Assmang (Pty) Ltd: Khumani Iron Ore Mine

DRAFT Environmental Impact Assessment and Management Report for in terms of Nation Environmental Management Act, 1998 for:

Project 1: New Return Water Dam 3 and King Water Containment Facility

Project 2: Pipelines Project

Project 3: Water Use Licence (WUL) amendment of approved infrastructure in

Report Purpose

For Stakeholder Review and Input

Report Status

DRAFT

Report Reference

EnviroGistics Ref.: 21819

Departmental Ref.: NC30/5/1/2/3/2/1/070

Mining Right Ref: NC30/5/1/2/3/2/1/070

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5 February 2019

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With more than 15 years' experience in environmental management and the consulting industry, she follows a methodical and practical approach in attending to environmental problems and identifying environmental solutions throughout the planning, initiation, operation and decommissioning or closure of projects.

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Report Title	DRAFT EIA AND EMPR REPORT FOR IN TERMS OF NATION ENVIRONMENTAL MANAGEMENT ACT, 1998 FOR: PROJECT 1: NEW RETURN WATER DAM 3 AND KING WATER CONTAINMENT FACILITY. PROJECT 2: PIPELINES PROJECT 3: WATER USE LICENCE (WUL) AMENDMENT	
Report Ref. No.	21819_D1	
Report Status	Draft	
Report Purpose	For Stakeholder Review and Input	
	Signature	**Date**
Author	Tanja Bekker	23 January 2019
Reviewer	Michelle Pretorius	22 January 2019

Amendments

Report Ref:	Nature of Amendment	Date	Report Output Ref:

Distribution

Distributed To:	Purpose:	Date	Format/Amount
Michelle Pretorius	Internal Review	15 January 2019	Electronic
Michelle Pretorius	Review	23 January 2019	Electronic
Dirk Coetzee	Review	23 January 2019	Electronic
Stakeholder Review	Review	5 February 2019	Hard Copy (DWS, DMR, NCDENC, Local and District Municipality) Soft copy (SAHRA and Registered Stakeholders)

Executive Summary

Introduction

Khumani Iron Ore Mine (hereafter referred to as "Khumani "or "the mine") is situated 15km south of Kathu, in the Northern Cape Province, adjacent to the Kumba Iron Ore Mine.

The mine comprises of four (4) farms, namely Parson 564 (including Police Camp 692) (Portions 0, 2, 8 and 9), King 561 (Portion RE), Bruce 544 (Portion RE) and Mokaning 560 (Portions 0, 1, 2, 3, and 4). Khumani falls within two (2) Local and two (2) District Municipalities. The farm Mokaning is situated within the Tsantsabane Local Municipality (NC085), which forms part of the ZF Mgcawu District Municipality (formerly known as the Siyanda District Municipality). The farms Parson, Bruce and King are situated within the Gamagara Local Municipality (NC01B1), which forms part of the John Taolo Gaetsewe District Municipality (formerly known as the Kgalagadi District Municipality).

Construction of Khumani commenced during 2006 and the mine has been operational since 2007.

Project Description

Project 1: New Return Water Dam 3 and King Water Containment Facility

Khumani intends to construct a new Return Water Dam ("Return Water Dam 3") associated with the existing Paste Disposal Facility, at a capacity of approximately 49 000m^3 (details and designs of the facility are not as yet finalised, however, the wall height will be below 5m). The new Return Water Dam 3 will be located on Portion RE of the farm King. The intention of the project is as follows:

- Supernatant and storm water will be pumped from the Paste Disposal Facility compartments to the existing concrete lined silt trap.
- The silt trap overflows into the existing HDPE lined Return Water Dam 1 from where the water is returned to the thickener overflow tank for re-use in the process.
- Excess storm water will overflow from the Return Water Dam 1 into the existing Return Water Dam 2.
- In turn, excess storm water will overflow from the existing Return Water Dam 2 into the new Return Water Dam 3.
- Water will then be pumped from the Return Water Dam 3 to the Return Water Dam 1 or 2 once the water level in the Return Water Dam 1 has dropped significantly.
- The intention is to operate the Return Water Dams dry and to maintain the level in the Return Water Dam 1 at less than 30%.

The new Return Water Dam 3 will have a spillway that will divert overflow to the Paste Disposal Facility Compartment 3B in case of an emergency. The design intent is not to utilise this spillway more than once in 50 years.

To comply with Government Notice (GN) 704 (1999) requirements in terms of the National Water Act (Act No 36 of 1998) (NWA) and to ensure the integrity of the Paste Disposal Facility, process water may not be stored in the Paste Disposal Facility Return Water Dams. For this reason a separate water containment facility must be constructed to serve this purpose. Water balance modelling shows that a facility with a capacity of more than 30 000m^3 will not be adequately utilised (refer to Annexure 6). It is therefore recommended that this facility have a capacity of between 25 000m^3 and 30 000m^3. For this reason a new water containment facility, in the design of a concrete tank, similar to those of the Gamagara Potable Water Tanks 2 and 3, is planned at the King Plant area to supply water to the mining operations, the specific coordinate for the location within the plant area has not been finalised. Currently water is being supplied via the Parson storage facilities, which in periods hampers capacities when water scarcity arises in the area. With a new storage facility at the King operation, Khumani can store water for this mining operation specifically and allow for buffer capacities in dry events. The capacity of the facility and the design of the facility are as yet not available, but will be less than 50 000m^3. Should clearance be required this will also be less than 1ha of indigenous vegetation.

Project 2: Pipelines Project (including associated pumping infrastructure)

As mentioned before, the mine operates in a closed water circuit and therefore various thickener phases are included on site (one at the Beneficiation Plant and one at the King Plant). Water from the King Plant is diverted back via a pipeline system to the Beneficiation Plant for reuse in the system. In order to maximise water return on site, the mine will establish a second pipeline to pump water from the Paste Disposal Facility circuit back to

the Beneficiation Plant. Water from the existing Return Water Dam will be pumped to the Thickener Tank and from there will be piped to the Beneficiation Plant. The volume to be pumped through the Paste Disposal Facility Return Water Pipeline is planned to be approximately 375l/s.

Another pipeline of approximately 3km in length is planned from the Parson Pollution Control Dam (PCD) (currently called the Parson Plant Storm Water) which will return water back to the Beneficiation Plant for reuse. The design of the Parson PCD Pipeline is currently not final, however it is anticipated that the throughput will be about 100m³/hr, which will amount to about 1 700l/s when water is present in this facility.

Project 3: Water Use Licence (WUL) amendment

Khumani intends to amend the existing 2013 WUL to correct various administrative errors, as well as to include water uses associated with the 2016 Environmental Authorisation (Permit 21/2016 for mine residue facilities, such as the Bruce Low Grade Run of Mine (ROM) Stockpile expansion and the Parson Discard Dump expansion). In addition to this, a Water Optimisation Study (which includes a hydrological and storm water management component) (hereafter referred to as the Water Study)has been undertaken by Geo Tail (Pty) Ltd. Based on the outcomes of the current Water Studies, various other amendments may be required to approved water uses in terms of throughput volume/ naming and/or capacity. Amendments currently considered is the duplication of the Braithwaite Water Tank at King to allow for additional buffer capacity, as well as the formalisation of the dams located next to the Beneficiation Plant (the Buffer Dams). The amendments to facilities are located on all four (4) farms owned by Khumani. The projects which will be included as part of the hydrologist recommendations are:

- The return capacity from the Parson PCD should be increased to at least 100m^3/hr, although a return capacity of 150m^3/hr to 200m^3/hr would provide greater operational flexibility in the medium to long term.
- The return capacity from the Loadout Storm Water Dam should be increased to at least 30m^3/hr.
- Although the hydrological study recommends that paddocks are implemented on the final footprint of the Discard Dump, it should be noted that these paddocks are already implemented on the final footprint as approved in the 2006 EMPr. These are earth walled paddocks as per the original design intent.
- The approved Process Recovery Dam on Parson is currently used when one or both of the primary thickeners needs to be dumped. It is unlikely that both thickeners will require complete emptying at the same time, therefore there is available capacity in this dam that can be utilised for additional water storage. This will come at no capital cost, but will come with a small risk in event that both primary thickeners need to be fully emptied at the same time.
- In addition to the above, four (4) borrow pits, constructed during the initial construction period in 2008-2009 are located near the existing Gamagara Potable Water Tanks 2 and 3 which can also provide suitable locations for additional water storage reservoirs. The excavations will only require limited earthworks, with two (2) of the excavations already approved in terms of the WUL for water storage purposes. They would require HDPE lining to prevent seepage losses and the use of evaporation protection is strongly recommended.
- Upgrade, or replacement of the current Braithwaite Water Tank on the Farm King.
- Construction of Return Water Dam 3 and the new King Water Containment Facility (see Project 1 description).

Listed Activities

In terms of the National Environmental Management Act (Act No. 107 of 1998) (NEMA), there are three (3) listing notices which should be considered for this application. These listing notices were amended during April 2017. This amendment did not repeal the 2014 listed activities, but purely amended certain listings. Listing Notice 1 (Regulation 983) activities require a Basic Assessment Process, whereas Listing Notice 2 (Regulation 984) activities require a full Environmental Impact Assessment (EIA) Process. Listing Notice 3 (Regulation 985) activities require a Basic Assessment Process if the area falls within certain geographic zones. Khumani is not characterised by gazetted Endangered Ecosystems, Critical Biodiversity Areas (CBAs) or located in proximity to a Protected or Conservation Area and for this reason Listing Notice 3 is not applicable to the mine.

Considering the above, the following listed activities may be triggered:

Name of Activity	Aerial extent of the Activity (Ha or m²)	Applicable Listing Notice	Waste Management Authorisation Required	Water Use Licence Authorisation Required (x for yes)
Project 1: Proposed New Return Water Dam 3	Approximately 2ha	Government Notice 327, Listing Notice 1: - Activity 13: The development of facilities or infrastructure for the off-stream storage of water,	Note: At the current time and with the information available it is not foreseen that a waste licence will	x

Name of Activity	Aerial extent of the Activity (Ha or m²)	Applicable Listing Notice	Waste Management Authorisation Required	Water Use Licence Authorisation Required (x for yes)
		including dams and reservoirs, with a combined capacity of 50 000 cubic meters or more unless such storage falls within the ambit of activity 16 in Listing Notice 2 of 2014.. Government Notice 325, Listing Notice 2: • Activity 6: The development of facilities or infrastructure for any process or activity which requires a permit or licence or an amended permit or licence in terms of national or provincial legislation governing the generation or release of emissions, pollution or effluent. This activity is triggered as the proposed dam would require approval in terms of a new water use (Section 21(g) of the NWA).	be required for the Return Water Dam, as this facility will be regarded as a storage facility (transfer point) between the Paste Disposal Facility and Beneficiation Plant. The facility is not considered a lagoon, but will be a constructed dam, which will contain runoff contaminated water (which constitutes waste water by the Department of Environmental Affairs (DEA)).	
Project 1: A new Water Containment Facility is planned at the King Plant area to supply the mining operations. Currently water is being supplied via the Parson storage facilities, which in periods hamper capacities when water scarcity arise in the area. With a new Water Containment Facility at the King operation, Khumani can store water for this mining operation specifically and allow for buffer capacities in dry events. The facility will be a concrete tank with a capacity of between 20 000 and 30 000m³. Should clearance be required this will also be less than 1ha of indigenous vegetation.	Less than 1ha	Government Notice 325, Listing Notice 2: • Activity 6: The development of facilities or infrastructure for any process or activity which requires a permit or licence or an amended permit or licence in terms of national or provincial legislation governing the generation or release of emissions, pollution or effluent. This activity is triggered as the proposed dam would require approval of a new water use in terms of Section 21(g) of the NWA.	-	**x**
Project 2 (new infrastructure): Proposed Pipeline from the Paste Disposal Facility Thickener to the Beneficiation Plant Thickener at a volume of approximately 375l/s. Proposed Pipeline from the Parson PCD to the Beneficiation Plant to support the commitment of Khumani to reuse water optimally within the water circuit. The throughput volume is 1 700l/s.	Paste Disposal Facility Pipeline: Approx. 4 200m (Approx. 375l/s) Parson PCD Pipeline: Approx. 3 000m (Approx. 1 700l/s)	Government Notice 327, Listing Notice 1: • Activity 10: The development and related operation of infrastructure exceeding 1 000 meters in length for the bulk transportation of sewage, effluent, process water, waste water, return water, industrial discharge or slimes – o with an internal diameter of 0,36 meters or more; or o with a peak throughput of 120 liters per second or more; excluding where— a) such infrastructure is for the bulk transportation of sewage, effluent, process water, waste water, return water, industrial discharge or slimes inside a road reserve or railway line reserve; or b) (b) where such development will occur within an urban area.	Not Applicable (N/A)	**x**
Project 3:	No new	All the activities for which amendments will be	All the activities for which	**x**

Name of Activity	Aerial extent of the Activity (Ha or m²)	Applicable Listing Notice	Waste Management Authorisation Required	Water Use Licence Authorisation Required (x for yes)
Changes to the approved WUL in terms of the establishment of: • Buffer dams, which will result in a combined capacity of between 100 000m³ and 150 000m³, but as individual dams of no more than 50 000m³; • The inclusion of facilities approved under existing approved Environmental Authorisations, such as Permit 21/2016 and the 2012 Environmental Authorisation; • Increase of the capacity and designs of the Storm Water Dam at the Loadout Facility; • Increase of the capacity and designs of the PCD at the Plant; • Inclusion of additional Braithwaite tanks, such as the duplication of the Braithwaite Water Tank at King.	clearance is required, but the overall approved area in terms of previous Environmental Authorisations (2012 and 2016) is 430ha.	required are approved in existing Environmental Authorisations and have been constructed. Therefore, no clearance activities are applicable. However the amendments to the WUL will trigger the following listed activities: Government Notice 327, Listing Notice 1: • Activity 13: The development of facilities or infrastructure for the off-stream storage of water, including dams and reservoirs, with a combined capacity of 50 000 cubic meters or more. • Activity 34: The expansion of existing facilities or infrastructure for any process or activity where such expansion will result in the need for a permit or licence or an amended permit or licence in terms of national or provincial legislation governing the release of emissions, effluent or pollution,. Government Notice 325, Listing Notice 2: • Activity 6: The development of facilities or infrastructure for any process or activity which requires a permit or licence or an amended permit or licence in terms of national or provincial legislation governing the generation or release of emissions, pollution or effluent. This activity is triggered as the proposed Return Water Dam 3 and additional Buffer Dam would require approval in terms of a new water use (Section 21(g) of the NWA).	amendments will be required are approved and constructed in existing Environmental Authorisations. It is currently not foreseen that additional waste licences will be required.	
Project 3: Regulation 158 amendment for administrative changes and corrections to the approved WUL.	N/A – overall farm portion of about 9000ha, no new construction areas.	A new Water Balance and Storm Water Management Assessment has been completed by the mine and have identified the need to amend certain approved Water Uses based on their throughput and capacities: Government Notice 327, Listing Notice 1: • Activity 13: The development of facilities or infrastructure for the off-stream storage of water, including dams and reservoirs, with a combined capacity of 50 000 cubic meters or more. • Activity 34: The expansion or changes to existing facilities for any process or activity where such expansion or changes will result in the need for a permit or licence or an amended permit or licence in terms of national or provincial legislation governing the release of emissions or pollution". This activity is not considered at this time, but may be required depending on the outcome of consultation with the DWS.	-	**x**

Aim and Motivation of the Project

<u>Project 1: New Return Water Dam 3 and King Water Containment Facility</u>

The mine currently has two return water dams which form part of the Paste Disposal Facility General Arrangements and water circuit. It is the intention of the mine to expand the capacity of storage around the Paste Disposal Facility due to the following reasons:

1. The expansion of the Paste Disposal Facility into its next disposal compartment will require the management of storm water around the area.
2. Additional storage capacity for storm water will be required when Compartment 3B (existing KM02 opencast pit) is commissioned as a paste storage compartment.
3. The initial intention of sourcing water from the groundwater aquifers to supplement water supply in periods when the Sedibeng Water Supply Scheme cannot provide water have been placed on hold, due to concerns raised by the surrounding landowners regarding water scarcity in the catchment, and the opportunity for the mine to firstly consider optimising its internal water circuit.
4. The new Return Water Dam 3 will also ensure legal compliance (i.e. GN 704 etc.).
5. The additional dam, Return Water Dam 3, will ensure that water can be optimally stored in the area and pumped to the Beneficiation Plant.

As mentioned before, a new Water Containment Facility is planned at the King Plant area to supply the mining operations. Currently water is being supplied via the Parson storage facilities, which in periods hamper capacities when water scarcity arise in the area. With a new Water Containment Facility at the King operation, Khumani can store water for this mining operation specifically and allow for buffer capacities in dry events. The capacity of the facility and the design of the facility are as yet not available, but will be less than 50 000m³. Should clearance be required this will also be less than 1ha of indigenous vegetation.

Project 2: Pipelines Project (including associated pumping infrastructure)

Khumani's only source of water supply is that of the Sedibeng Water Supply Scheme via the Vaal/ Gamagara Pipeline. For this reason it is pertinent for the mine to ensure that there is sufficient infrastructure on site to optimise water reuse within the process water circuit, as well as to allow for buffer storage capacity in periods when this pipeline scheme is not operational or supply lower volumes of water.

The additional pipeline to transport water to and from the Paste Disposal Facility is merely an upgrade and improvement of the existing mine water circulation system. The mine experiences blockages on the system due to the high density of the slurry pumped. For this reason the additional Paste Disposal Facility Return Water Pipeline will not only assist in transporting water during technical constraints on one line, but will also allow for an increase in pumping volume during periods of high rainfall events.

The Water Balance of Khumani and approved WUL requires Khumani to reuse water optimally in the circuit. The volumes of water currently being received in the Parson PCD cannot be pumped optimally to the Beneficiation Plant due to the infrastructure constraints. Through the additional pipelines and upgrades to the pumping infrastructure, the mine will have the opportunity to return more water from the dams to the process circuit. For this reason an upgrade to the pumping system at the Parson PCD and increase to the Parson PCD Pipeline from the Parson PCD to the Beneficiation Plant is required.

Project 3: WUL Amendment

The mine has an approved WUL, dated 2013 which repealed the 2008 WUL. Upon receipt of this WUL, the mine has requested various amendments to the WUL. The DWS presented the mine with a formal letter of rejection (dated 7 August 2017) which pertained to the amendment application submitted on 4 September 2013 (10/D41J/BCJ/2122; 21/11/2008 and 719242). The reasons for the rejection are related to the following:

- The Department cannot trace the administrative mistakes;
- The Department was unable to source the relevant application documents from DWS Head Office;
- The Department was unable to source the comments from DWS Head Office; and
- Some of the requested amendments were viewed by the Department as upgrades and not administrative mistakes.

In addition to the above, the mine has applied for a new WUL for the Mine Residue Facilities on Bruce, King, Mokaning and Parson farms, approved in terms of Permit 21/2016 (whereby the Bruce Low Grade ROM Stockpile expansion and the Parson Discard Dump expansion, amongst others, are approved). This application was submitted by GCS (Pty) Ltd during 2016. The DWS instructed the mine to resubmit the 2016 application as designs of the facilities were still outstanding, with the amendments required.

As mentioned before, the initial intention of sourcing water from the groundwater aquifers to supplement water supply in periods when the Sedibeng Water Supply Scheme cannot provide water have been placed on hold, due to concerns raised by the surrounding landowners regarding water scarcity in the catchment, and the opportunity for the mine to firstly consider optimising its internal water circuit. The mine has, as a commitment to stakeholders, engaged with a hydrologist to reassess the Water Balance and Storm Water Management system on site. This study has identified the following additions:

- Construction of additional activities (Return Water Dam 3, additional, formal Buffer Dam, etc.);
- Increase in the capacity of approved water containment facilities (such as the Parson Plant PCD); and
- Optimising pumping throughput through containment facilities, due to the rerouting of water in the system; etc.

All of the Section 21g activities, approved in EMPr's and constructed on site, but still to be included into the WUL are presented in the following table.

Original WUL Name	2018 Name	Water Activity
Parson Load Out		
Parsons Load out sewerage works	Parson Load Out WWTW (Biofilter)	Untreated sewerage from load out office for treatment
Parsons Discard sewerage works	Parsons Discard sewerage works	Untreated sewerage from discard office for treatment
Parsons Blasting storage sewerage	Parsons Blasting storage sewerage	Untreated sewerage from silo's offices for treatment
Load Out Dust Suppression Tanks	Load Out Dust Suppression Tanks	
Low grade Stockpile	Discard Low Grade Stockpile	Waste rock from the plant
Extension of Low-Grade Stockpile		
Low-Grade Tertiary By-pass Stockpile	Low-Grade Tertiary By-pass Stockpile	
Parson Plant		
Parsons Sewerage works	Mine Office Sewage Treatment Plant	Untreated sewerage from Parsons offices for treatment
Parson HO sewerage works	HO Sewage Treatment Plant 1	Untreated sewerage from discard office for treatment
Parson HO sewerage works 2	HO Sewage Treatment Plant 2	
Parsons Off grade sewerage works	Offgrade Sewage Treatment Plant	Untreated sewerage from off grade change house for treatment
Parsons Fire Station Sewerage works	Parson Fire Station WWTW (Biofilter)	Untreated sewerage from Parsons offices for treatment
Buffer Storage Dam 1	Buffer Storage Facility	Recycled Process Water
Buffer Storage Dam 2		Recycled Process Water
Buffer Storage Dam 3		
Parsons Thickener Phase 2 (Primary Thickener 1)	Primary Thickener Circuit	Wash water from process plant into thickener for separation purposes
Primary Thickener 2		
Plant Process Water Dam	Plant Process Water Dam	Decant from thickener
Kin/Mokaning		
Decant Dam	RWD2	Overflow from Paste Disposal RWD stored in decant lined dam
RWD 3	RWD3	Overflow from Paste Disposal RWD stored in decant lined dam
King dust suppression	King dust suppression	Dust suppression
Mokaning dust suppression	Mokaning dust suppression	Dust suppression
King Plant sewerage	King Plant WWTW (Biofilter)	Untreated sewerage from King plant for treatment
King Workshop sewerage	King Workshop WWTW (Biofilter)	Untreated sewerage from King plant for treatment
Backfill	Pit KM01	Opencast pit rehabilitation
Bruce		
Bruce plant area Sewerage works	Bruce Plant WWTW (Biofilter)	Untreated sewerage from Bruce office for treatment
Bruce Dust Suppression	Bruce Dust Suppression	Dust suppression with storm water
Backfill	Pit BA	Opencast pit rehabilitation
Backfill	Pit BB	Opencast pit rehabilitation
Backfill	Pit BC	Opencast pit rehabilitation

Alternatives Considered

The projects presented are located within the existing Mining Area. The activities considered in this application are linked to approved and established sites and therefore no property alternatives or location alternatives are relevant.

Project 1: New Return Water Dam 3 and King Water Containment Facility

Increasing the capacity of the existing Return Water Dam 1 was considered. The operation received an updated WUL (Reference 10/D41J/BC1J/2122) for Section 21(a), Section 21(c) & (i), Section 21(g) and Section 21(j) water uses on 16 March 2013. One of the activities approved in the 2013 WUL, is the Paste Disposal Decant Dam (i.e. Surge Dam/ Return Water Dam 2). This activity is approved as the Decant Dam (Activity 8 on page 18 of the WUL).

The current capacity of the facility is 49 000m³ (approved at 1 152 094m³/a disposal). The initial intention of the mine was to expand the capacity of this dam. The expansion would have resulted in an increase in the capacity of the facility to about 180 000m³. The concern was the large storage capacity in one facility close to the Paste Disposal Facility. The mine therefore initiated the investigation of optimising pumping capacities to and from the Paste Disposal Facility and as a result identified the opportunity to construct a smaller facility up gradient of the Return Water Dam 2, which will aid in the water storage management around the Paste Disposal Facility. For this reason the development of Return Water Dam 3 was considered as a more suitable alternative based on the management of the facilities (water volume storage) and the pumping of water between facilities, as well as safety considerations on the facility.

As mentioned before, Khumani has been operational since 2007. The mine has been investigating measures to optimise water management on site due to the fact that groundwater resources are mostly dewatered in the operational areas of the mine as a result of surrounding mining activities. Water supply is purchased at high costs from the Sedibeng Water Supply Scheme via the Vaal/ Gamagara Pipeline, which is the main source of water supply to not only the mine, but also the surrounding towns, farmers and communities.

As a result, the mine has identified various projects to aid in optimising the internal water circuit, which relates to the proposed Return Water Dam 3 and new pipeline infrastructure.

In terms of the King Water Containment Facility, the design considered ranged between a civil constructed (excavated) dam and a concrete tank facility. The final outcome is the construction of a concrete tank, which will allow for proper water management and a reduction in evaporation.

The only alternative to consider would be to operate in terms of the status quo, which presents water constraints during four months of the year (October to January) when the Sedibeng water supply is not consistent, or to apply for the use of groundwater, which has raised concerns during initial consultation processes in 2017.

Project 2: Pipelines Project

No alternatives are applicable as the pipelines are designed in line with the current infrastructure design successfully utilised on site and according to the required throughput capacities identified as part of the hydrological study.

Project 3: WUL Amendment

No alternatives are applicable, as the activities in question are already established, and/or approved in terms of Environmental Authorisations. No technological alternatives are relevant to the three projects, with the exception of evaporation control measures in the determination of storage capacities on site.

As mentioned before, the mine experiences periods of water shortages from October to January, which result in plant shut-downs and economic losses. The proposed solution to reduce plant shut-downs due to water shortages involves increasing the capacity of Sedibeng or process water stored on the mine. Extra storage on the mine will insulate the Parson Plant from unstable Sedibeng water supply and King returns. The current storage volumes have been shown to be inadequate and result in approximately 10% lost production hours.

At current production targets, this loss can be made up by various methods to allow for production targets to still be met.

Two sets of abstractions were analysed – a high abstraction peaking at 480m³/day (20m³/hr) during the typical high flow months, and a low abstraction peaking at 360m³/day (15m³/hr) during the typical high flow months.

In addition to the two abstraction scenarios, the effect of evaporation reduction on the additional water storage reservoir was analysed. It is assumed that no evaporation protection is added to other water reservoirs on the mine. The effect of a 70% evaporation reduction and no evaporation reduction was analysed. Evaporation reduction methods are described in Section 1.g.iv.5.b of this report.

Application and Consultation Process

The NEMA EIA Application was submitted to the Department of Mineral Resources (DMR) on 2 October 2018, by hand (courier). This application was acknowledged by the DMR via an email dated 1 November 2018, with the application acknowledged to have been received by the Department on 16 October 2018. At the time of the email confirmation on 1 November 2018, the DMR system thus stated that the application have been received 16 days prior. In terms of the 2014 NEMA EIA Regulations, as amended, it is understood that the competent authority must acknowledge receipt of all applications and documents contemplated in Regulations 16, 19, 21, 23, 29, 31 and 34 within 10 days of receipt thereof and for this reason the Environmental Authorisation process has continued to comply with the regulatory timeframes.

In terms of stakeholder consultation the following were undertaken:

- A project notification was sent to all stakeholders on the current Khumani Stakeholder Database;
- In accordance with Government Notice Regulation (GNR) 982 Section 41(2)(a-b) of Chapter 6, as amended, a site notice was developed (in both Afrikaans and English) and placed at four locations in order to inform surrounding communities and adjacent landowners of the proposed project. The site notices were placed on 22 August 2018 and at visible locations close to the site.
- In accordance with GNR 982 41(2)(c) of Chapter 6, as amended, an advertisement was placed in both the Diamond Fields Advertiser and the Kathu Gazette. The advertisement was placed in both Afrikaans and English in the aforementioned newspapers on 29 August 2018 and 1 September 2018 respectively.
- The Scoping Report was made available for public review for a period of 30 days from **16 October 2018**. Note that any comments received up until the EIA Phase will be considered for inclusion into the Final EIA Report.
- The Final Scoping Report was submitted to the DMR on 19 November 2018

To date the following comments have been raised as part of pre-consultation with authorities:

NO.	THEME: GENERAL COMMENTS / ISSUES			
	ISSUE RAISED	**DATE AND HOW ISSUE WAS RAISED**	**COMMENTATOR**	**RESPONSE**
1	Clarification on the inclusion of water uses. The DMR raised their uncertainty regarding their responsibility of approving water uses.	1 November 2018 email and telephonic conversation between EnviroGistics and the DMR (refer to Annexure 4).	Mr. Johannes Nematatani	Ms. Bekker informed the DMR that the new Return Water Dam and King Water Containment Facility (Project 1) would require a WUL and that a Water Use Licence Application (WULA) is also being undertaken as part of the application processes. This application is being considered by the DWS, Kimberley. Initial meetings have commenced between the applicant and the DWS during 2017. Project 1 involves new developments and therefore certain listed activities are triggered in terms of the EIA Regulations, including Government Notice 325, Listing Notice 2: • Activity 6: The development of facilities or infrastructure for any process or activity which requires a permit or licence or an amended permit or licence in terms of national or provincial legislation governing the generation or release of emissions, pollution or effluent. Project 3 does not trigger any Listed Activities in terms of construction, development or changes in approved footprints, but merely the amendment of the throughputs and capacities of existing facilities, as well as the inclusion of water uses which were previously included into the 2016 WULA, but not as yet finalised. However, the following listed activity is being applied for in terms of the EIA Regulations Government Notice 327, Listing Notice 1: • Activity 34: The expansion of existing facilities or infrastructure for any process or activity where such expansion will result in the need for a permit or licence or an amended permit or licence in terms of national or provincial legislation governing the release of emissions, effluent or pollution,.
2	The DMR stated in an email: "Please kindly note that DMR does not receive any application by hand. All applications are submitted	1 November 2018 via email.	Mr. Johannes Nematatani	In order to ensure that the Environmental Authorisation process in question is undertaken in terms of the law and associated regulatory requirements, it is the duty of the appointed Environmental Assessment Practitioner (EAP) to

NO.	THEME: GENERAL COMMENTS / ISSUES			
	ISSUE RAISED	**DATE AND HOW ISSUE WAS RAISED**	**COMMENTATOR**	**RESPONSE**
	when they are successfully uploaded on the [South African Mineral Resources Administration System] SAMRAD online system of the Department. Attached is the proof of application which indicates the date of application." "			follow the stipulated regulations. In terms of the NEMA Regulations: **"receipt"** means receipt on the date indicated- (a) on a receipt form if the application or document was hand delivered or sent via registered mail; (b) in an automated or computer generated acknowledgment of receipt; (c) on an acknowledgement in writing from the competent authority as the date of receipt if the application or document was sent via ordinary mail; or (d) on an automated or computer generated proof of transmission in the case of a facsimile message; **Regulation 3(6) of the EIA Regulations -** The competent authority **must acknowledge receipt of all applications** and documents contemplated in regulations 16, 19, 21, 23, 29, 31 and 34 within 10 days of **receipt** thereof. **Regulation 17** - Upon **receipt of an application**, the competent authority must check whether the application…**Regulation 21(1) -** The applicant **must, within 44 days of receipt of the application by the competent authority**, submit to the competent authority a scoping report which has been subjected to a public participation process of at least 30 days and which reflects the incorporation of comments received, including any comments of the competent authority. For these reasons, and to ensure the integrity of the application process, the EAP will ensure to comply with the regulated stipulations in terms of the EIA Regulations.
3	Pre-consultation meetings with the DWS regarding the required process to be undertaken for the WULA.	Meeting: 22 August 2017 Meeting: 22 February 2017	Adeyileka Esther Thivhonali K Tlonae F A Magomono Philani Msimango	The 2016 WULA is still open. The applicant was requested by the DWS to resubmit this application with the amendments required on the approved 2013 WUL. During the meeting of 22 February 2018, the applicant was instructed to submit a combined WUL application for all amendments and new water use activities. The WULA process is currently in planning phase, with the development of an overall Water Balance. Once the Water Balance has been finalised, the water uses applied for will be considered in line with this and amendments will be applied for. All new water uses, will also be applied for and part of this overall integrated WULA.
4	The proposed activities require a water use authorisation from the DWS in terms of Section 40 of the NWA. The proposed activities could trigger a Section 21(g) water use and an application for exemption from GN 704 may be required. It is advised that the water use authorisation be applied for and obtained prior to commencement of the proposed project activities. A pre-consultation meeting and site inspection has to be arranged with the DWS to advise on the water uses that are triggered.	27 November 2018, based on letter received from the DWS	DWS – FA Magonono	A WULA will be undertaken for the proposed activities. Initiation meetings have already be undertaken during 2017, and will be undertaken again once the water uses are finalised. No new river crossings will be undertaken by the project and therefore a Section 2(c) and (i) is not required. Design drawings will be submitted with the WULA – Geo Tail (Pty) Ltd has been appointed to undertake the design drawings. A detailed Water Study has been commissioned and is attached this this report. All wastes are disposed of in line with the mine's NEM:WA Waste Management License. Hazardous waste is also disposed of by a licensed waste disposal company. No prospecting activities will be undertaken as part of this project.

