Assmang Limited Beeshoek EMP Alignment Environmental Management Report

Report

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Title:	Assmang Limited Beeshoek Environmental Impact Assessment and Management Programme Alignment
Client:	Assmang Limited Beeshoek Mining Operations
Consultant:	Ivuzi Environmental Consultants (Pty) Ltd
Project Name:	Beeshoek Environmental Impact Assessment and Management Programme Alignment
Project Team:	Project Manager: Tanja Bekker Environmental Scientist: Priya Ramsaroop,
Ivuzi Project Number:	
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Key Words:	BAR: Basic Assessment Report DME: Department of Minerals and Energy DTEC: Department of Tourism, Environment and Conservation DWAF: Department of Water Affairs and Forestry EIA: Environmental Impact Assessment EMP: Environmental Management Programme EMPR: Environmental Management Programme Reports MPRDA: Mineral and Petroleum Resources Development Act (Act No. 28 of 2002) NEMA: National Environmental Management Act (Act No. 107 of 1998) NWA: National Water Act (Act No. 36 of 1998) PPP: Public Participation Process SAHRA: South African Heritage Resources Agency WULA: Water Use License Application
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1. *EXECUTIVE SUMMARY*

Project Background

Assmang Limited has mining operations in the Northern Cape Province, Mpumalanga and Natal which includes Beeshoek Iron Ore Mine ("Beeshoek Mine"). Mining at the Beeshoek Mine was established in 1964 with a basic hand sorting operation. In 1975 a full washing and screening plant was installed. Because of increased production, Beeshoek South, a southern extension of the Beeshoek Mine, was commissioned during 1999 on the farms of Beeshoek and Olynfontein.

Assmang is the holders of old order rights in respect of high-grade hematite iron ore deposits at Beeshoek Mine on the farms Beeshoek and Olynfontein. Assmang plans to replace and increase its iron ore sales by undertaking a new mining development (hereafter referred to as the Khumani Mine) in order to utilize the available iron ore deposits. Beeshoek Mine will be decreasing its iron ore production but at this lower rate the life will be extended for the next 17 years when it reaches the end of its production capacity. Khumani Mine is therefore intended to phase in iron ore production, replacing Beeshoek Mine production whilst Beeshoek Mine scales down. Increased production will take advantage of additional capacity allocation to be made available by Spoornet on the Sishen iron ore export channel over the period 2010 to 2015.

The Beeshoek Mine is situated in the Tsantsabane Local Municipality, with neighbouring towns being Postmasburg 7km east of the mine and Kathu being 70km north of the mine (Figure 1.1). The Beeshoek Mine is an opencast mining operation currently mining six (6) opencast pits with an estimated iron ore reserve of 160 million tonnes.

The Beeshoek Mine operation has an approved Environmental Management Programme Report (EMPR), approved on 1 December 1993 (NC 5/2/2/150) and was amended and approved on 7 November 1997 (NC 6/2/2/15) under the Minerals Act (Act No. 50 of 1991), for the opencast mining of iron ore on the farms Beesthoek 448 remaining extent of portion 1, Beesthoek 448 remaining extent, and Olynfontein 475 remainder of the farm.

In terms of Section 7(1) of the Transitional Arrangement of the Mineral and Petroleum Resources Development Act (Act No. 28 of 2002) (MPRDA), any mine is required to convert their old order mining rights to new order mining rights within five (5) years of the promulgation of the MPRDA. As part of the conversion process, the mine wishes to align its approved EMPR with the requirements of Section 39 of the MPRDA. In addition to the alignment process of the EMPR the mine will ensure that all activities taking place on the mine are included and assessed within the updated Environmental Impact Assessment and Management Programme (EIA/EMP).

Project Description

Broadly the Beeshoek mine site can be categorised as follows:

- Northern mining area: This area comprises active as well as historical mining areas. A number of small quarries and mine residue dumps of various categories are located within this area. The area also includes the iron ore beneficiation plant area as well as a new open cast pit.
- Housing and administration: This area comprises the older housing on the mine, as well as the offices and related administration buildings. This area is separated from the north eastern mining area by means of the railway line from Postmasburg to Sishen.
- Village and recreational area: This area is separated from the housing and administrative area by tarred road (R385) linking Postmasburg with Olifantshoek. The area comprises of the mine village and the golf course as well as associated recreational facilities.
- Southern mining area: This area includes the latest mining developments comprising large opencast pits and associated waste rock dumps. This area also includes a crushing and screening area as pre-preparation of the ROM iron ore before being routed by overland conveyor to the iron ore beneficiation plant located within the north eastern mining area.

Environmental Authorisation Process

The Beeshoek Mine operation has an approved Environmental Management Programme Report (EMPR), approved on 1 December 1993 (NC 5/2/2/150) and was amended and approved on 7 November 1997 (NC 6/2/2/15) under the Minerals Act (Act No. 50 of 1991), for the opencast mining of iron ore on the farms Beesthoek 448 remaining extent of portion 1, Beesthoek 448 remaining extent, and Olynfontein 475 remainder of the farm.

It is the intention of Assmang Limited to convert the old order mining rights to new order rights in accordance with Schedule II, Transitional Arrangements of the Mineral and Petroleum Resources Development Act (Act No. 28 of 2002) (MPRDA). In order to do this Assmang Limited will align the approved EMPR for Beeshoek Mine in accordance with the MPRDA into one holistic EIA/EMP, thereby streamlining the environmental management with the MPRDA.

This EIA/EMP, compiled in terms of the MPRDA is presented in two stand-alone reports, namely the EIA and the EMP. The EIA (this report), is compiled to address potential impacts specific to the additional proposed activities on site. The EMP is a legally binding report and presents a Programme applicable to all mine related activities and phases.

In addition to this the mine will submit and application for environmental authorisation with the Department of Tourism, Environment and Conservation in terms of the National Environmental Management Act (Act No. 107 of 1998) (NEMA). The application will be undertaken in terms of Regulations 387 of the Act and will be a Scoping and EIA Procedure. The listed activity applied for will be:

Activity 5 the route determination of roads and design of associated physical infrastructure, including roads that have not yet been built for which routes have been determined before the publication of this notice and which was not been authorised by a competent authority in terms of the EIA regulations, 2006 made under section 24(5) of the Act and published in GN No. R385 of 2006, where –
(a) it is a national road as defined in Section 40 of the South African National Roads Agency Limited and National Roads Act, 1998 (Act No. 7 of 1998);
(b) It is a road administered by a provincial authority; …

As part of the authorisation process for Beeshoek mine, the integrated water use license also needs to be updated to include all new activities and water uses. Beeshoek mine was issued an integrated water use license on 22April 2005 in terms of section 40 of the National Water Act (Act 36 of 1998) (NWA) by the department of Water Affairs and Forestry (DWAF) for the following water uses in terms of section 21 of the NWA:

- Section 21(a)-abstraction from a water resources
- 21(b)- Storage of clean water
- 21(f)-discharge of water containing waste to a water resource
- 21(g)- Disposing of waste, which may detrimentally impact on water resources
- 21(j) - removal of groundwater for the safe continuity of an activity.

The new water uses that will be incorporated into the existing water use license, for the new village opencast pit and smaller detrital operations, are:

- Section 21(i)- Removal of groundwater for the safe continuity of an activity and;
- Section 21(g) - disposing of waste, which may detrimentally impact on a water resources
- Section 21(j): Removing, discharging or disposing water found underground if it is necessary for the efficient continuation of an activity or for the safety of people.

Public Participation Process (PPP)

Public Participation Process (PPP) is a requirement of the EIA and EMP process and ensures that all relevant Interested and Affected Parties (I&APs) are consulted and involved. The process ensures that all stakeholders have an opportunity to raise their comments as part of an open and transparent process, which in turn ensures for a complete comprehensive environmental study.

The purpose of PPP and the engagement process is to:

- Introduce the proposed project;
- Explain the processes to be undertaken;
- Determine and record public issues and concerns;
- Provide opportunities for public input and gathering of local knowledge;
- Inform a broad range of stakeholders about the project and the environmental process to be followed;
- Establish lines of communication between stakeholders and the project team;
- Identify all the significant issues in the project; and
- Identify possible mitigation measures or environmental management plans to minimise and/or prevent environmental impacts, associated with the project.

The I&APs were notified of the project by means of media advertisements which were placed in the Diamond Field Advertiser. On the 16th September 2008

An Authorities and Public Meeting were held on the 30 September 2008 to inform the relevant authorities and public about the project. The minutes were distributed via email to the I&APs. Stakeholders have had an opportunity to raise their comments about the project.

Specialist Investigations

All activities that are planned in addition to the approved activities are located within the exiting disturbed mining area. Previous specialist studies have been undertaken for the entire mining area and therefore no additional specialist studies have been required.

There will be the new construction of the opencast pit where the village is currently. This is already within the mining property and will only require a groundwater investigation and an update of the Water Use Licence for Beeshoek Mine.

Conclusion

The outcomes of the EIA/EMP will have identified no significant impacts associated with the proposed activities and the continuation of the Beeshoek Mining Operations. Some amendments to management commitments have been incorporated into this holistic report to ensure that the mining operations can be managed in an environmentally effective manner.

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GLOSSARY OF TERMINOLOGY

BID	Background Information Document
DME	Department of Minerals and Energy
DTEC	Department of Tourism Environment and Conservation
DWAF	Department of Water Affairs and Forestry
EIA	Environmental Impact Assessment
EMP	Environmental Management Programme
EMPR	Environmental Management Programme Report
I&APs	Interested and Affected Parties
K	Hydraulic Conductivity (m/day)
mamsl	Metres above mean sea level
mbgl	Metres below ground level
MAP	Mean Annual Precipitation
MAR	Mean Annual Runoff
MRA	Mining Rights Application
NEMA	National Environmental Management Act
NWA	National Water Act
SLP	Social and Labour Plan
TOR	Terms of Reference
WULA	Water Use Licence Application

1. INTRODUCTION AND BACKGROUND

1.1. BACKGROUND

Assmang Limited has mining operations in the Northern Cape Province, which includes Beeshoek Iron Ore Mine ("Beeshoek Mine"). Mining at the Beeshoek Mine was established in 1964 with a basic hand sorting operation. In 1975 a full washing and screening plant was installed. Because of increased production, Beeshoek South, a southern extension of the Beeshoek Mine, was commissioned during 1999 on the farms of Beeshoek and Olynfontein.

Assmang is the holders of old order rights in respect of high-grade hematite iron ore deposits at Beeshoek Mine on the farms Beeshoek and Olynfontein. Assmang plans to replace and increase its iron ore sales by undertaking a new mining development (hereafter referred to as the Khumani Mine) in order to utilize the available iron ore deposits. Beeshoek Mine will be decreasing its iron ore production but at this lower rate the life will be extended for the next 17 years when it reaches the end of its production capacity. Khumani Mine is therefore intended to phase in iron ore production, replacing Beeshoek Mine production whilst Beeshoek Mine scales down. Increased production will take advantage of additional capacity allocation to be made available by Spoornet on the Sishen iron ore export channel over the period 2010 to 2015.

The Beeshoek Mine is situated in the Tsantsabane Local Municipality, with neighbouring towns being Postmasburg 7km east of the mine and Kathu being 70km north of the mine. The Beeshoek Mine is an opencast mining operation currently mining six (6) opencast pits with an estimated iron ore reserve of 160 million tonnes.

The Beeshoek Mine operation has an approved Environmental Management Programme Report (EMPR), approved on 1 December 1993 (NC 5/2/2/150) and was amended and approved on 7 November 1997 (NC 6/2/2/15) under the Minerals Act (Act No. 50 of 1991), for the opencast mining of iron ore on the farms Beeshoek 448 remaining extent of portion 1, Beesthoek 448 remaining extent, and Olynfontein 475 remainder of the farm.

In terms of Section 22 of the Minerals and Petroleum Resources Development Act (Act No. 28 of 2002) (MPRDA) which requires Assmang Limited to submit a Mining Right Application (MRA) for the company to mine the iron ore resources held by its old order rights. As part of the MRA process, the mine wishes to align its approved EMPR with the requirements of Section 39 of the MPRDA. In addition to the alignment process of the EMPR the mine will ensure that all activities taking place on the mine are included and assessed within the updated Environmental Impact Assessment and Management Programme (EIA/EMP).

Ivuzi (Pty) Ltd has been appointed as the independent environmental consultants to undertake the necessary environmental investigations required for the EIA/EMP alignment, the NEMA application regarding the road diversion and for the IWULA. Ivuzi will endeavour to guide Beeshoek Mine through the mandatory environmental processes.

Figure 1.1: Beeshoek Mine Locality Map

1.2 PROJECT DESCRIPTION

Broadly the Beeshoek mine site can be categorised as follows:

- Northern mining area: This area comprises active as well as historical mining areas. A number of small quarries and mine residue dumps of various categories are located within this area. The area also includes the iron ore beneficiation plant area as well as a new open cast pit.
- Housing and administration: This area comprises the older housing on the mine, as well as the offices and related administration buildings. This area is separated from the north eastern mining area by means of the railway line from Postmasburg to Sishen.
- Village and recreational area: This area is separated from the housing and administrative area by tarred road (R385) linking Postmasburg with Olifantshoek. The area comprises of the mine village and the golf course as well as associated recreational facilities.
- Southern mining area: This area includes the latest mining developments comprising large opencast pits and associated waste rock dumps. This area also includes a crushing and screening area as pre-preparation of the ROM iron ore before being routed by overland conveyor to the iron ore beneficiation plant located within the north eastern mining area.

In terms of Section 22 of the Minerals and Petroleum Resources Development Act (Act No. 28 of 2002) (MPRDA) which requires Assmang Limited to submit a Mining Right Application (MRA) for the company to mine the iron ore resources held by its old order rights. In order to do this Assmang Limited will align the approved EMPR for Beeshoek Iron Ore Mine in order to incorporate the additional activities undertaken by the mine.

1.2. ENVIRONMENTAL AUTHORISATION

The Beeshoek Mine is an opencast mining operation and has an approved Environmental Management Programme Report (EMPR), approved on 1 December 1993 (NC 5/2/2/150) and was amended and approved on 7 November 1997 (NC 6/2/2/15) under the Minerals Act (Act No. 50 of 1991), and was amended in 2004, for the opencast mining of iron ore on the farms Beeshoek 448 remaining extent of portion 1, Beesthoek 448 remaining extent, and Olynfontein 475 remainder of the farm.

In terms of Section 7(1) of the Transitional Arrangement of the MPRDA, any mine is required to convert their old order mining rights to new order mining rights within five (5) years of the promulgation of the MPRDA. As part of the conversion process, the mine wishes to align its approved EMPR with the requirements of Section 39 of the MPRDA. The mine will ensure that all current activities taking place and all proposed activities on the mine are included and assessed within the updated EIA/EMP.

In addition to the re-alignment, Beeshoek Mine is planning to extend their mining operations within their existing mining area to continue with its mining operation and to ensure that their mineral rights are mined optimally. The activities associated with the proposed extension of the LoM will include the mining of the area where the current Beeshoek Village is situated by

means of opencast mining (which will be known as the Village Pit), mining of detrital ore and the extension of the existing slimes dam.

As part of the new activities a road diversion of the road R385 will also be required. The R385 road is traversing the mining area, separating the mine into a northern and southern mining area, with the proposed new activities the road will require diversion around the proposed Village Pit, from where it will again tie into the R385 – the final layout of this road is not available at this stage, but will form part of the reporting process. The road diversion is a listed activity No. 5 under Government Notice R. 387 of 21 April 2006, which was promulgated under NEMA; this process requires that a Scoping Report and EIA be conducted for the road diversion, in conjunction with the MPRDA process.

As part of the authorisations for Beeshoek Mine the integrated water use license also needs to be updated to include all new activities and water uses. Beeshoek Mine was issued an integrated water use licence on 22 April 2005 in terms of Section 40 of the National Water Act (Act 36 of 1998) (NWA) by the Department of Water Affairs and Forestry (DWAF) for the following water uses in terms of Section 21 of the NWA: Section 21(a) – Abstraction from a water resource, 21(b) – Storage of clean water, 21(f) – Discharge of water containing waste to a water resource, 21(g) – Disposing of waste, which may detrimentally impact on a water resource, 21(j) – Removal of groundwater for the safe continuity of an activity. The new water uses that will be incorporated into the existing integrated water use license, for the new Village opencast mine and smaller detrital operations, are Section 21(j) – Removal of groundwater for the safe continuity of an activity and Section 21(g) – Disposing of waste, which may detrimentally impact on a water resource.

Other legislation applicable to the environmental investigations will include: Constitution of South Africa, 1996 (Act 108 of 1996), Atmospheric Pollution Prevention Act, 1965 (Act 45 of 1965), National Environmental Management: Air Quality Act, 2004 (Act 39 of 2004), Hazardous Substances Act, 1973 (Act 15 of 1973) and National Heritage Resources Act, 1999 (Act 25 of 1999).

Ivuzi (Pty) Ltd has been appointed as the independent environmental consultants to undertake the necessary environmental investigations required for the EIA/EMP re-alignment, the NEMA application regarding the road diversion and for the IWULA. Ivuzi will also be responsible for the public participation process related to the proposed project.

