

**ESCIENCE
ASSOCIATES
(PTY) LTD**

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



BLACK ROCK MINE OPERATIONS

BASIC ASSESSMENT REPORT

Department of Mineral Resources:

22 May 2019

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BASIC ASSESSMENT REPORT:

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22 May 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 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
<p>Activity No. 34: 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">(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 22nd of March 2019 and in the Kathu Gazette on the 22nd 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 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

BRMO	Black Rock Mine Operations
DEA	Department of Environmental Affairs
DMR	Department of Mineral Resources
DWA	Department of Water Affairs (now DWS)
DWS	Department of Water and Sanitation
EAP	Environmental Assessment Practitioner
ECO	Environmental Control Officer
EIA	Environmental Impact Assessment
Environmental Specialist	Project/Site Manager
EO	Environmental Officer
HDPE	High Density Polyethylene
LED	Local Economic Development
Mn	Manganese
MPRDA	Minerals and Petroleum Resources Development Act
Mtpa	Million tonnes per annum
NCDENC	Northern Cape Department of Environment and Nature Conservation
NCR	Non-conformance Reporting
NEMA	National Environmental Management Act, No. 107 of 1998 NEMA EIA
NEMAQA	National Environment Management: Air Quality Act, No. 39 of 2004
PM	Particulate matter
RDL	Red Data Listed
Regulations	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
ROM	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

a full description of the process followed to reach the proposed preferred alternative within the site, including (refer to Heading 2):	details of all the alternatives considered	Refer to Heading 2.3
	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	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	

location through the life of the activity, including	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"> i. cumulative impacts; ii. the nature, significance and consequences of the impact and risk; iii. the extent and duration of the impact and risk; iv. the probability of the impact and risk occurring; v. the degree to which the impact and risk can be reversed; 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 	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 environmental impact statement which contains	<ul style="list-style-type: none"> i. a summary of the key findings of the environmental impact assessment; 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 iii. a summary of the positive and negative impacts and risks of the proposed activity and identified alternatives; 	Refer to Figure 5-5
based on the assessment, and where applicable, impact management measures 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 conditional to the findings of		

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

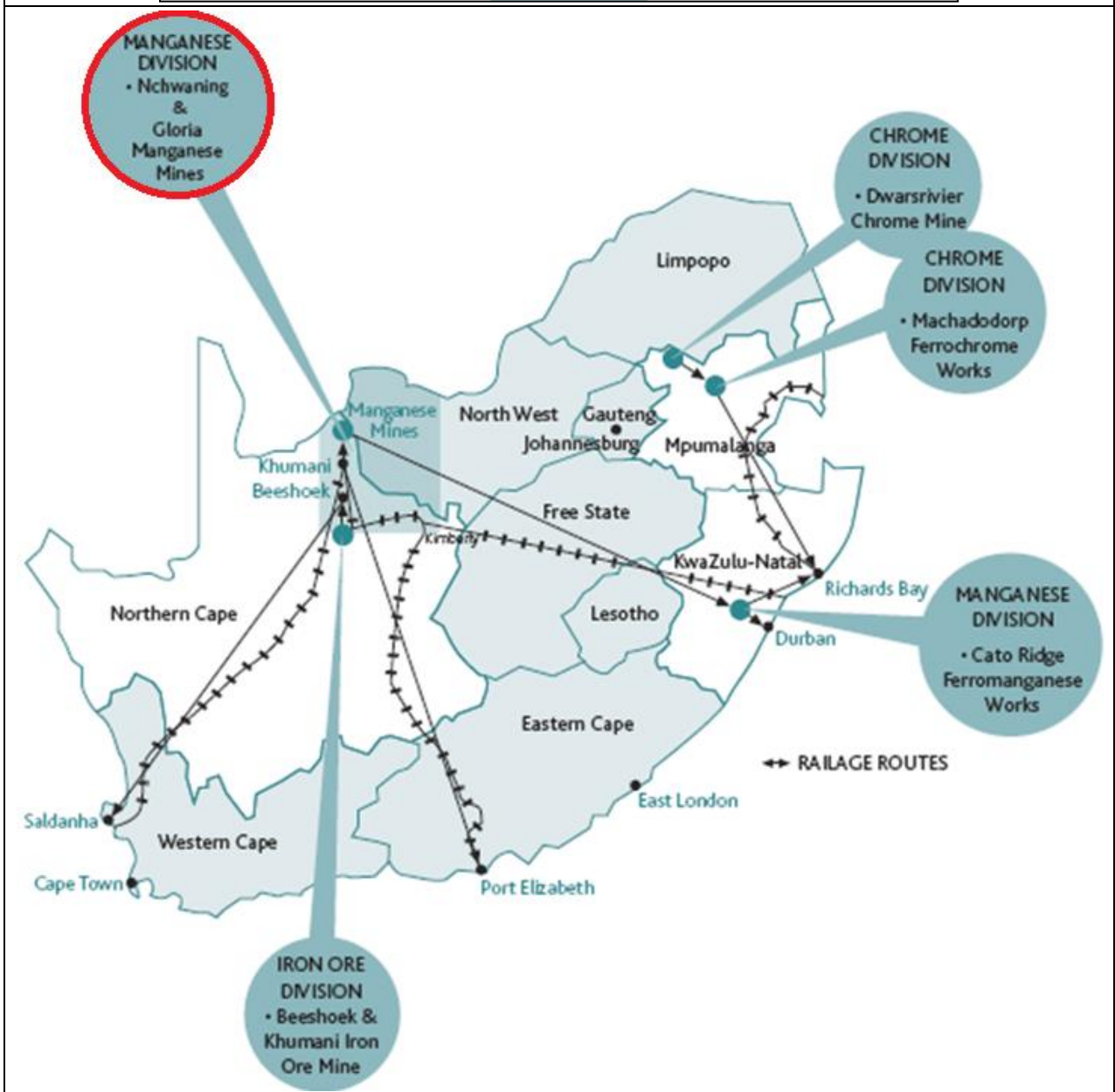
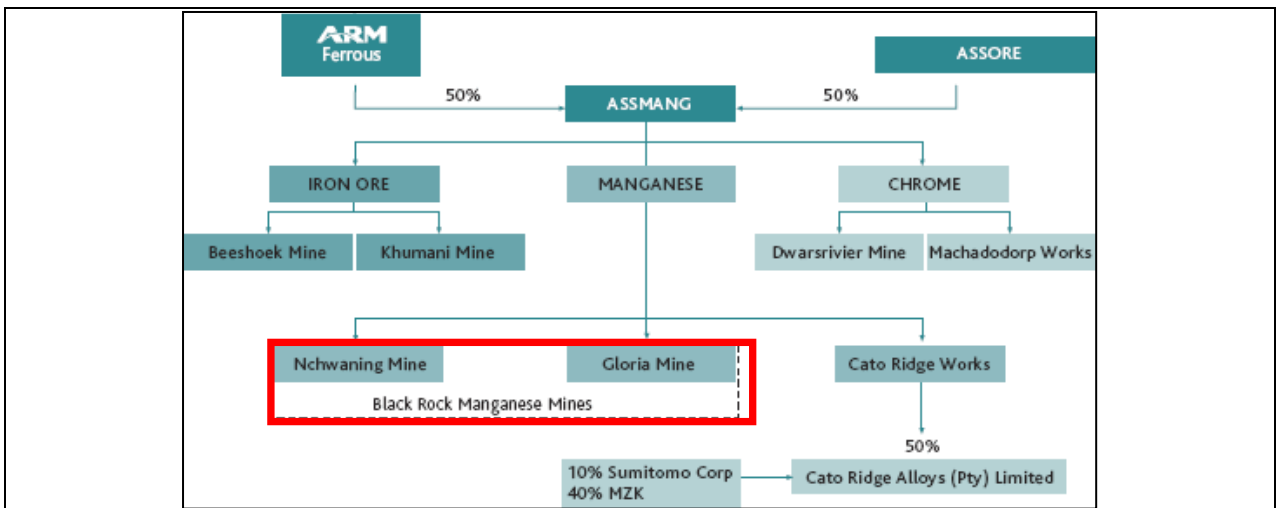
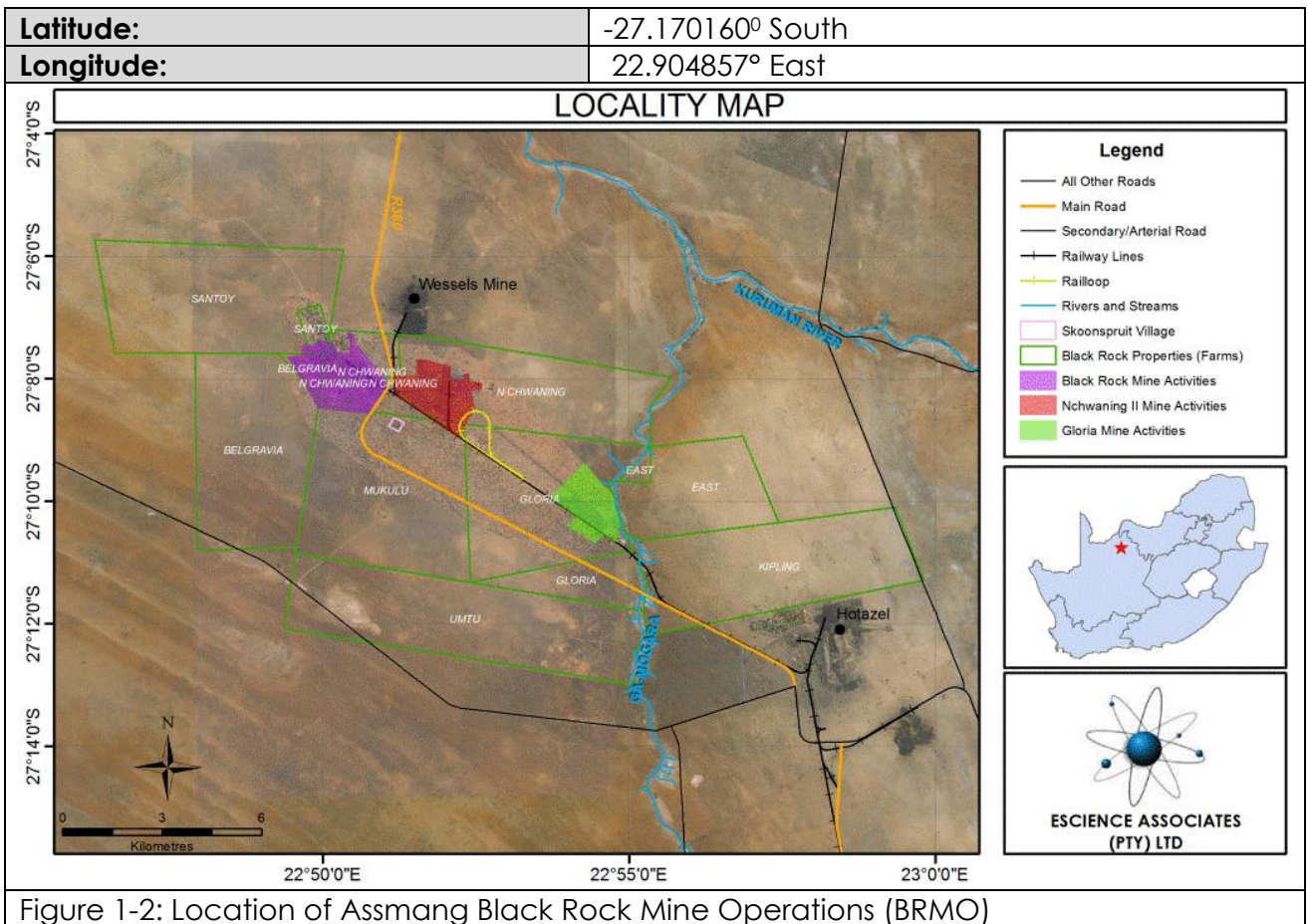


Figure 1-1: Overview of Assmang (Pty) Ltd South African Operations

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

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

EScience Associates (Pty) Ltd

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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	2 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).

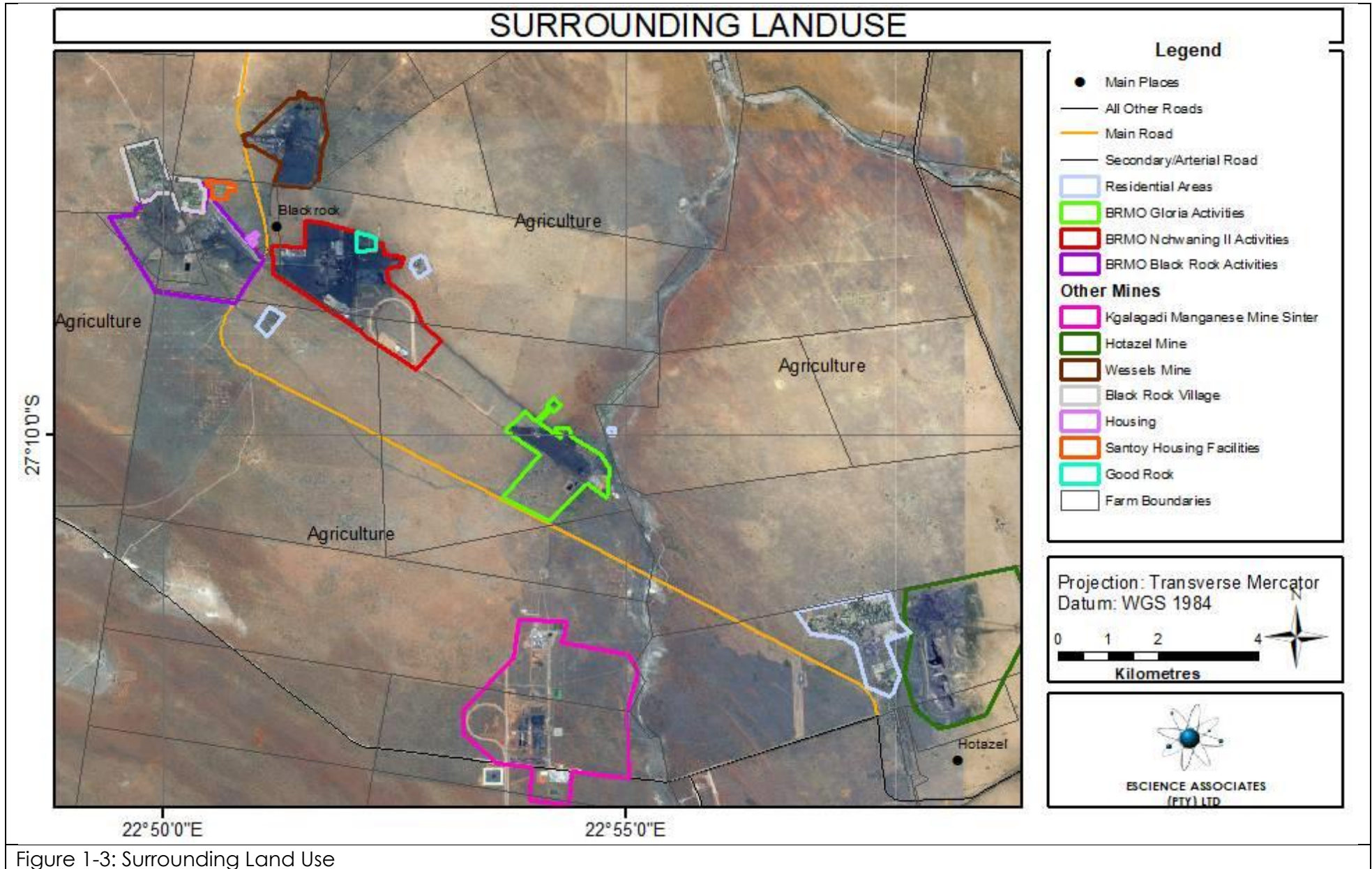


Figure 1-3: Surrounding Land Use

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

GLORIA MINE

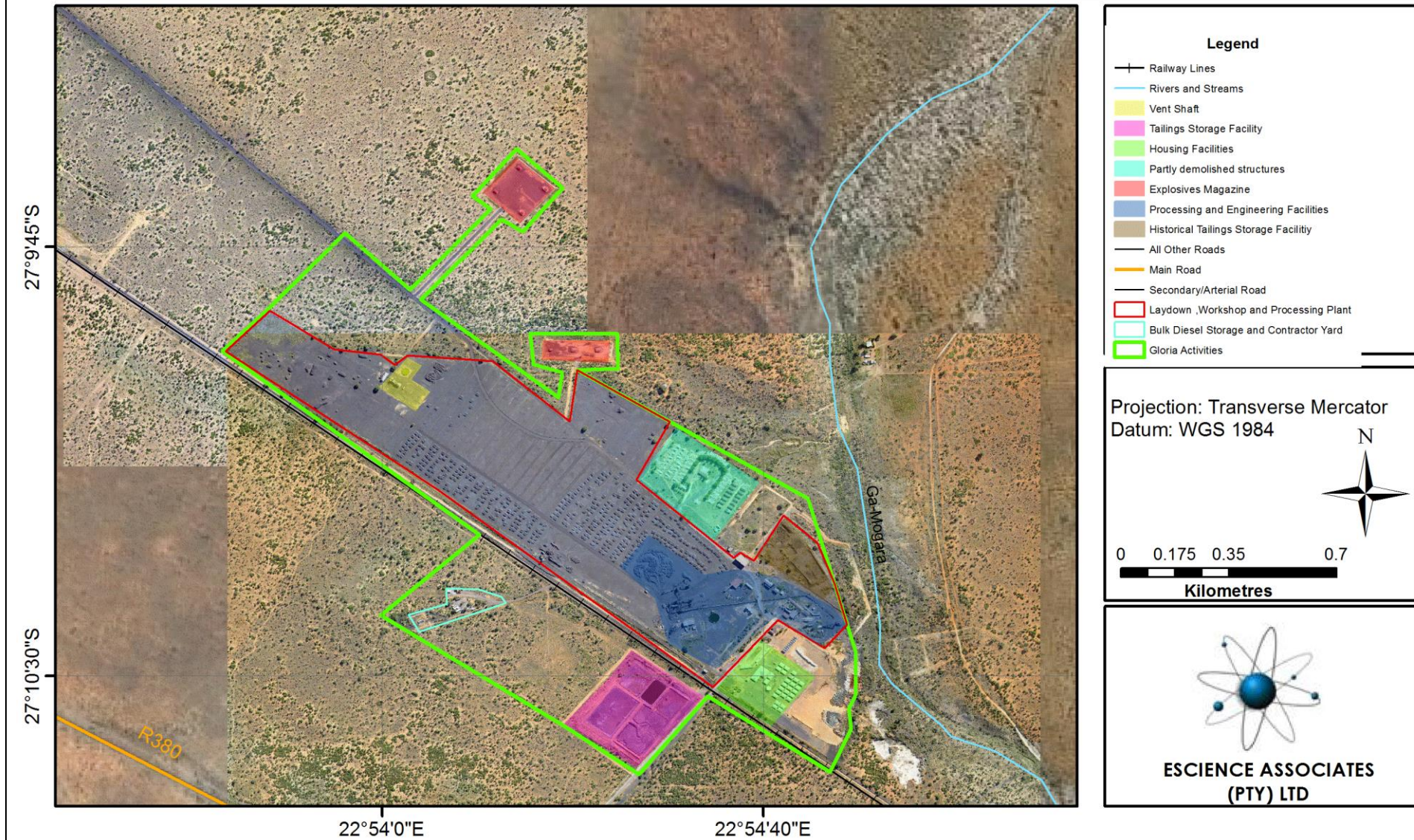


Figure 2-1: Current operations at Gloria mine

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 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

