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

BLACK ROCK MINE OPERATIONS

UPDATED ENVIRONMENTAL MANAGEMENT PROGRAMME (EMPr)

Department of Mineral Resources: (NC)30/5/1/2/2/203 MRC

20 JANUARY 2017

ESCIENCE ASSOCIATES (PTY) LTD

POSTAL ADDRESS:
PO Box 2950
Saxonwold
2132

PHYSICAL ADDRESS:
9 Victoria Street
Oaklands
Johannesburg
2192

TEL:
+27 (0)11 718 6380

FAX:
086 610 6703

E-MAIL:
info@escience.co.za

WEBSITE:
www.escience.co.za

ENVIRONMENTAL MANAGEMENT PROGRAMME:

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

COMPILED BY EAP:

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

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

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

20 JANUARY 2017

EXECUTIVE SUMMARY

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 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 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.

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

Ore extraction activities are all undertaken below surface. There is no extraction of ore via opencast operations, with the exception of authorised borrow pits for construction purposes as part of on-going upgrades. Recovery of fines and low grade ore is also undertaken from surface stockpiles. The thickness of the mined seams in conjunction with underground crushing ensures that waste rock is not unnecessarily brought to surface. The ore is then further crushed, and separated into various grades which are stockpiled in preparation for transport off the site. Transport is via rail and road.

In addition to the mining and primary beneficiation currently undertaken, Assmang BRMO proposes, and has environmental authorisation, to establish a sinter plant complex.

Initially BRMO operations had fragmented EMPs; these were consolidated into a single EMPr covering all operations and approved by the Department of Mineral Resources (DMR) on 11 February 2013. The EMPr was formulated prior to the "One Environmental System" as contemplated in Section 50A (2) of the National Environmental Management Act (Act 107 of 1998) as amended on 02 September 2014. This EMPr was compiled in accordance with the Integrated Environmental Management (IEM) philosophy which aims to achieve a desirable balance between conservation and development (DEAT, 1992).

GENERAL DESCRIPTION OF CURRENT AND PLANNED ACTIVITIES

BRMO is located within the Savanna biome and more specifically within the Eastern Kalahari Bushveld Bioregion with some incursion into Kalahari Duneveld. The site consists of transformed land, open veld grazed by livestock, open veld in the Belgravia farm, and limited riparian habitat (related to the Ga Magara River). There are several faunal and floral red data species inhabiting the area.

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. Stone Age artefacts are located in and on the river banks of the Gamagara, and the likelihood of uncovering archaeological material is very high in the river banks.

Mining has been undertaken since 1938, with the average grade of ore being approximately 42% manganese. The mine supplies high-grade manganese ore to both local and international markets. Only underground mining methods are presently utilised at the BRMO. Black Rock Mine previously had open cast and underground operations. The mining method for Gloria, as well as Nchwaning II and III, is via underground bord and pillar methods, making use of trackless machines and underground conveyer systems. Ore is drilled, blasted, and crushed underground before being conveyed to the processing facilities on the surface. The mine has a projected maximum capacity of 6.3 mtpa, and a life of 30 years or more.

Black Rock mine consists mainly of supporting and ancillary services for the active mining and ore processing facilities at the Gloria and Nchwaning mines. Operations at Gloria were commissioned in 1975. Gloria complex is comprised of several mining and mining related activities. Operations at Nchwaning II were first commissioned in 1981. The Nchwaning II complex is comprised of several mining and mining related activities. Surface operations at Nchwaning III occur within the Black Rock operations. Typical operations include:

- Offices, administration and support facilities
- Engineering services
- Processing Plant
- Ore laydown areas
- Waste management facilities, including a general landfill
- Salvage Yards
- A landing strip and hangars
- Top soil stockpiles
- Potable water and process water storage and management facilities
- Waste water treatment plants
- A back-up diesel power generation plant
- Sub-stations and electrical works
- Bulk fuel storage and refuelling stations
- Explosives magazines
- Contractor laydown areas
- Other ancillaries typical of such a mining operation
- Rail facilities, unpaved and paved roads connecting the above and other BRMO operations.

The DMR authorised the expansion of BRMO activities on 11 February 2013. The expansion project includes two broad project components:

The DMR authorised the expansion of BRMO activities on 11 February 2013. The expansion project includes two broad project components, summarised as follows:

- Expansion of the mine's manganese production capacity through provision for facilities and activities typical of this type of mining including:
    - New mine shafts and vent shaft;
    - Head gear and winder house;
    - New ore processing facilities;
    - Administrative and ancillary facilities;
    - Gate/guard house and associated security infrastructure;
    - Engineering workshops, stores and salvage yards;
    - Tailings storage facilities;
    - Waste handling and storage facilities;
    - Above ground bulk fuel storage facilities;
    - Water treatment and water management facilities, and associated reticulation;
    - Sewage treatment plant and associated reticulation;
    - Required clearing of land and establishment of roads;
    - An interconnecting overland conveyor between Gloria and Nchwaning II;
    - Road (access and haul) infrastructure; and,
    - Other ancillaries typical of such a mining operation
- Establishment of a new sinter plant complex, including product stockpile floors and related facilities including:
    - A sinter plant
    - A washing, crushing and screening plant
    - Ore and sinter feed stockpiles
    - Product stockpiles
    - Administrative offices and facilities
    - Engineering workshops and stores
    - Tailings storage facilities
    - Waste handling and storage facilities
    - Water management facilities
    - Required clearing of land and establishment of roads

DESCRIPTION OF SENSITIVE ENVIRONMENTAL FEATURES

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). The site consists of transformed land (current and legacy mining and related infrastructure), open veld (presently 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).

FLORAL DIVERSITY

When the boundary of the assessment site is superimposed on the vegetation types of the surrounding area, it is evident that the subject property falls within the Kalahari Thornveld and Shrub Bushveld veld type, and Kathu Bushveld vegetation type and partly in the Gordonia Duneveld vegetation type. Several red data listed (RDL)/protected floral species are documented within the site.

FAUNAL DIVERSITY

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

WETLAND/RIPARIAN ZONES

The Gamagara River and its associated wetland/riparian features (including a 32 m buffer zone) can be considered as an ecologically sensitive area in relation to the proposed development activities.

GROUNDWATER

According to a specialist hydrogeological assessment of the site (GPT Reference Number: EEESB-16-1806). 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 due to high porosity and permeability of the Kalahari sands (high infiltration rates during precipitation). Coupled with low precipitation and high evaporation rates, lack of groundwater users and the ~70 m thick unsaturated zone underlying the site, the transportation of contaminants sourced from the solid and liquid waste areas is foreseen as a low risk to the groundwater environment. Based on the numerical model it was concluded that that no human health effects are likely to occur at any monitoring boreholes within the assumed 100 year mining scenario.

SOIL

The area around Black Rock, in the vicinity where the mining operations are undertaken, consists mainly of Kalahari sand. Kalahari sand is typically homogenously very deep with the exception of certain areas which are under laid by calcrete. Soil fertility is low as is typical of sandy soils.

HERITAGE RESOURCES

A total of 14 sites with a Stone Age origin were recorded during a specialist archaeological field survey of the Gamagara river basin. The Stone Age sites, as well as the stone tools recorded in the area are similar to the one 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.

ENVIRONMENTAL MANAGEMENT GOALS AND OBJECTIVES

The environmental goals and objectives for the mine are set out as summarised below.

Table 1-1: Environmental Objectives	
Topography	• To minimise topographic disturbances resulting from mining and expansion project related activities; • To minimise the potential impacts of the mining activities and project on surface hydrology; • To minimise the potential for soil erosion resultant from the creation of steep slopes; and • To ensure that any alteration to site topography resultant from mining activities and the project can be reversed to the extent that it does not conflict with end-use planning objectives for the site.
Soils	• To effectively mitigate potential soil contamination impacts; • To maintain the viability of the site soils (particularly topsoil) for future rehabilitation purposes; • To ameliorate any altered ecological, physical and chemical properties of soils resulting through stripping, handling and stockpiling of 'topsoil'; and • To install and maintain long-term erosion control measures.
Land Capability	• To restore the affected surfaces to arable land capability; and • To re-establish indigenous, pre-development, floral species that will stabilise the soils in the short term, and re-create the natural grassland and/or grazing lands in the long term, so that the area can be returned to its natural state as far as possible, and used for agricultural purposes.
Land Use	• To restore the affected surface area to pre-mining status so that pre-mining land use activities can be resumed; and • To reduce the area that is to be disturbed, and contain the impacts on the natural habitat caused by the mechanised equipment.
Vegetation	• To minimise mining activities and project impact on the natural bio-diversity of the area to the greatest extent that is practical; • To control the establishment and propagation of alien invasive vegetation within the development area; • To ensure that protected trees removed during construction are re-established at closure and through concurrent rehabilitation efforts in similar numbers; • To ensure that the impact of the mining activities and project on protected floral species is appropriately off-set for the operational lifespan thereof and effectively remediated at closure; and • To re-introduce pioneer grass species for effective rehabilitation, such that will ensure natural succession over time.
Animal Life	• To minimise mining activities and project impacts on the

	natural bio-diversity of the area to the greatest extent that is practical; and • To ensure the prevention of animal hunting and poaching throughout the life of mine.
Surface- and Ground Water	• To ensure that no mining and project activities, or infrastructure, negatively influence ground- or surface water quality, or quantity, to the extent that human health or livelihoods are negatively influenced; and • To pro-actively monitor the mining activities and project's impacts on ground- and surface water quality/quantity, such that pro-active measures can be instituted by the BRMO to mitigate such impacts, where identified.
Noise	• To reduce the impact of mining related noise on the overall environment, and within the proposed mining area in particular.
Socio-economic	• To limit the socio-economic impacts as a result of cessation of the mining activities.
Maintenance	• To monitor and manage post-closure impacts until closure is obtained.
Infrastructure	• To find alternative uses for mine infrastructure, or if not possible, to ensure that the components are properly considered within the rehabilitation plan as stated.
Waste	• To minimise waste, and reduce/reuse/recycle where practical. • To collect and dispose of all waste at a permitted disposal site; where waste recovery, recycling or reuse alternatives are not reasonable or feasible.
Air Quality	• To minimise emissions where practical. • To ensure that emissions of atmospheric pollutants and subsequent impact on ambient air quality is within acceptable standards.

ENVIRONMENTAL MANAGEMENT AND MONITORING

The environmental management actions and requirements are set out in Chapter 6 in accordance with the requirements of NEMA. These tables provide management measures and responsibilities for preventing and/or managing the potential environmental impacts associated with BRMO's activities.

It is the responsibility of the BRMO to ensure that the commitments made in this EMPr are realised. Management must ensure that adequate resources are availed to this end.

A monitoring plan has also been set which covers key environmental aspects. These include:

- Surface water and groundwater
- Dust fallout
- Noise and vibration, and

- Biodiversity

SURFACE AND GROUNDWATER

Surface and groundwater monitoring must be undertaken in accordance with BRMO's Water Use Licence.

DUST FALLOUT

Dust fallout monitoring points have been established at key locations on the site. Dust outfall is measured and assessed per the National Dust Control Regulations GN.R 827 of 2013.

NOISE

BRMO has undertaken baseline noise monitoring, in terms of the provisions of SANS 10103 of 2008, in 2013 and subsequently in 2015. Results indicate that noise impact is within acceptable levels. Should BRMO subsequently receive noise complaints, then further monitoring must be undertaken in consultation with a noise specialist.

BIODIVERSITY MONITORING PLAN

BRMO has established a biodiversity management plan in accordance with the findings of biodiversity assessment undertaken on the site. This includes the management of invasive species as well as the protection of sensitive species on the site.

ENVIRONMENTAL AWARENESS PLAN

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.

In addition, the BRMO produces flash cards with key identification details and phots of protected species which are distributed to relevant personnel. Awareness training and presentations are also undertaken for training of contractors and personnel of on various environmental management and biodiversity issues related to BRMO's activities.

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ABBREVIATIONS

APPA	Atmospheric Pollution Prevention Act, No. 45 of 1965
Assmang	Assmang (Pty) Ltd
BEP	Best Environmental Practice
BPEO	Best Practicable Environmental Option
BRMO	Black Rock Mine Operations
CAD	Computer Aided Drawing
CO	Carbon monoxide
CO_2	Carbon dioxide
CTF	Coal Tar Fuel
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
FeMn	Ferromanganese
FGD	Flue-gas desulphurisation
HCFeMn	High Carbon Ferromanganese
HDPE	High Density Polyethylene
HFO	Heavy Fuel Oil
IAPs	Interested and Affected Parties
IPWM	Integrated Pollution and Waste Management
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 & NO2)
O_2	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
SO_2	Sulphur dioxide
VOC	Volatile Organic Compounds
WEEE	Waste Electric and Electronic Equipment
'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.

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.

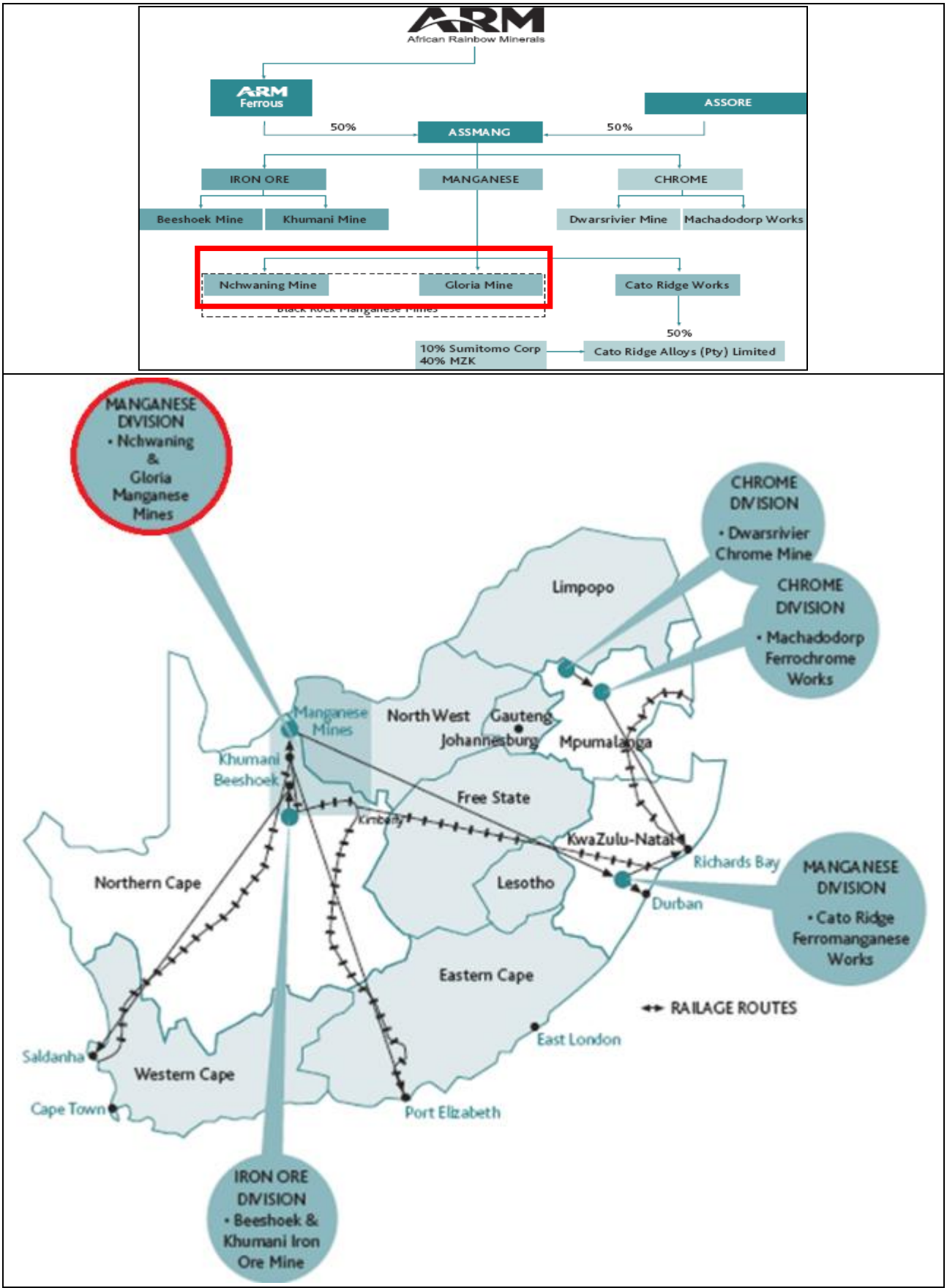


Figure 1-1: Overview of Assmang (Pty) Ltd South African Operations

1.2 REGIONAL LOCATION

The proposed site for the Assmang BRMO sinter plant and mine expansion is located predominantly on the western extent of Portion 1 of the farm Gloria No. 226 on the Assmang Black Rock Mine Operations (BRMO). Portion 1 of the farm Gloria No. 226 is approximately 134 hectares (ha) in extent. BRMO is situated in the Northern Cape Province approximately 80 km north-west of the town of Kuruman and 12 kilometres north-west of the village of Hotazel. The land capability of the adjacent and surrounding areas has largely been altered to mining and industrial land use and will remain as such for the remaining life of the mine.

BRMO falls within the jurisdiction of the John Taolo Gaetsewe District Municipality.

Latitude:	27^0 10' 19" South
Longitude:	22^0 54' 33" East

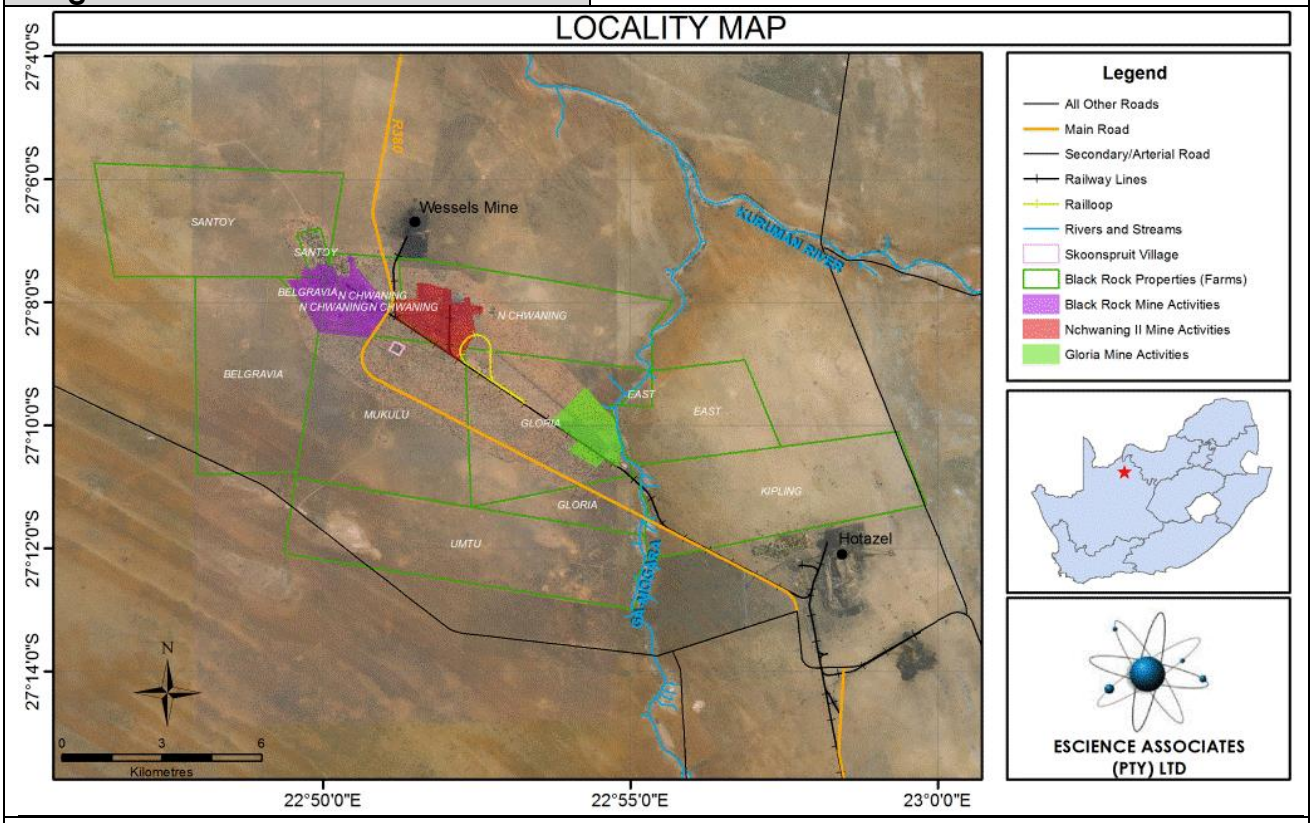


Figure 1-2: Locality of Assmang Black Rock Mine Operations (BRMO)

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 EMPr 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	Thami Mbonani
Physical Address	Main Offices Black Rock Mine Operations, Santoy, Northern Cape
Postal Address	PO Box 187 Santoy 8491
Telephone	(053) 751 5304
Fax	(053) 751 5251
Email	thamim@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 16

Table 1-4: Mining Rights, Surface Rights and Title Deed Description Relevant to BRMO				
Mine	Farm Name	Title Deed	Surface Rights	Mining Rights
Black Rock	Ptn. 1 Belgravia 264	No. 541 of 1940	Assmang (Pty) Ltd	Assmang (Pty) Ltd
	Ptn. 1 Santoy 230	No. 1491 of 1970	Assmang (Pty) Ltd	Assmang (Pty) Ltd
Gloria	Ptn. 1 Gloria 226	No. 506 of 1966	Assmang (Pty) Ltd	Assmang (Pty) Ltd
Nchwaning II	Ptn. 1 Nchwaning II67	No. 541 of 1940	Assmang (Pty) Ltd	Assmang (Pty) Ltd
	Ptn. 3 Nchwaning II67	No. 1491 of 1970	Assmang (Pty) Ltd	Assmang (Pty) Ltd
Nchwaning III	Ptn. 1 Nchwaning II67	No. 541 of 1940	Assmang (Pty) Ltd	Assmang (Pty) Ltd
	Ptn. 3 Nchwaning II67	No. 1491 of 1970	Assmang (Pty) Ltd	Assmang (Pty) Ltd

Table 1-5: Project Applicable Servitudes		
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.

Figure 1-3, Table 1-6, and Table 1-7, provide a concise overview of mining activities and neighbouring towns with the Assmang BRMO.

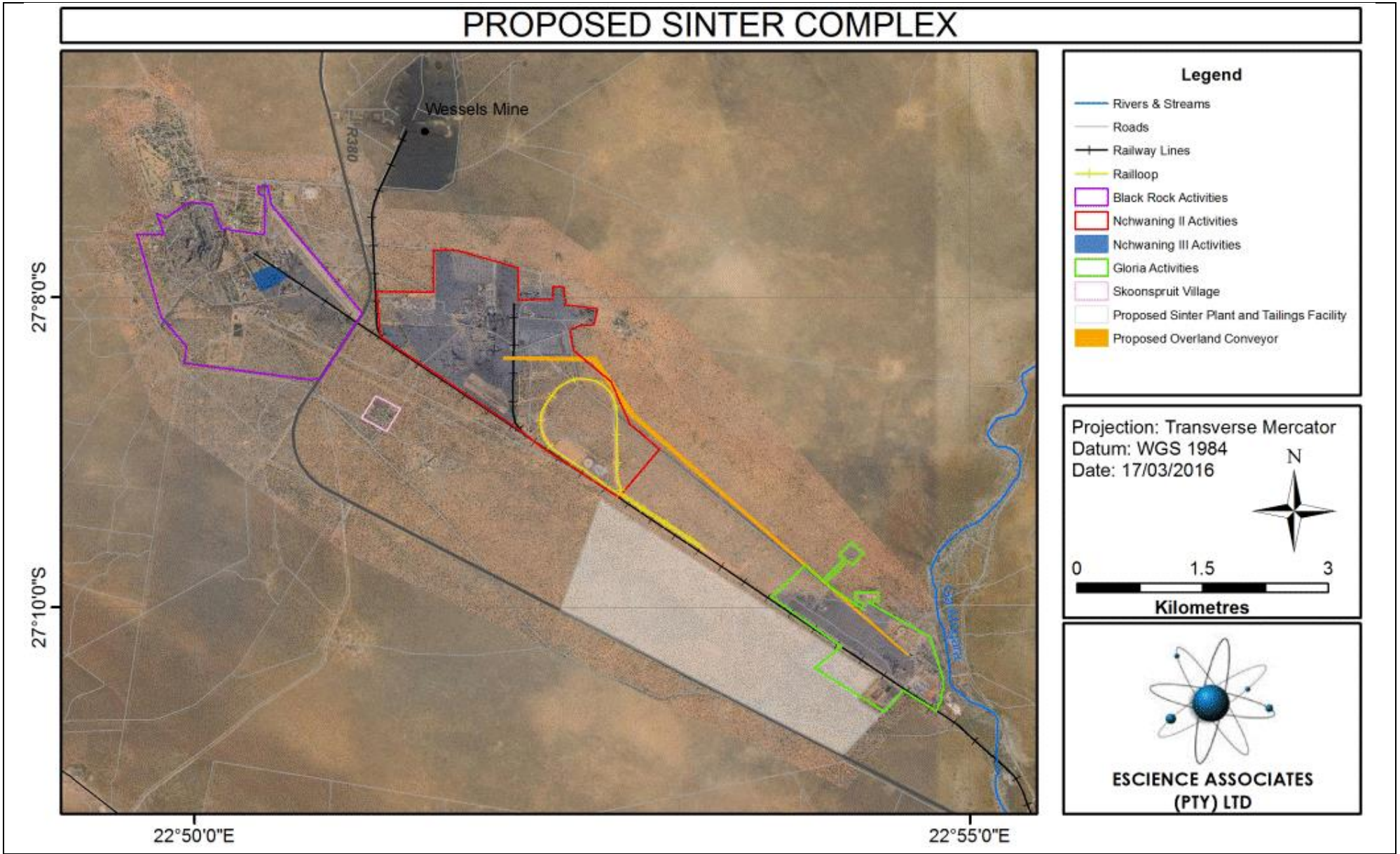


Figure 1-3: Aerial image showing Existing Mining/Industrial Land Use in the vicinity of the Assmang (Pty) Ltd BRMO

Table 1-6: Neighbouring Mining/Industrial Activity/ies	
Mine/Industry	**Distance/Direction from BRMO**
Good Rock (Pty) Ltd	Eastern boundary of Nchwaning II Mine
South 32 Wessels Manganese Mine	Approximately 1.3 km north of Nchwaning II Mine
Kalagadi Manganese Mine	Approximately 2.5 km south of Gloria Mine
South 32 Hotazel Manganese Mine	Approximately 7 km south east of Gloria Mine

Table 1-7: Neighbouring Towns	
Town	**Distance/Direction from BRMO**
Santoy (Black Rock Mine Village)	Adjacent to BRMO
Hotazel	Approximately 17 km south east of BRMO
Kuruman	Approximately 80 km south east of BRMO
Upington	Approximately 267 km south west of BRMO
Kimberley	Approximately 320 km south east of BRMO

1.5 SIGNIFICANT ENVIRONMENTAL FEATURES

BRMO is located within the Savanna biome and more specifically within the Eastern Kalahari Bushveld Bioregion with some incursion into Kalahari Duneveld. 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). There are several faunal and floral red data species inhabiting the area.

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. Stone Age artefacts are located in and on the river banks of the Gamagara, and the likelihood of uncovering archaeological material is very high in the river banks.

1.6 PLANNED LIFE OF MINE

The planned life of mine is approximately 30 years but may exceed this.

1.7 HISTORY OF THE EMPR

Initially BRMO operations had fragmented EMPs, these were consolidated into a single EMPr covering all operations and approved by the Department of Mineral Resources (DMR) on 11 February 2013. The EMPr was formulated prior to the "One Environmental System" as contemplated in Section 50A(2) of the National Environmental Management Act (Act 107 of 1998) as amended on 02 September 2014.

The EMPr was dated January of 2013, and included the proposed expansion project summarised as follows:

- Expansion of the mine's manganese production capacity through provision of two new vertical mine shafts, a vent shaft and associated surface shaft complexes, new washing, crushing and screening plant, upgrading of the Hotazel-Gloria Mine rail link, as well as the establishment of associated supporting service infrastructure (e.g. change house facilities, administrative

offices, stores, electricity generation/distribution, water reticulation, sewage management, tailings handling facilities, rail and roads); and

- Establishment of a new sinter plant complex.

Due to significant global economic uncertainty BRMO was compelled to reconsider the extent of mine expansion and the feasibility of the sinter plant. BRMO took a considered decision to hold off on the planned expansion and sinter plant installation until such time as economic indicators and demand forecasts for their manganese products allow more certainty until circa 2017. In the interim various refurbishments, upgrades, and the relocation of the rail loop were communicated to the DMR on 20 August 2013.

Approval of the EMPr was issued on 13 December 2013 and stamped on 16 January 2014 (DMR reference number (NC)30/5/1/2/2/203).

This EMPr was compiled in terms of the provisions of section 39 of the Mineral and Petroleum Resources Development Act, 2002 (Act No 28 of 2002)[MPRDA] and the Mineral and Petroleum Resources Development Act, 2008 (Act No 49 of 2008)[MPRDA], as amended. Furthermore, the EMPr was compiled to meet the requirements for the development of an environmental management programme, in terms of Regulation 33 of the 2010 NEMA EIA Regulations (GN.R 543 of 2010) and S22N of NEMA.

In addition to the above, this EMPr was compiled in accordance with the Integrated Environmental Management (IEM) philosophy which aims to achieve a desirable balance between conservation and development (DEAT, 1992). IEM prescribes a methodology for ensuring that environmental management principles are fully integrated into all stages of the development process. It advocates the use of several environmental management tools that are appropriate for the various levels of decision-making. One such tool is an Environmental Management Programme (EMPr).

The IEM guidelines encourage a pro-active approach to sourcing, collating and presenting information in a manner that can be interpreted at all levels. The basic principles underpinning IEM are that there be:

- Informed decision-making;
- Accountability for information on which decisions are taken;
- Accountability for decisions taken;
- A broad meaning given to the term environment (i.e. one that includes physical, biological, social, economic, cultural, historical and political components);
- An open, participatory approach in the planning of proposals;
- Consultation with interested and affected parties;
- Due consideration of alternative options;
- An attempt to mitigate negative impacts and enhance positive aspects of proposals;
- An attempt to ensure that the 'social costs' of development proposals (those borne by society, rather than the mine) be outweighed by the 'social benefits' (benefits to society as a result of the actions of the mine);

- Democratic regard for individual rights and obligations;
- Compliance with these principles during all stages of the planning, implementation and decommissioning of the proposals (i.e. from 'cradle to grave'); and
- The opportunity for public and specialist input in the decision-making process.

The EMPr was compiled using the following concepts and implementation requirements, so that the higher principles of sustainable development are realised:

- **Continuous improvement.** The project proponent (or implementing organisation) must commit to review and to continually improve environmental management, with the objective of improving overall environmental performance.
- **Broad level of commitment.** A broad level of commitment is required from all levels of management as well as the workforce in order for the development and implementation of this EMPr addendum to be successful and effective.
- **Flexible and responsive**. The implementation of the EMPr must respond to new and changing circumstances, i.e. rapid short-term responses to problems or incidents. The EMPr is a dynamic "living" document and thus regular planned review and revision of the EMPr must be carried out.
- **Integration across operations**. This EMPr must integrate across existing line functions and operational units such as health, safety and environmental departments in a company/project. This is done to change the redundant mind-set of seeing environmental management as a single domain unit.
- **Legislation.** It is understood that any development project during its construction phase is a dynamic activity within a dynamic environment. The proponent, Engineers, Contractors and Sub-contractors must therefore be aware that certain activities conducted during construction may require further licensing or environmental approval, e.g. river or stream diversions, bulk fuel storage, waste disposal, etc. The Contractor must consult the ER, Environmental Officer (EO) and Environmental Control Officer (ECO) on a regular basis in this regard.