1.3. NAME, ADDRESS, TELEPHONE AND FAX NUMBERS OF MINE, MINE OWNER, MINE MANAGER AND RESPONSIBLE PERSON FOR ENVIRONMENTAL MATTERS

1.2.1 Name and Address of Mine

Name of Mine	Assmang Limited
Physical Address	Beeshoek Iron Ore Mine Mancorp Mine Postmasburg 8423
Postal Address	PO Box Mancorp Mine Mancorp Mine Postmasburg 8423
Telephone	053 311 6666
Fax	053 311 4642
Contact Persons	Mr. Mark Oorsthuisen (Senior General Manager)

1.2.2 Mine Owner

Mine Owner	Assmang Limited
Physical Address	Beeshoek Iron Ore Mine Mancorp Mine Postmasburg 8423
Postal Address	PO Box Mancorp Mine Mancorp Mine Postmasburg 8423
Telephone	053 311 6666
Fax	053 311 4642
Contact Person	Mr. Mark Oorsthuisen (Senior General Manager)

1.2.3 Responsible Person

Name of Mine	Beeshoek Iron Ore Mine
Physical Address	Mancorp Mine

	Postmasburg 8423
Telephone	053 311 6666
Fax	053 311 4642
Contact Persons	Mr. Mark Oorsthuisen (Senior General Manager) Mr. Alex Mostert (Technical Service Manager)

1.2.4 Environmental Consultant

Name of Company:	Ivuzi (Pty) Ltd
Contact Person:	Priya Ramsaroop
Physical Address:	63 Wessels Road Rivonia 2128
Postal Address:	P.O. Box 2597 Rivonia 2128
Tel No:	011 803 5726
Fax No:	011 803 5745

1.3 TITLE DEED DESCRIPTION

Assmang Limited holds the rights to the following portions of land;

Name of Mine	Farm Name	Registration Division	Portion Number	Title Deed
Beeshoek	Beesthoek 448		RE of Portion 1	No. T1659/1965
	Beesthoek 448		RE	No. T245/1954
	Olynfontein 475		RE	No. T4859/1998

The project as a whole will be conducted over the farm portions as listed in Table 1.1 below.

Table 1.1: Surface Right Owners and Title Deed descriptions

Farm	Portion	Surface Right Owner	Title Deed Number
Beesthoek 448	RE of Portion 1	Assmang Limited	No. T1659/1965
Beesthoek 448	RE	Assmang Limited	No. T245/1954
Olynfontein 475	RE	Assmang Limited	No. T2925/1997, No. T4859/1998

1.4 REGIONAL SETTING

1.4.1 Magisterial District and Relevant Regional Service Council Authority

Beeshoek Mine falls within one Local and District Municipality. Both the farms Beeshoek and Olynfontein (Figure 1-2) are situated within the Tsantsabane Local Municipality (NC085) which forms part of the Siyanda District Municipality.

The governance aspects related to Beeshoek Iron Ore Mine are as follows:

- Administrative District: Hay
- Magisterial District: Posmansburg
- Local government: Tsantsebane

1.4.2 Neighbouring Towns

The Beeshoek Mine is located 7km west of Postmansburg and about 70km south of Kathu.

1.3.1. Surface Infrastructure

1.3.1.1. Existing Surface Infrastructure

Broadly the Beeshoek mine site can be categorised as follows:

- Northern mining area: This area comprises active as well as historical mining areas. A number of small quarries and mine residue dumps of various categories are located within this area. The area also includes the iron ore beneficiation plant area as well as a new open cast pit.
- Housing and administration: This area comprises the older housing on the mine, as well as the offices and related administration buildings. This area is separated from the north eastern mining area by means of the railway line from Postmasburg to Sishen.
- Village and recreational area: This area is separated from the housing and administrative area by tarred road (R385) linking Postmasburg with Olifantshoek. The area comprises of the mine village and the golf course as well as associated recreational facilities.
- Southern mining area: This area comprises large opencast pits and associated waste rock dumps. This area also includes a crushing and screening area as pre-preparation of the ROM iron ore before being routed by overland conveyor to the iron ore beneficiation plant located within the north eastern mining area.

The tar road from Postmasburg to Olifantshoek (R385) crosses the mine site. Eskom powerlines enter the site from the north. The railway line from Sishen to Postmasburg also traverses the mine site.

1.4.2.1 New Surface Infrastructure

Beeshoek Mine is planning to extend their mining operations within their existing mining area to continue with its mining operation and to ensure that their mineral reserves are mined optimally. Proposed activities associated with the extension of the Life of Mine include:

- The mining of the area where the current Beeshoek Village is situated by means of opencast mining (which will be known as the Village Pit);
- Mining of detrital ore that are available in small pockets that are easy to mine; and T
- The extension of the existing slimes dam on the north mine to be able to operate sufficiently with the extension activities.
- Road (R385) Deviation which will be addressed in a separate application (NEMA)

Beeshoek Mine also proposes a road diversion of road R385 that currently traverses the mining area in two parts. The road will be deviated around the area where the Village Pit is proposed and will tie in to the west of the mine with another road to lead back to the existing R385. The diversion of the road will be in conjunction with Sishen South Mine, they will also be using the new proposed road. Beeshoek Mine will be accountable for the road portion around the Village Pit area. This activity will be undertaken through the NEMA legislation.

1.4.3 Servitude

The following servitudes are related to the mine site:

- Servitude No K114/785 – subject to convey Electricity in favour of ESCOM.

- Servitude No K115/785 – subject to convey electricity in favour of ESCOM.
- Expropriation notice no C28/62 SAR
- Expropriation notice no C228/65 SAR

1.4.4 Land Tenure and use of Immediately Adjacent Land

The properties adjacent to Beeshoek Iron Ore Mine have a very low grazing capacity (3ha per sheep and goat unit).

1.4.5 River Catchment Area

The Beeshoek Iron Ore Mine is located within an unnamed catchment adjacent to the Groenwaterspruit catchment (D73A) forming part of the Lower Orange River catchment. Despite the mine being about 100 km from the Orange River, the area is endoreic (surface drainage within the area does not drain into the sea).

1.5 DESCRIPTION OF THE PROJECT

1.5.1 Mineral Deposit

Iron Ore is mined from the conglomeration type forming part of the Gamagara formation.

The conglomeratic ore of the Bruce-King-Mokaning and Beeshoek-Olynfontein deposits are preserved in a fault-bounded, graben-like structure and deep basin-like structures, found in the area with palaeo-ridges of Wolhaarkop Breccia at varying elevations. These basins are filled with conglomerate and shale of the lower part of the Gamagara Formation and overlie an undulating floor of chert-banded Manganore Iron Formation. The Sishen Shale Member forms a laterally continuous blanket deposit that pinches out against palaeo highs. The basin and dome structures of the ore deposits predate the deposition of the Gamagara Formation. However, post-Gamagara deformation also took place and in some areas karstic slumping related to the pre-Kalahari or present day erosion, affected the ore deposit.

In recent geological times the remaining outcrops of above ore types were exposed to weathering. These outcrops weathered down as slabs and boulders, which were scattered down mountain slopes and into ancient drainage systems. Wind and water eroded impurities from the rock leaving competent high-grade ore behind. In some areas this ore was covered by sand and sediments of the younger Kalahari Formation and vegetation. This is termed as detrital ore.

1.5.2 Mine Product

Beeshoek Mine will mine iron ore. Iron ore in the Sishen/Postmasburg area is preserved within a sequence of the Proterozoic sediment of the Transvaal Supergroup and Olifantshoek Group. Iron ore mined at Beeshoek Mine consists of the minerals hematite and specularite.

1.5.3 Estimated Reserves

Beeshoek Mine will scale down to 1.7 million tonnes per annum until 2038 supplying the local market. In order to maintain production over this period of time existing reserves are exploited and a new pit (Village Pit) is established. The overall footprint area to be disturbed by the proposed opencast pit development is estimated to be 119.6 ha.

Additional iron ore is available in the contaminated dumps on the mine site and these will be reworked to meet the mine's remaining planned life of mine.

1.5.4 Mining Method

The iron ore deposits on Beeshoek and Olynfontein are relatively shallow, making economic opencast mining viable.

The iron ore are exploited by means of conventional opencast mining techniques (drilling-blasting-load-haul). The drill-blast activities will be contracted out, whereas load-haul will be done by a combination of owner and contractors fleets.

The vegetated soil overlying the planned mining area is stripped from prior to mining and stockpiled on a dedicated dump to be used for rehabilitation purposes at a later stage. Then bench blocks of 10m height are drilled using drill rigs, which drill 165mm diameter blast holes. Drill patterns can be a staggered or square pattern, with burden & spacing varying from 4m x 5m in waste to 3m x 3m in difficult ore. Blast holes are charged with emulsion explosives and different down-hole charge configurations are used depending on the different rock types to be blasted. This together with the necessary blasting accessories will achieve optimal fragmentation.

The blasted rock is loaded with front-end loaders and excavators into rigid haul trucks and ADT's. Ore is hauled to the primary crusher and ore stockpiles. Based on the Fe-grade and destined metallurgical processes numerous ore stockpiles exist on Beeshoek.

As an integral part of the mining processes, backfilling of numerous existing pits will be employed in order to minimize both the final voids left at the end of mining as well as the size of waste dumps. Waste with a potential future use will be stockpiled separately in order to be accessible and ready to be processed by the future user.

Another mining method utilized on the Beeshoek Mine is the mining of detrital ore, where the deposits of ore are shallow enough to be scooped out of the ground for processing as opposed to employing more extensive opencast mining methods. There are a few of these detrital zones on the mine area which still need to be exploited.

1.5.5 Production Rate

The production rate of the mine is about 6.0 million tonnes per annum. Beeshoek Mine will scale down to 1.7 million tonnes per annum until 2038 supplying the local market.

1.5.6 Planned Life of Mine

The remaining life of mine for Beeshoek mine is 30 years.

2. *METHODOLOGY*

2.1. EIA/EMP PROCESS

2.1.1. Legislation

The environmental component of the project will comply with the requirements of inter alia, the following legislation (and 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);
- The National Environmental Management Act (Act No. 107 of 1998);
- The National Water Act (Act No. 36 of 1998);
- The Environment Conservation Act (Act 73 of 1989);
- The Conservation of Agricultural Resources Act (Act No.45 of 1965);
- 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).

2.1.2. Environmental Reporting Procedure

In terms of Section 22 of the Minerals and Petroleum Resources Development Act (Act No. 28 of 2002) (MPRDA) which requires Assmang Limited to submit a Mining Right Application (MRA) for the company to mine the iron ore resources held by its old order rights. As part of the MRA process, the mine wishes to align its approved EMPR with the requirements of Section 39 of the MPRDA. In addition to the alignment process of the EMPR the mine will ensure that all activities taking place on the mine are included and assessed within the updated Environmental Impact Assessment and Management Programme (EIA/EMP).

This EIA/EMP, compiled in terms of the MPRDA is presented in two stand-alone reports, namely the EIA and the EMP. The objectives of this EIA Report are to:

- Provide a description of the environment in which the project will be situated;
- Assess and do a comparative assessment on all potential alternatives that exist for the proposed project and determine which are the most feasible on an environmental, social and economical level (if relevant);
- Provide feedback on the stakeholder consultation undertaken for the proposed project;
- Identification of the impacts, which could occur as a result of the proposed project based on the nature, extent, duration, probability and significance of the impacts;
- Description of the arrangements for monitoring and management of environmental impacts;
- Identify knowledge gaps and report on the adequacy of predictive methods, underlying assumptions and uncertainties encountered in compiling the required information; and
- Assessing and utilising the comments received from all stakeholders, as well as the investigations undertaken by the environmental consultants and specialists, to identify all the impacts, which could occur as a result of the proposed project, accomplish the above.
- Description of the arrangements for monitoring and management of environmental impacts;
- Identify knowledge gaps and report on the adequacy of predictive methods, underlying assumptions and uncertainties encountered in compiling the required information.

This EIA/EMP, compiled in terms of the MPRDA is presented in two stand-alone reports, namely the EIA and the EMP. The EIA (this report), is compiled to address potential impacts specific to the additional proposed activities on site. The EMP is a legally binding report and presents a Programme applicable to all mine related activities and phases.

In addition to this the mine will submit an application for environmental authorisation with the Department of Tourism, Environment and Conservation in terms of the National Environmental Management Act (Act No. 107 of 1998) (NEMA). The application will be undertaken in terms of Regulations 386 of the Act and will be a Basic Assessment Report (BAR). The NEMA application will be undertaken for the following activity:

Activity 5 the route determination of roads and design of associated physical infrastructure, including roads that have not yet been built for which routes have been determined before the publication of this notice and which was not been authorised by a competent authority in terms of the EIA regulations, 2006 made under section 24(5) of the Act and published in GN No. R385 of 2006, where –

(a) it is a national road as defined in Section 40 of the South African National Roads Agency Limited and National Roads Act, 1998 (Act No. 7 of 1998);
(b) It is a road administered by a provincial authority; …

As part of the authorisations for Beeshoek Mine the integrated water use license also needs to be updated to include all new activities and water uses. Beeshoek Mine was issued an integrated water use licence on 22 April 2005 in terms of Section 40 of the National Water Act (Act 36 of 1998) (NWA) by the Department of Water Affairs and Forestry (DWAF) for the following water uses in terms of Section 21 of the NWA:

- Section 21(a) – Abstraction from a water resource,
- 21(b) – Storage of clean water,
- 21(f) – Discharge of water containing waste to a water resource,
- 21(g) – Disposing of waste, which may detrimentally impact on a water resource,
- 21(j) – Removal of groundwater for the safe continuity of an activity.

The new water uses that will be incorporated into the existing integrated water use license, for the new Village opencast mine and smaller detrital operations, are:

- Section 21(j) – Removal of groundwater for the safe continuity of an activity and
- Section 21(g) – Disposing of waste, which may detrimentally impact on a water resource?

2.1.3. Baseline Description/ Specialist Investigations

All activities that are planned in addition to the approved activities are located within the exiting disturbed mining area. Previous specialist studies have been undertaken for the entire mining area and therefore no additional specialist studies have been required.

There will be the new construction of the opencast pit where the village is currently. This is already within the mining property and will only require a groundwater investigation and an update of the Water Use Licence for Beeshoek Mine.

2.2. REPORT STRUCTURE

The report structure for the compilation of the EIA is detailed below and will guide the reader to the relevant sections.

Chapter 1 – Background and Introduction
Chapter 2 – Methodology
Chapter 3 – Environmental Objectives and Goals
Chapter 4 – Procedure for Environmental Related Emergencies and Remediation
Chapter 5 – Environmental Awareness Plan
Chapter 6 – Environmental Management Programme
Chapter 7 – Planned Environmental Monitoring and Performance Assessment
Chapter 8 – Financial Provision
Chapter 9 – Undertaking By Client
Chapter 10 – Conclusion
Chapter 11 – References
Appendices

3. *ENVIRONMENTAL OBJECTIVES AND GOALS*

The environmental consequences/impacts associated with the Beeshoek Mine Operations on the surrounding area is addressed within the EIA report and the associated management measures are provided within this report according to the prerequisites of the MPRDA and all relevant legislation as listed previously. 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. The environmental objectives need to be attained and/or maintained to ensure satisfactory environmental (social, economical, biophysical) management of the mining area and the potential cumulative impacts on the surrounding environment.

The overall objectives of closure will be to rehabilitate the disturbed areas to arable and grazing land, to ensure that the site is made safe and to control erosion and pollution emanating from the former mine area. More specifically, the following objectives in general to this project are defined:

Table 3.1: Environmental Objectives for the overall Beeshoek Mining Operations

Topography	• To mitigate topographic impacts created during the operational phase – to restore the topography to as close to its original harm if possible • To ensure the most effective water management of the mining site. • To prevent surface subsidence by using appropriate mitigation measures and to rehabilitate areas where subsidence may occur
Geology	• To limit the impact on the mining area • To limit the size of the area disturbed by mining • To ensure proper stockpiling of the overburden for use during rehabilitation.
Soils	• To mitigate long-term soil contamination impacts • To maintain the viability of the soils for future rehabilitation purposes • To ameliorate altered physical and chemical properties of soils caused by stripping, handling and stockpiling • To install and maintain long-term erosion control structures • To ensure proper and effective dust monitoring measures are put in place • To prevent the possible contamination of soils along the roads, and around the mining operational area • To install and maintain long-term erosion control structures, using natural vegetation and stand-alone methods
Land capability	• To restore the affected surfaces to arable land capability • To create indigenous vegetation that will stabilise the soils in the short term, and recreate 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 within time • To reduce the area that is to be disturbed, and contain the impacts on the natural habitat caused by the mechanised equipment
Vegetation	• To reduce the impact on the natural biodiversity in the area • To control weed/alien plant invasion • To establish a cover of vegetation that will control erosion until such time as the production of maize can continue • To create indigenous grassland that will stabilise the soils in the short term, and recreate the natural grassland and/or agricultural lands in the long term • To limit the mining activities to the designated areas • To reintroduce pioneer grass species for the effective rehabilitation that will ensure natural succession will occur
Animal life	• To reduce the impact on the natural biodiversity in the area • To ensure the prevention of animal hunting and poaching throughout the life of mine • To ensure proper rehabilitation and natural succession occurs so that the natural habitats can be restored • To make the area safe for animal rehabilitation
Surface water & Groundwater	• To continue the groundwater quality and groundwater level monitoring for a period of two years after mining ceases in order to establish post-closure groundwater level and quality trends. If required, the monitoring information will be used to update, verify and recalibrate the predictive tools used during the study. • To present the results of the monitoring programme to Government on an annual basis. The post-closure monitoring programme will be re-evaluated on an annual basis in consultation with Government.
Noise	• To reduce the impact of mining noise on the overall environment, and within the proposed mining area in particular
Visual	• To limit the visual impact of the mining activities to the road-users and local residence of the area
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 disposed off within the rehabilitation plan as stated.
Waste	• To collect and dispose of all waste at a permitted disposal site

4. PROCEDURE 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 and 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.