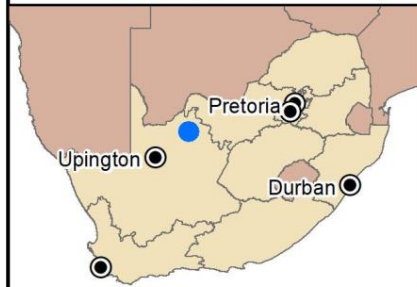
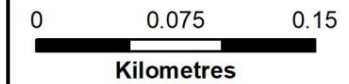


Legend

- 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	
Outcome	Location 1	+7	Location 2	-3	

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 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>Activity No. 34: 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">(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;(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(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.; <p>REASON: 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 ² /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 N^o 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 ₁₀	24-hours	75	4
	Annual	40	0
NO ₂	1-hour	200	88
	Annual	40	0
SO ₂	10-min (running)	500	526
	1-hour	350	88
	24-hours	125	4
	Annual	50	0
CO	1-hour	30	88
	8-hours (running) [^]	10	11
Pb	Annual	0.5	0
* FOE – Permitted Frequency of Exceedance in occurrences per year			
[^] Calculated on 1-Hourly averages.			

The Ministry of Water and Environmental Affairs further published limits for PM_{2.5} on the 29th 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 _{2.5}	24-hours	60	4	immediate
		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 000m² 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 000m² 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, although some portions of the land have previously been disturbed the area largely consists of undisturbed 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.

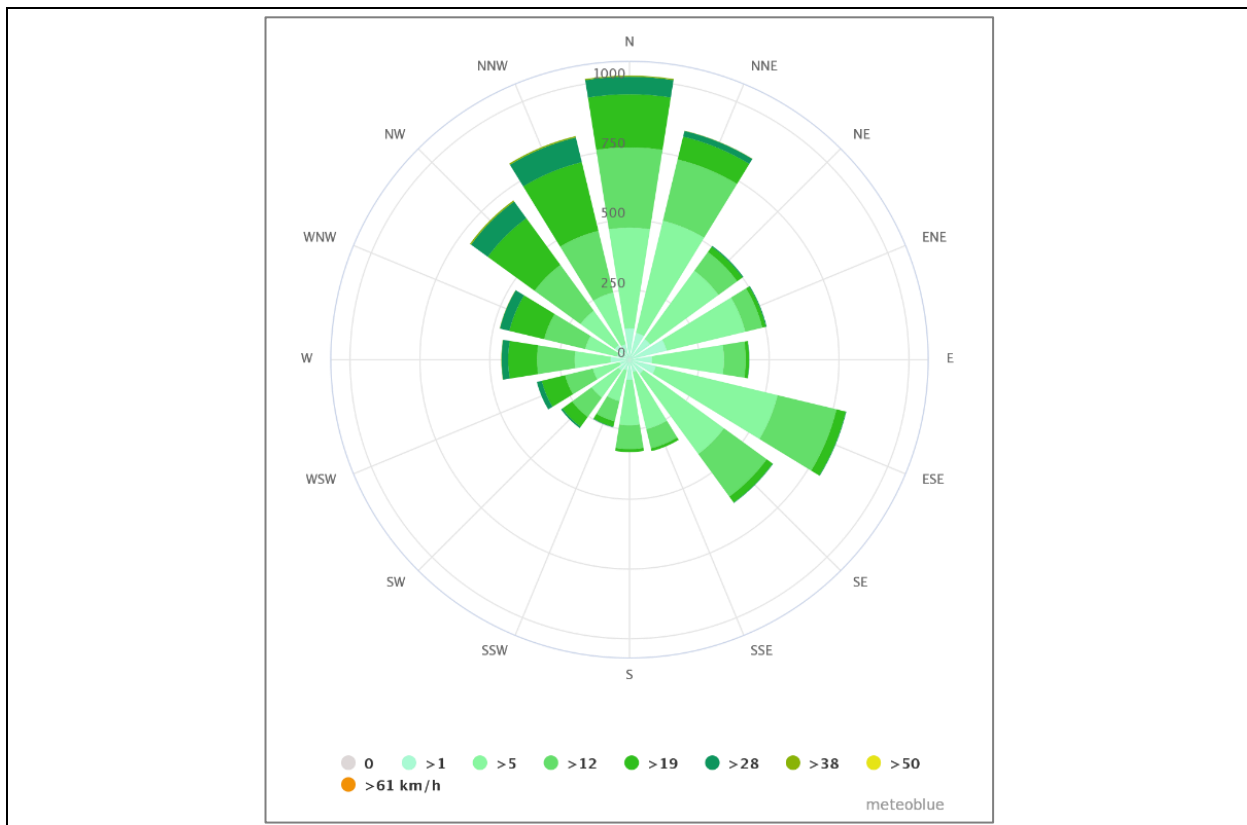


Figure 5-1: Annual wind rose for Kuruman (right) (<https://www.meteoblue.com>)

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.

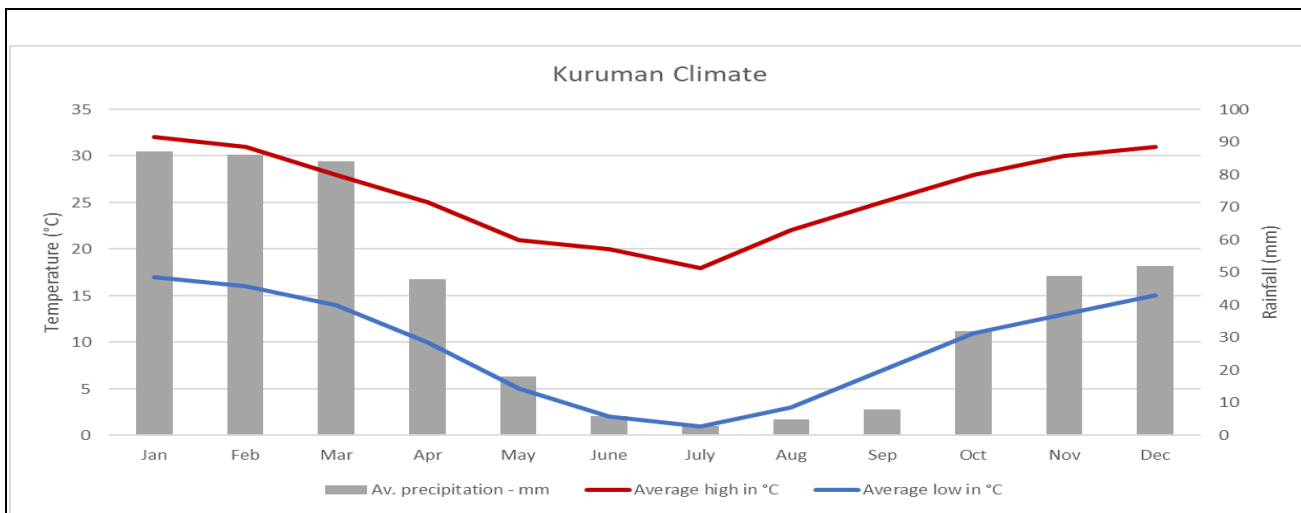


Figure 5-2: Monthly average temperature and rainfall for Kuruman (<https://www.climatedata.eu>)

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.

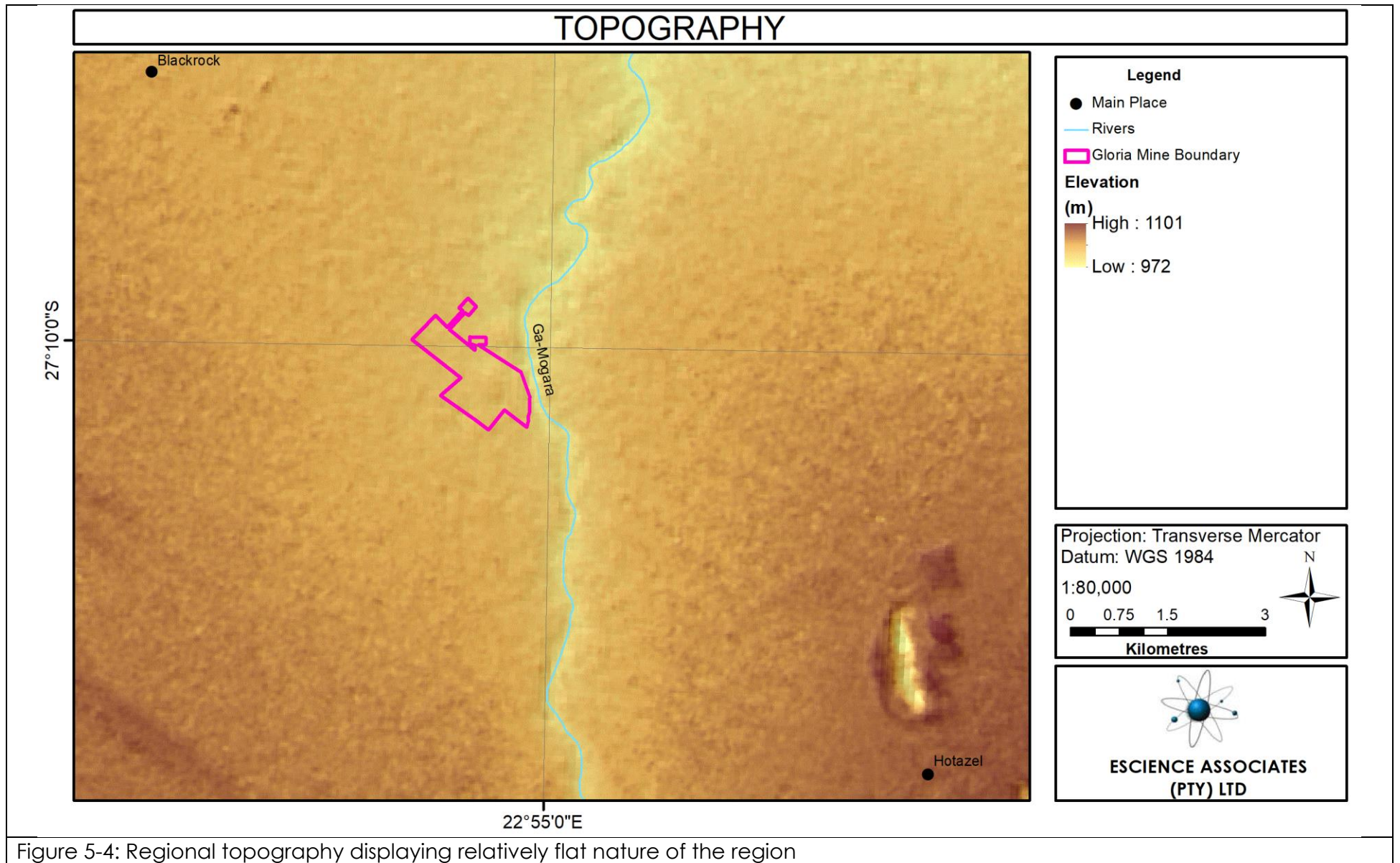
Month	Kuruman-D4E004		Olifantshoek-D4E002	
	Rainfall (mm)	Evaporation (mm)	Rainfall (mm)	Evaporation (mm)
January	26.4	236.3	19	234.9
Feb	45.1	243.6	27.4	266.6
March	44.9	272.7	32.7	293.2
April	85.6	259	59.6	276.1
May	82.9	208.4	52.1	221.6
June	86.5	161.3	63.3	191.9
July	45.1	122.3	33.4	139.8
August	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
Annual	465.9	2118.1	321.4	2212.8
Water Balance*	-1652		-1891	

* 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



5.1.6 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.

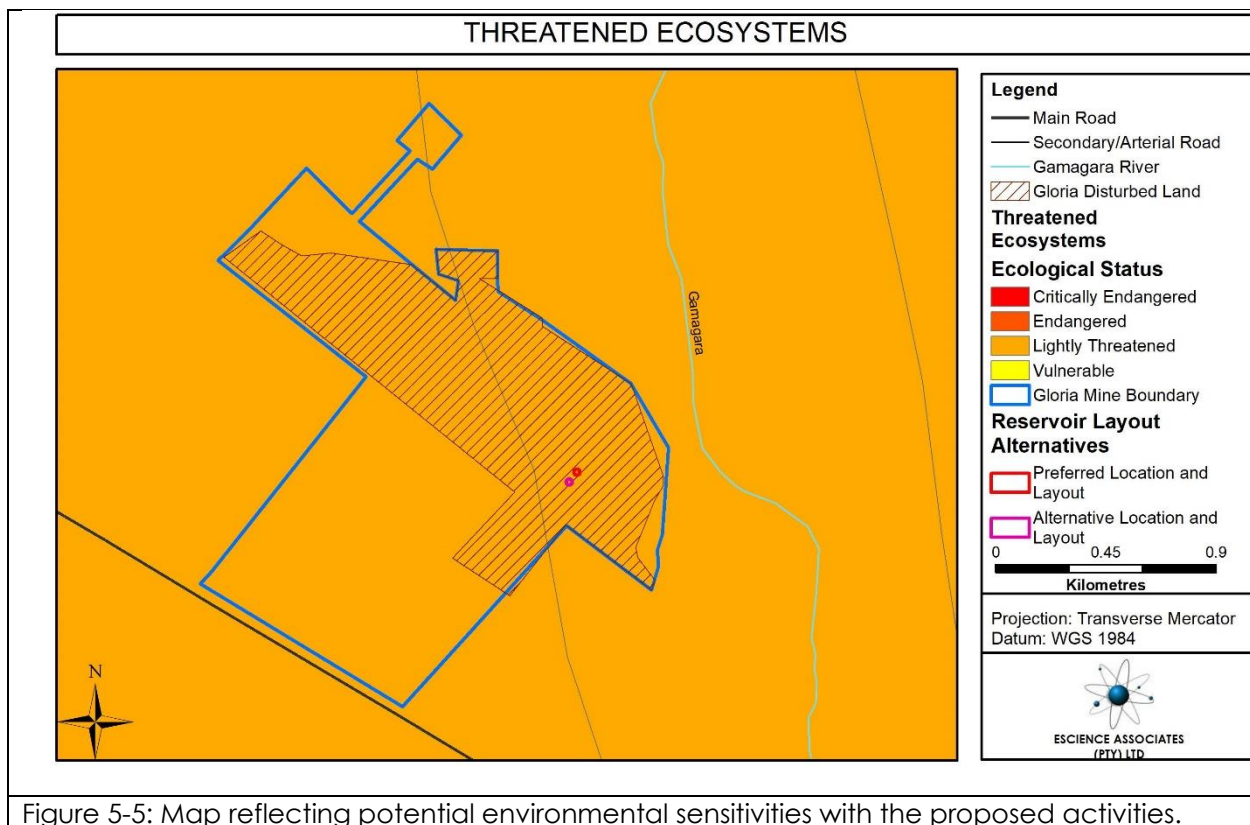


Figure 5-5: Map reflecting potential environmental sensitivities with the proposed activities.

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.