1.8 APPLICATION OF THE EMPR

This EMPr is relevant to BRMO's activities, and land within the BRMO boundaries which is under BRMO's control. Where there is conflict between this EMPr and any relevant environmental legislation, the Competent authority must advise BRMO in respect of how to resolve such conflicting requirements or stipulations.

2 GENERAL DESCRIPTION OF CURRENT AND PLANNED ACTIVITIES

Mining has been undertaken since 1938, with the average grade of ore being approximately 42% manganese. The mine supplies high-grade manganese ore to both local and international markets. Only underground mining methods are presently utilised at BRMO. Black Rock Mine previously had open cast and underground operations, however these have ceased. The mining method for Gloria, as well as Nchwaning II and III, is via underground bord and pillar methods, making use of trackless machines and underground conveyer systems. The mine has a projected maximum capacity of 6.3 mtpa.

Ore extraction activities are all undertaken below surface. There is no extraction of ore via opencast operations, with the exception of authorised borrow pits for construction purposes as part of on-going upgrades. Recovery of fines and low grade ore is also undertaken from surface stockpiles. The thickness of the mined seams in conjunction with underground crushing ensures that waste rock is not unnecessarily brought to surface. The ore is then further crushed, and separated into various grades which are stockpiled in preparation for transport off the site. Transport is via rail and road.

The general descriptions herein are intended to convey a broad understanding of the facilities and activities associated with the mining and proposed expansion. 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 BLACK ROCK

Black Rock mine consists mainly of supporting and ancillary services for the active mining and ore processing facilities at the Gloria and Nchwaning mines. These consist of, *inter alia*:

- Offices, administration and support facilities
- Engineering services
- Old Black Rock mine works
- Old Black Rock Processing Plant
- Ore laydown areas
- Black Rock waste management
- Salvage Yards
- A landing strip and hangars
- Top soil stockpiles
- Potable water and process water storage and management facilities
- Tailings/Slimes storage facilities
- A back-up diesel power generation plant
- Sub-stations and electrical works

- Bulk fuel storage and refuelling station
- Explosives magazines
- Other ancillaries typical of such a mining operation
- Unpaved and paved roads connecting the above and other BRMO operations.

Notably the historical laydown areas, and other areas that have been disturbed in the past by mining activities, will not be rehabilitated as expansions in administrative, support, and engineering operations will cover these areas in future.

BRMO also owns residential facilities which are outside of the mining areas. Mining areas are fenced off. Therefore, these residential facilities are separately accessed from public roads and have no interconnecting access to mining areas. These include:

- Black Rock Village which includes a golf course, recreational facilities, and a commercial area;
- Santoy housing and recreational club;
- District Six housing.

Facilities located within Black Rock's boundaries which are owned and operated by external parties include:

- Eskom's Klipkop substation
- Sedibeng Water's Potable water storage facilities connected to the Vaal Gamagara Water Scheme pipeline.

The historical mine works are not active. The remnants of the works are visible but fenced off.

2.1.1 NCHWANING III

Surface operations at Nchwaning III occur within the Black Rock operations. The Nchwaning III mine consists mainly of:

- A mine shaft
- A vent shaft
- Engineering workshops
- Administrative and support facilities

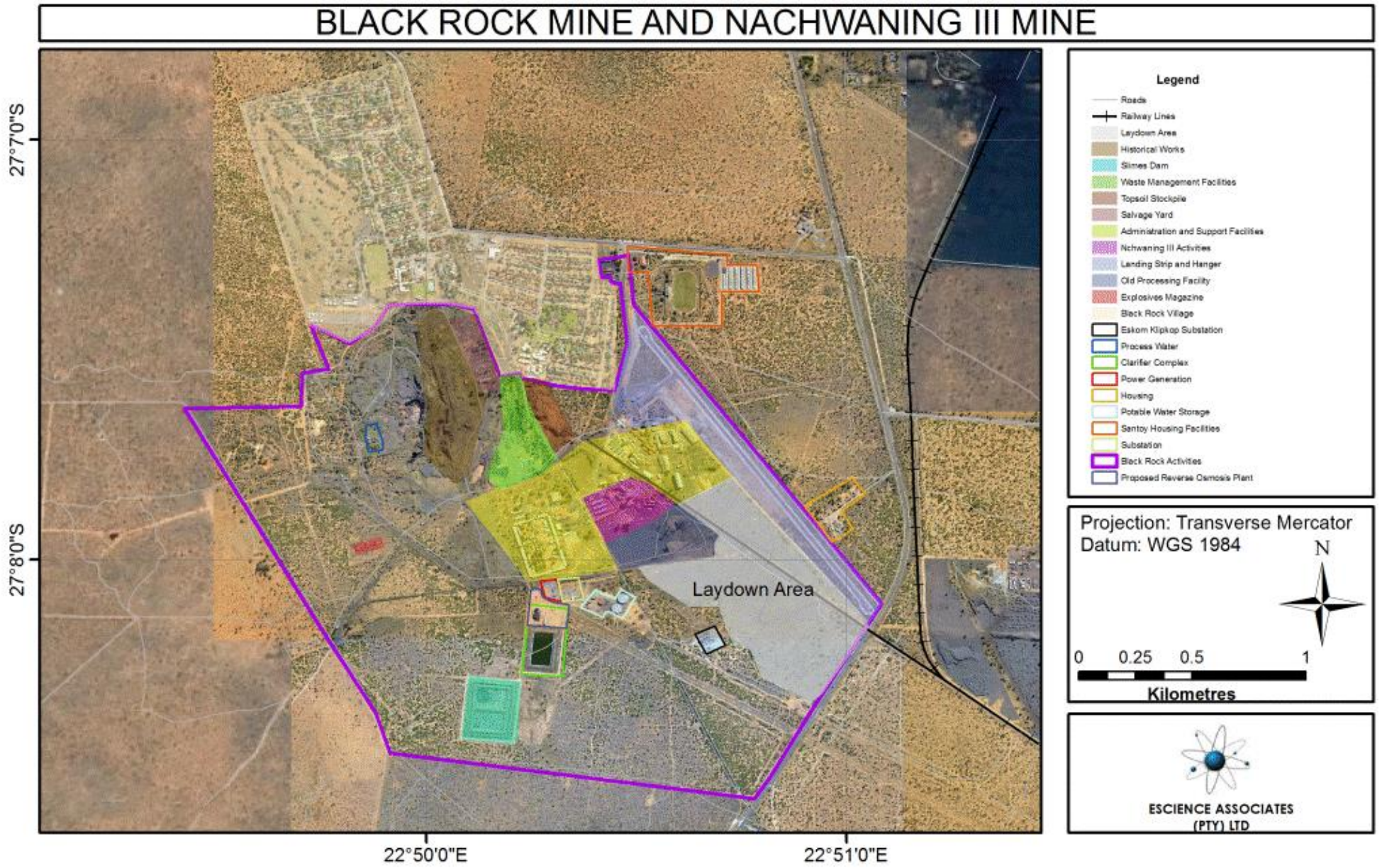


Figure 2-1: Overview of Black Rock Mine and Nchwaning III

2.2 NCHWANING II

Operations at Nchwaning II were first commissioned in 1981. The Nchwaning II complex is comprised of several mining and mining related activities, including *inter alia*:

- Offices, administration, and support facilities
- Engineering services and facilities
- Underground mining access shafts, vent shaft and related infrastructure
- Ore Processing Plants
- Ore (including fines) storage and laydown areas
- A rail loop
- Stacking, reclaiming and loading facilities for transportation of ore
- Current and historical tailings facilities, and reclamation thereof
- 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 magazine
- Unpaved and paved roads connecting the above and other BRMO operations.
- Other ancillaries typical of such a mining operation

The Schoonspruit village is situated to the south of the complex and is outside of the mining areas. Mining areas are fenced off. Therefore, these residential facilities are separately accessed from public roads and have no interconnecting access to mining areas.

Good Rock operates a manganese fines calcining plant on a separately owned piece of land in the north-eastern corner of the Nchwaning II complex. This is an independent commercial entity. The operation was formerly owned by Delta EMD.

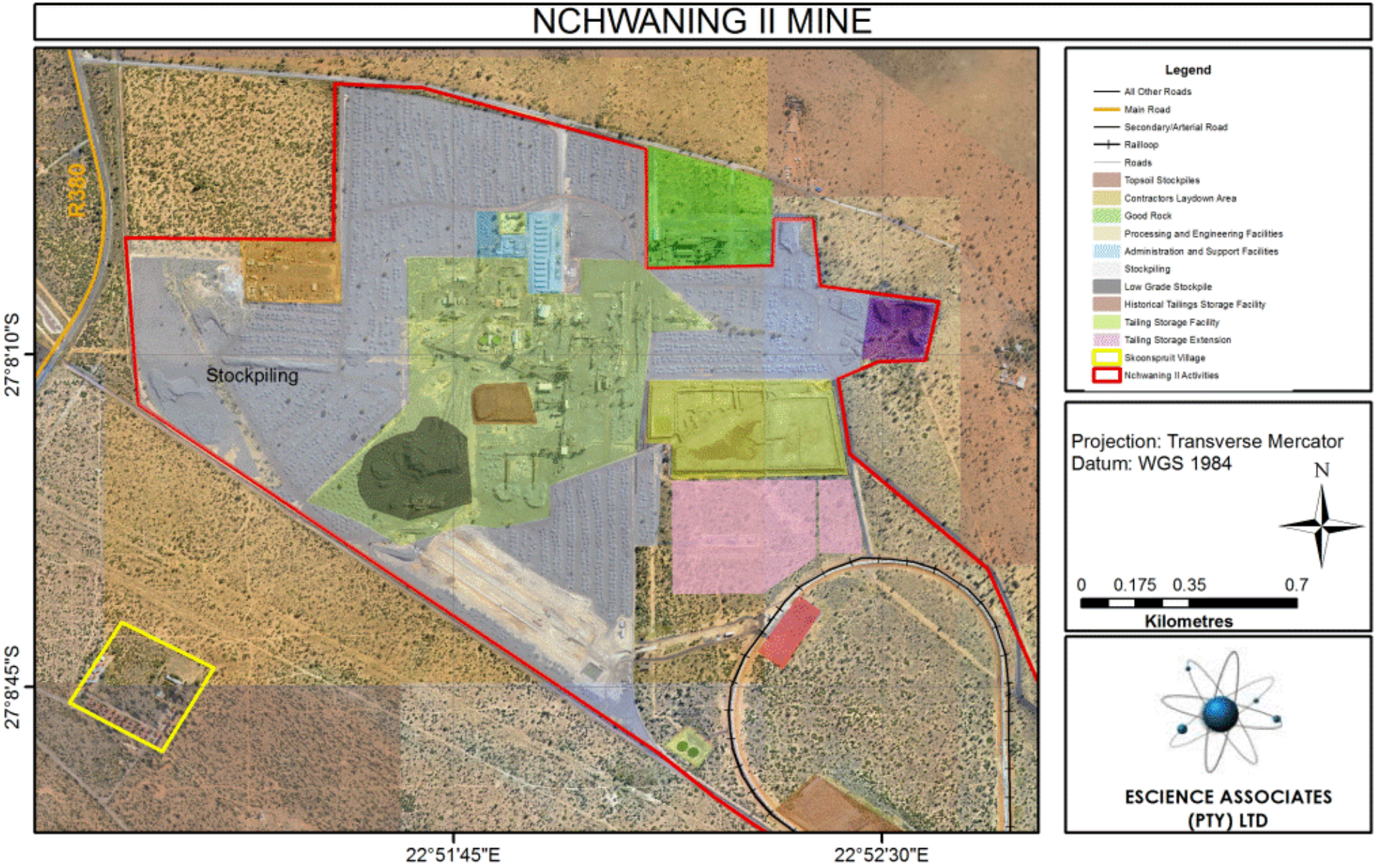


Figure 2-2: Overview of Nchwaning II Mine

2.3 GLORIA MINE

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.

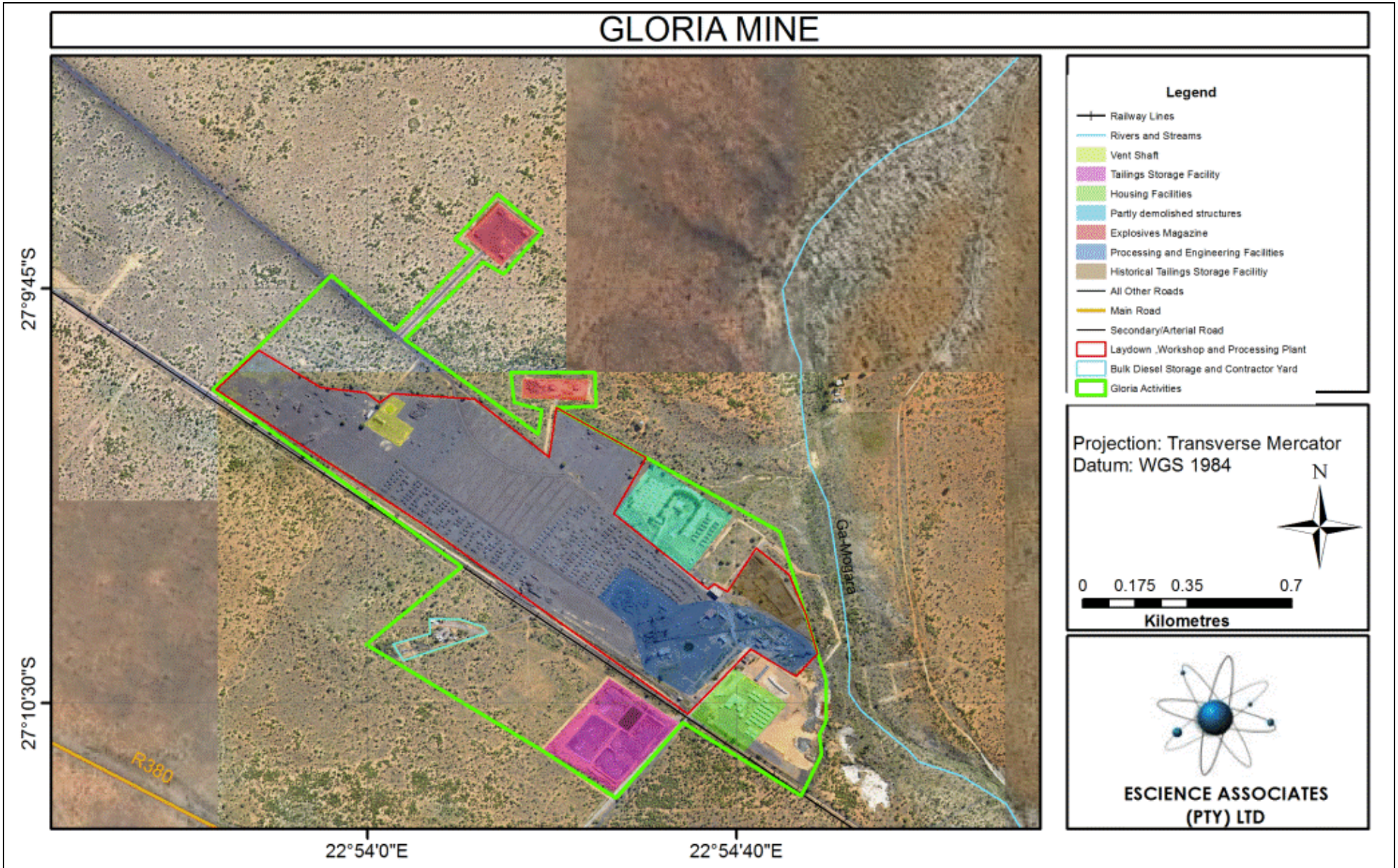


Figure 2-3: Overview of Gloria Mine

2.4 UNDERGROUND ACTIVITIES

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

- Drilling
- Blasting
- Crushing
- Handling and loading of ore

Facilities underground include, *inter alia*:

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

2.5 AUTHORISED MINE EXPANSIONS AND SINTER PLANT COMPLEX

The DMR authorised the expansion of BRMO activities on 11 February 2013. The expansion project includes two broad project components, summarised as follows:

- Expansion of the mine's manganese production capacity through provision of facilities and activities typical of this type of mining including:
    - New mine shafts and vent shaft;
    - Head gear and winder house;
    - New ore processing facilities;
    - Administrative and ancillary facilities;
    - Gate/guard house and associated security infrastructure;
    - Engineering workshops, stores and salvage yards;
    - Tailings storage facilities;
    - Waste handling and storage facilities;
    - Above ground bulk fuel storage facilities;
    - Water treatment and water management facilities, and associated reticulation;
    - Sewage treatment plant and associated reticulation;
    - Required clearing of land and establishment of roads;
    - An interconnecting overland conveyor between Gloria and Nchwaning II;
    - Road (access and haul) infrastructure; and,
    - Other ancillaries typical of such a mining operation
- Establishment of a new sinter plant complex, including product stockpile floors and related facilities including:
    - A sinter plant
    - A washing, crushing and screening plant

- Ore and sinter feed stockpiles
- Product stockpiles
- Administrative offices and facilities
- Engineering workshops and stores
- Tailings storage facilities
- Waste handling and storage facilities
- Water management facilities
- Required clearing of land and establishment of roads

2.5.1 TAILING STORAGE FACILITY (TSF) AND TAILINGS RECOVERY

Tailings storage dams are proposed for establishment as part of the mine upgrade and proposed sinter plant. Tailings are a fine residue derived from manganese ore crushing, washing and screening operations. The economic viability of selling or further processing the tailings is dependent on the market value of manganese. Due to market fluctuations, the material may be stored or recovered for periods of time. Recovered material can be pelletised and/or sintered, or otherwise sold in its current state.

The height of the proposed dams for the sinter plant complex will be restricted to approximately 10 m in height from ground level upward, with an interior basin excavated therein at approximately 3 m below ground level (Figure 2-5). In situ material excavated from the internal compartment basins will be utilised for embankment construction and the material will be placed mechanically, in horizontal layers, to an approved compaction specification. The results of an engineering stability analysis undertaken for the outer and internal dam walls (i.e. based on conceptual design parameters) indicated that the factor of safety for overall stability will be approximately 2.10 for the perimeter embankments and 1.38 for the division embankments. In engineering terms, this was considered to be satisfactory for normal operating conditions. However, it assumes that the management of the facility will be adequate and the need to monitor the identified critical parameters is essential.

Tailings generated from washing, crushing and screening operations will be deposited into the proposed dams; from where the material fines in the tailings will be 'dried' (evaporative water loss) through a process of sequential use of the proposed dams, and subsequently used for fines feed into the sinter plant and/or be processed at an offsite facility or sold. An 'emergency tailings pond' will also be constructed, into which tailings from the proposed thickening process can be diverted in the event of upset operating conditions. Tailings will be deposited into the proposed TSF at a rate of approximately 30 600 tons per month.

The existing tailings facility at Nchwaning II will also be expanded by an area of approximately 20 ha to cater for increased production capacity from the processing plant. The originally planned tailings facilities at the Sinter Plant complex will be reduced by a corresponding volume.

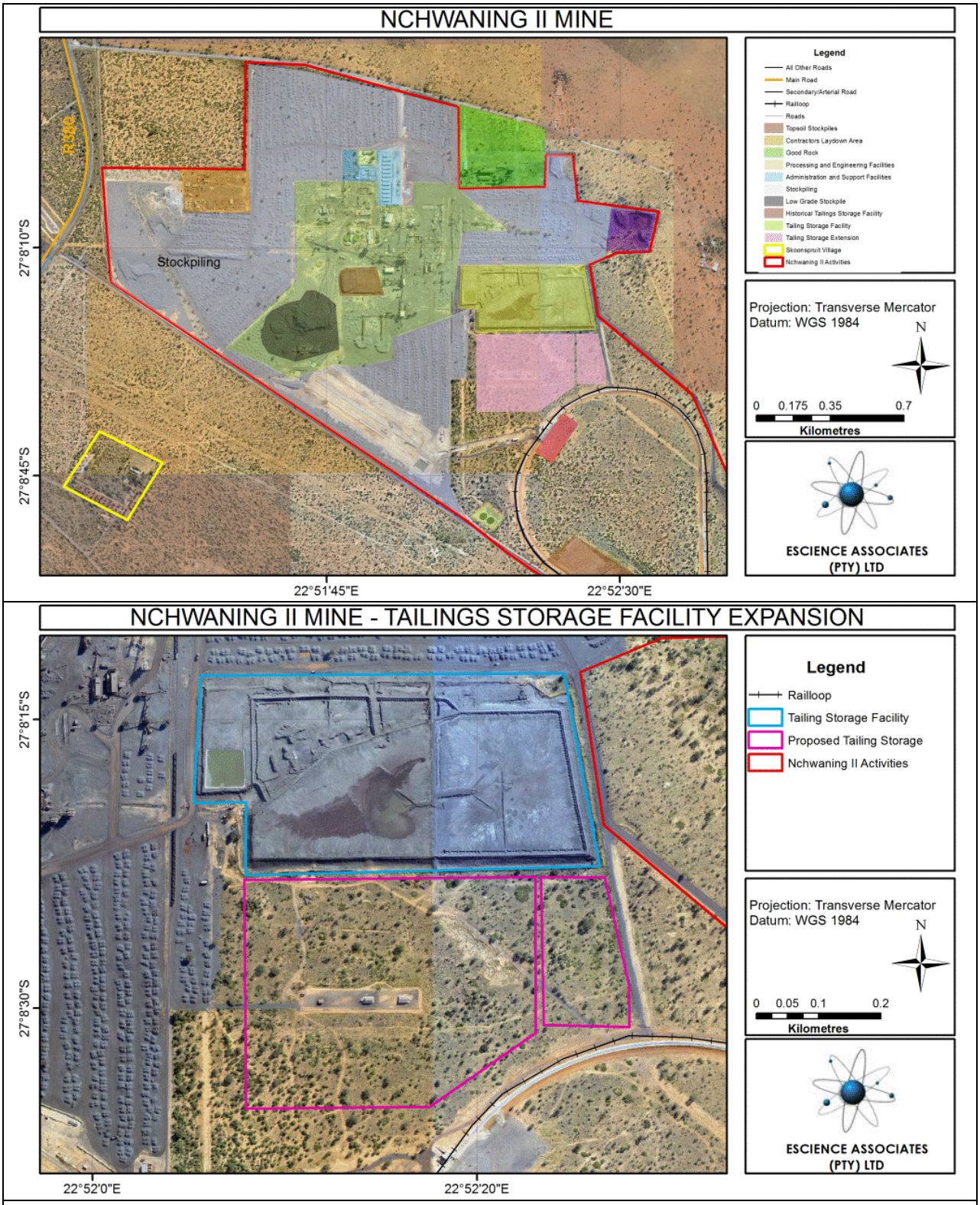


Figure 2-4: Planned Nchwaning II Tailings Expansion

2.5.1.1 Design Criteria

The design life of the proposed sinter plant TSF is approximately 30 years (143 Ha). The TSF is proposed to have a design freeboard for storm water infiltration (24 hr storm = 140 mm) in addition to a 0.8 m dry freeboard over and above the normal operating level and excluding decant return.

Unless otherwise stipulated by the competent authority, new tailings facilities must comply with the applicable legal requirements for mine residues deposits, as outlined in

NEM:WA and the NWA. Tailings from the Nchwaning plant will be generated and deposited in accordance with current practice and will have design life of approximately 10 years, however this may increase depending on future tailings generation and potential recovery. Specialist geohydrological assessment for the existing activities and Nchwaning II TSF and expansion thereof, concludes that a low risk to the groundwater environment is predicted (GPT Reference Number: EEESB-16-1806, refer to Appendix 14).

The TSF design for the proposed Sinter Plant complex will allow for the short-term re-mining/re-processing of the tailings stored in the facility through the sinter plant or an external party. In order to comply with the design objectives for the TSF, the proponent will, to the greatest extent that is practical, implement a high-density tailings disposal solution. To achieve this, a high-density/paste thickener system has been proposed in the design. The low-density tailings slurry, pumped from the proposed process plant, will pass through a high-density/paste thickener system located at the tailings storage facility. The solids will settle to the bottom of the thickener, and will then be extracted as underflow for release into the interior basin of the tailings storage facility. Most of the process water will be decanted off the top of the thickener as clear overflow and recycled back to the process plant. The thickening process will be sufficient to result in non-segregating slurry disposal.

Each of the storage units comprising the TSF for the Sinter Plant complex will have a two-year design life and these will be operated on a rotational basis (i.e. compartments will be filled to design capacity, following which the material therein will be left to dry and subsequently re-worked through the sinter plant).

Supernatant (i.e. layer of 'clear' water that results on the surface of the compartment due to sediment settling) in the compartment basins will accumulate in pools at the decant barges, as a result of floor beaching and deposition control. This supernatant, predominantly derived from storm rainfall, will be decanted from the top surfaces of the compartments and into a purpose built decant water dam adjacent to the TSF, because retained water could:

- Reduce the freeboard and the storm water storage capacity, and so increase the potential for overtopping;
- Increase the potential for slurry flows in the event of a breach;
- Increase the hydraulic gradient of seepage and pore water pressures, which could lead to lower factors of safety for structural stability;
- Inhibit consolidation and so reduce the strength and storage capacity of the facility; and
- Increase water losses through evaporation and seepage and so increase the environmental impacts on water consumption and groundwater.

The design and operational principles for the management of water in relation to the TSF are to:

- Divert clean storm water run-off away from the TSF;
- Minimise the storage of water on the TSF; and
- Contain and re-use the water emanating from the TSF in the sinter plant.

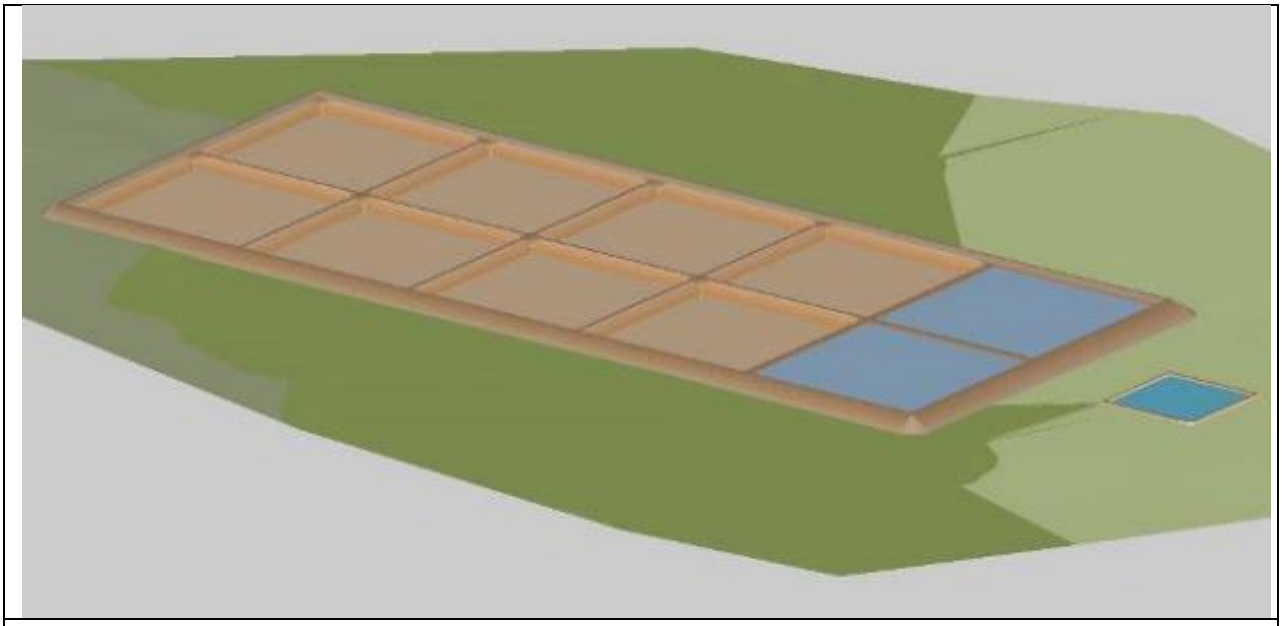


Figure 2-5: Basic aerial overview of proposed sinter complex TSF design and associated decant dam

Tailings will be discharged from three flanks of a compartment in order to form a beach that slopes downwards away from the embankments. This will create a top surface geometry for each compartment that will result in a supernatant pool that is maintained in the immediate vicinity of the decant barge that is located at the midpoint of the division embankment between the two operational compartments. An average beach angle of approximately 1% is expected for the non-segregating tailings material.

The consolidation of the tailings is important in enhancing stability and reducing the probability of a flow slide should structural instability occur. It also ensures the best utilisation of the volume capacity by increasing the stored tonnes of tailings per cubic metre. The expected low permeability of the tailings material implies that there will be virtually no drainage of entrained water by normal consolidation processes during the life of the facility. The effective operation of the facility therefore depends on the consolidation of the tailings by drying, which is a very efficient method.

In respect of the Nchwaning 2 TSF expansion, a Concept Design for New Nchwaning Super Fines Storage Facility was prepared by Geo Tail (Pty) Ltd (Report no. GT/12/16 – REV 0 November 2016). The SFSF will be developed as a single compartment ring dyke type storage facility. The SFSF will have a maximum vertical height of 20 m and the total SFSF footprint is approximately 20 ha. The slurry will initially be placed behind an engineered starter embankment. The maximum height of the starter embankment is 6 m.

An upstream construction methodology will be implemented above the starter embankment crest elevation. The perimeter embankment construction material will be the segregated coarse residue material from the head of the beach. The slurry will be discharged from the perimeter embankment to form a beach that slopes downwards and away from the embankment. This will create a top surface geometry that will result in a supernatant pool that is maintained in the immediate vicinity of the decant system. The slurry will be pumped to the SFSF basin through two slurry delivery pipelines. The design for the slurry pumping system falls outside the scope of this report.

The return water will be pumped from the return water dam to the process plant for re-use in the process.

The report further summarises environmental control measures as follows:

- In the design, the total seepage flux and, hence, the contaminant load will be minimised through:
  - Utilising the thickener at the process plant to increase the slurry density.
  - The lining of the RWD and SFSF with a High-Density Polyethylene (HDPE) geomembrane.
  - Always operating the SFSF with the minimum amount of water stored on the top surface.
  - Operating the SFSF in such a way that the beach angles are maximised and therefore the pool area will be kept as small as possible.
  - The fine segregated super fines in the pool area are expected to have a low permeability with the result that seepage infiltration will be low.
- The seepage will be diverted to the downstream RWD for re-use in the process.
- The storm water diversion system will divert clean precipitation run-off from the external catchment.
- The downstream side slope of the SFSF will be terraced and the engineered bench will collect surface run-off and silt load. The runoff will then be diverted to the RWD through a berm penstock system that is linked to the drainage collector pipe.
- Appropriate erosion protection and energy dissipation measures will be implemented for open trenches, spillways etc.
- Deposition of the slurry will be managed during the operation phase to control dust generation.

2.5.2 SEWAGE TREATMENT PLANT

The proposed sinter and shaft complex will require additional sewage treatment capacity associated with an increased number of people working on the mine property (approximately 1200 additional employees) as well as the 'extended' distribution thereof to un-serviced areas. A sewage treatment plant (anaerobic digestion with associated settling and maturation tanks) is therefore proposed at the new complex. The treatment plant capacity will be designed to accommodate the anticipated increase in the existing workforce. Treated effluent will not be discharged, but diverted to the mine's process water system for reuse. Sewage sludge will be dried in suitably sized drying beds and subsequently disposed of at an appropriately licensed landfill facility. The feasibility of composting the dried sewage sludge, for use on the village gardens and golf course is presently being investigated by the mine.

Figure 2-6 shows existing maturation vessels and drying beds at Black Rock sewage treatment plant as illustration of the proposed plant. The facilities are built on concrete bases.

Sludge Drying Beds

Maturation Tanks

Figure 2-6: Photographs of existing Black Rock SWTP

2.5.3 BULK FUEL STORAGE

A bulk fuel and oil storage area will be established within the shaft complex and at Nchwaning II. Bulk fuel and oil storage tanks, with a combined capacity of up to 150 m^3 will be erected within an appropriately sized bund. The area will be drained to a sediment trap and hydrocarbon separator. The diesel will be used to refuel arriving train locomotives, as well as haul trucks and other mine vehicles. In addition, fuel may be piped underground to refuel the plant, and machinery and vehicles working there. Photographic examples of existing facilities area provided below.

