectives for site closure met.</li> </ul>	Internal Environmental Officer	On-going, Monthly inspections for at least two years; every 6 months thereafter if efforts to rehabilitate are proving effective.
<b>GENERAL PROVISIONS</b>				
8.1	External, independent, 'Mine Rehabilitation' compliance audits must be undertaken by a competent auditor for all areas where rehabilitation is being implemented at the mine.  Audit to at least document compliance with this plan, as well as any other relevant provisions of the EMP revision approval by the DMR.	Full compliance with the provisions for mine site rehabilitation.	Internal Environmental Officer	Every 6 months for as long as any rehabilitation (concurrent and/or closure) is being undertaken at the site

Table 1-7: Requirements for General Surface Rehabilitation				
No.	Management/Monitoring Measures	Target	Responsible party(ies)	* Time-frames/ Frequency
8.2	BRMO should undertake monthly internal compliance audits for all areas where rehabilitation is being implemented at the mine.  Audit to at least document compliance with this plan, as well as any other relevant provisions of the EMP revision approval by the DMR.	Full compliance with the provisions for mine site rehabilitation.	Internal Environmental Officer	Monthly
8.3	BRMO should comply with all relevant environmental legal provisions concerning protected floral species, in executing any relevant provision of this plan.	Full legal compliance for the duration of rehabilitation efforts.	Internal Environmental Officer	On-going

\* All required actions to be implemented and completed within reasonable, practical, time-frames; unless time-frames otherwise expressly stated.

## **CONCURRENT REHABILITATION**

It is not anticipated that concurrent rehabilitation will apply to the proposed activities. However should concurrent rehabilitation be required in isolation of rehabilitation of the larger mining area then the requirements of Table 1-6 will apply.

## **CONCLUSIONS AND SUMMARY OF REHABILITATION PLAN**

This rehabilitation plan has taken into consideration the area that needs to be rehabilitated for the proposed activities. The effective end result of rehabilitation should be to return the entire project area to as close to its previous pre-mining state as is possible and practical unless removal of the structures is required prior to closure of the mine. All acceptable options for recycling and reuse should be considered before final disposal of any building materials, steel structures, electrical equipment or any associated equipment that could be reused, recycled or appropriately scrapped.

The rehabilitation plan is a working document and should change as seen fit, or necessary to achieve a better environmental outcome. The process of rehabilitation is diverse and various obstacles will be encountered during rehabilitation which may call for a revision in this plan. Maintenance of all rehabilitation must be on-going for a period of at least five years.

This maintenance will help to ensure that all rehabilitated areas, re-vegetated areas and alien invasive control is undertaken effectively. Rehabilitation of disturbed areas, as far as is practical, should proceed concurrently with the remainder of the operational period. Disturbed areas should be rehabilitated as quickly as possible. The requirements for such are similar for concurrent and closure rehabilitation.