4.1. WHAT IS 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 radio's, pagers 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 a field, 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, port and airport authorities; and
- Public information authorities and media organisations.

4.2. EMERGENCY PROCEDURES

Accident Handling Procedure 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:

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 Subordinate Manager.

4. If the mine manager is unobtainable then report the incident to the next lowest level of official (engineer, mine overseer, etc).

5. 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.
6. 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.

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.

4.3. EMERGENCIES, PROCEDURES AND REMEDIAL ACTION

The following define the most likely potential environmental emergencies:

4.3.1. Accidents

In the case of a medical accident or problem, the mine should have at least a first aid kit available and a First Aid officer should be on duty at all times. It is preferential that the mine has a First Aid room or a small clinic. In the event of an emergency a checklist of emergency response units must be consulted and the relevant units notified. In this case, many of the emergency services will be sourced from the nearest main town.

4.3.2. Fires

Veld fires and fires resulting from other sources must be handled with extreme caution. Fire extinguishers should be placed 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.
- If possible all surrounding drains, such as storm water drains need to be covered and or protected to prevent any contaminated water from entering the drains.
- 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.

4.3.3. Major Hydrocarbon Spill

Hydrocarbons such as diesel, petrol, and oil which is used as fuel for mine machinery will not be kept on site., but there is the possibility that spillage may occur onsite. As this is a coal mine there is also the possibility of a coal spillage occurring. In the event of a spillage, procedures must be put into place to ensure that there are minimal impacts to the surrounding environment.

Diesel, engine oil and hydraulic oil are the most likely hydrocarbons identified during impact assessments that can result in an emergency situation.

The following procedure applies to a major hydrocarbon spill:

- In the event of a small spillage, the soil should be treated in situ, using Hasmat clean up kits.
- Every precaution should be taken to prevent the spill from entering the surface water environment.
- In the event of a large spillage, adequate emergency equipment for spill containment or collection, such as additional supplies of booms and absorbent materials, will be available and if required, a specialised clean up crew will be called in to decontaminate the area. The soil should be removed and treated at a special soil rehabilitation facility.

- Reasonable measures must be taken to stop the spread of hydrocarbons and secure the area to limit access.
- Dispatch necessary services.
- The incident must be reported to the Environmental coordinator immediately.
- The Environmental Coordinator will assess the situation from the information provided, and set up an investigation team or relevant personnel. Included in this team could be the Mine Manager, Chief Safety Officer, the employee who reported the incident and any individual responsible for the incident.
- When investigating the incident, priority must be given to safety.
- Once the situation has been assessed, the Environmental Coordinator must report back to the Mine Manager.
- The Mine Manager and the investigation team must make a decision on what measures can be taken to limit the damage caused by the incident, and if possible any remediation measures that can be taken.
- The Environmental Officer or person in charge should have a list of company contact details that will facilitate with the clean up operations.

4.3.4. Major Water Leak or Spill

Dam wall failures and burst high-volume dirty water pipelines have been identified as potential emergency situations. The following steps should be followed:

- Turn off all water supplies to the dam/pipeline.
- Dispatch necessary emergency services.
- Take all reasonable measures to stop the spread of contaminated water.
- The incident must be reported to the Environmental Coordinator immediately.
- The Environmental Coordinator will assess the situation from the information provided, and set up an investigation team or relevant personnel. Included in this team could be the Mine Manager, Chief Safety Officer, the employee who reported the incident and any individual responsible for the incident.
- When investigating the incident, priority must be given to safety.
- Once the situation has been assessed, the Environmental Officer must report back to the Mine Manager.
- The Mine Manager and the investigating team must take a decision on what measures can be taken to limit the damage caused by the incident, and if possible any remediation measures that can be taken.

4.3.5. Explosions

Explosions can occur underground in the plant and workshop areas when working with gas cylinders and chemicals. These could result in large numbers of employees being injured and requiring medical assistance.

Procedure:

- A Proto Team (as stipulated in the Emergency Response Plan) should be ready and deployed for assisting with the evacuation of employees working underground;
- Alternative evacuation routes should be devised, should a rock fall occur as a result of the explosion;
- Alternative air supply routes should be identified and implemented; and
- All relevant emergency response units must be notified and hospitals informed of incoming patients.

4.3.6. Subsidence

Subsidence underground can result in injuries to human life and damage to property.

Procedure:

- Alternative evacuation and access routes should be identified and used, should the way in or out be blocked;
- A Proto Team (as stipulated in the Emergency Response Plan) should be ready and deployed for assisting with the location and extraction of employees trapped underground;
- There should be alternative air supply routes should the air supply become damaged in the rock fall; and
- All relevant emergency response units must be notified and hospitals informed of incoming patients.

5. *ENVIRONMENTAL AWARENESS PLAN*

Assmang will implement an Environmental Awareness Plan (EAP) at the Beeshoek Mine. The material/source of information for the EAP will be the approved Environmental Management Programme Report(s), as well as other relevant specialist reports. The environmental awareness plan is detailed in the table below.

Table 5.1: **Environmental Awareness Plan**

Aspects	Objectives	Description	Time Period	Responsible Party/Person
1. Environmental policy	Demonstrate management commitment to responsible environmental management	Top management has a role to play in building awareness and motivating employees by explaining the company's environmental values and communicating its commitment to environmental policy. All workers of the company should understand and be encouraged to accept the importance of implementing the environmental management program. Motivation to continually improve can be enhanced when employees are recognized for achieving environmental objectives and targets and encouraged to make suggestions that can lead to improved environmental performance.	In place	Environmental Manager
2.HSEC Management System		Identify, assess and manage risks to employees, non-employees, the environment and the communities within which the activity is carried out. Set HSEC targets, allocate appropriate resources to achieve those targets, and undertake periodic reporting of HSEC performance.	Ongoing	Environmental Manager
3.Communication	Describe the manner in which Beeshoek will inform employees of any environmental risks which may result from their work and; The manner in which the risks must be dealt with in order to avoid pollution or the degradation of the environment	How do the employees receive the information? • At safety training sessions; • Induction programmes; • Regular publications and information leaflets; • Bulletin boards (posters), • Electronic mail messages, • Forum meetings, which involves the local I&AP's and the DME. • Communicate and consult with employees and contractors in developing HSEC systems and improvements.	Ongoing	Management & Environmental Manager

Aspects	Objectives	Description	Time Period	Responsible Party/Person
4. Information		Information from internal (EMP, etc) and external sources would be put in a language understandable to workers. Environmental information will be communicated via the methods spelled out above.	Ongoing	Environmental Manager
5. Training		All employees should receive basic environmental awareness training, either as induction training or later at special training sessions. Different levels of responsibility in relation to individual's potential impact on the environment must be addressed in the training session. Further motivation of the workforce will be achieved through in-house training and attending short courses with regard to environmental management, etc. Appropriate training relevant to the achievement of the environmental policy, implementation of the environmental management program will be provided to all personnel. Employees shall have an appropriate knowledge base. Beeshoek will also ensure that the contractors working on site provide evidence that they have the requisite knowledge and skills to perform the work in an "environmentally responsible manner". Education and training is needed to ensure that the employees' knowledge of regulatory requirements, internal standards and policies and objectives is current.	Ongoing	Environmental Manager
6. Reporting		Every environmental incident that might happen and which the workers become aware off should be reported to the manager. The worker can only report on incidents if he is made aware off the possible environmental risks through the communications methods indicated in section 1. A written reporting format should be put in place. Communication includes establishing processes to report internally and, where desired, externally, on environmental activities in order to:	Ongoing	All

Aspects	Objectives	Description	Time Period	Responsible Party/Person
		Demonstrate management commitment to responsible environmental management; Deal with concerns and questions about environmental issues (handled within the Forum); Raise awareness of the organization's environmental policies, environmental management program; and Inform internal or external interested parties about the mine's management system; A formal complaints/concerns reporting system to address I&AP will be put in place (complaints register); Beeshoek will regularly communicate with the affected community. This communication must address new developments, problems, achievements and all other relevant aspects of mutual interest.		

6. *ENVIRONMENTAL MANAGEMENT PLAN*

In terms of The Constitution of the Republic of South Africa (Act No. 108 of 1996) everyone has the right to an environment that is not harmful to their health or well-being and to have the environment protected, for benefit of present and future generations, though reasonable legislation and other measures that prevent pollution and ecological degradation, promote conservation and secure ecologically sustainable development and use of natural resources while prompting justifiable economic and social development. The needs of the environment, as well as I&APs should thus be integrated into overall project management. This EMP provides a tool for meeting this objective by providing detailed mitigation and management commitments by Beeshoek.

The following tables provide the management measures recommended to manage the potential impacts rated in the EIA. In addition to the management measures provided the table indicates the person responsible to ensure that these commitments are adhered to and implemented and the priority of these commitments (either prior a phase, during a phase and/or ongoing).

The responsible persons have assessed these commitments in detail and have committed to the specific management measures where indicated in the table.

The following section provides the reader with a view on how the potential impacts will be rated in terms of their significant and what the contents of the EIA/EMP will entail.

6.1. ENVIRONMENTAL IMPACT SIGNIFICANT RATING METHODOLOGY

To ensure uniformity, the assessment of potential impacts will be addressed in a standard manner so that a wide range of impacts is comparable. For this reason a clearly defined rating scale will be provided to the specialist to assess the impacts associated with their investigation. Each impact identified will be assessed in terms of probability (likelihood of occurring), extent (spatial scale), intensity (severity) and duration (temporal scale). To enable a scientific approach to the determination of the impact significance (importance), a numerical value was linked to each rating scale. The sum of the numerical values defined the significance. In each instance the significance was indicated with either +/- sign in the EIA (please refer to volume 1 of 2), which indicates a positive or negative influence on the environment respectively.

6.2. CONSTRUCTION PHASE

The Beeshoek Mine has been in operation for more than 70 years. It is estimated that the mine has a remaining operational life of about 10 years.

As part of the ongoing mining operations the mine has experienced the need to construct various additional infrastructures. These facilities have however been constructed or is in the process of being constructed in previously disturbed mining area.

The new activities that have been constructed are listed below:

- The mining of the area where the current Beeshoek Village is situated by means of opencast mining (which will be known as the Village Pit);
- Mining of detrital ore that are available in small pockets that are easy to mine;
- The extension of the existing slimes dam on the north mine to be able to operate sufficiently with the extension activities; and
- Road diversion (NEMA application).

The footprint area for the slimes dam has already been prepared in the previously disturbed mining area as it is an extension of the existing slimes dam. The opencast village pit area is earmarked for the area which is currently the Beeshoek Village. In order for the new construction of the pit to commence, the existing surface infrastructure of the village will need to be demolished and the footprint area prepared. The road (R385) passes through the village area and this would need to be deviated should the opencast pit be constructed. This deviation will be addressed in a separate application under the NEMA regulations.

The following activities are associated with the construction of the opencast village pit:

- Clearing of existing surface infrastructure;
- Topsoil stripping and stockpiling;
- Landscaping;
- Construction of the opencast pit;
- Construction vehicles/machinery on site; and
- Contractors/workers on site.

The above activities can be grouped into the following main activities during the construction phase:

- Removal of existing building infrastructure as well as the stretch of road (R385) which runs through the village. This includes the movement of vehicles on site and waste generation.
- Preparation of the footprint area which will involve the stripping and stockpiling of soil, landscaping, presence of contractors and staff on site and movement of vehicles on site.

6.2.1. Removal of existing Buildings and Infrastructure

Before the construction of the opencast pit can commence, the existing infrastructure needs to be removed. Table 6.1 addresses the management measures associated with the above activities.

Table 6.1: Management measures associated with the removal of existing infrastructure

Impacted Area	Impact	Activity description and potential impacts on the environment	Significance	Management Measures	Action Plan	Responsible Person	Timeframes
Geology	No impact envisaged	N/A	N/A	N/A	N/A	N/A	N/A
Climate	No impact envisaged	N/A	N/A	N/A	N/A	N/A	N/A
Topography	No impact envisaged	N/A	N/A	N/A	N/A	N/A	N/A
Land Use	No impact envisaged	N/A	N/A	N/A	N/A	N/A	N/A
Soil	Soil contamination	The removal of the village infrastructure will produce waste, which may lead to soil contamination.	13 Moderate (-)	A detailed waste management strategy will be established and implemented, which will clearly demarcate the containments for different waste streams. Disused surface infrastructure and rubble will be disposed of at a suitable site which will be rehabilitated once its purpose is served. The mine will adopt a cradle-to-grave approach to ensure that the waste is removed and disposed of in a prescribed and correct manner.	Ongoing erosion control measures will be applied. Where disturbed areas cannot be re-vegetated during the life of operations, appropriate measure will be taken to control wind erosion. These will include grading of surfaces to prevent rapid run-off of storm water and / or the use of energy dissipaters.	Chief Environmental Officer.	Construction
		The utilisation of hydrocarbons and other chemicals during the removal of the village and other infrastructure may lead to the contamination of soils.	12 Moderate (-)	All hydrocarbons should be stored in designated, bunded areas with a capacity of at least 110% of the volume stored. Soil that has been contaminated by spillages, seepages and leachates will be sampled and analysed. If necessary, it will be treated, ameliorated or removed for safe disposal. In the event of a major spill that could result in major soil and water contamination the DWAF should be informed immediately and a remediation strategy should be	No activities associated with hydrocarbons and or chemicals (i.e. wash bays etc.) may be undertaken outside of an effectively designed contained area.	Chief Environmental Officer.	Construction

				enforced.			
	Erosion of soil	The demolition and removal activities may lead to increased sediment movement off the site.	12 Moderate (-)	Clean and dirty water systems should be maintained until closure.		Chief Environmental Officer.	Ongoing
Ecology (Flora)	Re-establishment of vegetation.	The removal of the buildings and landscaping of the site will allow the re-establishment of natural vegetation including invasive species.	N/A	The mine will establish and implement a regular weed-control programme to eradicate existing invader plants and to prevent new invasions during ongoing mining operation and decommissioning.	The weed management programme must continue for three (3) years after closure.	Chief Environmental Officer.	Ongoing
Ecology (Fauna)	Disturbance to animal habitats.	No impact envisaged as the area is already previously disturbed.	N/A	N/A	N/A	N/A	N/A
Surface Water	Contamination of surface water.	The utilisation of hydrocarbons and other chemicals during the removal of the village and other infrastructure may leads to the contamination of surface water.	12 Moderate (-)	Vehicles / machinery will be regularly monitored and maintained. Maintenance programmes will be established and implemented. If necessary, the polluted soils will be remediated by the use of a spill kit. After remediation of the contaminated soils, the affected areas will be rehabilitated..	Surface water quality will be monitored to ensure that stipulated limits are not contravened If spills do occur and soils become contaminated, the appropriate remedial measures will be identified in consultation with an appropriately qualified specialist.	Chief Environmental Officer.	Ongoing
		The removal of the village and other infrastructure will produce waste, which may lead to surface water contamination.	15 Moderate (-)	A detailed waste management strategy will be established and implemented, which will clearly demarcate the containments for different waste streams. Waste management will form a detailed component as part of the induction process provided by the mine. The mine will adopt a cradle-to-grave approach to ensure that the waste is removed and disposed of in a prescribed and correct manner.	An appropriate waste management plan will be implemented.	Chief Environmental Officer.	Decommissioning and Closure.
Groundwater	Contamination of groundwater	The utilisation of hydrocarbons and other	12	In the event of a major spill that could result in major soil and water	Should a spill take place the area should be cleaned	Chief Environmental Officer.	Ongoing

	resources.	chemicals during the removal of the plant may lead to the contamination of groundwater through filtration.	Moderate (-)	contamination the DWAF should be informed immediately and a remediation strategy should be enforced. No activities associated with hydrocarbons and or chemicals (i.e. wash bays etc.) may be undertaken outside of an effectively designed contained area.	immediately and the contaminated area will be rehabilitated as appropriate.		
Air Quality	No impact envisaged	N/A	N/A	N/A	N/A	N/A	N/A
Visual	Visual impacts on the surrounding area.	The removal of the village and other infrastructure will improve the visual quality of the site by removing the visual incongruity.	N/A	No impact is envisaged as this area is earmarked for the opencast pit which will have a visual impact.	N/A	N/A	N/A
Archaeology	No impact envisaged	N/A	N/A	N/A	N/A	N/A	N/A
Noise	Increase in noise levels.	Noise of operational vehicles removing rubble and waste material.	12 Moderate (-)	Machinery and vehicles will be well maintained to prevent excessive noise and to comply with national and provincial regulations. All employees working within the area will be issued with protective gear. All vehicles will have mufflers to minimise noise emissions. mented to address these.	Where noise becomes a nuisance noise management measures will be investigated and implemented to address these A noise monitoring network which conducts monthly noise measurements will be established.	Chief Environmental Officer.	Decommissioning and Closure.
Socio- Economic	Impact of new opencast pit area on local community of mine Workers.	Mine workers previously living in the Beeshoek Village were relocated to the town of Postmasburg.	N/A	The relocation of mine workers was done prior to the commencement of this report so no further impact is envisaged.	N/A	N/A	N/A

6.2.2. Preparation of footprint area

Once the buildings and infrastructure has been removed, the footprint area can be prepared which includes the .stripping and stockpiling of topsoil, landscaping, and presence of contractors and staff on site and movement of vehicles on site.

Table 6.2 addresses the management measures associated with the above activities.