Figure 2-7: Example of existing bunded fuel storage at Nchwaning III

Figure 2-8: Illustration of drainage containment for fuelling at existing Nchwaning III site

2.5.4 SALVAGE YARD AND WASTE STORAGE FACILITIES

A salvage yard is proposed for west of the shaft complex. Any items with a potential salvage value will be temporarily stored in this area for subsequent removal by an appropriately licensed contractor. Items to be stored could vary from redundant plant, vehicles or equipment to waste oils and rubber conveyers. Waste will be stored in accordance with the requirements of the National Norms and Standards for Storage of Waste (NEM:WA GN926:2013 or its successors). Figure 2-10 illustrates existing facilities used for storage of waste at the Black Rock waste management facility.

Figure 2-9: Existing hazardous waste storage at Black Rock waste management facility

Figure 2-10: Storm water collection sump and treatment Black Rock hazardous waste storage facility

2.5.5 PROPOSED NCHWANING MINE SHAFT

The proposed Nchwaning vertical shaft will be established to provide optimal access to the remaining Nchwaning ore body for the foreseeable future. The surface structural and infrastructural requirements will be significantly reduced from those of the proposed Gloria surface shaft complex. This is due to the preferred site being located within the existing Nchwaning II surface workings.

2.5.6 WATER STORAGE AND TREATMENT

2.5.6.1 Storage

As part of the required water storage capacity increase for the feasibility of the project, the following additional dams and concrete reservoirs are proposed by Assmang BRMO as part of the project:

- Establishment of storm water soakaways associated with the sinter plant- and Gloria Surface Shaft complexes, rail balloon related facilities including product stacking and reclaiming, as well as the open areas to the west-south-west thereof. The aim of which is to capture and divert storm water run-off from the stacking, reclaiming, and rail loading operations, and other areas where rainwater will not be exposed to potentially significant contamination. These dams will be un-lined earthen dams; where any rainwater captured therein will simply be allowed to infiltrate back into the groundwater environment. These dams are required to:

- Prevent the ingress of storm water run-off into the proposed Gloria vertical and vent shafts; and
- To prevent and minimise the unnecessary contamination of clean storm water run-off over potentially contaminated mine works areas, such as the Sinter Plant- and Surface Shaft complexes.

- Establishment of three 'dirty' storm water dams; where potentially contaminated surface water run-off from work areas will be diverted to these lined dams. These dams will also be fitted with silt traps and water will be fed into the process water reticulation system;
- Establishment of a TSF decant water storage dam for the proposed Sinter Plant complex TSF;
- Establishment of concrete potable/Vaal-Gamagara water reservoirs 2 x 5000 m^3, at the existing Black Rock mine and one 500 m^3 at Nchwaning II.
- The planned HDPE lined 'clear/process' water dam in the vicinity of the proposed sinter plant, has been replaced by two 2 500 m^3 concrete process reservoirs at Nchwaning II. These dams will receive water from the following sources, once treated, and subsequently used as the primary water supply to the sinter- and crushing plants:
  - Underground dewatering;
  - Recirculated water from the plant.
  - Dirty storm water containment dams;
  - TSF decant dam; and
  - Treated sewage plant effluent.

2.5.6.2 Treatment

Currently processed water goes through the clarifier complexes prior to being distributed amongst the mines, used for irrigation or watering wildlife at the Belgravia pan. For the proposed Sinter Plant complex the following treatment plants are proposed:

- De-chlorination Plant with an approximate treatment capacity of 960 m^3 per day (exact capacity to be finalised with final detailed design). The associated project technologies (i.e. real time on-line mineral scanners) cannot tolerate chlorine; and
- De-silting plant (clarifier) with an approximate treatment capacity of 570 m^3 per day (10 hour operational day) for de-silting of dewatered underground water from the mine, TSF decant water and potentially contaminated water from 'dirty' storm water containment dams (exact capacity to be finalised with final detailed design).

Water from the Vaal-Gamagara pipeline scheme will undergo additional treatment on site prior to the use thereof in domestic applications on the mine (i.e. drinking water, toilets, wash water, etc.). Treatment capacity is based on approximately 1200 additional people on the mine and an approximate water usage of 200 litres per person per day).

This treatment involves the following:

- Chlorination/ozone plant with an approximate treatment capacity of 240 m^3 per day to treat the current water supply from the Vaal-Gamagara system to ensure that it is fit for domestic purposes (exact capacity to be finalised with final detailed design); and
- Water softening plant with an approximate treatment capacity of 240 m^3 per day to treat the current water supply from the Vaal-Gamagara system to ensure that it is fit for domestic purposes (exact capacity to be finalised with final detailed design).

2.5.7 BORROW PIT ESTABLISHMENT

Approximately 650 000 m^3 of fill material is required for civil- and earth works during the construction period of the project. The material to be targeted/'borrowed' in this regard is Kalahari sand, as well as calcrete. Low grade ore is also used where feasible. Depending on the availability of these materials, it may be necessary for the Mine to use crushed waste rock from mining operations.

In order to minimise disturbances to naturally vegetated areas and associated ecological functioning (i.e. through extensive borrow pit establishment), the mine proposes to target the majority of the required fill material, to one degree or another, from the footprints of all proposed storm water, pollution control, potable water and tailings dams, and from low grade ore stock. The exploitation of this possible synergy is viewed favourably for the following reasons:

- The material excavated as part of dam establishment would otherwise have become overburden material, stockpiled at surface for the operational lifespan of the mine; and
- It negates the need for extensive establishment of borrow pits elsewhere on the mining site that would have contributed further to cumulative project impacts in respect of;
  - Disturbances to ecosystem functioning and associated flora/fauna;
  - Alterations to site topography and indirect surface water regime alteration impacts; and
  - Dust generation/soil erosion, through further exposing bare soil surfaces to the action of wind and rain.

The excavation depths for each of the following respective dam types, below normal ground level, will be approximately 3-4 m (to be finalised during the design phase):

- Pollution control dams;
- Storm water dams;
- Clean water storage dams; and
- TSF facility.

Any volume of 'borrowed' material required in excess of that obtainable from the development footprints described above will need to be obtained through the establishment of additional borrow-pits within the greater development footprint assessed as part of the EIA; where any required removal/destruction of protected floral species would need to be appropriately permitted and the extent (i.e. excavation depth and lateral extent thereof) of the pits optimised to ensure minimal surface area

disturbances without impacting on the effectiveness of post closure shaping and rehabilitation. The dimensions of any borrow pits would need to be such that the affected areas can be appropriately rehabilitated to meet the end-use planning objectives for the site to enable access to grazing by large grazing herbivores, and be of stable incline.

In addition, any borrow pit established outside of a proposed development footprint must be appropriately rehabilitated upon the closure thereof, in accordance with the mitigation prescribed in the rehabilitation section of the EMPr.

2.5.8 HOTAZEL-GLORIA MINE RAILWAY UPGRADE

The nature of the proposed railway upgrade on the Hotazel-Gloria Mine link was dependant on the outcome of an engineering feasibility assessment of the current line and associated bridge crossing over the Gamagara River. At worst, an entirely new line and rail bridge would have needed to be constructed adjacent to the existing line and bridge respectively (within the existing Assmang rail servitude). The proponent now proposes to upgrade the existing line, without expanding the current development footprint thereof; where such upgrade would involve the replacement of existing steel railway sleepers with concrete sleepers to accommodate the proposed use of larger, heavier, rail wagons. The elevation of the existing rail bridge over the Gamagara River, in relation to the remainder of the rail link, decreases as it follows the contours of the associated river bed. The steep gradients to and from the existing bridge may be problematic to the mine, in that a fully laden train may require a financially prohibitive number of locomotives in order to power the train through the 'dip' and away from site. A new, raised elevation, bridge crossing might thus be required in order to reduce the required number of locomotives utilised.

2.5.9 WASTE GENERATION

The proposed sinter plant, as well as the new washing, crushing and screening plant, will generate several waste streams at the mine which will require temporary storage and environmentally sound management prior to either:

- The reuse thereof in the sinter plant (in the case of recovered fines);
- Transfer to the proposed TSF for temporary storage (in the case of tailings); or
- Transfer to the Flue-Gas Desulphurisation (FGD) waste disposal facility (in the case of waste residues derived through FGD activities at the sinter plant.

These waste streams are as follows:

- Air Pollution Control System Waste from the emission abatement equipment fitted to the sinter plant. An air emission abatement system will be used to maintain air emissions from the plant to within applicable gazetted Minimum Emission Standards, in terms of the National Environmental Management Air Quality Act 2004 (Act. No 39 of 2004) [NEM:AQA]. Such systems result in a 'fines' waste stream being generated that is proposed for reuse as part of the raw material feed to the sinter plant. The sinter plant technology to be implemented will have a direct feed for this waste into the sinter plant raw material feed. No temporary storage is thus required from the point of generation to reuse thereof;
- Any proposed flue gas desulphurisation (FGD) required to meet applicable stack emission limits for SO_2 would, however, result in a waste stream requiring

either temporary storage on site prior to disposal thereof at an appropriately licensed waste disposal facility, or provision for the onsite disposal thereof; and

- Waste slurry will result from the ore washing, crushing and screening plant. The effluent stream will be heavily laden with manganese ore fines. This waste stream will be pumped into the proposed tailings dams.

2.5.10 FLUE-GAS DESULPHURISATION (FGD) WASTE RESIDUES

Flue-gas desulfurization (FGD) is a technology used to remove sulphur dioxide (SO_2) from the exhaust flue gases of certain industrial and power generation processes. FGD technology will likely be applied to the sinter plant, in order to ensure that stack emissions from the plant meet the regulatory limits set in the NEM:AQA for such point sources. The implementation of FGD will result in the generation of a sulphur containing waste with variable remaining composition, depending on the alkaline scrubbing agent used to remove the SO_2.

Almost all commercial FGD processes are based on the fact that SO_2 is acidic in nature, and consequently removes the SO_2 from flue gases by reaction with a suitable alkaline substance. The most commonly used alkaline materials are limestone (calcium carbonate), quicklime (calcium oxide, CaO) and hydrated lime (calcium hydroxide). Limestone is an abundant, and therefore relatively cheap, material and both quicklime and hydrated lime are produced from limestone. Other alkalis sometimes used include sodium carbonate, magnesium carbonate and ammonium compounds.

The reaction taking place in wet scrubbing using a $CaCO_3$ (limestone) slurry, for example, produces $CaSO_3$ (calcium sulphite) and can be expressed as:

$CaCO_3$ (solid) + SO_2 (gas) → **$CaSO_3$ (solid waste)** + CO_2 (gas)

When wet scrubbing with a $Ca(OH)_2$ (lime) slurry, for example, the reaction also produces $CaSO_3$ (calcium sulphite) and can be expressed as:

$Ca(OH)_2$ (solid) + SO_2 (gas) → **$CaSO_3$ (solid waste)** + H_2O (liquid)

When wet scrubbing with a $Mg(OH)_2$ (magnesium hydroxide) slurry, for example, the reaction produces $MgSO_3$ (magnesium sulphite) and can be expressed as:

$Mg(OH)_2$ (solid) + SO_2 (gas) → **$MgSO_3$ (solid waste)** + H_2O (liquid)

2.5.10.1 FGD Residue Management/Disposal

The exact volumes and chemical composition of the FGD waste residues to be generated at the plant are not known at this time by the proponent. These can only be determined once the detailed sinter plant design is completed and subsequently operational such that required FGD can be optimised. Nonetheless, an FGD waste residue will result from the project that will require disposal to landfill on the mine property. As a result of the current information gaps and uncertainties, a precautionary approach should be applied; where this waste stream should be deemed to be 'Hazardous'/'High Risk' in nature, until proven otherwise through appropriate sampling, analysis and 'risk profiling' for disposal to landfill.

Any FGD waste residue disposal or storage facility should therefore have an installed pollution containment barrier/'landfill liner' system with at least a 'Class A' containment barrier (Figure 2-11) performance equivalent (i.e. for as many disposal cells as are required by BRMO until the waste can be sampled, tested and appropriately 'risk profiled' for landfill disposal). If the FGD waste residue ultimately turns out to pose a lesser risk to the groundwater environment than is imposed through the precautionary approach advocated, a motivation would be made to the competent authority for a reduced containment barrier system applicable to all subsequent disposal cells; where those cells would need to be lined according to the actual risk posed by the FGD waste.

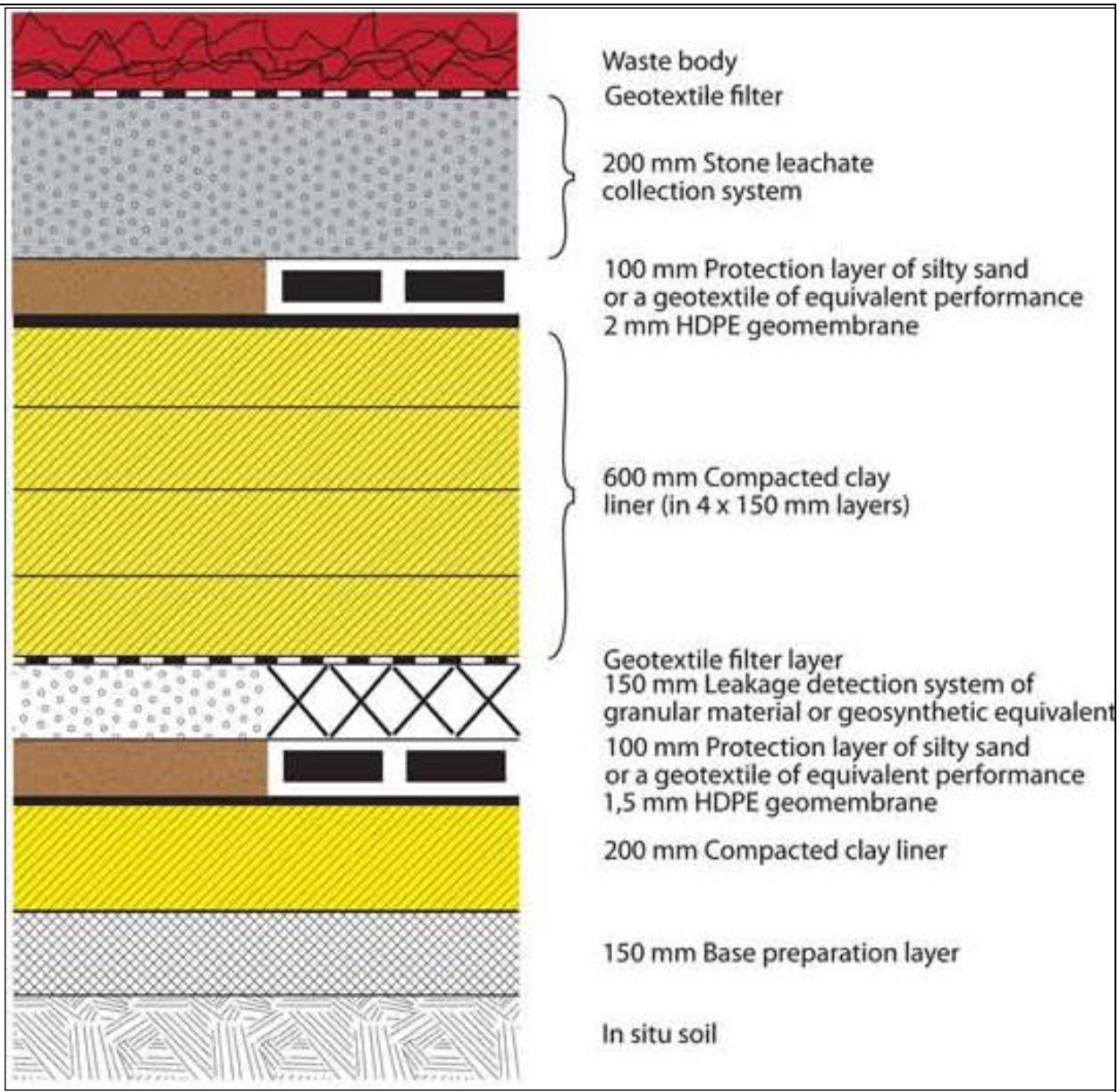


Figure 2-11: Class A Landfill Liner/Pollution Containment Barrier Design

Although the minimum proposed liner requirements for the disposal site are stated in the previous section, a detailed engineering landfill liner design would need to be submitted to the competent authority for consideration and approval prior to the proponent proceeding with the construction or operation of the disposal facility. In addition, positioning of the proposed FGD residue disposal facility would need to be shown to be favourable at the hand of geo-physics surveys to be undertaken at BRMO.

The results of which would also need to be submitted to the competent authority for their approval prior to construction of the facility.

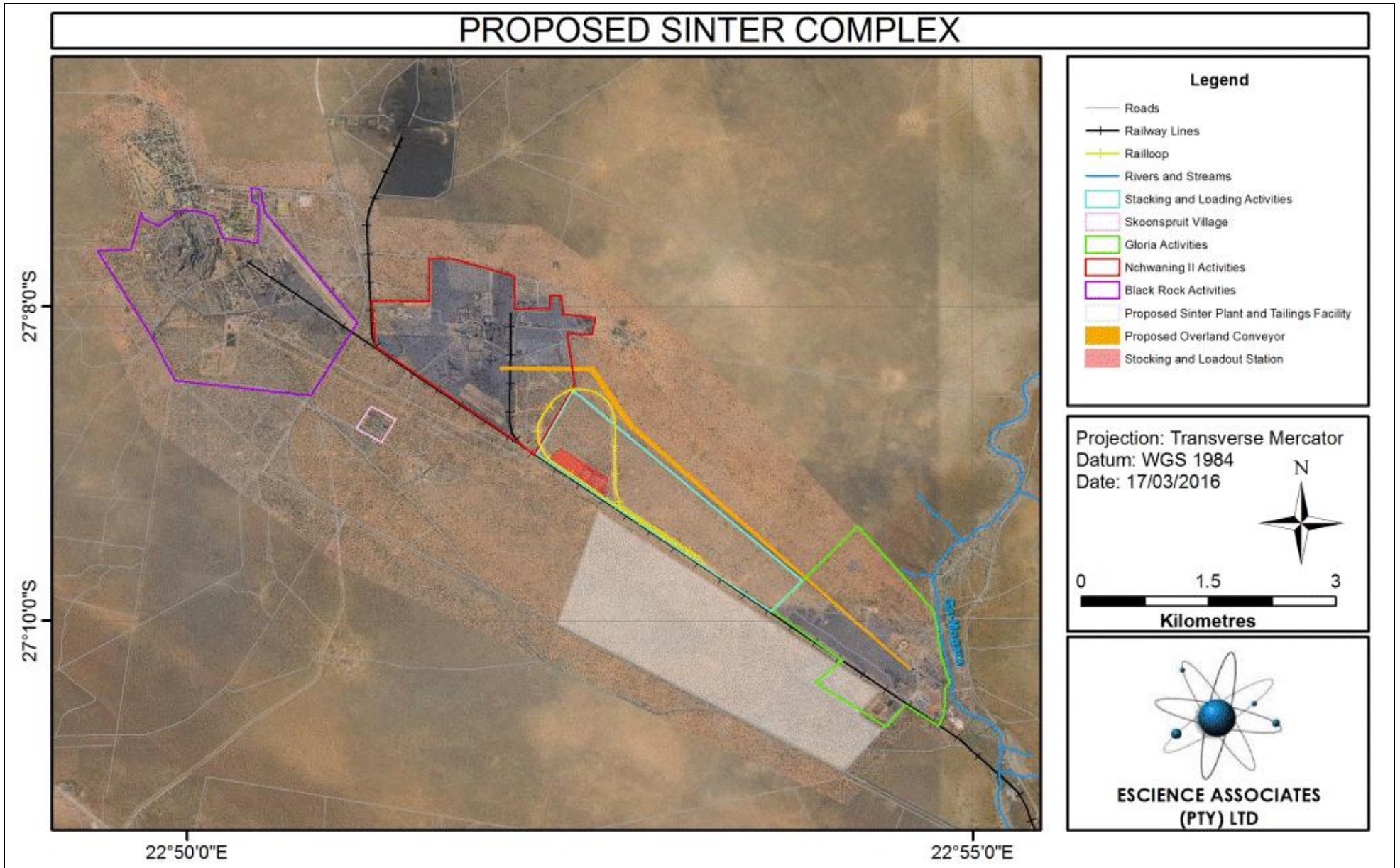


Figure 2-12: Proposed sinter complex and tailings facility general outline

2.6 SHARED AND INTERCONNECTING INFRASTRUCTURE

It is noteworthy that the mine's operations are spatially separate, however there are various interconnecting and shared facilities. These include:

- Interconnecting roads;
- Railways, rail loops and associated loading/offloading infrastructure;
- Water supply and reticulation;
- Electrical power supply.

2.7 NON-MINING RELATED ACTIVITIES

Surface areas, belonging to BRMO, which are not disturbed by mining and which are outside of the demarcated mining areas, are used for farming, residential and related commercial activities. A portion of the Belgravia farm is used by BRMO as a game farm.

3 SUMMARY OF APPLICABLE ENVIRONMENTAL LEGISLATION AND LISTED ACTIVITIES

A summary of current applicable legislation is presented in this section.

3.1 MINERAL AND PETROLEUM RESOURCES DEVELOPMENT ACT (ACT 28 OF 2002)

Initially BRMO operations had fragmented EMPs, these were consolidated into a single EMPr covering all operations and approved by the Department of Mineral Resources (DMR) on **11 February 2013**. The EMPr was formulated prior to the "One Environmental System" as contemplated in Section 50A(2) of the National Environmental Management Act (Act 107 of 1998) as amended on 02 September 2014.

The MPRDA has since been amended, such that environmental management regulation is largely covered in terms of the National Environmental Management Act (Act 107 of 1998) {NEMA} as amended. S102 of the MPRDA however remains in force and states:

"*102. Amendment of rights, permits, programmes and plans*

(1) A … environmental management programme or an environmental authorisation issued in terms of the National Environmental Management Act, 1998, as the case may be, may not be amended or varied (including by extension of the area covered by it or by the additional of minerals or a shares or seams, mineralised bodies or strata, which are not at the time the subject thereof) without the written consent of the Minister.

3.2 NATIONAL ENVIRONMENTAL MANAGEMENT ACT (ACT 107 OF 1998)

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

The 2014 amendments of the National Environmental Management Act (Act 107 of 1998) {NEMA} and the MPRDA have resulted in significant changes to the manner in which mining environmental permitting is undertaken:

1. According to the transitional arrangements S12(4) (4) An environmental management plan or programme approved in terms of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002); immediately before the date on which this Act came into operation must be regarded as having been approved in terms of the principal Act as amended by this Act. Thus, the EMPr approved in terms of the MPRDA is also deemed approved in terms of NEMA.
2. The Minister of Mineral Resources is now the competent authority in respect of mining related activities.

3.2.1 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). At the time of development of the EMPr, environmental impact assessment was undertaken in accordance with the requirements of the EIA regulations in force at the time (GN.R 543:2010) in order to pre-emptively, ensure alignment with NEMA requirements.

Table 3-1 presents a summary of activities that required Environmental Authorisation which were included in the EMPr. It was noted at the time of submission of the EMPr that the activities ultimately undertaken by Assmang would be based on final project infrastructure design, including certain capacity thresholds and integration with existing infrastructure of the existing mine operations at BRMO. Some of these are now indicated in the list below.

Table 3-1: Listed Activities applicable to the Mine
GN.R 983:2014
Activity No. 1: The development of facilities or infrastructure for the generation of electricity from a renewable resource where- (i) the electricity output is more than 10 megawatts but less than 20 megawatts; (ii) the output is 10 megawatts or less but the total extent of the facility covers an area in or excess of 1 hectare; REASON: Expansion of backup generator sets at Black Rock Mine due to increased power requirements resulting from the sinter plant and mine expansion activities. Current generation capacity caters only to existing electrical demand at BRMO.
Activity No. 9: The construction of facilities or infrastructure exceeding 1 000 metres in length for the bulk transportation of water, sewage or storm water - (i) with an internal diameter of 0,36 metres or more; or (ii) with a peak throughput of 120 litres per second or more, excluding where: a) such facilities or infrastructure are for bulk transportation of water, sewage or storm water or storm water drainage inside a road reserve; or b) where such construction will occur within urban areas but further than 32 metres from a watercourse, measured from the edge of the watercourse. REASON: Some infrastructure may be required in excess of 1 km for transport of process/waste water/tailings to and from the sinter plant. This includes shifting and/or upgrades to potable water piping.
Activity No. 11: The development of facilities or infrastructure for the transmission and distribution of electricity- (i) outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kilovolts; or (ii) inside urban areas or industrial complexes with a capacity of 275 kilovolts or more. REASON: Electricity of between 33 and 275 KV could possibly be transmitted. This

Table 3-1: Listed Activities applicable to the Mine
includes shifting of existing power lines.
Activity No. 12: The development of- (i) canals exceeding 100 square metres in size; (ii) channels exceeding 100 square metres in size; (iii) bridges exceeding 100 square metres in size; (iv)dams, where the dam, including infrastructure and water surface area, exceeds 100 square metres in size; (v) weirs, where the weir, including infrastructure and water surface area, exceeds 100 square metres in size; (vi) bulk storm water outlet structures exceeding 100 square metres in size; (vii) marinas exceeding 100 square metres in size; (viii) jetties exceeding 100 square metres in size; (ix) slipways exceeding 100 square metres in size; (x) buildings exceeding 100 square metres in size; (xi) boardwalks exceeding 100 square metres in size; or (xii) infrastructure or structures with a physical footprint of 100 square metres or more; where such development occurs (a) within a watercourse; (b) in front of a development setback; or (c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse; - Excluding (aa) the development of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour; (bb) where such development activities are related to the development of a port or harbour, in which case activity 26 in Listing Notice 2 of 2014 applies; (cc) activities listed in activity 14 in Listing Notice 2 of 2014 or activity 14 in Listing Notice 3 of 2014, in which case that activity applies; (dd) where such development occurs within an urban area; or (ee) where such development occurs within existing roads or road reserves. REASON: A railway bridge may be built across the Gamagara river.
Activity No. 13: The development of facilities or infrastructure for the off-stream storage of water, including dams and reservoirs, with a combined capacity of 50000 cubic metres or more, unless such storage falls within the ambit of activity 16 in Listing Notice 2 of 2014. REASON: The total installed capacity at BRMO (cumulative capacity) is in excess of 50 000 m^3.
Activity No.14: The development of facilities or infrastructure, for the storage, or for the storage and handling, of a dangerous good, where such storage occurs in containers with a combined capacity of 80 cubic metres or more but not exceeding 500 cubic metres. REASON: Facilities for the storage and handling of a dangerous good (heavy fuel oil – HFO, diesel) will be constructed with a capacity of greater than 80 but less than 500 m^3.

Table 3-1: Listed Activities applicable to the Mine
Activity No. 19: The infilling or depositing of any material of more than 5 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 5 cubic metres from (i) a watercourse (ii) the seashore; or (iii) the littoral active zone, an estuary or a distance of 100 metres inland of the high-water mark of the sea or an estuary, whichever distance is the greater- but excluding where such infilling, depositing, dredging, excavation, removal or moving (a) will occur behind a development setback; (b) is for maintenance purposes undertaken in accordance with a maintenance management plan; or (c) falls within the ambit of activity 21 in this Notice, in which case that activity applies. REASON: More than 5 m^3 of soil and/or sand may have to be deposited or excavated in the Gamagara watercourse for the construction of the railway line/bridge crossing.
Activity No. 24: The development of (i) a road for which an environmental authorisation was obtained for the route determination in terms of activity 5 in Government Notice 387 of 2006 or activity 18 in Government Notice 545 of 2010; or (ii) a road with a reserve wider than 13,5 meters, or where no reserve exists where the road is wider than 8 metres; but excluding (a) (a)roads which are identified and included in activity 27 in Listing Notice 2 of 2014; or (b) roads where the entire road falls within an urban area. REASON: The final sighting of the sinter plant may require new roads for access, delivery and distribution.
Activity No. 25: The development and related operation of facilities or infrastructure for the treatment of effluent, wastewater or sewage with a daily throughput capacity of more than 2000 cubic metres but less than 15000 cubic metres. REASON: Combined capacity of waste water and sewage treatment plants may exceed 2000 m^3 per day.
Activity No. 37: The expansion and related operation of facilities for the generation of electricity from a non-renewable resource where- (i) the electricity output will be increased by 10 megawatts or more, excluding where such expansion takes place on the original development footprint; or (ii) (ii) regardless the increased output of the facility, the development footprint will be expanded by 1 hectare or more. REASON: There will be an upgrade to the existing Black Rock Mine emergency power generation capacity.
Activity No. 48: The expansion (i) of canals where the canal is expanded by 100 square metres or more in size; (ii) channels where the channel is expanded by 100 square metres or more in

Table 3-1: Listed Activities applicable to the Mine
size; (iii) bridges where the bridge is expanded by 100 square metres or more in size; (iv) dams, where the dam, including infrastructure and water surface area, is expanded by 100 square metres or more in size; (v) weirs, where the weir, including infrastructure and water surface area, is expanded by 100 square metres or more in size; (vi) bulk storm water outlet structures where the bulk storm water outlet structure is (vii) expanded by 100 square metres or more in size; or (viii) marinas where the marina is expanded by 100 square metres or more in size; where such expansion or expansion and related operation occurs (a) within a watercourse; (b) in front of a development setback; or (c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a-watercourse; excluding (aa) the expansion of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour; (bb) where such expansion activities are related to the development of a port or harbour, in which case activity 26 in Listing Notice 2 of 2014 applies; (cc) activities listed in activity 14 in Listing Notice 2 of 2014 or activity 14 in Listing Notice 3 of 2014, in which case that activity applies; (dd) where such expansion occurs within an urban area; or (ee) where such expansion occurs within existing roads or road reserves. REASON: The rail bridge over the Gamagara river will potentially need to be expanded/ upgraded.
Activity No. 50: The expansion of facilities or infrastructure for the off-stream storage of water, including dams and reservoirs, where the combined capacity will be increased by 50000 cubic metres or more. REASON: The total expanded installed capacity at BRMO (cumulative capacity) is in excess of 50 000 m^3.
Activity No. 56: The widening of a road by more than 6 metres, or the lengthening of a road by more than 1 kilometre- (i) where the existing reserve is wider than 13,5 meters; or (ii) where no reserve exists, where the existing road is wider than 8 metres; excluding where widening or lengthening occur inside urban areas. REASON: The final site of the sinter plant may require link roads with existing road network.
Activity No. 64: The expansion of railway lines, stations or shunting yards where there will be an increased development footprint, excluding- (i) railway lines, shunting yards and railway stations in industrial complexes or zones; (ii) underground railway lines in mines; or (iii) additional railway lines within the railway line reserve.

Table 3-1: Listed Activities applicable to the Mine
REASON: In addition to the proposed rail load out facility and upgrading of the Hotazel-Gloria Mine rail link, the expanded processing and sinter plant capacity may require additional rail infrastructure for transport of raw materials and ore products, including sintered fines. A rail loop has also been constructed.
GN.R 984:2014
Activity No. 6: The development of facilities or infrastructure for any process or activity which requires a permit or licence in terms of national or provincial legislation governing the generation or release of emissions, pollution or effluent, excluding- (i) activities which are identified and included in Listing Notice 1 of 2014; (ii) activities which are 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; or (iii) the development of facilities or infrastructure for the treatment of effluent, wastewater or sewage where such facilities have a daily throughput capacity of 2000 cubic metres or less. REASON: The proposed sinter plant would require an Air Emission Licence in terms of the NEM: Air Quality Act (2004). Water management facilities require a Water Use Licence.
Activity No. 12: The development of railway lines, stations or shunting yards excluding (i) railway lines, shunting yards and railway stations in industrial complexes or zones; (iii) underground railway lines in a mining area; or (iv) additional railway lines within the railway line reserve REASON: A new rail loop has been constructed. Alignment of the existing Hotazel-Gloria railway line with the proposed rail bridge over the Gamagara River may require the construction of associated aligning railway sections of approximately 250 m, either side of the proposed new bridge crossing.
Activity No. 15: The clearance of an area of 20 hectares or more of indigenous vegetation, excluding where such clearance of indigenous vegetation is required for (i) the undertaking of a linear activity; or (ii) maintenance purposes undertaken in accordance with a maintenance management plan. REASON: The proposed sinter plant complex, new shaft complex, railway lines, etc. transform an area of greater than 20 ha in extent.
Activity No. 16. The development of a dam where the highest part of the dam wall, as measured from the outside toe of the wall to the highest part of the wall, is 5 metres or higher or where the highwater mark of the dam covers an area of 10 hectares or more. REASON: Some reservoirs exceed 5 m in height. Note that "dam" when used in these regulations means any barrier dam and any other form of impoundment used for the storage of water.