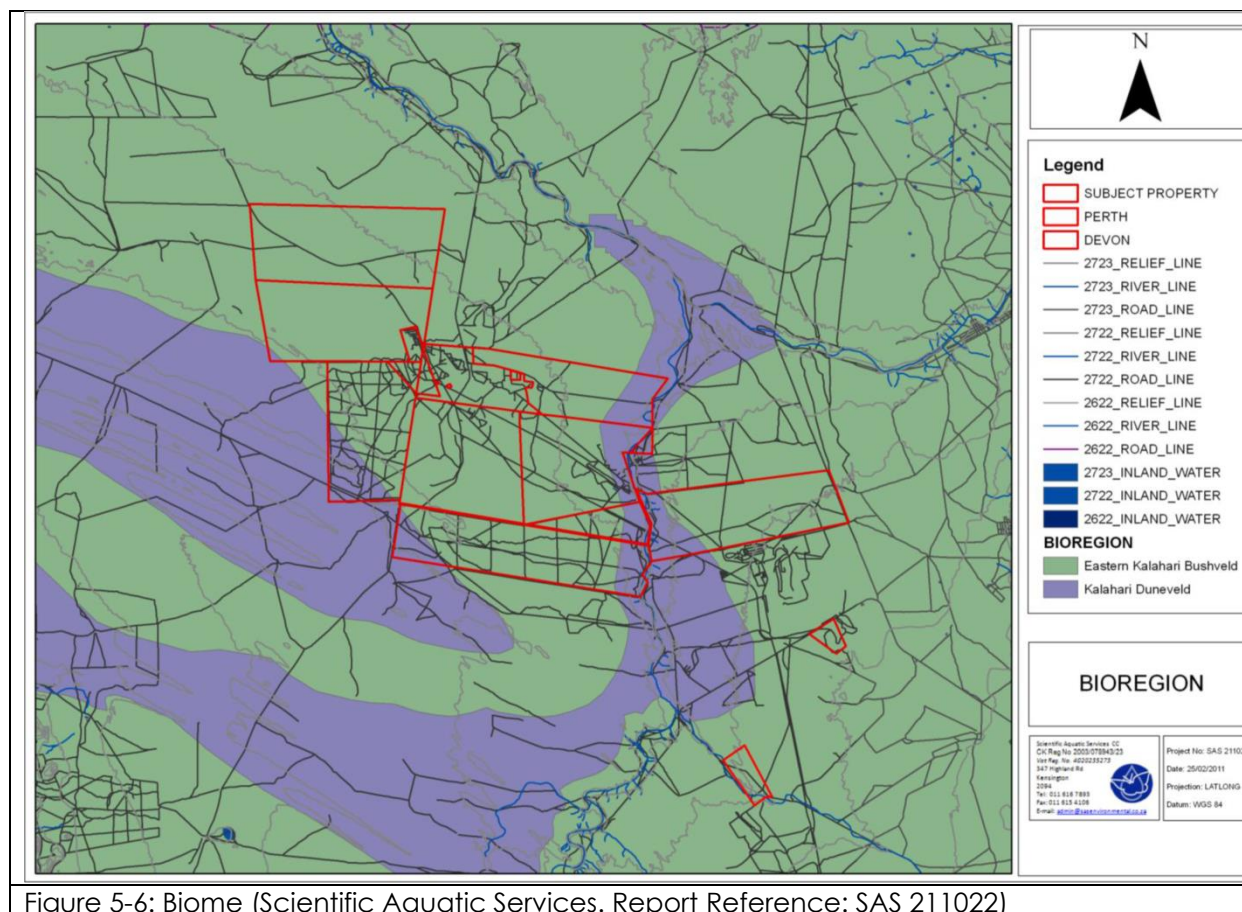


Figure 5-6: Biome (Scientific Aquatic Services. Report Reference: SAS 211022)

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	Cyanobacterial 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 m². 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.

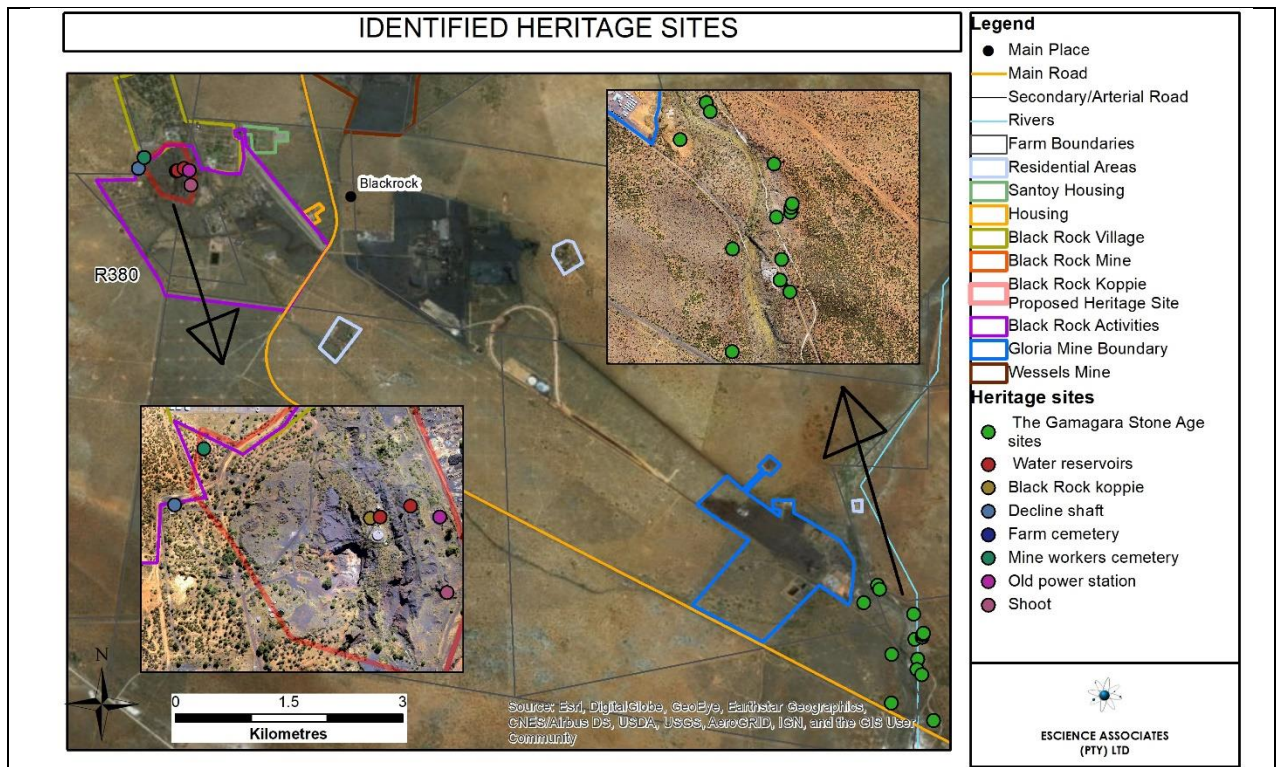


Figure 5-8: Identified archaeological sites



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.

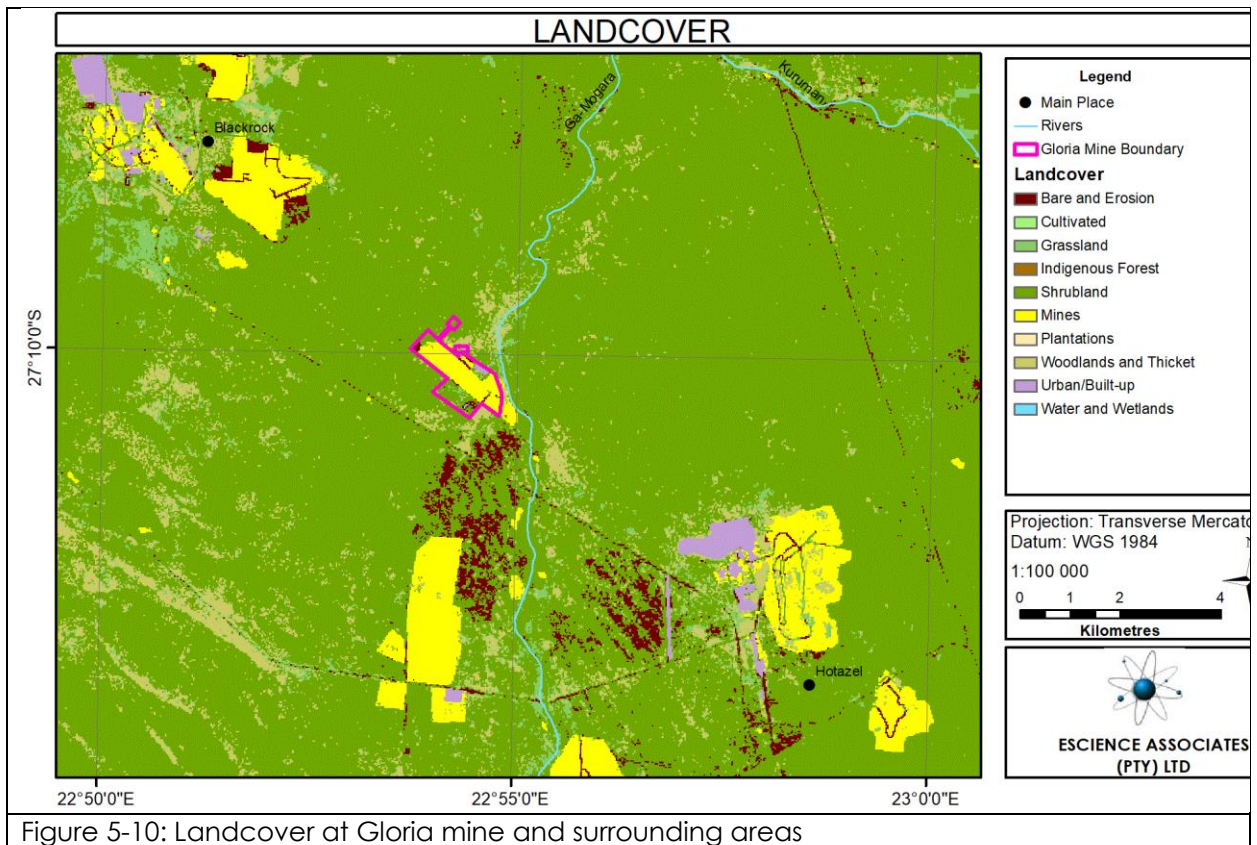


Figure 5-10: Landcover at Gloria mine and surrounding areas

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:

- 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
N-nature	positive	negative	-	-	-	-
E-extent	-	site	local	municipal	provincial	national
D-duration	-	very short	short	moderate	long	very long
I-intensity	-	negligible	minor	moderate	major	severe
P-probability	-	unlikely	likely	Very likely	definite	-
M-mitigation	-	none	slight	moderate	good	-
H-enhancement	-	none	slight	moderate	good	-
R-reversibility	-	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

Nature (N)	Potential negative impact on water resource quality	1
Extent (E)	Site: These activities will all occur within BRMO. BRMO operates a licensed general landfill that will receive all unrecyclable general waste.	1
Duration (D)	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
Intensity (I)	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
Probability (P)	very Likely: The potential for incorrect storage of waste without proper mitigation and management in place is high.	4

Mitigation (M)	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
Reversibility (R)	Slightly reversible: Groundwater remediation is possible but is a lengthy and costly process.		3
Significance Rating without Mitigation - Negative Impact (S)	$N \times (E+D) \times I \times P \div \frac{1}{2}(M+R)$	Low	10
Significance Rating with Mitigation - Negative Impact (S)	$N \times (E+D) \times I \times P \div \frac{1}{2}(M+R)$	Negligible	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.

Nature (N)	Negative impact on water resource quality	1
Extent (E)	Locally: Localised to the site and immediate surrounds.	2

Table 6-4: Impacts on groundwater and surface water quality (Construction)		
Duration (D)	Long term: Only if a plume enters groundwater will it be a long process to remediate contaminated groundwater.	4
Intensity (I)	Minor: Natural processes or functions are not expected to be appreciably affected mainly due to the low quantities.	2
Probability (P)	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
Mitigation (M)	Well mitigated: Providing adequate bunded facilities, for storage will largely reduce the potential for soil and groundwater contamination.	4
Reversibility (R)	Slightly reversible: Groundwater remediation is possible but is a lengthy and costly process.	2
Significance Rating without Mitigation - Negative Impact (S)	$N \times (E+D) \times I \times P \div \frac{1}{2}(M+R)$	Negligible 8
Significance Rating with Mitigation - Negative Impact (S)	$N \times (E+D) \times I \times P \div \frac{1}{2}(M+R)$	Negligible 4

Table 6-5: Impacts on soil (Construction)		
Nature (N)	Direct Negative impact on the site	1
Extent (E)	On site	1
Duration (D)	Short term: Potential impact addressed immediately	2
Intensity (I)	Minor: Natural processes or functions are not expected to be appreciably affected	2
Probability (P)	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
Mitigation (M)	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)		
Reversibility (R)	Moderately reversible: the impact requires that effort is taken immediately after the impact	3
Significance Rating without Mitigation - Negative Impact (S)	$N \times (E+D) \times I \times P \div \frac{1}{2}(M+R)$	Negligible 3
Significance Rating with Mitigation - Negative Impact (S)	$N \times (E+D) \times I \times P \div \frac{1}{2}(M+R)$	Negligible 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.

Table 6-6: Impacts on Air Quality (Construction)			
Nature (N)	Negative impact on ambient air quality.		1
Extent (E)	Locally: Localised to the site and immediate surrounds		2
Duration (D)	Short term: Construction phase (conservatively anticipated for up to 6 months)		2
Intensity (I)	Minor: Natural processes or functions will hardly be affected		2
Probability (P)	Likely: There is a possibility that the impact will occur, to the extent that provisions must be made for it [2]		2
Mitigation (M)	Well mitigated: Effective dust suppression methods readily available		4
Reversibility (R)	Irreversible: Not practical to reverse the impact once it has occurred		1
Significance Rating without Mitigation - Negative Impact (S)	$N \times (E+D) \times I \times P \div \frac{1}{2}(R)$	Low	16
Significance Rating with Mitigation - Negative Impact (S)	$N \times (E+D) \times I \times P \div \frac{1}{2}(M+R)$	Negligible	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)			
Nature (N)	Negative impact on site		1
Extent (E)	On site: Localised to the site		1
Duration (D)	Short term: Construction phase (conservatively anticipated for up to 6 months)		2
Intensity (I)	Minor: The facility is within a mining area and there are no nearby noise receptors outside of the facility		2
Probability (P)	Likely: It is likely that noise will be generated to an extent that mitigation measures should be considered		2
Mitigation (M)	Well mitigated: To be limited to normal working hours, in accordance with locally applicable by-laws.		4
Reversibility (R)	Irreversible: The status quo will return to the previous status quo upon completion of construction.		1
Significance Rating without Mitigation - Negative Impact (S)	$N \times (E+D) \times I \times P \div \frac{1}{2}(R)$	Low	12
Significance Rating with Mitigation - Negative Impact (S)	$N \times (E+D) \times I \times P \div \frac{1}{2}(M+R)$	Negligible	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		
Nature (N)	Negative impact on vegetation	1
Extent (E)	Existing Site only. No new disturbed areas.	1
Duration (D)	Very long term. The mine has a predicted lifespan past 2038.	5

Intensity (I)	Negligible: No new disturbed areas.		1
Probability (P)	Likely: The probability of a clearance is likely if alternative 2 is selected as the preferred location.		1
Mitigation (M)	None. Mitigation not required.		1
Reversibility (R)	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
Significance Rating without Mitigation - Negative Impact (S)	$N \times (E+D) \times I \times P \div \frac{1}{2}(M+R)$	Negligible	2.4
Significance Rating with Mitigation - Negative Impact (S)	$N \times (E+D) \times I \times P \div \frac{1}{2}(M+R)$	Negligible	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.

Nature (N)	Positive impact on job creation.	-0.25	
Extent (E)	Local: Expected to have an impact beyond the vicinity of the site.	2	
Duration (D)	The duration of the construction will be short term	2	
Intensity (I)	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	
Probability (P)	Likely: Impact will likely occur	2	
Enhancement (H)	Moderate enhancement, in the form of the proponent making a concerted effort to employ workers from the surrounding areas, can be applied.	3	
Significance Rating -Positive Impact (S)	$N \times (E+D) \times I \times P \times (H)$.	Low	-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 m³) in comparison to those assessed for the site wide report (well over 50 000m³) 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)		
Nature (N)	Direct Negative impact on the site	1
Extent (E)	On site	1
Duration (D)	Short term: Potential impact addressed immediately	2
Intensity (I)	Negligible: Natural processes or functions are not expected to be appreciably affected	1
Probability (P)	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
Mitigation (M)	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
Reversibility (R)	Moderately reversible: the impact requires that effort is taken immediately after the impact	3
Significance Rating without Mitigation - Negative Impact (S)	$N \times (E+D) \times I \times P \div \frac{1}{2}(R)$ Negligible	3
Significance Rating with Mitigation - Negative Impact (S)	$N \times (E+D) \times I \times P \div \frac{1}{2}(M+R)$ Negligible	1.7

Table 6-11: Impacts on soil (Operation)		
Nature (N)	Direct Negative impact on the site	1
Extent (E)	On site	1
Duration (D)	Short term: Potential impact addressed immediately	2
Intensity (I)	Minor: Natural processes or functions are not expected to be appreciably affected	1
Probability (P)	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
Mitigation (M)	Well mitigated: The potential for these impacts can largely be prevented by the recommended mitigatory measures that follow.	4
Reversibility (R)	Moderately reversible: the impact requires that effort is taken immediately after the impact	3

Table 6-11: Impacts on soil (Operation)			
Significance Rating without Mitigation - Negative Impact (S)	$N \times (E+D) \times I \times P \div \frac{1}{2}(M+R)$	Negligible	3
Significance Rating with Mitigation - Negative Impact (S)	$N \times (E+D) \times I \times P \div \frac{1}{2}(M+R)$	Negligible	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)			
Nature (N)	Negative impact on ambient air quality.		1
Extent (E)	Site: Within the site		1
Duration (D)	Long term: these impacts (if they occur) will occur as long as the mine is in operation.		5
Intensity (I)	Negligible: Natural processes or functions are not expected to be appreciably affected.		1
Probability (P)	Unlikely: No emissions of potential significance are expected during the operational.		1
Mitigation (M)	No potentially significant emissions are expected thus no practical mitigation has been identified.		1
Reversibility (R)	Reversible: The status quo will return to the previous status quo upon cessation of operation.		4
Significance Rating without Mitigation - Negative Impact (S)	$N \times (E+D) \times I \times P \div \frac{1}{2}(M+R)$	Negligible	4
Significance Rating with Mitigation - Negative Impact (S)	$N \times (E+D) \times I \times P \div \frac{1}{2}(M+R)$	Negligible	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)		
Nature (N)	Negative impact.	1
Extent (E)	Site: Localised to the site.	1
Duration (D)	Long term: these impacts will occur as long as the mine is in operation.	5
Intensity (I)	Negligible: Natural processes or functions are not expected to be appreciably affected.	1
Probability (P)	Likely: The water pumps will produce noise.	2
Mitigation (M)	Moderate: The installation of new pumps and maintenance procedures will maintain noise at low levels.	3
Reversibility (R)	Reversible: The status quo will return to the previous status quo upon cessation of operation.	1
Significance Rating without Mitigation - Negative Impact (S)	$N \times (E+D) \times I \times P \div \frac{1}{2}(M+R)$	Low 12
Significance Rating with Mitigation - Negative Impact (S)	$N \times (E+D) \times I \times P \div \frac{1}{2}(M+R)$	Negligible 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)		
Nature (N)	Negative impact on vegetation	1
Extent (E)	Existing Site only. No new disturbed areas.	1
Duration (D)	Very long term. The mine has a predicted lifespan past 2038.	5
Intensity (I)	Negligible: No new disturbed areas.	1

Probability (P)	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
Mitigation (M)	None. Mitigation not required.		1
Reversibility (R)	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
Significance Rating without Mitigation - Negative Impact (S)	$N \times (E+D) \times I \times P \div \frac{1}{2}(M+R)$	Negligible	2.4
Significance Rating with Mitigation - Negative Impact (S)	$N \times (E+D) \times I \times P \div \frac{1}{2}(M+R)$	Negligible	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.