Table 6.2: Management measures associated with the preparation of the footprint area

Impacted Area	Impact	Activity description and potential impacts on the environment	Significance	Management Measures	Action Plan	Responsible Person	Timeframes
Geology	No impact envisaged	N/A	N/A	N/A	N/A	N/A	N/A
Climate	No impact envisaged	N/A	N/A	N/A	N/A	N/A	N/A
Topography	Degradation of the landscape	Excavations in the landscape due to the stripping of soils.	15 Moderate (-)	In-fill the pits with excess mine residue Shaping of the in-filled pits to be free draining, resembling the natural surface topography.		Chief Environmental Officer.	Construction
Land Use	No additional impacts are envisaged.	The opencast pit area is within the mine site so no additional impact is envisaged.	N/A	N/A	N/A	N/A	N/A
Soil	Soil contamination	Hydrocarbon spills of vehicles and mining machinery utilised in the opencast pits.	13 Moderate (-)	Vehicles / machinery will be regularly monitored and maintained. Maintenance programmes will be established and implemented. If necessary, the polluted soils will be remediated by the use of a spill kit. After remediation of the contaminated soils, the affected areas will be rehabilitated.	If spills do occur and soils become contaminated, the appropriate remedial measures will be identified in consultation with an appropriately qualified specialist.	Chief Environmental Officer.	Construction

	Erosion of soil	Erosion of the area surrounding the opencast pit footprint could possibly course an increase in siltation.	12 Moderate (-)	Collect and stockpile usable soils over newly developed opencast pit area. If de-watering is undertaken, the resultant soil/silt could be stockpiled for use in backfilling during concurrent rehabilitation or final rehabilitation.	Identify disturbed areas that can be rehabilitated as part of the mine's operational activity and vegetate these areas after rehabilitation.	Chief Environmental Officer.	Construction
Ecology (Flora)	Loss of vegetation due to the establishment of invasive species.	Although no direct impact on vegetation is expected due to the fact that the vegetation has been removed with the demolition activities, the human activities could increase the presence and spread of invasive species.	N/A	N/A	N/A	N/A	N/A
Ecology (Fauna)	No impact envisaged	N/A	N/A	N/A	N/A	N/A	N/A
Surface Water	Contamination of surface water.	The drainage courses as part of the overall catchment may be contaminated should any spillages or leaking occur from the vehicles travelling on the construction site.	12 Moderate (-)	Vehicles / machinery will be regularly monitored and maintained. Maintenance programmes will be established and implemented. If necessary, the polluted soils will be remediated by the use of a spill kit. After remediation of the contaminated soils, the affected areas will be rehabilitated.	If spills do occur and soils become contaminated, the appropriate remedial measures will be identified in consultation with an appropriately qualified specialist. Surface water quality will be monitored to ensure that stipulated limits are not contravened	Chief Environmental Officer.	Ongoing
		Reduction in normal surface water runoff due to the artificial catchment created by the opencast pit.	15 Moderate (-)	Excess water will be pumped out of the pit and stored as dirty water in the slimes dam.		Chief Environmental Officer.	Construction and Operational
Groundwater	No impact envisaged	N/A	N/A	N/A	N/A	N/A	N/A
Air Quality	Dispersion of dust.	Dust will be generated in the area due to the operation of vehicles, blasting and drilling activities.	11 Moderate (-)	Install air quality monitoring stations that determine fall-out and respiral dust (PM10) concentrations that could arise from the mine activities. All denuded areas will be	Dust monitoring will be on-going throughout this phase.	Chief Environmental Officer.	Construction and Operational

				revegetated; and Dust suppression measures such as utilising a water bowser to wet haul roads and areas with fine powdered sand and soils can be utilised.			
Visual	Visual impacts of the opencast pit on the surrounding environment.	The opencast pit and mining of detrital ore will have a visual impact on the surrounding area.	19 Moderate to High (-)	Continuous pit in-filling and associated rehabilitation. Vegetate rehabilitated disturbed areas as far as possible.		Chief Environmental Officer.	Decommissioning and Closure.
Archaeology	No impact envisaged	The area is not marked as an area of historical significance.	N/A	N/A	Should anything that could be related to a historic artefact or civilisation be found during the excavation of the pits, operations will cease in that area and the relevant authorities must be notified.	Mine Manager and SAHRA representative	Ongoing
Noise	Increase in noise levels.	Noise of blasting activities as well as operational vehicles traversing the opencast area will have an impact.	12 Moderate (-)	Machinery and vehicles will be well maintained to prevent excessive noise and to comply with national and provincial regulations. All employees working within the area will be issued with protective gear. All vehicles will have mufflers to minimise noise emissions.	Where noise becomes a nuisance noise management measures will be investigated and implemented to address these A noise monitoring network which conducts monthly noise measurements will be established.	Chief Environmental Officer.	Ongoing
Socio- Economic	No impact envisaged	N/A	N/A	N/A	N/A	N/A	N/A

6.3. OPERATIONAL PHASE

There will be an increase in the potential for environmental impacts during the operational phase of the Beeshoek Mine operations. These impacts have been grouped into the following operational activities.

- Opencast and detrital mining
- Product and topsoil stockpiles
- Plant Infrastructure;
- Access Roads;
- Mine Waste;
- Transport Systems (conveyor, rail and trucks);
- Ancillary Surface Infrastructure;

The following EMP tables address the environmental management measures associated with the above activities and there management measures

6.3.1. Opencast and Detrital Mining

The mining operations at Beeshoek are all opencast mining operations. The new village pit will be the operational opencast pit. The mining method for the shallower pockets of ore reserve is termed detrital mining and is most feasible for these areas. The opencast mining operations consist of associated activities. These are listed as follows:

- Blasting;
- Movement of vehicles on and off site;
- Conveyor belt;
- Access road into the pit.

Table 6.3 overleaf addresses the impact associated with opencast mining operations.

Table 6.3: Operational impact of opencast and detrital mining

Impacted Area	Impact	Activity description and potential impacts on the environment	Significance	Management Measures	Action Plan	Responsible Person	Timeframes
Geology	Removal of natural mineral resource	Operation of the new village pit will have an impact on the geology of the area.	N/A	The removal of the iron ore through the village pit is a permanent impact on the geology as this mineral resource will not be able to be replaced. No management measures are required.	To limit sterilisation of iron ore reserves and thereby compromise subsequent mining once Beeshoek mining activities cease.	N/A	N/A
Climate	No impact envisaged	N/A	N/A	N/A	N/A	N/A	N/A
Topography	Degradation of the landscape	Excavations in the landscape due to the mining operations.	15 Moderate (-)	Ongoing rehabilitation during the opencast mining of the village pit as well as the detrital mining on the south mine. In-fill the pits with excess mine residue. Shaping of the in-filled pits to be free draining, resembling the natural surface topography.	Ongoing rehabilitation of opencast pit.	Chief Environmental Officer	Operational Phase
Land Use	No additional impacts are envisaged.	The opencast pits are all within the mine site so no additional impact is envisaged.	N/A	N/A	N/A	N/A	N/A
Soil	Soil contamination	Hydrocarbon spills of vehicles and mining machinery utilised in the opencast pits.	13 Moderate (-)	Vehicles / machinery will be regularly monitored and maintained. Maintenance programmes will be established and implemented. If necessary, the polluted soils will be remediated using a spill-kit. The affected areas will then be rehabilitated.	If spills do occur and soils become contaminated, the appropriate remedial measures will be identified in consultation with an appropriately qualified specialist.	Chief Environmental Officer.	Ongoing
	Erosion of soil	Erosion of the surrounding walls of the opencast pit has an impact on the operations and could possibly course an	12 Moderate (-)	Collect and stockpile usable soils over newly developed opencast pit area. If de-watering is undertaken, the		Chief Environmental Officer.	Ongoing

		increase in siltation.		resultant soil/silt could be stockpiled for use in backfilling during concurrent rehabilitation or final rehabilitation. Identify disturbed areas that can be rehabilitated as part of the mine's operational activity and vegetate these areas after rehabilitation.			
Ecology (Flora)	Loss of vegetation due to the establishment of invasive species.	Although no additional, direct impact on vegetation is expected due to the fact that the vegetation surrounding the opencast pit has been removed, the human activities could increase the presence and spread of invasive species.	N/A	N/A	N/A	N/A	N/A
Ecology (Fauna)	Disturbance to animal habitats.	No impact envisaged as the area is already previously mined.	N/A	N/A	N/A	N/A	N/A
Surface Water	Contamination of surface water.	The drainage courses as part of the overall catchment may be contaminated should any spillages or leaking occur from the vehicles travelling on the access roads.	12 Moderate (-)	Vehicles / machinery will be regularly monitored and maintained. Maintenance programmes will be established and implemented. If necessary, the polluted soils will be remediated using a spill-kit. The affected areas will then be rehabilitated..	If spills do occur and soils become contaminated, the appropriate remedial measures will be identified in consultation with an appropriately qualified specialist.	Chief Environmental Officer.	Ongoing
		Reduction in normal surface water runoff due to the artificial catchment created by the opencast pit..	15 Moderate (-)	Excess water will be pumped out of the pit and stored as dirty water in the slimes dam.			
Groundwater	Contamination of groundwater resources.	Groundwater may be contaminated with the excavation of the opencast pit.	12 Moderate (-)	Groundwater monitoring points were located as far as possible on existing boreholes.	Six monthly intervals of groundwater monitoring will be undertaken during the operational life of mine.	Chief Environmental Officer.	Ongoing
	Reduction in groundwater yield.	The reduction in the levels of groundwater due to use in the mining operations.	16 Moderate to High (-)	Establish the extent and nature of groundwater draw down zones with opencast mining within the southern mining area over the remaining operational life of mine. Determine the possible adverse	Quarterly monitoring of groundwater will be undertaken.	Chief Environmental Officer.	Ongoing

				yield effects on the local groundwater users.			
Air Quality	Dispersion of dust.	Dust will be generated in the area due to the operation of vehicles, drilling and blasting activities.	11 Moderate (-)	Install air quality monitoring stations that determine fall-out and respiral dust (PM10) concentrations that could arise from the mine activities. All denuded areas will be re-vegetated; and Dust suppression measures such as utilising a water bowser to wet haul roads and areas with fine powdered sand and soils can be utilised.	Dust control measures have been outlined and the dust monitoring programme will be adhered to.	Chief Environmental Officer.	Ongoing
Visual	Visual impacts of the opencast pit on the surrounding environment.	The opencast pit and mining of detrital ore will have a visual impact on the immediate and surrounding area. These areas have been previously mined.	19 Moderate to High (-)	Continuous pit in-filling and associated rehabilitation. Support re-vegetation of rehabilitated disturbed areas as far as possible.	Re-vegetation of rehabilitated disturbed areas	Chief Environmental Officer.	Ongoing
Archaeology	No impact envisaged	The area is not marked as an area of historical significance.	N/A	N/A	Should anything that could be related to a historic artefact or civilisation be found during the excavation of the pits, operations will cease in that area and the relevant authorities must be notified.	N/A	N/A
Noise	Increase in noise levels.	Noise operational vehicles traversing the opencast area will be almost constant.	12 Moderate (-)	Machinery and vehicles will be well maintained to prevent excessive noise and to comply with national and provincial regulations. All employees working within the area will be issued with protective gear. All vehicles will have mufflers to minimise noise emissions. A noise monitoring network which conducts monthly noise measurements will be established.	Where noise becomes a nuisance noise management measures will be investigated and implemented to address these	Chief Environmental Officer.	Ongoing
Socio- Economic	Impact of the opencast workings on the mine workers.	The Beeshoek Village area will be relocated to Postmasburg so as to accommodate the opencast village pit.	16 Moderate to High (-)	Beeshoek Village houses the mine workers and their families. The mine has entered into negotiations with the workers and the resulting decision is to relocate workers to	Relocation of mine workers and their families to Postmasburg	Chief Environmental Officer and HR	Construction Phase

				Postmasburg and transport them onto the mine.			

6.3.2. Product and Topsoil Stockpiles

The mining operations at Beeshoek are opencast mining operations. This entails the stockpiling of topsoil as it is excavated out on the new pit. Once the raw product goes through the crusher and plant process, the end product is stockpiled in designated areas before it is transported off the mine.

The environmental impacts listed in the table below addresses:

- Iron Ore Stockpiles (processed product); and
- Topsoil Stockpiles

Table 6.4: Operational impacts associated with the underground mine operations

Impacted Area	Impact	Activity description and potential impacts on the environment	Significance	Management Measures	Action Plan	Responsible Person	Timeframes
Geology	Utilise iron ore resource.	Mining of the already mined iron ore product stockpiles. No further impact is envisaged as this is part of the operational life of mine.	N/A	Rework all the contaminated iron ore stockpiles present on the mine site in order to optimise iron ore resource utilisation.	N/A	N/A	N/A
Climate	No impact envisaged	N/A	N/A	N/A	N/A	N/A	N/A
Topography	Alteration of surface features.	Stockpiling of topsoil from the opencast operations will alter the natural topography of the region. However the area has already been previously disturbed.	14 Moderate (-)	Stockpile areas will be contained to the designated footprint areas. Stockpiles will as far as practically possible be designed to ensure that they are free draining with a slope to blend into the surrounding environmental as near as practically possible.	Ongoing slope maintenance.	Chief Environmental Officer	Operational Phase
Land Use	Change of land use	As this is an increase of the already existing product stockpile footprint area and the topsoil stockpiles will be in already disturbed areas, no impact is envisaged.	N/A	No management measures required.	N/A	N/A	N/A
Soil	Erosion of soils	Stockpiled material will be susceptible to erosion.	15	Erosion control measures are required on all slopes.	Ongoing slope maintenance.	Chief Environmental Officer.	Ongoing

			Moderate (-)	Vegetation of the soil stockpiles with suitable grass species in order to limit erosion of the outer slopes of the stockpiles.			
	Loss of soils	The stockpiling of topsoil will lead to the further compaction and loss of soils.	12 Moderate (-)	Soils will be stripped prior to the stockpiling of product. The soils will be stockpiled on designated areas and will be clearly marked. The deposited material will be uncompacted as far as possible.	Erosion control measures will be implemented on all stockpiles and self-succession will be encouraged.	Chief Environmental Officer.	Ongoing
Ecology (Flora)	Loss of vegetation.	The presence of disturbed land could allow the establishment of alien invasive vegetation.	11 Moderate (-)	Beeshoek Mine will establish and implement a regular weed-control programme to eradicate existing invader plants and to prevent new invasions during ongoing mining operation and decommissioning.	The weed management programme must continue for three (3) years after closure.	Chief Environmental Officer.	Ongoing
Ecology (Fauna)	No impact envisaged	N/A	N/A	N/A	N/A	N/A	N/A
Surface Water	Contamination of surface water.	Runoff from stockpiles especially during rainstorms will results in siltation of drainage lines.	15 Moderate (-)	Berms will be constructed upstream of the stockpiles to ensure that clean water is kept separate from dirty water. All berms will be sized so as to prevent spilling for up to a 1:50 year storm event. Any storm water runoff from the outer slopes will contain some eroded residue solids. In order to prevent this from discharging into the surrounding environment, the side slopes will be dosed down to 1v:3h then covered with approximately 150mm topsoil and then grassed.	Stockpiles will be constructed in such a way to ensure stability and thereby preventing the possibility of wash down.	Chief Environmental Officer.	Operational Phase
		Deterioration of water quality due to diffuse pollution.	16 Moderate to High (-)	There will be no mining within the 1:100 year flood line of any of the tributaries and drainage channels in the area. The perimeter or footprint of the stockpile areas will be inspected to see whether storm water is flowing off site to the veld. If such an activity occurs and the water	Storm water controls at all sites of mine infrastructure will be established around all the mining activities in the mining area.	Chief Environmental Officer.	Ongoing

				contains pollutants in the form of fine ore particles, measures must be implemented for these particles to be contained prior to discharge.			
Groundwater	Reduction in groundwater yield.	Due to the depth of the groundwater levels no impacts are envisaged.	N/A	N/A	N/A	N/A	N/A
Air Quality	Deterioration in air quality	The removal, handling and stockpiling of materials and topsoil will increase dust emissions.	12 Moderate (-)	All denuded areas must be re-vegetated; and Beeshoek will commit to air quality management planning throughout the various operations of the mine.	Dust control measures have been outlined and the dust monitoring programme will be adhered to.	Chief Environmental Officer.	Ongoing
		Wind erosion from stockpiles will produce fugitive dust.	12 Moderate (-)	Vegetation of the soil stockpiles with suitable grass species in order to limit erosion of the outer slopes of the stockpiles.	Erosion control measures will be implemented in and around all stockpile areas.	Chief Environmental Officer.	Operational Phase
Visual	Impairment of visual character.	Fugitive dust emissions during the stockpiling of topsoil will have a negative visual impact.	9 Low to Moderate (-)	This is a low significance as the surrounding area is utilised for mining purposes and is already disturbed.	Dust control measures will be implemented.	Chief Environmental Officer.	Ongoing
		The increase in the product stockpile footprint areas due to operations could lead to an increase in the visual impacts associated with the area.	10 Low to Moderate (-)	The stockpiling of iron ore material will be limited to the designated areas. Stockpile heights will be restricted to 1.5m. Stockpiles will only be placed within the mine area boundaries.		Chief Environmental Officer.	Operational Phase
Archaeology	Loss or damage to sites of archaeological or cultural importance.	No evidence of past cultures has been found at the Beeshoek Mine.	N/A	There is no mitigation for this impact as the chance for such sites having occurred within the developed footprint of the mines are low to none.	Should anything that could be related to a historic artefact or civilisation be found during the excavation of the pits, operations will cease in that area and the relevant authorities must be notified.	N/A	N/A
Noise	Increase in noise levels.	Noise will be generated during the removal, transport and stockpiling of material.	10 Low to Moderate (-)	All the equipment, but especially the diesel powered mining equipment, must be well maintained. Ensure all vehicle noise emissions are within industry norms.	Where noise becomes a nuisance noise management measures will be investigated and implemented to address these Noise monitoring will be undertaken throughout the life of the mining activities to ensure	Chief Environmental Officer.	Ongoing

				The maintenance schedule will include the checking of exhaust and intake silencers. Any change in the noise emissions characteristics of equipment must serve as an indicator for its immediate withdrawal from service and placement on the maintenance schedule.	that noise levels comply with Safety and Health Standards.		
Socio- Economic	No impact envisaged	N/A	N/A	N/A	N/A	N/A	N/A

6.3.3. Plant Area with Associated Infrastructure

The mine has an existing plant area which deals with the processing of the product. The associated infrastructure in these areas is as follows:

- Primary and Secondary Crushers;
- Washing and Screening Plant;
- Preparation Plant;
- Jig Plant; and
- Clarified Water Dam.