NO.	THEME: GENERAL COMMENTS / ISSUES			
	ISSUE RAISED	**DATE AND HOW ISSUE WAS RAISED**	**COMMENTATOR**	**RESPONSE**
	Should the pipelines cross any water resources a Section 21 (c) and (i) must be applied for. Design drawings and an engineering report for the proposed construction of the Return Water Dam and pipelines must be submitted with the WUL. A Storm Water Management Plan, Geohydrological report, and a Rehabilitation Plan Public Participation must form part of the WUL application documents. The EMPr must clearly show the methods for collecting, storing and transporting and finally disposing of all waste products produced. Disposal of slimes from drilling during prospecting should be disposed of in terms of the NEM:WA. The disposal of general and hazardous waste must be carried out in an environmental safe way. The EMPr must clearly identify all risks that are association with the project. The EMPr must clearly show a responsibility matrix and organogram of the responsible persons for implement mitigation measures and reporting lines.The DWS has no objections to this activity, provided that the applicant has provided proof of adherence to the above mentioned recommendations.			A detailed impact and risk assessment is presented in Table 35 to Table 39 with the responsible persons indicated.
5	As the proposed development is undergoing an EA Application process in terms of the National Environmental Management Act, 107 of 1998 (NEMA), NEMA Environmental Impact Assessment (EIA) Regulations, it is incumbent on the developer to ensure that a Heritage Impact Assessment (HIA) is done as per section 38(3) and 38(8) of the National Heritage Resources Act, Act 25 of 1999 (NHRA).	15 November 2018, based on letter received by the SAHRA.	SAHRA – Natasha Higgitt	The activities in question will be undertaken in areas already disturbed by the mine. A detailed heritage assessment was undertaken for the overall mine during February 2005 by David Morris. A second Heritage and Paleontological Study was undertaken on the King Farm by HCAC (May 2017). The areas where activities are therefore planned has been assessed by Heritage Specialists and an additional study will be a duplication of the information already available. Please refer to Annexure 6 for a copy of the two studies undertaken in the past.

Key Findings from the EIA and EMPr

The aspects of the project assessed in the EIA phase are those considered by the Environmental Assessment Practitioner (EAP) as having the potential to result in environmental and social impacts.

Geo Tail (Pty) Ltd (Bruce Randall) has been appointed to conduct the assessment of water management on site and to update the Water Balance and Storm Water Management Plan. The Storm Water Management Plan is presented as an annexure to this report, with the final Water Balance still being completed.

Commenting authorities received hard copies the Draft Scoping Report and will receive hard copies of the Draft EIA Report. No comments have been received during the Scoping Phase to date. All comments received from the authorities in the phases to follow, will be provided to the DMR for considerations.

The followinginformation is provided in the EIA Report:

- Impact assessment undertaken and results thereof;
- Management measures;
- Monitoring plans; and
- Closure objectives.

Below, please find a summary of the key findings pertaining to the environmental authorisation application based on the outcomes of the specialist investigations:

Other Licence Requirements

A Water Use Licence Application (WULA) has not yet been submitted. A WULA will be submitted prior to the commencement of implementation of the projects for which authorisation is being applied for. Khumani has a WUL in place, however an updated WULA to include the amendments to existing infrastructure and the construction of new infrastructure has not yet been submitted. A WULA will be submitted prior to the commencement of the proposed project. No activities will be undertaken without the necessary approvals.

The WULA will be an update of the overall mine WUL to correct all changes and administrative errors. For this project, the following activities may trigger water uses as indicated:

- Section 21(b) for the storage of water;
- Section 21(c)&(i) for water uses which have been approved in terms of the Permit 21/2016 (under which infrastructure such as the Bruce Low Grade ROM Stockpile expansion and the Parsons Discard Dump expansion have been approved); and
- GN 704 exemption for the approved backfilling of opencast pits, but also for the use of waste rock in the construction of safety berms, surfaces and embankments, as well as the storage of storm water and process water in the Process Water Dams (such as on Parson).

Section 21(g) for the construction of the Return Water Dam 3, additional Buffer Dam, King Water Containment Facility and various water uses previously not included in the WUL (such as sewage treatment facilities below NEMA thresholds).

Main Impacts Identified:

- Unlawful or incorrect construction of the Water Management infrastructure.
- The area where the Return Water Dam 3 is planned is characterised by underlying dolomites. The mine is continuously monitoring movement of strata in this area.
- The Return Water Dam 3 and other water management activities or facilities are planned in terms of overall water management on site. The construction activities should have no impact on the Socio-Economic Setting in which the mine is located.
- Release of Contaminated Water into the environment is unlikely as the water facilities (current and new) are located within the overall dirty water system. The changes to water management due to the construction of the facility (Return Water Dam 3) could however impact on the integrity of the existing system.
- The establishment of alien and invasive plant species.
- Damage to the existing liners or incorrect upgrades (not in line with approved designs) of the facilities lead to groundwater pollution.
- Construction activities and material movement may temporarily result in dust dispersion.
- The activities are located within the mining boundary, in proximity to the current Parson and Bruce Plants. An increase in construction activities around existing water containment structures, could lead to an increase in noise levels in the area.
- The unmanaged disposal of waste, could result in the spread of invader species, as well as the influx of opportunistic species.
- Contamination of soils as a result of a lack of sanitary services.
- No further impact is foreseen as the area where the pipelines are planned are located within the existing buffer in which pipelines are located to and from the Paste Disposal Facility. However the construction phase may involve the use of hydrocarbons in the establishment of the pipeline structures. Vehicle movement in the area could also lead to soil contamination if not well managed. The presence of people in this area could lead to an increase in littering.

Main Management Measures:

- A legal assessment of all activities and future planned activities must be undertaken annually to ensure that all activities are authorised.

- All legally appointed personnel responsible or involved in water use activities and activities associated with the Environmental Authorisations on site must receive training on the requirements of the Environmental Authorisations and relevant Environmental Legislation.
- Early consultation must be undertaken with the South African National Roads Agency Limited (SANRAL) to determine whether there are any specific requirements in the establishment of the additional pipeline within the existing culvert under the N14.
- The Standard Operating Practices (SOP) and/or Contactors SOP for the establishment of the pipeline within the road reserve must be compiled.
- A Code of Practice (COP) must be developed during the construction phase for the operation of the water storage facilities and all existing, approved mine residue facilities in line with the overall water conservation and management requirements as identified in the Water Studies by Geo Tail (Pty) Ltd or subsequent approved amendments thereto.
- An Emergency Preparedness Plan must be developed for any incident which may occur around the Paste Disposal Facility which may impact the integrity of the Facility itself, as well as the existing Return Water Dams.
- Quarterly internal audits on the lawful implementation of the Environmental Authorisation must be undertaken during the construction phase, where after biannual audits can be undertaken once construction has been completed.
- A copy of the WUL must be available on site at all times for all Section 21 water uses.
- No development activities may take place within the 1:100 year flood line of the Gamagara River.
- The Return Water Dam 3 footprint must be clearly demarcated.
- The Return Water Dam 3 must be constructed in terms of detailed designs signed off by a Registered Engineer and the on-site Geologist.The approved design drawings must be available on site at all times.
- A suitably qualified engineer must be appointed to construct and/or oversee the construction of the Return Water Dam 3 and any other water containment facilities as stipulated in the EMPr.
- A COP must be developed during the construction phase for the operation of the Return Water Dam 3.
- As built drawings must be submitted to the DWS and DMR upon completion of the facility.
- All WUL requirements must be adhered to in terms of the construction of the Return Water Dam 3.
- The upgrades and amendment to the approved water uses must be undertaken in terms of detailed designs signed off by a Registered Engineer.
- The King Water Containment Facility will be constructed as a tank system and not an excavated dam.
- Ongoing monitoring of movement around the Paste Disposal Facility must continue.
- The Return Water Dam 3 must be constructed in terms of detailed designs signed off by a Registered Engineer and the on-site Geologist.
- An effective liner system should be implemented to ensure that no seepage from the facility occurs.
- Underdrainage systems must be in place to monitor the presence of seep.
- Evaporation controls should be implemented on the existing Process Water Dam at theBeneficiation Plant and the Buffer Return Water Dams.
- Chemical toilets must be readily available to employees where permanent infrastructure is not available.
- Licensed companies must be appointed to remove any contaminated material and or wastes to licensed landfill sites.
- An alien and invasive plant species eradication programme must be developed and implemented to eradicate alien and invasive plants and to prevent new invasions during the ongoing mining operation.
- In terms of revegetation, if natural succession of vegetation is not established within one rainy season after commencement of rehabilitation, the disturbed areas and areas adjacent to the infrastructural areas must be re-vegetated with an indigenous grass mix, if necessary, to re-establish a protective cover and to minimise soil erosion and dust emission.
- In the event that new areas, previously not altered due to mining activities, are impacted by the proposed projects, an ecological walk-over study must be undertaken to determine whether any protected or sensitive species are present. If such species are present, the required permits must be obtained.
- Dedicated waste handling areas must be developed and the spread of waste and access to rodents and opportunistic species prevented.
- Clean and dirty water separation systems should be upgraded in terms of the Water Studies undertaken by Geo Tail (Pty) Ltd.
- Measures should be implemented during the construction phase to ensure that excess silt is contained and not released into the water management area and thereby hampering its GN 704 compliance in terms of capacity and freeboard.
- Maintenance of all Storm Water Management systems must be undertaken regularly on site.
- Groundwater monitoring must continue in line with the requirements of the approved WUL.

- The current air quality monitoring stations that determine fallout must be maintained and respirable dust (PM10) monitoring that could arise from the mining activities must be maintained.
- Implement dust suppression in and around the construction area where required.
- Vehicles and machinery must be regularly maintained. Maintenance programmes will be established and implemented.
- Storage of fuels and oils, the refuelling of vehicles and equipment maintenance must be limited to designated, bunded areas (bunds to be 110% of volume of the materials stored).
- Chemicals and hazardous material must be stored in suitable containers, fit for purpose and in line with Safety Data Sheet (SDS) requirements.

Gaps

In each of the specialist reports included in Annexure 6, the relevant assumptions and gaps in knowledge have been listed. None of the assumptions listed resulted in uncertainty in terms of the outcomes of the specialist studies and therefore the EAP is confident that the management measures presented in this report will be suitable for achieving the environmental objectives.

Financial Provision

The amount that is required to both manage and rehabilitate the environment, associated with the three (3) projects in question in respect of rehabilitation is R53 892.84 (excluding VAT).

Environmental Impact Statement

The project in question is a Water Management Improvement project. The overall aim of the three (3) individual projects is to optimise water usage on site, and thereby limiting constraints on the existing Sedibeng Water Supply Scheme over time.

It is the opinion of the EAP that this EIA and EMPr provides the necessary and relevant information required in order to implement the principles of Integrated Environmental Management so as to ensure that the best long-term use of the soil, ecological and aquatic resources in the project area will be made in support of the principle of sustainable development. Recommendations made by the EAP and specialists have been considered favourably by the applicant and the final project plan has incorporated these recommendations.

If the proposed management and mitigation measures are not properly applied or if the applicant intentionally disregards any of these measures, it will negatively affect the environment and have potential consequences and for this reason it is important that the recommendations for conditions for inclusion as presented in Section**Error! Reference source not found.** be included should the Environmental Authorisation be considered favourably by the Competent Authority.

No fatal flaws based on the final layout have been identified.

It is recommended that, the proposed development be considered **favourably** provided that the recommended management measures for the identified impacts, monitoring requirements and auditing protocols are adhered to.

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mineral resources
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REPUBLIC OF SOUTH AFRICA

PART A

ENVIRONMENTAL IMPACT ASSESSMENT REPORT

And

ENVIRONMENTAL MANAGEMENT PROGRAMME REPORT

DMR REFERENCE NUMBER: NC30/5/1/2/3/2/1/070

SUBMITTED FOR ENVIRONMENTAL AUTHORISATIONS IN TERMS OF THE NATIONAL ENVIRONMENTAL MANAGEMENT ACT, 1998 AND THE NATIONAL ENVIRONMENTAL MANAGEMENT WASTE ACT, 2008 IN RESPECT OF LISTED ACTIVITIES THAT HAVE BEEN TRIGGERED BY APPLICATIONS IN TERMS OF THE MINERAL AND PETROLEUM RESOURCES DEVELOPMENT ACT, 2002 (MPRDA) (AS AMENDED).

NAME OF APPLICANT:	**Assmang (Pty) Ltd: Khumani Iron Ore Mine**
TEL NO:	**+27(0) 53 372 8000**
FAX NO:	**+27(0) 53 723 8599**
POSTAL ADDRESS:	**Private Bag X 503, Kathu, Northern Cape**
PHYSICAL ADDRESS:	**Khumani Iron Ore Mine, 15km south of Kathu along the N14**
FILE REFERENCE NUMBER SAMRAD:	**Mining Right Reference Number: NC30/5/1/2/3/2/1/070**

IMPORTANT NOTICE

In terms of the Mineral and Petroleum Resources Development Act (Act 28 of 2002 as amended), the Minister must grant a prospecting or mining right if among others the mining "will not result in unacceptable pollution, ecological degradation or damage to the environment".

Unless an Environmental Authorisation can be granted following the valuation of an Environmental Impact Assessment and an Environmental Management Programme report in terms of the National Environmental management Act (Act 107 of 1998) (NEMA), it cannot be concluded that the said activities will not result in unacceptable pollution, ecological degradation or damage to the environment.

In terms of section 16(3)(b) of the EIA Regulations, 2014, any report submitted as part of an application must be prepared in a format that may be determined by the Competent Authority and in terms of section 17 (1) (c) the competent Authority must check whether the application has taken into account any minimum requirements applicable or instructions or guidance provided by the competent authority to the submission of applications.

It is therefore an instruction that the prescribed reports required in respect of applications for an environmental authorisation for listed activities triggered by an application for a right or permit are submitted in the exact format of and provide all the information required in terms of, this template. Furthermore please be advised that failure to submit the information required in the format provided in this template will be regarded as failure to meet the requirements of the Regulation and will lead to the Environmental Authorisation being refused.

It is furthermore an instruction that the Environmental Assessment Practitioner must process and interpret his/her research and analysis and use the findings thereof to compile the information required herein. (Unprocessed supporting information may be attached as appendices). The EAP must ensure that the information required is placed correctly in the relevant sections of the Report, in the order, and under the provided headings as set out below, and ensure that the report is not cluttered with un-interpreted information and that it unambiguously represents the interpretation of the applicant.

OBJECTIVE OF THE ENVIRONMENTAL IMPACT ASSESSMENT PROCESS

The objective of the environmental impact assessment process is to, through a consultative process—

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

(b) Describe the need and desirability of the proposed activity, including the need and desirability of the activity in the context of the preferred location;

(c) identify the location of the development footprint within the preferred site based on an impact and risk assessment process inclusive of cumulative impacts and a ranking process of all the identified development footprint alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects of the environment;

(d) Determine the—-

(i) Nature, significance, consequence, extent, duration and probability of the impacts occurring to inform identified preferred alternatives; and

(ii) Degree to which these impacts—

(aa) can be reversed;

(bb) may cause irreplaceable loss of resources, and (cc) can be avoided, managed or mitigated;

(e) Identify the most ideal location for the activity within the preferred site based on the lowest level of environmental sensitivity identified during the assessment;

(f) Identify, assess, and rank the impacts the activity will impose on the preferred location through the life of the activity;

(g) Identify suitable measures to manage, avoid or mitigate identified impacts; and

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

(i) identify suitable measures to avoid, manage, or mitigate identified impacts and to determine the extent of the residual risks that need to be managed and monitored. _____

PART A

SCOPE OF ASSESSMENT AND ENVIRONMENTAL IMPACT ASSESSMENT REPORT

The application for the Environmental Authorisation Process was submitted to the Department of Mineral Resources (DMR) on 2 October 2018. An official letter of acknowledgement from the DMR has to date not been received from the DMR, although an email confirmation was received on 1 November 2018 No official response in terms of the Final Environmental Scoping Report (ESR) has been received, but a commitment by the DMR to provide such feedback was received on 4 December 2018.

Please refer to Annexure 1 for the submitted application form and proof of submission.

1 CONTACT PERSON AND CORRESPONDENCE ADDRESS

1.a Contact Person and Correspondence Address

1.a.i Details of the Environmental Assessment Practitioner (EAP)

Table 1: Details of EAP

Name	Tanja Bekker
Designation	Environmental Assessment Practitioner
Postal Address	PO Box 22014, Helderkruin, 1733
Physical Address	21 Gladiolus Street, Roodekrans, 1724
Telephone Number	+27 (0) 82 412 1799
Cell Phone Number	+27 (0) 82 412 1799
Fax Number:	+ 27 (0) 86 551 5233
Email Address	tanja@envirogistics.co.za

1.a.ii Expertise of the EAP

The following table presents a summary of the EAP's experience:

Table 2: Experience of EAP

Name	Position	Qualification	Professional Registrations	Experience
Tanja Bekker	Principal Practitioner	M.Sc. Environmental Management (RAU), now Johannesburg University)	Certified member of the Environmental Assessment Practitioners of South Africa (October 2013) Registered with the South African Council of National Scientific Professions (SACNASP: Pr.Sci.Nat. Reg No. 400198/09) Member of International Association of Impact Assessors (IAIA) Member of the Environmental Law Association of South Africa	17 Years

Please refer to Annexure 2 for the EAPs Curriculum Vitae.

Education

B.Sc. Earth Sciences (Geography & Geology) – RAU (University of Johannesburg)
B.Sc. Geography Honours - RAU (University of Johannesburg)
M.Sc. Environmental Management - RAU (University of Johannesburg)

Career Enhancing Courses

ISO 14000 Lead Auditors Course (WTH Management)
Certificate in Project Management (Pretoria University)
Management Advance Programme (MAP 81) (Wits Business School)

Professional Affiliations

Certified member of Environmental Assessment Practitioners Association of South Africa
Certified ISO 14001 Environmental Management System Auditor
Registered as a Professional Natural Scientist,
Member of the South African affiliate of the International Association for Impact Assessment
Member of the Environmental Law Association of South Africa (ELA).

Summary of the EAP's past experience

Ms. Bekker is registered as a Professional Natural Scientist in the field of Environmental Science with the South African Council for Natural Scientific Professions (SACNASP) Board and is also a Certified Environmental Assessment Practitioner (EAP) with the Interim Certification Board of Environmental Assessment Practitioners of South Africa (EAPSA), a legal requirement stipulated by NEMA. She is further certified as an ISO 14001 Lead Auditor. Her qualifications include BSc. Earth Sciences (Geology and Geography), BSc. Hons. Geography, and MSc. Environmental Management. In addition to these tertiary qualifications, she obtained a Certificate in Project Management, and completed the Management Advancement Programme at Wits Business School.

With more than 17 years' working experience in environmental management and the consulting industry and managing various Large Account Clients, she understands the South African Regulatory System, and can advise clients with due diligence on their environmental regulatory requirements and offer a solution driven service to their project life cycle. She is equipped with exceptional project management and coordination skills, which especially enhances the service she offers clients within the environmental permitting system.

Her key focus is environmental management and compliance with extensive experience in the mining industry. Project Management and Coordination of projects form a critical component of her duties, which include project planning, initiation of projects, client, authority and stakeholder consultation, specialist coordination, budget control, process control, quality control and timeframe management. Her interest lies in a client advisory capacity, being involved during due diligence investigations, pre-project development and assisting the client and engineering team in adding value to develop the project in an environmentally sustainable manner, considering client costs and liabilities, as well as considering the implication of environmental authorisation conditions and requirements on project deliverables. Her involvement in projects has spanned over the project life cycle from Due Diligence Investigations, Pre-Feasibility Investigations, Prospecting Right Applications, Mining Right Applications, Environmental Reporting and implementation and auditing of Environmental Management Plans and Authorisations.

1.a.iii Details of the Applicant

Khumani Iron Ore Mine (hereafter referred to as “Khumani” or “the mine”), located near Kathu in the Northern Cape Province, is owned by Associated Manganese Mines of South Africa Limited (“Assmang”).

Khumani has an approved Mining Right, granted by the Department of Mineral Resources (hereafter referred to as the “DMR”) in January 2007 for activities associated with the mining of iron ore. Khumani comprises four (4) farms, namely Parson 564 (including Police Camp 692) (Portions RE, 2, 8 and 9), King (Portion RE), Bruce 544 (Portion RE) and Mokaning 560 (Portions 0, 1, 2, 3, and 4), hereafter referred to as “Parson”, “King”, “Bruce” and “Mokaning” respectively.

The Mining Right is located over portions of the farms King, Bruce and Mokaning. The overall mining area, however, also includes the farm Parson, where the plant infrastructure, product and low grade stockpiles, an explosives magazine and main offices are situated. The farm Parson does not form part of the mining right and therefore no mining activities are undertaken over this farm.

Construction activities at Khumani commenced during June 2006, with an environmental approval in terms of the Environment Conservation Act, 1989 (Act No. 73 of 1989) (hereafter referred to as the “ECA”), while operational activities on the farm Bruce commenced during May 2007.

Khumani is an opencast Iron Ore Mine and is classified in terms of the DMR as a Primary Risk Class: A, which relates to the mining of base metals (including Iron Ore) for a Large Mining Operation, which includes a mine, mine waste, plant and plant waste.

The mining operations include opencast mining operations, within seven (7) Opencast Pits, from where the Run of Mine (ROM) is trucked to a primary crusher and transported via conveyor to the secondary and tertiary crushers, with the latter located at the Beneficiation Plant on the farm Parson. Material is washed and screened in the Beneficiation Plant, where the final product is stockpiled for rail transport to either Saldanha for export (via the OREX Line) or Port Elizabeth for local markets (via Transnet Fright Rail (TFR)). Waste rock (or low-grade material) is placed on, what will in future be named the Low Grade Stockpiles, and earmarked for reprocessing in the future, depending on market requirements. Waste material from the beneficiation process is pumped through a series of thickeners to the Paste Disposal Facility located on the farm King. Additional ancillary mine infrastructure has been constructed, such as the main offices, access roads, haul roads, power lines, fences for security purposes, etc. The mine has, over the past number of years, invested in the delineation of its primary catchment areas for the purposes of designing a detailed clean and dirty water management system for the mine. One of the key purposes of this system is water conservation. The area in which the mine is located is characterised as a water negative

environment, i.e. evaporation exceeds precipitation. The mine is committed to reuse as much water as possible, not only from an environmental and sustainable viewpoint, but also due to the fact that the mine is reliant on purchasing water from the Sedibeng Water Supply Scheme, which is currently considered to be an unreliable source of water supply, having often resulted in the mine not having access to water. Water from the storm water system is utilised as a dust suppressant over roads, in combination with roads also being treated with a dust suppressant (at this time supplied by E-Cat).

The mining infrastructure associated with each farm of the Mining Right is detailed as follows:

Parson:

- Rapid Load-Out Facility;
- Product Stockpile Area;
- ROM Stockpile Area;
- Discard Stockpile (to be known as the Low Grade ROM Stockpile);
- Plant Area (Original Beneficiation Plant and the Wet, High-Intensity Magnetic Separation (WHIMS) Plant);
- Plant Offices;
- Third Party Stockpile Area
- Workshop Areas;
- Explosives Magazine (operated by Sasol Nitro);
- Sewage Facilities;
- Conveyors;
- Storm Water Management Infrastructure (channels and dam);
- Borrow Pits; and
- Contractor Workshop Areas.

Bruce:

- Primary Crusher;
- Secondary Crusher;
- Mine Workshops;
- Offices;
- Overland Conveyors;
- Sewage Facilities;
- Contractor Workshop Areas;
- Opencast Operations (five main Opencast Pits – BA05, BB01, BC01, BC02 and BC03);
- Topsoil Stockpile;
- Barrier Pillar Mining operations;
- Panhandle Dump;
- Low Grade ROM Stockpile (Waste Rock Dump); and
- Storm Water Management infrastructure (channels and dam).

King/ Mokaning:

- Paste Disposal Facility;
- Topsoil Stockpile;
- Low Grade ROM Stockpile;
- Waste Rock Dump;
- Contractor Workshop Areas;
- Opencast Pits (two main Opencast Pits – KM01 and KM02);
- Primary and Secondary Crusher;
- Sewage Facilities;
- The TFR Diversion has been completed and the decommissioned Port Elizabeth Railway Line is being dismantled;
- River Diversion associated with the TFR Diversion;
- Mine Workshops; and
- Offices.

Linear Activities Connecting the Farms Include:

- Conveyors;
- Roads; and
- Power lines.

Table 3: Details of Applicant

Project applicant:	Assmang (Pty) Ltd: Khumani Iron Ore Mine
Registration no (if any):	1935/007343/06
Trading name (if any):	Assmang (Pty) Limited - Khumani Iron Ore Mine
Responsible Person, (e.g. Director, CEO, etc.):	Mr Dirk Coetzee
Contact person:	Mr Dirk Coetzee
Physical address:	Khumani Iron Ore Mine, Kathu, Northern Cape Province, 15km south of Kathu, along the N14.
Postal address:	Private Bag X503, Kathu, Northern Cape Province, 8446
Postal code:	8446
Telephone:	+27 (0) 53 723 8090
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1.a.iv Environmental Authorisations

The mine is operating with all required environmental authorisations in terms of the following:

- National Environmental Management Act, 1998 (Act No. 107 of 1998) (hereafter referred to as the "NEMA") [also the original approval in terms of the Environmental Conservation Act, 1989 (Act No. 73 of 1989) (hereafter referred to as the "ECA")];
- National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) (hereafter referred to as the "NEM:WA);
- Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002) (hereafter referred to as the "MPRDA"); and
- National Water Act, 1998 (Act No. 36 of 1998) (hereafter referred to as the "NWA").

A list of the Environmental Authorisations are provided in the following table. Copies of the Environmental Authorisations are available from the mine.

Table 4: List of Environmental Authorisations

#	Legislation	Licence	Reference	Date
1	Environment Conservation Act, 1989	Authorisation of Greenfields Mine	Permit 43/2006	12 June 2006
2	MPRDA	Authorisation of Greenfields Mine	MPRDA Record of Decision (ROD) 2007	25 January 2007
3	MPRDA	Barrier Pillar Mining	MPRDA ROD – undated	undated
4	NEMA	Establishment of Railway Siding, expansion of capacity and railway line diversion	Permit 47/2009	29 July 2009
5	NEM:WA	Domestic Landfill Site and Hazardous Waste Storage	Permit 12/9/11/L812/8	27 March 2010
6	MPRDA	Establishment of Railway Siding, expansion of capacity and railway line diversion	NC30/5/1/2/3/2/1(070)EM	17 February 2011
7	MPRDA	Expansion of diesel storage and silo for explosives, construction of tar road and additional refuelling stations, storm water dams and storage tanks	MPRDA ROD 2012	14 May 2012
8	NEMA	Expansion of diesel storage and silo for explosives, construction of tar road and additional refuelling stations, storm water dams and storage tanks	Permit 37/2012	23 July 2012
9	NWA	Water Use Licence for water and waste activities	10/D41J/BC1J/2122	16 March 2013
10	NEMA	Establishment of Offgrade 2 Plant	Permit 56/2013	10 December 2013
11	NEMA	Construction of the Process Water Recovery Dam on Parson	25/4/2(02/03/13)	28 March 2014

#	Legislation	Licence	Reference	Date
12	NEMA	The expansion of the Parson Low Grade Stockpile (previously the Parson Discard Dump), infrastructure associated with the reworking of this facility, expansion of the King/ Mokaning and Bruce Low Grade ROM Stockpiles, and the establishment of additional Low Grade ROM Stockpiles on the farm King	Permit 21/2016	6 July 2016
13	NEMA	Low Grade ROM Sorter Plant, Silo Decommissioning and Establishment of new Silos	NC 30/5/1/2/3/2/1/(070)EM	27 July 2018

1.b Description of the Property

1.b.i Location of the Mine

Khumani is situated 15km south of Kathu, adjacent to the Kumba Iron Ore Mine and compromises of four (4) farms, namely Parson, King, Bruce and Mokaning. The mine is located on the following properties: Parson 564 (including Police Camp 692) (Portions RE, 2, 8 and 9), King 561 (Portion RE), Bruce 544 (Portion RE) and Mokaning 560 (Portions RE, 1, 2, 3, and 4).

The mine falls within two Local and two District Municipalities. The farms Parson, Bruce and King are situated within the Gamagara Local Municipality (NC01B1), which forms part of the John Taolo Gaetsewe District Municipality (formerly known as the Kgalagadi District Municipality), while the farm Mokaning is situated within the Tsantsabane Local Municipality (NC085), which forms part of the ZF Mgcawu District Municipality (formerly known as the Siyanda District Municipality).

Neighbouring towns and villages include Olifantshoek, Beeshoek, Postmasburg and Dingleton. The main industries in the area include mining (mainly of manganese ore, iron ore and tiger's eye), agriculture (mainly cattle, sheep, goat and game farming) and tourism.

Please refer to the following table for the registered name, administrative jurisdiction and summary of location of the land.

Table 5: Property Information

Farm Name:	Farm Ownership: - King 561, Portion RE - Mokaning 260, Portion 1 - Mokaning 260, Portion 3 - Parson 564, Portion RE - Parson 564, Portion 2 - Parson 564, Portion 9 (new registration) - Bruce 544, Portion RE Overall WUL[1] Project (National Water Act, 1998, Regulation 158 Amendment – amendment to water uses previously excluded or errors/ amendments required): - King 561, Portion RE - Mokaning 260, Portion 1 - Mokaning 260, Portion 3 - Parson 564, Portion RE - Parson 564, Portion 2 - Bruce 544, Portion RE New WUL Applications [(Permit 21/2016 issued by the Northern Cape Department of Environment and Nature Conservation (NCDENC)]:

[1] The 2013 WUL is being updated to include new uses and to correct various administrative errors.