Table 3-1: Listed Activities applicable to the Mine
Activity No. 26: Commencing of an activity, which requires an atmospheric emission license in terms of Section 21 of the National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004), excluding - (i) activities which are identified and included in Listing Notice 1 of 2014; (ii) activities which are 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, REASON: The proposed sinter plant would require an Air Emission Licence in terms of the NEM: Air Quality Act (2004).
GN R.546 Basic Assessment activities (18 June 2010) – 'Sensitive Areas'
Activity No. 14: The clearance of an area of 300 square metres or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a maintenance management plan. REASON: The establishment of proposed structural and infrastructural project components requires the prior clearance of indigenous vegetation from the 'green-fields' development area.

3.2.2 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.

3.3 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;

(iii) 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".

The waste streams resultant directly from the sinter plant and expanded beneficiation plant and mining operations in general fall within the definition of 'waste'. Notably, at the time of approval of the EMPr, NEM:WA did not apply to *inter alia* '*Residue deposits and residue stockpiles that are regulated under the Mineral and Petroleum Resources Development Act 2002 (Act No. 28 of 2002)[MPRDA]*'. The current amended NEM:WA does regulate residue deposits and residue stockpiles. The existing and planned tailings facilities, as well as other waste management activities were authorised in terms of the MPRDA prior to the NEM:WA amendments.

'Residue stockpiles and residue deposits' are defined in the MPRDA as follows:

- Residue stockpile, means any debris, discard, tailings, slimes, screening, slurry, waste rock, foundry sand, beneficiation plant waste, ash or any other product derived from or incidental to a mining operation and which is stockpiled, stored or accumulated for potential re-use, or which is disposed of, by the holder of a mining right, mining permit or production right.

- Residue deposit, means any residue stockpile remaining at the termination, cancellation or expiry of a prospecting right, mining right, mining permit, exploration right or production right;

The Processing Plant tailings are deemed to be derived from, or incidental, to a mining operation and are stored for potential re-use by the mine in the sinter plant (as raw material), or to be otherwise sold to depending on market demand.

3.3.1 LISTED ACTIVITIES

According to Section 19(1) and 19(3) of the Act, the Minister may publish a list of waste management activities that have, or are likely to have, a detrimental effect on the environment, and must specify whether a waste management licence is required to conduct these activities. Under these provisions, a list of 'Category A' and 'Category B' waste management activities, which require a Waste Management Licence in terms of Section 20(b) of NEM:WA, were published via GN 718:2009 as Schedule 1 to NEM:WA, and were subsequently amended by GN 921: 2013.

In terms of this notice, a person who wishes to commence, undertake or conduct any of these listed activities. Table 3-2 indicates the applicable listed activities which apply to the activities described in the authorised EMPr.

Table 3-2: Table of Waste Management Activities applicable to the project
Category B
Activity 4 (1): The storage of hazardous waste in lagoons excluding storage of effluent, wastewater or sewage. REASON: If the definition of a 'lagoon' is applied in the strictest sense, then excavated holding tanks required for the proposed oil separators, and used oil storage, to be constructed at wash bays and workshops will be regarded as lagoons.
Activity 4 (7): The disposal of any quantity of hazardous waste to land. REASON: FGD waste residue disposal to landfill on site.
Activity 4 (11): The establishment or reclamation of a residue stockpile or residue deposit resulting from activities which require a mining right, exploration right or production right in terms of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002). REASON: Construction of tailings facilities.
Activity 4 (11): The construction of facilities for activities listed in Category B of this Schedule. REASON: Construction of waste management related structures and infrastructure for the aforementioned activities.
Category A
Activity 3 (13): The expansion of a waste management activity listed in Category A or B of this Schedule which does not trigger an additional waste management activity in terms of this Schedule.

REASON: Expansion of existing facilities e.g. existing Nchwaning 2 tailings.
Activity 3 (13): ((14) The decommissioning of a facility for a waste management activity listed in Category A or B of this Schedule. REASON: Capping and closure of facilities as per the rehabilitation plan and as required for tailings facilities by the site's Water Use Licence.

3.4 AIR QUALITY

Air Quality Management in South Africa has undergone significant changes with regard to 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.

3.4.1 NATIONAL NORMS AND STANDARDS

According to S9 of NEMAQA:

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

> *(a) must identify substances or mixtures of substances in ambient air which through ambient concentrations, bioaccumulation, deposition or in any other way, present a threat to health, well-being or the environment or which the Minister reasonably believes present such a threat; and*
>
> *(b) must, in respect of each of those substances or mixtures of substances, establish national standards for ambient air quality, including the permissible amount or concentration of each such substance or mixture of substances in ambient air; …"*

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

Table 3-3: National Ambient Air Quality Standards - GN 1210:2009			
Pollutant	**Averaging period**	**Concentration (µg/m³)**	**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 3-4.

Table 3-4: National Ambient Air Quality Standards for $PM_{2.5}$ - GN 486:2012				
Pollutant	**Averaging period**	**Conc. µg/m³**	**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				

3.4.2 LISTED ACTIVITIES AND ATMOSPHERIC EMISSIONS LICENSING

S21 of NEMAQA provides for the minister (or MEC) to:
"…publish a list of activities which result in atmospheric emissions and which the Minister or MEC reasonably believes have or may have a significant detrimental effect on the environment, including health, social conditions, economic conditions, ecological conditions or cultural heritage;..."

S22 of NEMAQA states that no person may, without a provisional atmospheric emission licence or an atmospheric emission licence, conduct a listed activity. A list of activities was published in GN 248 of 2010, and subsequently superseded by GN 551 on 12 June 2015, in accordance with S21 of NEMAQA. Subcategory 4.5: Sinter Plants, would apply to the proposed sinter plant.

Table 3-5: Subcategory 4.5: Sinter Plants			
Description	Sinter plants for agglomeration of fine ores using a heating process, including sinter cooling where applicable		
Application	All installations		
Substances or mixtures of substances		Plant status	Mg/Nm^3 under normal conditions of 273 Kelvin and 101.3kPa
Common name	Chemical Symbol		
Particulate Matter	N/A	New	50
		Existing	100
Sulphur Dioxide	SO_2	New	500
		Existing	1000
Oxides of Nitrogen	NO_x expressed as NO_2	New	700
		Existing	1200

3.4.3 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 3-6 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.

Table 3-6: GN827:2013 Acceptable Dust Fall Rates		
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

3.5 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.

3.5.1 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.

Application for water use licensing has been made to the DWS with respect to listed Section 21 water uses to be undertaken as part of the project and existing mining activities. The water uses are, *inter alia*, as follows:

- 21(a) taking water from a water resource;
- 21 (b) storing water;
- 21 (e) engaging in a controlled activity identified as such in section 37(1) or declared under section 38(1);
- 21 (g) disposing of waste in a manner which may detrimentally impact on a water resource;
- 21(i) altering the bed, banks, course or characteristic of a watercourse;
- 21(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

Other provisions of the NWA have been taken into account, 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.

3.5.2 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 poorly effected 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.

3.6 BIODIVERSITY

3.6.1 NATIONAL FORESTS ACT (ACT NO. 84 OF 1998)

There are a number of tree species that are protected according to Government Notice no. 1012 under section 12(I)(d) of the National Forests Act, 1998 (Act No. 84 of 1998). In terms of section1 5(1) of the National Forests Act, 1998 "*no person may cut, disturb, damage or destroy any protected tree or possess, collect, remove, transport, export, purchase, sell donate or in any other manner acquire or dispose of any protected tree or any forest product derived from a protected tree, except under a*

license granted by the Minister to an (applicant and subject to such period and conditions as may be stipulated)".

The occurrence of two such protected tree species has been confirmed by a specialist biodiversity assessment of the BRMO (Appendix 14). An application for a licence for the removal and/or relocation of these trees has been made with the Department of Agriculture, Forestry and Fisheries. The applicant will aim to avoid the unnecessary destruction of protected species during the detail design phase of the project. Where such avoidance may be impractical, the Applicant will apply for the necessary permits to remove.

3.6.2 CONSERVATION OF AGRICULTURAL RESOURCES ACT (ACT 43 OF 1983)

As per the Conservation of Agricultural Resources Act (CARA) (Act 43 of 1983), Conservation is defined as: "*in relation to the natural agricultural resources, includes the protection, recovery and reclamation of those resources*;"

The objectives of the CARA, as stated in section 2 of the Act, entitled "Objects of Act", are:

"*The objects of this Act are to provide for the conservation of the natural agricultural resources of the Republic by the maintenance of the production potential of land, by the combating and prevention of erosion and weakening or destruction of the water sources, and by the protection of the vegetation and the combating of weeds and invader plants*."

The objectives of CARA are noted, and the proposed project will strive to meet these objectives as far as practicably possible. Of most significance to the project are the provisions stated in Regulation 5 of the Act for the "Prohibition of spreading weeds", which states that:

No person shall-
(a) sell, agree to sell or offer, advertise, keep, exhibit, transmit, send, convey or deliver for sale, or exchange for anything or dispose of to any person in any manner for a consideration, any weed; or
(b) in any other manner whatsoever disperse or cause or permit the dispersal of any weed from any place in the Republic to any other place in the Republic.

3.6.3 NATIONAL ENVIRONMENTAL MANAGEMENT: BIODIVERSITY ACT (ACT 10 OF 2004)

The National Environmental Management: Biodiversity Act (Act 10 Of 2004) (NEMBA) is the primary legislation governing biodiversity management in South Africa.

Section 2: "Objectives of the Act", states the following:

2. The objectives of this Act are-
a) within the framework of the National Environmental Management Act, to provide for-
(i) the management and conservation of biological diversity within the Republic and of the components of such biological diversity.
(ii) the use of indigenous biological resources in a sustainable manner; and

(iii) the fair and equitable sharing among stakeholders of benefits arising from bio-prospecting involving indigenous biological resources;

b) to give effect to ratified international agreements relating to biodiversity which are binding on the Republic;

c) to provide for co-operative governance in biodiversity management and conservation; and

d) to provide for a South African National Biodiversity Institute to assist in achieving the objectives of this Act.

3.7 HERITAGE

Aspects concerning the conservation of cultural resources are dealt with mainly in two acts. These are the National Heritage Resources Act (Act 25 of 1999) and to a lesser extent, the National Environmental Management Act (Act 107 of 1998).

3.7.1 NATIONAL HERITAGE RESOURCES ACT (NHRA) (ACT 25 OF 1999)

According to the above-mentioned act the following is protected as cultural heritage resources:

a. Archaeological artefacts, structures and sites older than 100 years;
b. Ethnographic art objects (e.g. prehistoric rock art) and ethnography;
c. Objects of decorative and visual arts;
d. Military objects, structures and sites older than 75 years;
e. Historical objects, structures and sites older than 60 years;
f. Proclaimed heritage sites;
g. Grave yards and graves older than 60 years;
h. Meteorites and fossils; and
i. Objects, structures and sites or 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 to be developed as well as the possible impact of the proposed development thereon. An Archaeological Impact Assessment (AIA) only looks at archaeological resources. An HIA must be done under the following circumstances:

i. The construction of a linear development (road, wall, power line, canal etc.) exceeding 300m in length;
ii. The construction of a bridge or similar structure exceeding 50m in length;
iii. Any development or other activity that will change the character of a site and exceed 5 000m^2 or involve three or more existing erven or subdivisions thereof;
iv. Re-zoning of a site exceeding 10 000 m^2; and
v. Any other category provided for in the regulations of SAHRA or a provincial heritage authority.

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*'.

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.

3.8 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.

4 DESCRIPTION OF SENSITIVE ENVIRONMENTAL FEATURES

This section aims to provide a summary of the more pertinent site sensitivities that need to be understood and acknowledged in implementing the environmental management programme. The sensitive elements described in the section that follow have been identified through specialist assessments commissioned for the environmental impact assessment process that was undertaken prior to the mine expansion.

4.1 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). 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).

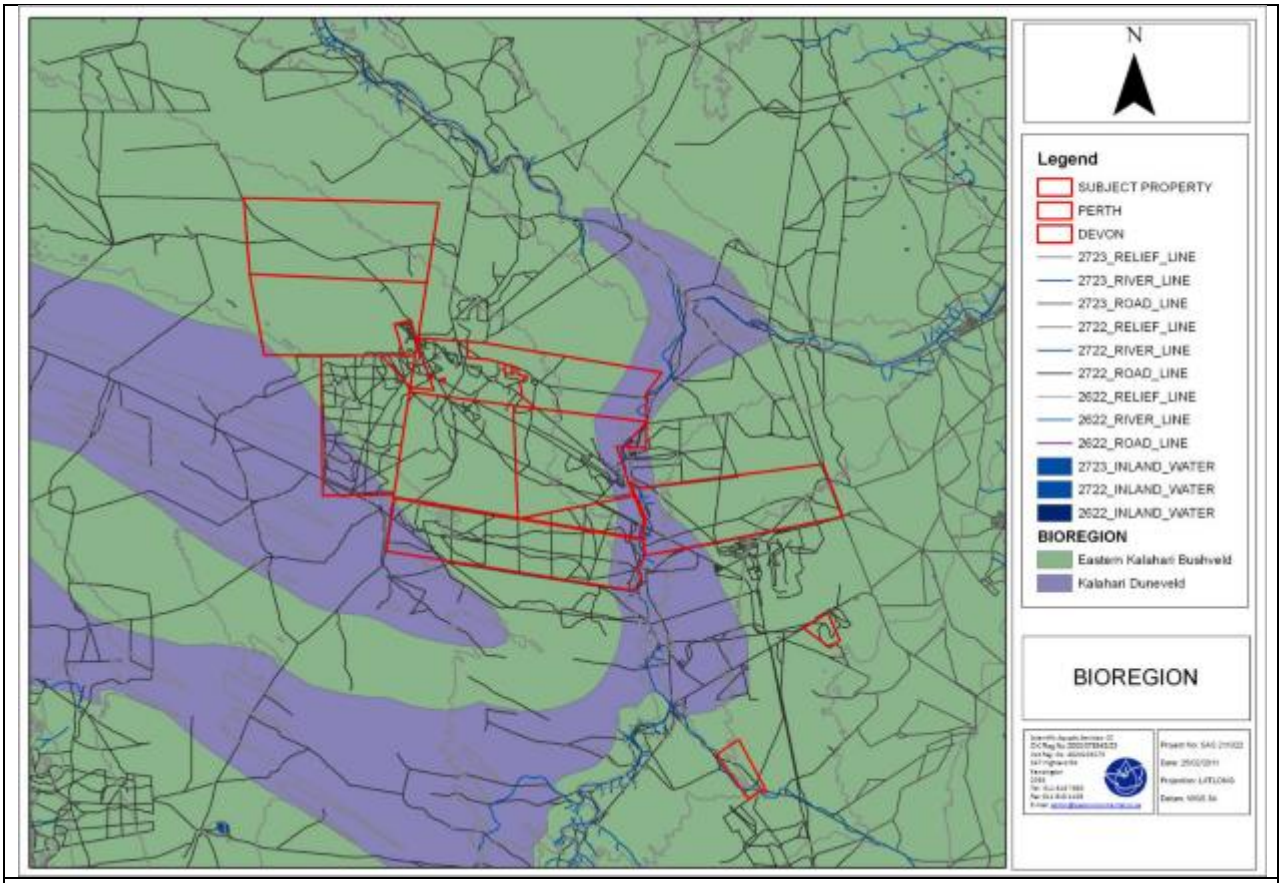


Figure 4-1: Biome (Scientific Aquatic Services. Report Reference: SAS 211022)

4.1.1 FLORAL DIVERSITY

When the boundary of the assessment site is superimposed on the vegetation types of the surrounding area, it is evident that the subject property falls within the Kalahari Thornveld and Shrub Bushveld veld type, Kathu Bushveld vegetation type and partly in the Gordonia Duneveld vegetation type.

Several red data listed (RDL)/protected floral species are documented within the site, as shown in Table 4-1. The species identified are expected throughout the site. None of the listed species may be cut, removed, relocated, or destroyed without permits having been issued by the relevant competent authorities, in terms of the legislation listed in Table 4-1.

Various exotic and/or invasive species are also noted on the site, in particular where has been disturbed through trampling or excavation. Dominant exotic species on the site include *Spartium junceum* (Spanish broom), *Pennisetum setaceum* (Fountain grass) *Sesamum triphyllum* (Wild sesame), *Verbesina encelioides* (Wild sunflower), *Ziziphus mucronata* (Buffalo thorn), *Morus nigra* (Black mulberry), *Melia azedarach* (Syringa), Eucalyptus sp. (Gum trees), *Chinus molle* (Pepper tree), *Prosopis glandulosa* var. *torreyana* (Mesquite), *Agave americana* (Sisal), *Cuscuta campestris* (Dodder), *Opuntia ficus-indica* (Sweet prickly pear), *Nerium oleander* (Oleander), *Lantana camara* (Lantana), *Ipomoea indica* (Morning glory), *Cortaderia selloana* (Pampas grass).

Table 4-1: Protected Floral Species Identified on Site

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

4.1.2 FAUNAL DIVERSITY

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

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

4.2 WETLAND/RIPARIAN ZONES

The Gamagara River and its associated wetland/riparian features (including a 32 m buffer zone) can be considered as an ecologically sensitive area in relation to the proposed development activities (Figure 4-2). No mining related activities, unless otherwise authorised as part of the proposed new bridge crossing, should take place within this sensitive feature and associated 32 m buffer zone. This area should be delineated as a sensitive, no-go, area to all mine employees and contractors alike.

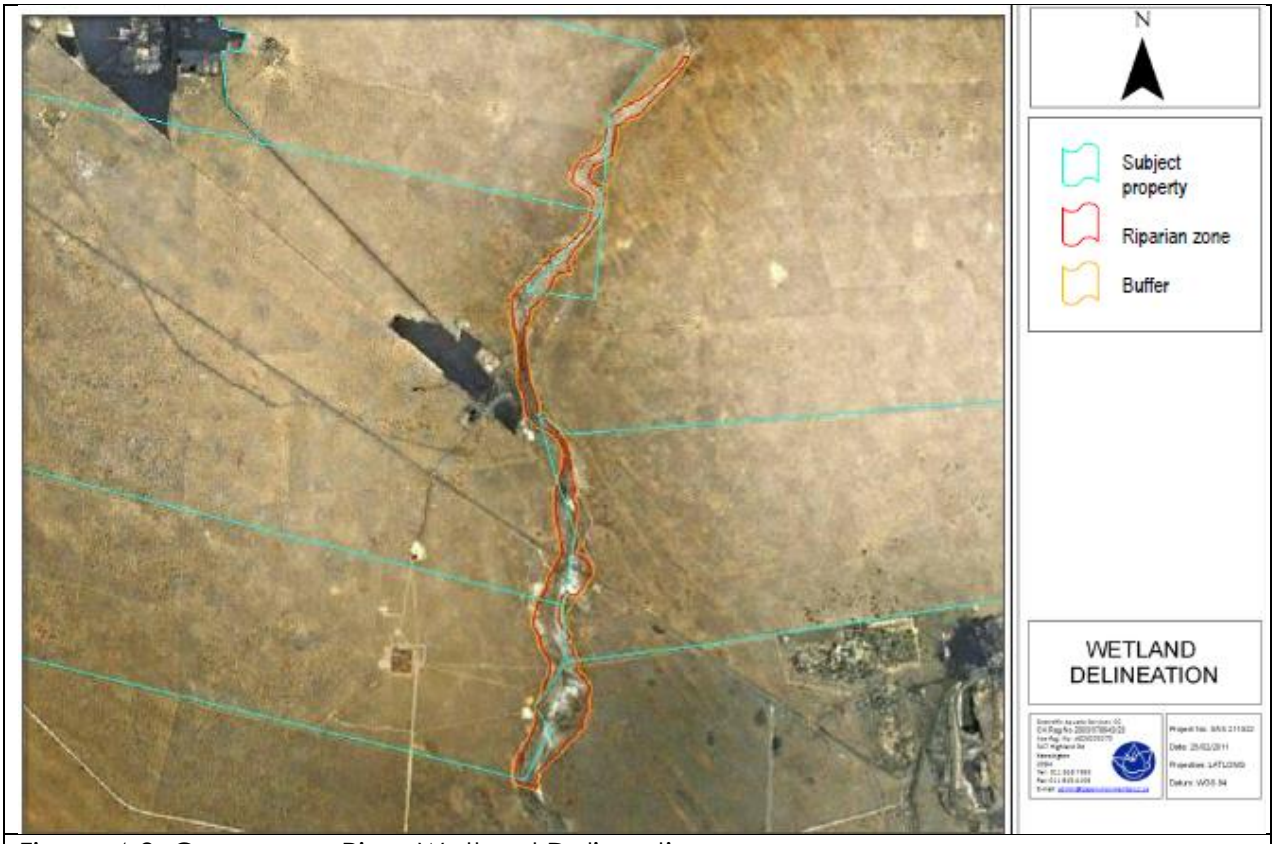


Figure 4-2: Gamagara River Wetland Delineation

4.3 GROUNDWATER

According to a specialist hydrogeological assessment of the site (Geo Pollution Technologies, Report Reference Number: EBR-10-320). The site is underlain by the

Kalahari formation. This formation at BRMO consists of a top layer of aeolian sands followed by calcrete of tertiary age. If weathered, the calcareous sands have the favourable characteristics of porosity and permeability. There is limited surface runoff in the Kalahari area (high infiltration rates during precipitation). Due to high porosity and permeability of the Kalahari sands, the calcrete deposit below the top layer of Kalahari sands acts like a "sponge".

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

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

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

4.4 SOIL

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

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

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

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.

4.5 HERITAGE RESOURCES

A heritage impact assessment was undertaken in 2011 (Archaetnos Culture & Cultural report ASBR 2011) which employed literature review, filed 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 4-3. 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 existing old railway bridge, adjacent to the area where the new rail crossing is proposed, can be considered as a 15th site.

The Stone Age sites, as well as the stone tools recorded in the area are similar to the one 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 4-4). In certain areas the red sand dunes are being eroded (wind erosion), exposing the calcretes and Stone Age artefacts.

Figure 4-3: Identified archaeological sites relevant to proposed railway bridge

Figure 4-4: Photographic examples of ESA and MSA tools recorded on site

The sites vary from low density scatters with only a few artefacts, to areas with thousands of cores, flakes and more formal tools. The significance of the sites is seen as medium to high, and although many might not be impacted on by the development (depending on final engineering design), it is envisaged that any development activity will uncover Stone Age sites and occurrences in the area. This would also be true for a new rail crossing, should it be undertaken, which will be in the Gamagara riverbed.

Stone Age artefacts are located in and on the river banks, and the likelihood of uncovering archaeological material is very high. It is, therefore, recommended that Phase II mitigation is undertaken on some of the sites identified in the area to minimize the impact of the development. This will entail mapping of the sites, as well as controlled surface sampling of material.

All parties involved in civil- and earth works as part of the project (particularly in the area shown in Figure 4-3) need to be aware of the potential presence of such archaeological artefacts and trained to respond accordingly to unearthing of any new archaeological finds.

5 ENVIRONMENTAL MANAGEMENT GOALS AND OBJECTIVES

The environmental consequences/impacts on the receiving 'environment' associated with the mine expansion and sinter plant complex establishment were addressed within the EIA report associated with the authorised EMPr. This section is an additional tool used to provide the assurances that BRMO has made suitable provision for the effective mitigation of the aforementioned consequences/impacts. This section furthermore, describes the method and procedures required for the effective mitigation and monitoring of impacts; where the prescribed mitigation and monitoring actions are closely linked with environmental objectives and targets that the proponent needs to achieve in order to reduce, or eliminate, negative impacts over the full project lifecycle (Aucamp, 2010).

To ensure that the impacts associated with the mine as a whole are properly mitigated, managed and/or avoided (where possible), a number of specific environmental objectives have been defined for the project. The environmental objectives need to be attained and/or maintained to ensure satisfactory environmental management of the affected areas and the potential cumulative impacts on the surrounding environment.

One also needs to make a distinction between the objectives for on-going environmental management applicable to the construction and operational phases, and the objectives for mine closure; where the inherent linkages between such objectives also need to be acknowledged. The most effective means of ensuring that closure objectives are achieved, is by ensuring that all preceding development phases are managed with 'mine closure' in mind, as follows:

- Design with closure in mind;
- Construct with closure in mind; and
- Operate with closure in mind.

5.1 CLOSURE OBJECTIVES

The broad 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;
- 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 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.

5.2 ENVIRONMENTAL OBJECTIVES STATED IN THE APPROVED BRMO EMPR

Table 5-1: Environmental Objectives	
Topography	• To minimise topographic disturbances resulting from mining and expansion project related activities; • To minimise the potential impacts of the mining activities and project on surface hydrology; • To minimise the potential for soil erosion resultant from the creation of steep slopes; and • To ensure that any alteration to site topography resultant from mining activities and the project can be reversed to the extent that it does not conflict with end-use planning objectives for the site.
Soils	• To effectively mitigate potential soil contamination impacts; • To maintain the viability of the site soils (particularly topsoil) for future rehabilitation purposes; • To ameliorate any altered ecological, physical and chemical properties of soils resulting through stripping, handling and stockpiling of 'topsoil'; and • To install and maintain long-term erosion control measures.
Land Capability	• To restore the affected surfaces to arable land capability; and • To re-establish indigenous, pre-development, floral species that will stabilise the soils in the short term, and re-create the natural grassland and/or grazing lands in the long term, so that the area can be returned to its natural state as far as possible, and used for agricultural purposes.
Land Use	• To restore the affected surface area to pre-mining status so that pre-mining land use activities can be resumed; and • To reduce the area that is to be disturbed, and contain the impacts on the natural habitat caused by the mechanised equipment.
Vegetation	• To minimise mining activities and project impact on the natural bio-diversity of the area to the greatest extent that is practical; • To control the establishment and propagation of alien invasive vegetation within the development area; • To ensure that protected trees removed during construction are re-established at closure and through concurrent rehabilitation efforts in similar numbers; • To ensure that the impact of the mining activities and project on protected floral species is appropriately off-set for the

	operational lifespan thereof and effectively remediated at closure; and • To re-introduce pioneer grass species for effective rehabilitation, such that will ensure natural succession over time.
Animal Life	• To minimise mining activities and project impacts on the natural bio-diversity of the area to the greatest extent that is practical; and • To ensure the prevention of animal hunting and poaching throughout the life of mine.
Surface- and Ground Water	• To ensure that no mining and project activities, or infrastructure, negatively influence ground- or surface water quality, or quantity, to the extent that human health or livelihoods are negatively influenced; and • To pro-actively monitor the mining activities and project's impacts on ground- and surface water quality/quantity, such that pro-active measures can be instituted by the BRMO to mitigate such impacts, where identified.
Noise	• To reduce the impact of mining related noise on the overall environment, and within the proposed mining area in particular.
Socio-economic	• To limit the socio-economic impacts as a result of cessation of the mining activities.
Maintenance	• To monitor and manage post-closure impacts until closure is obtained.
Infrastructure	• To find alternative uses for mine infrastructure, or if not possible, to ensure that the components are properly considered within the rehabilitation plan as stated.
Waste	• To minimise waste, and reduce/reuse/recycle where practical. • To collect and dispose of all waste at a permitted disposal site; where waste recovery, recycling or reuse alternatives are not reasonable or feasible.
Air Quality	• To minimise emissions where practical. • To ensure that emissions of atmospheric pollutants and subsequent impact on ambient air quality is within acceptable standards.

6 ENVIRONMENTAL MANAGEMENT PROGRAMME

The environmental mitigation tables to follow provide the management measures recommended to prevent and/or manage the potential environmental impacts associated with BRMO's activities. In addition to the management measures provided, the table indicates the person responsible to ensure that these commitments are adhered to and implemented.

It is the responsibility of BRMO to ensure that the commitments made in this EMPr are realised. Management must ensure that adequate resources are availed to this end.

6.1 LEGISLATION

Where relevant to environmental management, the environmental management actions will comply with the requirements of, *inter alia*, the following legislation (and relevant the Regulations promulgated hereunder):

- Constitution of South Africa (Act No. 108 of 1996);
- The Mineral and Petroleum Resources Development Act (Act No. 28 of 2002), as amended;
- The National Environmental Management Act (Act No. 107 of 1998), as amended;
- The National Water Act (Act No. 36 of 1998);
- The National Environmental Management: Waste Act, 2008 (Act 59 of 2008);
- The National Forests Act (Act No. 84 of 1998):
- The National Environmental Management: Air Quality Act (Act No. 39 of 2004);
- The Hazardous Substances Act (Act No. 15 of 1973);
- The National Heritage Resources Act (Act No. 25 of 1999); and
- The National Environmental Management: Biodiversity Act (Act No. 10 of 2004); and,
- Fertilizers, Farm Feeds, Agricultural Remedies and Stock Remedies Act of 1947.

6.2 KEY ROLES AND RESPONSIBILITIES

This section summarises the roles and responsibilities of key persons.

6.2.1 THE PROPONENT (ASSMANG (PTY) LTD)

Assmang BRMO will be responsible for the overall implementation, monitoring and enforcement of the activities as outlined in the EMPr. The site manager, will be a senior designate from Assmang BRMO, and will be responsible for overseeing that environmental compliance and monitoring is performed, and will direct correspondence with the relevant authorities.

Assmang BRMO remains ultimately responsible for ensuring that all activities are implemented according to the provisions of the EMPr and all conditions of relevant licences/permits/approvals/authorisations. Although role-players will be appointed by Assmang to perform certain functions on its behalf, the ultimate responsibility is not delegated. Assmang must ensure that sufficient resources (time, financial, human,

equipment, etc.) are available to these other parties to efficiently perform their tasks in terms of the EMPr. Assmang is liable for harm caused to the environment; consequently, members of staff must be responsible and accountable for compliance with the EMPr where applicable.

6.2.2 ENVIRONMENTAL SPECIALIST

Assmang BRMO must appoint/designate a senior representative as Environmental Specialist to act on its behalf. The duties of this representative, as relevant, would include:

- Ensure compliance with the requirements of the EMPr;
- Ensure that the EMPr is part of relevant contractual documentation so that any contractors are bound to the conditions of the EMPr and relevant licences, permits/approvals/authorisations;
- Ensure environmental awareness training is undertaken for all new personnel coming onto site, and undertake environmental awareness courses themselves where appropriate;
- Appoint an Internal Environmental Officer (Internal Environmental Officer) to assist with day-to-day EMPr implementation and monitoring duties;
- Provide necessary support to the Internal Environmental Officer to facilitate the fulfilment of the Internal Environmental Officer's duties and responsibilities;
- Ensure that necessary information and planning data is availed to the Internal Environmental Officer timeously for fulfilment of the Internal Environmental Officer's duties and responsibilities;
- Ensure that the necessary environmental authorisations and permits have been obtained and are maintained;
- Review operational procedures in conjunction with the Internal Environmental Officer;
- Monitor, review and verify compliance with the EMPr as reported by the Internal Environmental Officer, and drive action if the specifications are not followed or issues of non-compliance are not addressed in a timeous manner;
- Assist the Internal Environmental Officer in finding environmentally responsible and effective solutions to challenges encountered during implementation;

6.2.3 INTERNAL ENVIRONMENTAL OFFICER (INTERNAL ENVIRONMENTAL OFFICER)/(PRACTITIONER)

Assmang BRMO's Internal Environmental Officer will be responsible for monitoring, reviewing and verifying compliance with the EMPr on a day-to-day basis. This role may be fulfilled by any suitably qualified and responsible representative involved with daily on-site operations (e.g. Environmental Manager/Officer/Practitioner). In particular, the Internal Environmental Officer shall:

- Regularly inspect and continuously monitor the site to ascertain the level of compliance with the EMPr;
- Maintain inspection reports on file;

- Monitor and verify that the EMPr is adhered to at all times and take action if the specifications are not followed;
- Monitor and verify that environmental impacts are kept to a minimum;
- Assist Assmang in finding environmentally responsible solutions to problems;
- Inform and advise the Environmental Specialist where applicable of EMPr, legal, and/or permitting requirements to facilitate planning and environmental legal compliance;
- Keep records of all activities/incidents concerning environmental performance;
- Keep a register of complaints from IAPs;
- Provide material/manuals and support for raising environmental awareness of staff;
- Ensure that activities on site comply with legislation of relevance to the environment;
- Liaise with relevant authorities;
- Liaise with contractors regarding environmental management.
- Complete checklists as necessary; and
- Internally review the EMPr and liaise with the Environmental Specialist.