Table 6.5: Operational impacts associated with the plant area and associated infrastructure

Impacted Area	Impact	Activity description and potential impacts on the environment	Significance	Management Measures	Action Plan	Responsible Person	Timeframes
Geology	No impact envisaged	N/A	N/A	N/A	N/A	N/A	N/A
Climate	No impact envisaged	N/A	N/A	N/A	N/A	N/A	N/A
Topography	Alteration of surface features.	The impact of infrastructure on site is established and will not change during the remaining operational life of mine.	N/A	No management measures required.	N/A	N/A	N/A
Land Use	Change of land use	All plant and crusher infrastructure is within the mine area. No impact is envisaged.	N/A	N/A	N/A	N/A	N/A
Soil	Loss of soils	Existing exposed soils will be susceptible to soil erosion.	15 Moderate (-)	The re-establishment of natural vegetation will be encouraged. Should re-establishment not take place, re-seeding options will be investigated. Where disturbed areas cannot be re-vegetated during the life of operations, appropriate measure will be taken to control wind	Ongoing erosion control measures will be applied.	Chief Environmental Officer.	Ongoing

				erosion.			
Ecology (Flora)	Loss of vegetation.	The presence of disturbed land could allow the establishment of alien invasive vegetation.	11 Moderate (-)	The weed eradication programme will be established and implemented.	The weed management programme must continue for three (3) years after closure.	Chief Environmental Officer.	Ongoing
Ecology (Fauna)	No impact envisaged	N/A	N/A	N/A	N/A	N/A	N/A
Surface Water	Contamination of surface water.	Deterioration of water quality due to diffuse pollution.	16 Moderate to High (-)	Storm water controls at all sites of mine infrastructure will be established around the crushers and plant infrastructure as well as the clarified water dam.		Chief Environmental Officer.	Operational Phase
Groundwater	Reduction in groundwater yield.	No impacts are envisaged.	N/A	N/A	N/A	N/A	N/A
Air Quality	Deterioration in air quality	Dust will be produced during the tipping of material into the crushers, as well as the crushing process.	12 Moderate (-)	Dust extraction systems comprising of wet scrubbers will be installed at the secondary and tertiary crushing and screening plants. For crushing and screening operations at metallic mineral processing plants, fugitive dust can be controlled with wet scrubbers or baghouses. Chemical dust suppression systems will be implemented at the primary crushing and screening plants.	Dust control measures have been outlined and the dust monitoring programme will be adhered to. Beeshoek will commit to air quality management planning throughout the various operations of the mine.	Chief Environmental Officer.	Ongoing
		Wind erosion from stockpiles will produce fugitive dust.	12 Moderate (-)	Vegetation of the soil stockpiles with suitable grass species in order to limit erosion of the outer slopes of the stockpiles.	Erosion control measures will be implemented in and around all stockpile areas.	Chief Environmental Officer.	Operational Phase
Visual	Impairment of visual character.	Due to the presence of the existing infrastructure in the area, no further impacts are envisaged.	N/A	N/A	N/A	N/A	N/A
Archaeology	Loss or damage to sites of archaeological or cultural importance.	No evidence of past cultures has been found at the Beeshoek Mine.	N/A	There is no mitigation for this impact as the chance for such sites having occurred within the developed footprint of the mines are low to none.	Should anything that could be related to a historic artefact or civilisation be found during the excavation of the pits, operations will cease in that area and the relevant authorities must be notified.	N/A	N/A
Noise	Increase in noise levels.	Beneficiation and crushing/ screening activities and ore	10 Low to Moderate	Implement operational controls on equipment to reduce noise levels.	Where noise becomes a nuisance noise management measures will	Chief Environmental Officer.	Ongoing

		or waste handling.	(-)		be investigated and implemented to address these Noise monitoring will be undertaken throughout the life of the mining activities to ensure that noise levels comply with Safety and Health Standards.		
Socio- Economic	Impact of mine on existing businesses, residents and services.	Operation of Mine Plant and associated infrastructure.	15 Moderate (+)	The operations at Beeshoek Mine have a positive benefit on the regional and local economy. It creates an additional employment opportunities which have an effect on the local economy.	N/A No management measures required.	N/A	N/A

6.3.4. Access Roads

There are various gravel roads within the entire mine area. The tar road from Postmasburg to Olifantshoek (R385) crosses the mine site. Currently this road passes through the existing Beeshoek Village. There is a need to deviate this road as it crosses through the middle of the area earmarked as the Village pit which will be mined. The deviation of this road will be addressed in a separate application under the NEMA regulations.

Table 6.6: Operational impact of the access roads.

Impacted Area	Impact	Activity description and potential impacts on the environment	Significance	Management Measures	Action Plan	Responsible Person	Timeframes
Geology	No impact envisaged	N/A	N/A	N/A	N/A	N/A	N/A
Climate	No impact envisaged	N/A	N/A	N/A	N/A	N/A	N/A
Topography	No impact envisaged, as there are no additional roads required.	The access roads are all constructed and will not contribute to any topographical impacts.	N/A	N/A	N/A	N/A	N/A
Land Use	No impact envisaged, as there are no additional roads required.	The access roads are all within the mine site so no impact is envisaged.	N/A	N/A	N/A	N/A	N/A
Soil	Soil contamination	Hydrocarbon spills of vehicles travelling on the access roads.	13 Moderate (-)	Vehicles / machinery will be regularly monitored and maintained. Maintenance programmes will be established and implemented. If necessary, the polluted soils will be remediated with a spill-kit. After remediation of the contaminated soils, the affected areas will be rehabilitated.	If spills do occur and soils become contaminated, the appropriate remedial measures will be identified in consultation with an appropriately qualified specialist.	Chief Environmental Officer.	Ongoing
Ecology (Flora)	Loss of vegetation due to the establishment of invasive species.	No additional, direct impact on vegetation is expected due to the fact that the roads exist.	11 Moderate (-)	Beeshoek Mine will establish and implement a regular weed-control programme to eradicate existing invader plants and to prevent new invasions during ongoing mining operation and decommissioning.	The weed management programme must continue for three (3) years after closure.	Chief Environmental Officer.	Ongoing

Ecology (Fauna)	Disturbance to animal habitats.	The only impact that may occur is the accidental death of animals on the access roads by trucks.	10 Low to Moderate (-)	Clearly marked signs will be erected along the transportation roads to create awareness of animals crossing the roads. A clearly marked and enforced vehicle speed will be implemented on the internal mine and transportation roads.		Chief Environmental Officer.	Operational Phase
Surface Water	Contamination of surface water.	The surface water runoff may be contaminated should any spillages or leaking occur from the vehicles travelling on the access roads.	12 Moderate (-)	Vehicles / machinery will be regularly monitored and maintained. Maintenance programmes will be established and implemented. If necessary, the polluted soils will be remediated with a spill-kit. After remediation of the contaminated soils, the affected areas will be rehabilitated.	If spills do occur and soils become contaminated, the appropriate remedial measures will be identified in consultation with an appropriately qualified specialist.	Chief Environmental Officer.	Ongoing
Groundwater	Impact on groundwater resources.	Due to the depth of the groundwater in the area and the fact that the mine surfaces have been compacted no impacts are envisaged.	N/A	N/A	N/A	N/A	N/A
Air Quality	Dispersion of dust.	Dust will be generated in the area due to the operation of vehicles.	11 Moderate (-)	Haulage roads will be wet on a regular basis to prevent dust emissions. Tarpaulins will be placed over all vehicles transporting product. All denuded areas will be re-vegetated; and	Dust control measures have been outlined and the dust monitoring programme will be adhered to.	Chief Environmental Officer.	Ongoing
Visual	Visual impacts of the access roads on the surrounding environment.	No further impacts are envisaged as the roads are existing and within the overall mining area.	N/A	N/A	N/A	N/A	N/A
Archaeology	No impact envisaged	N/A	N/A	N/A	N/A	N/A	N/A
Noise	Increase in noise levels.	Noise of vehicles traversing the access roads will be almost constant.	12 Moderate (-)	Machinery and vehicles will be well maintained to prevent excessive noise and to comply with national and provincial regulations. All vehicles will have mufflers to	Where noise becomes a nuisance noise management measures will be investigated and implemented to address these Noise monitoring will be	Chief Environmental Officer.	Ongoing

				minimise noise emissions.	undertaken throughout the life of the mining activities to ensure that noise levels comply with Safety and Health Standards.		
Socio- Economic	No impact envisaged	N/A	N/A	N/A	N/A	N/A	N/A

6.3.5. Mine Waste

This entails the following infrastructure on the Beeshoek Mine (North and South):

- Waste rock dumps;
- Mine Residue (Fines) Dumps; and
- Slimes dam which includes the extension to the slimes dam on the North mine.

Table 6.7: Operational impacts of mine waste.

Impacted Area	Impact	Activity description and potential impacts on the environment	Significance	Management Measures	Action Plan	Responsible Person	Timeframes
Geology	No impact envisaged	N/A	N/A	N/A	N/A	N/A	N/A
Climate	No impact envisaged	N/A	N/A	N/A	N/A	N/A	N/A
Topography	Alteration of surface topography.	Operation of mine residue deposits including waste rock dumps and slimes dams.	15 Moderate (-)	Slope the slimes dams where possible to blend into the surrounding topography and to make rehabilitation measure earlier. Limit the mine residue disposal on site. Excess waste rock dumps not used for in-filling of pits will be consolidated, reprofiled and revegetated.	Ongoing slope maintenance for the waste rock, mine residue dumps and the slimes dam.	Chief Environmental Officer	Operational Phase
Land Use	Change of land use	As all waste rock dumps, slimes dams and mine residue dumps already exist, no impact is envisaged.	N/A	N/A	N/A	N/A	N/A
Soil	No impact envisaged	N/A	N/A	N/A	N/A	N/A	N/A
Ecology (Flora)	No impact envisaged	N/A	N/A	N/A	N/A	N/A	N/A
Ecology (Fauna)	No impact envisaged	N/A	N/A	N/A	N/A	N/A	N/A
Surface Water	Contamination of surface water.	Overflowing of slimes dams will results in surface water	12	The slimes dams must be able to handle the 1:100 year flood events.	The slimes dam will be inspected on a weekly basis.	Chief Environmental Officer.	Operational Phase

		contamination.	Moderate (-)	No water will be released directly into the environmental from the dam. The seasonally wet portions of the dam and the sump will be lined with concrete. All containment dams will be maintained to ensure that no leakages occur. A freeboard of 0.8m must be maintained. Overflow pipes will be kept clean. Sumps will be kept clean and all pumps will be maintained.	Storm water controls at all sites of mine infrastructure will be established around all the mining activities in the mining area.		
		Erosion and siltation of drainage lines	14 Moderate (-)	Berms will be constructed upstream and of the dumps to ensure that clean water is kept separate from dirty water. All berms will be sized so as to prevent spilling for up to a 1:50 year storm event. Any storm water runoff from the outer slopes will contain some eroded residue solids. In order to prevent this from discharging into the surrounding environment, the side slopes of the waste rock dumps will be dosed down to 1v:3h then covered with approximately 150mm topsoil and then grasses.	The dumps will be constructed in such a way that dust and water erosion is limited. The dumps will be constructed in such a way to ensure stability and thereby preventing the possibility of wash down.	Chief Environmental Officer.	Ongoing
		Deterioration of water quality due to runoff from waste rock and mine residue dumps.	12 Moderate (-)	Berms will be constructed upstream and of the dumps to ensure that clean water is kept separate from dirty water. All berms will be sized so as to prevent spilling for up to a 1:50 year storm event. Any storm water runoff from the outer slopes will contain some eroded residue solids. In order to prevent this from discharging into the surrounding environment, the side slopes of the waste rock dumps will be dosed down to 1v:3h then covered with approximately 150mm topsoil and then grasses.	The dumps will be constructed in such a way that dust and water erosion is limited. The dumps will be constructed in such a way to ensure stability and thereby preventing the possibility of wash down.	Chief Environmental Officer.	Ongoing

Groundwater	Contamination of groundwater resource.	Seepage from the slimes dams may lead to decrease in groundwater quality	15 Moderate (-)	All slimes dams will be maintained to ensure that no leakages occur. Overflow pipes will be kept clean. Feed water piping and return water piping will be maintained. Dirty water will be contained in fit-for-purpose designed facilities, which will limit infiltration of contaminated water to the groundwater. Due to the shortage of water in the area, the mining operations will operate with a closed water circuit (reuse and recycling), to conserve water effectively, hence no water will be discharged into the surrounding environment.	Boreholes will be monitored for groundwater level and quality to assess the impacts on the groundwater due to the taking of water from the groundwater resources. The results of the water quality monitoring will be used to verify the rate of movement of the groundwater pollution plume. Should it be indicated by a suitably qualified person that the yield and quality of groundwater available to surrounding users are affected due to the proposed activities, an alternative water resource will be provided to replace the loss.	Chief Environmental Officer	Operation Phase
Air Quality	Deterioration in air quality	Wind erosion from dumps will produce fugitive dust.	12 Moderate (-)	Dust control measures in the form of slope stability and vegetation (self-succession will be encouraged) will be implemented. Should self-succession not take place the mine will commit to a vegetation strategy.	Dust control measures have been outlined and the dust monitoring programme will be adhered to.	Chief Environmental Officer.	Ongoing
Visual	Impairment of visual character.	Fugitive dust emissions during the stockpiling process on the dumps will have a negative visual impact.	9 Low to Moderate (-)	Dust control measures in the form of slope stability and vegetation (self-succession will be encouraged) will be implemented. Should self-succession not take place the mine will commit to a vegetation strategy.	Dust control measures will be implemented.	Chief Environmental Officer.	Ongoing
		The slimes dam, mine residue dumps and the waste dumps will have a visual impact (visual intrusion, visibility and visual exposure of stockpiles).	14 Moderate (-)	Waste rock and mine residue dump heights will be restricted and will only be placed within the mine area boundaries. Conduct outer slope modification and/or provide outer shells to the existing mine residue dumps. Natural vegetation re-establishment on the dam walls and in the area adjacent to the dams will be encouraged.	Should natural vegetation re-establishment not take place, options for re-seeding of the embankments will be investigated. Re-vegetated areas will be maintained by means of regular watering, weed controls and cattle-grazing exclusion until the vegetation has settled to ensure that it is stable and that erosion does not occur	Chief Environmental Officer.	Operational Phase. Decommissioning and Closure

Archaeology	Loss or damage to sites of archaeological or cultural importance.	The waste rock, mine residue dumps and the slimes dam already exist in the mine area. No evidence of past cultures has been found at Beeshoek Mine.	N/A	There is no mitigation for this impact as the chance for such sites having occurred within the developed footprint of the mines are low to none.	There is no mitigation for this impact as the chance for such sites having occurred within the developed footprint of the mines are low to none.	N/A	N/A
Noise	No impact envisaged	N/A	N/A	N/A	N/A	N/A	N/A
Socio- Economic	No impact envisaged	N/A	N/A	N/A	N/A	N/A	N/A

6.3.6. Transport Systems

The transport systems associated with the mine includes the following:

- Road (Mine access roads and the R385 from Postmasburg to Olifantshoek);
- Railway Line (Sishen to Postmasburg); and
- Conveyor.