	• King 561, Portion RE • Mokaning 260, Portion 1 • Mokaning 260, Portion 3 • Parson 564, Portion RE • Bruce 544, Portion RE *(note that the listed activities relating to Permit 21/2016 have been approved in terms of Activity 5 of GNR 545 of 18 June 2010 (please refer to* Annexure 3*) . This activity relates to the construction of facilities or infrastructure for any process or activity which requires a permit or licence in terms of national or provincial legislation governing the generation or release of emissions, pollution or effluent…. These activities have however been re-included as the DMR is now the competent authority and the water uses will be undertaken as part of the integrated WUL, for which the WULA process is now being recommissioned). Should the DMR deem it not necessary to re-include these activities, these could be excluded from the application.* New Infrastructure (Proposed new Return Water Dam 3, Paste Disposal Facility Water Return Pipeline, King Water Containment Facility, formalisation of the additional Buffer Dam and Return Water Pipeline from the Parson Return Water Dam to the Beneficiation Plant): • King 561, Portion RE • King 561, Portion 2 (crossing of pipeline underneath N14 at existing culvert) • Parson 564, Portion 2
Magisterial district:	Kuruman Registration Division (RD)
Distance and direction from nearest town.	The entrances to Bruce and Parson Mines are located 16km and 23km south of Kathu respectively, with the entrance to King Mine located approximately 13km to the south of Kathu.
21-digit Surveyor General Code for each farm portion applicable to this application.	• King 561, Portion RE: C04100000000056100000 • King 561, Portion 2: C04100000000056100002 • Mokaning 260, Portion 1: C04100000000056000001 • Mokaning 260, Portion 3: C04100000000056000003 • Parson 564, Portion RE: C04100000000056400000 • Parson 564, Portion 2: C04100000000056400002 • Bruce 544, Portion RE: C04100000000054400000

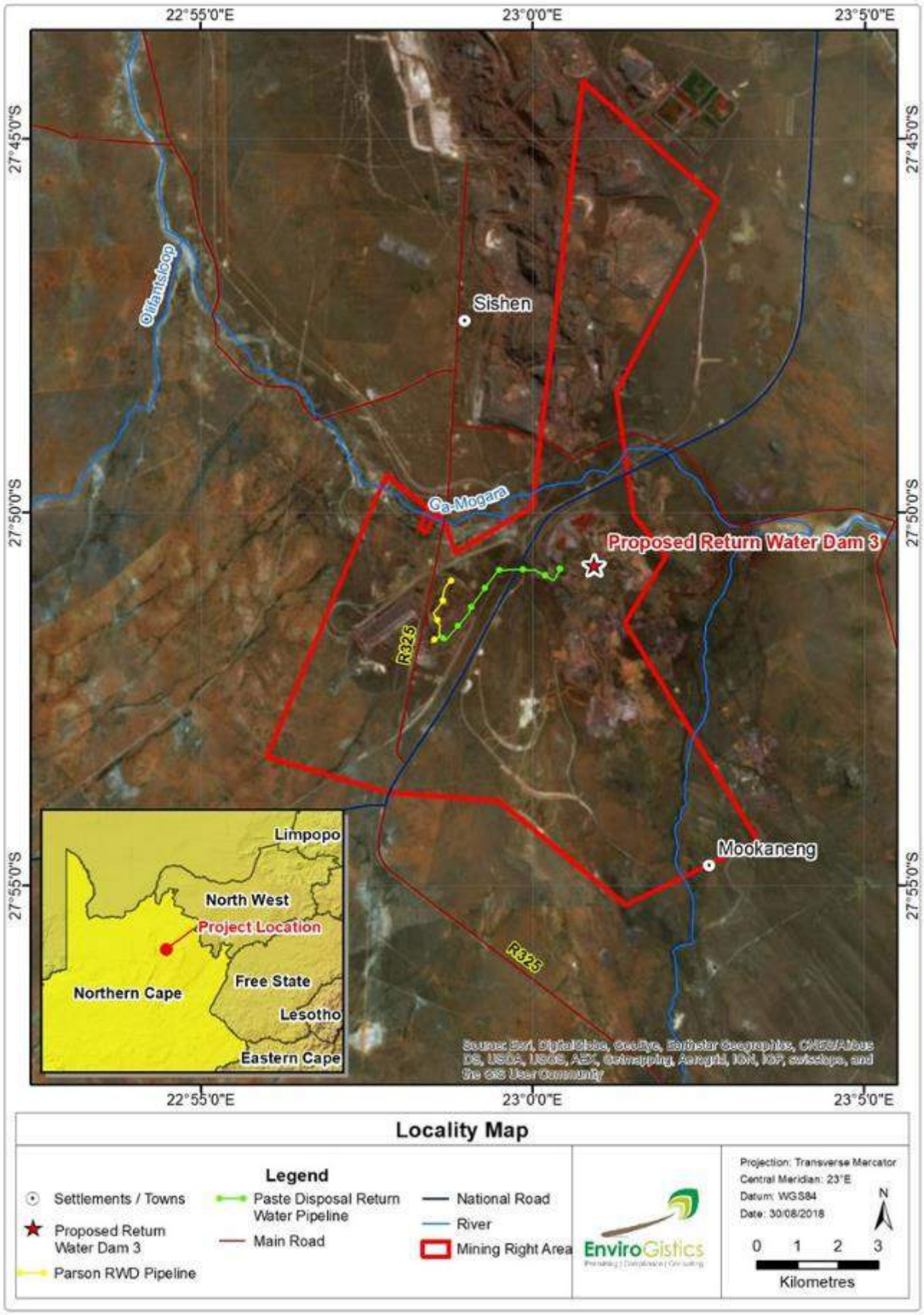


Figure 1: Local and Regional Setting of the surface operations

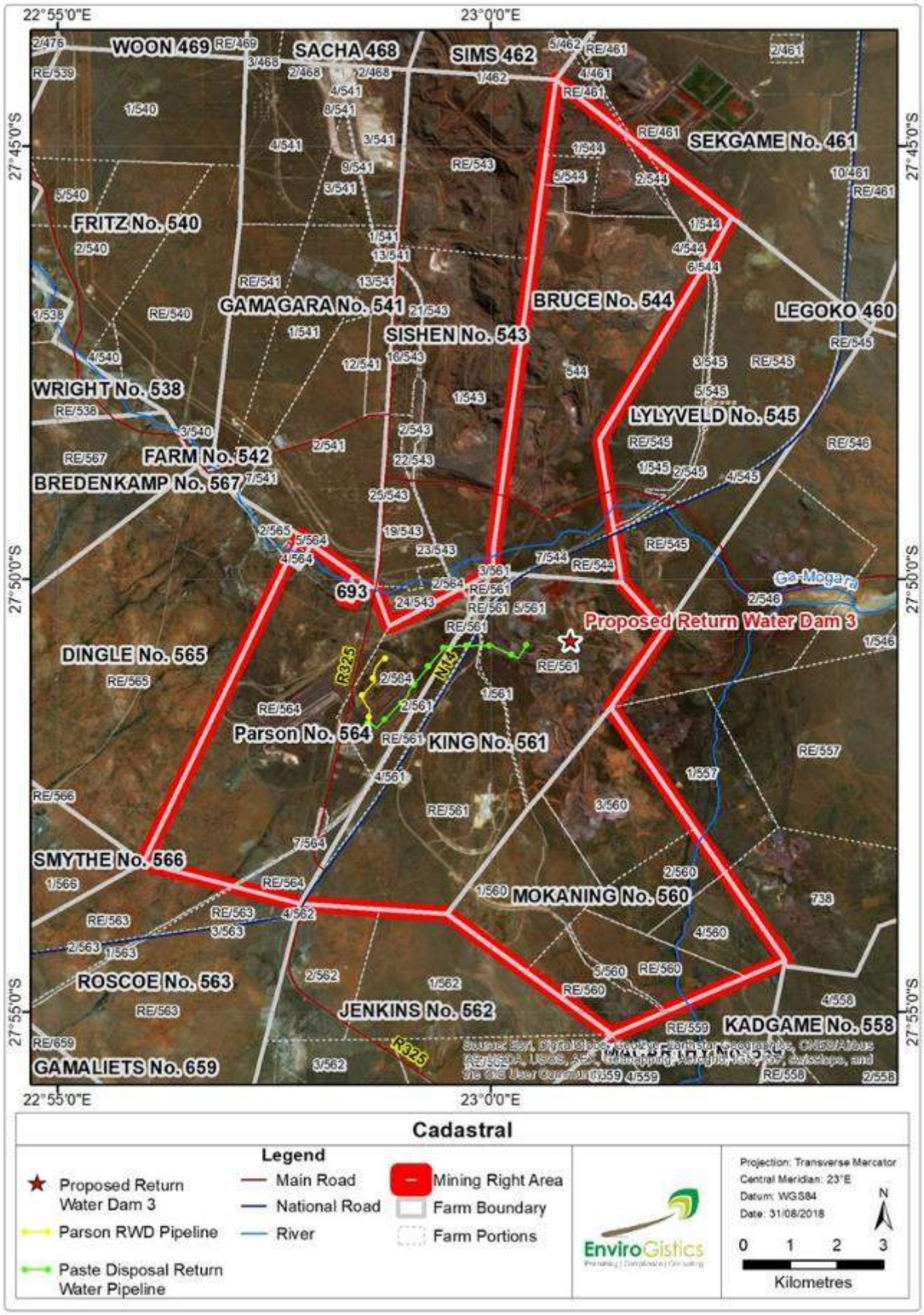


Figure 2: Cadastral Information

1.b.ii Ownership of Land

As mentioned before, the mine comprises of four (4) farms, namely Parson, King, Bruce and Mokaning, located on the following properties: Parson 564 (including Police Camp 692) (Portions 0, 2, 8 and 9), King 561 (Portions 0), Bruce 544 (Portion RE) and Mokaning 560 (Portions 0, 1, 2, 3, and 4). Khumani falls within two Local and District Municipalities. The farms Parson, Bruce and King are situated within the Gamagara Local Municipality (NC01B1), which forms part of the John Taolo Gaetsewe District Municipality (formerly known as the Kgalagadi District Municipality). The farm Mokaning is situated within the Tsantsabane Local Municipality (NC085), which forms part of the ZF Mgcawu District Municipality (formerly known as the Siyanda District Municipality). The property details are presented in the following table:

Table 6: Landownership

Farm Name	Portion	Registration Division	Size	Surface Owner and Title Deed	Mineral Rights Ownership
Bruce No. 544	RE	Kuruman RD	2346ha	Assmang Ltd T 349 of 1954	√
	3		11ha	Transnet Ltd T 790 of 1993	√
	4		5ha	Transnet Ltd T 790 of 1993	?
	5		91ha	Sishen Iron Ore Company (Pty) Ltd T 3280 of 2001	√
King No. 561	RE	Kuruman RD	2320ha	Assmang Pty Ltd T 3565 of 2017	√
	1		17ha	Transnet Ltd T 1447 of 1993	√
Mokaning No. 560	RE	Kuruman RD	542ha	Assmang (Pty) Ltd T 3565 of 2017	√
	1		652ha	Assmang Ltd T 572 of 1968	√
	2		326ha	Assmang Ltd T 572 of 1968	√
	3		558.7530ha	Assmang Ltd T 572 of 1968	√
	4		279ha	Assmang (Pty) Ltd T 3565 of 2017	√
	5		16.6819ha (19.4802M)	Transnet Ltd T 414 of 1968	√
	6		21.9ha	Transnet Ltd	-
	9		13.2ha	Assmang (decom railway)	√
	10		202ha	Transnet Ltd	-
Parson No. 564	RE	Kuruman RD	1879ha	Assmang Ltd T 193 of 2006	√
	2		426ha	Assmang Ltd T 3907 of 2005	-
	6		1.4076ha	Transmet Ltd T 45 of 1993	-
	9		7.5ha	Assmang Ltd	√
Police Camp No. 693	-	Kuruman RD	10.6ha	Assmang Ltd	√

Note, the details in this table is captured via the Deeds website, site information and Planet GIS Cadastral Information (SA).

1.c Locality Map

Figure 3, Figure 4, *Figure 5*, Figure 6 and Figure 12 present the location of the activities being applied for within the approved mine surface rights as described in the following table. Please refer to Figure 1 for the local setting of the site.

Table 7: Location of Listed Activities

Farm Name and associated activities:	Farm Ownership: • King 561, Portion RE • Mokaning 260, Portion 1 • Mokaning 260, Portion 3 • Parson 564, Portion RE • Parson 564, Portion 2 • Parson 564, Portion 9 (new registration) • Bruce 544, Portion RE Overall WUL[2] Project (National Water Act, 1998, Regulation 158 Amendment – amendment to water uses previously excluded or errors/ amendments required): • King 561, Portion RE • Mokaning 260, Portion 1 • Mokaning 260, Portion 3 • Parson 564, Portion RE • Parson 564, Portion 2 • Bruce 544, Portion RE New WUL Applications [(Permit 21/2016 issued by the Northern Cape Department of Environment and Nature Conservation (NCDENC)]: • King 561, Portion RE • Mokaning 260, Portion 1 • Mokaning 260, Portion 3 • Parson 564, Portion RE • Bruce 544, Portion RE *note that the listed activities relating to Permit 21/2016 have been approved in terms of Activity 5 of GNR 545 of 18 June 2010 (please refer to* Annexure 3*). This activity relates to the construction of facilities or infrastructure for any process or activity which requires a permit or licence in terms of national or provincial legislation governing the generation or release of emissions, pollution or effluent…. These activities have however been re-included as the DMR is now the competent authority and the water uses will be undertaken as part of the integrated WUL, for which the WULA process is now being recommissioned. Should the DMR not deem it necessary to re-include these activities, these could be excluded from the application.* New Infrastructure to be constructed (Proposed new Return Water Dam 3, King Water Containment Facility, King Braithwaite Water Tank, Paste Disposal Facility Water Return Pipeline and Parson Return Water Dam Pipeline from the Parson Return Water Dam to the Beneficiation Plant): • King 561, Portion RE • King 561, Portion 2 (crossing of pipeline underneath N14 at existing culvert) • Parson 564, Portion 2
Application area (Ha)	Project 1: The area on which the new Return Water Dam 3 and King Water Containment Facility will be constructed: • King Portion RE: Approximately 2ha on existing disturbed land (no clearance in excess of 1ha is foreseen)

[2] The 2013 WUL is being updated to include new uses and to correct various administrative errors.

	Project 2: The area on which the additional Paste Disposal Facility Return Water Pipeline will be located (no clearance required, within and existing pipeline route): • King 561, Portion RE • King 561, Portion 2 (crossing of pipeline underneath N14 at existing culvert) • Parson 564, Portion 2 The area on which the additional Parson Return Water Dam Pipeline will be located (no clearance required, within and existing pipeline route): • Parson 564, Portion 2 Project 3: No additional clearance, which has not yet been approved is required. The overall Mining Area is about 9 000ha.

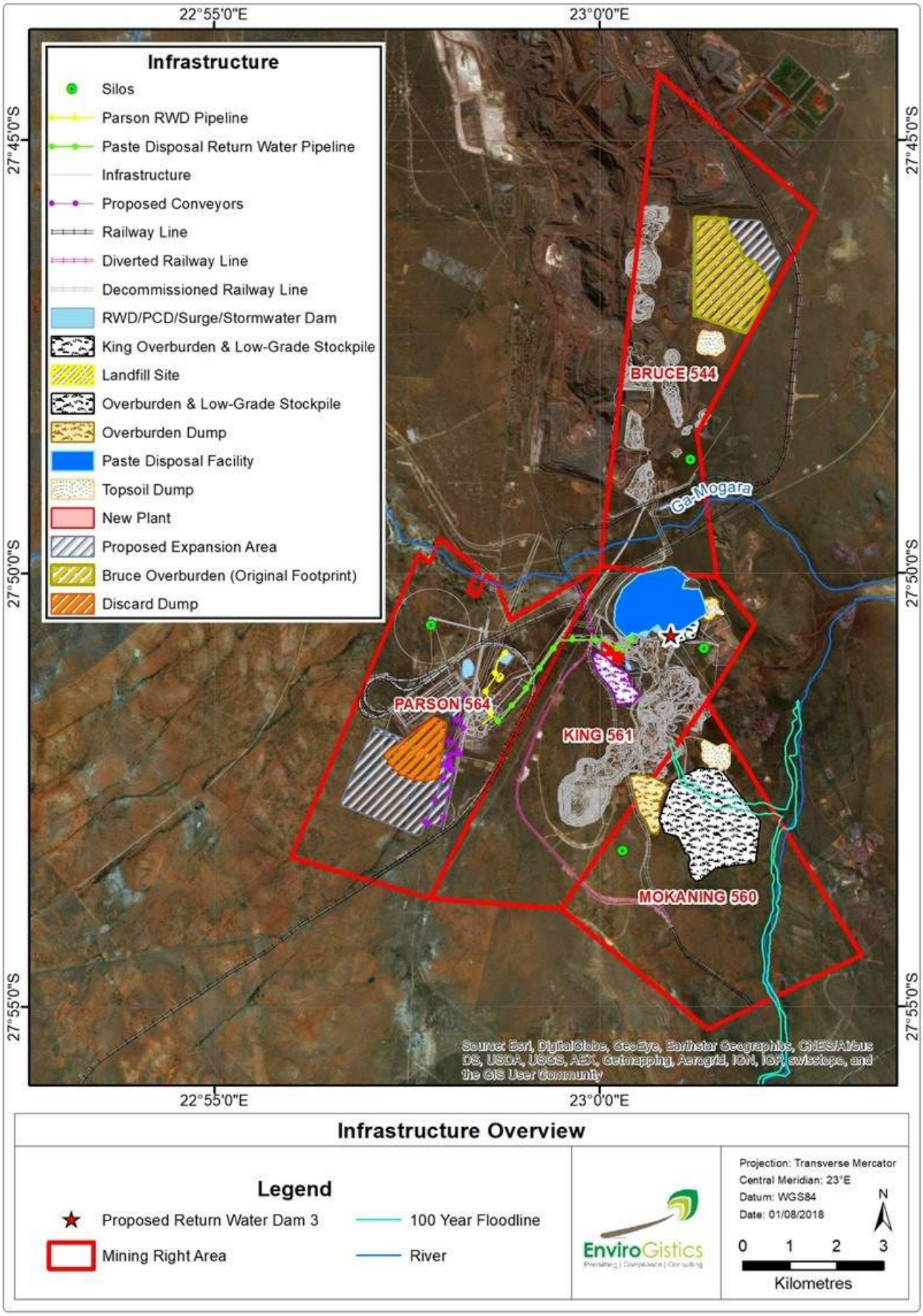


Figure 3: Location of Mine Infrastructure

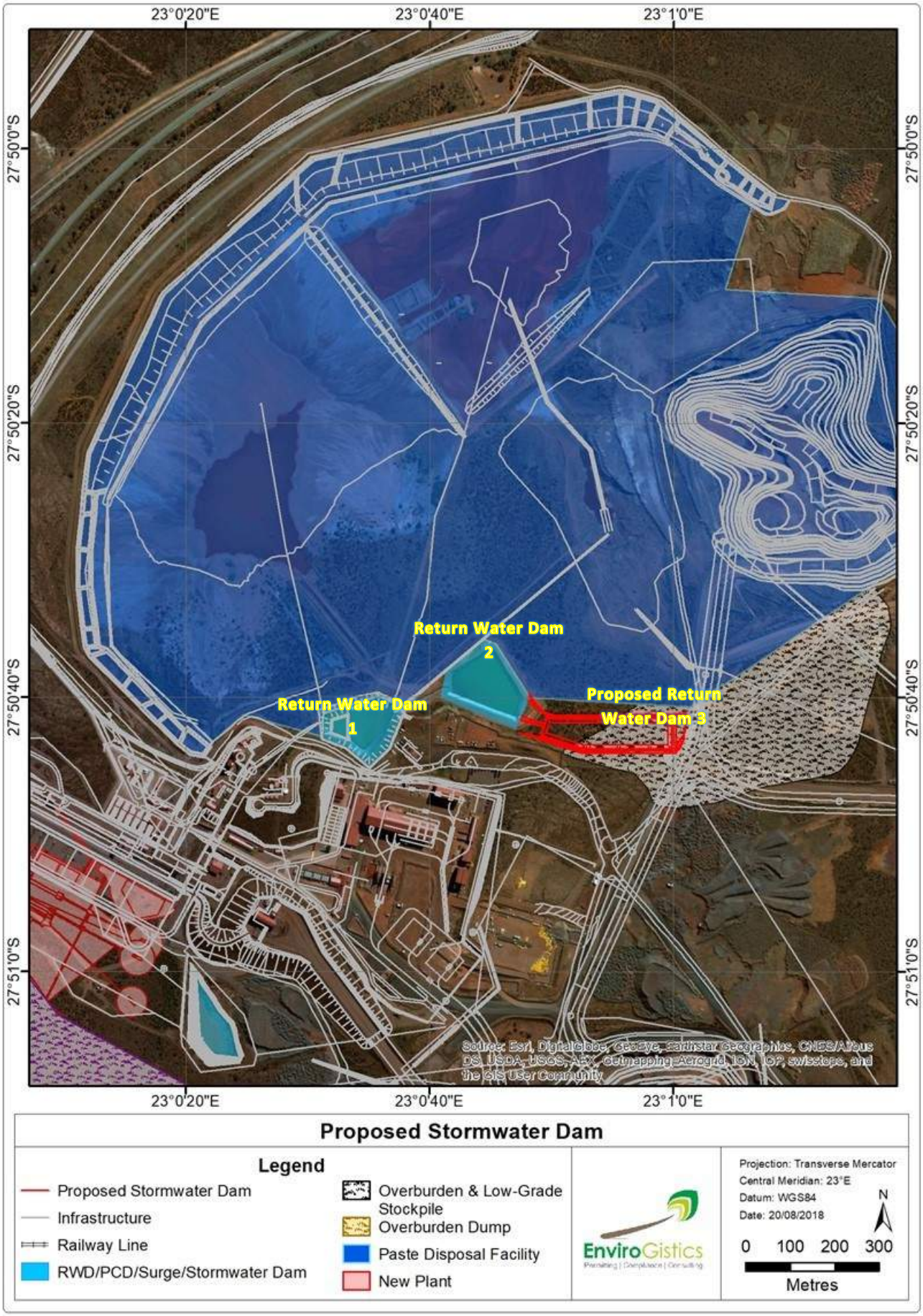


Figure 4: Location of Activities – New Return Water Dam 3

Figure 5: Location of Activities – New Pipelines (yellow – Paste Disposal Facility Return Water Pipeline; orange – Parson Return Water Dam Pipeline))

1.d Description of the Scope of the Proposed Activity

It is the intention of Khumani to apply for the necessary WUL for activities already approved in terms of Environmental Authorisations (Project 3). In addition to this, Khumani will apply for the construction of a third return water dam (which will be referred to as Return Water Dam 3 for the purpose of this project) (Project 1). This latter activity will also require a WUL for a Section 21(g) water use. Other projects which will form part of the water optimisation project is the additional pipeline from the Paste Disposal Facility to the Beneficiation Plant (Paste Disposal Facility Return Water Pipeline) and the additional pipeline from the Parson Plant Storm Water Dam to the Beneficiation Plant (Parson Return Water Dam Pipeline) to optimise water reticulation and return within the water circuit (Project 2). Based on the hydrological investigation undertaken, capacities of approved infrastructure may be required, such as the duplication in tanks like the King Braithwaite Tank to allow for additional water storage buffer capacity on site (Project 3).

The following sections present a detailed description of each of the projects. However, prior to introducing the activities, a background to the Environmental Authorisation required is presented to provide clarity on the purpose of the current authorisation process.

- Project 1: Return Water Dam 3 and the King Water Containment Facility (Concrete Tank);
- Project 2: Pipelines Project (Paste Disposal Facility Return Water Pipeline and the Parson Return Water Dam Pipeline); and
- Project 3: Update and application for new uses of the approved 2013 Water Use Licence (WUL).

The following sections present a detailed description of each of the projects.

1.d.i Listed and Specific Activities

1.d.i.1 National Environmental Management Act, 1998 (NEMA)

In terms of the NEMA, there are three (3) listing notices which should be considered for this application. These listing notices were amended during April 2017. This amendment did not repeal the 2014 listed activities, but purely amended certain listings. Listing Notice 1 (Regulation 983) activities require a Basic Assessment Process, whereas Listing Notice 2 (Regulation 984) activities require a full Environmental Impact Assessment (EIA) Process. Listing Notice 3 (Regulation 985), as amended in the 2017 Regulations activities require a Basic Assessment Process if the area falls within certain geographic zones. Khumani is not characterised by gazetted Threatened Ecosystems, Critical Biodiversity Areas (CBAs) or located in proximity to any Protected or Conservation Areas and for this reason Listing Notice 3 is not applicable to the mine.

Considering the above, the following listed activities may be triggered:

NEMA Government Notice 983 (amended 2017 in Government Notice 327), Listing Notice 1:

- Activity 10: The development and related operation of infrastructure exceeding 1 000 meters in length for the bulk transportation of sewage, effluent, process water, waste water, return water, industrial discharge or slimes –

  (i) with an internal diameter of 0,36 meters or more; or

  (ii) with a peak throughput of 120 liters per second or more;

  excluding where—

  (a) such infrastructure is for the bulk transportation of sewage, effluent, process water, waste water, return water, industrial discharge or slimes inside a road reserve or railway line reserve; or

  (b) where such development will occur within an urban area.

- Activity 13: The development of facilities or infrastructure for the off-stream storage of water, including dams and reservoirs, with a combined capacity of 50 000 cubic meters or more…
- Activity 34: The expansion of existing facilities or infrastructure for any process or activity where such expansion will result in the need for a permit or licence or an amended permit or licence in terms of national or provincial legislation governing the release of emissions, effluent or pollution, excluding—
  (i) where the facility, infrastructure, process or activity is included in the list of waste management

activities published in terms of section 19 of the National Environmental Management: Waste Act, 2008 in which case the National Environmental Management: Waste Act, 2008 applies.

NEMA Government Notice 984 (amended in Government Notice 325), Listing Notice 2:

- Activity 6: The development of facilities or infrastructure for any process or activity which requires a permit or licence or an amended permit or licence in terms of national or provincial legislation governing the generation or release of emissions, pollution or effluent.

No additional road construction or linear infrastructure development which triggers the NEMA listed activities is required. In addition to this, no clearance of vegetation is required for the activities in question as these have either been approved for such purpose (Permit 21/2016 activities) or will be located in already disturbed areas, such as the proposed Return Water Dam 3 (49 000m^3 facility with a dam height of less than 5m) which will be located within the footprint of the existing Paste Disposal Facility on the southern perimeter.

1.d.i.2 National Heritage Resources Act, 1999 (NHRA)

For this project, no authorisations in terms of the National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA) are triggered when considering:

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

Section 34 of the NHRA deals with structures that are older than 60 years. Section 35(4) of the NHRA deals with archaeology, palaeontology and meteorites. Section 36 of the NHRA, deal with human remains older than 60 years. Unidentified/ unknown graves are also handled as older than 60 years until proven otherwise. Heritage studies have been completed for the areas in question as part of the approved Environmental Authorisations. As no areas of clearance will take place, within heritage sensitive areas, as per the heritage reports (please refer to Anneuxre 6), it is confidently stated that no impact on heritage resources will take place.

According to Regulation 38 of the NHRA, any development or other activity which will change the character of a site exceeding 5 000m^2 in extent requires notification to the South African Heritage Resources Agency (SAHRA). As mentioned above, as no areas of clearance will take place, within heritage sensitive areas, as per the heritage reports (please refer to Anneuxre 6), it is confidently stated that no impact on heritage resources will take place and the character of the site will not be altered.

1.d.i.3 National Environmental Management: Waste Act, 2008 (NEM:WA)

Regulation 921 of the NEM:WA, dated 29 November 2013 and as amended, makes provision for lists of waste management activities that have, or are likely to have a detrimental effect on the environment.

No waste activities are planned in terms of the project. Sumps may be present as silt traps to the Return Water Dam 3 at the Paste Disposal Facility. Dirty water will be disposed of in terms of legal practices to a licensed facility (in this event the Paste Disposal Facility should the freeboard require this). It is further pertinent to note that at present and with the information available, it is not foreseen that a NEM:WA permit/ waste management licence will be required for the Return Water Dam 3, as this facility will be regarded as a storage facility (transfer point) between the Paste Disposal Facility and the Beneficiation Plant. The facility is not considered a lagoon, but will be a constructed dam, which will contain runoff contaminated water (which constitutes waste water as defined by the Department of Environmental Affairs (DEA)).

1.d.i.4 National Water Act, 1998 (NWA)

Chapter 4 of the NWA specifically addresses the use of water and is a tool for an authority to ensure the implementation of the principle that National Government has overall responsibility over water resource management, including the equitable allocation and beneficial use of water in the public interest, including that a person can only be entitled to use water if the use is permissible under the Act. In general, a water use must be licensed unless it is listed in Schedule I, is an existing lawful use, is permissible under a general authorisation, or if a responsible authority waives the need for a licence. Section 21 of the NWA identifies eleven (11) consumptive and non-consumptive water uses which must be authorised.

The activities associated with this project will trigger WULs, due to the following:

- The new Return Water Dam 3 and the King Water Containment Facility will trigger a Section 21(g) water use for storage of water containing "waste";
- The new pipelines will not require any additional WULs as no watercrossings will be required;
- The Permit 21/2016 activities (approved for Mine Residue Facilities such as the Bruce Low Grade ROM Stockpile expansion and the Parson Discard Dump expansion) will trigger a Section 21(g) water use for the disposal of waste in a manner which may detrimentally impact on a water resource;
- The Permit 21/2016 activities (Bruce Low Grade ROM Stockpile) is located near a dry pan and therefore triggers both Section 21(c) (impeding or diverting the flow of water in a watercourse) and Section 21(i) (altering the bed, banks, course or characteristics of a watercourse) within the ambit of the definitions of the NWA.
- Various amendments will be applied for on the approved WUL (2013) based on water throughput volumes in dams, disposal volumes, etc.

It is important to note that this Environmental Authorisation Process currently being undertaken only provides for the following:

- Environmental Authorisation Application for the proposed Return Water Dam 3 and the proposed King Water Containment Facility;
- Environmental Authorisation Application for the construction of pipelines namely the Paste Disposal Facility Return Water Pipeline and Parson Return Water Dam Pipeline, including associated pumping infrastructure and likely the proposed Water Containment Facility at King;
- Environmental Authorisation Application for the required changes to the WUL (2013) or inclusion of approved Environmental Authorisations which trigger: Listing Notice 1, Activity 34: "The expansion of existing facilities or infrastructure for any process or activity where such expansion will result in the need for a permit or licence or an amended permit or licence in terms of national or provincial legislation governing the release of emissions, effluent or pollution, excluding— (i) where the facility, infrastructure, process or activity is included in the list of waste management activities published in terms of section 19 of the National Environmental Management: Waste Act, 2008 in which case the National Environmental Management: Waste Act, 2008 applies" or "The development of facilities or infrastructure for any process or activity which requires a permit or licence or an amended permit or licence in terms of national or provincial legislation governing the generation or release of emissions, pollution or effluent", and also Listing Notice 2, Activity 6: "The development of facilities or infrastructure for any process or activity which requires a permit or licence or an amended permit or licence in terms of national or provincial legislation governing the generation or release of emissions, pollution or effluent."

The activities in question and a brief location description is presented in the following table:

Table 8: Listed Activities

Name of Activity	Aerial extent of the Activity (Ha or m²)	Listed Activity (X – yes where applicable)	Applicable Listing Notice	Waste Management Authorisation Required	Water Use Licence Authorisation Required (x for yes)
Project 1: Proposed New Return Water Dam 3	Approx. 2ha	x	Government Notice 327, Listing Notice 1: • Activity 13: The development of facilities or infrastructure for the off-stream storage of water, including dams and reservoirs, with a combined capacity of 50 000 cubic meters or more unless such storage falls within the ambit of activity 16 in Listing Notice 2 of 2014. Government Notice 325, Listing Notice 2: • Activity 6: The development of facilities or infrastructure for any process or activity which requires a permit or licence or an amended permit or licence in terms of national or provincial legislation governing the generation or release of emissions, pollution or effluent. This activity is triggered as the proposed dam would require approval of a new water use in terms of Section 21(g) of the NWA.	Note: At the current time and with the information available it is not foreseen that a waste licence will be required for the Return Water Dam, as this facility will be regarded as a storage facility (transfer point) between the Paste Disposal Facility and Beneficiation Plant. The facility is not considered a lagoon, but will be a constructed dam, which will contain runoff contaminated water (which constitutes waste water by the Department of Environmental Affairs (DEA)).	**x**
Project 1: A new Water Containment Facility is planned at the King Plant area to supply the mining operations. Currently water is being supplied via the Parson storage facilities, which in periods hamper capacities when water scarcity arise in the area. With a new Water Containment Facility at the King operation, Khumani can store water for this mining operation specifically and allow for buffer capacities in dry events. The facility will be a concrete tank with a capacity of between 20 000 and 30 000m³. Should clearance be required this will also be less than 1ha of indigenous vegetation.	Less than 0.1ha	x	Government Notice 325, Listing Notice 2: • Activity 6: The development of facilities or infrastructure for any process or activity which requires a permit or licence or an amended permit or licence in terms of national or provincial legislation governing the generation or release of emissions, pollution or effluent. This activity is triggered as the proposed dam would require approval of a new water use in terms of Section 21(g) of the NWA.	-	**x**
Project 2 (new infrastructure):	Paste Disposal	x	Government Notice 327, Listing Notice 1:	Not Applicable (N/A)	**x (Water**

Name of Activity	Aerial extent of the Activity (Ha or m²)	Listed Activity (X – yes where applicable)	Applicable Listing Notice	Waste Management Authorisation Required	Water Use Licence Authorisation Required (x for yes)
Proposed Pipeline from the Paste Disposal Facility Thickener to the Beneficiation Plant Thickener at a volume of approximately 375l/s. Proposed Pipeline from the Parson PCD to the Beneficiation Plant to support the commitment of Khumani to reuse water optimally within the water circuit. The throughput volume is 1 700l/s.	Facility Return Water Pipeline: Approx. 4 200m (Approx. 375l/s) Parson Return Water Dam Pipeline: Approx. 3 000m (Approx. 1 700l/s)		• Activity 10: The development and related operation of infrastructure exceeding 1 000 meters in length for the bulk transportation of sewage, effluent, process water, waste water, return water, industrial discharge or slimes – (i) with an internal diameter of 0,36 meters or more; or (ii) with a peak throughput of 120 liters per second or more; excluding where— (a) such infrastructure is for the bulk transportation of sewage, effluent, process water, waste water, return water, industrial discharge or slimes inside a road reserve or railway line reserve; or (b) where such development will occur within an urban area.		**Containment Facility at King)**
Project 3: Changes to the approved WUL in terms of the establishment of: • Buffer dams, which will result in a combined capacity of between 100 000m³ and 150 000m³, but as individual dams of no more than 50 000m³; • The inclusion of facilities approved under existing approved Environmental Authorisations, such as Permit 21/2016 and the 2012 Environmental Authorisation; • Increase of the capacity and designs of the Storm Water Dam at the Loadout Facility; • Increase of the capacity and designs of the PCD at the Plant; • Inclusion of additional Braithwaite tanks, such	No new clearance but the overall approved area in terms of previous Environmental Authorisations (2012 and 2016) are 430ha.	x	All the activities for which amendments will be required are approved in existing Environmental Authorisations and have been constructed. Therefore, no clearance activities are applicable. However the amendments to the WUL will trigger the following listed activities: Government Notice 327, Listing Notice 1: • Activity 13: The development of facilities or infrastructure for the off-stream storage of water, including dams and reservoirs, with a combined capacity of 50 000 cubic meters or more. • Activity 34: The expansion of existing facilities or infrastructure for any process or activity where such expansion will result in the need for a permit or licence or an amended permit or licence in terms of national or provincial legislation governing the release of emissions, effluent or pollution,. Government Notice 325, Listing Notice 2: • Activity 6: The development of facilities or infrastructure for any process or activity which requires a permit or licence or an amended permit or licence in terms of national or provincial legislation governing the generation or release of emissions, pollution or effluent. This activity is triggered as the proposed Return Water Dam 3 and additional Buffer Dam would require approval of a new water use in terms of Section 21(g) of the NWA.	All the activities for which amendments will be required are approved and constructed in existing Environmental Authorisations. It is currently not foreseen that additional waste licences will be required.	**x**

Name of Activity	Aerial extent of the Activity (Ha or m²)	Listed Activity (X – yes where applicable)	Applicable Listing Notice	Waste Management Authorisation Required	Water Use Licence Authorisation Required (x for yes)
as the duplication of the Braithwaite Water Tank at King.					
Project 3: Regulation 158 amendment for administrative changes and corrections to the approved 2013 WUL.	N/A – overall farm portion of about 9000ha, no new construction areas.	x	A new Water Balance and Storm Water Management Assessment has been completed by the mine and have identified the need to amend certain approved Water Uses based on their throughput and capacities: Government Notice 327, Listing Notice 1: • Activity 34: The expansion or changes to existing facilities for any process or activity where such expansion or changes will result in the need for a permit or licence or an amended permit or licence in terms of national or provincial legislation governing the release of emissions or pollution". This activity is not considered at this time, but may be required depending on the outcome of consultation with the DWS.	-	**x**

1.d.ii Description of the Projects to be undertaken

1.d.ii.1 Project 1: Return Water Dam 3 and King Water Containment Facility

Please refer to the following table for details regarding this project:

Table 9: Project 1: Return Water Dam 3

Description	Footprint Size	Dimensions	Coordinates	Listed Activities triggered
Return Water Dam 3	2.7ha	Approx. 330m in length Approx. 90m in width *Depth: To be finalised* Wall height below 5m	Corner Points: 27°50'40.97"S 23° 0'49.53"E 27°50'41.23"S 23° 1'1.09"E 27°50'43.83"S 23° 1'0.57"E 27°50'44.14"S 23° 1'0.14"E 27°50'44.03"S 23° 0'52.58"E 27°50'43.02"S 23° 0'48.88"E	<u>Government Notice 327, Listing Notice 1:</u> Activity 13: The development of facilities or infrastructure for the off-stream storage of water, including dams and reservoirs, with a combined capacity of 50 000 cubic meters or more. <u>Government Notice 325, Listing Notice 2:</u> Activity 6: The development of facilities or infrastructure for any process or activity which requires a permit or licence or an amended permit or licence in terms of national or provincial legislation governing the generation or release of emissions, pollution or effluent. This activity is triggered as the proposed dam would require approval of a new Water Use in terms of Section 21(g) of the NWA).
Temporary Access Roads	N/A			
Permanent linear infrastructure (roads or pipelines)	N/A			
Clearance	N/A will be located within the existing cleared area associated with the Paste Disposal Facility.			
A new Water Containment Facility is planned at the King Plant area to supply the mining operations. Currently water is being supplied via the Parson storage facilities, which in periods hamper capacities when water scarcity arise in the area. With a new Water Containment Facility at the King operation, Khumani can store water for this mining operation specifically and allow for buffer capacities in dry events. The facility will be a concrete tank with a capacity of between 20 000 and 30 000m^3. Should clearance be required this will also be less than 1ha of indigenous vegetation.	Less than 1ha	*Not yet finalised, this facility may be a tank or dam structure.*	Not yet finalised.	<u>Government Notice 325, Listing Notice 2:</u> Activity 6: The development of facilities or infrastructure for any process or activity which requires a permit or licence or an amended permit or licence in terms of national or provincial legislation governing the generation or release of emissions, pollution or effluent. This activity is triggered as the proposed dam would require approval of a new Water Use in terms of Section 21(g) of the NWA.