6.2.3.1 a) Liaison with Authorities

The Environmental Specialist would be responsible for liaising with all relevant competent authorities (NC DENC, DEA, DMR, DWS, DAFF etc.). The Internal Environmental Officer would be responsible for submitting Environmental Audit Reports on the activities related to the proposed activities to these Departments where required. The Internal Environmental Officer in consultation with the Environmental Specialist will be responsible for reporting of environmental incidents. The Internal Environmental Officer, in consultation with the Environmental Specialist, will be responsible for accompanying or arranging the logistics of site inspections by the competent authorities.

6.2.3.2 b) Liaison with Contractors

The Internal Environmental Officer will be responsible for informing the contractors of any decisions that are taken concerning the natural and social environment during the project activities. This would also include informing the contractors of the necessary corrective actions to be taken against employees transgressing the management activities stipulated in this EMPr.

6.2.4 ENVIRONMENTAL CONTROL OFFICER (ENVIRONMENTAL CONTROL OFFICER)

It is recommended that an independent Environmental Control Officer be appointed by Assmang BRMO for significant construction phase activities. The Environmental Control Officer would need to conduct regular independent audits to assess compliance with the EMPr and be responsible for providing feedback on potential environmental problems associated with the activities on site.

The Environmental Control Officer will:

- Assist the Internal Environmental Officer in ensuring that necessary environmental authorisations and permits are obtained;

- Undertake independent audits with regards to compliance with the EMPr;
- Compile audit reports identifying areas of non-compliance and recommendations for rectification thereof; and
- Assist Assmang in achieving and maintaining acceptable environmental management practices.

6.3 COMPLIANCE MONITORING, RECORD KEEPING, AND UPDATING

An essential aspect of any EMPr is the review process. This includes auditing, record keeping, reporting and updating. The findings of the review process can inform planning on the mine, allowing future operations to benefit from the experiences of the past.

6.3.1 COMPLIANCE MONITORING

Foremost, auditing must be undertaken in accordance with the requirements of the various environmental permits issued for the site. Audits must include the following three key investigation techniques:

- Document review, including previous audit reports, technical reports, and monitoring data, etc.;
- Interviews with relevant staff and contactors; and
- Observation of activities and environmental management on the site.

Audit reports must:

- Specify whether the requirements of the EMPr are adhered to;
- Include an interpretation of relevant data and analyses in respect of operation of the site and impacts on the environment;
- Recommend corrective and/or preventative action and target dates for the implementation of the recommendations;

6.3.2 RECORD KEEPING

Record keeping must be done in such a way that all information generated can be accessed easily in the future. The information must be clearly labelled and filed. All reports must be dated, and all monitoring results must specify monitoring points and where applicable provide comparison to permit standards or otherwise applicable legislated environmental standards. Audit and related corrective/preventative actions must be recorded and filed. Records must be kept for a period of at least 5 years from date generated unless a longer period is stipulated in any applicable permit or legislation.

6.3.3 UPDATING THE EMPR

An EMPr is a working document. As management methods are improved and as the mine operations change, requiring new methods and allowing others to fall away, the EMPr needs to be adjusted to reflect these changes. It is recommended that a biennial review of the adequacy of the EMPr be undertaken. The review process must consider:

- Changes in mine plans and operations which may be of significance;
- Results of audit and inspections;
- Monitoring results and trends identified;
- Changes in legislation;
- Advancements in environmental management best practice;

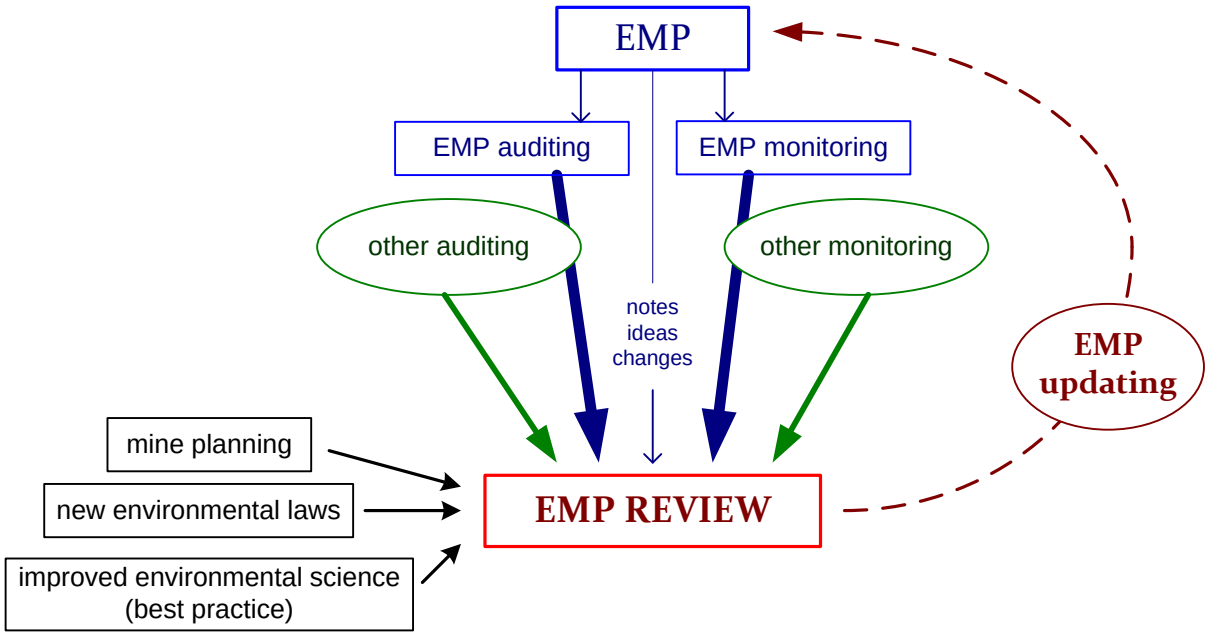


Figure 6-1: Conceptual diagram for EMPr review cycle. Note the main division between internal information, such as auditing and monitoring, and external information, such as changes to environmental laws and regulations, which should provide input on the revision of the EMPr.

6.4 NOTE ON DEVELOPMENT PHASES

The EMPr is divided into the actions required for each phase of BRMO's activities, namely:

- Planning and design;
- Construction;
- Operations (the life of the activity); and
- Closure and aftercare.

The phases above may be applicable concurrently to different activities at BRMO.

6.5 GENERAL REQUIRMENTS

Table 6-1: 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 6-1: 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	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; 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. All incidents must be managed and reported as per the requirements of S30 of NEMA, and/or S20 of the NWA as applicable.		Environmental Specialist	As soon as reasonably practicable after obtaining knowledge of the incident, Preferably within 24 hours.

6.6 PRE-CONSTRUCTION, PLANNING AND DESIGN

Table 6-2: 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
	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 prior to commencement of listed activities

Table 6-2: Mitigation for Pre-construction, Planning and Design Phase				
ASPECT	ACTIVITY or IMPACT	MANAGEMENT ACTIONS	RESPONSIBILITY	DATE/FREQUENCY
	Waste Management Licence	Obtain a Waste Management Licence in terms of the National Environmental Management: Waste Act (59 of 2008) where activities listed in terms of S19 of the act are triggered and not otherwise authorised.	Environmental Specialist with support of Internal Environmental Officer	Once-off prior to commencement of listed activities
	Emissions to Air	Obtain an Atmospheric Emission Licence (AEL), in terms of the National Environment Management: Air Quality Act (39 Of 2004), from NCDENC for the operation of the sinter plant	Environmental Specialist with support of Internal Environmental Officer	Once-off prior to operation of the sinter plant
	Removal/destruction of protected floral species	Permits applicable to the removal, relocation or destruction of protected plants must be obtained prior to undertaking any such activity.	Environmental Specialist with support of Internal Environmental Officer	Prior to removal
	Identify requirements for other environmental permitting	Identify the need for any other environmental permits and obtain these as required.	Environmental Specialist with support of Internal Environmental Officer and Environmental Control Officer	As per legislated requirement
	Waste handling and storage	Facilities for the storage and hazardous waste must be incorporated into the project design to ensure that all hazardous waste will be handled and stored in compliance with the NEMWA National Norms and Standards for the Storage of Waste GN 926: 2013, or superseding equivalent.	Environmental Specialist	Once-off prior to commencement
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

6.7 CONSTRUCTION PHASE

Table 6-3: 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 (See Appendix 5 for alternative palliative options). 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 steams 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.	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 sites activities in accordance with the MHSA as a minimum. Mobile facilities must be inspected on a daily basis for leaks and cleanliness, and emptied at frequency adequate to prevent overflow. 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.	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
	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

Table 6-3: 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
		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 6-3: 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
		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 6-3: 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
		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 separate 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 6-3: 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
		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; Except where: • The waste is regarded as being 'inert' (e.g. waste bricks, un-contaminated 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 6-3: 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 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 6-3: 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
	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	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: • 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 (Appendix 10)	No alien invasive floral species infestation within sites	Site supervisors	Continuous

Table 6-3: 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
		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 6-3: 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
		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: • 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 6-3: 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 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

Table 6-4: Vegetation Clearance					
Activity/Structure/Infrastructure	Vegetation clearance				
ASPECT	ACTIVITY or IMPACT	MANAGEMENT ACTIONS	TARGET	RESPONSIBILITY	TIME-FRAME/FREQUENCY
Biodiversity	Destruction of habitat leading to overall loss of biodiversity (Incl. relocation, removal and destruction of protected species)	Vegetation clearance must be limited to the smallest area practical to enable construction activities and the establishment of structures and infrastructure. These areas need to be clearly marked out (e.g. taped off) under the supervision/assistance of the Internal Environmental Officer as vegetation clearance proceeds on site. Required to ensure that all vegetation clearance is restricted to designated areas to the greatest extent practical.	No unnecessary clearance of indigenous vegetation.	Project manager, Internal Environmental Officer	Continuous
		No protected species may be removed, relocated or destroyed without the necessary permits for such having been obtained from the relevant competent authority	Copies of permits on file prior to proceeding with vegetation clearance	Project manager, Contractor, Internal Environmental Officer	Once-off
		The removal, relocation or destruction of protected plant and tree species must be undertaken in compliance with all conditions stipulated in the above-mentioned permits, as well as supporting biodiversity off-set implementation plan	Procedures developed and implemented in accordance with permit requirements	Project manager, Contractor, Internal Environmental Officer	Continuous
		Any *Ammocaris coranica, Harpogophytum procumbens, Babiana hypogaea and Boophane disticha*, or any other red data listed (RDL) species identified on site, need to be rescued and relocated under the guidance of a competent ecologist, or by parties trained to undertake such by a competent ecologist, as part of species specific rescue and relocation plans formulated by a competent ecologist, where possible.	Records kept of all RDL plant species rescued and relocated, as well as point of relocation thereof. Record of specialist ecologist appointment on file, as proof of involvement in rescue and relocation.	Project manager, Contractor, Internal Environmental Officer	Once-off, prior to commencing with broad-scale vegetation stripping.

Table 6-4: Vegetation Clearance					
Activity/Structure/Infrastructure	Vegetation clearance				
ASPECT	ACTIVITY or IMPACT	MANAGEMENT ACTIONS	TARGET	RESPONSIBILITY	TIME-FRAME/FREQUENCY
		All contractors and employees involved in vegetation clearance must be trained to identify the species above.	Internal Environmental Officer to issue flashcards for identification of species	Environmental Specialist, Site supervisors	Once-off, prior to commencing with broad-scale vegetation stripping.
	Establishment of alien invasive species and associated negative impacts on biodiversity	All areas stripped of indigenous vegetation cover and topsoil need to be regularly inspected for the potential establishment of alien invasive species, and appropriate control measures applied where these species are observed to have established (i.e. in accordance with the provisions of the BRMO 'alien invasive species management plan').	Proof of training, in 'weed' identification, provided to mandated 'inspector/s. Inspection register maintained by the contractor/s, as well as documentation of any control measures applied (location, method & effectiveness at the very least)	Project manager, Contractor, Internal Environmental Officer	Monthly 'weed' inspections Problem species cleared within 2 weeks of their identification.
		A copy of the BRMO alien invasive species management plan, inclusive of quick 'weed identification' flash-card sets, to be supplied to the relevant employees and contractor/s involved in vegetation stripping.	Proof of contractor's receipt of the management plan	Environmental Specialist	Once-off
Soils	Loss of topsoil to vegetation stripping, thereby reducing remaining available extent thereof for rehabilitation efforts at mine closure	The degree of 'topsoil' lost to vegetation stripping needs to be kept to an absolute minimum by the relevant contractor/s.	Minimal loss of topsoil with 'stripped' vegetation.	Contractor	Continuous

Table 6-4: Vegetation Clearance					
Activity/Structure/Infrastructure	Vegetation clearance				
ASPECT	ACTIVITY or IMPACT	MANAGEMENT ACTIONS	TARGET	RESPONSIBILITY	TIME-FRAME/FREQUENCY
	Erosion losses from exposed soil surfaces	Any runnels, or erosion channels, which develop shall be back-filled and the area restored to the acceptable condition. The contractor shall not allow erosion to develop on a large scale before effecting repairs and all erosion damage shall be repaired as soon as possible (Topsoil washed away shall be replaced).	No evidence on site of erosion channels. Topsoil has been appropriately replaced where it has been lost through surface storm water flows.	Project Manager, Contractor	Continuous. Remedial action within 48 hours.
Heritage Resources	Negative impacts on elements of cultural, or heritage significance	Appropriate training to be issued to BRMO Internal Environmental Officer and other relevant staff by a suitably qualified specialist.	Records of Proof of training maintained.	Environmental Specialist	Once-off, prior to commencement of vegetation stripping
		Basic training needs to be provided to the relevant contractor/s, as well as their relevant vehicle/grader operator/s, for the identification of possibly encountered elements of cultural and heritage significance (e.g. archaeological sites, graves, etc.)	Records of Proof of training maintained.	Environmental Specialist	Once-off, prior to commencement of vegetation stripping
		If archaeological sites are exposed during vegetation or topsoil stripping and borrowing activities, these should immediately be reported to the Local and National Branches of the South African Heritage Resources Agency (SAHRA)	No unauthorised disturbances to elements of potential cultural, or heritage, significance	Project manager, Contractor. Environmental Specialist/Internal Environmental Officer for reporting.	Continuous. Reporting of archaeological finds within 48hours
		Under no circumstances shall archaeological artefacts discovered on site during construction or operational activities be removed, destroyed or interfered with.	Compliance with the provisions of the National Heritage Resources Act (Act No. 25 of 1999) [HRA].	Project manager, Contractor.	Continuous

Table 6-4: Vegetation Clearance					
Activity/Structure/Infrastructure	Vegetation clearance				
ASPECT	ACTIVITY or IMPACT	MANAGEMENT ACTIONS	TARGET	RESPONSIBILITY	TIME-FRAME/FREQUENCY
Socio-economics	Wood harvesting 'off-set' in local communities	The wood from trees stripped during this phase of construction must be supplied to local community/ies as fire wood; unless otherwise directed in the respective 'protected tree removal/destruction permit/s'.	Recovery and use of feasible firewood stock to the greatest extent possible	Environmental Specialist	Continuous

Table 6-5: Topsoil Stripping					
Activity/Structure/Infrastructure	Topsoil stripping for construction purposes.				
ASPECT	ACTIVITY or IMPACT	MANAGEMENT ACTIONS	TARGET	RESPONSIBILITY	TIME-FRAME/FREQUENCY
Soils	Reduced effectiveness of rehabilitation efforts at mine closure, resulting from poor topsoil management practices	Topsoil to be stripped to a depth of at least 30 cm from all development footprints and stockpiled for reuse in rehabilitation actions at mine closure.	Topsoil is stockpiled in accordance with BRMO's topsoil management procedure. Refer to Appendix 11	Project Manager, Contractor	Continuous
		Vegetation stripping should not be conducted more than two weeks (14 calendar days) prior to topsoil stripping, in preparation of development, or mining.	No areas left bare of vegetation for longer than a fortnight following the 'stripping' thereof for development, or mining	Project Manager, Contractor	Continuous. Fourteen (14) day window
		Topsoil and subsoil must only be utilised as required for rehabilitation within the mining area, and according to the topsoil management plan.	Topsoil Reuse Plan available for inspection. No unauthorised use of topsoil in contravention of the aforementioned plan.	Internal Environmental Officer	6 months from the DMR's acceptance of this EMPr addendum. Implementation thereof subsequent to approval is an on-going task
		Stockpiles must be monitored for alien vegetation any existing alien vegetation must be removed and destroyed in accordance biodiversity management plan	Records kept on file of at least monthly inspections	Internal Environmental Officer	Continuous
		A 'topsoil balance calculation' will be held by the BRMO, showing reasonable estimates of the topsoil volumes available in stockpiles against the volumes required for rehabilitation of affected development footprints for the project.	Topsoil balance calculation used to inform preparation of Topsoil Management Plan	Internal Environmental Officer	Once off, within 6 months of the DMR's acceptance of this revised EMPr

Table 6-5: Topsoil Stripping					
Activity/Structure/Infrastructure	Topsoil stripping for construction purposes.				
ASPECT	ACTIVITY or IMPACT	MANAGEMENT ACTIONS	TARGET	RESPONSIBILITY	TIME-FRAME/FREQUENCY
		In view of the overall deficiency of topsoil for rehabilitation, and the absence of alternative sources of topsoil, rehabilitation trials must be undertaken. Trials must be undertaken to assess the propensity for modification of subsoil to be effectively used in lieu of topsoil.	Topsoil deficiency is eliminated by use of in situ subsoil.	Internal Environmental Officer	Upon commencement of concurrent rehabilitation in areas where there is no topsoil.

Table 6-6: 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 erosion by appropriate storm water management measures, or slope stabilisation/re-vegetation	No slopes >33°	Project Manager, Contractor	Continuous
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 6-7: Shaft Sinking					
Activity/Structure/Infrastructure	Sinking of vertical and ventilation shaft/s				
ASPECT	ACTIVITY or IMPACT	MANAGEMENT ACTIONS	TARGET	RESPONSIBILITY	TIME-FRAME/FREQUENCY
Topography	Reduced requirements for 'borrowing' of construction aggregates (minimise use of non-renewable resources in construction activities)	All waste rock generated through shaft sinking is to be temporarily stockpiled at surface within the greater surface shaft complex development footprint/s, and subsequently used as fill/founding aggregate in the construction of structural, or infrastructural, foundations and/or establishment of operational working floors (or any other environmentally acceptable use within the greater BRMO)	Reuse of waste rock from shaft sinking in associated construction and operational applications at surface	Project Manager	Continuous
Surface water	Ingress of 'clean' storm water run-off into underground mine workings	No storm water run-off at surface should enter underground workings through vertical shaft/s openings at surface	Zero storm water ingress into underground mine workings. Storm water management appropriately effected	Mine manager	Continuous

Table 6-8: Borrow Pit Establishment					
Activity/Structure/Infrastructure	Borrow pit establishment for the purposes of sourcing of construction aggregate/fill material				
ASPECT	ACTIVITY or IMPACT	MANAGEMENT ACTIONS	TARGET	RESPONSIBILITY	TIME-FRAME/FREQUENCY
Topography	Alterations to site topography rendering rehabilitation of borrow pits at the closure thereof ineffective	Borrow pit dimensions must be optimised, such that final shaping and rehabilitation measures at closure are able to return the disturbed footprint/s to a state commensurate with end-land use objectives for the site	No evidence to suggest that borrowing activities are undertaken in conflict with end-use objectives	Project Manager	Continuous
	Alteration of site topography, such that preferential storm water flows, or sensitive ecological features, are disrupted/disturbed	Borrow pits may not be established within 32 m of any prominent drainage lines on site. Borrow pits may not be established within the buffer zone and delineated wetland/riparian zone of the Gamagara River (Figure 4-2), or 100m from the edge 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)	Environmental Specialist, Project Manager	Continuous
		Where borrow pits are established outside of dam/TSF footprint/s, the borrow pits must be appropriately rehabilitated within 6 months of the last borrowing from the respective pit/s	No evidence of redundant, un-rehabilitated borrow pits on site	Environmental Specialist	6 months from last borrowing campaign
Surface water	Ingress and ponding of storm water flows	Appropriate storm water diversions must be installed on the up-slope/s of borrow pits, such that storm water ingress therein is minimised to the greatest extent possible (Borrow pit access on down-slope thereof)	No surface water ingress into borrow pits	Project Manager	Once-off prior to establishment, with continuous maintenance thereafter
Biodiversity	Loss of biodiversity through habitat destruction for borrow pit establishment	Borrow pits must be established within the proposed development footprints to the greatest extent that is practical (i.e. based on the suitability for purpose of the underlying material)	Proof of habitat destruction minimisation through optimised borrow pit positioning	Project Manager	Once-off

Table 6-9: Haul/Access Roads					
Activity/Structure/Infrastructure	Heavy and light vehicle movements on un-surfaced site haul/access roads. Vehicle access to, and over-nighting on, site.				
ASPECT	ACTIVITY or IMPACT	MANAGEMENT ACTIONS	TARGET	RESPONSIBILITY	TIME-FRAME/FREQUENCY
Air Quality	Degraded air quality through vehicle entrained dust	Dust palliation with an effectiveness of at least 80% must be applied to all un-surfaced/gravel access and haul roads for the duration of the construction period	Compliance with national dust outfall standards and national ambient air quality standards are complied with.	Project manager	Continuous
		Palliatives must be applied and re-applied as necessary per the manufacturer/supplier's recommendations		Project manager	Continuous
		Vehicle speeds must be limited to 60 km/h on access roads unless these have bound paving, in which case sped regulations as per the relevant traffic regulations must apply. Vehicle speeds must be limited to 40 km/h on any exposed surfaces where palliatives or paving have not been applied.		Environmental Specialist	Continuous
Biodiversity	Biodiversity loss through unnecessary habitat destruction	Access and haul roads may only be established, immediately adjacent to (within 20 m), or directly between, the anticipated development footprints of the various project components.	Access and haul roads established, immediately adjacent to (within 20m), or directly between, the anticipated development footprints	Project manager	Continuous
		The hauling of materials and vehicle access to and from development sites must be strictly maintained to designated access/haul roads on site	No evidence of random, un-planned, road creation on site	Project Manager, Contractor	Continuous

Table 6-10: 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 6-11: Gamagara River Railway Bridge Construction					
Activity/Structure/Infrastructure	Construction of new rail bridge over the Gamagara River				
ASPECT	ACTIVITY or IMPACT	MANAGEMENT ACTIONS	TARGET	RESPONSIBILITY	TIME-FRAME/FREQUENCY
Topography	Degradation of hydrological regime and associated flood-lines through alteration of topography	The engineering design for the railway bridge must be such that it does not result in the ponding of potential flood waters behind the bridge structure, or associated supporting columns and railway alignments	Appropriate engineering design signed off by competent civil engineer	Project Manager	Once-off, prior to construction
		In the event that a new bridge will be constructed, the redundant bridge columns north of the 'existing' railway bridge must either – a) be used in the construction of the new bridge (i.e. where this is technically feasible and safe), or b) removed from the river bed and either disposed of, or safely recovered for use as aggregate elsewhere on the project	Redundant columns removed, or used in construction of new bridge; where new bridge is constructed	Project Manager	Once-off
		The alignment of the 'old'/redundant bridge, and what was once its associated railway track, should be used as the alignment for the 'new' bridge crossing over the Gamagara River; unless otherwise deemed technically flawed, in writing, by a competent engineer	Use of the 'old' alignment, or written description of alignments technical fatal flaws by a competent civil engineer	Project Manager	Once-off
Biodiversity	Biodiversity loss through unnecessary habitat destruction	The construction of the railway bridge, as well as the associated track alignments either side thereof, must take place within a 30 m construction corridor	No bridge/track alignment related construction activities outside of the 30 m construction corridor	Proponent, Contractor	Continuous
Heritage Resources	Disturbance/Destruction of archaeological resources through bridge construction and railway re-alignment	Care should be taken by the contractor/s during any development activities, that if any archaeological and/or historical sites, features or artefacts are accidentally discovered, a qualified archaeologist be called in to investigate.	No disturbances to such sites, artefacts or features; unless otherwise previously identified in the	Proponent, Contractor	Continuous

Table 6-11: Gamagara River Railway Bridge Construction					
Activity/Structure/Infrastructure	Construction of new rail bridge over the Gamagara River				
ASPECT	ACTIVITY or IMPACT	MANAGEMENT ACTIONS	TARGET	RESPONSIBILITY	TIME-FRAME/FREQUENCY
			Heritage Impact Assessment		
		Phase II heritage mitigation measures, as required by SAHRA, should be undertaken before the bridge development commences. This will need to entail the following: a) (Mapping of the most significant sites (highest density of material) in the area. Sites 6 and 12, as identified by Dr. A. Pelser, are recommended. With Site 6 located outside the area earmarked for development activities, Site 12 will therefore be mapped; and b) Controlled sampling of material in order to obtain a representative sample of the Stone Age material in the area. This will be in the form of blocks on the site, which will be mapped and material in these blocks will then be sampled.	Completion of phase II mitigation to SAHRA's satisfaction	Proponent, Heritage specialist	Once-off prior to commencement

6.8 OPERATIONAL PHASE

The requirements stipulated in Table 6-12 apply to all operations. Subsequent table provide specific measures for particular activities where appropriate.

Table 6-12: 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 manger 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 (See Appendix 5 for alternative palliative options). 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 steams 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.	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 (Appendix 10)	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.

Table 6-13: Ore Processing Plant					
Activity/Structure/Infrastructure	Processing plant operation				
ASPECT	ACTIVITY or IMPACT	MANAGEMENT ACTIONS	TARGET	RESPONSIBILITY	TIME-FRAME/FREQUENCY
Soil and Water contamination	Generation of potentially contaminated water	All water and storm water contaminated through process works must be collected into the process water circuit.	Records kept of required inspections, as well as any maintenance applied	Proponent	Monthly

Table 6-14: Manganese Product Stockpiles					
Activity/Structure/Infrastructure	Product stockpile management (Including sinter, medium-ratio lumpy, high-grade small lumpy, fines - high-ratio, fines - medium ratio and Nchwaning products)				
ASPECT	ACTIVITY or IMPACT	MANAGEMENT ACTIONS	TARGET	RESPONSIBILITY	TIME-FRAME/FREQUENCY
Clearance of Land and Vegetation	Establishment of product stockpiles	Product stockpile areas must be contained to the designated footprints. No further land may be cleared without appropriate permitting and review of the EMPr.	No *ad hoc* establishment of stockpile areas or clearance of vegetation.	Production manager	Continuous
Generation of fugitive dust	Dust generated from unpaved roads and vehicles traversing stockpile areas.	Stockpile areas and road will be compacted and covered with ore to prevent generation of dust. Dust suppression will be applied to unpaved roads.	Compliance with national dust outfall and ambient air quality standards	Production manager	Continuous
Soil Erosion	Channelling of run-off resulting in soil erosion	Areas where significant runoff and subsequent erosion may occur must be identified and berms, cut-off trenches, soakaways and/or other suitable measures put in place to prevent erosion.	No significant observable soil erosion	Internal Environmental Officer	Continuous

Table 6-15: Sinter Plant Raw Material Stockpiles					
Activity/Structure/Infrastructure	Raw material stockpile management (Including *inter alia* sinter plant reductants, intermediary ore fines sinter feed)				
ASPECT	ACTIVITY or IMPACT	MANAGEMENT ACTIONS	TARGET	RESPONSIBILITY	TIME-FRAME/FREQUENCY
Soil, Ground water and surface water	Potential contamination of groundwater quality through potential leachate generation from reductants stockpile/s	Reductants must be off-loaded and stored at a single dedicated storage area; unless otherwise stored in day bins provided for such Reductants with potential to cause contamination of soil and water must be stored in impermeable bunkers, ideally roofed to prevent ingress of rain.	No contact between potential leachate from stockpiles and groundwater. No disparate storage of reductants on site	Sinter plant Manager	Once-off establishment of storage area with impermeable base layer, with continuous maintenance thereafter to ensure structural integrity thereof
		All potentially contaminated/'dirty' water run-off from the storage area must be diverted to a pollution control dam on site	Appropriate 'dirty' water run-off diversion and containment effected	Sinter plant Manager	Continuous
	Separation of clean and dirty water	Appropriate berms, cut-off trenches or other suitable infrastructure must be pi in place to prevent ingress and subsequent contamination of clean surface water, and outflow of contaminated surface water.	Complete separation of clean and dirty water	Sinter plant Manager	Once-off establishment, with continuous maintenance thereafter
Soil erosion	Generation of potentially contaminated storm water flows through contact with diffuse and point pollution sources	All storm water management infrastructure (i.e. cut-off trenches, diversion berms, silt traps, pollution control/storm water dams, etc.) applicable to storm water management in relation to raw material stockpile floors 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 (i.e. nature of maintenance, date, responsible party)	Internal Environmental Officer	Monthly

Table 6-16: Sinter Plant					
Activity/Structure/Infrastructure	Sinter Plant operation				
ASPECT	ACTIVITY or IMPACT	MANAGEMENT ACTIONS	TARGET	RESPONSIBILITY	TIME-FRAME/FREQUENCY
Air Quality	Emissions to atmosphere and consequent degradation of ambient air quality	Stack emission limits and tolerable exceedances must not exceed those stipulated for all applicable criteria pollutants, in terms of the conditions of the AEL issued.	Compliance with AEL stack emission limits.	Sinter plant Manager	Per AEL
		Stack emissions must be measured, monitored, and reported according to requirements set out in the AEL issued.	Monitoring and auditing in compliance with AEL specifications	Internal Environmental Officer	Per AEL
		A fugitive dust emission plan must be developed and implemented if dust fall out exceeds the limits stipulated in the national dust control regulations.	Compliance with dust fall out standards	Internal Environmental Officer – monitoring and investigation Sinter plant manager – corrective and preventative action	Quarterly (unless otherwise indicated in the AEL).
Waste Management	Classification of FGD sludge	Sludge produced from flue gas desulphurisation must be analysed and classified in accordance with the requirements of NEM:WA. An MSDS and labelling must be formulated for handling of this material.	Waste is classified and has appropriate MSDS and labelling for handling.	Internal Environmental Officer	Once off, upon commencement of operation.
	Treatment and/or disposal of FGD sludge	FGD sludge must be treated and/or disposed at a facility appropriately authorised for that purpose.	Legally compliant treatment and/or disposal	Internal Environmental Officer	Continuous