Nature (N)	Positive impact on job creation	-0.25
Extent (E)	Municipal	3
Duration (D)	Very long term: applicable for the life of the mine.	5
Intensity (I)	Minor: This will largely be a maintenance of current contributions.	2
Probability (P)	Definite	4
Enhancement (H)	Unenhanced: continuation of existing processes	1
Significance Rating - Positive Impact (S)	$N \times (E+D) \times I \times P \times (H).$	Low (Positive) -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)			
Nature (N)	Indirect negative impact on landfill airspace availability.		1
Extent (E)	Municipal: Use of airspace that would otherwise be available to other users in the municipality		3
Duration (D)	Very long term – Waste will be permanently placed in landfill		5
Intensity (I)	Negligible: The anticipated impact will be negligible, with a very little effect on relative airspace availability.		1
Probability (P)	Definite: The generation of waste during the decommissioning phase is largely unavoidable (the amount generated can, however, be managed)		4
Mitigation (M)	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
Reversibility (R)	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
Significance Rating without Mitigation - Negative Impact (S)	$N \times (E+D) \times I \times P \div \frac{1}{2}(R)$	Low	16
Significance Rating with Mitigation - Negative Impact (S)	$N \times (E+D) \times I \times P \div \frac{1}{2}(M+R)$	Negligible	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

Nature (N)	Negative impact on water resource quality	1
Extent (E)	Locally: Localised to the site and immediate surrounds	2
Duration (D)	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
Intensity (I)	Minor: Natural processes or functions are not expected to be appreciably affected. Contaminants that have a possibility of entering groundwater are small	2
Probability (P)	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.	
Mitigation (M)	Well mitigated: Providing adequate bunded facilities, for storage will largely reduce the potential for soil and groundwater contamination.	4
Reversibility (R)	Slightly reversible: Groundwater remediation is possible but is a lengthy and costly process.	2
Significance Rating without Mitigation - Negative Impact (S)	$N \times (E+D) \times I \times P \div \frac{1}{2}(R)$	Negligible 8
Significance Rating with Mitigation - Negative Impact (S)	$N \times (E+D) \times I \times P \div \frac{1}{2}(M+R)$	Negligible 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.

Nature (N)	Negative impact on ambient air quality.		1
Extent (E)	Locally: Localised to the site and immediate surrounds		2
Duration (D)	Short term: Decommissioning phase (conservatively anticipated for up to 6 months)		2
Intensity (I)	Minor: Natural processes or functions will hardly be affected		2
Probability (P)	Likely: There is a possibility that the impact will occur, to the extent that provisions must be made for it [2]		2
Mitigation (M)	Well mitigated: Effective dust suppression methods readily available		4
Reversibility (R)	Irreversible: Not practical to reverse the impact once it has occurred		1
Significance Rating without Mitigation - Negative Impact (S)	$N \times (E+D) \times I \times P \div \frac{1}{2}(R)$	Low	16
Significance Rating with Mitigation - Negative Impact (S)	$N \times (E+D) \times I \times P \div \frac{1}{2}(M+R)$	Negligible	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)			
Nature (N)	Negative impact on site		1
Extent (E)	On site: Localised to the site		1
Duration (D)	Short term: Construction phase (conservatively anticipated for up to 6 months)		2
Intensity (I)	Minor: The facility is within a mining area and there are no nearby noise receptors outside of the facility		2
Probability (P)	Likely: It is likely that noise will be generated to an extent that mitigation measures should be considered		2
Mitigation (M)	Well mitigated: To be limited to normal working hours, in accordance with locally applicable by-laws.		4
Reversibility (R)	Irreversible: The status quo will return to the previous status quo upon completion of construction.		1
Significance Rating without Mitigation - Negative Impact (S)	$N \times (E+D) \times I \times P \div \frac{1}{2}(R)$	Low	12
Significance Rating with Mitigation - Negative Impact (S)	$N \times (E+D) \times I \times P \div \frac{1}{2}(M+R)$	Negligible	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

0 0.075 0.15

Kilometres



Projection: Transverse Mercator
Datum: WGS 1984



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(PTY) LTD

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 m².

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 22nd of March 2019 and in the Kathu Gazette on the 22nd 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:

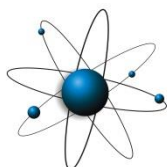
- The information herein is true and correct to the best of our knowledge;
- The EAP has kept a register of all interested and affected parties that participated in a public participation process;
- The EAP has ensured that information containing all relevant facts in respect of the application is distributed 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.

NAME OF EAP

SIGNATURE OF EAP

DATE

APPENDIX 1: EAP CURRICULUM VITAE



EScience Associates
9 Victoria Road, Oaklands
Johannesburg, 2192
Tel: +27 (0)11 718 6380

Curriculum Vitae:

Abdul
Ebrahim

Surname: Ebrahim
Name: Abdul
Date of birth: 07 December 1977
Residency: RSA
Position: Director
Key Qualifications: BEng (Hons) Environmental, BEng (Hons) Mechanical

Contact details

☎: 011 7186380/ 072 268 1119
✉: abdul@escience.co.za

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), International Association of Impact Assessment SA (IAIASa), 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.

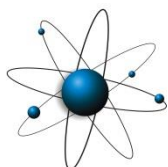
Education

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

Languages

English (excellent speaking and writing)

Limited French and Portuguese



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Curriculum Vitae:

Abdul
Ebrahim

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

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

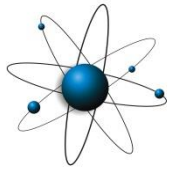
1. AIR QUALITY MANAGEMENT:

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.
- Ekurhuleni Metropolitan Municipality - Development of an Air Quality Management Plan (AQMP)
- Nkangala District Municipality - Development of an Air Quality Management Plan (AQMP)
- North West Province - development of provincial emissions inventory (PM, NO_x, SO₂ 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)

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.

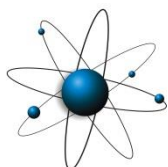
- Lanxess CISA Chrome Chemicals Plant Expansion, CO₂ generation, Power Generation and hazardous waste treatment and recovery
- Samancor Chrome Proposed Chrome Chemicals plant
- Karbochem (Synthetic Rubber Manufacture) proposed Power Generation Plant
- PPC Cement Slurry Cement Plant Expansion
- PPC Cement 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

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



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Curriculum Vitae:

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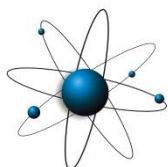
- Turfontein Race Course night racing
- Alumicor secondary aluminium recovery rotary salt furnaces
- Hays Lemmerz Aluminium smelters, furnace and alloy die casting
- Plettenburg Polo Estates
- PG Bison Decorative Panels
- British Aerospace Land Based OMC Systems
- BPB Gypsum phosphogypsum plant
- Extrupet 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

5. 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



6. 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

7. ISO14001 AUDITING:

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

8. 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 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.

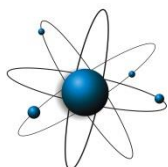
- University Of Pretoria Specialist Lecturer
 - Environmental Legal Compliance inspections and investigations (RSA)
 - Environmental Legal Compliance achievement (RSA)
 - Environmental Legal Compliance inspections and investigations (Africa)

- 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.

9. SOIL AND GROUNDWATER CONTAMINATION ASSESSMENT:



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Curriculum Vitae:

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Ebrahim

- 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

10. 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:
 - 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

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



A)



B)

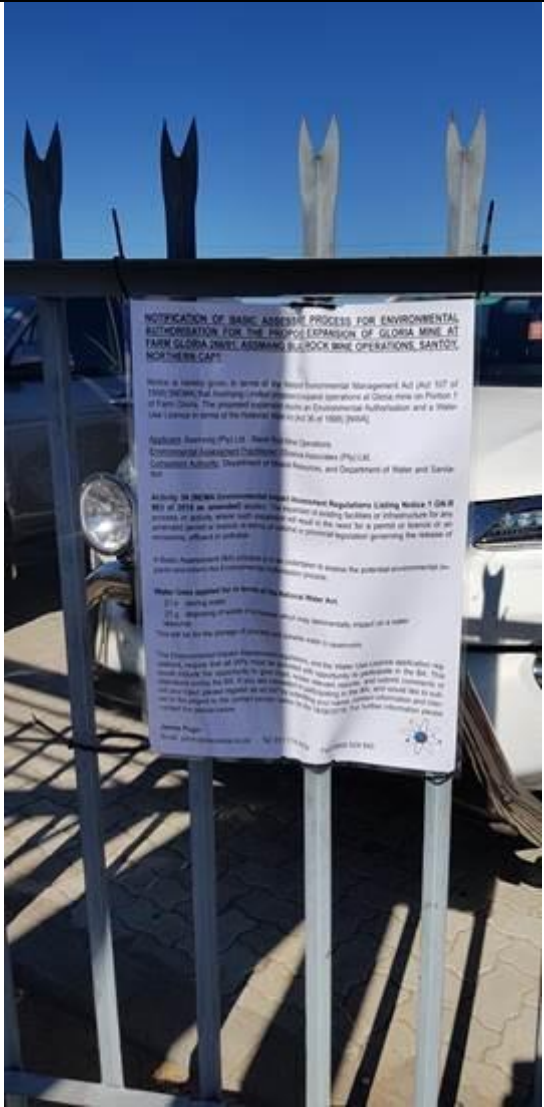


C)

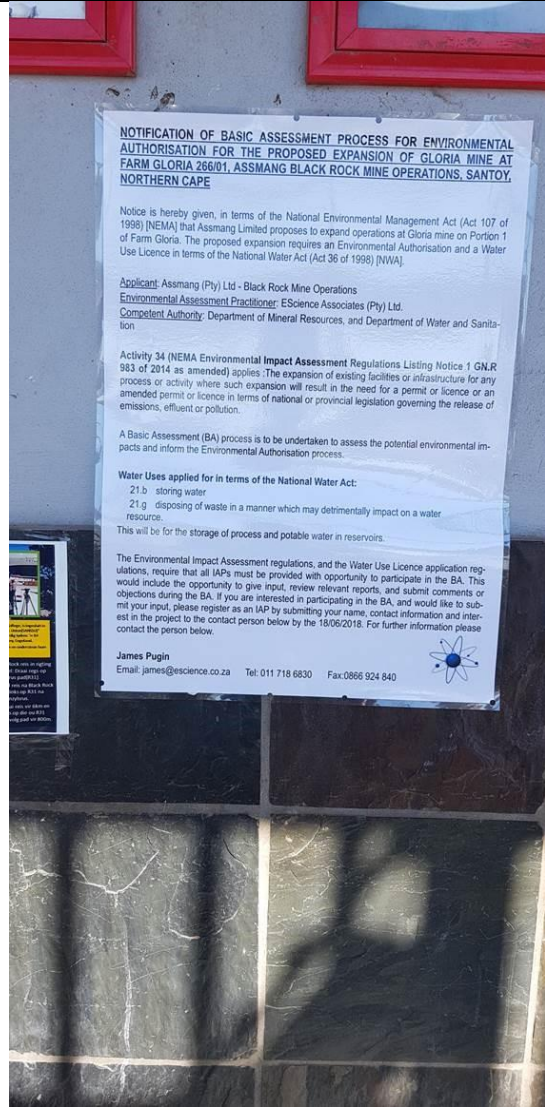
Site notices at different locations (A-Gloria Mine. B-Hotazel, C-Black Rock Superette)



A)



B)



C)

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

APPENDIX 2.2: NEWSPAPER ADVERTISEMENTS

G E K L A S S I F I S E E R D

BETREKKINGS



ASSMANG Pty Ltd – Manganese Division requires the services of the following individual at their Black Rock Mine Operations situated 80km north-west of Kuruman in the Northern Cape.



MINE ACCOUNTANT (1 VACANCY) (D1 Paterson Grading)

Preference will be given to applicants from previously disadvantaged groups to support the company's Employment Equity Plan.

Main tasks and responsibilities:

- Provide and interpret management accounting information, assistance with budget control and management information reporting
- Assist with the preparation of business plans to ensure budgets are within Exco financial targets
- Assist with capital and cash-flow forecasting
- Assist with compiling a capital application and track authorisation
- Monitor capital expenditure against the business plan and report on variances
- Assist with forecasts of probable expenditure and advise on vote changes
- Support and participate in sub-functional change management to drive transformation and optimisation
- Draw from own experience or vocational knowledge, identify and recommend initiatives aimed at eliminating waste, improved productivity and reduce operating costs within scope
- Monitor and measure monthly/quarterly/annual actual vs budget within elements and process costs and produce variance analysis and interpretations
- Develop Qlikview models to assist management decision making
- Obtain, check and refine information
- Collate and submit reports
- Run data exception reports and take corrective action
- Conduct document control spot-checks
- Identify recurring problems and derive creative solutions involving team members or use own vocational knowledge and experience to deliver on cost-saving initiatives
- Provide input into sub-functional planning
- Plan team activities
- Ensure that the operational plan is implemented
- Implement compliance requirements
- Communicate compliance changes.

Minimum requirements (essential unless otherwise indicated):

- Grade 12 Certificate
- Bachelor of Commerce Accounting
- Code B/EB driver's licence
- 5 years' cost and management accounting experience
- Systems skills which include Microsoft Office, JDE, Qlikview and Oracle
- Knowledge of management reporting, budget control as well as cost information management and reporting.

The candidate will be appointed on the condition of being certified medically fit as per the Mine Health and Safety Act, 29/1996. Preference will be given to applicants from previously disadvantaged groups to support the company's Employment Equity Plan.

Remuneration: Remuneration will be based on a competitive all-inclusive flexible package. The successful candidate that conforms to all said requirements and experience will be appointed on this grading. A candidate that does not conform to all set requirements and experience will be considered only if a suitable candidate that does comply cannot be selected and only if the requirements of the position support a developmental appointment according to policy.

Interested applicants are requested to submit their CVs with certified copies of qualifications to Barbara Kügel, e-mail: bararak@brmo.co.za

Please be advised that short-listed candidates will be required to authenticate information provided in CVs.

Applications close on 23 May 2018.

Late applications will not be entertained.

If you have not been contacted within 21 days of the closing date, please consider your application to be unsuccessful. Correspondence will only be limited to short-listed candidates.

Assmang (Pty) Limited reserves the right not to appoint.

www.humanjobs.co.za

Human Communications 141268



MAKING A DIFFERENCE FROM THE GROUND UP



South32 is a distinctive business with a leading presence in the global market. Our operations span multiple continents and offer an excellent platform for those seeking to fast-track their career. Join our dynamic business and become part of the South32 Group.

Mamatwan Mine, Northern Cape Auto-Electrician Ref. 781440

The purpose of the role is the timely installation, repair and maintenance of equipment to ensure that mining activities are executed in a safe manner, as well as the operation of equipment and testing of all working parts in a functional area to ensure proper utilisation. You must interpret and coordinate pre-work with regards to repairs, planned and predictive maintenance, perform safety inspections of equipment and assess risks on equipment, as well as ensure the upkeep of maintenance tools and equipment. It will be important to access any area safely to perform necessary maintenance on machines or equipment, as well as to maintain a clean and safe worksite.