1.d.ii.1.a Location

Return Water Dam 3 will be located on Portion RE of the farm King, on the southern boundary of the existing Paste Disposal Facility.

The King Water Containment Facility location will be located in the vicinity of the King Plant footprint area on Portion RE of the farm King.

Please refer to Figure 4 for the location of Return Water Dam 3.

1.d.ii.1.b Operational Setting

In 2015, water supply shortages were experienced at the mine and an augmentation project was initiated in consultation with the DWS, Kimberley, to site, drill and test boreholes suitable for supplying the water requirements

of the mine in periods when the Sedibeng Water Supply Scheme cannot meet the requirement. The lack of water supply during the October to January period every year results in significant production losses with the processing plant coming to a halt.

For this reason, the mine initiated investigations to implement abstraction boreholes on the Remainder Portion of the farm Bruce, located within the mining area. It was the intention of the mine to abstract a combined volume of approximately 456 192m³ (at 44l/s) of groundwater from these boreholes during the four (4) month period. Based on the outcomes of the Stakeholder Consultation Process, and the concern raised by stakeholders on the already strained aquifers, the mine committed to undertake further studies to optimise water management within the existing water circulation system. This brought attention to the optimisation of the dirty water catchment and water management in and around the Paste Disposal Facility. Khumani operates the Paste Disposal Facility to dispose of the fines from the beneficiation process.

This paste technology is a benchmark technology to ensure that no significant environmental impacts occur and that the maximum volume of water returns to the Plant. For this reason approximately 90% of water is recovered through the paste thickening procedures. Water recovered during the thickening process is returned to the Beneficiation Plant to be reused. The remaining water on the Paste Disposal Facility is captured via a barge system and pumped to the Return Water Dam. The water system between the Beneficiation Plant and the Paste Disposal Facility is interlinked.

General Arrangement of the Paste Disposal Facility

The Paste Disposal Facility complex comprises three active paste storage compartments (Compartments 1, 2 and 3A), the Return Water Dam 1 and the Return Water Dam 2 (approved in the 2013 WUL as the Decant Dam). The Return Water Dam 1 (utilised during normal operating conditions) overflows into the Return Water Dam 2 (utilised during storm conditions) which overflows into Compartment 3A (only during emergency conditions – not utilised to date). The KM02 Opencast Pit is currently an active pit located adjacent to Compartments 2 and 3A. The locations of these storage compartments are shown in the following figure.

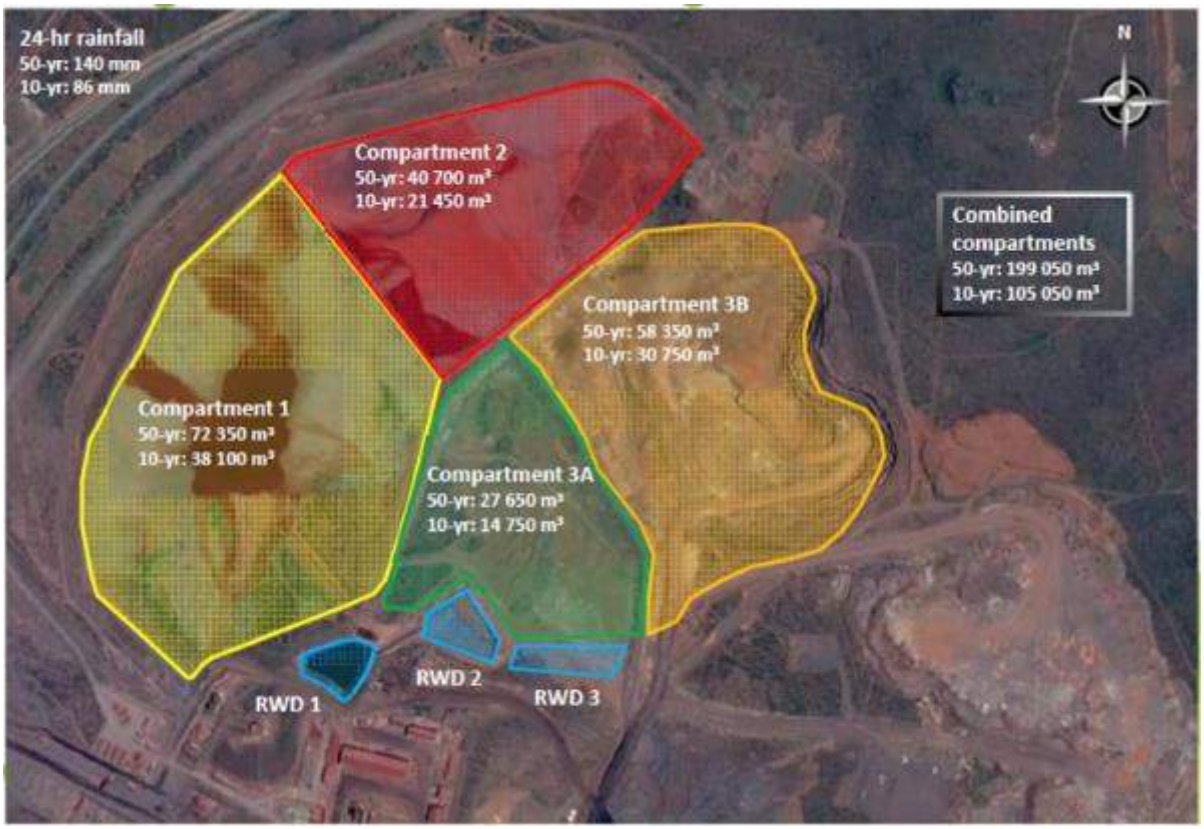


Figure 6: General Arrangements of the Paste Disposal Facility layout in terms of Storm Water Management

As per the approved EMPr and WUL, once mining in KM02 Opencast Pit is complete, it will be converted into a paste storage compartment and named Compartment 3B. Compartment 3B will form part of the overall Paste Disposal Facility. Compartments 1, 2, 3A and 3B are fully impoundment with perimeter embankments constructed using waste rock and other suitable construction materials

Paste is discharged from the impoundment wall delivery stations to form a beach that slopes downwards away from the wall to the southeast flank of the facility, where the supernatant pond will be located.

A waste rock dump (referred to as the Southeast Overburden Dump) has been formed in the upstream catchment of the Paste Disposal Facility, creating a broadly oval shaped facility.

Supernatant water on the Paste Disposal Facility accumulates in a pool within each of the compartments as a result of beaching. This supernatant water, predominantly derived from the process, but also from rainfall, is decanted from the surface of the Paste Disposal Facility for the following reasons:

- To conserve water;
- To prevent accumulation and eventual overtopping;
- To allow drying consolidation of the residue;
- To reduce infiltration and potential rises in the phreatic surface and eventually instability or groundwater contamination; and
- To reduce evaporation losses.

The decant arrangement comprises of duty and standby submersible pumps mounted on a floating barge, connected to an HDPE pipeline. Supernatant is pumped to the Return Water Dam 1 at a nominal rate of 400m^3/h and a maximum rate of 600m^3/h. The decant pump is relocated, as required, to keep it within the pool. A floating walkway and platform provide access to the floating barge. The decant barge system returns supernatant to the Return Water Dam from where it is pumped to the secondary thickener water tank. Overflow from the thickener also report to this tank from where it is pumped to the primary thickener located at the Beneficiation Plant for use as process water. This Return Water Dam 1 is HDPE lined and has a capacity of 49 000m^3. To optimise water management in terms of freeboard of the Return Water Dam and when water cannot be pumped to the Beneficiation Plant, an additional Return Water Dam 2 was included to the system in early 2013. Water from the Return Water Dam 1 gravity feeds to the Return Water Dam 2, which is also a HDPE lined facility at 49 000m^3.

Phased Development and the Water Management Requirements

Compartments 1 and 2 have rate of rise restrictions to ensure their structural stability. Deposition rates on Compartments 1 and 2 are currently maximised, so excess paste is deposited on Compartment 3A.

The paste level within Compartment 3A is nearing the point where further impoundment embankment raising is required to maintain adequate freeboard in Compartment 3A. Most of the impoundment embankments were historically raised to final height apart from a section in the southern portion of Compartment 3A. This is along the interface between Return Water Dam 2 and Compartment 3A. This section of the embankment needs to be raised to maintain legal freeboard requirements for Compartment 3A. Return Water Dam 2 is located within the Compartment 3A basin, in the upstream (southern) portion of the basin.

The existing Return Water Dam 2 has a trapezoidal shaped spillway that discharges into the Compartment 3A basin. However, by raising the outstanding impoundment embankment section, the spillway route will be blocked. As the basin of Compartment 3A continues to rise, its elevation will also become higher than that of Return Water Dam 2.

To mitigate this, the mine will develop the proposed new Return Water Dam 3. The water from the Return Water Dam 2 will be gravity fed to Return Water Dam 3 through a pipe system. Return Water Dam 3 will in turn discharge into Compartment 3B though a pipe spillway. This will ensure that the Return Water Dam 1 and Return Water Dam 2 operate in the same way that it was originally designed to operate.

The exact designs of the proposed Return Water Dam 3 are not yet available, but the volume of the facility will be approximately 49 000m^3.

The intention of the project is as follows:

- Supernatant and storm water will be pumped from the Paste Disposal Facility compartments to the existing concrete lined silt trap.
- The silt trap overflows into the existing HDPE lined Return Water Dam 1 from where the water is returned to the thickener overflow tank for re-use in the process.
- Excess storm water will overflow from the Return Water Dam 1 into the existing Return Water Dam 2.
- In turn, excess storm water will overflow from the existing Return Water Dam 2 into the new Return Water Dam 3.
- Water will then be pumped from the Return Water Dam 3 to the Return Water Dam 1 or 2 once the water level in the Return Water Dam 1 has dropped significantly.

- The intention is to operate the Return Water Dams dry and to maintain the level in the Return Water Dam 1 at less than 30%.

Water Containment Facility for King mining operations

To comply with GN 704 (1999) requirements in terms of the NWA and to ensure the integrity of the Paste Disposal Facility, process water may not be stored in the Paste Disposal Facility Return Water Dams. For this reason a separate water containment facility must be constructed to serve this purpose. Water balance modelling shows that a facility with a capacity of more than 30 000m^3 will not be adequately utilised (refer to Annexure 6). It is therefore recommended that this facility have a capacity of between 25 000m^3 and 30 000m^3. The facility will be constructed as a concrete tank facility.

Based on the above, a new Water Containment Facility is planned at the King Plant area to supply the mining operations. Currently water is being supplied via the Parson storage facilities, which in periods hamper capacities, when water scarcity arise in the area. With a new Water Containment Facility at the King operation, Khumani can store water for this mining operation specifically and allow for buffer capacities in dry events. The capacity of the facility and the design of the facility are as yet not available, but will be less than 50 000m^3 (likely between 25 000 and 30 000m^3, depending the outcomes of the final Water Balance and workshop discussion). Should clearance be required this will also be less than 1ha of indigenous vegetation.

1.d.ii.2 Project 2: Pipelines

Table 10: Project 2: New Pipelines and Water Containment Facility

Description	Footprint Size	Dimensions/Details	Coordinates	Listed Activities triggered
Proposed Pipeline from the Paste Disposal Facility thickener to the Beneficiation Plant thickener at a volume of approximately 375l/s.	Approximately 4 200m in length	*Type of pipe to be confirmed (steel or HDPE)* *Diameter of pipe to be confirmed*	Start Point: 23° 0'24.73"E 23° 0'24.73"E End Point: 22°58'29.97"E 22°58'29.97"E	Government Notice 327, Listing Notice 1: Activity 10: The development and related operation of infrastructure exceeding 1 000 metres in length for the bulk transportation of sewage, effluent, process water, waste water, return water, industrial discharge or slimes – (I) with an internal diameter of 0,36 metres or more; or (ii) with a peak throughput of 120 litres per second or more; excluding where— (a) such infrastructure is for the bulk transportation of sewage, effluent, process water, waste water, return water, industrial discharge or slimes inside a road reserve or railway line reserve; or (b) where such development will occur within an urban area.
Proposed Pipeline from the Parson Return Water Dam to the Beneficiation Plant to support the commitment of Khumani to reuse water optimally within the water circuit. The throughput volume is 1 700l/s.	Approximately 3 000m in length	*Type of pipe to be confirmed (steel or HDPE)* *Diameter of pipe to be confirmed*	Start Point: 27°50'55.16"S 22°58'46.91"E End Point: 22°58'29.97"E 22°58'29.97"E	Government Notice 327, Listing Notice 1: Activity 10: "The development and related operation of infrastructure exceeding 1 000 meters in length for the bulk transportation of sewage, effluent, process water, waste water, return water, industrial discharge or slimes – (i) with an internal diameter of 0,36 meters or more; or (ii) with a peak throughput of 120 litres per second or more; excluding where— (a) such infrastructure is for the bulk transportation of sewage, effluent, process water, waste water, return water, industrial discharge or slimes inside a road reserve or railway line reserve; or (b) where such development will occur within an urban area.

1.d.ii.2.a Location

The Paste Disposal Facility Return Water Pipeline is planned to tap of the existing Paste Disposal Facility Tank circuit and follow the existing pipe system towards the Beneficiation Plant.

The pipe will cross underneath the N14 National Road, via an existing circuit and will run parallel with the existing conveyors and pipeline systems towards the Parson Beneficiation Plant.

The PCD Return Water Pipeline will be routed from the existing pumping facility at the Parson PCD (also known as the Parson Storm Water Dam) and will follow the existing pipeline route towards the Beneficiation Plant.

Please refer to *Figure 5* for the location of the two new pipelines.

1.d.ii.2.b Operational Setting

Paste Disposal Facility Return Water Dam Pipeline

As mentioned before, the mine operates in a closed water circuit and therefore various thickener phases are included on site (one at the Beneficiation Plant and one at the King Plant). Water from the King Plant is diverted back via a pipeline system to the Beneficiation Plant for reuse in the system. In order to maximise water return on site, the mine will establish a second pipeline to pump water from the Paste Disposal Facility circuit back to the Plant. Water from the existing Return Water Dam will be pumped to the Thickener Tank and from there will be piped to the Beneficiation Plant.

Figure 7: Location of the Thickener Tank and the Return Water Dam

The type and design of the pipeline are yet to be finalised, but will likely be an HDPE pipeline. Various flanges will be included to optimise maintenance on the infrastructure. It is currently planned that a volume of 375 l/s will be pumped from the Paste Disposal Facility Circuit to the Beneficiation Plant via this circuit.

Parson PCD Pipeline

Another pipeline of approximately 3km in length is planned from the Parson Pollution Control Dam (PCD) (currently called the Parson Plant Storm Water) which will return water back to the Beneficiation Plant for reuse. The design of the Parson PCD Pipeline is currently not final, however it is anticipated that the throughput will be about 100m³/hr, which will amount to about 1 700l/s when water is present in this facility.

1.d.ii.3 Project 3: Changes and/or Amendments to WUL

Table 11: Project 2: Changes to the approved WUL

Description	Footprint Size	Dimensions/Details	Coordinates	Listed Activities triggered
Regulation 158 amendment for changes and corrections to the approved WUL. • Buffer Dams, which will result in a combined capacity of between 100 000m³ to 150 000m³, but as individual dams of no more than 50 000m³; • The inclusion of facilities approved under approved Environmental Authorisations, such as Permit 21/2016 and the 2012 Environmental Authorisation; • Increase of the capacity and designs of the Storm Water Dam at the Loadout Facility; • Increase of the capacity and designs of the PCD at the Plant; • Inclusion of additional Braithwaite tanks, such as the duplication of the Braithwaite Water Tank at King.	N/A – overall mining area is about 9 000ha, no new construction areas.	*The various water uses to be amendment is still to be confirmed.*	General changes to the existing WUL (2013)	The Storm Water Management Plan, identified activities which trigger the following listed activities: <u>Government Notice 327, Listing Notice 1:</u> Activity 13: The development of facilities or infrastructure for the off-stream storage of water, including dams and reservoirs, with a combined capacity of 50 000 cubic meters or more. Activity 34: The expansion of existing facilities or infrastructure for any process or activity where such expansion will result in the need for a permit or licence or an amended permit or licence in terms of national or provincial legislation governing the release of emissions, effluent or pollution. (The inclusion of this activity is not considered at this time, but may be required depending on consultation with the DWS). <u>Government Notice 325, Listing Notice 2:</u> Activity 6: The development of facilities or infrastructure for any process or activity which requires a permit or licence or an amended permit or licence in terms of national or provincial legislation governing the generation or release of emissions, pollution or effluent. This activity is triggered as the proposed new Return Water Dam would require approval of a new Water Use in terms of Section 21(g) of the NWA.

Khumani intends to amend the existing WUL to correct various administrative errors, as well as to include water uses associated with the 2016 Environmental Authorisation (Permit 21/2016). The latter involves the expansion and development of various mine residue facilities, such as the Bruce Low Grade ROM Stockpile expansion and the Parson Discard Dump expansion on site. In addition to this, the mine intends to construct a new Return Water Dam (details and designs not as yet finalised) associated with the existing Paste Disposal Facility. The projects are located on all four (4) farms owned by Khumani.

1.d.ii.3.a Inclusion of Permit 21/2016 activities into the WUL

The Permit 21/2016 issued by the NCDENC makes provision for the following activities:

- Expansion of the Parson Low Grade Discard Stockpile (or Parson Discard Dump);
- Expansion of the King/Mokaning Overburden Low Grade ROM Stockpile (H);
- New Low Grade Stockpile (J); and
- Expansion of the Bruce Low Grade ROM Stockpile.

The areas approved under Environmental Authorisations, such as those activities provided for in Permit 21/2016 as indicated above, but which still require a WUL, have been included into this application. The construction and development thereof have already been approved as per Permit 21/2016 in terms of Activity 5 of GNR 545 of 18 June 2010 (please refer to Annexure 3). This listed activity relates to the construction of facilities or infrastructure for any process or activity which requires a permit or licence in terms of national or provincial legislation governing the generation or release of emissions, pollution or effluent…*".*

These activities have however been re-included for approval in terms of the 2017 EIA Regulations, as the DMR is now the competent authority and the water uses will be undertaken as part of the integrated WUL, for which the WUL application process is now being recommissioned. Should the DMR deem it not necessary to re-include these

activities, these could be excluded from the application. The listed activity applied for, however, remains relevant to the new projects.

1.d.ii.3.b Inclusion of Hydrologist recommendations into the WUL

In addition to the above, and based on the outcomes of the Water Studies by Geo Tail (Pty) Ltd, various amendments are required to approve water uses in terms of throughput/ naming and/or volume amendments. The water balance is still in progress to determine the throughput volumes, however, all the information in terms of the capacity requirements for new infrastructure (as per Project 1 and 2) are available. The current outcomes of the Storm Water Management Plan (see Annexure 6) states the following:

<u>For the farm Parson (please refer to the following figure):</u>

The return capacity from the Parson Return Water Dam (also referred to as the Parson PCD or Parson Storm Water Dam) should be increased to at least 100m^3/hr, although a return capacity of 150m^3/hr to 200m^3/hr would provide greater operational flexibility in the medium to long term.

The return capacity from the Loadout Storm Water Dam should be increased to at least 30m^3/hr.

Although the hydrological study recommends that paddocks be implemented on the final footprint of the Discard Dump, it should be noted that such paddocks are already implemented on the final footprint as approved in the 2006 EMPr (see Photo 1). These are earth walled paddocks as per the original design intent.

Figure 8: Parson Water Management Requirements

Illustration of paddock system

Discard Dump in the background from the paddock systems

Photo 1: Discard Dump Paddock System (November 2018)

As mentioned before, the mine experiences periods of water shortages during October to January, which result in plant shut-downs and economic losses. The proposed solution to reduce plant shut-downs due to water shortages involves increasing the capacity of Sedibeng or process water stored on the mine. Extra storage on the mine will insulate the Parson Plant from unstable Sedibeng water supply and King returns. The current storage volumes have been shown to be inadequate and result in approximately 10% lost production hours.

At current production targets, this loss can be made up by various methods to ensure that production targets are still met. However, this comes at a cost of reduced maintenance time, and the King Paste Disposal Facility and Parson Plant may be placed under stress as a result. Should the TFR bottleneck be lifted and production targets increased, the mine may not be able to increase production to the approved production rates of 16 million tons per annum, due to water supply constraints.

Based on the hydrological study, it is found that additional water can be abstracted from the Sedibeng Water Supply Scheme system during most months of the year, as shown in the following figure.

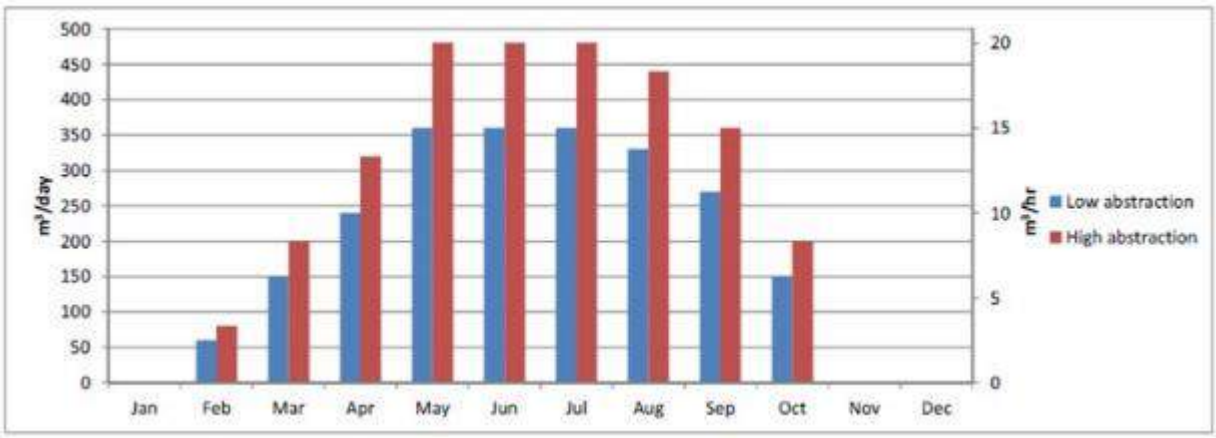


Figure 9: Assumed availability of additional Sedibeng Water Supply Pipeline Water (Hydrological Study, 2018)

Two sets of abstractions were analysed – a high abstraction peaking at 480m^3/day (20m^3/hr) during the typical high flow months, and a low abstraction peaking at 360m^3/day (15 m^3/hr) during the typical high flow months.

In addition to the two abstraction scenarios, the effect of evaporation reduction on the additional water storage reservoir was analysed. It is assumed that no evaporation protection is added to other water reservoirs on the mine. The effect of a 70% evaporation reduction and no evaporation reduction was analysed. Evaporation reduction methods are described in Section 1.g.iv.5.b of this report.

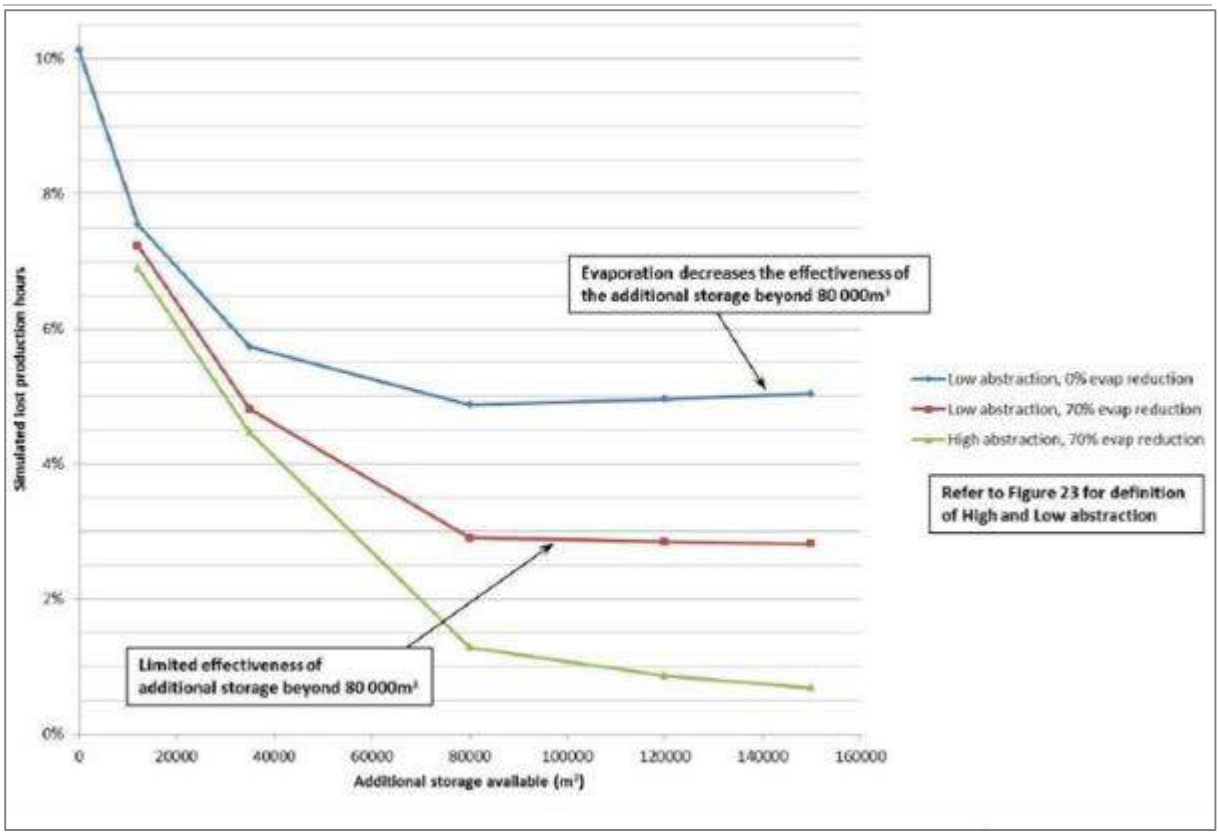


Figure 10: Summary of results of effectiveness of increased storage

The results of the above analysis show that increased additional storage of process/ Sedibeng water on the mine insulates the mine from shortfalls or instability in Sedibeing water supply, as well as from instability in the King returns.

For the combination of low abstraction and no evaporation reduction, storage beyond 80 000m^3 provides decreasing benefits as evaporation losses associated with a larger reservoir negate the additional incoming water. The base scenario (as is currently the case), yields approximately 10% loss of production hours. The combination of low abstraction and no evaporation reduction halves this loss of production hours.

For the combination of low abstraction and 70% evaporation reduction, storage beyond 80 000m^3 provides limited benefit as there in insufficient additional Sedibeng water being added to the system to take advantage of higher storage volumes. Simulated loss of production hours is reduced from 10% to 3% with a storage of 80 000m^3 and 70% evaporation protection on the additional water storage reservoir.

The combination of high abstraction (within approved limits) and 70% evaporation reduction yields less than 1% simulated lost production hours with 150 000m^3 additional water storage. The benefit reduces beyond 80 000m^3 of additional storage, but the benefits are still significant beyond 80 000m^3 of additional storage.

Note that under no instance does the mine ever approach their approved abstraction allowance from Sedibeng Water.

The approved Process Recovery Dam on Parson is currently used when one or both of the primary thickeners needs to be dumped. It is unlikely that both thickeners will require complete emptying at the same time, therefore there is available capacity in this dam that can be utilised for additional water storage. This will come at no capital cost, but will come with a small risk in event that both primary thickeners need to be fully emptied at the same time.

The Process Recovery Dam have a capacity of about 100 000m^3. Each thickener has a 45 000m^3 capacity.

Up to 60 000m^3 of storage can be utilised for additional water storage. It is recommended that evaporation reduction infrastructure be employed on the Process Recovery Dam if it is to be used for long term water storage.

In addition to the above, four (4) borrow pits, constructed during the initial construction period in 2008-2009 are located near the existing Gamagara Potable Water Tanks 2 and 3 which can also provide suitable locations for additional water storage reservoirs. The excavations will only require limited earthworks, with two (2) of the excavations already approved in terms of the WUL for water storage purposes. They would require HDPE lining to prevent seepage losses and the use of evaporation protection is strongly recommended. The locations of these excavations, along with their available capacities is shown in the following figure.

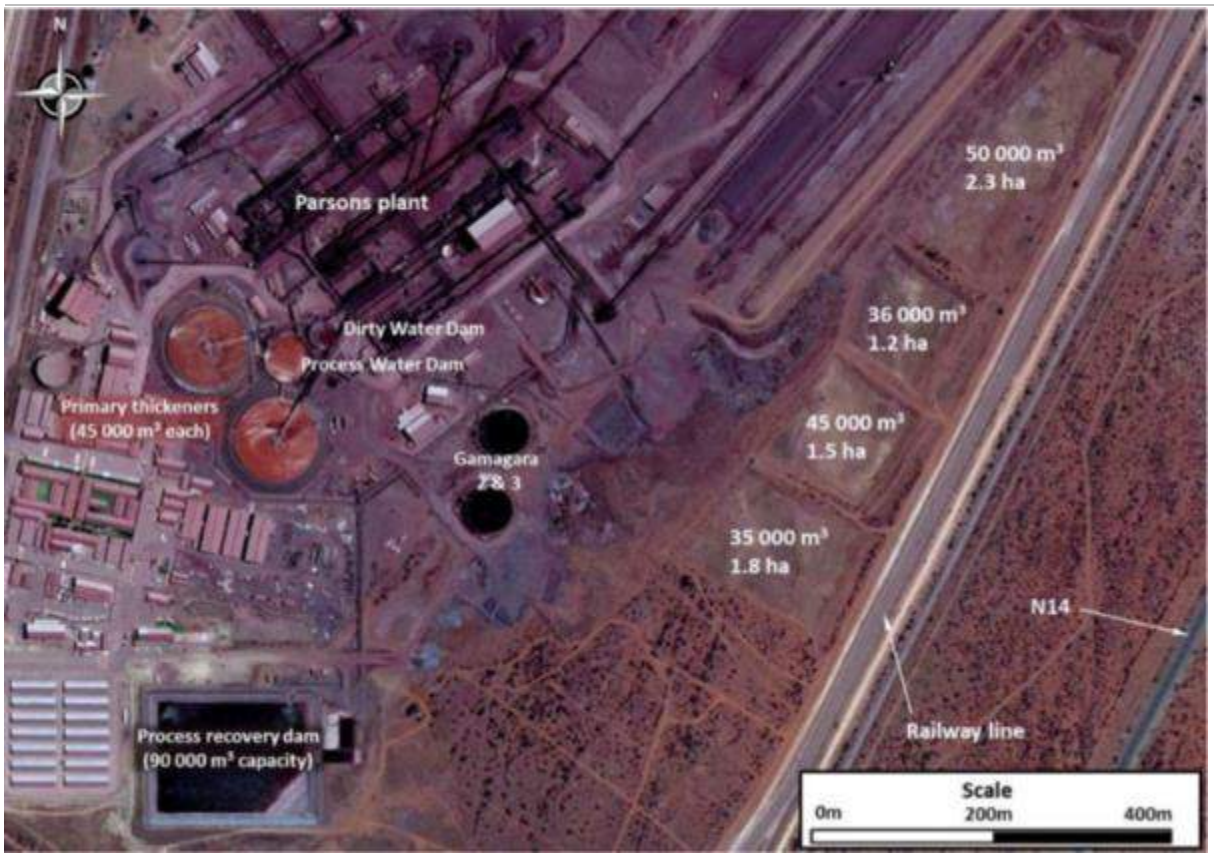


Figure 11: Potential sites for additional water storage

<u>For the farm King:</u>

Please refer to the discussions for the new Return Water Dam 3 and the upgrade of pipeline pumping capacities in Sections 1.d.ii.1 and 1.d.ii.2 of this report.