Table 6-17: Flue Gas Desulphurisation Waste Disposal					
Activity/Structure/Infrastructure	FGD Waste Residue Management (from point of generation to landfill deposition)				
ASPECT	ACTIVITY or IMPACT	MANAGEMENT ACTIONS	TARGET	RESPONSIBILITY	TIME-FRAME/FREQUENCY
Ground water	Degraded groundwater quality due to the potential leaching of contaminants from an **INTERMEDIARY** FGD Residue Waste Disposal site	As a precautionary approach, the intermediary FGD disposal facility must be lined to "Class A" performance equivalent, until such time as FGD waste sampling and analysis can take place to determine the actual groundwater risk posed by the waste (i.e. to inform the engineering design of the operational FGD disposal site).	Appropriate pollution containment barrier effectively installed	Environmental Specialist, Competent Landfill Engineer	Once-off
		Detailed intermediary FGD disposal site engineering- and liner designs must be submitted to the DWS and the DMR for approval prior to construction of the facility	Written approval of facility design on record	Environmental Specialist	Once-off
		No waste, or materials, other than FGD residues may be deposited onto the intermediary disposal site	Only FGD waste residue deposited to FGD disposal site	Sinter Plant Manager	Continuous
		The final positioning of the intermediary FGD disposal site must be informed by a geo-physics survey of the proposed area, as well as inputs from a specialist geo-hydrologist, to ensure that groundwater pollution risks are minimised	Geo-physics survey conducted. Written recommendations from a specialist geo-hydrologist on suitability of the facility positioning	Environmental Specialist, Geo-hydrologist	-
		Any person either directly, or indirectly, involved in aspects relating to the disposal of FGD waste residues must receive training to ensure competency in respect of fulfilling their operational role in a manner that yields acceptable environmental outcomes	Records of training kept on file	Environmental Officers and Landfill assistant	Once-off, with annual refreshers thereafter

		Assmang must rehabilitate the site or any portion thereof upon decommissioning, in accordance with a closure and rehabilitation plan, which must be submitted to the DMR for approval	Closure and rehabilitation undertaken according to an approved plan for such	Environmental Specialist,	Submission of plan at least one year prior to closure of the site, or portion thereof
	Degraded groundwater quality due to the potential leaching of contaminants from the **OPERATIONAL** FGD Residue Waste Disposal site	Once operational, the FGD waste residues from the sinter plant must be subjected to sampling and analysis by a competent, specialist, EAP, such that the actual risk posed to the groundwater environment by the waste can be determined.	'Risk profile' for operational phase FGD waste residues on record	Environmental Specialist,	Within three months of sinter plant commissioning
		The FGD disposal facility must be lined according to the 'risk profile' of the waste, as determined through the prescribed method in the '*National Standard for the Assessment of Waste for Landfill*' – presently in draft, but reasonably believed to be in effect at the time of project implementation.	FGD liner design appropriately aligned with FGD waste residue 'risk class'	Environmental Specialist, Engineer,	Once-off
		Detailed FGD disposal site engineering- and liner designs must be submitted to the DWS and the DMR for approval prior to construction of the facility	Written approval of facility design and liner specification on record	Environmental Specialist,	Once-off
		No waste, or materials, other than FGD residues may be deposited onto the disposal site	Only FGD waste residue deposited to FGD disposal site	Environmental Specialist,	Continuous
		The final positioning of the FGD disposal site must be informed by a geo-physics survey of the proposed area, as well as inputs from a specialist geo-hydrologist, to ensure that groundwater pollution risks are minimised	Geo-physics survey conducted. Written recommendations from a specialist geo-hydrologist on suitability of the facility positioning	Environmental Specialist, Geo-hydrologist	Once-off
		The final positioning of the TSF must be approved by the DWS and the DMR prior to construction of the facility	Written approval on record	Environmental Specialist,	Once-off

		Any person either directly, or indirectly, involved in aspects relating to the disposal of FGD waste residues must receive training to ensure competency in respect of fulfilling their operational role in a manner that yields acceptable environmental outcomes	Records of training kept on file	Environmental Specialist,	Once-off, with annual refreshers thereafter
		Assmang must rehabilitate the site or any portion thereof upon decommissioning, in accordance with a closure and rehabilitation plan, which must be submitted to the DMR for approval	Closure and rehabilitation undertaken according to an approved plan for such	Environmental Specialist,	Submission of plan at least one year prior to closure of the site, or portion thereof
Soils	Soil pollution through unaddressed pipe leaks	All pipe-work and associated infrastructure used in the transport of FGD waste residues from the processing plant to the disposal site must be regularly inspected (i.e. for structural integrity) and maintenance applied as necessary to ensure no losses between the plant and the disposal site	No FGD losses during transfer from plant to disposal facility. Records kept of monthly inspections, as well as of any maintenance effected (i.e. nature of problem, nature of maintenance, date and party who effected maintenance/repair)	Environmental Specialist,	Monthly inspections by competent person. Maintenance/repair within 24 hrs of problem identification (unless in the case of major incident; where emergency response procedures will apply)
Access Control and Signage	Environmental incidence/s resulting from access and potential operational interferences/malfunction by unauthorised party/ies	The proponent must ensure effective access control of the waste management facility to prevent unauthorised access thereto	Records kept of all entry obtained to the site (i.e. name, section, contact details, date and time) as well as the reason for the entry	Environmental Specialist and Landfill site assistant	Continuous

		Weatherproof, durable and legible signs in at least three relevant languages applicable to the area must be displayed at all site entrances and must convey information pertaining to at least the following: • Risks involved in entering the site; and • Name and contact details of the licence holder and person/s responsible for the operation of the site.	Appropriate signage in place and well maintained	Environmental Specialist,	Once-off

Table 6-18: Tailings Management - TSF					
Activity/Structure/Infrastructure	Tailings management (from point of generation to TSF deposition)				
ASPECT	ACTIVITY or IMPACT	MANAGEMENT ACTIONS	TARGET	RESPONSIBILITY	TIME-FRAME/FREQUENCY
Ground water	Degraded groundwater quality due to the potential leaching of inorganic contaminants from TSF	The TSF must have an installed pollution containment barrier with at least a "Class C" performance equivalent.	Appropriate pollution containment barrier installed	Engineering Manager	Once-off
		Detailed TSF liner designs are to be submitted to the Department of Mineral Resources for consideration and approval prior to commencing with construction or operation of the TSF.	Written approval of TSF liner design on record	Engineering Manager and Environmental Specialist	Once-off
		No waste, or materials, other than tailings may be deposited into the TSF	Only tailings deposited to TSF	Production Manager and sinter plant manager	Continuous
		Update Geochemical model	Updated model	Environmental Specialist	Every 5 years
Water Demand Management	Unnecessary water losses through tailings deposition; taking cognisance of the water stressed nature of the receiving environment	The proponent must investigate and implement processes to maximise recovery of process water for re-use in the processing plant	Minimum deposition of water with tailings.	Engineering Manager	Continuous
		Supernatant (i.e. water pooling at compartment surfaces - predominantly derived from storm water ingress) must be decanted from the top surfaces of the TSF compartments via purpose built decant barges, and diverted into a purpose built decant water dam adjacent to the TSF; for subsequent reuse in plant processes	TSF decant dam established. Supernatant decant effectively undertaken	Engineering Manager	Once-off infrastructure establishment, with on-going supernatant decant and reuse thereafter

Soils	Soil pollution through unaddressed pipe leaks	All pipe-work and associated infrastructure used in the transport of tailings from the processing plant to the TSF must be regularly inspected (i.e. for structural integrity) and maintenance applied as necessary to ensure no losses between the plant and the TSF	No tailings losses during transfer from plant to TSF. Records kept of monthly inspections, as well as of any maintenance effected (i.e. nature of problem, nature of maintenance, date and party who effected maintenance/repair)	Engineering Manager	Monthly inspections by competent person. Maintenance/repair within 24 hrs of problem identification (unless in the case of major incident; where emergency response procedures will apply)
	Soil pollution from TSF over-flows	The TSF must have a minimum design free-board for storm water infiltration, in addition to a minimum 0.8 m dry freeboard over and above the normal operating level and excluding decant return.	Minimum free-board of 0.8 m maintained at all times	Engineering Manager – Design Production manager - operation	Continuous
	Soil pollution due to tailings spillages resulting from the recovery thereof	Any tailings spillages outside of the TSF footprint, resulting from tailings recovery activities, must be immediately removed from location for subsequent recovery thereof.	No prolonged residence of tailings outside of TSF, or intermediary storage areas at sinter plant, footprints	Production manager	Daily

Table 6-19: Mechanical shaft ventilation					
Activity/Structure/Infrastructure	Mechanical ventilation of underground workings				
ASPECT	ACTIVITY or IMPACT	MANAGEMENT ACTIONS	TARGET	RESPONSIBILITY	TIME-FRAME/FREQUENCY
Noise propagation	Increases to ambient noise levels due to the continuous operation of mechanical ventilation equipment at surface	Vent shaft openings are to be directed away from sensitive noise receptors, and appropriately coupled with diffusers if necessary to ensure compliance with ambient noise limits stipulated in SANS 10103 of 2008	Compliance with SANS 10103 of 2008	Engineering Manager	Once-off

Table 6-20: Sewage Treatment Plant					
Activity/Structure/Infrastructure	Sewage treatment plant operation				
ASPECT	ACTIVITY or IMPACT	MANAGEMENT ACTIONS	TARGET	RESPONSIBILITY	TIME-FRAME/FREQUENCY
Ground water	Degraded groundwater quality through prolonged exposure to seepage of un-, or partially, treated sewage to the groundwater environment	The plant must be regularly inspected, and maintenance applied as necessary (within 2 days of problem identification), to ensure the optimal efficiency thereof and prevention of leaks and spillages. Daily inspection log to be signed off by plant operator	No contact between sewage and site soils/groundwater	Engineering Manager	Weekly inspections. Routine maintenance according supplier specifications
		Flow meters must be installed on the incoming sewerage feed, as well as treated effluent output pipelines, in order to allow for water balance approximations as part pro-active identification of any significant plant leaks to the groundwater environment	Flow meters installed. Monthly water balances on record.	Engineering Manager	Once-off flow meter installation
Water demand management	Unnecessary water losses through treated effluent discharge to the environment	Treated effluent must be recovered to the process water circuit for reuse on site	No discharge of treated effluent to the environment	Engineering Manager	Continuous
Soils	Soil pollution resulting from contact with un-, or poorly, treated sewage	Final plant design must ensure adequate installed treatment capacity in relation to additional project demand	No over-flows or insufficient retention time due to inadequate treatment capacity.	Engineer, Proponent	Once-off
		The mine must ensure that the operator/s of the plant are technically trained to operate the specific plant and prevention of environmental impacts therefrom.	Records of training applicable to "class" of the plant kept on file.	Engineering Manager	Once-off training, with annual refresher courses.
	Soil contamination through inappropriate intermediary storage, and final management of sewage sludge and screenings	All sewage sludge and screenings must be stored on impermeable, bunded, platforms within the plant grounds	Adequate storage capacity available	Engineering Manager	Once-off
		Screenings and sludge from the sewage plant must be temporarily stored as hazardous waste, in accordance with the NEMWA national norms and standards for storage of waste.	Safe disposal certificates kept on file. Copy of waste contractor's company profile and appropriate licenses kept on file	Engineering Manager	Continuous

Access control	Unauthorised access to 'controlled' area by, un-authorised, un-trained parties	The site must be fenced off from the remainder of the operations and access thereto well regulated by a designated operator	No unauthorised access to the plant area. Records kept of all access gained to the plant area	Engineering Manager	Continuous

Table 6-21: Salvage Yard					
Activity/Structure/Infrastructure	Salvage yard management				
ASPECT	ACTIVITY or IMPACT	MANAGEMENT ACTIONS	TARGET	RESPONSIBILITY	TIME-FRAME/FREQUENCY
Soil, surface water and groundwater	Potential contamination of storm water through contact with diffuse pollution sources	The salvage yard floor must be concreted where potentially contaminated bulky material/items are stored outside of water tight steel skips/containers, and appropriately integrated with the remainder of the site's 'dirty' storm water management system.	No contamination of soil and water.	Internal Environmental Officer and relevant foreman	Once-off, with continued maintenance
		All machinery that may leak lubricants or any other pollutants that is not stored on an impermeable surface must have appropriate drip trays in place.	No contamination of soil and water.	Internal Environmental Officer	Continuous
		The salvage yard must be inspected on a monthly basis to ensure that there is no contamination of soil and water from leakages or exposure of hazardous materials to soil and rainfall.	No contamination of soil and water.	Internal Environmental Officer	Monthly
Records	Management of stocks and lifespan in the salvage yard	Records of all materials deposited at the salvage yard must be maintained including the date of placement.	All materials in salvage yard are accounted for.	Boiler and Fitter Foreman	
Access control	Unauthorised access to 'controlled' area by, un-authorised, un-trained parties	The site must be fenced off from the remainder of the operations and access thereto well regulated by a designated gate controller.	No unauthorised access to the plant area. Records kept of all access gained to the plant area	Internal Environmental Officer	Continuous
		Records must be kept of all parties entering the site (Name, Section, Date, Time and Signature), as well as of the type and estimated volumes of wastes off-loaded by those parties.	Appropriate records kept on file of all waste stored at salvage yard	Internal Environmental Officer	Continuous

Table 6-22: Bulk Fuel (including *inter alia* diesel, petrol, HFO and CTF)/Oil/Chemical Storage)					
Activity/Structure/Infrastructure	Bulk storage of fuel and oil				
ASPECT	ACTIVITY or IMPACT	MANAGEMENT ACTIONS	TARGET	RESPONSIBILITY	TIME-FRAME/FREQUENCY
Soil, surface water and groundwater	Undesirable impacts resulting from the storage of fuel, oil and hazardous materials	Above ground fuel, or oil storage tanks, must be located within appropriately sized, impermeable, bund walls (inclusive of valve for release of storm water ingress, unless otherwise roofed)	Bund wall capacity sized to at least 110% of the cumulative volume of fuel and oil stored therein. Records of weekly bund wall integrity inspections kept on record	Engineering Manager	Continuous. Weekly inspections of bund wall integrity.
		Appropriate hydrocarbon spill management kits must be kept and maintained on site wherever fuels and oils are stored, and where refuelling and/or servicing of plant, vehicles and machinery takes place, in order to manage potential hydrocarbon spillages effectively	Spill management kits available on site and replenished as necessary	Engineering Manager	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	Records of training kept on record	Internal Environmental Officer	Once-off, with annual refresher training every year thereafter
		Hazardous material/chemical containers/tanks must be stored within appropriately sized, impermeable, bund walls (inclusive of valve for release of storm water ingress, unless otherwise roofed or indoors)	Bund wall capacity sized to at least 110% of the volume of the largest chemical container stored therein. Records of weekly bund wall integrity inspections kept on record	Internal Environmental Officer	Continuous. Weekly inspections of bund wall integrity.

Soils	Soil pollution through exposure to hydrocarbon based contaminants	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
		Spill management must take place according to the BRMO 'Spill Management' environmental procedure – Appendix 7)	Compliance with existing BRMO environmental procedure	Proponent	Continuous
Access control	Unauthorised access to 'controlled' area by, un-authorised, un-trained parties	The site must be fenced off from the remainder of the operations and access thereto well regulated by a designated operator	No unauthorised access to storage area. Records kept of all fuel and oil dispensed.	Proponent	Continuous

Table 6-23: Vehicle Maintenance and Wash Bays					
Activity/Structure/Infrastructure	Vehicle/plant workshops & wash bays				
ASPECT	ACTIVITY or IMPACT	MANAGEMENT ACTIONS	TARGET	RESPONSIBILITY	TIME-FRAME/FREQUENCY
Soil, surface water and groundwater	Potential contamination of soil and water from hydrocarbons and any other hazardous chemicals substances associated with vehicle maintenance.	All servicing and washing of vehicles is to take place strictly within maintenance workshops or otherwise off-site at appropriate maintenance facilities.	No servicing of plant or vehicles outside of workshop areas	Engineering Manager,	Continuous
		Furthermore, servicing and maintenance of 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,	Continuous
		Where emergency/unplanned repairs are required, 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,	Continuous
		Vehicle wash bay surfaces must be concreted, and all wash water run-off diverted to an impermeable collection sump linked to an oil-water separator	No 'discharge' of potentially contaminated wash water to the environment	Proponent	Once-off
		Wash water must be effectively diverted, contained and managed, such that no hydrocarbon contaminants are ever in contact with site soils	No contact between potentially contaminated wash water and site soils, or storm water flows	Proponent	Continuous

		Vehicles may only be serviced on site in a dedicated workshop, which must; • Have a concrete floor; • Have a dedicated hazardous waste skip/container (marked clearly for purpose) for temporary storage of oiled rags, oil/fuel filters, etc.); and • Well bunded waste oil container; and • Available, well maintained, hydrocarbon spill kits	No contact between hydrocarbon contaminants and site soils	Proponent	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
		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,	Continuous
		All equipment (e.g. gear boxes) 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.	Engineering Manager,	Continuous

	Maintenance waste	All potentially hazardous waste (e.g. oily rags, used oil filters, etc.) must be stored in appropriately labelled hazardous waste containers, and kept in a bunded area or indoors on an impermeable floor as appropriate. Non-recyclable waste must be treated and/or disposed of at an appropriately authorised facility. Used oil must be stored separately for collection.	All waste is manged appropriately.	Engineering Manager,	Continuous
		Used oil must be collected and recycled if economically feasible.	Maximise recycling.	Internal Environmental Officer	Continuous

7 CLOSURE AND REHABILITATION PHASE

This 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.

7.1 PRINCIPLES OF REHABILITATION

The following principles should be followed during the planning, implementation and post-implementation phases of the rehabilitation process:

- Define and agree upon end-goals for the rehabilitation process, such as land-use, rehabilitation objectives, areas to be rehabilitated, etc.;
- Prevent and continually manage the propagation and establishment of alien and invasive species;
- As far as is practical, implement concurrent rehabilitation in order to limit degradation of soil biota;
- Limit the footprint area of the disturbing activity in order to minimise environmental damage;
- Rehabilitation earthworks should aim to reshape the disturbed areas to represent the area prior to disturbance (with the exception of the two opencast voids) and to present a safe, functional and sustainable environment;
- Visual impacts of rehabilitated areas must be minimised by recreating natural landforms and ensuring that reshaped areas are visually suited to surrounding landscapes;
- Natural landforms such as drainage lines, undulating areas and ridges, which have been damaged during activities, must be restored;
- Implement erosion control measures to prevent the loss of topsoil;
- Rip and aerate all compacted soils in order to facilitate plant establishment and growth;
- Re-vegetate all disturbed areas with suitable vegetation cover and methods;
- After completion of activities ensure that the site is safe for use by the intended land users and remove all activity equipment; and
- Implement a monitoring plan to determine the efficacy of the rehabilitation exercise (this should be a long-term monitoring program).

7.2 REHABILITATION OBJECTIVES

The rural/agricultural nature of the mine, and the aridity of the area, limits the range of potentially feasible end land-use alternatives available to BRMO at the end of life of the mine.

The overall environmental objectives of mine closure are proposed as follows:

- To rehabilitate the disturbed areas to arable grazing land capable of at least supporting an extensive livestock production system;
- To restore the pre-development topography to the greatest extent that is practical and feasible at closure;

- To restore the site biodiversity and ecological system functioning to as close as practically possible to pre-development conditions;
- To ensure that the site is made safe; 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.

7.2.1 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.

7.2.2 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.

7.3 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.

7.4 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.

7.5 AREAS AND ACTIVITIES TO BE REHABILITATED

In general terms, the rehabilitation requirements for various areas of disturbance at the mine will not be relatively homogenous, with the exception of distinct features such as the tailings facilities and the general landfill.

Distinction has been made between areas that require general surface rehabilitation alone (i.e. following the removal of surface structures and infrastructure, as well as site preparation for rehabilitation), and those activities that warrant unique management and rehabilitation provisions at closure (Table 7-2); where, *inter alia*, the following circumstances warrant such interventions:

- The activity/area presents a potential, residual, point source of groundwater- or soil pollution; or
- The activity/area presents a potential, direct, risk to human health or well-being.

7.5.1 EXTENT OF REQUIRED 'GENERAL SURFACE REHABILITATION'

The relevant extent of requiring 'general surface rehabilitation' at BRMO is as per Figure 7-1 that follows (concurrent and end of life of mine); unless the area or activity is otherwise detailed in the following two sub-sections. The requisite requirements for 'general surface rehabilitation' are discussed in the sections that follow.

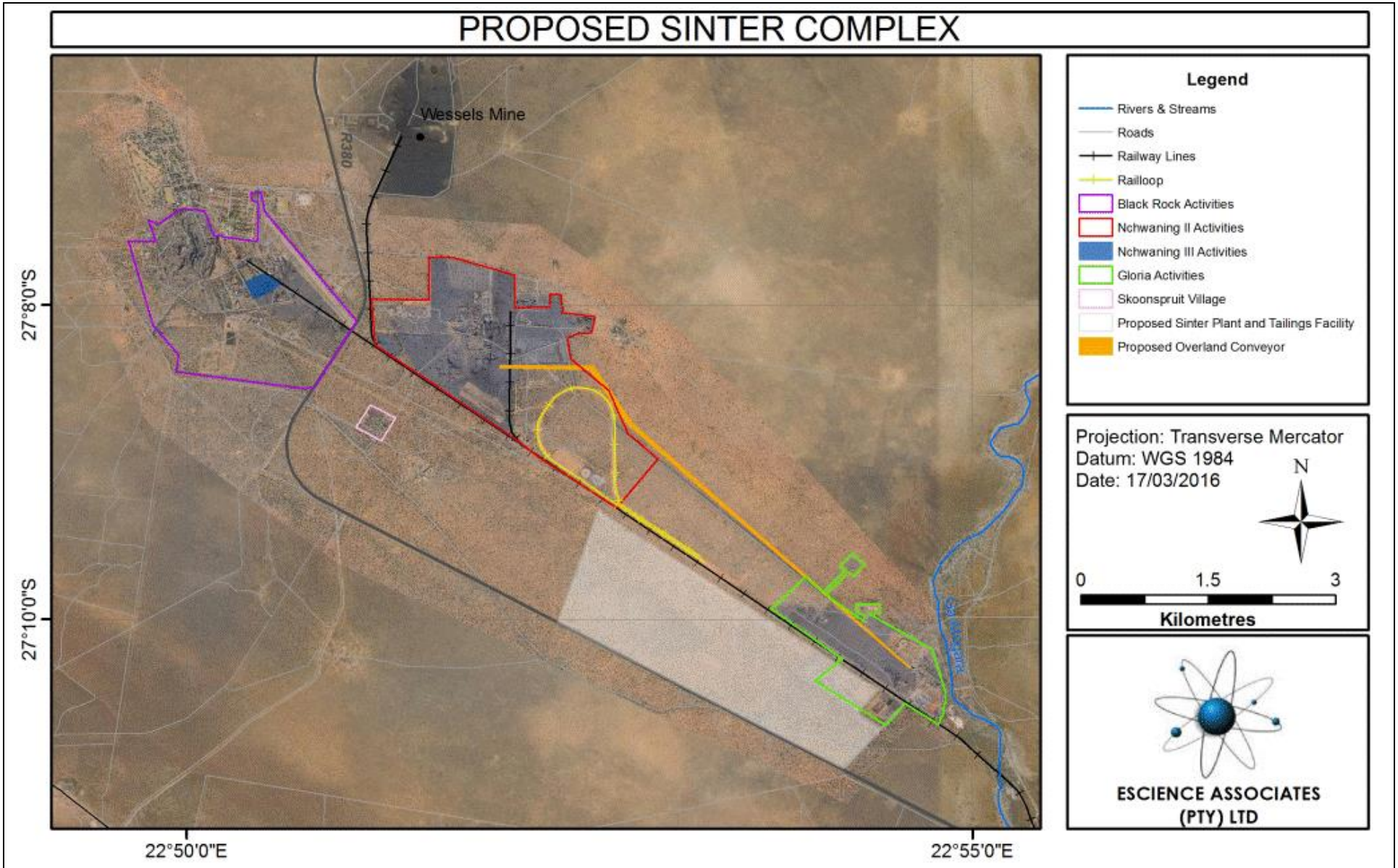


Figure 7-1: Aerial overview of all areas/activities requiring rehabilitation

7.5.2 MINE RESIDUE DEPOSITS

Mine residue deposits i.e. tailings dams, present potential point sources of groundwater pollution and continued visual intrusion following closure of the mines. These facilities will, unless otherwise recovered, remain on the surface at mine closure and require specific actions at closure, or concurrent to operation, to mitigate the potential long-term impacts thereof on groundwater quality and the visual and aesthetic character of the landscape.

The required mitigation at closure will differ from the greater closure and rehabilitation provisions for 'general surface rehabilitation'. These facilities will also need to be effectively fenced-off from the remainder of the site in order to prevent any potential injury, or loss of life, that could result through indiscriminate access thereto until final closure status is achieved. The unique closure and rehabilitation of such facilities is discussed in Table 7-2.

7.5.3 OPENCAST VOIDS

The legacy opencast pit from historical opencast mining at Black Rock has been transformed into a general landfill. This presents BRMO with the opportunity of using this landfill to dispose of demolition rubble (concrete, bricks, and other relatively inert demolition waste). The landfill can thus be filled to be in line with the surrounding landscape, and subsequently capped and vegetated. Capping must be undertaken in accordance with closure requirements of the DWAF Minimum Requirements for Disposal of Waste to Landfill (or its successor as applicable at the time of closure).

7.5.4 SHAFT, INCLINES AND UNDERGROUND WORKS

Underground works consist in the main of steel and concrete structures which are not expected to pose a significant risk to groundwater if sealed in situ. Facilities which may pose a risk include, in the main:

- Hydrocarbon storage (fuel and lubricants)
- Transformers
- Oil separators and waste accumulation receptacles
- Gear boxes and any other mechanical systems with significant quantities of lubricants.
- Vehicles and mobile equipment

7.6 LEGACY BLACK ROCK KOPPIE MINING

It has been noted that the mine works at the Black Rock Koppie may be considered as a heritage site. BRMO must establish with assistance whether the site must be declared and managed as such, or whether rehabilitation thereof may proceed. Notably the site may be home to various red data species of bats.

7.7 GENERAL SURFACE REHABILITATION

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 7-1 to Table 7-2 that follow provide further detail as to the actions that need to be taken by BRMO for each of the respective phases of surface rehabilitation.

Table 7-1: Requirements for General Surface Rehabilitation

No.	Management/Monitoring Measures	Target	Responsible party(ies)	* Time-frames/ Frequency
		Preparation and Initiation		
A1	Notify the Minister of Environmental Affairs of intended cessation of mining activities and rehabilitation in accordance with S33 of NEM:AQA.	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' (*inter alia*, 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	No remaining sub-surface	Project	Once-off

Table 7-1: Requirements for General Surface Rehabilitation				
No.	Management/Monitoring Measures	Target	Responsible party(ies)	* Time-frames/ Frequency
	to be removed to a depth of at least 0.5m below ground level.	structures that may impede further phases of rehabilitation, or the ultimate root penetration of re-introduced plant and tree species.	Manager	
1.3	The soils beneath any structures used for the bulk storage of hazardous substances (i.e. bulk fuel and oil storage facilities, oil-water separators/sumps), must be made subject to a hydrocarbon contamination screening exercise undertaken by a suitably qualified, independent, professional.	Documented proof of contamination assessments on record. Compliance with any further recommendations from appointed specialist prior to further rehabilitation of contaminated site(s).	Internal Environmental Officer	Once-off
1.4	On-going alien and invasive floral species control is required through all phases of rehabilitation.	No establishment and propagation of 'undesirable' plant species over rehabilitation sites.	Internal Environmental Officer	On-going. Monthly inspections; unless otherwise expressly stated for subsequent phases of rehabilitation
PHASE 2: Preparation of underlying soils for further phases of rehabilitation				
2.1	Exposed, compacted, soil surfaces must be ripped to a depth of at least 0.5 m to allow for adequate aeration and plant root penetration.	No topsoil replacement on compacted underlying soil horizons.	Project Manager	Once-off
2.2	Pre-mining topography should be reasonably restored through shaping, such that the topography of rehabilitated areas will ultimately be commensurate with that of adjacent, non-disturbed areas, 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	Vehicular access to rehabilitation sites from this phase of	No *ad hoc*, unauthorised,	Project	On-going

Table 7-1: Requirements for General Surface Rehabilitation				
No.	Management/Monitoring Measures	Target	Responsible party(ies)	* Time-frames/ Frequency
	rehabilitation onward should be limited to vehicles/machinery expressly required for the sound implementation of this plan.	vehicular movements over rehabilitation sites.	Manager	
PHASE 3: Topsoil/growth substrate replacement/preparation				
3.1	As far as available stockpile volumes allow, topsoil should be replaced in the appropriate order to a consistent depth of at least 20cm across areas prepared in terms of phase 2. Where topsoil is insufficient, subsoil must be treated in accordance with the specification of the soil specialist to meet rehabilitation objectives.	Topsoil replacement implemented prior to further efforts to re-introduce basal cover. Even surface, free from surface ponding of water.	Internal Environmental Officer	Once-off
3.2	Topsoil should be screened, as necessary, to remove any foreign objects, rocks, etc., prior to the replacement thereof.	Replacement of topsoil that is fit for purpose, and which does not impede BRMO from achieving the stated end-use objectives for the site.	Project Manager	On-going
3.3	Topsoil, and modified subsoil should at least meet the following physical and chemical profile required for successful rehabilitation:	Replacement of topsoil that is fit for purpose, and which does not impede BRMO from achieving the stated end-use objectives for the site.	Project Manager, soil scientist	Once-off
3.4	Any areas with slope ≥ 3° 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	Sufficient available seed stock on	Proponent,	Proof of

Table 7-1: Requirements for General Surface Rehabilitation				
No.	Management/Monitoring Measures	Target	Responsible party(ies)	* Time-frames/ Frequency
	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).	hand to effect rehabilitation that meets the stated land-use objective for the site.	specialist	commercial availability within 3 months of the EMP approval, or seed harvesting programme commencement within 12 months.
4.3	Seeding, or any other suitable means of re-introducing basal cover, should be planned and implemented in conjunction with the professional inputs and services of a competent contractor, with experience in such undertakings.	Optimal establishment of basal cover that will ensure that BRMO achieves the stated end-use objectives for the site.	Internal Environmental Officer	Once-off appointment with on-going management thereafter
4.4	Re-seeding should commence within 14 days of topsoil replacement, and areas should be free of alien and invasive plants.	Records kept of topsoil replacement and re-seeding dates for all rehabilitation sites.	Internal Environmental Officer	Within 30 days of topsoil replacement
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.	• 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	Documented records of weekly inspections. Basal cover establishment commensurate with	Internal Environmental Officer,	Weekly monitoring until adequate basal cover

Table 7-1: Requirements for General Surface Rehabilitation				
No.	Management/Monitoring Measures	Target	Responsible party(ies)	* Time-frames/ Frequency
	where basal cover establishment fails.	adjacent undisturbed areas over the mine surface rights areas (i.e. % cover relative to exposed soil surfaces).	ecologist	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
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.	• 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

Table 7-1: Requirements for General Surface Rehabilitation				
No.	Management/Monitoring Measures	Target	Responsible party(ies)	* Time-frames/ Frequency
				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
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.

Table 7-2: Unique Structural and Infrastructural Rehabilitation Requirements at Closure				
No.	Management/Monitoring Measures	Target	Responsible party(ies)	Time-frames
Mine Residue Deposits				
1.1	The TSF must be capped, rehabilitated and closed in compliance with the relevant provisions of Section 11 of the Department of Water Affairs & Forestry Minimum Requirements for Waste Disposal by Landfill (2nd Edition, 1998), or any future amendments thereto/ new legislation applicable to such.	Ultimate compliance with stated 'general closure' objectives for the Mine	Project Manager	Once-off. Within at least 24 months of last deposition /disposal thereto.
1.2	Engineering design drawings for capping and closure of the aforementioned facilities, as developed by a competent civil engineer, must be submitted to the Department of Water Affairs, as well as the Department of Mineral Resources, for approval prior to commencing with the closure thereof.	Ultimate compliance with stated 'general closure' objectives for the greater Mine site	Project Manager, civil engineer	Once -off
1.3	The side slopes of all mine residue deposits should be shaped to at least 18°; unless otherwise assessed by a competent person in accordance with the legislation in place at the time.	Slope stability/safety, effective plant establishment and no signs of erosion.	Project Manager	Once-off
1.4	All mine residue deposits should be effectively fenced off to avoid access thereto by unauthorised parties, until such time as they are permanently stable.	Mine residue deposits made safe and inaccessible to the general public at closure. Mine residue deposits effectively fenced-off with controlled access.	Project Manager	Immediately. Once-off
Return Water- and Pollution Control Dams				
2.1	Any plastic liners and any other non-natural materials (e.g. piping, gantries, pump-houses), as well as any residues contained therein, should be removed for subsequent off-site recovery, re-use, recycling or disposal.	All artificially established structures and infrastructure removed from site. Records of waste manifest/safe disposal certificate(s).	Project Manager and Engineering manager	Once-off
2.2	Dam walls should be flattened into the respective dam basins following 2.1 above.	Resultant topography conforming to that of the adjacent, pre-mining, land surfaces (Item 2-3, Table 7-1)	Project Manager	Once-off. Within 14 days of completing 2.1 above.
2.3	Proceed with relevant provisions of phases 2 through to 7 of Table 7-1 (i.e. once 2.1 and 2.2 above are appropriately implemented).	Ultimate compliance with stated end land-use-, ecological- and general closure objectives for the Mine.	Project Manager	Once-off. Within 14 days of completing 2.2 above.