Table 6.8: Operational impacts of transport systems on the surrounding area

Impacted Area	Impact	Activity description and potential impacts on the environment	Significance	Management Measures	Action Plan	Responsible Person	Timeframes
Geology	No impact envisaged	N/A	N/A	N/A	N/A	N/A	N/A
Climate	No impact envisaged	N/A	N/A	N/A	N/A	N/A	N/A
Topography	No impact envisaged	N/A	N/A	N/A	N/A	N/A	N/A
Land Use	Impact of transport on the land use in the area.	The conveyors and rail are all within the mine site so no impact is envisaged.	N/A	N/A	N/A	N/A	N/A
Soil	Soil contamination	Hydrocarbon spills of vehicles or product spillage of conveyor belts and rail while being transported.	13 Moderate (-)	Vehicles / machinery will be regularly monitored and maintained. Maintenance programmes will be established and implemented. If necessary, the polluted soils will be remediated with a spill-kit. After remediation of the contaminated soils, the affected areas will be rehabilitated.	If spills do occur and soils become contaminated, the appropriate remedial measures will be identified in consultation with an appropriately qualified specialist.	Chief Environmental Officer.	Ongoing
Ecology (Flora)	Loss of vegetation.	Although no additional, direct impact on vegetation is expected due to the fact that the conveyors and rail exist, the utilising of these systems could increase the presence and spread of	11 Moderate (-)	Beeshoek will establish and implement a regular weed-control programme to eradicate existing invader plants and to prevent new invasions during ongoing mining operation and decommissioning.	The weed management programme must continue for three (3) years after closure.	Chief Environmental Officer.	Ongoing

		invasive species.					
Ecology (Fauna)	Disturbance to animal habitats.	The only impact that may occur is the accidental death of animals on the access roads by trucks.	10 Low to Moderate (-)	Clearly marked signs will be erected along the transportation roads to create awareness of animals crossing the roads. A clearly marked and enforced vehicle speed will be implemented on the internal mine and transportation roads.		Chief Environmental Officer.	Operational Phase
Surface Water	Contamination of surface water.	Surface water may be contaminated should any spillages or leaking occur from the vehicles travelling on the transport systems or product spillage from the conveyor belts.	12 Moderate (-)	Railways and conveyors will be maintained and constructed with appropriate drains, levelling and surfacing to ensure adequate drainage. Topsoil and natural vegetation self-succession will be used in the vegetating of the berm, rail, conveyor and rail track embankments. Culverts will be maintained and be kept clean to ensure that no obstructions occur should a 1:100 year flood occur.	Vehicles and conveyor belts will be maintained effectively. If spills do occur and soils become contaminated, the appropriate remedial measures will be identified in consultation with an appropriately qualified specialist.	Chief Environmental Officer.	Ongoing
	Siltation of watercourses.	The operations of the transport systems could lead to increased erosion.	15 Moderate (-)	Storm water controls at all sites of mine infrastructure should be established. A berm will be constructed down gradient of the mining infrastructure to prevent wash down soil from entering the sensitive surface water areas. Clean water will be diverted away from the dirty water by the use of berms and cut off trenches The dirty water systems will be constructed to allow for a 1:50 year storm event. The clean water systems (including the diversion channel), as well as the mine dirty water dams will have a minimum freeboard of 0.8m above full supply, to ensure that no spillages occur.	Disturbed and contaminated surfaces will be landscaped and vegetated to promote even runoff and reduced erosion potential.	Chief Environmental Officer.	Ongoing

Groundwater	Impact on groundwater resources.	Due to the depth of the groundwater in the area and the fact that the mine surfaces have been compacted no impacts are envisaged.	N/A	N/A	N/A	N/A	N/A
Air Quality	Dispersion of dust.	Dust will be generated in the area due to the operation of transport systems, but these are within the mining area.	11 Moderate (-)	Haulage roads will be wet on a regular basis to prevent dust emissions. Tarpaulins will be placed over all vehicles (trucks and rail) transporting product. All denuded areas will be re-vegetated; and Roads will be treated or surfaced in order to reduce the impact of dust on the aesthetics of the surrounding area. During operational phase of the mine, haulage roads will be treated with dust suppression techniques such as wet to reduce dust creation.	Dust control measures have been outlined and the dust monitoring programme will be adhered to.	Chief Environmental Officer.	Ongoing
Visual	Visual impacts of the transport routes on the surrounding environment.	Due to the presence of the existing transportation in the area, no further impacts are envisaged.	N/A	N/A	N/A	N/A	N/A
Archaeology	No impact envisaged	N/A	N/A	N/A	N/A	N/A	N/A
Noise	Increase in noise levels.	Noise of vehicles traversing the access roads will be almost constant.	12 Moderate (-)	Machinery and vehicles will be well maintained to prevent excessive noise and to comply with national and provincial regulations. All employees working within the area will be issued with protective gear. All vehicles will have mufflers to minimise noise emissions.	Where noise becomes a nuisance noise management measures will be investigated and implemented to address these Noise monitoring will be undertaken throughout the life of the mining activities to ensure that noise levels comply with Safety and Health Standards.	Chief Environmental Officer.	Operational phase
Socio- Economic	No impact envisaged	N/A	N/A	N/A	N/A	N/A	N/A

6.3.7. Ancillary Surface Infrastructures

This entails the following infrastructure on the Beeshoek Mine:

- Administration offices;
- Workshops; and
- Domestic waste disposal site (old quarry).

Table 6.9: Operational impacts of ancillary surface infrastructure on the surrounding environment.

Impacted Area	Impact	Activity description and potential impacts on the environment	Significance	Management Measures	Action Plan	Responsible Person	Timeframes
Geology	No impact envisaged	N/A	N/A	N/A	N/A	N/A	N/A
Climate	No impact envisaged	N/A	N/A	N/A	N/A	N/A	N/A
Topography	Alteration of surface features.	The impact of infrastructure on site is established and will not change during the remaining operational life of mine.	N/A	N/A	N/A	N/A	N/A
Land Use	Change of land use	All infrastructures are within the mine area. No impact is envisaged.	N/A	N/A	N/A	N/A	N/A
Soil	Loss of soils	Exposed soils will be susceptible to soil erosion.	15 Moderate (-)	The re-establishment of natural vegetation will be encouraged. Should re-establishment not take place, re-seeding options will be investigated. Re-vegetated areas will be maintained by means of regular watering, weed controls and cattle-grazing exclusion until the vegetation has settled to ensure that it is stable and that erosion does not occur.	Ongoing erosion control measures will be applied. Where disturbed areas cannot be re-vegetated during the life of operations, appropriate measure will be taken to control wind erosion. These will include grading of surfaces to prevent rapid run-off of storm water and / or the use of energy dissipaters.	Chief Environmental Officer.	Ongoing
		Creation of domestic waste and the incorrect disposal	14	An appropriate waste management plan will be implemented.		Chief Environmental Officer.	Ongoing

		thereof.	Moderate (-)	Beeshoek utilises an existing quarry on the mine site as a general waste disposal site. Only domestic and general waste will be disposed off in this site, no industrial or hazardous waste will be dumped on this site.			
Ecology (Flora)	Loss of vegetation.	The presence of disturbed land could allow the establishment of alien invasive vegetation.	11 Moderate (-)	The weed eradication programme will be established and implemented.	The weed management programme must continue for three (3) years after closure.	Chief Environmental Officer.	Ongoing
Ecology (Fauna)	No impact envisaged	N/A	N/A	N/A	N/A	N/A	N/A
Surface Water	Contamination of surface water.	Surface water may be contaminated should any spillages or leaking occur from the workshop or office areas.	12 Moderate (-)	Ensure fuels, lubricants and chemicals for use in the workshop/operational areas are stored in properly bunded and protected areas. Vehicles will be maintained effectively.	Surface water quality will be monitored to ensure that stipulated limits are not contravened	Chief Environmental Officer.	Ongoing
		Incorrect disposal of domestic waste could contaminate the surface water.	14 Moderate (-)	An appropriate waste management plan will be implemented.	An appropriate waste management plan will be implemented.	Chief Environmental Officer.	Ongoing
Groundwater	No impact envisaged.	Due to the depth of the groundwater in the area, no impacts are envisaged.	N/A	N/A	N/A	N/A	N/A
Air Quality	Deterioration in air quality	Wind erosion from exposed areas.	12 Moderate (-)	Dust control measures will be implemented.	Dust control measures have been outlined and the dust monitoring programme will be adhered to.	Chief Environmental Officer.	Ongoing
Visual	Impairment of visual character.	The ancillary surface infrastructures are already in place on site, and the additional infrastructure required will be situated within the existing footprint areas.	N/A	N/A	N/A	N/A	N/A
Archaeology	Loss or damage to sites of archaeological or cultural	Operation of ancillary surface infrastructure. No evidence of past cultures has been found at the Beeshoek	N/A	There is no mitigation for this impact as the chance for such sites having occurred within the developed footprint of the mines	N/A	N/A	N/A

	importance.	Mine.		are low to none.			
Noise	Increase in noise levels.	Noise levels at the offices and buildings.	10 Low to Moderate (-)	Implement operational controls on equipment used in the workshops, buildings etc. to reduce noise levels. The offices and workshops will generate normal amounts of noise which will be absorbed into the ambient noise in the area which is all within the mine residential area.	Where noise becomes a nuisance noise management measures will be investigated and implemented to address these	Chief Environmental Officer.	Ongoing
Socio- Economic	Impact of mine on neighbouring town.	Operation of the entire Beeshoek Mine.	10 Moderate (+)	The Beeshoek Mine is located in an isolated area. Potential impacts to neighbouring towns are limited. Existing lines of communication exist between Beeshoek personnel and neighbouring community. No management measures required.	N/A	N/A	N/A

6.4. DECOMMISSIONING

The decommissioning activities will be discussed holistically under the following headings, determined in terms of similar activities that will be undertaken as part of the decommissioning phases:

- Dismantling and removal of all surface infrastructures, which includes the access roads, transportation systems, product and topsoil stockpiles, plant area with associated infrastructure, ancillary infrastructure, and mine waste.
- Active rehabilitation which includes final rehabilitation of the opencast operations as well as the rehabilitation of all disturbed areas that had surface infrastructure.

6.4.1. General Infrastructure

The dismantling and removal of the access roads, transportation systems, product and topsoil stockpiles, plant area with associated infrastructure, ancillary infrastructure, and mine waste requires the following:

- Demolishment of all infrastructure (plants, ancillary, etc.);
- Removal of linear infrastructure (conveyors, railway, roads and pipelines);
- Landscaping stockpiles; and
- Ripping and applying topsoil.

Please take note that impacts associated with the vehicles on site (i.e. Hydrocarbon spills and noise generation) are present in the overall decommissioning activities. For the purpose of the decommissioning section, these impacts have been incorporated into the following table.

Table 6.10 below addresses the cumulative environmental impacts of general infrastructure

Table 6.10 Cumulative impacts associated with decommissioning activities

Aspect	Direct Impact	Indirect and Cumulative Impacts
Dismantling and removal of infrastructure	The natural topography will be restored through the removal of the infrastructure Generation of construction waste may affects soils and land capability, surface water and the local ecology The removal of infrastructure will leave a temporary bare "scar" on the landscape, creating a visual impacts The removal process will increase the ambient noise levels in the area Fugitive dust will be created by wind erosion from exposed surfaces	Restoration of natural topography Soil and surface water contamination will have ecological implications The presence of disturbed land may allow the establishment of alien invasive vegetation The presence of exposed soils may lead to an increase in volume and speed of surface water run-off, increasing the erosive capacity (increased erosion) Sedimentation of surface water will lead to impacts on wetland and riparian zone integrity in terms of biodiversity and function
Active rehabilitation	The ripping and landscaping will restore the area to that of a more natural, gentle topography The rehabilitation will remove the visual incongruity	The ripping of soils will result in greater groundwater recharge due to the softening of surfaces

Following cessation of mining and processing, it is planned that all infrastructures will be decommissioned and removed from site in a systematic and regulated manner. The proposed project can only proceed, depending on the findings of the Environmental Impact Assessment (EIA) and the decision of the relevant environmental authorities. Such an outcome could then result in the actual decommissioning of the mine as the coal production would come to an end over time.

6.4.1.1. Buildings

- All infrastructures will be removed and rehabilitated, should no alternative use be found for the structures.
- Foundations will be removed to a depth of 1m below surface.
- An alternative use for the brick structures will first be sought i.e. they can either be sold/donated to the post-mining landowner on sale of the land. If an alternative use cannot be found, the buildings will be demolished.
- All material recovered from the demolition of buildings and/or structures will either be transported to a permitted disposal site, sold as scrap or made available to the local community as building materials (provided they are in a satisfactory condition following demolition).

6.4.1.2. Linear Infrastructure

- Linear infrastructure constructed by the mine (i.e. roads, conveyors, railways and power lines) will be removed if it proves to inhibit land use at decommissioning. Where possible infrastructure will remain for social investment opportunities, this will be decided in conjunction with Integrated Development Plan (IDP) of the area and the local authorities (i.e. municipality). The soils and land capability will be rehabilitated to near pre-mining conditions.
- All haul roads and access roads will be rehabilitated by ripping these structures to a depth of 500mm.
- All fences erected around the mine will be dismantled and either disposed of at a permitted disposal site or sold as scrap (provided these structures will no longer be required by the post-mining land owner). Fences erected to cordon-off dangerous excavations will remain in place and will be maintained as and when required.
- The overland conveyors and rapid load out facility, if not used as a community initiative, will be disassembled and the components removed from the site. The material can either be sold (as a unit) or the components sold as scrap.

6.4.1.3. Dams

- All containment dams will be maintained to ensure that no leakages occur.
- Overflow pipes will be kept clean.
- Sumps will be kept clean and all pumps will be maintained.
- The containment dams will only be demolished should the area proof to be free draining with no pollution potential after rehabilitation.

However, it should be noted that all clean and dirty water systems in and around the co-disposal facility should be maintained, as long as these mining infrastructures remain.

Table 6.11: Decommissioning impacts of general infrastructure on the surrounding environment.

Impacted Area	Impact	Activity description and potential impacts on the environment	Significance	Management Measures	Action Plan	Responsible Person	Timeframes
Geology	No impact envisaged	N/A	N/A	N/A	N/A	N/A	N/A
Climate	No impact envisaged	N/A	N/A	N/A	N/A	N/A	N/A

Topography	No impact envisaged	N/A	N/A	N/A	N/A	N/A	N/A
Land Use	No impact envisaged	N/A	N/A	N/A	N/A	N/A	N/A
Soil	Soil contamination	The removal of the plant and infrastructure will produce waste, which may lead to soil contamination.	13 Moderate (-)	A detailed waste management strategy will be established and implemented, which will clearly demarcate the containments for different waste streams. Disused surface infrastructure and rubble will be disposed of at a suitable site which will be rehabilitated once its purpose is served. The mine will adopt a cradle-to-grave approach to ensure that the waste is removed and disposed of in a prescribed and correct manner.	Ongoing erosion control measures will be applied. Where disturbed areas cannot be re-vegetated during the life of operations, appropriate measure will be taken to control wind erosion. These will include grading of surfaces to prevent rapid run-off of storm water and / or the use of energy dissipaters.	Chief Environmental Officer.	Decommissioning and Closure.
		The utilisation of hydrocarbons and other chemicals during the removal of the plant and other infrastructure may lead to the contamination of soils.	12 Moderate (-)	Soil that has been contaminated by spillages, seepages and leachates will be sampled and analysed. If necessary, it will be treated, ameliorated or removed for safe disposal. In the event of a major spill that could result in major soil and water contamination the DWAF should be informed immediately and a remediation strategy should be enforced.	No activities associated with hydrocarbons and or chemicals (i.e. wash bays etc.) may be undertaken outside of an effectively designed contained area.	Chief Environmental Officer.	Decommissioning and Closure.
	Erosion of soil	The decommissioning activities may lead to increased sediment movement off the site.	12 Moderate (-)	Limit decommissioning activities to the 10m conveyor servitude as far possible. Clean and dirty water systems should be maintained until closure.	Once disturbed areas have been rehabilitated and erosion is controlled by vegetation cover, disused surfacewater management facilities will be removed and the associated disturbed areas rehabilitated.	Chief Environmental Officer.	Ongoing
Ecology (Flora)	Re-establishment of vegetation.	The removal of the plant and rehabilitation of the site will allow the re-establishment of natural vegetation.	N/A	The mine will establish and implement a regular weed-control programme to eradicate existing invader plants and to prevent new invasions during ongoing mining operation and decommissioning.	The weed management programme must continue for three (3) years after closure.	Chief Environmental Officer.	Ongoing

Ecology (Fauna)	Disturbance to animal habitats.	No impact envisaged as the area is already previously mined.	N/A	N/A	N/A	N/A	N/A
Surface Water	Contamination of surface water.	The utilisation of hydrocarbons and other chemicals during the removal of the plant leads to the contamination of surface water.	12 Moderate (-)	Vehicles / machinery will be regularly monitored and maintained. Maintenance programmes will be established and implemented. If necessary, the polluted soils will be remediated with the use of a spill kit. After remediation of the contaminated soils, the affected areas will be rehabilitated..	Surface water quality will be monitored to ensure that stipulated limits are not contravened If spills do occur and soils become contaminated, the appropriate remedial measures will be identified in consultation with an appropriately qualified specialist.	Chief Environmental Officer.	Decommissioning and Closure.
		The removal of the plant and infrastructure will produce waste, which may lead to surface water contamination.	15 Moderate (-)	A detailed waste management strategy will be established and implemented, which will clearly demarcate the containments for different waste streams. Waste management will form a detailed component as part of the induction process provided by the mine. The mine will adopt a cradle-to-grave approach to ensure that the waste is removed and disposed of in a prescribed and correct manner.	An appropriate waste management plan will be implemented.	Chief Environmental Officer.	Decommissioning and Closure.
		Limit seepage from closed slimes dam to the receiving surface water environment.	12 Moderate (-)	Modify the outer slope of the slimes dam to an overall gradient of 16o and associated gradient between benches of 18o. Provide benches on the modified outer slope of the slimes dam at vertical spacing of 12m. Benches will be at least 5m wide. Provide a suitable cover on the modified outer slope varying from armouring to topsoil.		Chief Environmental Officer.	Decommissioning and Closure.
Groundwater	Contamination of groundwater	The utilisation of hydrocarbons and other chemicals during the	12 Moderate (-)	In the event of a major spill that could result in major soil and water contamination the DWAF should be	Should a spill take place the area should be cleaned immediately and the	Chief Environmental Officer.	Decommissioning and Closure.

	resources.	removal of the plant may lead to the contamination of groundwater through filtration.		informed immediately and a remediation strategy should be enforced. No activities associated with hydrocarbons and or chemicals (i.e. wash bays etc.) may be undertaken outside of an effectively designed contained area.	contaminated area will be rehabilitated as appropriate.		
Air Quality	No impact envisaged	N/A	N/A	N/A	N/A	N/A	N/A
Visual	Visual impacts on the surrounding area.	The removal of the plant and infrastructure will improve the visual quality of the site by removing the visual incongruity.	19 Moderate to High (-)	Natural vegetation establishment (self-succession) will be encouraged. The mine will investigate an appropriate seed mix for the rehabilitation purposes should self-succession not establish on rehabilitated sites. Attempts will be made to restore the natural character of the landscape.	An ecological approach to rehabilitation and screening measures, as opposed to a horticultural approach to landscaping, will be adopted. For example, communities of indigenous plants enhance bio-diversity and blend well with existing vegetation.	Chief Environmental Officer.	Decommissioning and Closure.
Archaeology	Historical significance.	Areas of the north mine can be demarcated as historical mining sites.	12 Moderate (+)	Demarcate portions of the mining area which has heritage value and preserve these in terms of a heritage plan which includes the historical mining workings located to the north of Beeshoek Iron Ore Mine.	No management measures required as this is a positive impact.	Mine Manager and SAHRA representative	Decommissioning and Closure.
Noise	Increase in noise levels.	Noise of blasting activities as well as operational vehicles traversing the opencast area will be almost constant.	12 Moderate (-)	Machinery and vehicles will be well maintained to prevent excessive noise and to comply with national and provincial regulations. All employees working within the area will be issued with protective gear. All vehicles will have mufflers to minimise noise emissions. mented to address these.	Where noise becomes a nuisance noise management measures will be investigated and implemented to address these A noise monitoring network which conducts monthly noise measurements will be established.	Chief Environmental Officer.	Decommissioning and Closure.
Socio- Economic	Impact of decommissioning on local community.	Plant, store and workshop areas could benefit local community.	14 Moderate (+)	Instead of demolition of these areas, they could be sold-off as commercial property for use in the local community. No management measures required	N/A	Mine Manager and HR	Decommissioning and Closure.

				as this is a positive impact.			
	Loss of jobs.	Prior to the closure of the mine, retrenchments will be made.	18 Moderate to High (-)	Continue with the skills development programme to empower the workforce to undertake other activities.	Align skills development programme to the Social and Labour Plan and the Local IDP	Mine Manager and HR	Decommissioning and Closure.