The overall summary of the Water Uses to be applied for is presented in the following table:

Table 12: Water Uses to be applied for in line with the previous WULs (lines in green are new water uses to be included into the WUL 2013) (names highlighted in red are the new activities as part of Project 1 and 2)

2018 Name	Original WUL Name	Volume (capacity per annum) m3			Farm Name	Farm Portion	South	East	WUL Map Referencing
				2018 Application					
		2008 WUL	2013 WUL	m3/a					
	Section 21(a) Uses								
Taking of water from PBE01	Taking of water from PBE01	14832	14832	14832	Parson 564	RE/2	27° 51’ 03.2”	22° 59’ 02.6”	1
Taking of water from PBW02	Taking of water from PBW02	5820	5820	5820	Parson 564	RE	27° 51’ 29.6”	22° 57’ 08.0	2
	Section 21(b)								
2018 Name	Name	Volume (capacity per annum) m3			Farm Name	Farm Portion	South	East	
				2018 Application					
		2008 WUL	2013 WUL	Holding Capacity					
	Parson Load Out								
Load Out Braithwaite Tank				144m3	Parson 564	RE	27°51'39.49"S	22°57'21.81"E	1
Load Out Fire Water Tank System				760m3	Parson 564	RE	27°51'40.27"S	22°57'22.36"E	2
	Parson Plant								
Gamagara Potable Water Tank 1				10 000m3	Parson 564	RE/2	27°51'45.56"S	22°58'17.87"E	3
Gamagara Potable Water Tank 2				20 000m3	Parson 564	RE/2	27°51'47.63"S	22°58'36.09"E	4
Gamagara Potable Water Tank 3				20 000m3	Parson 564	RE/2	27°51'50.71"S	22°58'35.47"E	5
Plant Braithwaite Tank				144m3	Parson 564	RE/2	27°51'44.77"S	22°58'19.25"E	6
Plant Fire Water Tank System				760m3	Parson 564	RE/2	27°51'46.51"S	22°58'18.39"E	7
	King/Mokaning								
King Braithwaite Tank 1				144m3	King 561	RE	27°50'46.45"S	23° 0'26.79"E	8

2018 Name	Original WUL Name	Volume (capacity per annum) m3			Farm Name	Farm Portion	South	East	WUL Map Referencing
				2018 Application					
		2008 WUL	2013 WUL	m3/a					
King Braithwaite Tank 2				144m3	King 561	RE	27°50'46.41"S	23° 0'26.41"E	9
King Potable Water System				520m3	King 561	RE	27°50'47.17"S	23° 0'26.68"E	10
King Fire Water Tank System				760m3	King 561	RE	27°50'46.45"S	23° 0'27.83"E	11
	Bruce								
Bruce Braithwaite Tank 1 (Operational Top Up)				144m3	Bruce 544	RE	27°49'6.92"S	23° 0'33.90"E	12
Bruce Braithwaite Tank 2 (Potable)				144m3	Bruce 544	RE	27°49'6.32"S	23° 0'34.34"E	13
Bruce Braithwaite Tank 3 (Crusher Dust Suppression)				144m3	Bruce 544	RE	27°48'54.42"S	23° 0'38.30"E	14
Bruce Fire Water Tank				760m3	Bruce 544	RE	27°49'5.83"S	23° 0'34.70"E	15
	Section 21(c&i)								
2018 Name	**Name**	**Volume (capacity per annum) m3**			**Farm Name**	**Farm Portion**	**South**	**East**	**WUL Map Referencing**
				2018 Application					
		2008 WUL	**2013 WUL**						
	Parson Load Out								
Extension of Parsons Low-Grade Stockpile					Parson 564	RE	27° 52’ 32.4” S	22° 57’ 10.5” E	1
Low-Grade Tertiary By-pass Stockpile					Parson 564	RE	27° 52’ 36.4” S	22° 57’ 58.0” E	2
Extension of the Bruce Low-Grade and RoM Stockpile					Bruce 544	RE	27° 46' 7.4" S	23° 01' 41.2" E	3
	Parson Plant								
Parson Railway siding Crossing 1	Parson Railway siding Crossing 1		√	√	Parson 564	2	27°50’39.0”S	22°58’55.1”E	4
Parson Railway siding Crossing 2	Parson Railway siding Crossing 2		√	√	Parson 564	2	27°50’34.7”S	22°59’05.9”E	5

2018 Name	Original WUL Name	Volume (capacity per annum) m3			Farm Name	Farm Portion	South	East	WUL Map Referencing
				2018 Application					
		2008 WUL	2013 WUL	m3/a					
Parson Railway siding Crossing 3	Parson Railway siding Crossing 3		√	√	Parson 564	2	27°50'23.9"S	22°59'40.1"E	6
	King/Mokaning								
River: Watercourse No 1 (King/Mokaning Diversion)	River: Watercourse No 1 (King/Mokaning Diversion)	√	√	√	Mokaning 560	RE	27°54'26.2" 27°53'31.2"	23°00'46.7" 22°59'11.9"	7a 7b
Watercourse 2: (Railway Crossing 2)	Watercourse 2: (Railway Crossing 2)	√	√	√	King 561	RE	27°50'58.6"S	22°59'45.0"E	8
Watercourse 2 (Conveyor Crossing 1)	Watercourse 2 (Conveyor Crossing 1)	√			King 561	RE	27°50'58.6"S	22°59'45.0"E	9
Watercourse 2 (Railway Crossing 1)	Watercourse 2 (Railway Crossing 1)	√			King 561	RE	27°54'05.1"S	22°59'45.0"E	10
King Culvert A	King Culvert A		√	√	King 561	RE	27˚49'55.2"	23˚0'36"	11
King Culvert B	King Culvert B		√	√	King 561	RE	S 27˚49'51.5"	23˚0'43.2"	12
King Culvert C	King Culvert C		√	√	King 561	RE	S 27˚49'44.4"	23˚0'50.3"	13
Mokaning Overburden Low-grade Stockpile Impediment	King/Mokaning Diversion	√		√	Mokaning 560	3	At the start of the diversion: 27◦52'18.2" At the end of the diversion: 27◦52'43.9"	23◦01'01.6" 23◦02'14.8"	14a 14b
	Bruce								
Extension of the Bruce Low-Grade and RoM Stockpile					Bruce 544	RE	27° 46' 7.4" S	23° 01' 41.2" E	15
River: Gamagara River (Conveyor Crossing)	River: Gamagara River (Conveyor Crossing)	√	√	√	Bruce 544	RE	27°49'38.8"	23° 0'20.00"E	16
River: Gamagara River (Haul Road Crossing)	River: Gamagara River (Haul Road Crossing)	√	√	√	Bruce 544	RE	27°49'12.3"S	23°01'15.0"E	17
	Section 21(g)								

2018 Name	Original WUL Name	Volume (capacity per annum) m3			Farm Name	Farm Portion	South	East	WUL Map Referencing
				2018 Application					
		2008 WUL	2013 WUL	m3/a					
2018 Name	Name	Volume (capacity per annum) m3			Farm Name	Farm Portion	South	East	
				2018 Application					
		2008 WUL	2013 WUL	Holding Capacity					
	Parson Load Out								
Load Out Storm Water Dam	Product stockpile pollution control dam	20 000	20 000m3/a	92 236m3	Parson 564	RE	27°51'2.27"S	22°58'14.61"E	1
Load Out Product Stockpiles	Parson Load out Stockpile		264m3/a	42 000 t	Parson 564	RE	27°51’26.8”	22°57’48.1”	2
Parson Load Out WWTW (Biofilter)	Parsons Load out sewerage works			1 460m3	Parson 564	RE	27°51'34.94"S	22°57'24.55"E	3
Parsons Discard sewerage works	Parsons Discard sewerage works			3 650m3	Parson 564	RE	27°51'33.45"S	22°58'0.01"E	4
Parsons Blasting storage sewerage	Parsons Blasting storage sewerage			1 460m3	Parson 564	RE	27°50'35.17"S	22°57'49.64"E	5
Load Out Dust Suppression Tanks	Load Out Dust Suppression Tanks			20m3	Parson 564	RE	27°51'40.43"S	22°57'24.88"E	6
Discard Low Grade Stockpile	Low grade Stockpile		17 375m3/a	29 685 425t	Parson 564	RE	27°52’02.2”	22°57’40.3”	7a
	Extension of Low-Grade Stockpile			365ha			27° 52’ 32.4” S	22° 57’ 10.5” E	7b
Low-Grade Tertiary By-pass Stockpile	Low-Grade Tertiary By-pass Stockpile			30ha	Parson 564	RE	27° 52’ 36.4” S	22° 57’ 58.0” E	8
	Parson Plant								
Parson Plant PCD	Parson Storm water Dam 2		8 175	89 124m3	Parson 564	RE/2	27°50’58.1”	22°58’43.9”	9
	Parson plant pollution control dam	20 160	20160m3/a						
Mine Office Sewage Treatment Plant	Parsons Sewerage works			18 250	Parson 564	RE/2	27°51'39.84"S	22°58'19.18"E	10
HO Sewage Treatment Plant 1	Parson HO sewerage works			3 650	Parson 564	RE/2	27°51'29.39"S	22°58'34.20"E	11
HO Sewage Treatment Plant 2	Parson HO sewerage works 2			3 650	Parson 564	RE/2	27°51'30.49"S	22°58'37.31"E	12

2018 Name	Original WUL Name	Volume (capacity per annum) m3			Farm Name	Farm Portion	South	East	WUL Map Referencing
				2018 Application					
		2008 WUL	2013 WUL	m3/a					
Offgrade Sewage Treatment Plant	Parsons Off grade sewerage works			3 650	Parson 564	RE/2	27°51'37.86"S	22°58'38.04"E	13
Parson Fire Station WWTW (Biofilter)	Parsons Fire Station Sewerage works			1 460	Parson 564	RE/2	27°51'54.91"S	22°58'24.75"E	14
Plant ROM and Product Stockpile Area	ROM Stockpile Area		144m3/a	400 000t	Parson 564	RE/2	27°51'35.7"	22°58'48.7"	15a
	Parson Semi Fines Product S/P 2		10m3/a		Parson 564	RE/2	27°51'38"	22°58'22.1"	15b
	Parson Semi Fines Product S/P 3 (middlings)		10m3/a		Parson 564	RE/2	27°51'40.8"	22°58'21.4"	15c
	Fines stockpile		10m3/a		Parson 564	RE/2	27°51'33.5"	22°58'34.1"	15d
	Parson Lumpy Product S/P		10m3/a		Parson 564	RE/2	27°51'33.2"	22°58'37.1"	15e
Buffer Storage Facility	Process Water Recovery Dam 1		5 233m3/a	36 000m3	Parson 564	RE/2	27°51'44.19"S	22°58'51.98"E	16a
	Process Water Recovery Dam 2		5 233m3/a	45 000m3			27°51'48.24"S	22°58'50.07"E	16b
	Buffer Storage Dam 3			35 000m3			27°51'52.21"S	22°58'46.87"E	16c
Plant	WHIMS Process Water Tank at Parson		24 000 722m3/a	1 520m3	Parson 564	RE/2	27°51'41.22"S	22°58'33.62"E	17a
	WHIMS Gland Service Water Tank at Parsons		1 800 428m3/a	1530m3	Parson 564	RE/2	27°51'41.9"	22°58'37.5"	17b
Process and Dirty Water Dam Circuit	Dirty water Dam		84 004 331m3/a	5 558m3	Parson 564	RE/2	27°51'43.5"	22°58'28.6"	18a
	Process water dam		175 321 875m3/a	13 500m3	Parson 564	RE/2	27°51'44.5"	22°58'27.3"	18b
Primary Thickener Circuit	Parsons Thickener Phase 2 (Primary Thickener 1)		90 002 336m3/y 246552m3/d	45 000m3	Parson 564	RE/2	27°51'44"	22°58'24"	19a
	Primary Thickener 2			45 000m3			27°51'47.95"S	22°58'26.61"E	19b
Plant Washbay	Wash bay Ponds		1 000m3/a	12m3	Parson 564	RE/2	27°51'47.1"	22°58'29.2"	20
Plant Process Water Recovery Dam	Plant Process Water Dam	2 0 131 m3/a		100 000m3	Parson 564	RE and 2	27°51'58.98"S	22°58'24.99"E	21

2018 Name	Original WUL Name	Volume (capacity per annum) m3			Farm Name	Farm Portion	South	East	WUL Map Referencing
				2018 Application					
		2008 WUL	2013 WUL	m3/a					
	Kin/gMokaning								
King Dust Suppression Tank System	Dust Suppression Dam		4000m3	400m3	King 561	RE	27°50’53.2”	23°00’53.9”	22
King Water Storage Facility	New King Dust Suprression Dam			25 000m3			27°51'0.57"S	23° 0'51.16"E	23
King Paste disposal facility	King Paste disposal facility	1 920 000	1 920 000m3/a	42,3 million tonnes (1920000m3)	King 561	RE	27° 50’ 16.6”	23° 00’ 51.4”	24
RWD1	Return Water Dam	44 484	44 484m3/a	44 484	King 561	RE	27° 50’ 38.7”	23° 00’ 44.4”	25
RWD2	Decant Dam		1 152 094m3/a	180 000	King 561	RE	27°50’36.9”	23°00’45.0”	26
RWD3	RWD 3			49 000m3	King 561	RE	27°50'45.51"S	23° 0'56.35"E	27
Paste Return Water Tank	Paste Return water dam		5 878 281m3/a 16 105m3/d	5 300	King 561	RE	27°50'42.22"S	23° 0'34.43"E	28
Secondary Thickener Circuit	Secondary Thickener Tank 1		3 600 000m3/a	3 800	King 561	RE	27°50’44.2”	23°00’24.2”	29a
	Secondary Thickener Tank 2		3 600 000m3/a	3 800			27°50’44.8”	23°00’23.7”	29b
King Wash Bay	King Wash Bay		100 000m3/a	900m3	King 561	RE	27°50'52.42"S	23° 0'35.31"E	30
King Crusher PCD	King crusher pollution control dam	11 520	11 520m3/a 32m3/day	13 771m3	King 561	RE	27°51'4.03"S	23° 0'22.14"E	31
New stockpile dam	New stockpile dam		6 121m3/a	20 249m3	King 561	RE	27°50’47.5”	22°59’59.2”	32
King buffer ROM S/P	King buffer ROM S/P		105 000m3/a	1 650 000 t	King 561	RE	27°50’45.6”	23°00’03.4”	33
King overburden dump	King overburden dump	7 000 000	7 000 000t/a	Require End of Life Design	King 561	RE	27° 51’ 47”	23° 01’ 12”	34
KMO2 WRD	King waste rock dump	40 000 000	40 000 000t/a	Require End of Life Design	King 561	RE	27° 50’ 40.7”	23° 01’ 22.1”	35
WRD J	Overburden Dump			58ha	King 561	RE	27° 51' 12.8" S	23° 00' 11.2" E	36
Mokaning overburden waste rock dump	Mokaning overburden waste rock dump	2 600 000	2 600 000m3/a	65 000 000t	Mokaning 560	3	27° 52’ 41.2”	23° 01’ 28.2”	37a
	Mokaning Waste Dump		69,5m3/a	Require End of Life Design	Mokaning 560	3	27°52’33.54”	23°00’51.42”	37b
	Mokaning overburden waste			48ha	King 561	RE	27° 52' 38.6" S	23° 00' 38.1" E	37c

2018 Name	Original WUL Name	Volume (capacity per annum) m3			Farm Name	Farm Portion	South	East	WUL Map Referencing
				2018 Application					
		2008 WUL	2013 WUL	m3/a					
	rock dump (extension)								
Diversion (Discard) Waste Rock Dump	Diversion (Discard) Waste Rock Dump		2880000m3/a	1 200 000 m3	King 561	RE	27°53'03.00"	23°00'10.6"	38
King dust suppression	King dust suppression			*Suppression as required.*	King 561	RE	27°51'8.69"S	23° 1'2.13"E	39
Mokaning dust suppression	Mokaning dust suppression			*Suppression as required.*	Mokaning 560	1	27°52'55.99"S	23° 0'40.11"E	40
King Plant WWTW (Biofilter)	King Plant sewerage			10 950m3	King 561	RE	27° 51.007	23° 00.187	41
King Workshop WWTW (Biofilter)	King Workshop sewerage			10 950m3	King 561	RE	27° 50.114	23° 00.545	42
Pit KM01	Backfill			29 952 926 m3	King 561	RE	27°51'55.25"S	22°59'59.21"E	43
	Bruce								
Bruce PCD	Bruce Crusher pollution control dam	11 520ha	11 520m3/a	21 400m3	Bruce 544	RE	27°49'13.91"S	23° 0'50.63"E	44
Bruce overburden and low grade ROM stockpile	Bruce overburden and low grade ROM stockpile	2 643 333	2 643 333m3/a	268ha	Bruce 544	RE	27°46'12.0"	23°01'42.0"	45a
	Extension of the Low-Grade and RoM Stockpile			75ha	Bruce 544	RE	27° 46' 8.1" S	23° 02' 3.2" E	45b
Bruce ROM Buffer S/P	Bruce ROM Buffer S/P		10m3/a	1 200 000 t	Bruce 544	RE	27°49'06.0"	23°00'36.5"	46
Bruce Wash Bay	Bruce Wash Bay		100 000m3/a	900m3	Bruce 544	RE	27°48'58.79"S	23° 0'32.50"E	47
Bruce evaporation Pond	Bruce evaporation Pond		30 000m3/a	3 200	Bruce 544	RE	27°48'55.8"	23°00'41.3"	48
BC04 Tank	Dam BC 04		672 000m3/a	200	Bruce 544	RE	27°48'40.12"S	23° 0'44.54"E	49
Dirty Water Tank	Dirty Water Dam		160 444m3/a	200	Bruce 544	RE	27°48'45.98"S	23° 0'41.39"E	50
Bruce Banded Iron Stone Dump	Bruce Banded Iron Stone Dump		20m3/a	7310000t	Bruce 544	RE	27°48'25.04"S	23° 0'45.88"E	51
Bruce Quartz dump	Bruce Quartz dump		10 m^3/a or 20 000 m^3/a	20000t	Bruce 544	RE	27°48'54.49"S	23° 0'45.91"E	52

2018 Name	Original WUL Name	Volume (capacity per annum) m3			Farm Name	Farm Portion	South	East	WUL Map Referencing
				2018 Application					
		2008 WUL	2013 WUL	m3/a					
Bruce Plant WWTW (Biofilter)	Bruce plant area Sewerage works			18 250m3	Bruce 544		27°49'3.97"S	23° 0'39.95"E	53
Bruce Dust Suppression	Bruce Dust Suppression			*Suppression as required.*	Bruce 544	RE	27°47'17.09"	23° 0'28.03"E	54
Pit BA	Backfill			20 076 404 m3	Bruce 544	RE	27°48'9.28"S	23° 0'28.98"E	55
Pit BB	Backfill			15 418 020 m3	Bruce 544	RE	27°47'32.22"S	23° 0'31.83"E	56
Pit BC	Backfill			14 369 353 m3	Bruce 544	RE	27°46'28.23"S	23° 0'36.57"E	57
	Name	**Volume (capacity per annum) m3**			**Farm Name**	**Farm Portion**	**South**	**East**	**WUL Map Referencing**
		2008 WUL	**2013 WUL**	**2018 Application**					
	Section 21(j)								
	Removal of water from the King/Bruce pits	432 000	432 000	432 000	King 561	RE	-	-	1

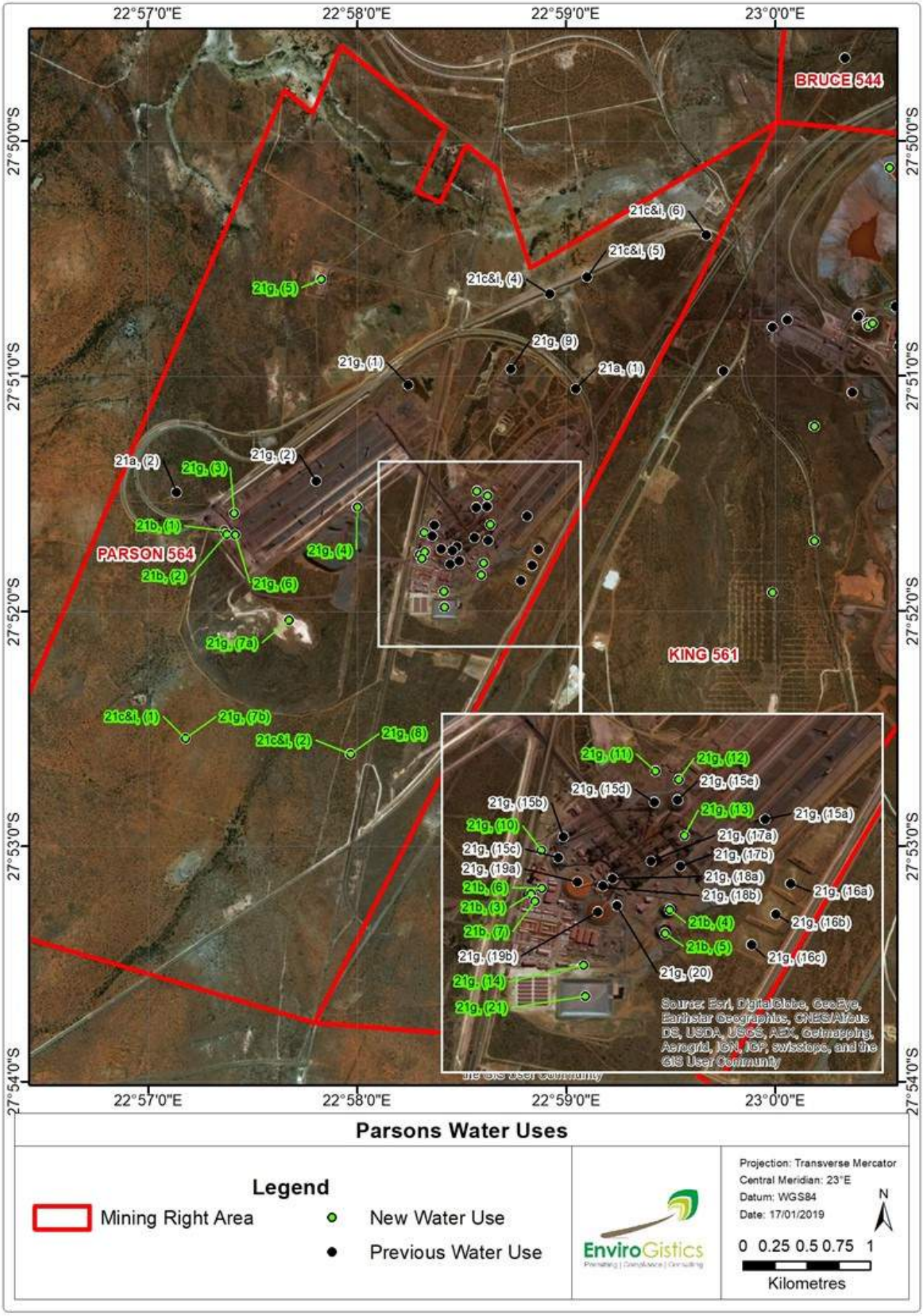


Figure 12: Preliminary Parson Water Use Locations

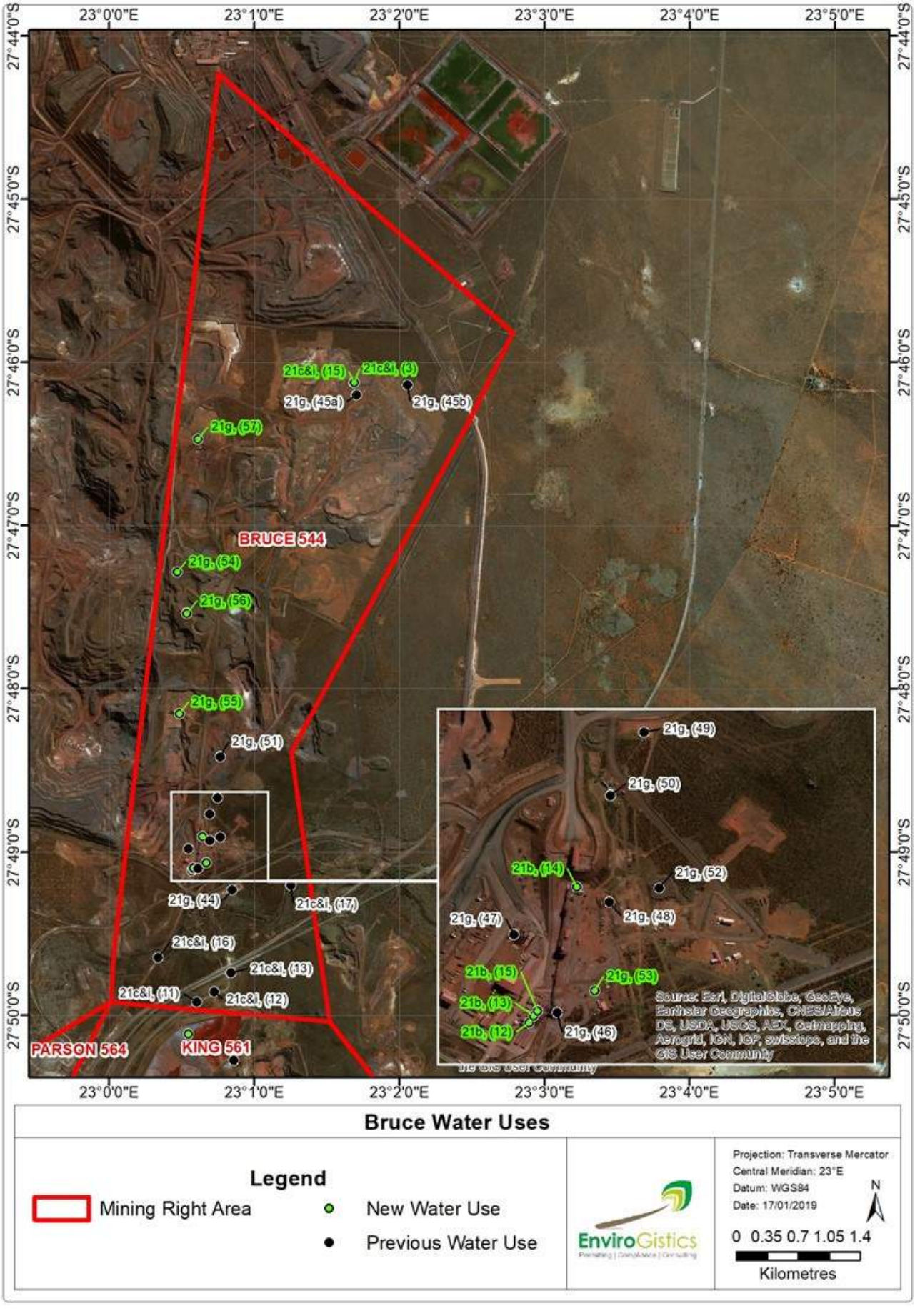


Figure 13: Preliminary Bruce Water Use Locations

Figure 14: Preliminary King Water Use Locations

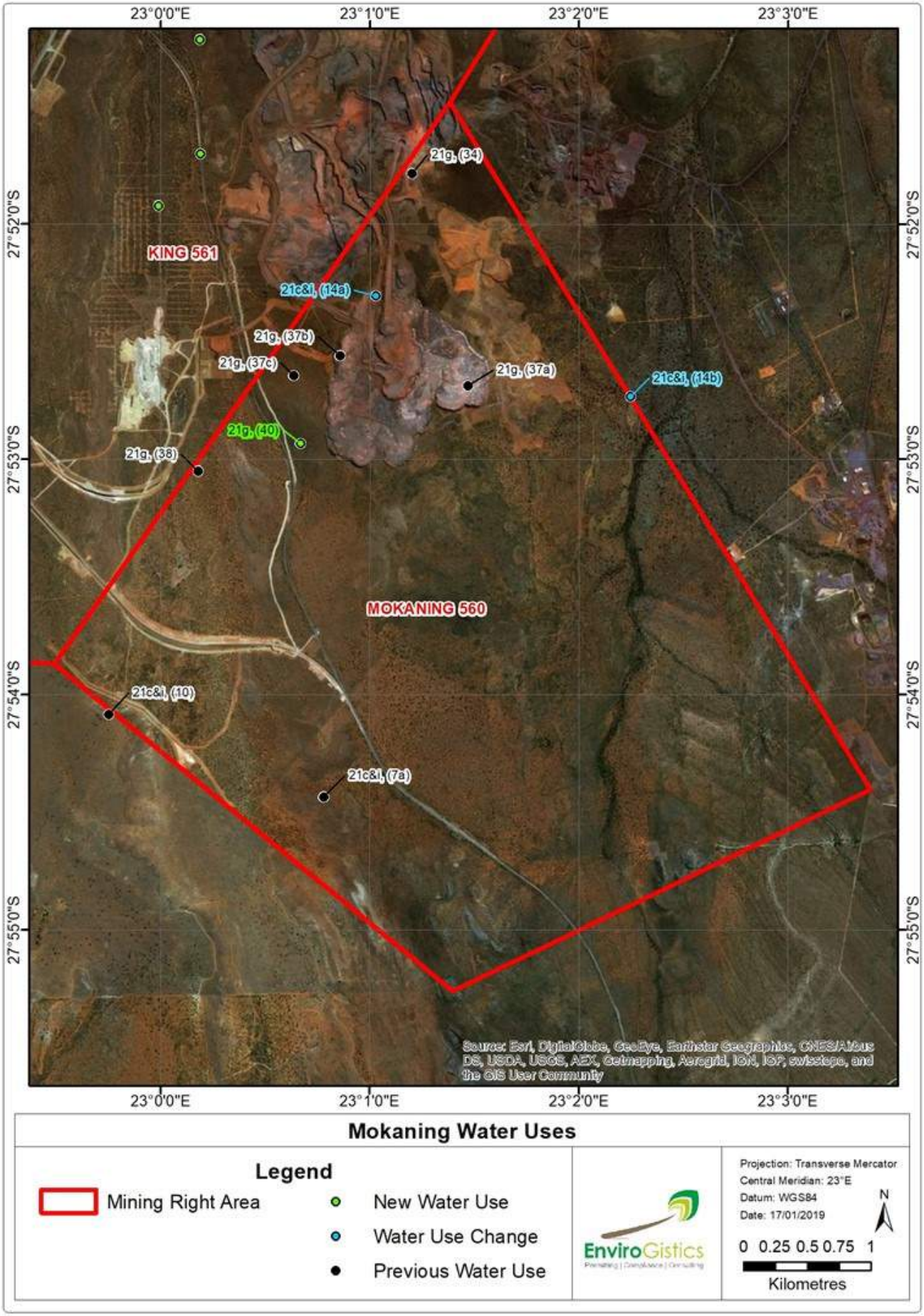


Figure 15: Preliminary Mokaning Water Use Locations

1.d.iii Description of the Activities to be undertaken

The infrastructure and activities that will form part of the proposed project will include the following:

- Planning Phase:
  - Ensure the implementation of Legal Requirements (Environmental Permits and Authorisations).
- Construction Phase:
  - Establishment of surface infrastructure;
  - Storm Water Management; and
  - Waste Management.
- Operational Phase:
  - Optimise pumping of water from the Paste Disposal Facility circuit to the Beneficiation Plant;
  - Operation of the Return Water Dam and Water Containment Facility;
  - Storm Water Management; and
  - Waste Management.
- Closure Phase:
  - Ensure the implementation of Legal Requirements (Environmental Permits);
  - Storm Water Management;
  - Removal of Pipelines and potential spills as a result of the removal;
  - Removal and Rehabilitation of the Water Containment Facility;
  - Rehabilitation of the Return Water Dam 3 in parallel with the Paste Disposal Facility;
  - Earth moving, shaping and ripping of ground;
  - Cessation of Labour Contracts; and
  - Waste Management.

1.e Policy and Legislative Context

South Africa has a comprehensive environmental governance framework underpinned by an extensive array of environmental laws. The past years have evidenced the wholesale reform of South Africa's environmental legal framework under the guidance of the Constitution.

Historically, the mining industry in South Africa has not been subjected to comprehensive environmental regulation. However, in recent years, this has changed significantly and the industry is now required to comply with a multifaceted network of mining and environmental legislation. There are no shortages of policy and legal frameworks to ensure "responsible" mining in South Africa. The Minerals and Mining Policy for South Africa, 1998 affirmed that the State, as custodian of the nation's natural resources, will support mining development while maintaining and enhancing environmental awareness of the mining industry in accordance with national environmental policy, norms and standards.

The following table presents the key policy and legislative considerations as part of this application.