Table 7-2: Unique Structural and Infrastructural Rehabilitation Requirements at Closure				
No.	Management/Monitoring Measures	Target	Responsible party(ies)	Time-frames
Opencast Voids				
General Landfill				
3.1	The landfill should be back-filled during the life of the mine. If space remains then inert waste from demolition must be used to fill the landfill to the height of surrounding land profile.	Ultimate compliance with stated end land-use-, ecological- and general closure objectives for the Mine.	Internal Environmental Officer and Project Manager	Once-off
3.2	The landfill must be capped, rehabilitated and closed in compliance with the relevant provisions of Section 11 of the Department of Water Affairs & Forestry Minimum Requirements for Waste Disposal by Landfill (2nd Edition, 1998), or any future amendments thereto/ new legislation applicable to such.	Ultimate compliance with stated 'general closure' objectives for the Mine	Project Manager	Once-off. Within at least 24 months of last deposition /disposal thereto.
3.3	Engineering design drawings for capping and closure of the aforementioned facilities, as developed by a competent civil engineer, must be submitted to the Department of Water Affairs, as well as the Department of Mineral Resources, for approval prior to commencing with the closure thereof.	Ultimate compliance with stated 'general closure' objectives for the greater Mine site	Project Manager, civil engineer	Once -off

7.7.1 BUILDINGS AND INFRASTRUCTURE

Brick buildings and infrastructure serving as offices, workshops, etc. can be put to beneficial use upon closure of the mine, and thus should not be removed if there is an adequate use for these buildings post-closure. This "adequate use" should be determined before final closure and rehabilitation measures are formally implemented.

If, however, any agreement is reached with the community and or any other organization to take over the occupation of one (1) or more buildings, then a formal agreement to that extent needs to be entered into and signed by all parties concerned. The DMR also needs to be alerted to this fact, and adequate legal arrangements need to be made in this regard. If various parties cannot reach agreement on the adequate use for these buildings, then these buildings too need to be demolished. All temporary buildings (pre-fabricated buildings) should be removed and their footprints rehabilitated.

7.8 CONCURRENT REHABILITATION

The procedures stipulated in 7.5 and 7.7 apply hereto as well. This section relates to ongoing rehabilitation requirements, as well as areas identified at the time of updating this EMPr which require rehabilitation as depicted in the ensuing maps.

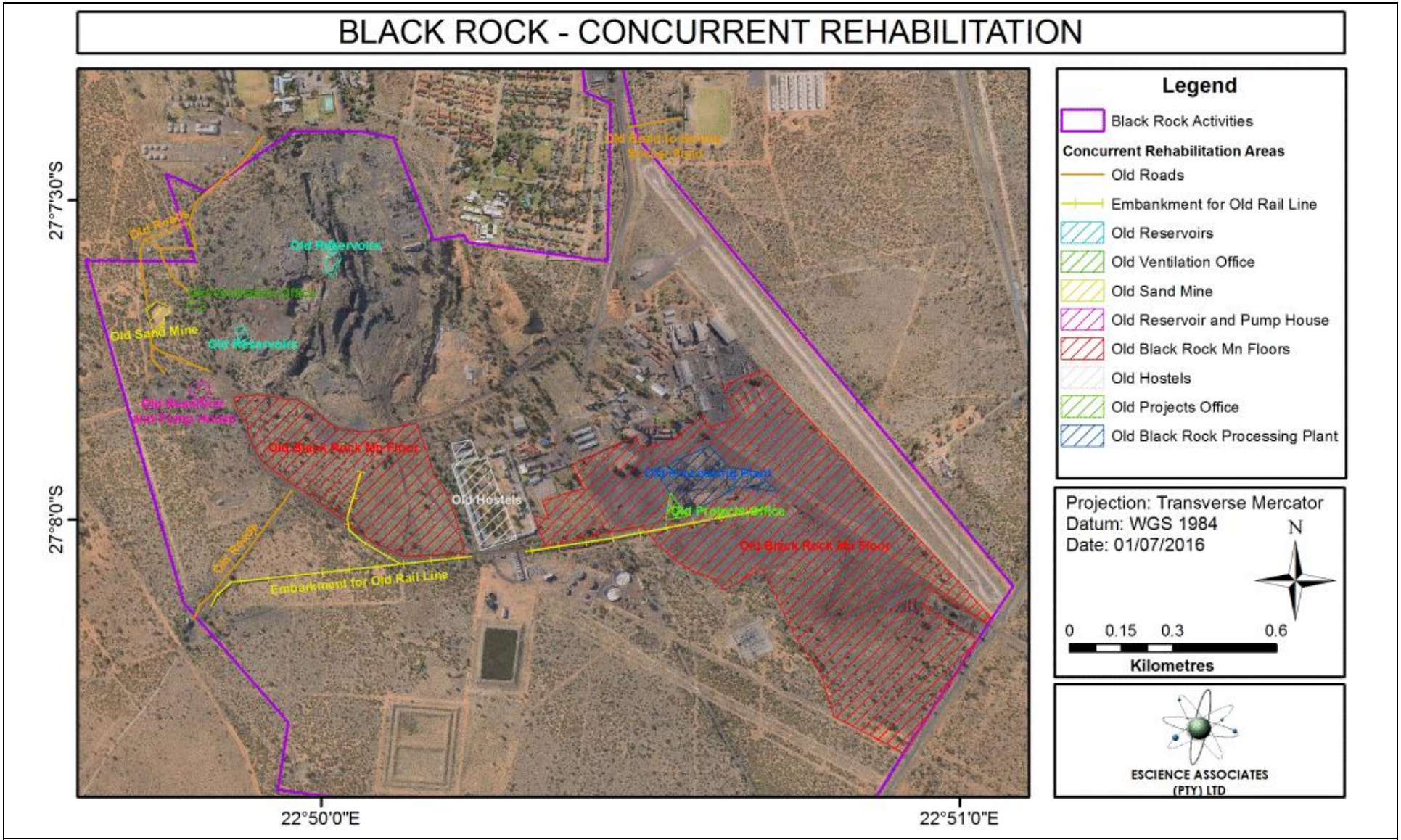


Figure 7-2: Black Rock Mine and Nchwaning III areas requiring rehabilitation

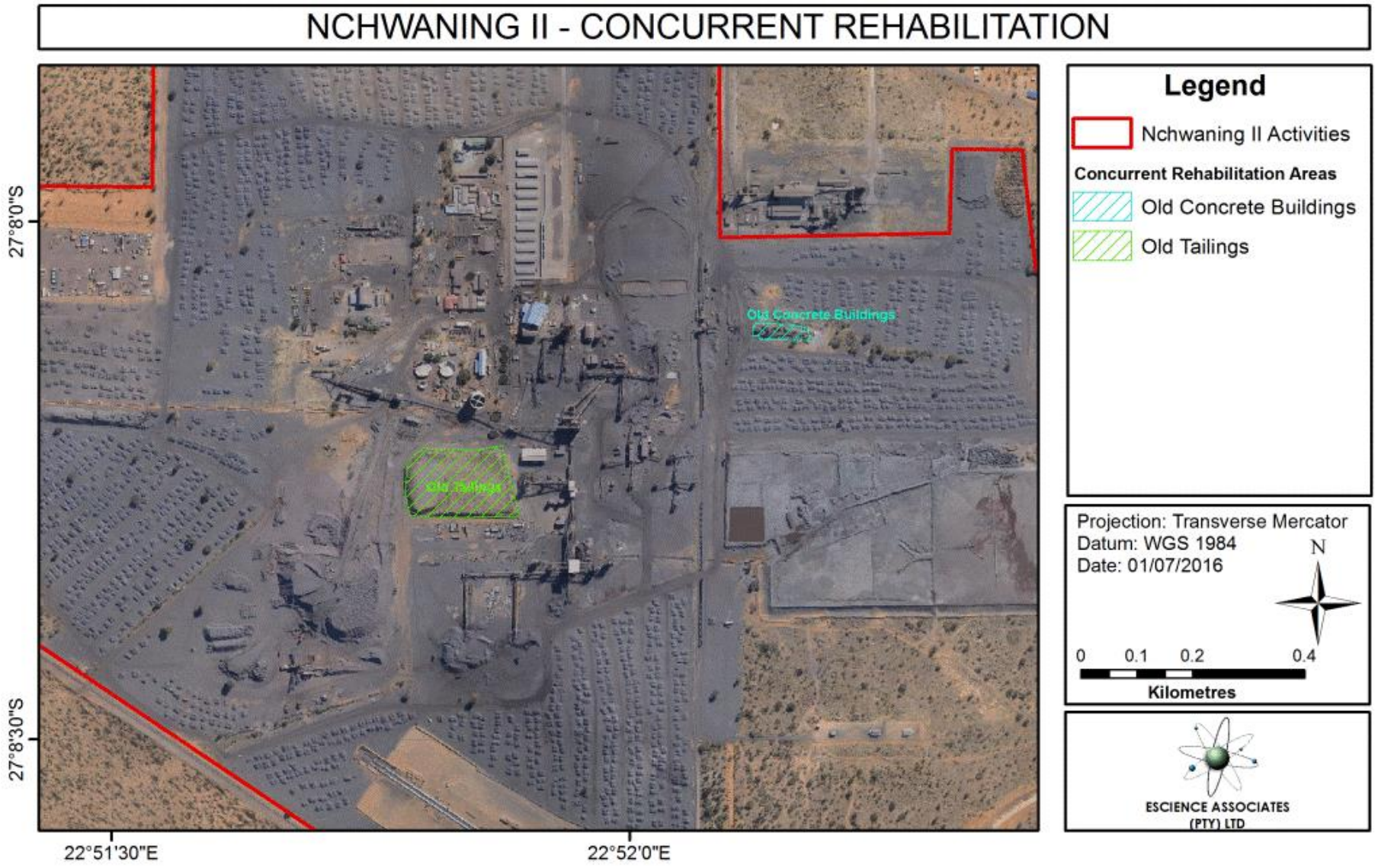


Figure 7-3: Nchwaning II areas requiring rehabilitation

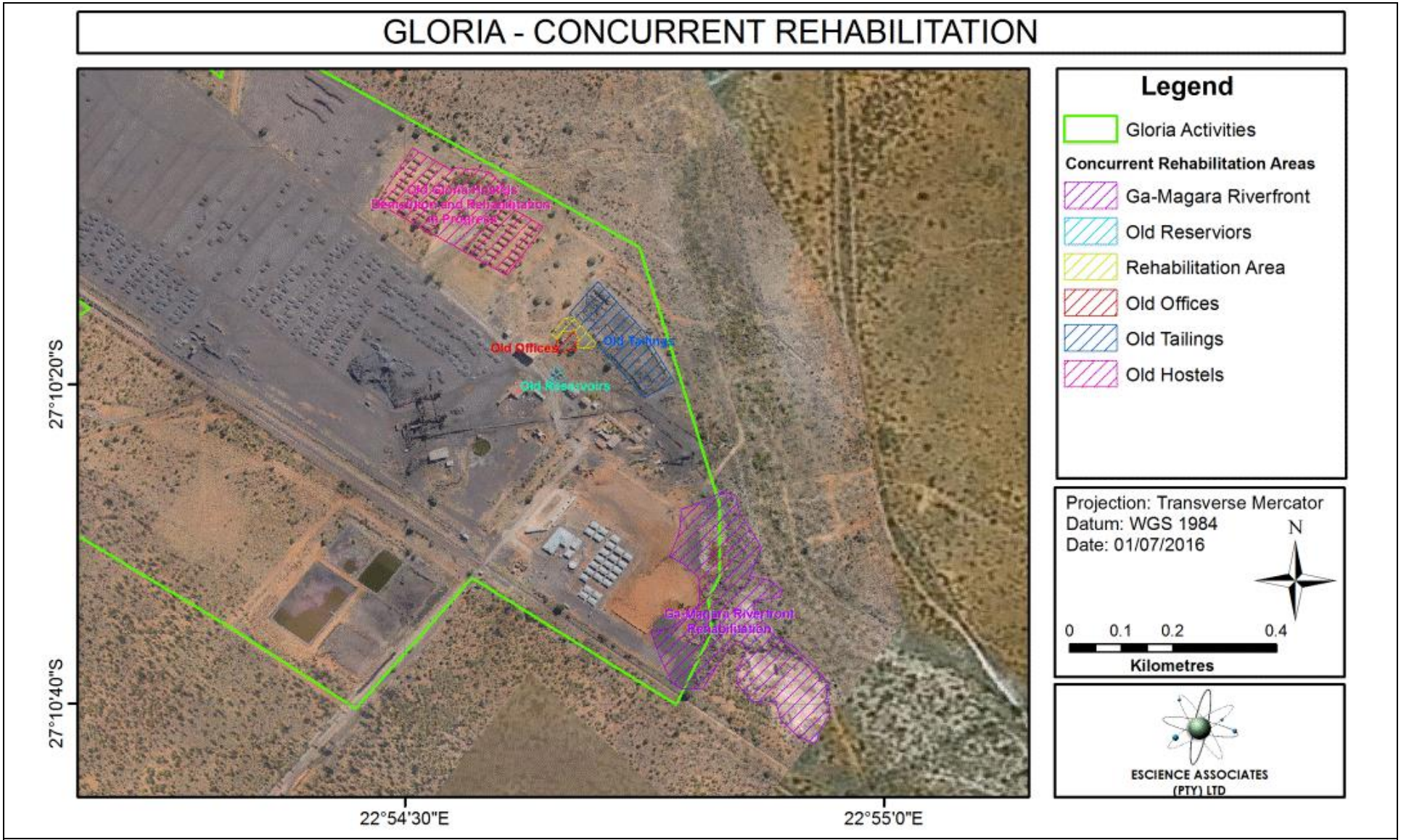


Figure 7-4: Gloria Mine areas requiring rehabilitation

Table 7-3: Concurrent Rehabilitation				
No.	Management/Monitoring Measures	Target	Responsible party(ies)	Time-frames
Redundant Building, water reservoirs, plant and other such structures				
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	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
1.4	All structures must be demolished and removed.	No structures or residue remaining	Engineering Manager	Within one year of declared redundancy
1.5	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
1.6	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
1.7	Shape to contours of natural surrounds, Rip to 500 m, and scarify compacted soil.	Soil is loosened and aerated for plant growth. No steeps slopes or areas for water ponding.	Engineering Manager	Within 2 weeks of removal of structures
1.8	Cover exposed surfaces with topsoil and revegetate.	All surfaces vegetated	Environmental Specialist	Within 2 weeks of previous step.
1.9	Monitor and manage rehabilitated area in accordance with alien and invasives management procedure.	Indigenous vegetation fully colonises the site.	Environmental Specialist	On going
1.10	Any areas with slope ≥3° should be inspected for signs of	Records of weekly 'erosion	IEO	After rainfall

Table 7-3: Concurrent Rehabilitation				
No.	Management/Monitoring Measures	Target	Responsible party(ies)	Time-frames
	topsoil erosion following the replacement thereof, and appropriate action taken to curb any problematic areas. This to be undertaken until vegetation is permanently established.	inspections'. No topsoil erosion following replacement.		events and weekly during rainy season.
Disturbed area on the eastern boundary of Gloria mine encroaching on the Gamagara river				
2.1	Obtain a Water Use Licence or a General Authorisation in terms of the National Water Act (Act 36 of 1998) prior to commencement of rehabilitation activities in the river bed/riparian zone or other restricted demarcation.	Rehabilitation approved by the DWS.	Environmental Specialist	Prior to commencement.
2.2	Identify any protected species that may require permitting prior to disturbing.	Required biodiversity permits in place.	Environmental Specialist	Prior to commencement.
2.3	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
2.4	Removal of all foreign material and legacy waste in the area to be rehabilitated.	No residues remaining	Environmental Specialist	2017 financial year
2.5	Rip compacted areas, and landscape to prevent erosion.	No soil erosion. Land prepared for revegetation.	Environmental Specialist	2017 financial year
2.6	Revegetate in accordance with the recommendations of the biodiversity specialist, and monitor in accordance with alien and invasives management procedure.	Successful revegetation with appropriate indigenous land cover.	Environmental Specialist	2017 financial year
Golf Course, old laydown areas, old railway track (removed), and other disturbed surfaces				
3.1	All residual structures must be demolished and removed.	No structures or residue remaining	Engineering Manager	2017 financial year
3.2	Shape to contours of natural surrounds, Rip to 500 m, and scarify compacted soil.	Soil is loosened and aerated for plant growth. No steeps slopes or areas for water ponding.	Engineering Manager	Within 2 weeks of removal of structures
3.3	Cover exposed surfaces with topsoil and revegetate.	All surfaces vegetated	Environmental Specialist	Within 2 weeks of previous step.
3.4	Monitor and manage rehabilitated area in accordance with alien and invasives management procedure.	Indigenous vegetation fully colonises the site.	Environmental Specialist	On going
3.5	Any areas with slope ≥3° should be inspected for signs of topsoil erosion following the replacement thereof, and appropriate action taken to curb any problematic areas. This	Records of weekly 'erosion inspections'. No topsoil erosion following replacement.	IEO	After rainfall events and weekly during rainy

Table 7-3: Concurrent Rehabilitation				
No.	Management/Monitoring Measures	Target	Responsible party(ies)	Time-frames
	to be undertaken until vegetation is permanently established.			season.
General provisions				
4.1	All areas disturbed through construction related activities, and which can reasonably and feasibly be rehabilitated once the subject construction ceases, should be rehabilitated in accordance with Phases 4 to 7 in Table 7-1.	All areas that can reasonably and feasibly be rehabilitated following construction are indeed rehabilitated in a timely manner.	Proponent, contractor	Rehabilitation to commence within 3 months of the completion of construction

7.9 CONCLUSIONS AND SUMMARY OF REHABILITATION PLAN

This rehabilitation plan has taken into consideration all possible areas that need to be rehabilitated on the mine site either at closure, or concurrently. 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. 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.

8 ENVIRONMENTAL MONITORING PLAN

8.1 SURFACE AND GROUNDWATER

Surface and groundwater monitoring must be undertaken in accordance with BRMO's Water Use Licence with the inclusion of antimony. Figure 8-1, Figure 8-2, and Figure 8-3 indicate the locations of boreholes for groundwater monitoring, wastewater usage monitoring points, and treated water quality monitoring points respectively.

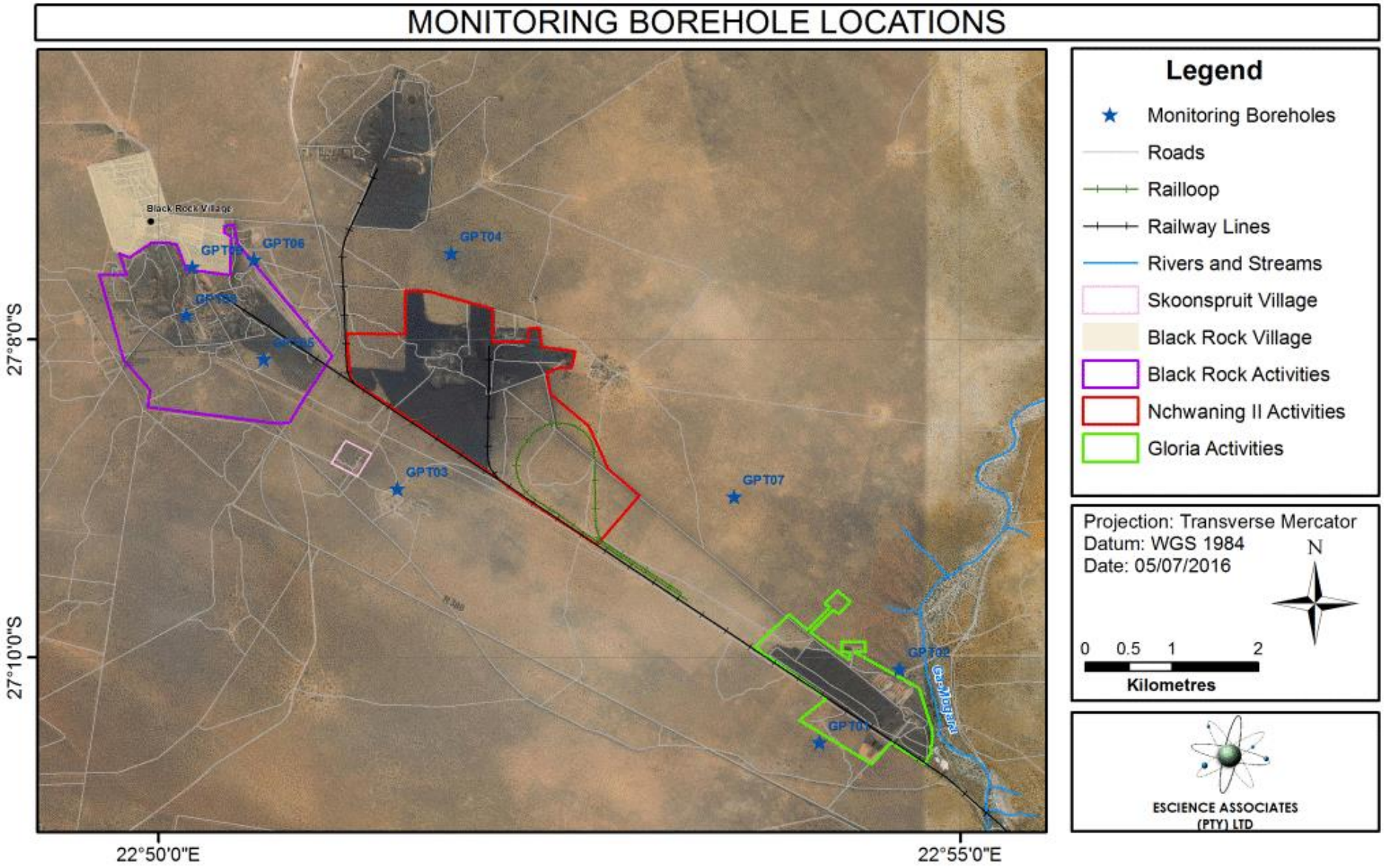


Figure 8-1: BRMO Groundwater Monitoring Network (GPT, 2011)

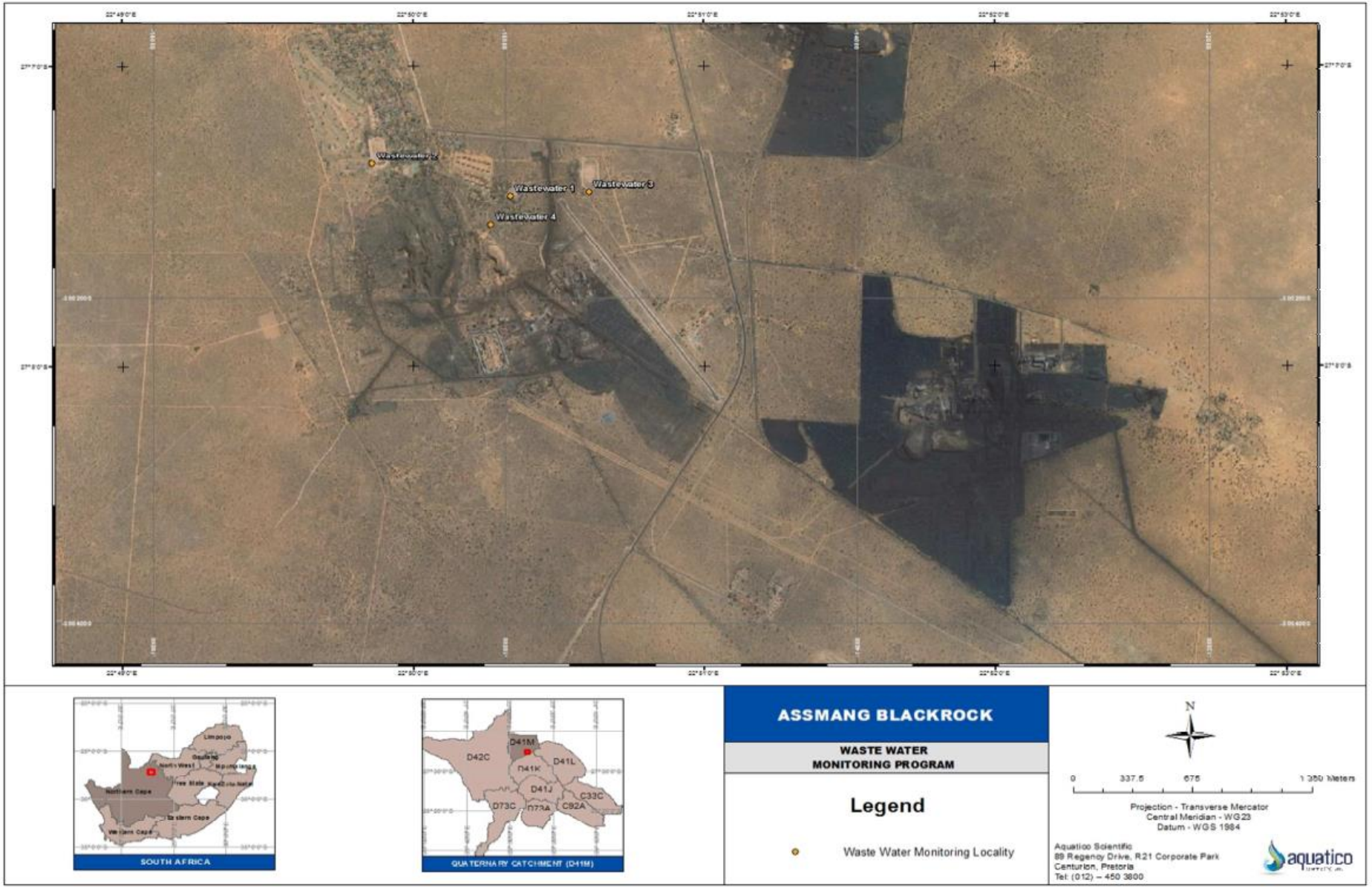


Figure 8-2: BRMO Wastewater Monitoring Network (Aquatico, 2016)

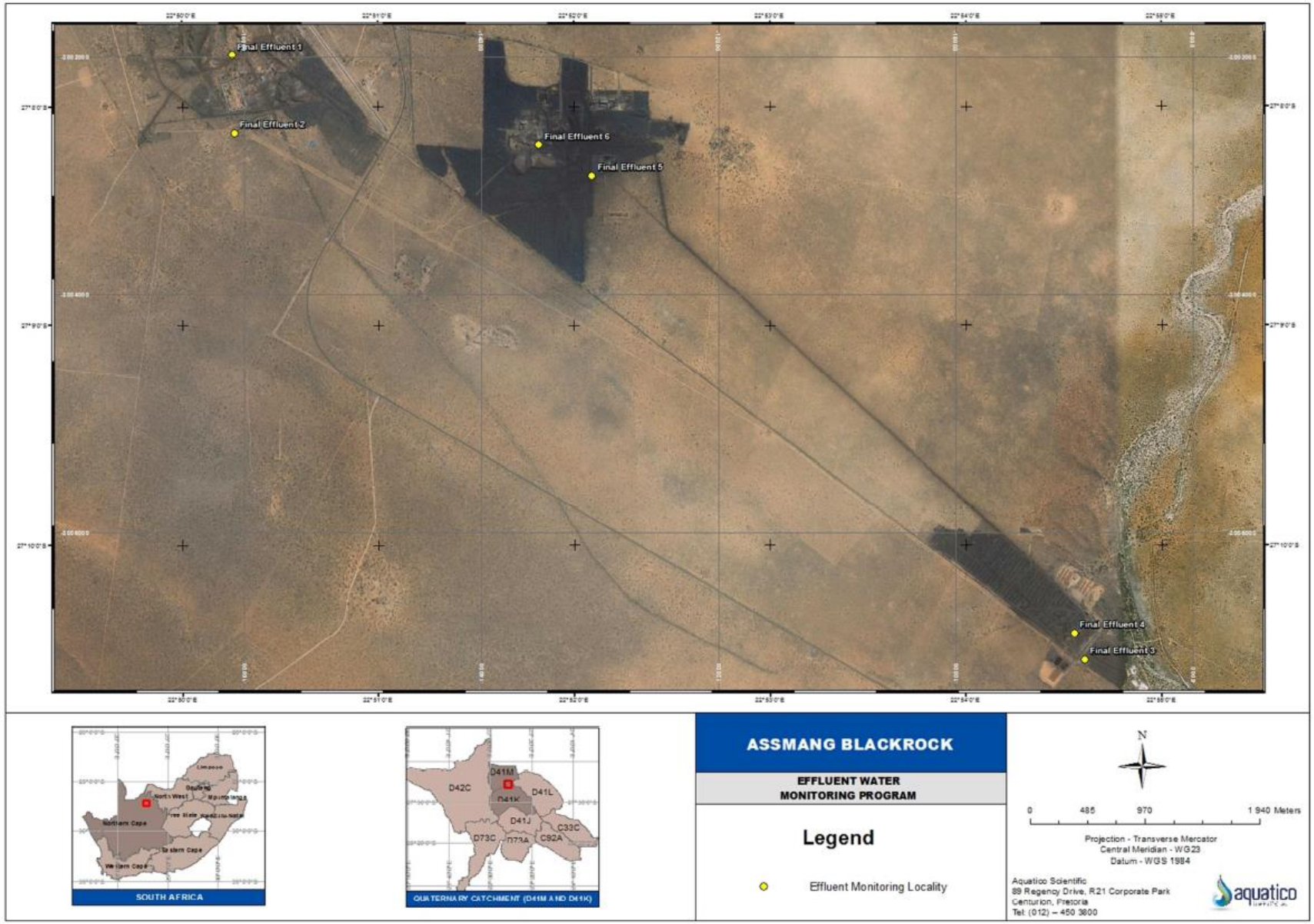


Figure 8-3: BRMO Effluent Monitoring Network (Aquatico, 2016)

8.2 DUST FALLOUT

Because of the potential impact the haul road PM entrainment has on ambient air quality, it is required that the proponent implements a palliative abatement method on unpaved road surfaces, with a minimum abatement efficiency of 80%. The monitoring of the effectiveness thereof will be needed, and it is proposed that this be done at least at the locations indicated in Figure 8-4 and Table 8-1. The locations were chosen so that while they will still be able to collect dust from the surroundings it will not result in the over-estimation of ambient dust emissions by being placed too close to any haul roads and product stockpile areas.

Table 8-1: Co-ordinates of the dust emissions monitoring

Name	No.	Latitude	Longitude
North boundary point	1	-27.1225	22.8649
East boundary point	2	-27.1368	22.87949
Far East boundary point	3	-27.1735	22.9153
South boundary	4	-27.171301	22.88858
Mokala Guest Lodge	5	-27.1367	22.8328
Black Rock School	6	-27.1265	22.8406

Monitoring must be undertaken as per the requirements of national dust control regulations (NEM:AQA GN.R 827 2013 or their successor as appropriate).