Serious contenders will have a Grade 12 with Mathematics and Science or N3 Technical Certificate/N2 Technical Certificate (internal employees) with a recognised Auto-Electrician trade test and a minimum of 2 years' technical experience in maintenance and faultfinding on CAT machines. Thorough knowledge and understanding of VIMS systems, CAT electronic Technician (ET) and the starting and charging systems components and operations is essential. You will also need extensive knowledge of earthmoving equipment (CAT 789, 994 and 993 loader, 785/777/ADT and dozers) and workshop exposure (which includes rebuilding of machines, wiring systems, faultfinding and repairs to electrical circuits). The ability to read a parts manual and interpret electrical schematic is essential. A valid Code B driver's licence is compulsory.

Artisan Assistant Ref. 781427

Ensuring compliance with the South32 commitment to Zero Harm, you will play a key role in safely assisting artisans with plant maintenance, breakdowns and inspections. Compliance with all applicable procedures and health, safety and housekeeping standards is essential. You will participate in investigations into workplace incidents and must report any unsafe behaviour, defects, conditions and incidents to the responsible person. Pre-use inspections, routine inspections and risk assessments before all tasks (to identify risks and hazards) are part of the job. The role also involves basic use of hand tools. You must keep all equipment clean and in a good condition at all times.

Serious contenders will have a Grade 12 with Mathematics and Science, together with a minimum of 1 year's experience in mining, plus in electrical, boilermaking or fitting work, a valid Code B or CC1 driver's licence and knowledge of surface mining principles.

Please apply online by entering the preferred position reference number at our website: <http://careers.south32.net>

Applications close 1 June 2018 at 17:00.

South32 has an overriding commitment to safety and environmental responsibility.

Q141311

KENNISGEWINGS

NOTIFICATION OF BASIC ASSESSMENT PROCESS FOR ENVIRONMENTAL AUTHORISATION FOR THE PROPOSED EXPANSION OF GLORIA MINE AT FARM GLORIA 266/01, 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 Limited proposes to expand operations at Gloria Mine on Portion 1 of farm Gloria. 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 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.

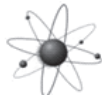
This will be for the storage of process and potable water in reservoirs.

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. If you are interested in participating in the BA and would like to submit your input, please register as an IAP by submitting your name, contact information and interest in the project to the contact person below by the 18/06/2018. For further information please contact the person below.

James Pugin
E-mail: james@escience.co.za

Tel. 011 718 6830

Fax: 0866 924 840



X1UK1FF9-KA170518

MUNISIPALITEIT KGATELOPELE

Hersiening van die Ruimtelike Ontwikkelingsraamwerk (ROR) van die Plaaslike Munisipaliteit Kgateloepel KLM2017/18/016

Kennis geskied dat die Munisipaliteit Kgateloepel beoog om die Ruimtelike Ontwikkelingsraamwerk te hersien en uit te brei in terme van die Wet op Ruimtelike Beplanning en grondgebruikers bestuurswet (wet 16 van 2013).

Die Ruimtelike Ontwikkelingsraamwerk is 'n strategiese dokument wat die doelwitte vir 'n wenslike stedelike vorm van die munisipaliteit uiteensit en wat ook strategieë en beleide identifiseer waardeur doelwitte bereik moet word. Nadere besonderhede en volledige dokumentasie sal deur die loop van die proses aan die algemene publiek vir insette en kommentaar beskikbaar gestel word. Die stadsbeplanningfirma, Macroplan (Murraylaan 4A, Upington), is aangestel deur die Munisipaliteit Kgateloepel om die projek af te handel.

Nadere besonderhede in verband met die proses en die agtergrond tot die proses is verkrygbaar vanaf die Munisipaliteit Kgateloepel (Hoof Stadsbeplanner, mnr. Thanyani Mushadu), telefoon 053 384 8600, gedurende normale kantoorure (Maandae tot Vrydae, 07:30 tot 12:30 en 13:30 tot 16:30).

U word uitgenooi om te registreer as 'n belanghebbende en geaffekteerde party vir bovermelde proses by die kantore van Macroplan Upington (Murraylaan 4A, Upington – Len Fourie en Rienie Cornelissen), telefoon 054 332 3642 gedurende normale kantoorure (Maandae tot Vrydae, 08:00 tot 13:00 en 14:00 tot 16:30), e-pos: macroplan@mweb.co.za

Die Munisipale Bestuurder
Posbus 43
Daniëlskuil
8405

Die Kalahari Bulletin: 17 Mei 2018
Provinsiale Koerant: 21 Mei 2018

KGATELOPELE MUNICIPALITY

Revision of the Spatial Development Framework (SDF) of the Kgateloepel Local Municipality KLM2017/18/016

Notice is hereby given of the intention of the Kgateloepel Municipality to review and expand the Spatial Development Framework in terms of the Spatial Planning and Land Use Management Act (Act 16 of 2013).

The Spatial Development Framework is a strategic document setting out objectives reflecting the desired spatial form of the municipality, as well as identifying strategies and policies through which to achieve such objectives. Further details and complete documentation will be made available to the general public for inputs and comments throughout the process. The town planning firm, Macroplan (4A Murray Avenue) has been appointed by the Kgateloepel Municipality to complete this project.

Further details and background to the process may be attained from the Kgateloepel Municipality (Head Town Planner, Mr Thanyani Mushadu), telephone 053 384 8600, during normal office hours (Mondays to Fridays, 07:30 to 12:30 and 13:30 to 16:30).

You are invited to register as an interested and affected party for the above-mentioned processes at the offices of Macroplan Upington (4A Murray Avenue, Upington – Len Fourie and Rienie Cornelissen), telephone 054 332 3642 during normal office hours (Mondays to Fridays, 08:00 to 13:00 and 14:00 to 16:30), e-mail: macroplan@mweb.co.za

The Municipal Manager
PO Box 43
Daniëlskuil
8405

The Kalahari Bulletin: 17 May 2018
Provincial Gazette: 21 May 2018

X1UK1EHM-KA170518

KENNISGEWING

In die boedel van wyle JACOB STEYN DE KLERK, Identiteitsnommer: 5410235086085, wyle JACOB STEYN DE KLERK, in lewe 'n Pensioenaris, wie oorlede is op 21 Februarie 2018 en was woonagtig te Kokerboomstraat 60, Kathu, 8446.

BOEDELNOMMER: 1020/2018

Krediteure en Debiteure in bogenoemde boedel word hiermee versoek om hulle eise in te dien en hulle skulde te betaal by die kantore van die ondergenoemdes binne 'n tydperk van 30 dae vanaf datum van publikasie van hierdie kennisgewing.

OOSTHUIZEN, SWEETNAM & REITZ
 Prokureurs vir die Eksekuteur
 Posbus 497, Rietbokstraat, Kathu 8446



Kudumane Manganese Resource (KMR) is a Manganese mining company in the Northern Cape 60km NW of Kuruman. KMR is a producer and exporter of manganese ore. KMR's management philosophy is the long term partnership with all stakeholders including customers, investors, employees and the communities

**INTERNAL / EXTERNAL ADVERT
 TENDER NOTIFICATION
 (Hotazel)**

Tender notification for the Supply and construction of perimeter fences at Kudumane Manganese Resources:

1. Tender 2018/FEN/005 for the supply and construction of perimeter fences at Kudumane Manganese Resources
2. Tender clarification site meeting to be held 10:00am on 17 May 2018 at KMR, Farm 297 York, Hotazel.
3. RSVP company details and representative details to khaya.mvambo@asia-minerals.com before 16:00 on 14 May 2018.
4. Scope of Work
 - 4.1 Erecting a 2,7m high game fencing off approximately 5,5km on three different location on KMR's farms located near Hotazel
5. All tender documents will be handed out at site clarification meeting.
6. Prequalification Requirements
 - BBBEE of at least level 3 with 26.1% ownership
 - Current SARS tax Clearance
 - Current Letter of Good Standing with COIDA Workman's Compensation
 - Contactable reference of similar fencing construction works

Mine contact person:
Khaya Mvambo
 053 742 3514
 khaya.mvambo@asia-minerals.com

NUMBER IMSE-HR-FOR-020/ BOILERMAKER	HUMAN RESOURCES	IMSM ENGINEERING
--	------------------------	----------------------------

NOTIFICATION OF PERMANENT EMPLOYMENT

POSITION: BOILERMAKER
REPORTS TO: Representative/ Northern Cape Service Centre
LOCATION: Kathu/ Northern Cape
DATE: 08.05.2018
POSITION REQUIREMENTS: Boilermaker
QUALIFICATION: National Diploma (or equivalent certificate) – Boilermaker
EXPERIENCE: Minimum three years

- REQUIRED SKILLS:**
- Knowledge of the Mining Industry
 - Knowledge of crushing equipment
 - Technical aptitude
 - Competent in MS Office
 - Driver's Licence (needs to drive in Red Permit Area/ telescopic Boom handler)
 - Excellent communication skills on all levels
 - Physically fit to work on crushing equipment
 - Own transport

- KEY RESPONSIBILITIES:**
- Fabricate components from drawings/specifications or draw own drawings for fabrication from instructions/client requests
 - Perform welding, gas cutting and heating on replacement parts as needed during maintenance of equipment
 - Fabrication and welding comply to benchmarked engineering standards
 - Responsible for all mechanical and technical refurbishments and servicing on entire product line
 - Installation of new and refurbished crushers and parts on site
 - Assist engineering personnel with final commissioning of new equipment
 - Complete fault finding on above equipment
 - Compile reports on their findings and suggest recommendations
 - Applicable administration is processed
 - Complete timesheets and submit
 - Stripping of components and cleaning for inspection purposes.
 - Action safety talks and assist with training of subordinates
 - Compile job risk assessments and assistance is in line with SHE standards
 - Assist with mobilizing and demobilizing equipment on site.
 - Assist with general activities as may be required from time to time.
 - Assisting supervisor by means of acting in absence and accepting full responsibility
 - Providing support to team members in addressing complex maintenance tasks/problems
 - Complete any ad hoc duties as and when required

APPLICATION DEADLINE: 31 May 2018
E-MAIL APPLICATIONS TO: ilinzbacher@imgroup.co.za

Continued from page 1

KURUMAN



Minimum wage receives COSATU signature

Victor Mulangisi

The joint memorandum was handed to SAPS Cluster Commander General Johan Bean, the Executive Mayor Sofia Mosikatsi and the District Manager in the Department of Health Ms Kautsane. Reading the memorandum is the background is the National Treasurer of COSATU, behind her is Nyameka Macanda an Executive Member of COSATU and carrying the microphone is Mothusi Gaborokwe the Regional Chairperson of COSATU.

The annual International Workers' Day, May 01, 2018 was celebrated in a gigantic way as national, provincial and regional gurus descended on Kuruman town to lobby for discipline and unity within various sectors of the party, government and labour unions, while on the other hand, cautioning the broader private sector employers to align themselves with the call for better wages and salaries not based on racial lines.

Service delivery deficiencies within departments, municipalities and mines were the centres of attraction and appeal.

A combined memorandum was handed over to the SAPS, the Department of Health, the district municipality and mining houses in the region as a clarion call by the communities at the police station after a march from ABSA plain to the bus terminal.

Every speaker at the ceremony was appealing to employers that paying peanuts to employees for insurmountable profits cannot be en-

tertained anymore, as the legislation is being amended to ensure there is transparency between company and worker earnings.

The provincial chairman of the ruling ANC party, Zamani Saul, said that the tripartite alliance that exists within its affiliates (COSATU and SACP) needs further galvanisation to ensure challenges faced by workers are tackled within a well coordinated approach. He reiterated at length that rogue elements within the party must be disciplined. He was bold enough to say that the Northern Cape structures of the alliance believes in "washing its dirty linen at home."

Mr Saul emphasised the need to resolve internal differences and friction of party structures, using internal consultative processes. The scramble for power remains the epicentre for hostilities. Everyone wants to be a leader to bring or create cronyism.

The National Deputy Parliamentary Speaker, Mr Lechoti, said that the alliance fully supports the introduc-

tion of minimum wage in the country and clearly stated that some employers will take advantage of the wage peg and remain anchored on it.

The R20 per hour minimum does not inhibit the employer to go far beyond the stipulated threshold. It is just a start-up point where an employer who is genuine enough in his limited earnings must, at least, pay a worker. The speaker also spoke about the trending "state capture" euphoria within different structures of the economy.

He said that the new government is determined to "exterminate" rotten apples within its ranks to bring sanity in the revitalisation of the economy.

"No stone will remain unturned where corruption is suspected to be thriving, in all arms of government and the private sector because that is the source crippling service delivery to our people." He said that COSATU is the oldest and only labour organisation that represents the aspirations of the working class.

Happiness is to spend my whole life in giving you respect and serving you, even this will not be enough for describing your greatness. Happy Mothers Day!



NOTIFICATION OF BASIC ASSESSMENT PROCESS FOR ENVIRONMENTAL AUTHORISATION FOR THE PROPOSED EXPANSION OF GLORIA MINE AT FARM GLORIA 266/01, 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 Limited proposes to expand operations at Gloria mine on Portion 1 of Farm Gloria. 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: ESscience 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 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 and potable water in reservoirs.

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. If you are interested in participating in the BA, and would like to submit your input, please register as an IAP by submitting your name, contact information and interest in the project to the contact person below by the 10/06/2018. For further information please contact the person below.

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



ESscience Associates (Pty) Ltd.

KATHU GAZETTE
Audit Bureau of Circulations of SA

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Die Kathu Gazette onderskryf die voorskrifte van die Suid-Afrikaanse Perskode dat nuus waar, akkuraat, billik en gebalanseerd moet wees. Sou ons nie voldoen aan hierdie kode nie, skakel met die Persombudsman by 011 484 3612/8 faks 011 484 3619 webtuiste www.presscouncil.org.za

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PaarlColdset (Pty) Ltd
 79 Nelson Mandela Drive Bloemfontein



Judi Bolweg
 Editor - Redakteur



Hester Nortje
 Co-Owner - Mede-eienaar

APPENDIX 2.3: PROOF OF DISTRIBUTION TO IAPS

James Pugin

From: James Pugin
Sent: Wednesday, 23 May 2018 11:19 PM
To: 'nobelar@dwa.gov.za'; 'MsimangoP@dws.gov.za'; 'AdeyilekaE@dws.gov.za';
'MarlaineA@L2B.co.za'; 'jaison.rajan@bhpbilliton.com';
'david.mamphitha@bhpbilliton.com'; 'avontuur@harpogo.co.za';
'cpeche@lantic.net'; 'dpretorius@masterdrilling.com'; 'Kgosietsile@kalagadi.co.za';
'jpleader@intekom.co.za'; 'marillettevdw@brmo.co.za';
'louw.vanderwalt@bhpbilliton.com'; 'zyde101@rocketmail.com';
'Ruan@infrasors.co.za'; 'stellewoning@gmail.com'; 'zide@zyde.co.za';
'contact@infrasors.co.za'
Subject: NOTIFICATION OF BASIC ASSESSMENT PROCESS FOR ENVIRONMENTAL
AUTHORISATION FOR THE PROPOSED EXPANSION OF GLORIA MINE AT FARM
GLORIA 266/01, ASSMANG BLACK ROCK MINE OPERATIONS, SANTOY, NORTHERN
CAPE

Follow Up Flag: Follow up
Flag Status: Flagged

Tracking:

Recipient

Read

'nobelar@dwa.gov.za'

'MsimangoP@dws.gov.za'

'AdeyilekaE@dws.gov.za'

'MarlaineA@L2B.co.za'

'jaison.rajan@bhpbilliton.com'

'david.mamphitha@bhpbilliton.com'

'avontuur@harpogo.co.za'

'cpeche@lantic.net'

'dpretorius@masterdrilling.com'

'Kgosietsile@kalagadi.co.za'

'jpleader@intekom.co.za'

'marillettevdw@brmo.co.za'

'louw.vanderwalt@bhpbilliton.com'

'zyde101@rocketmail.com'

'Ruan@infrasors.co.za'

'stellewoning@gmail.com'

'zide@zyde.co.za'

'contact@infrasors.co.za'

Abdul Ebrahim

Read: 2018/05/24 11:14 AM

'jamespugin@yahoo.com'

'tshifhiwar@brmo.co.za'

ATTENTION: INTERESTED AND AFFECTED PARTIES

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

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Environmental Assessment Practitioner: EScience Associates (Pty) Ltd.

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

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Please find the report available at the link below. Please forward any comments you may have within 30 Days (Monday 22 June).

https://www.dropbox.com/sh/tlqi0ag4di6dhor/AACi9_ulkSFDXlyLNn6fx2xMa?dl=0

Regards,
James Pugin



EScience Associates (Pty) Ltd

E-mail: james@escience.co.za

Tel: 011 718 6380

Fax: 0866 924 840

Web: 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

James Pugin

From: James Pugin
Sent: Wednesday, 23 May 2018 11:13 PM
To: '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'; 'bfischer@half.ncape.gov.za'; 'nramuhulu@ncpg.gov.za'; 'ntsundeni.ravhugoni@dmr.gov.za'; 'jacolinema@daff.gov.za'; 'nhiggitt@sahra.org.za'; 'mgalimberti@sahra.org.za'; 'vanderwesthuizen@taologaetsewe.gov.za'
Subject: NOTIFICATION OF BASIC ASSESSMENT PROCESS FOR ENVIRONMENTAL AUTHORISATION FOR THE PROPOSED EXPANSION OF GLORIA MINE AT FARM GLORIA 266/01, ASSMANG BLACK ROCK MINE OPERATIONS, SANTOY, NORTHERN CAPE

Follow Up Flag: Follow up
Flag Status: Flagged

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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.

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Water Uses 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 and potable water in reservoirs.