Table 13: Policy and Legislative Context

Applicable Legislation And Guidelines Used To Compile The Report	Reference Where Applied	How Does This Development Comply With And Respond To The Legislation And Policy Context
The Constitution of South Africa (Act No. 108 of 1996)	Sustainable development is relevant to all projects.	The Constitution reigns supreme and the advancement of human rights is one of the foundations of South Africa's democracy. Furthermore, the Bill of Rights plays a central role in the democratic regime because it embodies a set of fundamental values which should be promoted at all times. An environmental right is contained in Section 24 and is, arguably, the cornerstone for environmental governance in South Africa, which includes the mining industry. Section 24(a) proclaims the right of everyone "to an environment that is not harmful to their health or well-being". Mining companies are thus duty-bound to constitutional, legislative, and other measures to prevent pollution and ecological degradation, promote conservation and to develop in a sustainable manner. The Constitution cannot manage environmental resources as a stand-alone piece of legislation, hence additional legislation have been promulgated in order to manage the various spheres of both the social and natural environment. Each promulgated Act and associated Regulations is designed to focus on various industries or components of the environment to ensure that the objectives of the Constitution are effectively implemented and upheld on an on-going basis throughout the country. In terms of Section 7, a positive obligation is placed on the State to give effect to the environmental rights.
Specific Environmental Management Acts (SEMAs)		
The Hazardous Substances Act, 1973 (Act No. 15 of 1973) (HSA)	Management of Chemicals	All chemicals transported to and stored on site will be handled in accordance with the HSA and the applicable materials safety data sheets. A chemical log will be kept and all the necessary signage erected on site.
National Heritage Resources Act, 1999 (Act No. 25 of 1999 (NHRA)	-	Sections 34 and 38 of the NHRA details specific activities that require an approved heritage impact assessment by the South African Heritage Resources Association (SAHRA). *A heritage permit will only be required where a road exceeding 300m in length will be constructed, or more than 5 000m² of land will be cleared – none of these are applicable to this project.*
National Water Act, 1998 (Act No. 36 of 1998) (NWA)	Amendment of the WUL (2013) as well as the application for the Return Water Dam 3.	One of the main and ever-continuing concerns in South Africa is the sustainability of water management, and the costs associated with the prevention and remediation of pollution. The NWA is one of the government's answers to some of these challenges and functions as sectoral legislation within the framework of NEMA. Section 19 of the NWA echoes the duty of care envisaged in Section 28 of NEMA and addresses the prevention and remediation of the effects of pollution. The NWA provides for a broad duty of care in that: ***"(1) an owner of land, a person in control of land or a person who occupies or uses the land on which-*** ***a) any activity or process is or was performed or undertaken; or*** ***b) Any other situation exists, which causes, has caused or is likely to cause pollution of a water resource must take all reasonable measures to prevent any such pollution from occurring, continuing or recurring."*** The words "likely to cause pollution" broadens the scope of the duty, which enables an activity, or situation that is land-based, to trigger the application of the duty. The "reasonable measures" are not prescribed, but may include measures intended to:

Applicable Legislation And Guidelines Used To Compile The Report	Reference Where Applied	How Does This Development Comply With And Respond To The Legislation And Policy Context
		"Cease, modify or control any act or process causing the pollution; comply with any prescribed waste standard or management practice; contain or prevent the movement of pollutants; eliminate any source of pollution; remedy the effects of pollution; and remedy the effects of any disturbance to the bed and banks of a watercourse." The NWA, furthermore, provides for water use authorisations which a mine will have to apply for, before commencing with its primary activity of mining. Water uses that need to be licensed under Section 21 of the NWA include: a) Taking water from a water resource; b) Storing water; c) Impeding or diverting the flow of water in a watercourse; d) Engaging in a stream flow reduction activity; e) Engaging in a controlled activity; f) Discharging waste or water containing waste into a water resource through a pipe, canal, sewer, sea outfall or other conduit; g) Disposing of waste in a manner which may detrimentally impact on a water resource; h) Disposing in any manner of waste which contains waste from, or which has been heated in , any industrial or power generation process; i) Altering the bed, banks, course or characteristics of a watercourse; j) Removing, discharging or disposing of water found underground if it is necessary for the efficient continuation of an activity or for the safety of people; and k) Using water for recreational purposes. Khumani's existing WUL is currently being updated and the changes to the approved facilities will be incorporated into this process.
National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) (NEM:WA)	The NEM:WA waste activities are not being triggered as part of this project. However, this legislation is considered in the development of waste management measures and assessing potential impacts.	The NEM:WA fundamentally reformed the law regulating waste management, and for the first time provides a coherent and integrated legislative framework addressing all the steps in the waste management hierarchy. The objectives of the NEM:WA are to protect health, well-being and the environment by providing reasonable measures for, *inter alia*, remediating land where contamination presents, or may present, a significant risk of harm to health or the environment. The objectives of the NEM:WA are structured around the steps in the waste management hierarchy, which is the overall approach that informs waste management in South Africa. The waste management hierarchy consists of options for waste management during the lifecycle of waste, arranged in descending order of priority; i.e.: waste avoidance, reduction, re-use, recycling, recovery, treatment, and safe disposal as a last resort. NEMA, as previously mentioned, introduced a number of additional guiding principles into South African environmental legislation, including the life-cycle approach to waste management, producer responsibility, the precautionary principle and the polluter pays principle (i.e. the sustainability principles as contained in Section 2 of NEMA). Section 5(2) of the NEM:WA stipulates that the Act should be interpreted and guided in accordance with these sustainability principles. The NEM:WA, furthermore, echoes the duty of care provision in terms of Section 28 of NEMA, by obliging holders of waste to take reasonable measures to implement the waste management hierarchy. Section 16(1) of the NEM:WA provides that: ***"A holder of waste must, within the holder's power, take all reasonable measures to –*** ***a) avoid the generation of waste and where such generation cannot be avoided, to minimise the toxicity and amounts of waste that are generated;*** ***b) reduce, re-use, recycle and recover waste;***

Applicable Legislation And Guidelines Used To Compile The Report	Reference Where Applied	How Does This Development Comply With And Respond To The Legislation And Policy Context
		c) where waste must be disposed of, ensure that the waste is treated and disposed of in an environmentally sound manner; ***d) manage the waste in such a manner that it does not endanger health or the environment or cause a nuisance through noise, odour or visual impacts;*** ***e) prevent any employee or any person under his or her supervision from contravening this Act; and*** ***f) prevent the waste from being used for an unauthorised purpose."*** When considering whether a "substance" is considered a "waste" or not, the definition of the NEM:WA must be considered. The NEM:WA defines "waste" as: ***"Any substance, material or object, that is unwanted, rejected, abandoned, discarded or disposed of, or that is intended or required to be discarded or disposed of, by the holder of that substance, material or object, whether or not such substance, material or object can be re-used, recycled or recovered and includes all wastes as defined in Schedule 3 of this Act; or*** ***Any other substance, material or object that is not included in Schedule 3 that may be defined as a waste by the Minister by notice in the Gazette."*** At the current time and with the information available it is not foreseen that a waste licence will be required for the new Return Water Dam 3, as this facility will be regarded as a storage facility (transfer point) between the Paste Disposal Facility and Beneficiation Plant. The facility is not considered a lagoon, but will be a constructed dam, which will contain runoff contaminated water (which constitutes waste water by the DEA).
National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) (NEM:BA)	Relevant to protected tree removals, as well as to development within CBAs and listed Threatened Ecosystems.	The NEM:BA addresses a number of issues related to biodiversity and how it should be protected and managed in undertaking development activities. The purpose of the NEM:BA is to provide for the management and conservation of South Africa's biodiversity within the framework of the NEMA and the protection of species and ecosystems that warrant national protection. As part of its implementation strategy, the National Spatial Biodiversity Assessment was developed. Khumani is not located in a CBA, and furthermore, no clearance of large areas of vegetation is required as part of this project. In the event that clearance is required for the King Water Containment Facility this will be less than 1ha and where required the necessary permits will be applied for as per the standard practice currently implemented by the mine.
Framework Legislation		
National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA)	This Scoping Report & the EMPr which will follow as part of the EIA process.	In respect of the Listed Activities in terms NEMA, Section 24F(1)(a) of NEMA stipulates the following: ***"no person may- commence an activity listed or specified in terms of section 24(2)(a) or (b) unless the competent authority or the Minister of Minerals and Energy, as the case may be, has granted an environmental authorisation for the activity..."*** Section 24F is clear in its prohibition that only those "***listed or specified***" activities may not commence without prior Environmental Authorisation. Consequently, the activities to be conducted by the Mine will only trigger Environmental Authorisation requirements when these said activities trigger a listed or specified activity referred to in Section 24F. Furthermore, note that the law is clear in that NEMA and its Regulations ***do not have retrospective working***. Accordingly, in terms of the various Listing Notices promulgated since 1997, it is paramount to link the commencement date of the specific activities with the corresponding Listed Activities.

Applicable Legislation And Guidelines Used To Compile The Report	Reference Where Applied	How Does This Development Comply With And Respond To The Legislation And Policy Context
		There are currently five sets of EIA Regulations (with an addition 2017 amendment to the listed activities, which did not repeal the 2014 regulations) which govern potential Listed Activities. The focus should be on if ***and when*** a Listed Activity was commenced with in terms of the specific Regulations; i.e.: • Environmental Conservation Act, 1989 (ECA) Listed Activities, promulgated in terms of the ECA (effective between 08 September 1997 and end of day 09 May 2002); • ECA Listed Activities, promulgated in terms of the ECA (effective between 10 May 2002 and before end of day 02 July 2006); • The 2006 EIA Regulations, 2006 Listing Notice 1 and 2006 Listing Notice 2 (effective between 03 July 2006 and end of day 01 August 2010); • The 2010 EIA Regulations, 2010 Listing Notice 1, 2010 Listing Notice 2 and 2010 Listing Notice 3 (effective between 02 August 2010 and end of day 07 December 2014); and • The 2014 EIA Regulations, 2014 Listing Notice 1, 2014 Listing Notice 2 and 2014 Listing Notice 3 (commencement date 08 December 2014, as amended in April 2017). Accordingly, an activity must be assessed in terms of the specific Regulations applicable at the time of commencement of the specific activity. EnviroGistics undertook a detailed review of the listed activities according to the proposed project description to assess the listed activities that are considered applicable. The assessment was undertaken in line with the 2014, as amendd by the 2017 EIA Listed Activities. The EIA Application fee of R10 000 was paid to the DMR on 28 September 2018. An Application for Environmental Authorisation was couriered to the DMR and received by the DMR on 2 October 2018. The acknowledgement of the application has as yet not been received from the DMR. *Under the One Environmental System (December 2014), the Minister of Mineral Resources will issue environmental authorisations in terms of the NEMA for mining activities related to the primary extraction and/or primary processing of ore material. The Minister of Environmental Affairs will form the appeal authority.*
Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 1998) (MPRDA)	Existing Mining Right, amendments to activities and addition to infrastructure and activities on site.	Since 2004, the MPRDA has been the principle piece of legislation that regulates the South African mineral and petroleum sector. The MPRDA was enacted with the objectives of promoting local and rural development, ensuring equal access to minerals, and eradicating discriminatory practices in the industry, while still guaranteeing security of tenure to participants in the industry and increasing the industry's international competitiveness. Recent amendments to NEMA and the MPRDA have been published with the objective to align NEMA and the MPRDA authorisation processes as well as to provide for cooperative governance between the DMR and the DEA. The governing provisions in respect of EMPs/ EMPr's were removed from the MPRDA and incorporated into Sections 24N, 24O, 24P, 24Q, 24R and 24S of NEMA. The project does not entail any additional authorisation for mining rights in terms of the MPRDA. The surface infrastructure will be located within the approved mining area within Khumani. No changes to the Mining Works Programme are required at this time.
Municipal Plans		

Applicable Legislation And Guidelines Used To Compile The Report	Reference Where Applied	How Does This Development Comply With And Respond To The Legislation And Policy Context
Integrated Development Plan (IDP) for the Gamagara Local Municipality (Draft for Year 2017-2022) in which the new activities are located.	Economic Development	The IDP, clearly states that the Gamagara Local Municipality, "being situated in an arid area, has extremely limited water resources. Settlements in the area are therefore extremely dependent on the extraction of groundwater for various uses. Although water resources in the area are supplemented by Sedibeng Water, the exponential growth in the area, especially around Kathu, has necessitated the close monitoring and protection of underground water resources" (IDP 2010/11). The purpose of optimising water management and circulation within the mining area is therefore paramount to the key water issues raised in the IDP.
National Development Plan (NDP)	Local Municipality within the National and Provincial Planning Context	The IDP/ Budget argues that South Africa displays what could be seen or described as a "top-down, and, at the same time, bottom-up" process of development planning. The NDP is a plan for the country to encourage long term planning, i.e. up to 2030. The municipality incorporates the long term visioning as espoused in the NDP. The following six pillars have widespread merits for strategic planning: • Unite all South Africans around a common programme to fight poverty and inequality and promote social cohesion; • Have South Africans be active citizens in their community and in the development of the country; • A growing and inclusive economy with higher investment, better skills, rising savings and greater levels of competitiveness; • Building capabilities of the people and the state; • A developmental state capable of correcting historical inequalities and creating opportunities for more people while being professional, competent and responsive to the needs of all citizens; and • South African leaders putting aside narrow sectarian interests in favour of national interest and putting the country first.

1.f Need and Desirability of the Proposed Activities

Khumani has been operational since 2006 when construction started and operations started I . The mine has been investigating measures to optimise water management on site due to the fact that groundwater resources are mostly dewatered in the operational areas of the mine as a result of surrounding mining activities and water supply is purchased at high costs from the Sedibeng Water Supply Scheme, which is the main source of water supply to not only the mine, but also the surrounding towns, farmers and communities.

As a result the mine has identified various projects to aid in optimising the internal water circuit.

1.f.i Project 1: Return Water Dam 3 and King Water Containment Facility

The mine currently has two dams which form part of the Paste Disposal Facility General Arrangements and water circuit. It is the intention of the mine to expand on the capacity of storage around the Paste Disposal Facility due to the following reasons:

1. The expansion of the Paste Disposal Facility into its next disposal compartment will require the management of storm water around the area.
2. Additional storage capacity for storm water will be required when Compartment 3B (existing KM02 opencast pit) is commissioned as a paste storage compartment.
3. The initial intention of sourcing water from the groundwater aquifers to supplement water supply in periods when the Sedibeng Water Supply Scheme cannot provide water have been placed on hold, due to concerns raised by the surrounding landowners regarding water scarcity in the catchment, and the opportunity for the mine to firstly consider optimising its internal water circuit.
4. The new Return Water Dam 3 will also ensure legal compliance (i.e. GN 704 etc.).
5. The additional dam, Return Water Dam 3, will ensure that water can be optimally stored in the area and pumped to the Beneficiation Plant.

As mentioned before, a new Water Containment Facility is planned at the King Plant area to supply the mining operations. Currently water is being supplied via the Parson storage facilities, which in periods hamper capacities, when water scarcity arise in the area. With a new Water Containment Facility at the King operation, Khumani can store water for this mining operation specifically and allow for buffer capacities in dry events. The facility will be a concrete system, with a capacity of between 20 000 and 30 000m^3. Should clearance be required this will also be less than 1ha of indigenous vegetation.

1.f.ii Project 2: Pipelines Project

Khumani's only source of water supply is that of the Sedibeng Water Supply Scheme via the Vaal/ Gamagara Pipeline. For this reason it is pertinent for the mine to ensure that there is sufficient infrastructure on site to optimise water reuse within the process water circuit, as well as to allow for buffer storage capacity in periods when this pipeline scheme is not operational or supply lower volumes of water.

The additional pipeline to transport water to and from the Paste Disposal Facility is merely an upgrade and improvement of the existing mine water circulation system. The mine experiences blockages on the system due to the high density of the slurry pumped. For this reason the additional Paste Disposal Facility Return Water Pipeline will not only assist in transporting water during technical constraints on one line, but will also allow for an increase in pumping volume during periods of high rainfall events.

The Water Balance of Khumani and approved WUL requires Khumani to reuse water optimally in the circuit. The volumes of water currently being received in the Parson PCD cannot be pumped optimally to the Beneficiation Plant due to the infrastructure constraints. Through the additional pipelines and upgrades to the pumping infrastructure, the mine will have the opportunity to return more water from the dams to the process circuit. For this reason an upgrade to the pumping system at the Parson PCD and increase to the Parson PCD Pipeline from the Parson PCD to the Beneficiation Plant is required.

1.f.iii Project 3: WUL Amendment

The mine has an approved WUL, dated 2013 which repealed the 2008 WUL. Upon receipt of this WUL, the mine has requested various amendments to the WUL. The DWS presented the mine with a formal letter of rejection (dated

7 August 2017) which pertained to the amendment application submitted on 4 September 2013 (10/D41J/BCJ/2122; 21/11/2008 and 719242). The reasons for the rejection are related to the following:

- The Department cannot trace the administrative mistakes;
- The Department was unable to source the relevant application documents from DWS Head Office;
- The Department was unable to source the comments from DWS Head Office; and
- Some of the requested amendments were viewed by the Department as upgrades and not administrative mistakes.

In addition to the above, the mine has applied for a new WUL for the Mine Residue Facilities on Bruce, King, Mokaning and Parson farms, approved in terms of Permit 21/2016 (whereby the Bruce Low Grade ROM Stockpile expansion and the Parson Discard Dump expansion, amongst others, are approved). This application was submitted by GCS (Pty) Ltd during 2016. The DWS instructed the mine to resubmit the 2016 application as designs of the facilities were still outstanding, with the amendments required.

As mentioned before, the initial intention of sourcing water from the groundwater aquifers to supplement water supply in periods when the Sedibeng Water Supply Scheme cannot provide water have been placed on hold, due to concerns raised by the surrounding landowners regarding water scarcity in the catchment, and the opportunity for the mine to firstly consider optimising its internal water circuit. The mine has, as a commitment to stakeholders, engaged with a hydrologist to reassess the Water Balance and Storm Water Management system on site. This study has identified the following additions:

- Construction of additional activities (Return Water Dam 3, additional, formal Buffer Dam, etc.);
- Increase in the capacity of approved water containment facilities (such as the Parson Plant PCD); and
- Optimising pumping throughput through containment facilities, due to the rerouting of water in the system; etc.

All of these activities will require amendments to the existing WUL.

1.g Motivation for the preferred development footprint within the approved side including a full description of the process followed to reach the proposed development footprint within the approved site

1.g.i Details of the Development Footprint Alternatives Considered

1.g.i.1 Details of all alternatives considered

1.g.i.1.a The property on which or location where it is proposed to undertake the activity

The projects presented are all located within the existing Mining Area. The activities considered in this application are linked to approved and established sites and therefore no property alternatives or location alternatives are relevant.

1.g.i.1.b The design or layout of the activity

1.g.i.1.b.1 Project 1: Return Water Dam 3 and King Water Containment Facility

Increasing the capacity of the existing Return Water Dam 1 was considered. The operation received an updated WUL (Reference 10/D41J/BC1J/2122) for Section 21(a), Section 21(c) & (i), Section 21(g) and Section 21(j) water uses on 16 March 2013. One of the activities approved in the 2013 WUL, is the Paste Disposal Decant Dam (i.e. Surge Dam/ Return Water Dam 2). This activity is approved as the Decant Dam (Activity 8 on page 18 of the WUL).

The current capacity of the facility is 49 000m³ (approved at 1 152 094m³/a disposal). The initial intention of the mine was to expand the capacity of this dam. The expansion would have resulted in an increase in the capacity of the facility to about 180 000m³. The concern was the large storage capacity in one facility close to the Paste Disposal Facility. The mine therefore initiated the investigation of optimising pumping capacities to and from the Paste Disposal Facility and as a result identified the opportunity to construct a smaller facility up gradient of the Return Water Dam 2, which will aid in the water storage management around the Paste Disposal Facility. For this reason the development of Return Water Dam 3 was considered as a more suitable alternative based on the management of the facilities in terms of water volume storage and the pumping of water between facilities, as well as safety considerations on the facility.

In terms of the King Water Containment Facility, the location and size will be dependent on the outcomes of the Water Study currently being completed by Geo Tail (Pty) Ltd. The alternatives in terms of design ranged from a tank structure or a civil constructed dam. Based on the fact that a tank will aid in reducing water losses, as well as siltation, the option for a tank was preferred.

1.g.i.1.b.2 Project 2 – Pipelines Project

No alternatives are applicable as the pipelines are designed according to the current infrastructure design successfully utilised on site and with the throughput capacities as identified as part of the Storm Water Management study.

1.g.i.1.b.3 Project 3: Changes and/or Amendment to WUL

No alternatives are applicable, as the infrastructure in question are already established, and/or approved in terms of Environmental Authorisations.

1.g.i.1.c The technology to be used in the activity

No technological alternatives are relevant to the three projects, with the exception of evaporation control measures in the determination of storage capacities on site.

As mentioned before, the mine experiences periods of water shortages during October to January, which result in plant shut-downs and economic losses. The proposed solution to reduce plant shut-downs due to water shortages involves increasing the capacity of Sedibeng or process water stored on the mine. Additional storage on the mine will insulate the Parson Plant from unstable Sedibeng water supply and King returns. The current storage volumes have been shown to be inadequate and result in approximately 10% lost production hours.

At current production targets, this loss can be made up by various methods with production targets still being met.

Two sets of abstractions were analysed – a high abstraction peaking at 480m^3/day (20m^3/hr) during the typical high flow months, and a low abstraction peaking at 360m^3/day (15 m^3/hr) during the typical high flow months.

In addition to the two abstraction scenarios, the effect of evaporation reduction on the additional water storage reservoir was analysed. It is assumed that no evaporation protection is added to other water reservoirs on the mine. The effect of a 70% evaporation reduction and no evaporation reduction was analysed. Evaporation reduction methods are described in Section 1.g.iv.5.b of this report.

Please refer to Section 1.d.ii.3.b of this report, which details the outcome of the hydrological study. The outcomes of the report and the recommendation of the EMPr is that the mine includes evaporation measure on at least the Buffer Dams, as well as the Process Water Recovery Dam.

1.g.i.1.d The operational aspects of the activity

As mentioned before, Khumani has been constructed in 2006, with operation commencing in 2007. The mine has been investigating measures to optimise water management on site due to the fact that groundwater resources are mostly dewatered in the operational areas of the mine as a result of surrounding mining activities. Water supply is purchased at high costs from the Sedibeng Water Supply Scheme, which is the main source of water supply to not only the mine, but also the surrounding towns, farmers and communities.

As a result, the mine has identified various projects to aid in optimising the internal water circuit, which relates to the required Return Water Dam 3 and new pipeline infrastructure.

The only alternative to consider would be to operate in terms of the status quo, which present water constraints during four months of the year (October to January) when the Sedibeng water supply is not consistent, or to apply for the use of groundwater, which has raised concerns during initial consultation processes in 2017.

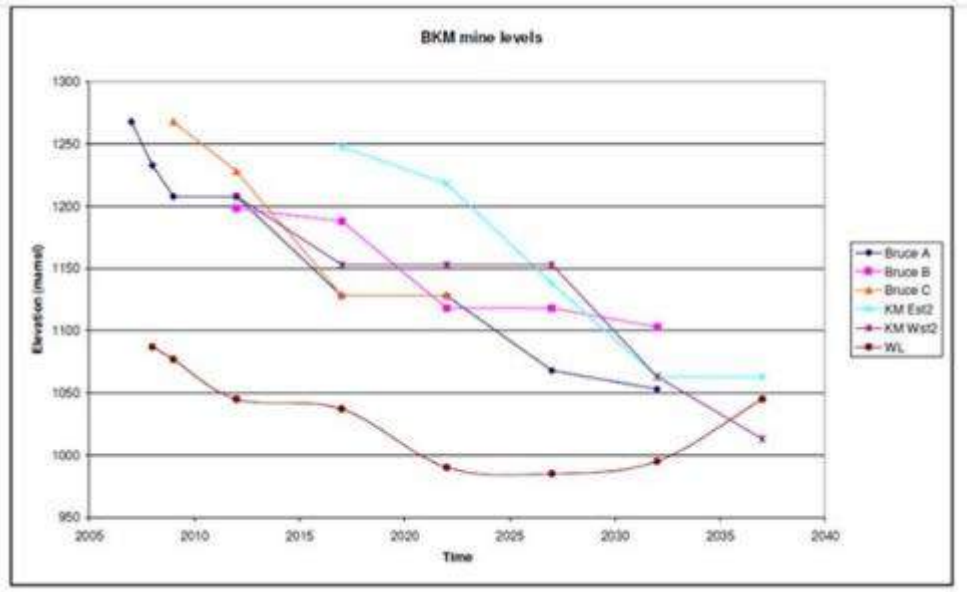
The options in question relate to the improvement of existing facilities on site.

1.g.i.1.e The option of not implementing the activity

In 2007, Khumani was granted a mining right and mine construction began shortly thereafter. Production at the mine started in 2007. Khumani has the capacity to mine approximately 16 million tons of iron ore per annum, which is mined from a series of opencast pits by conventional mining methods such as drilling, blasting and loading into trucks for haulage to the crushers. To date no dewatering has been required from Khumani mine to ensure safe

mining conditions. Water supply for processing has been supplied by Sedibeng Water Board via the Vaal/ Gamagara Pipeline.

Khumani currently has an approved WUL (Reference 10/D41J/BC1J/2122 dated 16 March 2013). In addition, the mine has another WUL (Reference 719242, dated 27 November 2008), which was repealed by the 2013 WUL. Both of these WULs allow the mine to abstract groundwater for safe mining conditions (Section 21(j) water use - abstraction of water at 432 000m^3/annum for safe mining purposes) once the mine intercepts groundwater through its opencast pit operations. Current studies foresee these activities to be required from 2035. The numerical studies of 2006 and 2017 indicate that the dewatering will only affect the groundwater compartment within which the opencast pits are situated, please refer to the following graph.



Graph 1: Future Dewatering Trends

In 2015 water supply shortages were experienced at the mine and an augmentation project was initiated in consultation with the DWS, Kimberley, to site, drill and test boreholes suitable for supplying the water requirements of the mine in periods when the Sedibeng Water Supply Scheme cannot meet the requirement. The lack of water supply during the October to January period every year results in significant production losses with the processing plant coming to a halt.

For this reason, the mine investigated the implementation of four boreholes on Portion RE of the farm Bruce, located within the mining area. It was the intention of the mine to abstract a combined volume of approximately 456 192m^3 (at 44l/s) of groundwater from these boreholes during the four (4) month period. During the consultation phase with stakeholders in 2017, the stakeholders voiced concern regarding further water abstraction in the catchment. The mine therefore committed to undertake further water studies to first identify measures to optimise water internally.

The activities applied for in terms of this application (specifically the new activities: Return Water Dam 3, King Water Containment Facility and two new pipelines) is considered to optimise the internal water flow within the mining circuit. If this project is not approved, the mine will continue to experience shortage of water supply during certain times of the year, and lose the opportunity to implement sound Water Conservation and Demand Management Practices.

The new activities being applied for will be located in existing disturbed or cleared areas, where ancillary infrastructure is already present. The Return Water Dam 3 will be located in the Paste Disposal Facility footprint area, and the pipelines will follow existing linear corridors.

The activities relating to the WUL Amendment are approved activities in terms of Environmental Authorisations and therefore No Go alterantives are not applicable.

1.g.ii Details of the Public Participation Process Followed

Public participation is understood to be a series of inclusive and culturally appropriate interactions aimed at providing stakeholders with opportunities to express their views, so that these can be considered and incorporated

into the Scoping and Environmental Impact Reporting (S&EIR) process. Effective public participation requires the prior disclosure of relevant and adequate project information to enable stakeholders to understand the risks, impacts and opportunities of the proposed project.

The objectives of the public participation process can be summarised as follows:

- Identify relevant individuals, organisations and communities who may be interested in or affected by the proposed project;
- Clearly outline the scope of the proposed project, including the scale and nature of the existing and proposed activities;
- Identify viable proposed project alternatives that will assist the relevant authorities in making an informed decision;
- Identify shortcomings and gaps in existing information;
- Identify key concerns, raised by Stakeholders that should be addressed in the subsequent specialist studies;
- Highlight the potential for environmental impacts, whether positive or negative; and
- To inform and provide the public with information and an understanding of the proposed project, issues and solutions.
- In accordance with the NEMA GNR 982, as amended, Chapter 6, the following activities as stipulated in the sections hereafter, have taken place or are proposed to take place as part of the Environmental Authorisation Process.

1.g.ii.1 Stakeholder Identification

The public participation process must include consultation with (1) the competent authority, (2) every state department that administers a law relating to the matter, (3) all organs of state which have jurisdiction in respect of the activity to which the application relates, (4) all potential, or, where relevant, registered Interested and Affected Parties (I&APs). In order to satisfy this requirement, the EAP included the following consultations in the process:

- Competent Authority - The DMR is the competent authority related to this application. The EAP undertakes to engage in on-going communications with the DMR (preferably directly with the allocated case officer).
- Departments that administer a law relating to the matter - The DWS has been directly informed of the proposed projects via email and telephonic conversations. DWS will be the competent authority due to a WUL application that needs to be submitted as part of the proposed project.
- All organs of state which have jurisdiction in respect of the activity to which the application relate:
    - National Level: DEA - Under the “One Environmental System” rolled out by Government on 8 December 2014, licensing processes for mining, environmental authorisations and water use have been streamlined. Under the One Environmental System, the Minister of Mineral Resources will issue environmental authorisations and waste management licences in terms of the NEMA and the NEM:WA respectively, for mining and related activities. However, note that under the new system, the Minister of Environmental Affairs will be the appeal authority for these authorisations to ensure complete independence of the competent authority.
    - Provincial Level: Given that the activity is located within the Northern Cape Province, the Northern Cape Department of Environment and Nature Conservation (NCDENC) will form a primary commenting authority during the process. The provincial Heritage Resource authority will be informed of the project.
    - District and Local Level: The farm Mokaning is situated within the Tsantsabane Local Municipality (NC085), which forms part of the ZF Mgcawu District Municipality (formerly known as the Siyanda District Municipality). The farms Parson, Bruce and King are situated within the Gamagara Local Municipality (NC01B1), which forms part of the John Taolo Gaetsewe District Municipality (formerly known as the Kgalagadi District Municipality).
    - All potential and registered I&APs - The existing Khumani stakeholder database was used as a base starting point. The database was updated following any stakeholder requests to be registered. The use of site notices, notification letters, Short Messaging Systems (SMS), email and fax was used as methods in which to reach potential I&APs.
- Affected Adjacent Landowners and Land Owners - As far as possible, all affected adjacent property owners were contacted and informed of the proposed new development at Khumani.
- Property Owners: Khumani holds the mining rights and surface rights.

The latest stakeholder database is included within this report as Annexure 4.

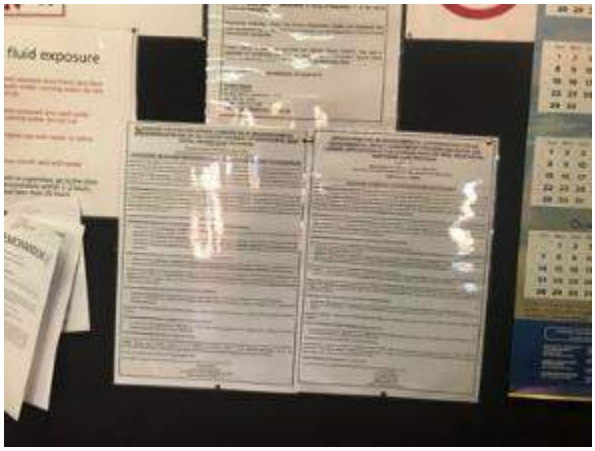
All registered I&APs, which have a direct affect/effect on the proposed project or are directly or indirectly impacted by the proposed project, have the right to lodge a comment/question on the project (until such time that the appeals process comes to a close).

1.g.ii.2 Stakeholder Identification and Notification

Please refer to Annexure 4 for copies of these notifications. Proof of email submissions can be requested from the EAP.

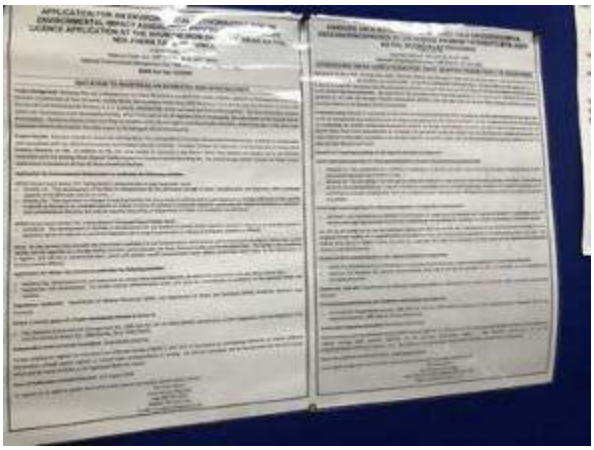
1.g.ii.3 Site Notices

In accordance with GNR 982 Section 41(2)(a-b) a site notice was developed in both Afrikaans and English and placed at four locations (see proof of placement below), in order to inform surrounding communities and adjacent landowners of the proposed project. The site notices were placed on 22 August 2018 at visible locations close to the site. Site notices were placed at the following locations:



Bruce Mine

King Mine



Parson Entrance

Gamagara Municipality

1.g.ii.4 Background Information Documents

Key stakeholders, that included the following sectors, were directly informed of the proposed development by e-mail and fax through the submission of the Background Information Document and Registration Sheet:

- Authorities;
- Municipalities;
- Residential Associations;
- Non-Governmental Organisations;
- General public;
- Parastatals/ Service providers, and
- Adjacent landowners.