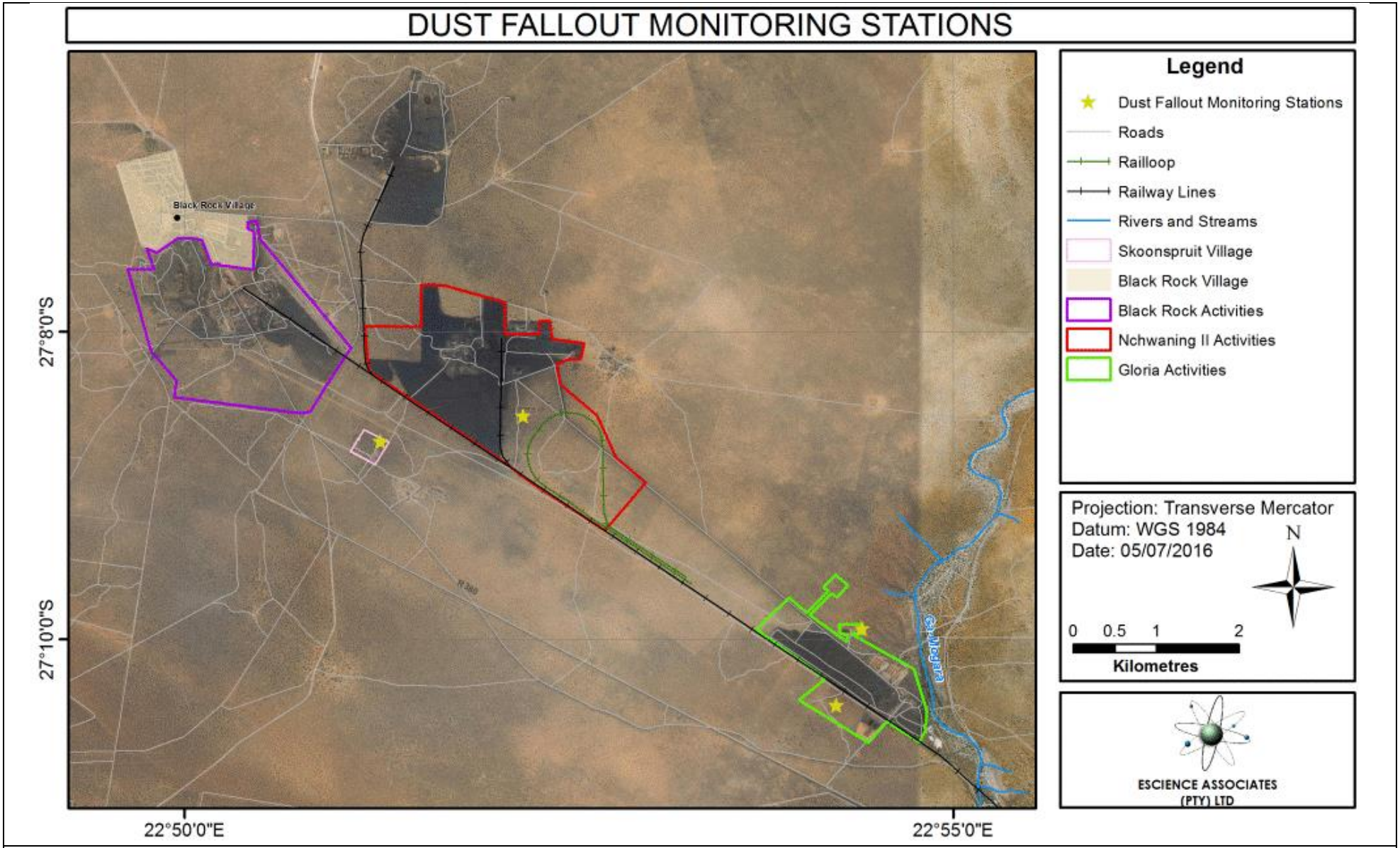


Figure 8-4: Dust fallout monitoring locations

8.3 NOISE

BRMO has undertaken baseline noise monitoring in 2013 (dBAcoustics Project No.: 046/2013), and subsequently in 2015 (Royal Haskoning DHV report Reference: 14003217/O1/ST).

In respect of current mining operations, should BRMO receive noise complaints, then further monitoring must be undertaken in consultation with a noise specialist.

In respect of the proposed sinter plant, an independent noise monitoring campaign must be undertaken by a competent noise and vibration specialist within 6 months of commissioning of the proposed sinter plant complex, or infrastructure. Subsequent periodic monitoring, if recommended by the specialist, can either be undertaken by a competent noise and vibration specialist, or by BRMO environmental management staff who have received appropriate training to undertake such.

8.4 BIODIVERSITY MONITORING PLAN

8.4.1 MONITORING PHILOSOPHY AND REQUIREMENTS

Prudent biodiversity monitoring on the property is important, as this will ensure a continual flow of data, enabling all parties involved to accurately assess and manage biodiversity related progress and issues. To ensure the accurate gathering of data, the following techniques and guidelines should be followed:

- Fixed point monitoring should be applied as the preferred method of monitoring (Figure 8-5);
- All data gathered should be measurable (i.e. both qualitative and quantitative);
- Monitoring reporting should be repeatable, as well as temporally and spatially comparable;
- Data should be auditable;
- Data gathered should be an accurate representation of the Present Ecological State of the subject property, as well as the various floral communities and habitat units represented by each monitoring site;
- Data, when compared to previous sets, should show spatial and temporal trends;
- Data gathered should represent all aspects of all communities i.e. grasses, forbs, shrubs and trees;
- General habitat unit overviews should also be undertaken; and
- Monitoring of protected species populations must also take place.

Biodiversity management is undertaken as per BRMO's biodiversity management procedure.

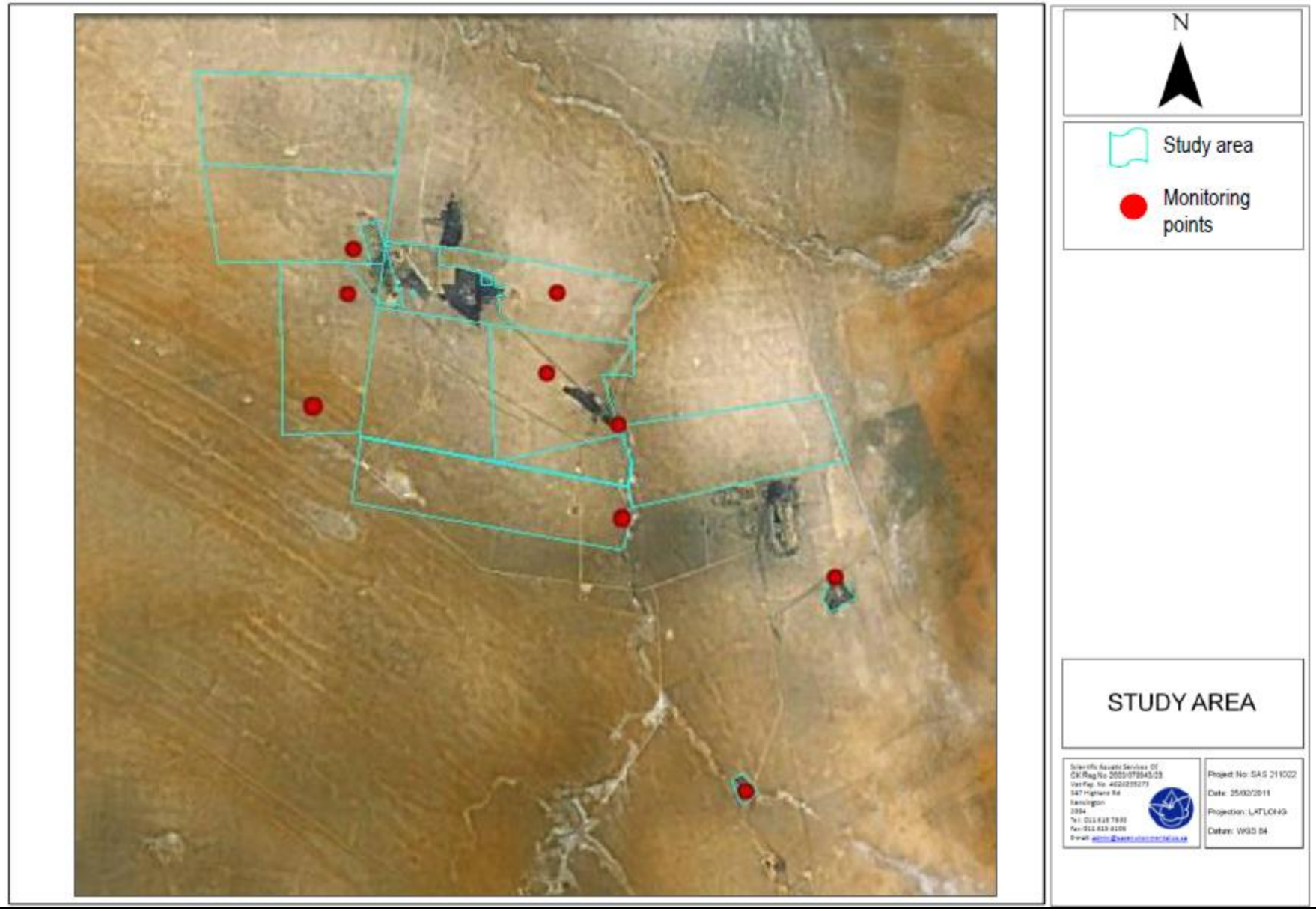


Figure 8-5: Fixed Monitoring Points at BRMO for Biodiversity Monitoring

8.5 BLACK ROCK MINE BIODIVERSITY MONITORING SYSTEM

8.5.1 MONITORING INFRASTRUCTURE/SITES/ LOCALITIES

In addition to general assessments of each habitat unit, specific fixed monitoring points are also deemed necessary. Figure 8-5 presents the fixed monitoring points for the BRMO surface rights area biodiversity monitoring program.

8.5.2 MONITORING/SAMPLING FREQUENCY

Monitoring should occur on an annual basis in the summer growing season. In order to ensure that temporal comparisons can be made assessments should take place at the same time each year.

8.5.3 MONITORING/SAMPLING TECHNIQUE

8.5.3.1 Step 1: Data collection

Before any routine monitoring can begin, baseline data must be available to provide a standard against which to detect change. Baseline data is collected and analysed with the aim of defining the present state of the vegetation under the existing environment or management regime. This was done as part of a specialist biodiversity assessment

8.5.3.2 Step 2: Apply pre-monitoring management

Recovery of vegetation after some form of management can greatly influence the measurement of species diversity. For example, the recovery of grassland after a fire can be rapid, but seldom involves change in the species diversity. In other words, shortly after a fire a different assemblage of species will be present to the assemblage of species that would be present one year after a fire. This does not mean that the first assemblage of species has disappeared, it simply means that they are dormant and not noticeable, but are waiting for the same conditions that occur shortly after a fire to return, when they will again grow and produce and set seed. This cyclical phenomenon is known as recovery succession and in the case of vegetation recovery after fire is known as 'pyric succession'.

With this in mind, it is important in certain types of vegetation to record the sequence of management events, such as fire, that occurred before the vegetation species diversity is measured, with the aim of taking all follow up measurements after the same sequence of events.

8.5.3.3 Step 3: Locate the plots in the field

Plots are located for the first time in the field using a GPS and the co-ordinates determined from the map above. At each point in the field locate a square plot of 40 X 40 m and permanently mark and record GPS co-ordinates of each corner of the plot. Thereafter, all follow up surveys will be undertaken in the same permanently marked plots.

8.5.3.4 Step 4: Collect data

For the herbaceous layer (i.e. grasses and forbes), record within each permanently located 40 X 40 m plot, the nearest, rooted, living plant to each of 200 linear points spaced 3 m apart (i.e. adapted step-point survey for grassland assessments). For each point record the species name on a field form. For the woody layer (i.e. trees and shrubs), record within the same permanently located 40 X 40 m plots, each living woody plant and record the species name on a field form.

8.5.4 MONITORING/SAMPLING EQUIPMENT

- Sampling plot equipment, which includes pegs, string, measuring tape;
- GPS;
- Sample bags; and
- Reference collection.

8.5.5 INFORMATION GENERATION PROTOCOLS

8.5.5.1 Reporting Frequency

Reporting should follow after monitoring has taken place (i.e. annually).

8.5.5.2 Report Content

All aspects pertaining to floral diversity and sensitive habitats as covered by the Biodiversity Action Plan should be included in the annual monitoring report.

8.6 FAUNAL DATA CAPTURING PROTOCOLS

8.6.1 MONITORING/SAMPLING FREQUENCY

Monitoring should occur on an annual basis in the summer. In order to ensure that temporal comparisons can be made assessments should take place at the same time each year.

8.6.2 MONITORING/SAMPLING TECHNIQUE

- *Ad libitum* recording, of all faunal species observed through direct visual observation or identified by calls, tracks, scats and burrows are recorded;
- Bird census involving 15 minute point counts on the monitoring points on the assessment site; and
- Sweep netting and pitfall traps to gather information of the invertebrate community.

8.6.3 MONITORING/SAMPLING EQUIPMENT

- Sweep nets;
- Pitfall traps;
- Binoculars;
- Sampling bags/buckets; and
- Reference lists.

8.6.4 INFORMATION GENERATION PROTOCOLS

8.6.4.1 Reporting Frequency

Reporting should follow after monitoring has taken place, i.e. annually with assessments of the general faunal integrity of the site.

Report Content

All aspects pertaining to faunal diversity and sensitive habitats as covered by the Biodiversity Action Plan should be included in the annual monitoring report.

9 PROCEDURES FOR ENVIRONMENTAL RELATED EMERGENCIES AND REMEDIATION

An effective, comprehensive, well-considered and tested environmental emergency preparedness and response plan has the potential to save lives, prevent unnecessary damage to the company and other property, as well as to manage environmental risk in the event of a large chemical spill, oil spill, fuel spill or explosives spill.

The MPRDA requires in the Regulations Section 51(b) iii that the mine implement procedures to environmental related emergencies and remediation. Refer to the Black Rock Mine (BRMO) Emergency Preparedness and Response Plan included in Appendix 4.

Some specific legal requirements were identified for the emergency response activities in the mining industry. A number of SABS standards apply, such as the SANS10232 - the minimum requirements for emergency responses. Legislation requires that relevant government departments are kept informed of incidents and accidents that occur within the mining area in terms of the following acts:

- Regulation 51 of Regulations under the MPRDA - Procedure for environmental related emergency and remediation;
- Mine Health & Safety Act (Act 29 of 1996) - Manner of reporting and keeping of information regarding incidents & emergencies; and
- Occupational Health & Safety Act (Act 85 of 1993) - Employee requirements to report incidents where activity has occurred.

9.1 OBJECTIVES OF AN ENVIRONMENTAL EMERGENCY RESPONSE PLAN

Environmental emergencies occur over the short-term and require an immediate response. A mine, as part of its management tools, especially if it is ISO 9000 and ISO 14001 compliant, should have an Emergency Response Plan. If one does not exist then one should be compiled and disseminated to all employees and contractors and in the event of an emergency, the emergency response plan should be consulted.

This plan should be placed around the mine where it will be easily viewed. The plan should contain a list of procedures, evacuation routes and a list of emergency contact numbers. It is advisable that the mine tests the emergency response plan in order to identify any areas for improvement.

If the emergency has the potential to affect surrounding communities, they should be alerted via alarm signals or contacted in person. The surrounding community will be informed, prior to mining taking place, of the potential dangers and emergencies that exist, and the actions to be taken in such emergencies.

Communication is vital in an emergency and thus communication devices, such as mobile phones, two-way radios or telephones must be placed around the mine. A checklist of emergency response units must be consulted and the relevant units notified.

The checklist includes:

- Fire department;
- Police;

- Emergency health services such as ambulances, paramedic teams, poisons centres;
- Hospitals, both local and further afield, for specialist care;
- Public health authorities;
- Environmental agencies, especially those responsible for air, water and waste issues;
- Other industrial facilities in the vicinity with emergency response facilities;
- Public works and highways departments; and
- Public information authorities and media organisations.

9.1.1 EMERGENCY PROCEDURES

The following is an Accident Handling Procedure (AHP) for Duty Officials:

1. Take down details from reportee including the following:

a) Telephone number of reportee;

b) Nature of injuries to accident victim;

c) If assistance is required from the paramedic;

d) Where the accident victim is located;

e) If transport is required to CASEVAC patient; and

f) Instruct reportee to leave a messenger by the phone.

2. If the injuries are serious contact the relevant emergency services who will notify the paramedics.
3. Await paramedics and instruct them to proceed to the accident site.
4. Notify security and inform them of ambulance arrangements and where the said vehicle must go to.
5. Inform the paramedic called out on the following:

a) Telephone number of reportee;

b) Nature of injuries to accident victim or victims;

c) Where is the injury, part of body (arm, leg, head, etc.);

d) Where the accident victim is presently;

e) What is the condition of victim (breathing, stable, etc.); and

f) If an ambulance is required to CASEVAC victim from surface location to hospital.

6. If necessary provide a guide, at security gate, to escort the ambulance or paramedics to the required location.
7. Inform manager of the accident.

NOTE:

The procedure does not change because there is more than one accident victim. One victim or 20 victims must be handled in the same manner.

Emergency Procedure for Duty Officials:
In the event of an explosion or fire occurring in the underground environment, the following action must be taken by the duty official as a first phase:

9.1.1.1 First Phase:

1. Take down the following details of the incident from the reportee:

a) Nature of the incident, explosion, fire etc.;

b) Location of the incident, explosion, fire etc.;

c) If there are casualties and the nature and extent of their injuries;

d) Ask if the reportee requires assistance (rescue team, doctor, paramedic, Transport etc.);

e) If the reportee and his team are going to, or are in the rescue chamber;

f) The phone number of the reportee; and

g) Name of person reporting the incident.

2. Based on the above-mentioned information, the official on duty will take a decision whether to evacuate any or all other work areas of the mine, making use of the current escape plan for the section or area.
3. Report the incident to the mine manager and the Sub-ordinate Manager.
4. If the mine manager is unobtainable then report the incident to the next lowest level of
5. Official (engineer, mine overseer, etc.).
6. Contact and call out the following personnel:

a) The mine doctor and paramedics;

b) Occupational hygienist (Ventilation Officer);

c) The mine overseer for the incident area;

d) The mine engineer; and

e) The safety manager.

7. Begin a logbook or record of events putting in detail of times and who said what, where and when, going back to the original reportee.

NOTE:

i. The official will assume the position of the incident controller until relieved of that position by the newly appointed incident controller, i.e. (mine manager, engineer, etc.).

ii. It is important to ensure that all phone messages are kept to a minimum duration throughout the incident period.

9.1.1.2 Second Phase:

1. Appoint lamp room attendant as required in terms of this emergency standard procedure to conduct shaft clearance of evacuates.
2. If necessary send for emergency service, fire brigade, police, etc.
3. Give feedback to newly appointed incident coordinator once he is present on the mine and hand over role to new incident coordinator.
4. Follow instructions of Mine Manager.
5. Refer all media enquiries to head office legal department.
6. Remain in position at control room until relieved.
7. Brief official on current situation.

NOTE:
Remember to maintain the logbook at all times throughout the duration of the incident.

9.2 EMERGENCIES, PROCEDURES AND REMEDIAL ACTION

The following define the most likely potential environmental emergencies

9.2.1 FIRES

Veld fires and fires resulting from other sources must be handled with extreme caution. Fire Extinguishers should be placed at easily accessible locations around the mine.

Procedure:

- In the event of a fire, an alarm should be activated to alert all employees and contractors;
- Identify the type of fire and the appropriate extinguishing material. For example, water for a grass fire, and mono ammonium phosphate based fire extinguisher for chemical and electrical fires.
- In the event of a small fire the fire extinguishers placed around the mine should be used to contain and extinguish the fire.
- In the event of a large fire, the local area council's fire department will be notified and should react timeously.
- All staff will receive training in response to a fire emergency on site.
- A Fire Association should be set up with the mine and surrounding land owners to facilitate communication during fire events and assist in fighting fires, where necessary.
- In case of a chemical or petroleum fire, run-off from the area should be contained as far as possible using the most appropriate measures e.g. spill absorbent cushions, sand or a physical barrier.
- Contaminated run-off must be diverted into an oil sump, or cleaned up.

9.2.2 MAJOR HYDROCARBON/HAZARDOUS MATERIAL SPILLAGE

Hydrocarbon, or any other chemical spills, must be handled in an appropriate manner in order to minimize the environmental impacts and rectify the damages done to the environment.

9.2.2.1 Spill Clean Up

All employees, especially machine operators, are responsible for the immediate spillage containment (control from spreading), application of a spill absorbent and spill cleaning for all spills resulting from machines in their control.

The steps for any clean-up operation are:

- Contain the spill, to stop it from spreading;
- Remove, block or stop the source of the pollution, i.e. close any taps or valves;
- Clean up the affected areas; and
- Rehabilitate the area.

Personal Protective Equipment must be worn when handling oil, diesel, solvents or any other chemicals.

9.2.2.2 Spills on Concrete Surfaces

- Mop up liquid chemical spills on concrete or cement floors with loose, absorbent materials;
- Put used fibre into a 210 L drum or container marked for that purpose;
- Once it is full, send the drum to the hazardous waste management yard;
- All diesel, oil, petrol, chemical and acid contaminated fibre sorbs or soil should be handled as hazardous waste;
- Extra caution must be taken with drums filled with flammable substances (e.g. petrol, oil) – if using metal drums, care must be taken not to cause sparks;
- Contain large oil spills with fibre booms, bio-tube or sand filled plastic bags (depending on which is available);
- Ensure that all efforts are taken to prevent the spread of the substance;
- Pump up or scoop excess oil, diesel or liquid chemicals into a holding tank/drum marked for that purpose;
- Avoid the use of chemicals to absorb oil; and
- Use the biological degreaser to remove traces of oil left on the concrete surface.

9.2.2.3 Spills on Tar Surfaces

- As for the spills on concrete, speed is important, because oil and diesel softens the tar surface;
- Soak up oil and/or chemicals with a suitable absorbent (loose fibre); and

- Clean the remaining or stains with biological cleaner that should be in stock.

9.2.2.4 Spills on Soil

- Unless otherwise removed from location and disposed of at a hazardous waste disposal facility, use a bio-remediation agent containing oil/diesel degrading bacteria;
- Remove the excess oil and or diesel as quickly as possible to prevent further penetration into the ground, by scooping up excess with shovels;
- Use plastic sheeting where necessary to divert and pick up the oil/diesel;
- Place any excess oil/diesel/chemical into a drum marked for that purpose; and
- Bio-remediation of oil/diesel polluted soil on site must be undertaken as follows:
  - Determine the depth and width that the oil/diesel has penetrated into the soil as far as possible, by digging up the polluted soil;
  - Remove the polluted ground to one side and mix it thoroughly with the bio-remediation powder;
  - One spade remediation powder per cubic metre of polluted ground;
  - Replace the mixture of bioremediation powder and contaminated soil back into the excavated site and water thoroughly – note the ground must be saturated, but not so wet that the water drains through;
  - Leave for two to three weeks;
  - Conduct a visual inspection by checking the colour of the ground, contact the Environmental Management Section located within the SHEQ Department for advice if necessary; and
  - It may be necessary to add more bio-remediation agent. The bioremediation process depends on the temperature, moisture content and the presence of air in the soil. The clean-up process occurs faster in warmer weather. It is necessary to send the soil sample to a laboratory to test for hydrocarbon content, to determine if the clean-up has been successful.

9.2.2.5 Spills of More Than 100 Litres of Diesel, Oil, Acid or any other Hazardous Substance

- Report spill immediately to the SHEQ Department; and
- Follow procedures as above, depending on spill location

9.2.2.6 Spills of Tailings

- Report to the Plant Manager so that the necessary action can be taken according to the Mandatory Code of Practice for Tailings Disposal reference number COP - T – 01;
- Contain and pick up tailings spills where possible; and
- Dispose of the tailings spills to the current tailings facility.

9.2.2.7 Spills of Sewage or Grey Water

- Report sewage spills or overflows, noted during working hours, to the SHEQ Department;
- For sewage spills noted after hours, report to the Security Department; and
- The SHEQ or Security Department should contact the Engineering Department to facilitate the drain or pipe repairs.

9.2.2.8 Spills of Sewage Underground

- Contain and pick up the sewerage spill, using a shovel and place it in one of the portable toilets that contains a disinfectant;
- Personal Protective Equipment must be worn, i.e. long rubber gloves, gumboots, face masks and safety goggles;
- Disinfect the contaminated area with a suitable environmentally friendly chemical such as lime, and wash the area well with water; and
- Report the spill to your supervisor.

9.2.2.9 Spills at the Sewage Treatment Works

Overflow of drying beds or pipe leaks:

- Contain the sewage using long handled shovels and place it back into the system; and
- Sprinkle lime over the contaminated ground to discourage flies and disinfect the area.

In the event of tank failure:

- During working hours report the incident immediately to the Engineering Manager and the SHEQ Department;
- After hours report to the Security Department; and
- The Engineering Department will ensure that retaining walls are built, excess sewage effluent is pumped back into the system and the area is cleaned up.

9.2.3 REPORTING, TRAINING AND MANAGEMENT

It is the responsibility of all employees to report all spillages through the NCR system and the incident reporting systems – this entails reporting to their supervisors, who shall then report to the Environmental Manager located in the SHEQ Department.

It is the responsibility of the relevant supervisors, in liaison with the SHEQ Department to make sure that immediate corrective actions are taken to remedy the damage caused to the environment.

It is the responsibility of the relevant supervisors with the assistance from the SHEQ Department personnel to evaluate the success of remedial and preventative action taken, and to record the results of the NCR or the Incident Reporting System, including any ISO14000 requirements.

The SHEQ Department, in conjunction with the Training Department, will generate a one page quick step-by-step reference (to be laminated and attached to all mobile machinery) for use by operators in a case of spillage.

It is the SHEQ Department's responsibility to ensure that all equipment necessary to implement the aforementioned response procedures is readily available on site.

10 ENVIRONMENTAL AWARENESS PLAN

10.1 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 EMPr 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.

10.1.1 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.

10.1.2 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.

10.1.3 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.

10.1.4 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.

10.2 ENVIRONMENTAL RISKS AND PRIORITIES

10.2.1 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.

10.2.2 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.

10.3 INCREASING ENVIRONMENTAL AWARENESS

10.3.1 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.

10.3.2 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.

10.3.2.1 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.

10.3.2.2 Evaluation

Evaluation of awareness and competency training (implementation of training in the work place) 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.

10.3.2.3 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).

10.4 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.

10.4.1 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.

11 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).

12 PUBLIC PARTICIPATION

12.1 INTRODUCTION

Public participation provides the opportunity for Interested and Affected Parties (IAPs) to participate on an informed basis, and to ensure that their needs and concerns are considered during the 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 and the authorities to obtain clear, accurate and understandable information about the expected environmental and socio-economic impacts of the proposed development;
- Establish a formal platform for the public with the opportunity to voice their concerns and to raise questions regarding the project;
- Utilise the opportunity to formulate ways for reducing or mitigating any negative impacts of the project, and for enhancing its benefits;
- Enable project proponent to consider the needs, preferences and values of IAPs in their decisions;
- Clear up any misunderstandings about technical issues, resolving disputes and reconciling conflicting interests;
- Provide a proactive indication of issues which may inhibit project progress resulting in delays, or which may result in enhanced and shared benefits; and
- Ensure transparency and accountability in decision-making.

The public participation process f is discussed below:

- Identification and registration of IAPs in accordance with the EIA regulations including:
    - Advertisements
    - Site notices
    - Prescribed IAPs (e.g. neighbours, ward councillor, relevant authorities etc.)
- Notifications to IAPs of the application for Environmental Authorisation;
- Distribution of a project Background Information Document (BID);
- Distribution of reports for IAPs' comments.
- Public meetings; and
- Authority Meetings.

For this updated EMPR the following was undertaken:

- Review of the existing of IAPs, and identification of potential new IAPs in accordance with the EIA regulations including:
    - Advertisements
    - Site notices
- Distribution of the updated EMPR IAPs' comments.
- Authority site meeting.

Refer to Appendix 15 for proof of the public participation process undertaken. No comments were received from registered IAPs. No new IAPs registered in response to the site notices and advertisements.

13 UNDERTAKING

I, _____

The undersigned, and duly authorised thereto by Assmang (Pty) Ltd - Black Rock Mine Operations, have studied and understand the contents of this document in its entirety and hereby duly undertake to adhere to the conditions as set out therein.

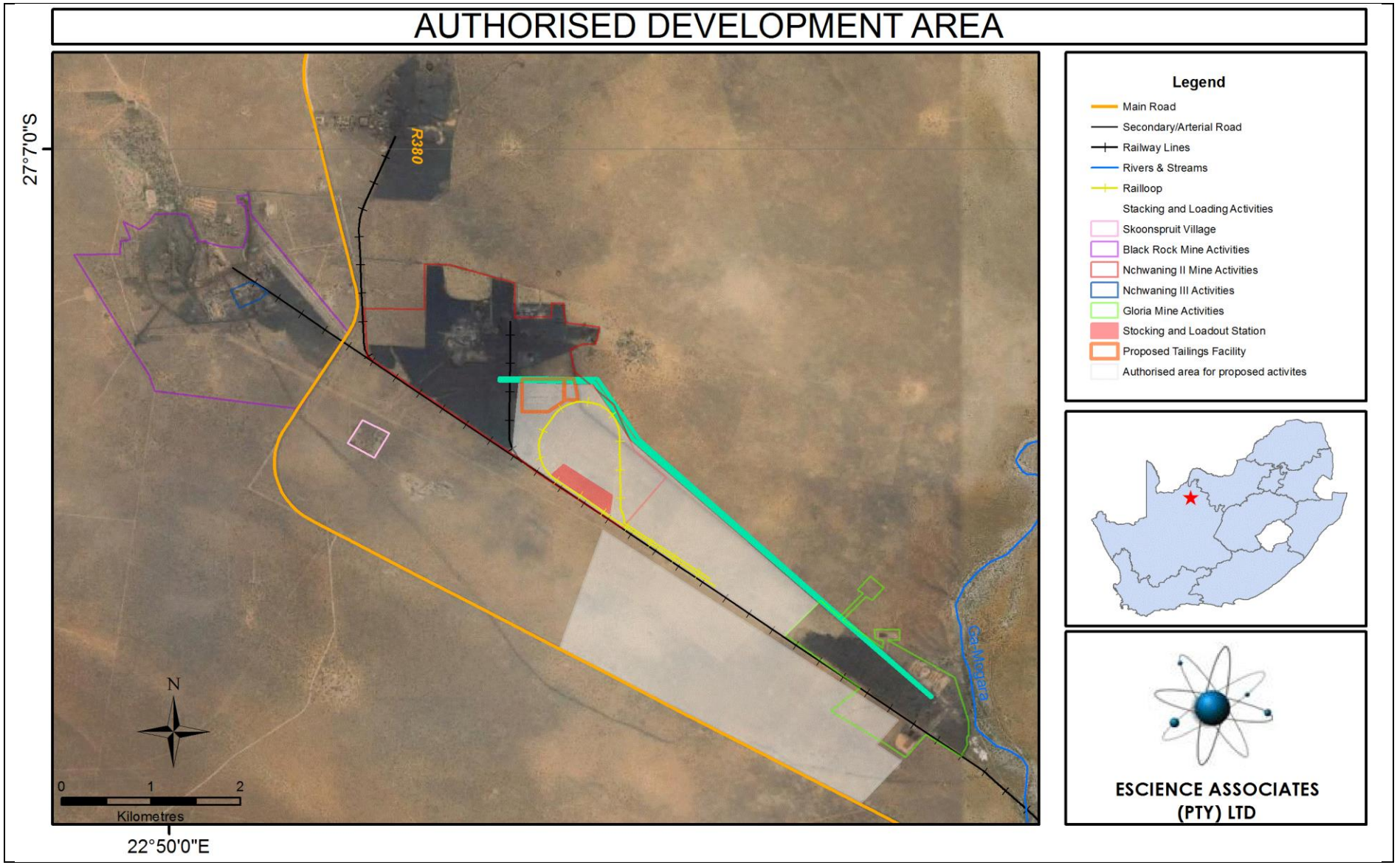
Signed at _____

This _____ day of _____, 2016

Name:

Designation:

APPENDIX 1: DEVELOPMENT LAYOUT PLAN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Railloop
Stacking and Loading Activities
Skoonspruit Village
Black Rock Mine Activities
Nchwaning II Mine Activities
Nchwaning III Activities
Gloria Mine Activities
Stocking and Loadout Station
Proposed Tailings Facility
Authorised area for proposed activites
ESCIENCE ASSOCIATES
(PTY) LTD