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

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Please find the report available at the link below. Please forward any comments you may have within 30 Days (Monday 22 June).

https://www.dropbox.com/sh/tlqi0qg4di6dhor/AACi9_ulkSFDXlyLNn6fx2xMa?dl=0

Regards,
James Pugin



EScience Associates (Pty) Ltd

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'sunday.mabaso@dmr.gov.za'; 'iabader@environment.gov.za'; 'iris@tsamail.co.za';
'iris@tsamail.co.za'; 'swarttj@taologaetsewe.gov.za';
'rossouwJ@taologaetsewe.gov.za'; 'khakhane@gmail.com'; 'majolar@dwaf.gov.za';
'majolar@dwa.gov.za'; 'leburun@dwa.gov.za'; 'dKgosi@ncpg.gov.za'
Subject: NOTIFICATION OF BASIC ASSESSMENT PROCESS FOR ENVIRONMENTAL
AUTHORISATION FOR THE PROPOSED EXPANSION OF GLORIA MINE AT FARM
GLORIA 266/01, ASSMANG BLACK ROCK MINE OPERATIONS, SANTOY, NORTHERN
CAPE

Follow Up Flag: Follow up
Flag Status: Flagged

ATTENTION: INTERESTED AND AFFECTED PARTIES

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. 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

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Regards,
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Subject: NOTIFICATION OF BASIC ASSESSMENT PROCESS FOR ENVIRONMENTAL AUTHORISATION FOR THE PROPOSED EXPANSION OF GLORIA MINE AT FARM GLORIA 266/01, ASSMANG BLACK ROCK MINE OPERATIONS, SANTOY, NORTHERN CAPE
Follow Up Flag: Follow up
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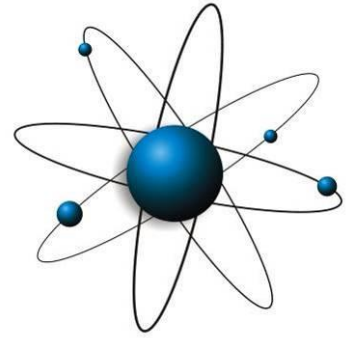
9 Victoria Street, Oaklands, Johannesburg, 2192

VAT No: 473 025 4416

Reg No: 2009/014472/07

APPENDIX 2.4: COMMENTS RECEIVED DURING PUBLIC PARTICIPATION

**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
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Saxonwold
2132

**PHYSICAL
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Oaklands
Johannesburg
2192

TEL:
+27 (0)11 718 6380

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WEBSITE:
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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

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

15 MARCH 2019

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ABBREVIATIONS

Assmang	Assmang (Pty) Ltd
BRMO	Black Rock Mine Operations
CO	Carbon monoxide
CO₂	Carbon dioxide
DEA	Department of Environmental Affairs
DMR	Department of Mineral Resources
DWA	Department of Water Affairs (now DWS)
DWS	Department of Water and Sanitation
EAP	Environmental Assessment Practitioner
ECO	Environmental Control Officer
EO	Environmental Officer
EIA	Environmental Impact Assessment
HDPE	High Density Polyethylene
LED	Local Economic Development
Mn	Manganese
MPRDA	Minerals and Petroleum Resources Development Act
Mtpa	Million tonnes per annum
NCDENC	Northern Cape Department of Environment and Nature Conservation
NCR	Non-conformance Reporting

NEMA	National Environmental Management Act, No. 107 of 1998 NEMA EIA
NEMAQA	National Environment Management: Air Quality Act, No. 39 of 2004
NO_x	Nitrogen oxides (NO & NO ₂)
O₂	Oxygen
PM	Particulate matter
Environmental Specialist	Project/Site Manager
RDL	Red Data Listed
Regulations	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
ROM	Run of Mine
TSF	Tailings Storage Facility
SO₂	Sulphur dioxide
'The mine'	Includes Black Rock, Gloria and Nchwaning operations
The Site	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.

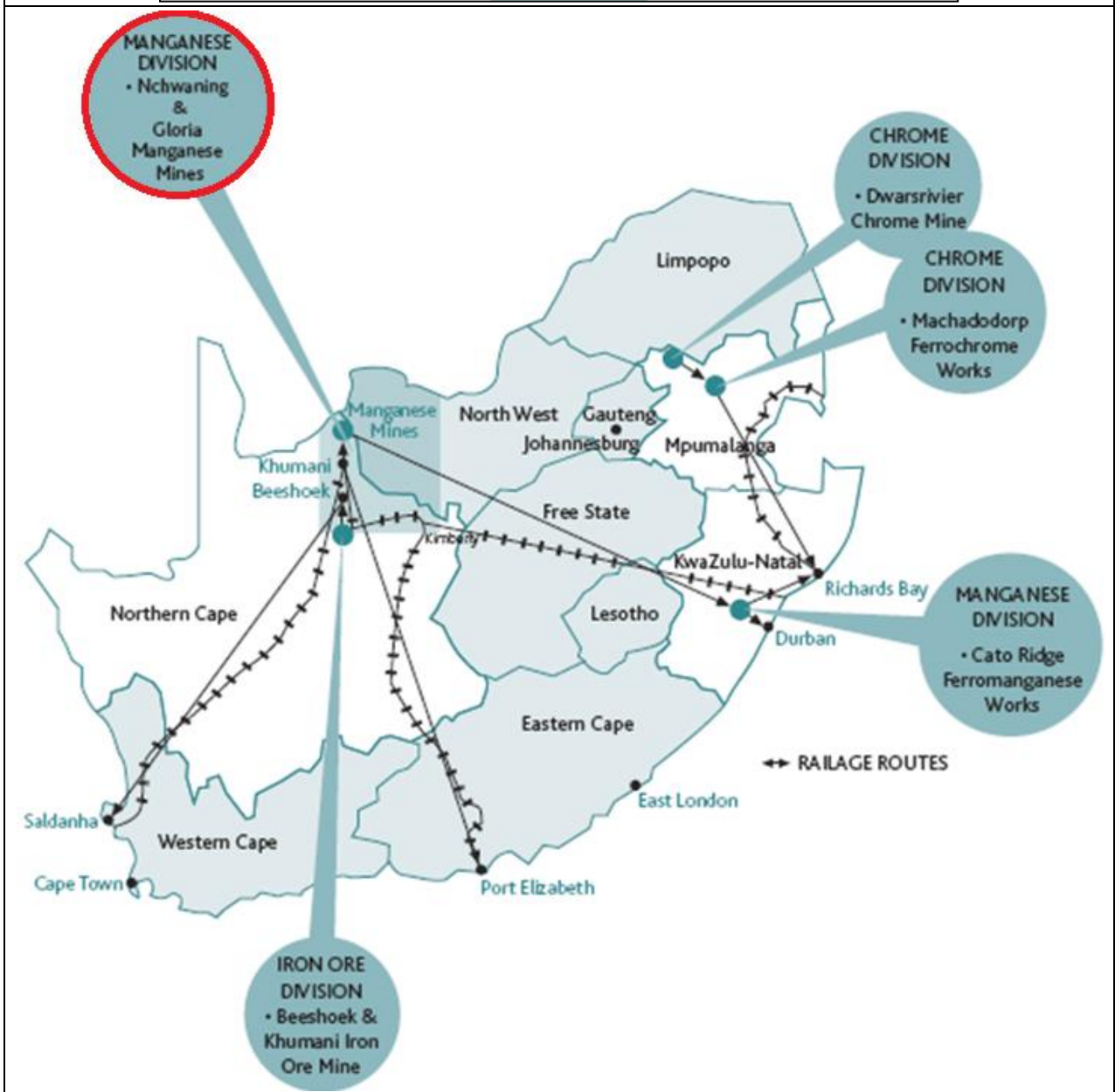
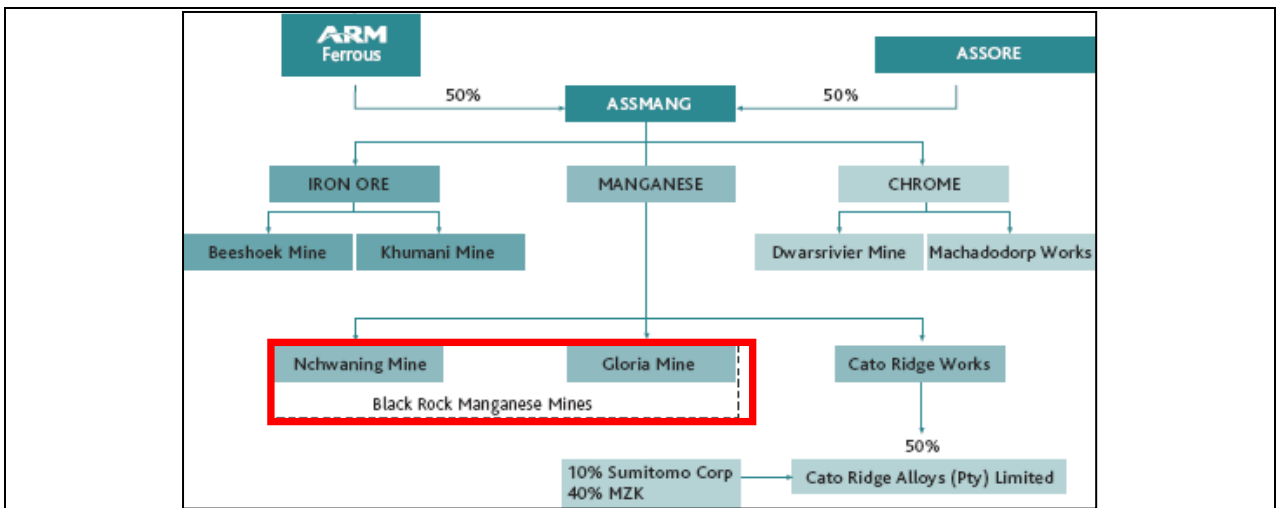
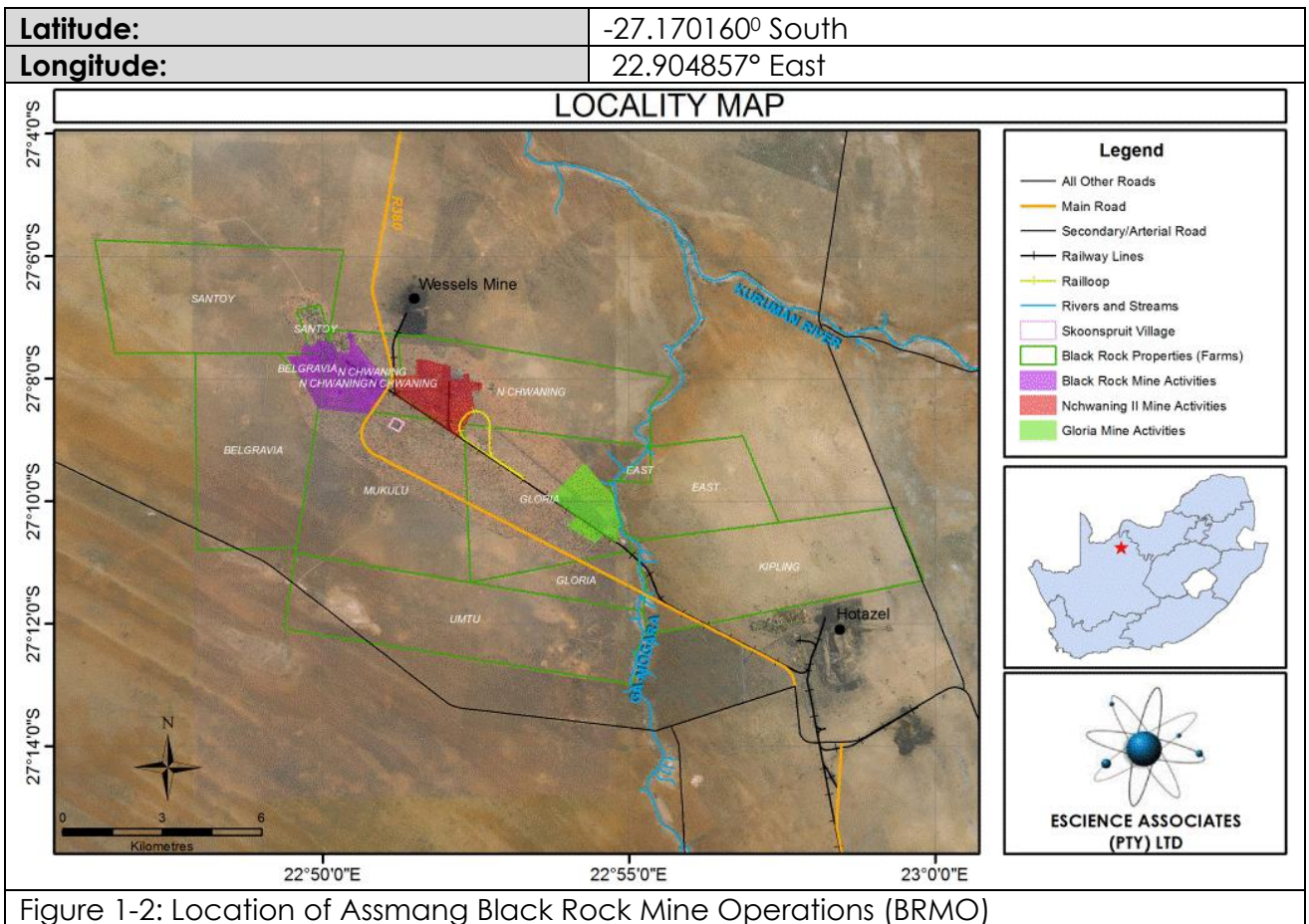