Please refer to Annexure 4 for a copy of the Background Information Document, which was made available to all stakeholders on 31 August 2018, when the notification of the project was emailed to all stakeholders.

1.g.ii.5 Advertisements

In accordance with NEMA GNR 982, 41(2)(c), as amended of Chapter 6 an advert was placed in:

- The Diamond Fields Advertiser (DFA); and
- The Kathu Gazette.

The advert was place in both Afrikaans and English in the above newspapers on 29 August 2018 and 1 September 2018 respectively (see proof of newspaper adverts below).

Should the EAP note an affected stakeholder and be made aware of his/ her existence by the ward councillor or traditional leader, efforts will be made to ensure his/ her participation in the stakeholder engagement process (as required by NEMA GNR 982, Section 41(2)(e) of Chapter 6), as amended.

Any stakeholder who submits a comment during the course of the process will automatically be registered on the project-specific stakeholder database.

Diamond Fields Advertiser (DFA)

Kathu Gazette

1.g.ii.6 Document Review

The draft Scoping Report was made available on public review for a period of 30 days from **16 October 2018 (when the document was delivered)**. Note that all comments received up until the review of the draft EIA Report will be included into the Final EIA Report.

Electronic Copies of the report were made available from:

- Public Participation Office via Dropbox link and via email.

Hard copies of the draft Scoping Report were couriered to the following authorities:

- Department of Mineral Resources – Registry
- Northern Cape Department of Environment and Nature Conservation (NCDENC) – Ms. Doreen Werth
- Department of Water and Sanitation (Kimberley) – Mr. Aron Magono
- SAHRA – Online system (although no activities will be located in sensitive heritage areas)
- Gamagara Local Municipality – Municipal Manager
- ZF Mgcawu District Municipality – Municipal Manager

The draft report was made available to stakeholders from 8 February 2019 to 11 March 2019.

1.g.ii.7 Stakeholder Meetings

Due to the nature of the project (being largely the optimisation of existing infrastructure), no stakeholder meetings are considered. However, initiations meetings have been held with the DWS. EnviroGistics also requested the DMR to indicate whether a meeting could be undertaken either on site or at the DMR Office, to date no feedback was received.

1.g.ii.8 Summary of Issues raised by the I&APs

The Issues and Responses Register includes the comments as received during the Stakeholder Consultation Process undertaken for the proposed project. This includes responses to the advertisements, response sheets, individual discussions with key stakeholders, and any other comments received during the project timeframe up to 16 November 2018 for to the Draft Scoping Report (note that no comments were received). This will be updated in the final EIA Report with the comments received during the commenting period for the draft EIA Report.

The following table presents the comments received as part of the Environmental Process to date:

Table 14: Stakeholder Comments received

NO.	THEME: GENERAL COMMENTS / ISSUES			
	ISSUE RAISED	**DATE AND HOW ISSUE WAS RAISED**	**COMMENTATOR**	**RESPONSE**
1	Clarification on the inclusion of water uses. The DMR raised their uncertainty regarding their responsibility of approving water uses.	1 November 2018 email and telephonic conversation between EnviroGistics and the DMR (refer to Annexure 4).	Mr. Johannes Nematatani	Ms. Bekker informed the DMR that the new Return Water Dam and King Water Containment Facility (Project 1) would require a WUL and that a Water Use Licence Application (WULA) is also being undertaken as part of the application processes. This application is being considered by the DWS, Kimberley. Initial meetings have commenced between the applicant and the DWS during 2017. Project 1 involves new developments and therefore certain listed activities are triggered in terms of the EIA Regulations, including Government Notice 325, Listing Notice 2: • Activity 6: The development of facilities or infrastructure for any process or activity which requires a permit or licence or an amended permit or licence in terms of national or provincial legislation governing the generation or release of emissions, pollution or effluent. Project 3 does not trigger any Listed Activities in terms of construction, development or changes in approved footprints, but merely the amendment of the throughputs and capacities of existing facilities, as well as the inclusion of water uses which were previously included into the 2016 WULA, but not as yet finalised. However, the following listed activity is being applied for in terms of the EIA Regulations Government Notice 327, Listing Notice 1: Activity 34: The expansion of existing facilities or infrastructure for any process or activity where such expansion will result in the need for a permit or licence or an amended permit or licence in terms of national or provincial legislation governing the release of emissions, effluent or pollution,.
2	The DMR stated in an email: "Please kindly note that DMR does not receive any application by hand. All applications are submitted when they are successfully uploaded on the [South African Mineral Resources Administration System] SAMRAD online system of the Department. Attached is the proof of application which indicates the date of application."	1 November 2018 via email.	Mr. Johannes Nematatani	In order to ensure that the Environmental Authorisation process in question is undertaken in terms of the law and associated regulatory requirements, it is the duty of the appointed Environmental Assessment Practitioner (EAP) to follow the stipulated regulations. In terms of the NEMA Regulations: **"receipt"** means receipt on the date indicated- (a) on a receipt form if the application or document was hand delivered or sent via registered mail; (b) in an automated or computer generated acknowledgment of receipt; (c) on an acknowledgement in writing from the competent authority as the date of receipt if the application or document was sent via ordinary mail; or

NO.	THEME: GENERAL COMMENTS / ISSUES			
	ISSUE RAISED	**DATE AND HOW ISSUE WAS RAISED**	**COMMENTATOR**	**RESPONSE**
				(d) on an automated or computer generated proof of transmission in the case of a facsimile message; **Regulation 3(6) of the EIA Regulations -** The competent authority **must acknowledge receipt of all applications** and documents contemplated in regulations 16, 19, 21, 23, 29, 31 and 34 within 10 days of **receipt** thereof. **Regulation 17** - Upon **receipt of an application**, the competent authority must check whether the application…**Regulation 21(1) -** The applicant **must, within 44 days of receipt of the application by the competent authority**, submit to the competent authority a scoping report which has been subjected to a public participation process of at least 30 days and which reflects the incorporation of comments received, including any comments of the competent authority. For these reasons, and to ensure the integrity of the application process, the EAP will ensure to comply with the regulated stipulations in terms of the EIA Regulations.
3	Pre-consultation meetings with the DWS regarding the required process to be undertaken for the WULA.	Meeting: 22 August 2017 Meeting: 22 February 2017	Adeyileka Esther Thivhonali K Tlonae F A Magomono Philani Msimango	The 2016 WULA is still open. The applicant was requested by the DWS to resubmit this application with the amendments required on the approved 2013 WUL. During the meeting of 22 February 2018, the applicant was instructed to submit a combined WUL application for all amendments and new water use activities. The WULA process is currently in planning phase, with the development of an overall Water Balance. Once the Water Balance has been finalised, the water uses applied for will be considered in line with this and amendments will be applied for. All new water uses, will also be applied for and part of this overall integrated WULA.
4	The proposed activities require a water use authorisation from the DWS in terms of Section 40 of the NWA. The proposed activities could trigger a Section 21(g) water use and an application for exemption from GN 704 may be required. It is advised that the water use authorisation be applied for and obtained prior to commencement of the proposed project activities. A pre-consultation meeting and site inspection has to be arranged with the DWS to advise on the water uses that are triggered. Should the pipelines cross any water resources a Section 21 (c) and (i) must be applied for. Design drawings and an engineering report for the proposed construction of the Return Water Dam and pipelines must be submitted with the WUL. A Storm Water Management Plan, Geohydrological report, and a Rehabilitation Plan Public Participation must form part of the WUL application documents. The EMPr must clearly show the methods for collecting, storing and transporting and finally disposing of all waste products produced. Disposal of slimes from drilling during prospecting should be disposed of in terms of the NEM:WA.	27 November 2018, based on letter received from the DWS	DWS – FA Magonono	A WULA will be undertaken for the proposed activities. Initiation meetings have already be undertaken during 2017, and will be undertaken again once the water uses are finalised. No new river crossings will be undertaken by the project and therefore a Section 2(c) and (i) is not required. Design drawings will be submitted with the WULA – Geotail has been appointed to undertaken the design drawings. A detailed Storm Water Management Plan has been commissioned and is attached this this report. All wastes are disposed of in line with the mine's NEM:WA Waste Management Licence. Hazardous waste is also disposed of by a licensed waste disposal company. No prospecting activities will be undertaken as part of this project. A detailed impact and risk assessment is presented in Table 35 to Table 39 with the responsible persons indicated.

NO.	THEME: GENERAL COMMENTS / ISSUES			
	ISSUE RAISED	**DATE AND HOW ISSUE WAS RAISED**	**COMMENTATOR**	**RESPONSE**
	The disposal of general and hazardous waste must be carried out in an environmental safe way. The EMPr must clearly identify all risks that are association with the project. The EMPr must clearly show a responsibility matrix and organogram of the responsible persons for implement mitigation measures and reporting lines.The DWS has no objections to this activity, provided that the applicant has provided proof of adherence to the above mentioned recommendations.			
5	As the proposed development is undergoing an EA Application process in terms of the National Environmental Management Act, 107 of 1998 (NEMA), NEMA Environmental Impact Assessment (EIA) Regulations, it is incumbent on the developer to ensure that a Heritage Impact Assessment (HIA) is done as per section 38(3) and 38(8) of the National Heritage Resources Act, Act 25 of 1999 (NHRA).	15 November 2018, based on letter received by the SAHRA.	SAHRA – Natasha Higgitt	The activities in question will be undertaken in areas already disturbed by the mine. A detailed heritage assessment was undertaken for the overall mine during February 2005 by David Morris. A second Heritage and Paleontological Study was undertaken on the King Farm by HCAC (May 2017). The areas where activities are therefore planned has been assessed by Heritage Specialists and an additional study will be a duplication of the information already available. Please refer to Annexure 6 for a copy of the two studies undertaken in the past.

1.g.iii The Environmental Attributes associated with the Alternatives

As no significant changes in the location of infrastructure have been required based on the alternative discussions to date, the environmental attributes associated with the current site locations are presented.

1.g.iii.1 Baseline Information

1.g.iii.1.a Climate

Information contained in this section was obtained from Khumani EMPr Amendment undertaken in 2011, the Air Quality Assessment undertaken by Airshed Planning Professionals (Pty) Ltd in 2005 and the Air Quality Gap Analysis undertaken by Prism EMS (Pty) Ltd in 2015.

Temperature

Although the Northern Cape is mainly semi desert, the western areas of the Northern Cape, including Namaqualand, a small section of the Green Kalahari and Calvinia, Nieuwoudtville and Loeriesfontein in the Karoo fall in the winter rainfall area, with rains received from April to September. Sharing the same climate as Namaqualand, these two sub regions provide displays of wild flowers during spring months from July to October.

The Northern Cape's weather is typical of desert and semi desert areas. This is a large dry region of fluctuating temperatures and varying topographies. The annual rainfall is sparse, only 50 to 400mm per annum. In January, afternoon temperatures usually range from 34 to 40°C. In 1939 an all-time high of 47.8°C was recorded at the Orange River. Summer temperatures often reach 40°C. The following figure indicates the mean monthly minimum and maximum temperatures recorded from the Parson Weather Station.

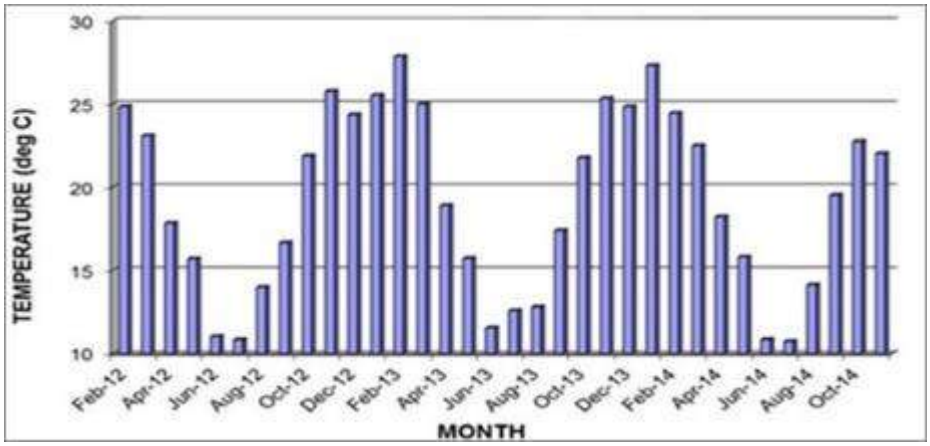


Figure 16: Mean monthly Minimum and Maximum temperatures

Rainfall

Records from a previous study, obtained from the South African Weather Service (SAWS) for the Postmasburg and Kuruman Weather Stations (years 2000 and 2003) and from the Sishen Weather Station for the years 1961 to 2001 (Sishen Iron Ore Mine EMPr, 2002) show that the mean annual rainfall for the area is approximately 386mm, while the observed records on the farm Parson for the three year period show 353mm. The data obtained from the weather station on site for the periods 2012, 2013 and 2014, noted an annual rainfall for the area of 418mm, 154mm and 314mm respectively, as shown in the following figure.

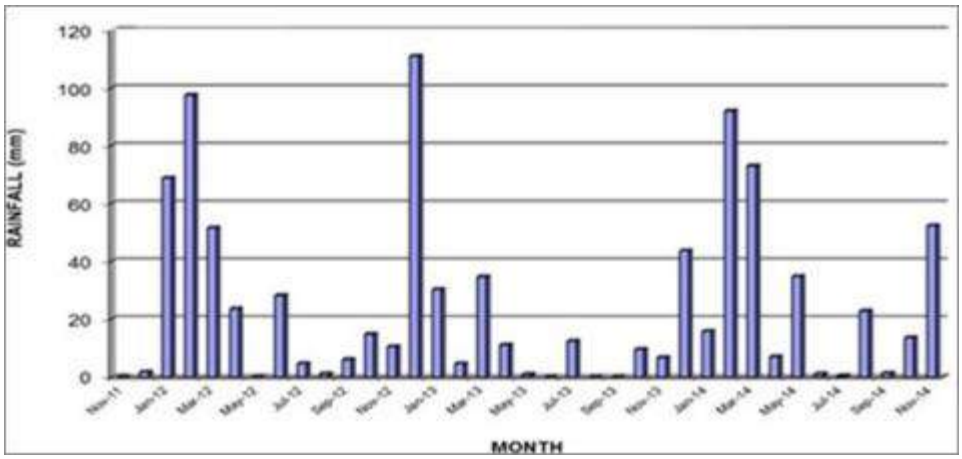


Figure 17: Total Annual Rainfall measured at Parson Weather Station (2012-2014)

Wind

The weather station that monitors standard meteorological parameters has been operational on the farm Parson at the Salvage Yard, north of processing plant and west of stackers/ reclaimers since the end of November 2011. The station experienced problems with data capturing during the first few months of operation, but is now yielding results on a regular basis. The graphs for wind roses and different measured parameters are presented in the following figure.

In terms of the data collected from the weather station, the spatial and annual variability in the wind field for farm Parson is clearly evident in the figure below. The predominant wind direction is from north-northeast and south-southwest, with frequent winds also occurring from the north and south. Over the three-year period, frequency of occurrence was over 8% from the south and south south-westerly sector, with south-westerly winds occurring over 7% of the time. Less frequent (above 6% of the time), but stronger winds were noted from the north, north-north-easterly and north-easterly sector.

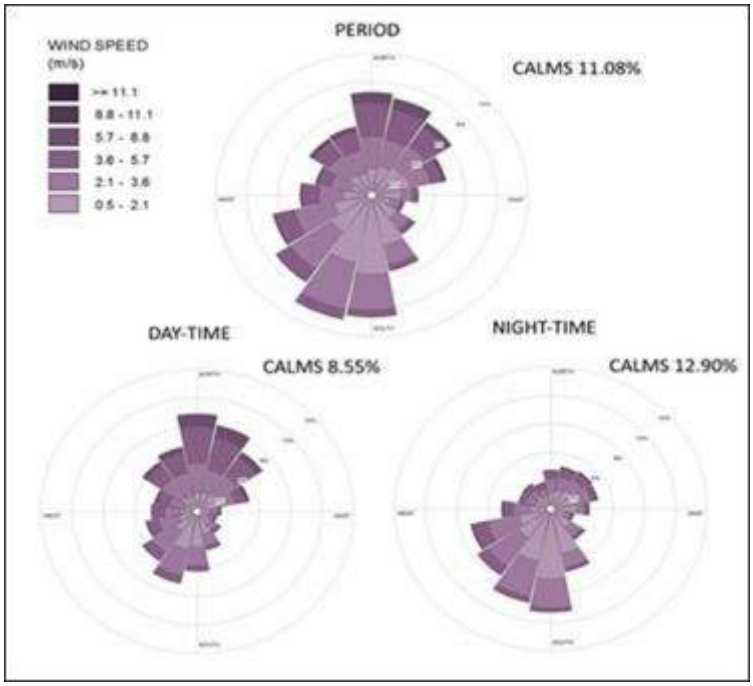


Figure 18: Period wind roses measured at Parson Weather Station (2012-2014)

Calm conditions (wind speeds less than 0.5m/s) occur for less than 11.8% of the time, with winds between 0.5-2.1m/s occurring for 40% of the time. The data is in good agreement with data sourced for a previous study for the SAWS automated weather station in Kathu, indicating that the average wind speeds over this site for the period November 2011 to end November 2014 is 2.21m/s.

During daytime there is an increase in winds from north-northwest, north and northwest, with frequencies of greater than 10%. Nocturnal wind flow reflects more dominant winds from the south, south-southwest and southwest. Frequent winds from the south occur for approximately 10% of the time. Night-time conditions also reflect a decrease in wind speeds with average wind speed decreasing to 1.87 m/s in comparison to daily wind speeds of between 2.55m/s. Refer to Figure 19 for an indication of seasonal wind directions as measures at Parson Weather Station.

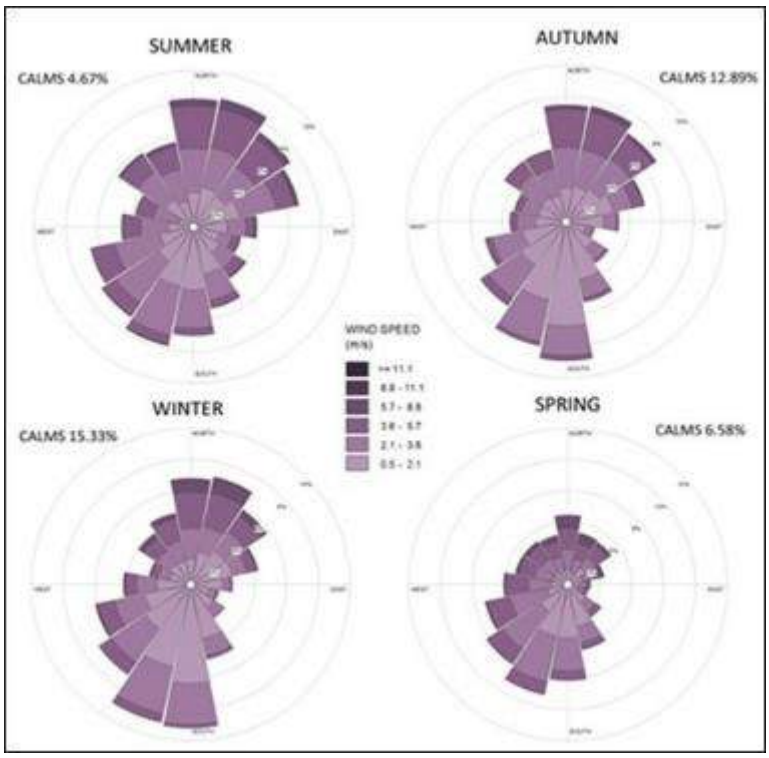


Figure 19: Seasonal wind roses measured at Parson Weather Station (2012-2014)

1.g.iii.1.b Topography

The topography of the project area is characterised by relatively flat terrain, with no steep inclines with the exception of the mountain ranges to the west (Langberg range) and a smaller range to the east (Kuruman Heuwels). Altitudes range from approximately 1235 metres above mean sea level (mamsl) in the south to 1210mamsl in the north.

Various landform elevations occur within the mining right area, with the highest elevation present on the southern portion of farm Bruce (1271mamsl) and the lowest elevation (1200mamsl) in the floodplain of the Gamagara River, with the land gradually increasing in gradient to approximately 1240mamsl in the central part of the mining right area. The elevation gradient from north to south along the central line of the mining right areas is shown in the figure below.

The project areas in question are located on relatively flat terrain already graded as part of the overall mining area, as can be seen from the following figures.

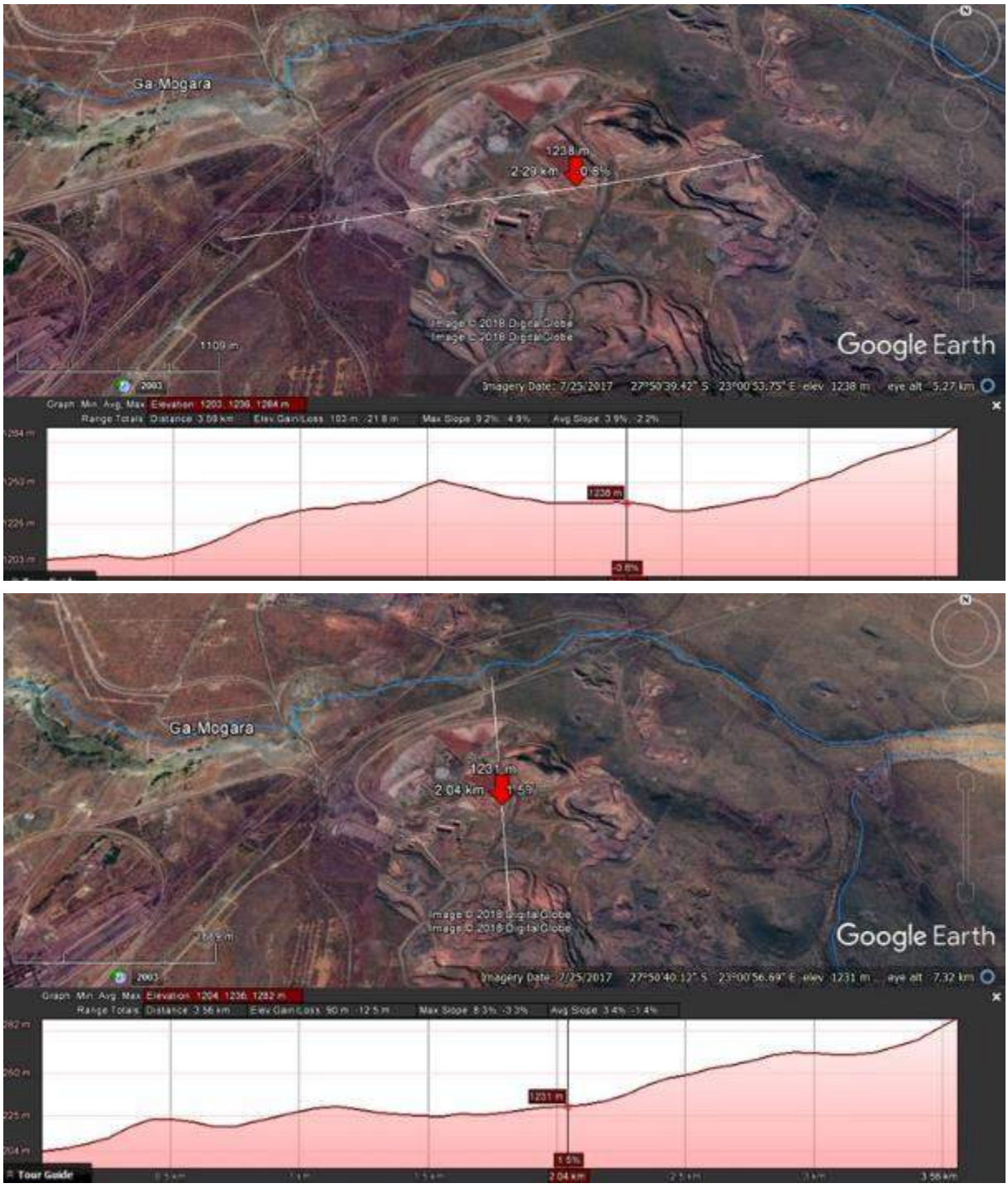


Figure 20: Topographical setting where the Return Water Dam 3 is planned

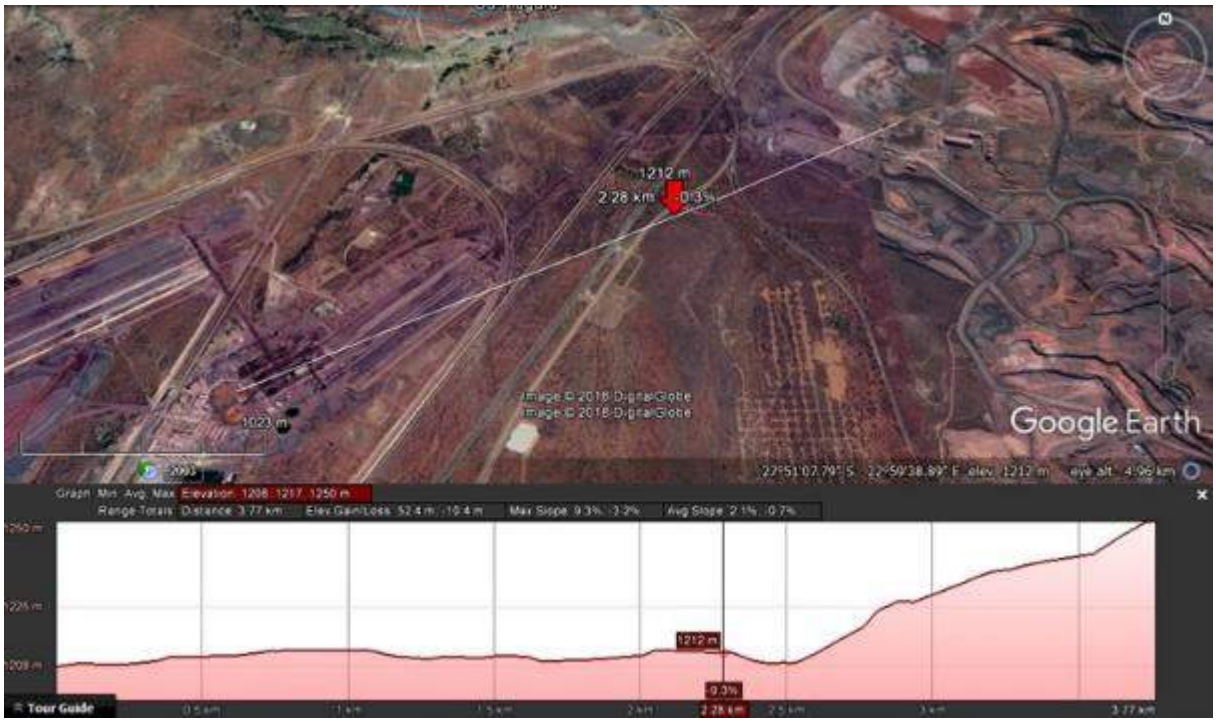


Figure 21: Topographical setting of the area in which the pipelines are planned

1.g.iii.1.c Geology

According to a report compiled by Golder Associates Africa (Pty) Ltd on the Water Augmentation Project (January 2017), the central part of the mine consists of the Campbellrand Subgroup (Ghaap Group) and represents the Maremane Anticline (Dome). East of the dome is the Asbestos Hills Subgroup (Kuruman Iron-Formation) in the form of large, easterly arching syncline, the Dimoten Syncline. The Ongeluk Formation (andesitic lavas) represents the cover rocks in the syncline, deposited on an unconformity. The western boundary of the Ghaap Group lies on a regional thrust fault system overlain by quartzite and shales of the Mapedi and Gamagara Formations.

The regional geology of the mine comprises of sedimentary and extrusive rocks of three Supergroup sequences, spanning a significant geological time span (between 2 680 and 358 Million Years Ago (Ma)) and is illustrated in the table below. These sequences are partially covered by Tertiary-Quaternary sediments of the Kalahari Group and windblown sands of the Gordonia Formation.

The rock formations of the pre-Karoo Group are located close to the western margin of the Kaapvaal Craton. This margin has been subjected to intensive, structural deformation due to tectonism ~2400 – 1700 Ma (i.e. the Kheis Orogeny: folding, thrusting and faulting).

A thick succession of dolomites, namely the Campbell Rand Subgroup represents the central part of the Maremane Dome (or anticline) and consists of alternating layers of oolitic and stromatolitic dolomite with thin interbedded layers of shale and quartzite. This succession is believed to be several thousand metres thick, based on the stratigraphic core borehole drilled by the Council of Geoscience just north of Sishen during the 1990s. During the Kheis Orogeny, the basal units of the dolomite were exposed to palaeo-erosion and subsequent karstification of the dolomites. This process has played a major role in the enrichment (i.e. leaching of silica from the overlying Banded Ironstone Formation (BIF)) of hematite and subsequently forming the vast amounts of iron ore occurrences in the study area.

The Asbestos Hills Subgroup lies conformably on the Campbellrand Subgroup and consists of typical banded ironstones of various thicknesses. The “blinkklip breccia”, a basal layer of banded iron stone, lies on the Campbell Rand Formation in the Maremane Anticline (see the following table) and serves as a marker in the regional geological sequences in the area.

The Postmasburg Group (Makganyane diamictite formation and the overlying Ongeluk lava formation) in the western part of the Maremane Dome, unconformable overlies the Ghaap Group (i.e. Campbellrand and Asbestos Hills Formations) and underlies the Gamagara Formation (Olifantshoek Group) with an unconformity – representing a local thrust fault package from the west which sits between the Asbestos Hills Subgroup (lower) and the Makganyene

diamictite and Ongeluk lava. The regional extent of this feature is not known, although it has been mapped in the Sishen and Beeshoek areas.

Table 15: Basic Geological Model of the Area

Sequence	Supergroup	Group/ Subgroup/ Formation	Lithology	Comments
(5)		Kalahari	Sand Calcrete/Clay Boulder Beds	*D41J: Moderate aquifer & local flow path.*
(4)	Karoo	Dwyka	Shale Diamictite	D41J: Karoo paleo-channel fill;
(2)	Olifantshoek	*Mapedi/Gamagara*	Quartzite/Shale Lava Shale Quartzite/Flagstone Shale Quartzite Shale Conglomerate	Represents western boundary formations of study area; Tectonism – regional, but low metamorphism.
(3)-(2)		Diabase		Intrusive, localised occurrence.
(3)	Transvaal	Postmasburg: *Ongeluk* *Makganyene*	Andesitic lava ♠Diamictite	Western and Eastern flanks of the Maremane Dome (Anticline). ♠Localised occurrences
		Thrust Fault Zone		Originated from the west during regional tectonism (2400 Ma-2700Ma)
(1)	Transvaal	Ghaap: Asbestoshills	Banded iron formation (BIF)	Western and Eastern flanks of the Maremane Dome (Anticline); Large exposures on Dimoten Syncline in the east; and Forms the eastern high lands area and subsequent boundary of the study area.
		Chert Breccia		Localised, mainly in Maremane Dome (Anticline).
		Ghaap: Campbellrand	Dolomite (DLMT)	Large exposures in the centre of the Maremane Dome (Anticline) Extremely thick succession (~3000m just north of Sishen – CGS Exploration bh.)
	Unconformities in geological profile (GCS, 2011 and Da Silva, 2011).			

The Ongeluk Formation (lava) forms the upper part of the Transvaal Supergroup and overlies the Makganyane Group. Andesitic lava belonging to this formation crops out in the Dimoten Syncline and southeast of the Maremane Anticline and disappears under the Kalahari sand cover further north.

The Gamagara Formation was deposited on the Maremane Anticline; this contact zone represents an unconformity overlying the dolomite and banded iron formations of the underlying formations.

Tertiary - Quaternary Deposits

The bedrock geology in the mining right area is partially concealed by sediments of the Kalahari Group. In the eastern parts of the mine the cover becomes thin and patchy and large areas of bedrock are exposed.

The Kalahari Group consists primarily of calcrete, gravel and clay beds. It is subdivided into five Formations, i.e. Wessels Gravel Formation, overlain by the Budin Clay Formation and the Eden Sandstone Formation, followed by the Mokalanen Limestone Formation (mainly calcrete) with the Gordonia Aeolian Sand Formation at the top.

Kalahari Group sediments with roughly a northeast to southwest strike direction vary in thickness from a few millimetres to several meters and covers the northern middle part of the mining right area. Relatively thick deposits of calcrete occur as cappings of the dolerite rocks and normally cause a higher relief due to the expansion mechanism present in the calcification process.