6.4.2. Active Rehabilitation

Active rehabilitation of the area will involve the following:

- Recovery of all saleable infrastructure, including the conveyor system;
- Ripping of all compacted areas, which will be followed with amelioration and vegetation;
- Ensure that all remaining piles and slopes are sufficiently shaped to blend in with the surrounding environment;
- Amelioration and vegetation of all disturbed areas;
- Maintenance of all re-vegetated areas up until such areas initiate succession and create a sustainable cover;
- Monitoring of key environmental variables (i.e. soils, vegetation, groundwater and surface water) in order to demonstrate stability of rehabilitated areas; and
- Weed management after closure, limited to areas disturbed by mining or included as infrastructure related to the mine.

Table 6.12 below addresses the environmental impacts associated with active rehabilitation.

Table 6.12: Decommissioning impacts of active rehabilitation

Impacted Area	Impact	Activity description and potential impacts on the environment	Significance	Management Measures	Action Plan	Responsible Person	Timeframes
Geology	No impact envisaged	N/A	N/A	N/A	N/A	N/A	N/A
Climate	No impact envisaged	N/A	N/A	N/A	N/A	N/A	N/A
Topography	Alteration of surface features.	Landscaping of the area will have a positive impact on the overall topography of the area.	N/A	N/A	N/A	N/A	N/A
Land Use	Change of land use	Restoration of mining area to pre-determined land use and land capability.	16 Moderate to High (+)	Mining areas could be rehabilitated to a wilderness final state with a final land capability of about 60% of the original land capability.	These rehabilitated mining areas could also be handed over to the local municipality for other beneficial use.	Mine Manager	Decommissioning and Closure.
Soil	Erosion of soils	Ripping and topsoil replacement will restore the soil physical characteristics prior to re-vegetation. This	15 Moderate (-)	Compacted soils will be ripped and topsoil will be replaced. After the topsoil has been replaced	Where disturbed areas cannot be re-vegetated during the life of operations, appropriate measure will be taken to control wind	Chief Environmental Officer.	Decommissioning and Closure.

		is a positive impact to the environment.		the area should be ameliorated and seeded, should self-succession of vegetation not take place. Only species indigenous to the area will be included.	erosion. These will include grading of surfaces to prevent rapid run-off of storm water and / or the use of energy dissipaters.		
		Stability of the outer slopes on mine residue deposits against surface erosion and slumping.	12 Moderate (-)	Change the outer slopes of the mine residue and waste rock dumps to an overall gradient of 16^{o} and the associated gradient between benches of 18^{o}. Slope modification will be achieved by means of either shaping existing waste rock dumps to predetermined side slopes and associated bench configurations or adding waste rock shells with the required outer slopes and associated benches onto existing waste rock dumps with waste material as it is produced.		Chief Environmental Officer.	Decommissioning and Closure.
Ecology (Flora)	Re-vegetation of the site.	Re-vegetation will be undertaken on the decommissioned and rehabilitated areas before mine closure. This will be a positive impact to the flora and fauna of the area.	11 Moderate (-)	After the topsoil has been replaced the area should be ameliorated and seeded, should self-succession of vegetation not take place. Only species indigenous to the area will be included. Remove alien vegetation post decommissioning, with long term follow-up afterwards.	The weed management programme must continue for three (3) years after closure.	Chief Environmental Officer.	Ongoing
Ecology (Fauna)	No impact envisaged	N/A	N/A	N/A	N/A	N/A	N/A
Surface Water	Contamination of surface water.	Top-soiling of the rehabilitated areas may lead to Increased sediment movement off the site and erosion.	15 Moderate (-)	Drainage systems should subsequently be restored to reduce erosion and return flow patterns. Water diversion canals that have no further purpose will be backfilled and re-vegetated.	Surface water quality will be monitored to ensure that stipulated limits are not contravened	Chief Environmental Officer.	Decommissioning and Closure.
Groundwater	Recovery of groundwater yield.	Rehabilitation/ closing of the opencast village pit means no further decrease	17 Moderate to	Once mining has ceased and the opencast dewatering discontinued, it is predicted that the recovery of		Chief Environmental Officer.	Decommissioning and Closure.

		in the groundwater yield in the area.	High (+)	groundwater in the pit will be fast, it could be at 50% of pre-mining levels in one year and 80% in 10 years. Twenty-five years after mining, the groundwater levels are predicted to have recovered to pre-mining levels.			
Air Quality	Deterioration in air quality	Fugitive dust will be created by wind erosion from exposed surfaces.	12 Moderate (-)	Dust control measures will be implemented. Wet suppression techniques will be implemented to limit dust dispersion where and when necessary.	Dust monitoring will be on-going throughout this phase.	Chief Environmental Officer.	Decommissioning and Closure.
		Vehicle-entrained fugitive dust emissions.	12 Moderate (-)	Dust control measures will be implemented. Wet suppression techniques will be implemented to limit dust dispersion where and when necessary	Dust monitoring will be on-going throughout this phase.	Chief Environmental Officer.	Decommissioning and Closure.
Visual	Impairment of visual character.	The rehabilitation (ripping, topsoil replacement and landscaping) will remove the visual incongruity.	16 Moderate to High (+)	An overall visual improvement will be noticed once all mining related infrastructure has been demolished and the area has been landscaped and revegetated. In general the removal of infrastructure is seen as a positive impact to the environment.		Chief Environmental Officer.	Decommissioning and Closure.
Archaeology	No impact envisaged	N/A	N/A	N/A	N/A	N/A	N/A
Noise	Increase in noise levels.	Improperly maintained vehicles / machinery may produce excessive noise.	10 Low to Moderate (-)	Vehicles will be equipped with mufflers where practical to reduce the emission of noise.	Where noise becomes a nuisance noise management measures will be investigated and implemented to address these A noise monitoring network which conducts monthly noise measurements will be established.	Chief Environmental Officer.	Decommissioning and Closure.
Socio- Economic	Secure and habitable environment.	Creating a safe mine site for humans and domestic animals	13 Moderate(-)	Conduct in-filled opencast pits with excess mine waste material. Shape the outer slopes of the opencast pits to 16^{o}.	N/A	Mine Manager and HR	Decommissioning and Closure.

				Provide an enviro berm and associated vegetation barrier (preferably with indigenous species) around the opencast pits which can only be partially in-filled with excess waste material.			

6.4.3. Opencast Pits

Due to the philosophy of the mine, the mine aims to backfill the opencast areas as part of the Operational phase and thus no decommissioning impacts are envisaged. However, to conform to the mine closure objectives, the following management measures should still be implemented.

These include:

- In the circumstance that the opencast areas are completely backfilled during the operational phase, the mine will:
    - Self-succession of vegetation will be promoted;
    - Should self-succession not establish, the mine will implement a vegetation programme;
    - The area in question will be fenced off until vegetation has established; and
    - A weed management programme will continue up until closure.
- In the circumstance that an opencast void is still remaining, the mine will:
    - Source material for backfilling. If this is not a viable option, the mine will commit to incorporating the necessary safety mechanisms which will include:
        - Construction of enviro - berms and/or berms covered with thorny indigenous vegetation around the perimeter of the opencast pits; and
        - Clear signs will be erected to inform parties of the presence of the void.

6.5. CLOSURE PHASE

Closure for mining activities is highly important as far as the environmental factors are concerned. If mitigation measures are not followed properly it could have devastating impacts. As closure without mitigation factors could have a permanent effect on the area and its surrounds.

During the Closure Phase it is assumed that all the aspects presenting negative impacts would be removed or rehabilitated as far as possible.

6.5.1. Closure objectives

The main environmental closure objectives can be summarised as follows:

- To ensure an effective surface runoff control system in order to deal with the separation of clean and dirty water environment;
- Rehabilitate areas as soon as possible;
- The sustainable and safe rehabilitation of all activities, in order to address all environmental impacts as far as practical according to the EMP;
- The sustainable rehabilitation of all activities and the mining area as a whole in order to ensure a sustainable endues for the majority of the activity sites/areas;
- Return of land to its pre-mining state where possible (grazing land);
- Make all areas safe for both humans and animals;
- Ensure that all areas remaining upon closure are stable, which will prevent dust and water erosion;
- Minimise the impact on the local community;
- Minimise the impact on the surrounding economic environmental and other mining activities;
- Maintenance requirements for rehabilitated activity areas/sites need to be established and documented within the capability of the subsequent land user;
- Financial provision for post closure maintenance cost of rehabilitation activity area/sites will at all times be appropriate to provide for premature closure in terms of the MPRDA;
- No rehabilitation work, demolition of buildings shall take place without the approval of the General Manager in consultation with the Manger (Group Environmental Manger); and
- Final rehabilitation of all infrastructures shall be completed within a period as specified in the appropriate closure document and rehabilitation activities will comply with the specifications as per the appropriate closure document. Should the mine, due to unforeseen circumstances, need to deviate from the closure plan, approval from the DME and relevant State Departments will be obtained.

6.5.2. Infrastructure areas (buildings, building footprint areas and internal roads).

The rehabilitation of the surface infrastructure will include the following and will be completed within a period as specified in the appropriate closure document:

- Removal of infrastructure
    - Photographs of the infrastructure, before, during and after rehabilitation will be taken at selected fixed points and kept on record for the Manager (Group Environmental Department) and the DME purpose;
    - All fixed assets that can be profitably removed will be removed for salvage or resale (the salvage and resale value have however not been incorporated into the closure cost estimate as per the legislative requirements);
    - Any item that has no salvage value to the mine but could be of value to individuals will be treated as waste;
    - All structures will be demolished, terracing removed and foundations demolished to 1m below the original ground level;
    - Dismantle and remove redundant fencing for salvage; and
    - Demolish all concrete foundations to 1m below the original ground level.

- Rehabilitation of surfaces previously occupied by infrastructure

    - The areas will be landscaped to be free draining;
    - Where sites have been alienated of vegetation or where soils have been compacted or covered with concretes, these sites will be ripped and ploughed. The topsoil and subsoils with the appropriate seedbed as stripped during the construction and operational phases will be placed over these areas to a depth as specified by a qualified specialist. The topsoil shall be appropriately ameliorated to allow vegetation to grow rapidly if required – it should be noted that the mine will encourage self-succession of vegetation, if this does not take place effectively a revegetation project will be implemented;
    - If a reasonable assessment indicates that the re-establishment of vegetation is unacceptable slow, the soil need to be analysed and any deleterious effects must be corrected and the area be seeded with a seed mix to specification;
    - Appropriate erosion control measures (i.e. contour banks) must be taken where required;
    - All rehabilitated areas will be fenced off up until the area is regarded as stable; and
    - All illegal invader plants and weeds shall be dealt with as required in terms of the relevant legislation.

- Disposal of material

    - No building rubble or any other types of waste shall be dumped in the surrounding environment or in the opencast voids without approval by the relevant authorities;

- All types of waste shall be removed entirely from the area and appropriately dealt with in respect of the general waste handling procedure;
- All foreign matter shall be removed form the site;
- Inert ceramics such as bricks, concrete, gravel etc. will be used as backfill or disposed of in a permitted waste disposal site;
- Inert waste, which is more than 1m underground, such as pipes will be left in place; and
- Inert ceramic and buried waste with a salvage value to individuals such as scrap metal, building materials, etc. will be removed and disposed of at a proper facility.

6.5.3. Product Stockpile Areas

The following closure objectives are relevant to the product footprint at the operation area:

- All material will be removed from the footprint area:
  - Where possible the product will be sold;
  - If the product cannot be sold, the material will be backfilled into the past opencast voids.
- The footprint areas will be topsoiled and ripped;
- One rainy season will be allowed for self-succession to take place
  - If a reasonable assessment indicates that the re-establishment of vegetation is unacceptable slow, the soil need to be analysed and any deleterious effects must be corrected and the area be seeded with a seed mix to specification;
  - Should self-succession of vegetation not take place, the mine will implement a vegetation strategy to establish vegetation on these disturbed areas
  - Appropriate erosion control measures (i.e. contour banks) must be taken where required;
- All rehabilitated areas will be fenced off up until the area is regarded as stable; and
- All illegal invader plants and weeds shall be dealt with as required in terms of the relevant legislation.

6.5.4. Waste Rock Dumps

The waste rock dumps present at will be rehabilitated:

- The slopes of the waste rock dumps will be shaped to be stable and that the structure blends into the surrounding environment;
- Clean and dirty water systems will be implemented to remain as long terms structures to ensure that the area is free draining as far as practically possible;
- Terraces and berms will be implemented to encourage the self succession of vegetation and the reduced potential for erosion;
- Should self succession not establish the mine will cover the remaining waste rock dumps with the necessary topsoil and subsoil mixture, with the associated seedbed;

- The re-vegetation process will be monitored and encouraged until the area is regarded as stable;
- The waste rock dump will be fenced off until the vegetation is stable and the rehabilitation is regarded to be finalised.

6.5.5. Fine Residue Dumps

The following closure objectives are relevant to the fines dumps, similar to that of the product footprint areas:

- All material will be removed from the footprint area
    - Where possible the product will be sold;
    - If the product cannot be sold, the material will be backfilled into the past opencast voids.
- The footprint areas will be topsoiled and ripped;
- One rainy season will be allowed for self-succession to take place
    - If a reasonable assessment indicates that the re-establishment of vegetation is unacceptable slow, the soil need to be analysed and any deleterious effects must be corrected and the area be seeded with a seed mix to specification;
    - Should self-succession of vegetation not take place, the mine will implement a vegetation strategy to establish vegetation on these disturbed areas
    - Appropriate erosion control measures (i.e. contour banks) must be taken where required;
- All rehabilitated areas will be fenced off up until the area is regarded as stable; and
- All illegal invader plants and weeds shall be dealt with as required in terms of the relevant legislation.

6.5.6. Slimes Dams

The slimes dams have no residual environmental impacts associated with it due to the composition of the material deposited on them. There is however management measures that will be included as part of the closure condition:

- The slopes of the slimes dams will be shaped to be stable and that the structure blends into the surrounding environment;
- Clean and dirty water systems will be implemented to remain as long terms structures to ensure that the area is free draining as far as practically possible;
- Terraces and berms will be implemented to encourage the self succession of vegetation and the reduced potential for erosion;
- Should self succession not establish the mine will cover the remaining waste rock dumps with the necessary topsoil and subsoil mixture, with the associated seedbed;
- The re-vegetation process will be monitored and encouraged until the area is regarded as stable;
- The dams will be fenced off until the vegetation is stable and the rehabilitation is regarded to be finalised.

6.5.7. Opencast Pit

It is the aim of the mine to backfill the opencast voids with existing material on site. Should it be found that opencast pit voids remain at the end of the mining operations the following will be enforced:

- The area will be made safe by the establishment of enviro-berms around the perimeter of the remaining voids in order to make the area safe and limit access;
- The enviro-berms will be covered with indigenous thorny vegetation.

Should it be found that there is sufficient material available to backfill the voids completely, the following measures will be implemented:

- The areas will be landscaped to be free draining;
- The topsoil and subsoils with the appropriate seedbed as stripped during the construction and operational phases will be placed over these areas to a depth as specified by a qualified specialist. The topsoil shall be appropriately ameliorated to allow vegetation to grow rapidly if required – it should be noted that the mine will encourage self-succession of vegetation, if this does not take place effectively a revegetation project will be implemented;
- If a reasonable assessment indicates that the re-establishment of vegetation is unacceptable slow, the soil need to be analysed and any deleterious effects must be corrected and the area be seeded with a seed mix to specification;
- Appropriate erosion control measures (i.e. contour banks) must be taken where required;
- All rehabilitated areas will be fenced off up until the area is regarded as stable; and
- All illegal invader plants and weeds shall be dealt with as required in terms of the relevant legislation.