Figure 1-1: Overview of Assmang (Pty) Ltd South African Operations

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

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

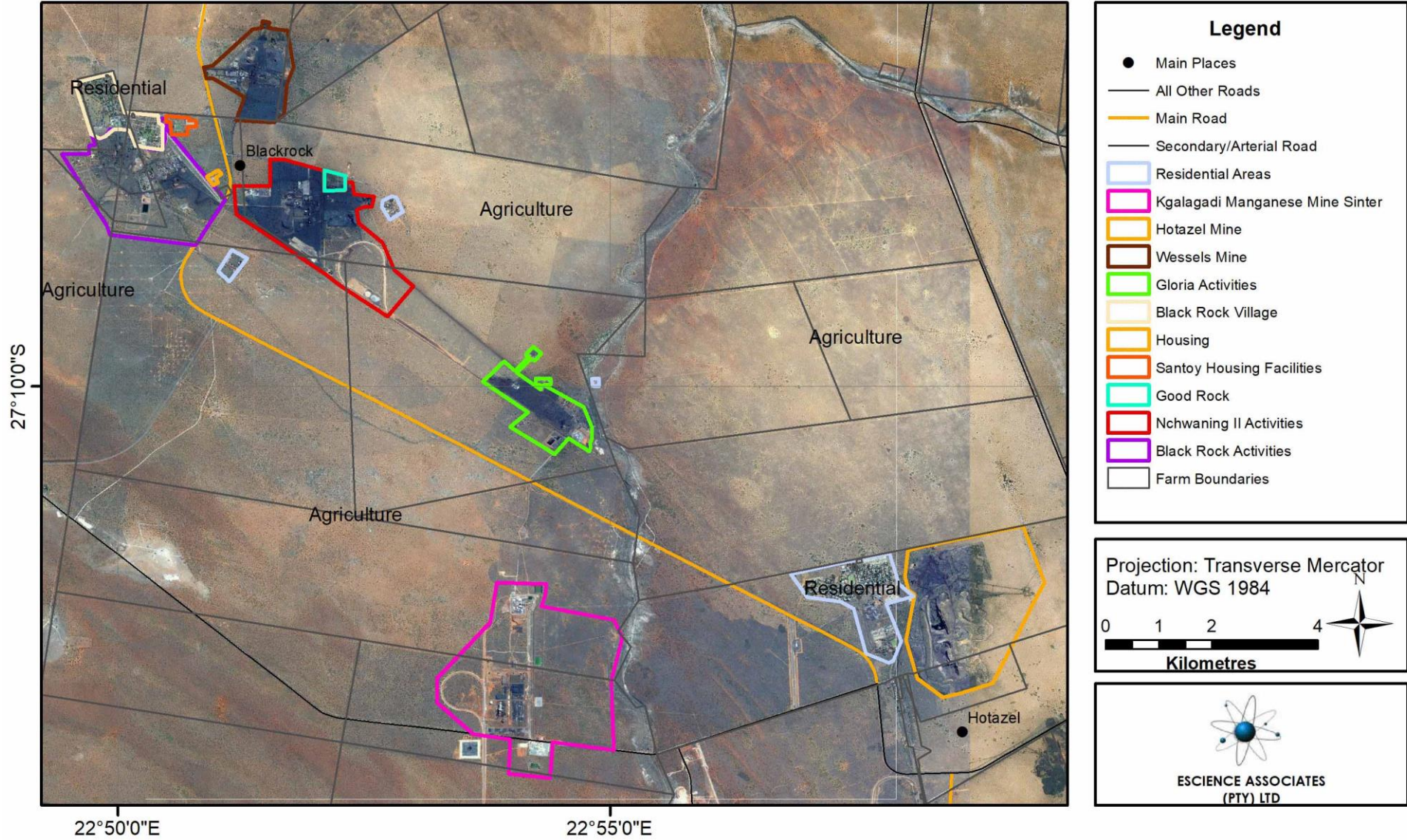


Figure 1-3: Surrounding Land Use

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

GLORIA MINE

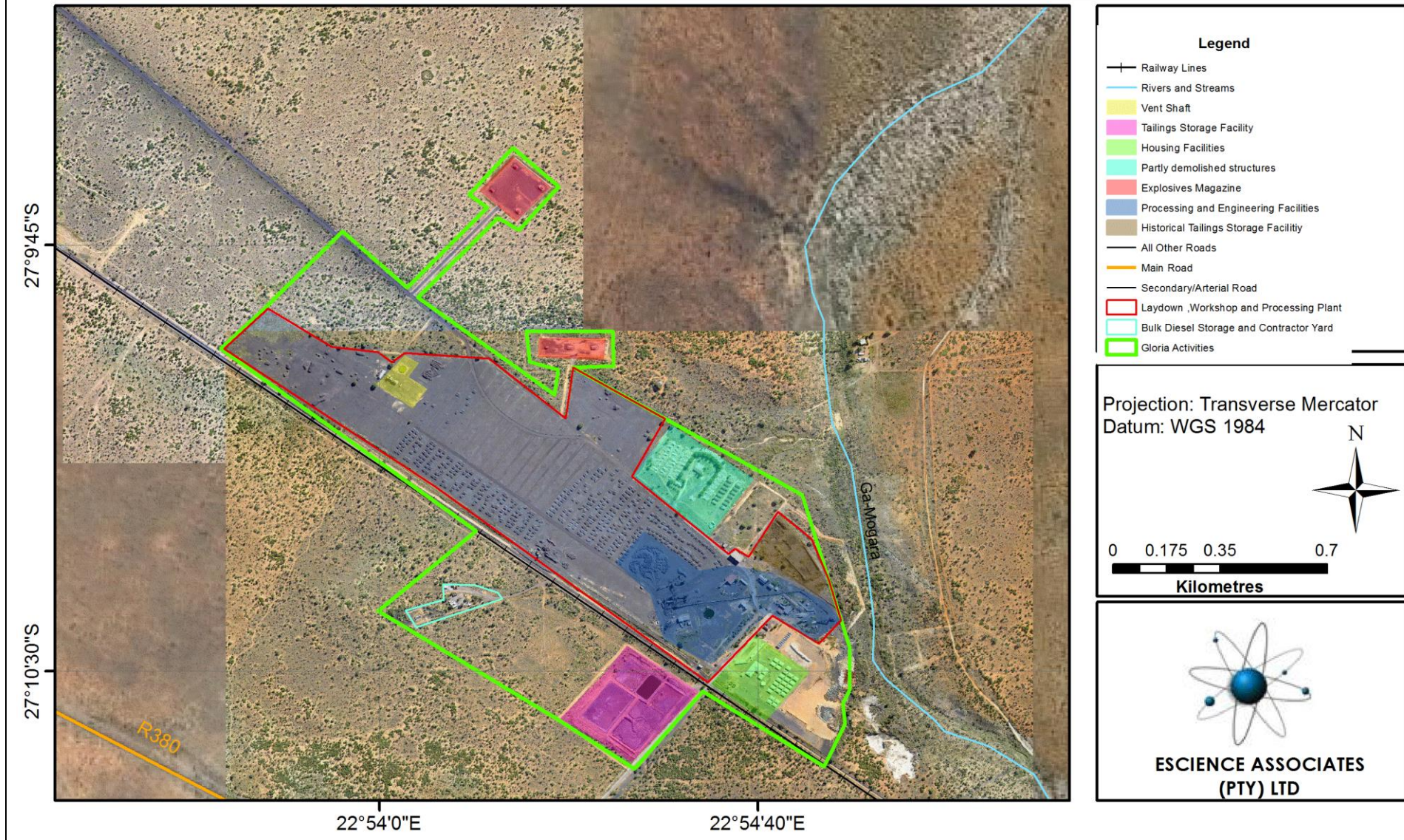


Figure 2-1: Current operations at Gloria mine

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).

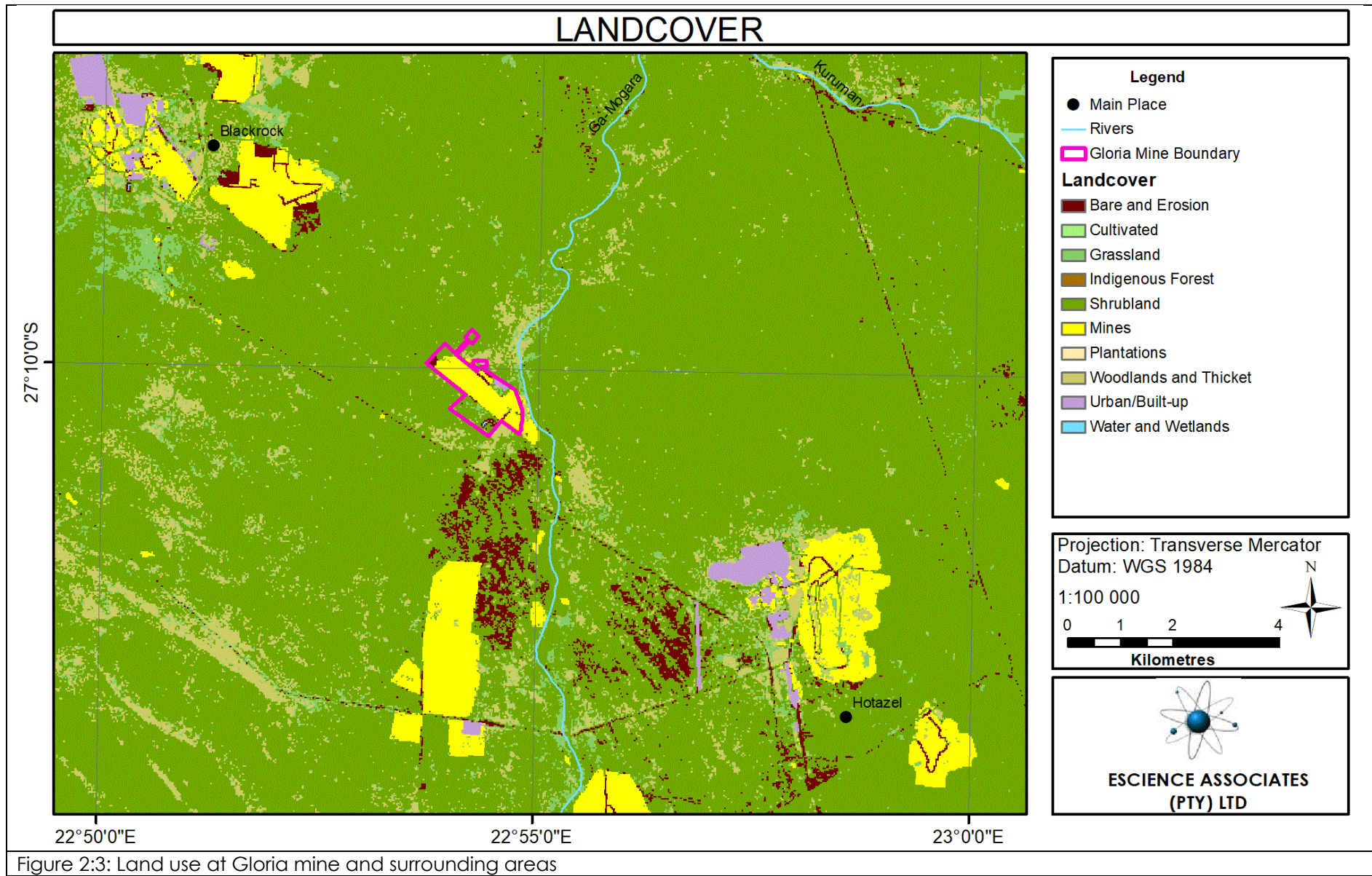


Figure 2:3: Land use at Gloria mine and surrounding areas

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 – (a) pollutes or has the potential to pollute a water resource; or (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"> 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); The waste will be removed from site within 30 days of the generation thereof; and No component of the waste is susceptible to dispersal by wind 	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"> • Must be well removed from fuel and hazardous material storage areas, in line with appropriate BRMO safety standards; • Must be well removed from indigenous vegetation (at least 15m); • Fire-extinguisher must be readily available; • Must be screened from wind with non-flammable material/s; and • Non-smouldering ash residues must be disposed of in general waste skip/s, or containers, on site. 	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"> • Employ labour-intensive methods in construction, where economically feasible; • Employ local residents and communities, where possible; • Sub-contract to local construction companies (in the JT Gaetsewe DM), where feasible; and utilise local suppliers, where feasible. 	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 ² /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

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"> • 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); • The waste will be removed from site within 30 days of the generation thereof; and • No component of the waste is susceptible to dispersal by wind 	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"> • Must be well removed from fuel and hazardous material storage areas, in line with appropriate BRMO safety standards; • Must be well removed from indigenous vegetation (at least 15m); • Fire-extinguisher must be readily available; • Must be screened from wind with non-flammable material/s; and • Non-smouldering ash residues must be disposed of in general waste skip/s, or containers, on site. 	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"> • Employ labour-intensive methods in construction, where economically feasible; • Employ local residents and communities, where possible; • Sub-contract to local construction companies (in the JT Gaetsewe DM), where feasible; and utilise local suppliers, where feasible. 	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.

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



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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;

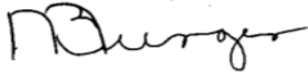
It is concluded that the source-receptor linkage is incomplete in the mining area, and that *“(the) risk of seepage entering the groundwater environment and reaching receptors with no lining using existing leach results for Life of TSF, 20 years, 50 years and 100 years”* is indeed negligible.

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

ISO 9001 Certified Company

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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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South Africa

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

Report Title	Palaeontological Exemption Letter of the proposed 2.5ml process water reservoir at Gloria Mine, Black Rock, Hotazel, Northern Cape		
Control	Name	Signature	Designation
Author	Elize Butler		Palaeontologist
Reviewed			Principal Heritage Specialist
Client			

CLIENT:

EScience Associates (Pty) Ltd.

CONTACT PERSON:

Abdul Ebrahim,

E-mail: 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 m².

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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.

Abbreviations	Description
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.**

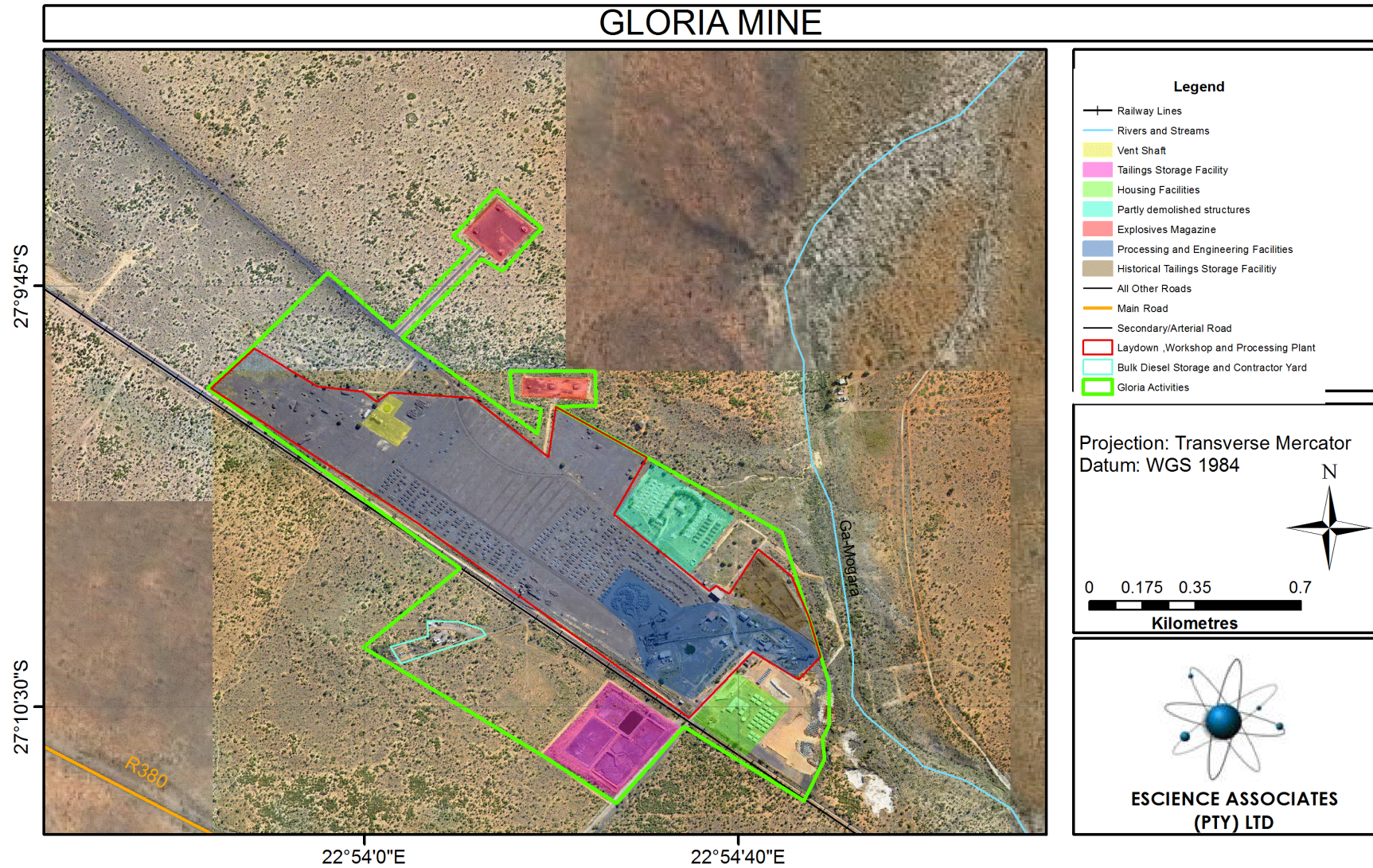


Figure 1: Current operations at Gloria mine

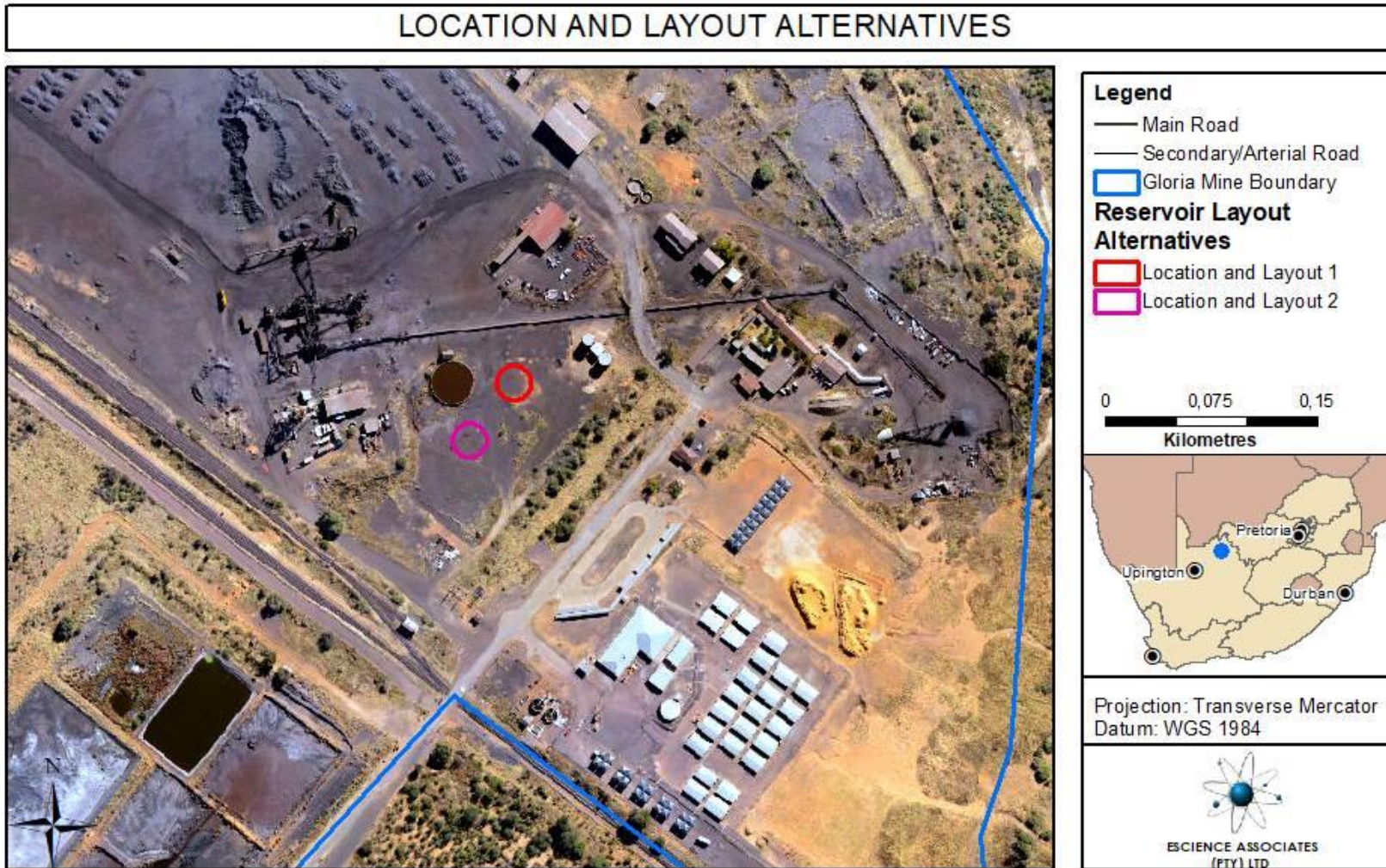


Figure 2: Proposed Activities

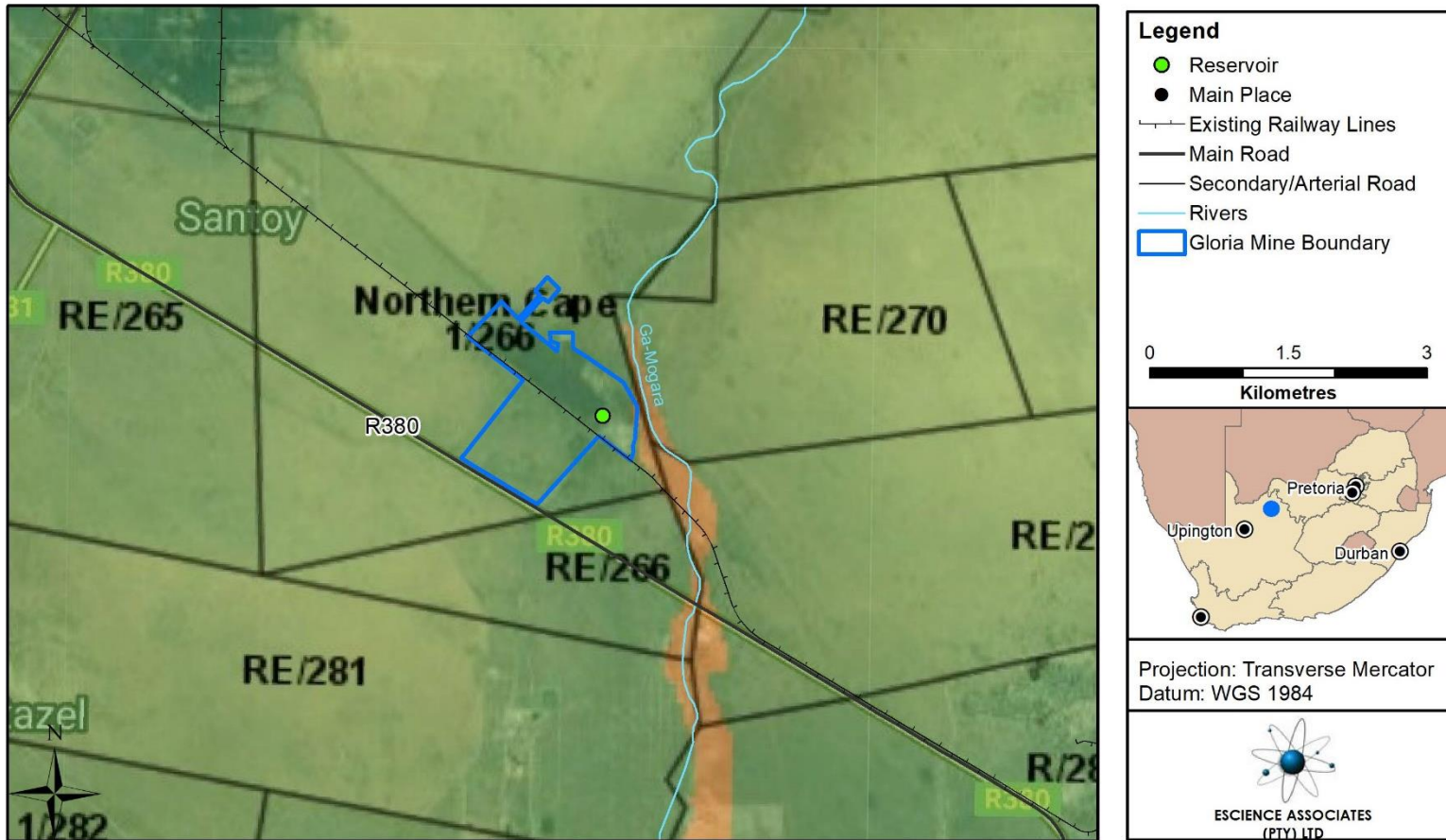


Figure 3: Locality map of the Gloria mine reservoir. Map modified from map provided by EScience Associates (Pty) Ltd.

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 m² 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 m² 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.

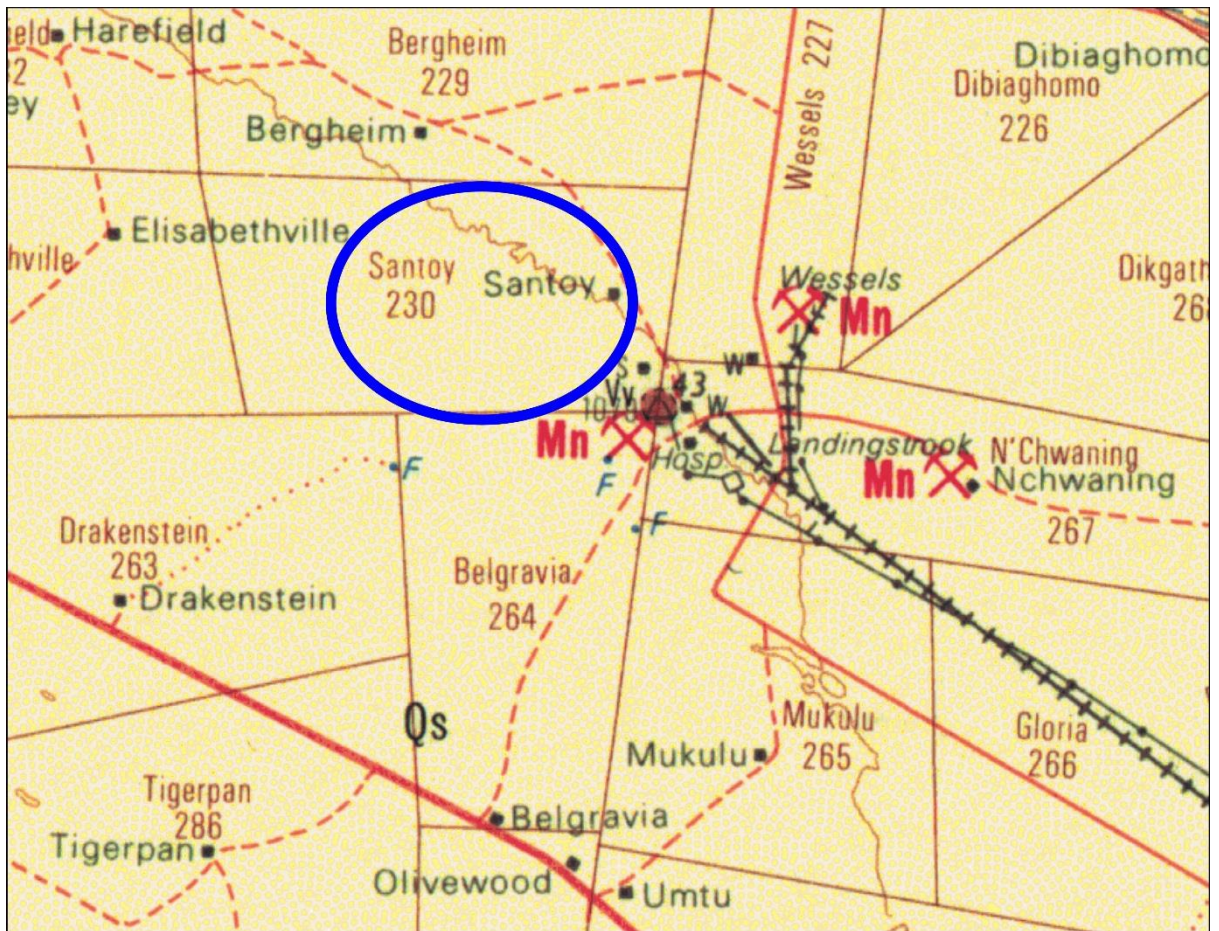


Figure 4: Extract of the 1:250 000 Kuruman geological map 2722 (Council for Geoscience, Pretoria) indicating the approximate position of the proposed Gloria reservoir (indicated in blue), in the John Taolo Gaetsewe District Municipality, Hotazel, Northern Cape.

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 m².

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APPENDIX 4.3: LETTER OF HERITAGE IMPACT ASSESSMENT EXEMPTION REQUEST



15 March 2019

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.

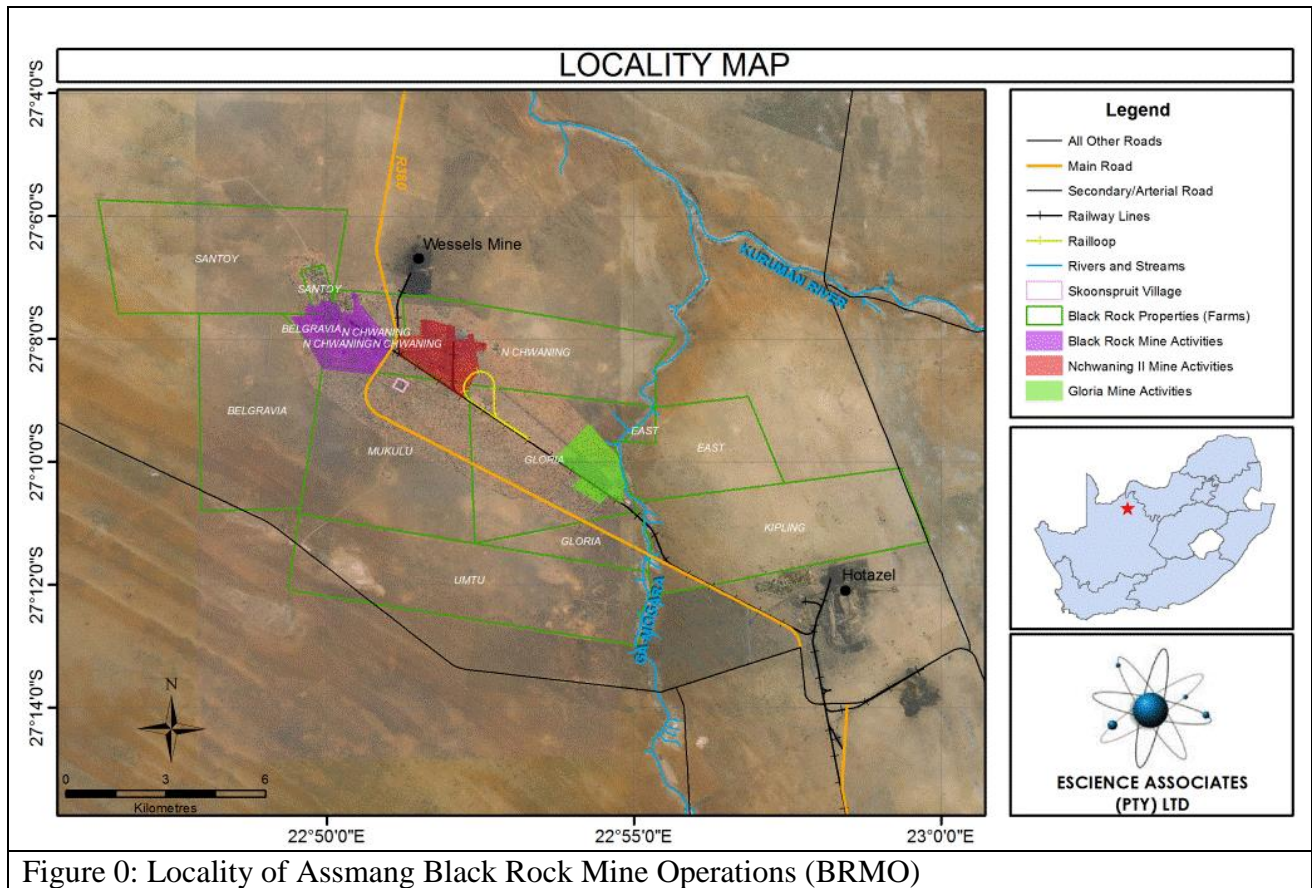


Figure 0: Locality of Assmang Black Rock Mine Operations (BRMO)

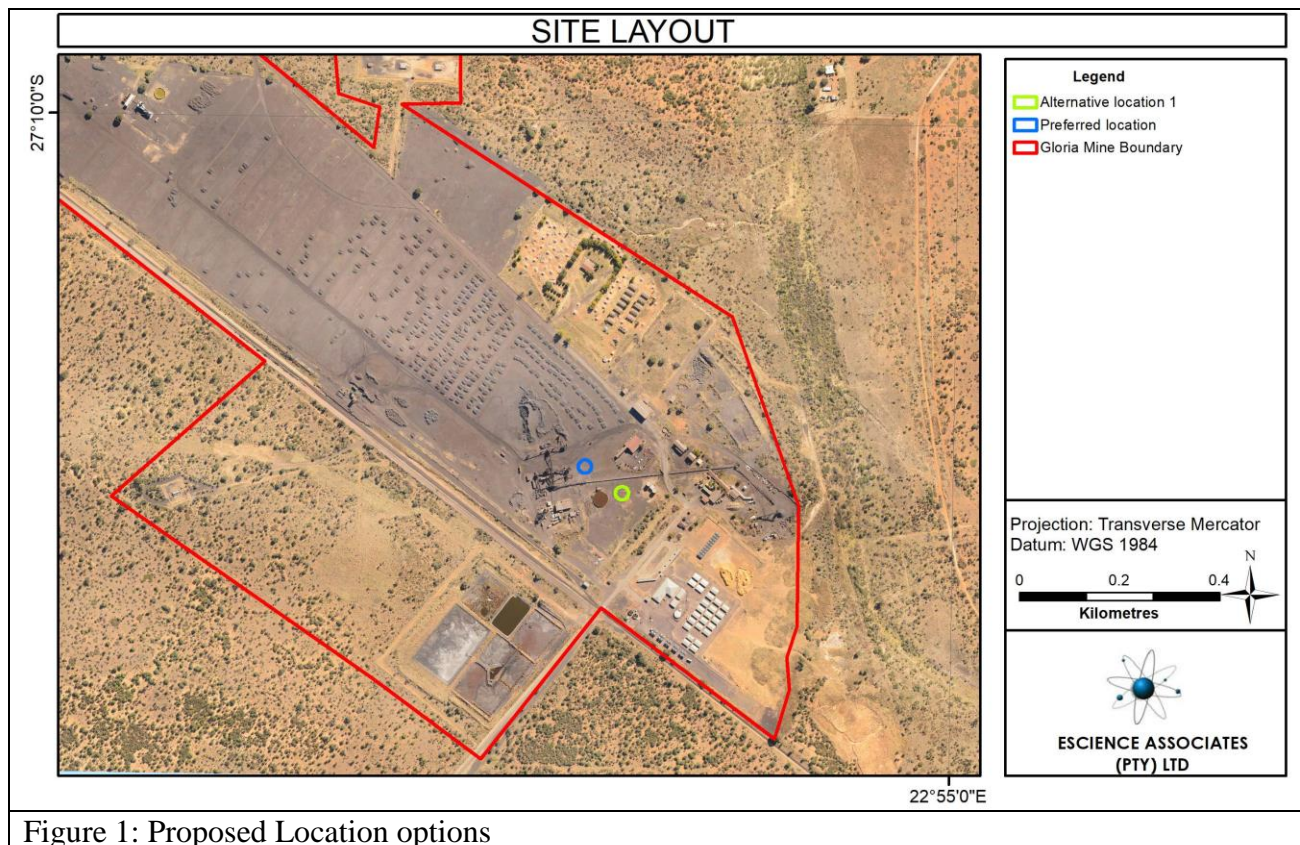


Figure 1: Proposed Location options

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 (Küsel¹) as well as various reports by Van Vollenhoven between 2014 and 2016². 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.

¹ 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).

² 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

Prof AC van Vollenhoven: Director

APPENDIX 5: FINANCIAL PROVISION/REHABILITATION QUANTUM

APPENDIX 6: CLOSURE AND REHABILITATION PLAN

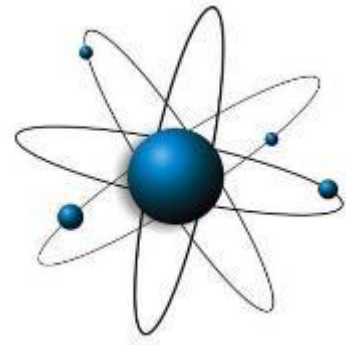
**ASSMANG (PTY) LTD BLACK
ROCK MINE OPERATIONS,
HOTAZEL, NORTHERN CAPE:**



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 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

1.2 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 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 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.

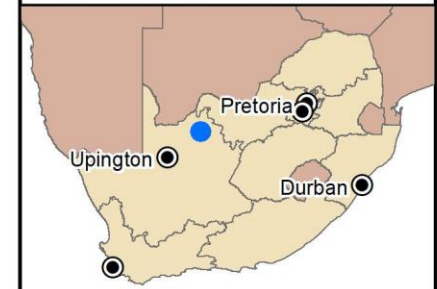
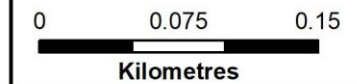
LOCATION AND LAYOUT ALTERNATIVES



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

Reservoir Layout Alternatives

- Preferred Location and Layout
- Alternative Location and Layout



Projection: Transverse Mercator
Datum: WGS 1984



Figure 1-1: Aerial overview of all areas/activities requiring rehabilitation

1.10 DEMOLITION AND GENERAL SURFACE REHABILITATION

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
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.

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"> • Documented records of dates upon which re-seeding was effected; • Establishment of robust basal cover prior to introducing grazing herbivores; and • BRMO to meet stated end land-use objectives for the site 	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 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
PHASE 6: Establishment of Central Sandy Bushveld				
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.
PHASE 7: On-going monitoring, maintenance and aftercare				
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"> At least 90%, sustainable, establishment of re-introduced plants/trees; and 'Ecological' objectives for site closure met. 	Internal Environmental Officer	On-going, Monthly inspections for at least two years; every 6 months thereafter if efforts to rehabilitate are proving effective.
GENERAL PROVISIONS				
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.