6.5.8. Water pollution control structures

Water pollution control structures will remain until the completion of all demolition and associated rehabilitation activities where after these will be rehabilitated.

6.5.9. Maintenance

The aim of the maintenance measures are to ensure that the area affected by the mining operations is rehabilitated according to the closure plan and to apply for closure. The objective is for the area to be rehabilitated sustainability (ensuring self-succession of plants and the associated return of natural wildlife; as well as the improvement of the natural watercourses). The following maintenance measures will be implemented as part of the closure and post-closure process:

- All natural physical, chemical and biological processes for which a closure condition has been specified must be monitored for three (3) years after closure or as long as required by the relevant authorities. Such processes include erosion of the rehabilitated

surfaces, surface water drainage, air quality, surface water quality, groundwater quality, vegetative re-growth, weed encroachment and colonisation by animals;

- Measures must be implemented to curb environmental impacts and to ensure that they do not worsen/cumulate over time;
- The closure plan will be reviewed every two (2) years during the life of the mine (closure, operational and decommissioning phases) due to the short nature of the mining operations;
- All rehabilitated areas will be monitored and maintained until such time as required to enable the mine to apply for closure of these different areas.

6.5.10. Rehabilitation responsibilities

The following table indicates the various responsibilities and responsible parties for the rehabilitation activities.

***Table 6.13*: Responsibilities and responsible parties for rehab activities**

Responsible Party	Responsibility
Mine Manager, Mine Engineer and Environmental Officer	Planning of rehabilitation projects Initiating rehabilitation projects Compilation of closure plans with regard to rehabilitation areas/sites
Environmental Officer	General monitoring/surveillance and reporting and coordination Implementation/coordination with regard to particular environmental measure/action plans
Environmental Officer	Audits (Environmental, EMP Performance Assessment, etc.) and surveillance
Mine Manager, Mine Engineer and Environmental Officer	Authorisation of all rehabilitation projects

6.5.11. Submission of information

- The operation must ensure to maintain the Environmental Management System (EMS);
- All procedures (emergency, environmental awareness, rehabilitation strategies, etc.) must be included into the mine's EMS. The mine's EMS will monitor and assess the performance of the EMP on an ongoing basis. Formal audit of the performance assessment of the EMP will take place every two year as stipulated by law, or at any other period if required by government.;
- All information as required by the various government departments should be captured and be readily available for submission when required;

- Groundwater monitoring occurs on a quarterly basis and is undertaken by outsourced specialists. Annual groundwater reports will be submitted to the Department of Water Affairs;
- An EMP Performance Assessment will be undertaken every two years as required by the MPRDA and will be submitted to the DME;
- The financial provision for closure (quantum and method) will be updated every two years as part of the EMP Assessment; and
- The Closure Plan must be reviewed every two (2) years during the life of mine (due to the short nature of the proposed mining operations), and must always keep pace with the current best practices.

7. PLANNED ENVIRONMENTAL MONITORING AND PERFORMANCE ASSESSMENT

Ongoing monitoring of the bio-physical and socio-economic environments will continue throughout the life of the project as per the approved EMPR's and the accepted monitoring programmes. Beeshoek will monitor and assess the performance of the EMP on an ongoing basis.

7.1. MONITORING OBJECTIVE:

Monitoring of different environmental aspects/impacts shall take place by means of quantitative and qualitative evaluation techniques in order to determine whether the requirements of the EMP are being adhered to.

Monitoring is a continuous data-gathering and control procedure. It may range from routine visual inspections to in-depth investigative monitoring (refer to table 9.1)

***Table 7.1*: Monitoring programme**

Activity	Period
Groundwater monitoring	Bi-annual groundwater monitoring reports to be submitted to DWAF.
Surface water monitoring	Quarterly surface water monitoring reports to be submitted to DWAF.
Dust Monitoring	Yearly audit reports to be submitted to the DME.
Noise	Annually
Environmental Performance Assessment Monitoring	Every two years

7.1.1. Surface Water and Groundwater

Surface water and ground water will be monitored quarterly at various points around the existing mining area. Borehole water levels, depth and casing statistics are also noted during sampling. A bailer is used to purge the boreholes and take a fresh sample. The amount of water purged is dependent on the borehole depths and rest water levels. After purging, a sample is taken and submitted, together with the surface water samples, to the laboratories for analysis. One litre bottles are used to collect water samples from various streams, dams, water channels and monitoring boreholes.

These determinants are then compared against the following documentation:

- DWAF, 1996: "South African Water Quality Guidelines: Volume 1 Domestic Use"
- DWAF, 1996: "South Africa Water Quality Guidelines: Volume 5 Agricultural Use: livestock watering"

A quarterly monitoring report is compiled and submitted to mine management and once a year a trend report is compiled and submitted to mine management and DWAF.

Ground Water Monitoring

The main objective of conducting groundwater monitoring is to establish, operate and maintain a groundwater level monitoring system to check on the possible lowering of local groundwater levels due to mining activity at Beeshoek iron Ore Mine.

7.1.2. Air Quality

An air quality monitoring programme has been implemented to measure fallout dust and to monitor ambient concentration of suspended particulate matter (dust). Owing to the nature of the mining activity at Beeshoek Iron Ore Mine, air quality in the area surrounding the mine site will not be adversely affected by dust (fall-out and PM10).

Dust monitoring has been done over the last 4 years. The monitoring network consists of 3 directional buckets and two single buckets that have been monitored on a monthly basis. The PM10 monitoring has been done at the Beeshoek village on a monthly basis over a period of 24 hours as required by SANS code for ambient air quality.

Part of the monitoring system is to ensure that all control systems are fully operational and maintained regularly for effective dust suppression.

7.1.3. Soil and vegetation monitoring

The only area where rehabilitation will be taking place during the operational phase is the open cast pits that have been mined through the roll-over mine method. The plant and final box cut areas will be rehabilitated during the decommissioning phase. A monitoring program will be implemented during the operational phase to monitor the rehabilitation of the previously mentioned areas. During decommissioning this same programme will be implemented at the other sites to ensure rehabilitation is taking place according to the EMP commitments.

The establishment of good vegetation cover is essential for rehabilitation, and it is essential that both the soil properties and the vegetation are monitored annually. Should there be deficiencies in the soil, the establishment of vegetation will be difficult and succession will not take place. The purpose of monitoring the soil is to establish its suitability for vegetation and to make recommendations for its improvement. Aspects like soil depth, structure, fertility and areas of erosion will be investigated. The vegetation will be monitored to ascertain species richness and biodiversity.

7.1.4. Noise Survey

Noise monitoring from the plant area will be conducted annually, using a sound level meter, to ascertain the area of impact of the noise generation and to ascertain if noise abating measures need to be implemented.

7.1.5. Vibration Survey

Monitoring of the vibrations will be done as and when required. Vibration sensing equipment will be used, which should be placed ten inches from residential dwellings (the nearest farmer's homestead and offices) to record blast over pressure and vibration. A report will be compiled using the data collected by the vibration sensors and submitted to management to ascertain compliance with any relevant standards.

Together with the vibration surveys, visual census will also take place. Photo's of structures in and around the mining area, will be taken and retaken after blasting have occurred and a few weeks there after. Such a survey will illustrate the possible damages caused by mining activities and blasting.

7.1.6. Performance Assessment

- All procedures (emergency, environmental awareness, rehabilitation strategies, etc.) will continuously be updated;
- All information as required by the various government departments should be captured and be readily available for submission when required;
- An annual report will be submitted to the DME;
- Surface water monitoring occurs on a quarterly basis and is undertaken by outsourced specialists;
- Groundwater monitoring occurs on a quarterly basis and is undertaken by outsourced specialists;
- The Groundwater levels will be monitored on quarterly bases and will be presented in the form of piezometric maps, from which changes can be determined through time;
- An Environmental Management Programme Performance Assessment will be undertaken every two years as required by the MPRDA and will be submitted to the DME; and
- The financial provision (method and quantum) will be updated every two (2) years as part of the Environmental Programme Performance Assessment.

***Table 7.2**: Proposed monitoring boreholes*

NR_ON_MAP	FARM NAME	LONGITUDE	LATITUDE	ALTITUDE
AU02	Aucampsrus	-3564.94	3130391.34	0
AU04	Aucampsrus	-5961.79	3129852.62	0
AU06	Aucampsrus	-2590.74	3126219.91	0
AU09	Aucampsrus	-4697.16	3125062.51	0
AU11	Aucampsrus	-3549.75	3128714.66	0
AU10	Aucampsrus	-4576.78	3126725.83	1292
WG1	Beeshoek	1573	3129337	1340
BKD2/7	Beeshoek	1800	3127000	1358
UO3/71	Olynfontein	1000	3135850	1319
PFWIND10	Ploegfontein	-415.38	3138715	1307
PFWIND2W	Ploegfontein	-2553.11	3137544.64	1295
KH2_R_HUIS	Kameelhoek	-12284.08	3134186.59	1256
KH_N-WINDP	Kameelhoek	-10474.46	3137102.68	1253
DP03	Doornpan	7548.26	3121760.4	1385
DP04	Doornpan	7474.91	3116955.23	1385
DRIE02	Driehoekspan	3020.64	3114342.94	1380
DOOR2	Doornfontein	3187	3125575	1351
AHD2/9	Doornfontein	900	3123000	1329
DOOR7	Doornfontein	4047	3124371	1351
AOD1/90	Doornfontein	-550	3124400	1310
KAR04	Kareepan	10023.73	3125736.26	1380
KAR05	Kareepan	8172.6	3125931.85	1390
PENS03	Pensfontein	5796.45	3129581.28	1370
PENS04	Pensfontein	4511.28	3126647.13	1370
PENS09	Pensfontein	7760.59	3130665.96	1355
AFB2/73	Beeshoek	-2399	3132349	1299
OB1/31	Beeshoek	-2000	3129800	1302
AHO2/15	Olynfontein	-700	3137050	1306
YO 1/10	Olynfontein	-1550	3136000	1303
WG3	Beeshoek	-879	3127723	1312
MON1	Olynfontein	-1209	3134588	1304
BOORGAT10	Olynfontein	4849.55	3136112.41	1284
PFNUUTW	Ploegfontein	3157.99	3139461.19	1275
KALKFONTEIN	Kalkfontein	4768.8	3138129.2	1305
OLYN1	Olynfontein	5266.28	3137225.45	1289
OLYN2(P2NW)	Olynfontein	4428.95	3137187.52	1277
OLYN3(WPOMP)	Olynfontein	2558.46	3137433.92	1287
00119		-3601.95	3121565.86	1280
00127		-10280.31	3125363.02	1264
00144		-12505.36	3116781.28	1249
00217		-6926.98	3120020.33	1263
00022		-8611.33	3130214.4	1240
00055		-1687.92	3139935.74	1270
00057		-3921.33	3138428.02	1249
00072		6538.71	3133288.29	1249
00078		136.24	3140827.72	1280
10089		7900.31	3134304.22	1316

Figure 7.1: Monitoring Stations

8. *FINANCIAL PROVISION*

8.1. METHOD FOR FINANCIAL PROVISION

The financial provision for the environmental rehabilitation and closure of any mine and its associated mining operations forms an integral part of the MPRDA. Sections 41 (1), 41(2), 41(3) and 45 of the MPRDA deals with the financial provision for mine rehabilitation and closure.

The "Guideline document for the evaluation of financial provision made by the mining industry" has been developed by Golder Associates Africa, in order to empower the personnel at Regional DME offices to review the quantum determination for the rehabilitation and closure of mining sites.

The closure cost was formulated by utilising this universal guideline document in order to comply with the DME requirements. It should be noted that no detailed or surveyed information, except for the existing infrastructure has been available during the estimation of the bill of quantities and broad estimations were assumed.

The financial provision for the environmental rehabilitation and closure of any mine and its associated mining operations form an integral part of the Minerals and Petroleum Resources Development Act (Act 28 of 2002). Sections 41(1), 41(3) and 45 of the Act deal with the financial provision for mine rehabilitation and closure.

The financial provisions required by the holder of the mining right must be provided for by one or more of the following methods in order to achieve the total quantum of rehabilitation and remediation of environmental impacts and damage as well as final closure:

- Approved dedicated trust fund;
- Financial guarantee from a South African registered bank or any other approved financial institution;
- Cash deposit to be deposited at the office of the Regional Manager; and
- Any other manner determined by the Minister.

The Mine is required to annually assess the total quantum of environmental liability for the mining operation and ensure that financial provision is sufficient to cover the current liability (in the event of premature closure) as well as the end-of-mine liability.

As per Government Legislature, the mine is required to ensure full financial cover for the current liability at any point in the life of the mine. Pecuniary provision must be made for the shortfall between the existing trust fund balance and the premature closure or current environmental rehabilitation liability.

8.2. OUTCOMES OF THE FINANCIAL PROVISION

The table below summarizes the unit rates for closure components as specified in the DME Guideline Document and indicates which rates were used by Ivuzi in the assessment.

Table 8.1: DME Master Rates Utilised

No	Description	Unit	Master rate 2006	Master rate 2007 (CPIX = 5.0%)	Master Rate 2008 (CPIX = 8.6%)	Master Rate 2009 (CPIX = 12.1%)
				by 5% as per Stats SA - November 2006	Rates increased by 8.6% per Stats SA – January 2008	Rates increased by 12.1% per Stats SA – January 2009
1	Dismantling of processing plant and related structures	m^3	R 277.00	R 290.85	R 315.90	R 354.12
2a	Demolition of steel buildings and structures (including floor slabs)	m^2	R 99.00	R 103.95	R 112.90	R 126.56
2b	Demolition of reinforced concrete buildings and structures	m^2	R 150.00	R 157.50	R 171.25	R 191.97
3	Rehabilitation of access roads	m^2	R 19.00	R 19.95	R 21.70	R 24.33
4a	Demolition of conveyor belt lines	m	R 155.00	R 162.75	R 176.75	R 198.14
4b	Demolition and rehabilitation of non-electrified railway lines	m	R 73.00	R 76.65	R 83.25	R 93.32
5	Demolition of housing and facilities (including floor slabs)	m^2	R 120.00	R 126.00	R 136.85	R 153.41
6	Opencast rehabilitation (including final voids and ramps)	ha	-			
7a	Sealing of vertical shaft	l/s	R 59,500.00	R62,475.00	R 67,847.85	R 76,057.44
7b	Sealing of incline shaft (including concrete cap)	l/s	R 45,000.00	R 47,250.00	R 51,313.50	R 57,522.43
8a	Rehabilitation of overburden and spoils	ha	-			
8b	Rehabilitation of processing waste deposits and evaporation ponds (basic, salt-producing waste)	ha	R 22,145.00	R 23,252.25	R 25,251.95	R 28,307.44
8c	Rehabilitation of processing waste deposits and evaporation ponds (acidic, metal-rich waste)	ha	-			
9	Rehabilitation of subsided areas	ha	-			
10	General surface rehabilitation, including grassing of all denuded areas	ha	R 21,600.00	R 22,680.00	R 24,630.48	R 27,610.77
11	River diversions	ha	-			
12	Fencing & Powerlines	m	R 5.25	R 5.51	R 5.90	R 6.61
13	Water management (Separating clean and dirty water, managing polluted water and managing the impact on groundwater, including treatment, when required)	ha	-			
14	2 to 3 years of maintenance and aftercare	ha	R 3,877.00	R 4,070.85	R 4,420.95	R 4,955.88
15a	Specialist study	Sum				
15b	Specialist study	Sum				

8.2.1. Cost Estimate Summary

A summary of the estimated closure costs is provided below. Refer to Appendix A for detailed breakdowns of the closure cost assessments for the Beeshoek Mine.

Sub Total 1	R 82, 058,609.85 (excluding VAT)
Sub Total 2	R 100,111.02(excluding VAT)
Sub Total 3	R 114,127.58(including VAT)

The total for the Assmang Mine Complex closure cost is **R114, 127,114.58**.

9. *UNDERTAKING BY CLIENT*

An undertaking of agreement to the management strategies as proposed in the Environmental Management Programme (EMP) as well as an undertaking of approval of the EMP is provided on the following page.

UNDERTAKING

I, _____ the undersigned and duly authorized thereto by Beeshoek Mine, have studied and understand the contents of this Environmental Management Programme (EMP) and duly undertake to adhere to the conditions as set out therein, unless specifically or otherwise agreed to.

Signed at _____ on this day ____of 2009.

_____

Signature of Mine Manager

I, _____ the undersigned and duly authorized thereto by DEPARTMENT OF MINERALS AND ENERGY have studied and approved the contents of this Environmental Management Programme.

Signed at _____ on this day ____of 2009.

_____

Signature of Director: Mineral Development

10. *CONCLUSION*

The environmental impact recorded by this EMPR indicates that the nature of Beeshoek Iron Ore Mine's activity is such that it poses a limited environmental consequence related to the bio-physical environment during its operational and closure states. The most notable impact in this regard, is the draw-down of the local groundwater levels, thereby posing a possible adverse impact on groundwater yield for groundwater users.

However, the challenge lies in meeting socio-economic requirements at mine closure and beyond. Maintaining quality of life of the Beeshoek/Postmasburg communities during the post closure period must be the primary closure goal of the mine. Towards this end, the mine committed to engage in a structured process with the local community to establish a closure vision for the affected area and associated strategic objectives. Moreover, the mine committed to identify and devised measures to affect these strategic objectives and is willing to collectively participate with the community and the State to implement these measures.

The outcomes of the EIA have identified no significant impacts associated with the proposed activities and the continuation of the Beeshoek Mining Operations. Some amendments to management commitments have been incorporated into this holistic report to ensure that the mining operations are managed in an environmentally effective manner.