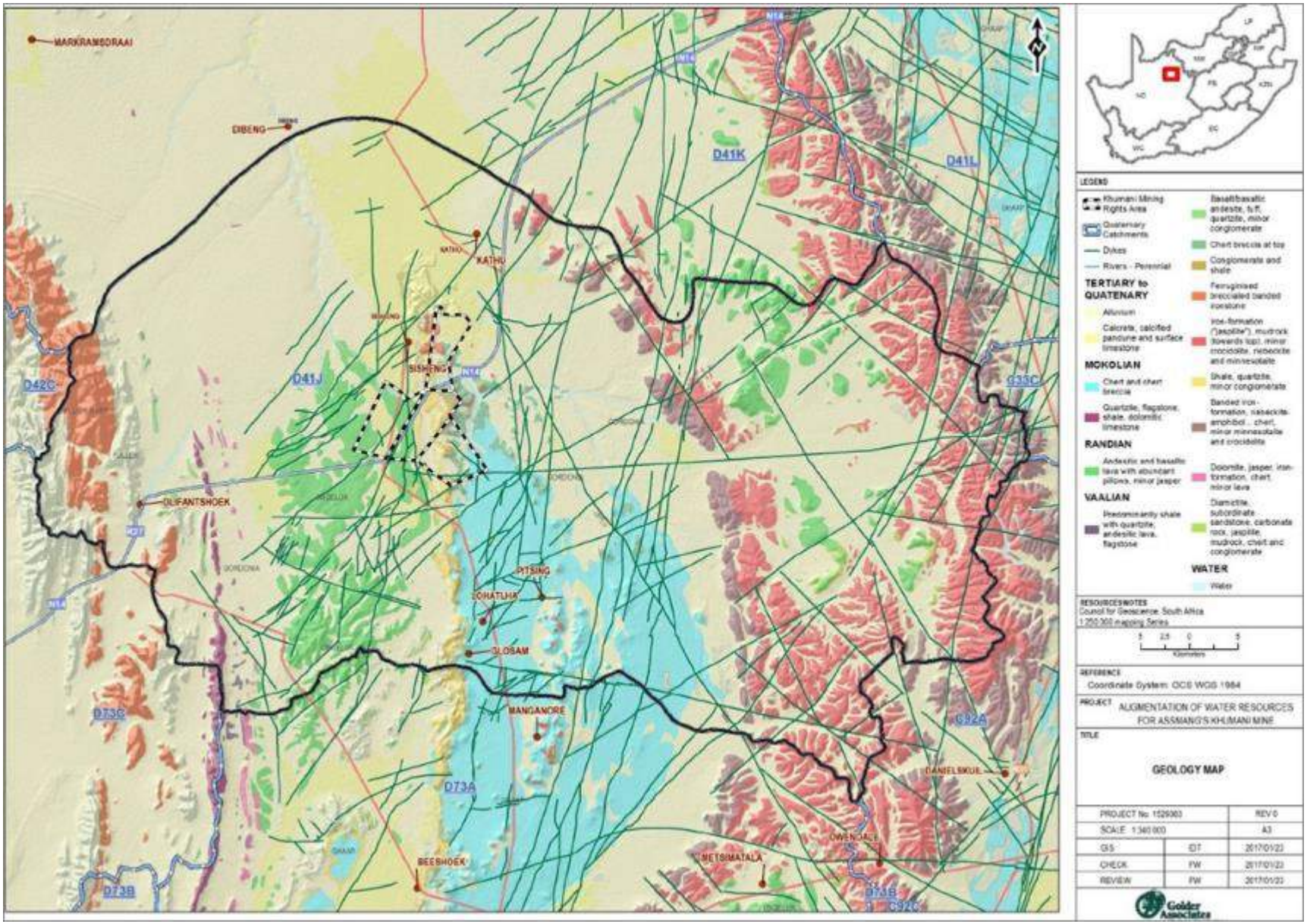


Figure 22: Geological Setting (Golder, 2017)

Intrusive Structures

The area is relatively deformed and intense fracturing has occurred in the hard rock units - this fracturing is associated with the development of faults and in many cases dyke material intrusions. Intrusive dolerite/ diabase dykes are a common feature, but seldom outcrops. Dolerite dykes are typically observed as major linear structures and intersect the geological formations perpendicularly. These dykes are subjective to both positive and negative weathering, depending on the specific hydrological environment and their geochemical characteristics.

Chemical weathering is responsible for the deposition of secondary calcite on top of the dykes, with the intensive materialising of clayey decomposed dolerite at depth. These dykes naturally appear as ridges with depressions formed by the solution of the country rocks within the contact zone alongside the dykes. Most of the surface water drainage channels are restricted to these features. These dolerite dykes with low permeability compartmentalise the dolomite aquifer.

1.g.iii.1.d Soils

Soil distribution is strongly linked to the topography of the area. In turn, the topography is closely linked to the underlying surface geology. Hard rock outcrops characterise the topographic highs of the area. The outcrops generally comprise quartzites and the iron ore bearing ironstones. These outcrops form prominent hills or ridges with moderate to steep slopes. In these areas, soils are very shallow to non-existent, occurring as erratic pockets of orange sands within the outcrops. The pockets can be as deep as 1m. These soils are classified as Mispah Form soils, with minor occurrences of Hutton Form soils.

The very gently sloping areas between the hills and ridges are generally underlain by calcrete or dolomite. The calcrete is overlain by orange fine sands, which can be classified as Plooysburg Form soils. The calcrete surface is undulating, with isolated boulder outcrops occurring within the soils. The soil depth is highly variable, being between about 0,3m to greater than 2m.

On the lower slopes, between the Plooysburg Form soils and the Mispah Form soils, are Hutton Form soils. These areas are characterised by the presence of abundant to numerous surface boulders, derived from the outcrops upslope thereof, which have moved by gravity down slope to be deposited on the ground surface. Refer to the following figure for the soil map.

The area where the new Return Water Dam 3 is planned, has no more natural soils occurring as it is located within the Paste Disposal Facility footprint area. The land type Ae12 is classified as: Red-yellow apedal, freely drained soils, red with high base status, greater than 300mm deep. The pipeline routes will also cross this land type as well as land type Ag110, which has the same description as the Ae12 land type.

1.g.iii.1.e Ecological Footprint

According to Mucina & Rutherford (2006), Khumani falls within four vegetation types (please refer to the following figure), namely Kuruman Thornveld (SVk 9), Kuruman Mountain Bushveld (SVk 10), Kathu Bushveld (SVk 12) and Olifantshoek Plains Thornveld (SVk 13). All three projects forming part of this EIA application however fall within the Kuruman Thornveld (SVk 9) vegetation type.

The projects are located within the savanna vegetation biome of South Africa and Swaziland, which constitutes the southernmost extension of the most widespread biome in Africa. It represents 32.8% of South Africa (399 600km^2) and 74.2% of Swaziland (12 900km^2). It extends beyond the tropics to meet the Nama-Karoo Biome on the central plateau, the Grassland Biome at higher altitudes towards the east and extends down the eastern seaboard interior and valleys where it grades into Albany Thicket in the Eastern Cape. The most recent and detailed description of the vegetation of this region is part of a national map (Mucina & Rutherford, 2006).

The diversity of African savanna is exceptional, comprising more than 13 000 plant species, of which 8 000 are savanna endemics. Specifically, dry savannas have more than 3 000 species. This diversity equals that of the South African grasslands and is only exceeded by Fynbos (Knobel, 1999). Similarly, in respect of animal diversity, savannas are without peer, including approximately 167 mammals (15% endemism), 532 birds (15% endemism), 161 reptiles (40% endemism), 57 amphibians (18% endemism) and an unknown number of invertebrates (Knobel, 1999). Flagship species include the Starburst Horned Baboon Spider (*Ceratogyrus bechuanicus*), ground Hornbill (*Bucorvus leadbeateri*), Cape Griffon (*Gyps coprotheres*), Wild dog (*Lycaon pictus*), Short-Eared Trident Bat (*Cloeotis percivali*) and the White Rhino (*Ceratotherium simum*) (Endangered Wildlife Trust, 2002).

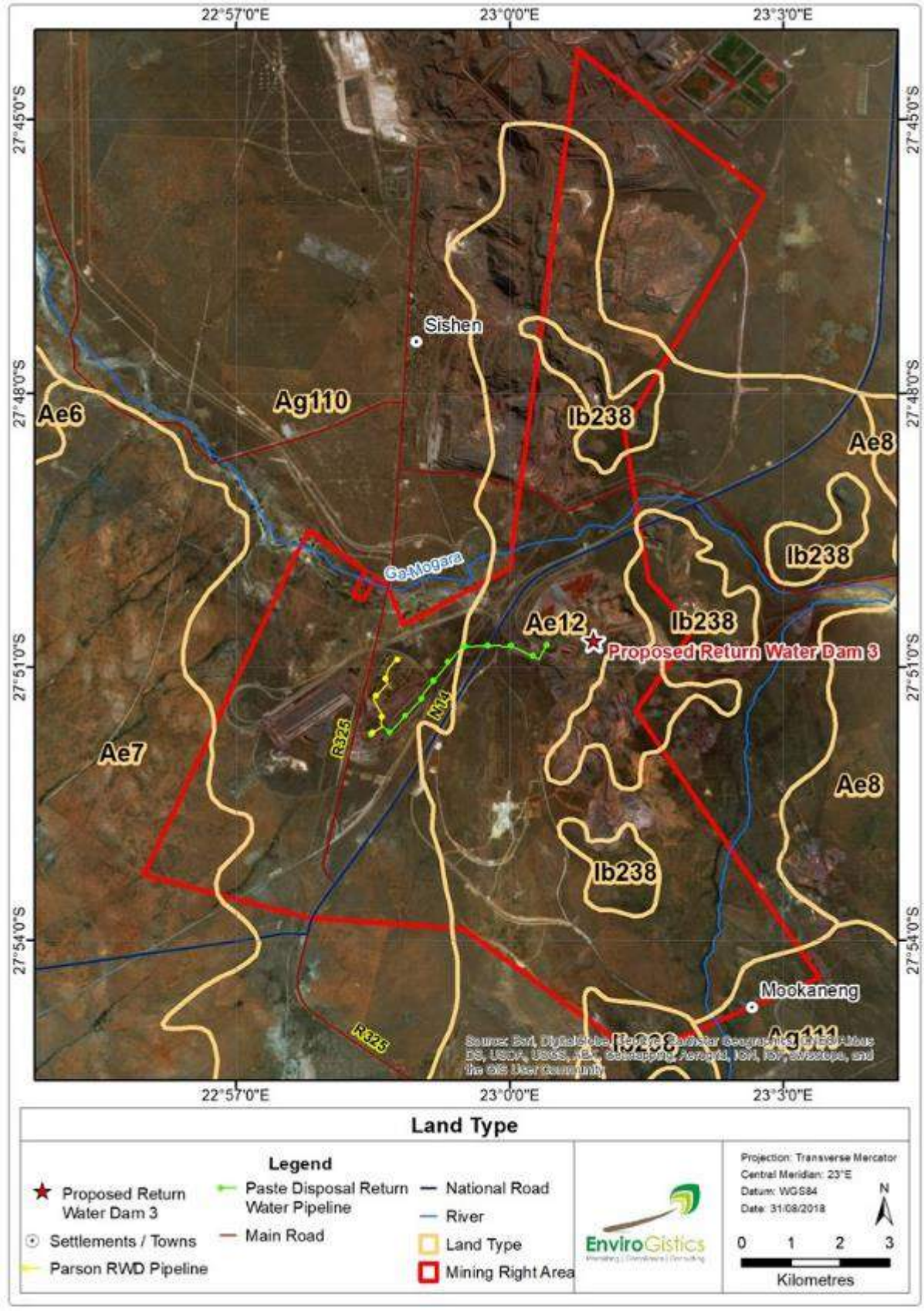


Figure 23: Soils map of the mine

Distribution of Kuruman Thornveld SVk9:

This vegetation type occurs in the North West and Northern Cape Provinces. This vegetation type tends to occur on flats from the vicinity of Postmasburg and Danielskuil (west of the Kuruman Hills) in the south, and extend via Kuruman to Tsineng and Dewar in the North West Province in the north, at an altitude of 1 100 – 1 500mamsl (Mucina & Rutherford, 2006).

Vegetation and Landscape Features:

This vegetation type is characterised by an open tree layer dominated by *Vachellia erioloba, V. karroo*, *Searsia lancea* and *Ziziphus mucronata*. The shrub layer is poorly developed and dominated mainly by *Grewia flava* and *Tarchonanthus camphoratus*. The grass layer is characterised as open, with a large amount of bare soil in places (Mucina & Rutherford, 2006).

Important Taxa (Mucina & Rutherford, 2006):

(d dominant species)

Tall Tree: *Vachellia erioloba* (d*).

Small Trees: *Senegalia mellifera* subsp. *detinens* (d), *Boscia albitrunca* (d).

Tall Shrubs: *Grewia flava* (d), *Lycium hirsutum* (d), *Tarchonanthus camphoratus* (d), *Gymnosporia buxifolia.*

Low Shrubs: *Vachellia hebeclada* subsp. *hebeclada* (d), *Monechma divaricatum* (d), *Lasiosiphon polycephalus*, *Helichrysum zeyheri*, *Hermannia comosa*, *Pentzia calcarea*, *Plinthus sericeus*. Geoxylic Suffrutex: *Elephantorrhiza elephantina.*

Graminoids: *Aristida meridionalis* (d), *A. stipitata* subsp. *stipitata* (d), *Eragrostis lehmanniana* (d), *E. echinochloidea*, *Melinis repens*

Herbs: *Dicoma schinzii*, *Gisekia africana*, *Harpagophytum procumbens* subsp. *procumbens*, *Indigofera daleoides*, *Limeum fenestratum*, *Nolletia ciliaris*, *Seddera capensis*, *Tripteris aghillana*, *Vahlia capensis* subsp. *vulgaris*

Biographically Important Taxa (Mucina & Rutherford, 2006):

([GW]Griqualand West endemic, [K]Kalahari endemic, [S]Southern most distribution in interior of southern Africa)

Small Trees: *Vachellia luederitzii* var. *luederitzii* [K], *Terminalia sericea*[S]

Tall Shrub: *Vachellia haematoxylon*[K]

Low Shrub: *Blepharis marginata*[GW]

Graminoid: *Digitaria polyphylla*[GW]

Herb: *Corchorus pinnatipartitus*[GW]

Endemic Taxon:

Herb: *Gnaphalium englerianum*

Conservation Status:

This vegetation type is classified as Least Threatened. It has a conservation target of 16%, but none of this vegetation type is conserved in statutory conservation areas. Only approximately 2% of this vegetation type is already transformed and erosion potential is very low. Disturbed areas of this vegetation type are characterised by *Aristida adscensionis*, *A. congesta*, *Enneapogon scoparius*, *Geigeria ornativa*, *Melhania rehmanii* and *Rhigozum trichotomum* (Mucina & Rutherford, 2006).

Site Specific Discussion

It should be noted that the projects in question are located in already cleared area where ancillary infrastructure is present. The proposed new Return Water Dam 3 will be located in the Paste Disposal Facility footprint area and the pipelines will follow an existing linear corridor.

Flora

A list of plant species previously recorded in the quarter degree grid in which the mine is situated was obtained from the South African National Biodiversity Institute (SANBI) as part of previous ecological assessments for the mine. Additional species that could occur in similar habitats, as determined from official database searches and reviewed literature, but not recorded in mining right area were also taken into account. During an ecological study undertaken by Adrian Hudson for the Silo Relocation Project at Khumani, 2017, a total of 21 threatened or

protected species were determined to possibly occur in the mine. As the projects are planned in existing cleared areas no disturbance to these will occur.

During the 2017 ecological study it was observed that alien plant species were not numerous although a number of alien plant species were recorded in low abundances.

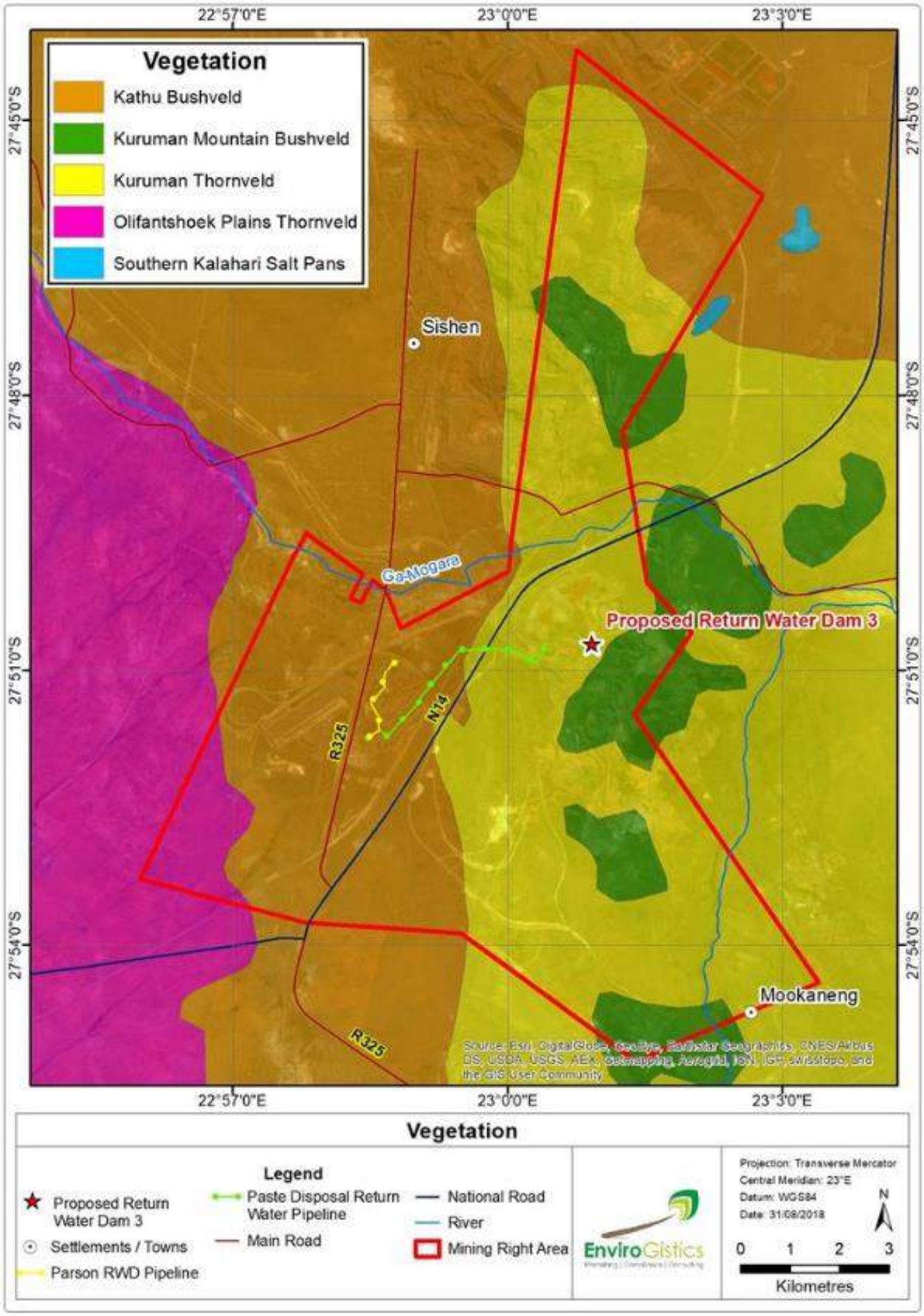


Figure 24: Vegetation Types

Fauna

Thirty arthropod species were recorded during the 2017 ecological study by Adrian Hudson. No threatened arthropod species were recorded and the likelihood of finding any threatened invertebrate species is considered low due to the lack of suitable habitat and the proposed development is unlikely to pose a significant conservational threat to species of concern for this taxon.

Eight species of herpetofauna were confirmed during the site visit and no species of conservation importance were recorded during the study. No alien herpetofauna species are expected to occur on the study site.

Six amphibian species were recorded in the study area during the study; it is unlikely that all six these species would be present on site at drier times. All the recorded species were common species which are not listed or range restricted.

Recorded avifauna species diversity and abundance was low with only 39 species being recorded during the site visit. All the recorded avifauna species were common species which are not listed or range restricted.

All eleven mammal species recorded species recorded are robust and widespread, mostly with the proviso that suitable habitat and sufficient space to maintain home ranges/ territories are available. Given no or low-key prosecution, all species are capable of maintaining their presences in remote areas such as the site and surrounding properties.

A regional list of protected faunal species for the Northern Cape Province is included in the Northern Cape Nature Conservation (Act No. 9 of 2009) (NCNCA). No threatened status has been included in this report and thus the National publication of threatened faunal species list, which was published in 2004 and amended in 2007 (NEM:BA 2007) and the International Union for Conservation of Nature (IUCN) red data list, was used to identify listed or threatened species with distribution ranges that overlap with the mining right area. Optimal habitat for these species as documented by the IUCN (2013) and Birdlife International were then compared to the habitat available within the mining right area.

No faunal species of conservation importance were identified within Khumani and due to surrounding anthropogenic activity it is deemed unlikely that a great diversity of species of conservation importance would be found.

1.g.iii.1.f Hydrological Setting

Khumani falls within the Lower Vaal Water Management Area (WMA) and within the Molop subWMA. The area is situated in the catchment of the Gamagara River, the quaternary catchment being D41J (refer to the following figure). The mine is located on gently sloping to hilly terrain with rivers flowing in a north-westerly direction. The major river traversing the site is the Gamagara River, which flows from the east to west north of the Parson Plant area. The river then flows north to confluence with the Kuruman River.

Iron ore, diamonds and manganese are mined in the water management area. Farming activity ranges from extensive livestock production and rain fed cultivation to intensive irrigation enterprises at Vaalharts. Kimberley, which straddles the divide between the Lower Vaal and Upper Orange WMAs, is the largest urban centre in the area. More than 50% of the yield from natural water resources in the tributary catchments within the water management area is supplied from groundwater.

<u>Water Management Area and Catchment</u>

The Lower Vaal WMA borders Botswana in the North of the Northern Cape Province and also extends into the North West Province. The major rivers are listed as Molopo, Harts, Dry Harts, Kuruman and Vaal Rivers. A particular characteristic of the Lower Vaal and Upper Orange WMAs is the extensive inter-catchment transfer of water within WMAs as well as interbasin transfers between these and other adjoining WMAs.

The Lower Vaal WMA is dependent on water releases from the Middle Vaal WMA for meeting the bulk of the water requirements by the urban, mining and industrial sectors within its area of jurisdiction, with local resources mainly used for irrigation and smaller towns.

Water quality is of special concern in the lower reaches of the Harts and the Vaal Rivers because of the high salinity of leach water from the Vaalharts irrigation scheme. To counter this problem, better quality water is transferred from the Orange River to the Douglas Weir in the lower reaches of the Vaal River for blending purposes.

<u>Downstream Water Users</u>

There are no significant surface water users downstream of the mine due to the unreliability of flow in the Gamagara River and its tributaries (Knight Piesold, 2005). Downstream users (primarily the farming community) rely on groundwater abstraction for livestock watering and domestic consumption (Knight Piesold, 2005).

Surface Water Settling

Within the region there are no significant dams on the Orange River. There are however various containment dams from which water for irrigation or urban settlement is diverted through canals. Examples of these are Boegoeberg Dam near Groblershoop and the Neusberg Dam near Kakamas. The Rooiberg Dam at Kenhardt is fed by the Hartbees River and is sometimes empty because of the inconsistency of the river flow. In the north of the region is the Leeubos Dam in the Swartbees River.

Although the amount of silt in the Orange River has decreased since the construction of the Gariep Dam, the Boegoeberg Dam was already covered by silt before the building of the Gariep Dam. The quality of the rain water is good in the area since there is no significant air pollution in the area which could result in acid rain.

A bulk water supply scheme from the Vaal River (Sedibeng Water Supply Scheme) to the arid areas of the Gamagara valley near Postmasburg and north thereof was implemented by the DWS to supply potable water to these areas and thus to enable the development of the large scale mining operations in areas such as Beeshoek, Lime Acres, Sishen, Mamatwane, Hotazel and Black Rock.

The closest river to the project area is the Gamagara River, which is located approximately 2km to the north and approximately 3.5km west of the proposed new Return Water Dam 3 and start of the pipeline route (please refer to the figure above). This river is a non-perennial river.

1.g.iii.1.g Hydrogeological Setting

According to the Water Augmentation Project Report (2017), prepared by Golder Associates Africa (Pty) Ltd, groundwater resources occur throughout the D41J quaternary catchment, but aquifer characteristics are highly variable due to the nature of the various rock formations, as well as topographical effects such as elevated mountainous areas on the eastern and western perimeters of the quaternary catchment. Intergranular (Kalahari Sediments), weathered and fractured Banded Ironstone Formation (BIF) as well as karst dolomite bedrock aquifers are present in the different geological formations. The major aquifers identified comprise of:

- Kalahari Group Sediments - intergranular unconfined and shallow aquifer system - sandstone, gravel & calcrete, with low permeability retards and restrict water movement and acts as a storage unit – occurs in the north-central part of the quaternary catchment;
- Banded Ironstone Formation (BIF) - weathered and fractured semi confined aquifer system mostly present on the eastern perimeter of the quaternary catchment representing the Kuruman Hills. These hills represent the major groundwater recharge area in the quaternary catchment. A few relicts of enriched BIF inliers occur in the central parts of the quaternary catchment's (viz. the iron ore mining areas);
- Dolomite karst aquifers - unconfined to confined aquifer system, compartmentalised by dolerite dykes; and
- Ongeluk Lava - the water bearing properties of the Ongeluk Lava is highly variable (mainly fractured type water bearing zones) and much dependant on frequent and local recharge.

The intergranular aquifers of the Kalahari sediments are presented by the upper (Eden Formation) as well as basal sand and gravel beds (Wessels Formation). These aquifers are low productive with borehole yields generally less than 2l/s, but with the ability to store large volumes of water. They are separated by the red clays of the Budin Formation acting as a confining layer.

The basal Kalahari sand and gravel formation and underlying bedrock can be regarded as one aquifer. In the absence of the red clays the upper sand and gravel aquifer of the Eden Formation are in hydraulic continuity with the bedrock aquifers.

Massive calcrete, acting as an aquitard, appear in the area. In areas with limited Kalahari thickness (< 40m) the calcrete directly overlay the underlying bedrock. The calcrete with relative low permeability retards and restricts the movement of water, but acts as a storage unit. It is reported by Dziembowski (1979) that for three years after the 1973/74 rainy season there was a very high water table in the calcrete in the north mine excavations, with associated surface seepage.

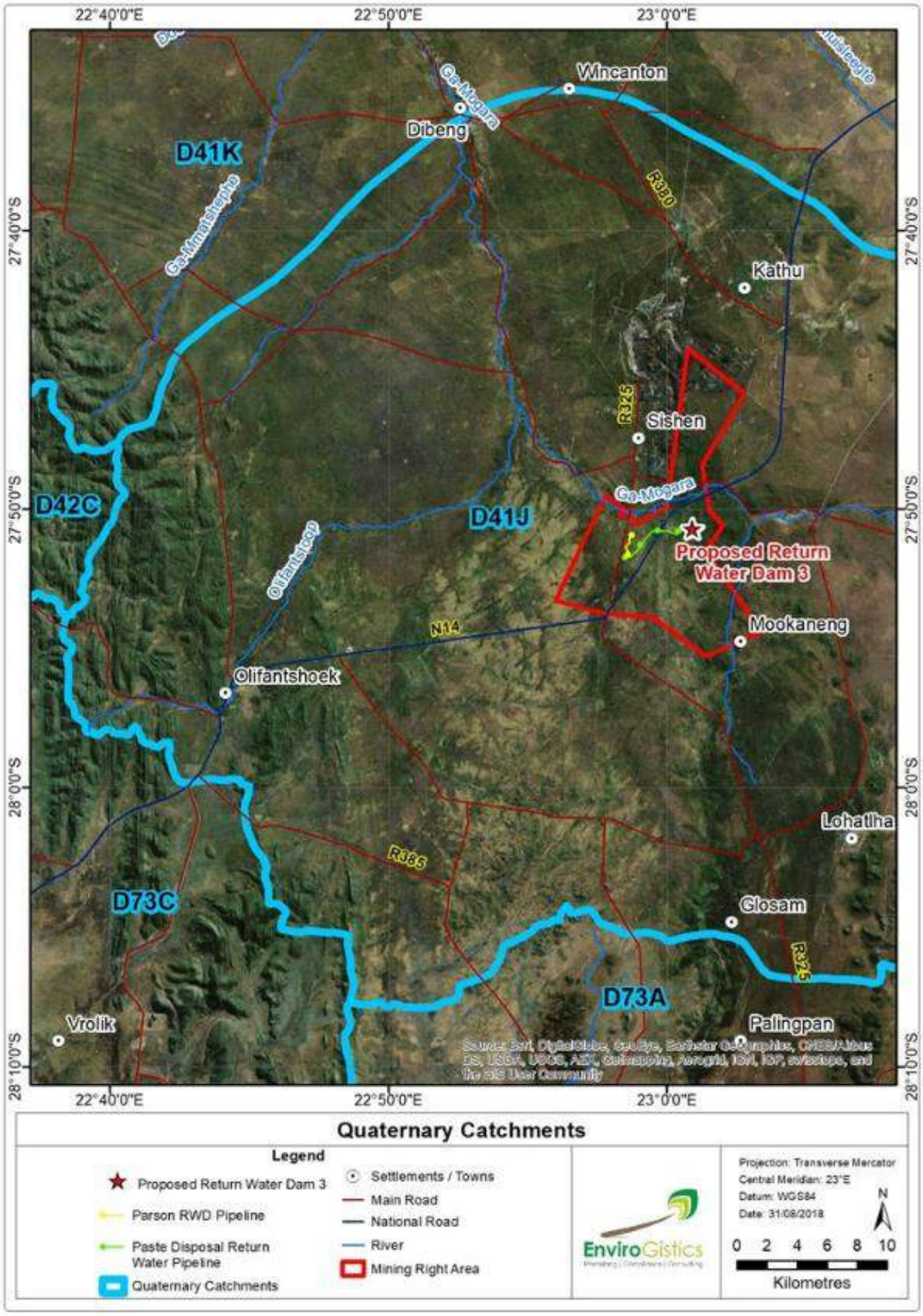


Figure 25: Catchments

The weathered and fractured BIF bedrock aquifer is quite productive and supports borehole blow yields of over 45l/s. The BIF aquifer and underlying dolomite can be regarded as one aquifer. The karst aquifers associated with the Ghaap Plateau dolomite formations, are highly productive. High yielding production boreholes in karst aquifers (abstraction rate > 40 l/s for 24 hours per day) are in use at Sishen and Kathu.

Several intrusive dykes, with low to impervious hydraulic conductivity, compartmentalize the dolomite aquifer. These dykes are only present in the bedrock underlying the Kalahari sediments. The dykes act near surface as aquitards in terms of perpendicular groundwater flow and will therefore retard groundwater flow across the dyke feature. Theoretically, at depth, the dykes become fresher; thus more solid and intact and act as aquicludes, i.e. significantly retarding groundwater flow through its matrix and even not allowing any flow through the matrix. Recent research work (Meyer, 2009) suggests that younger fracturing (east-west directional faults) in the area may have displace sections of the older north-south directed dykes. Groundwater flows along-side dyke structures are significantly higher; features such as dykes can play a major role diverting groundwater flow from the normal expected down gradient pathways characteristically observed in aquifer systems. It is therefore important to note that dyke/bedrock contact zones itself represent preferential groundwater flow paths.

Groundwater Use

Groundwater is mainly used for domestic supply, livestock watering and watering of gardens. The borehole yields from the upper calcrete aquifer are relatively low. The deeper fractured rock aquifer is generally associated with higher yields, with exploitable potential.

1.g.iii.1.h Sensitive Sites or Wetlands

The Atlas of Freshwater Ecosystem Priority Areas in South Africa (Nel et al, 2011), which represents the culmination of the National Freshwater Ecosystem Priority Areas project (NFEPA), a partnership between SANBI, Council for Scientific and Industrial Research (CSIR), Water Research Commission (WRC), DEA, DWS, World Wide Fund for Nature (WWF), South African Institute for Aquatic Biodiversity (SAIAB) and South African NAtional Parks (SANParks), provides a series of maps detailing strategic spatial priorities for conserving South Africa's freshwater ecosystems and supporting sustainable use of water resources. Freshwater Ecosystem Priority Areas (FEPAs) were identified through a systematic biodiversity planning approach that incorporated a range of biodiversity aspects such as ecoregion, current condition of habitat, presence of threatened vegetation, fish, frogs and birds, and importance in terms of maintaining downstream habitat. The Atlas incorporates the National Wetland Inventory (SANBI, 2011) to provide information on the distribution and extent of wetland areas.

No sensitive landscapes or rivers are located within close vicinity (500m) of the proposed projects. However, various areas defined as part of the NFEPA database in terms of wetlands are present on the southern portions of the mine. These are associated with the Eastern Kalahari Bushveld Group 3 Depressions (refer to Figure 26). Note that the projects in question will not impact on any of the identified NFEPA systems.

1.g.iii.1.i Air Quality

An air quality monitoring programme has been implemented to measure fallout dust and to monitor ambient concentration of suspended particulate matter (dust).

The air quality data used are from the previous Khumani EMPr Amendment (2011), and from the Air Quality Gap Analysis undertaken by Prism EMS (Pty) Ltd in 2015.

Sources that may contribute to air pollution include blasting activities associated with the mining operations, windblown dust from the various mine stockpiles in the area, vehicle emissions (the N14 runs between the farms Bruce and King), household fuel combustion, biomass burning (from veld fires and agriculture) and various miscellaneous fugitive dust sources (agriculture activities, wind erosion of open areas and vehicle entrainment of dust along unpaved and paved roads).

Sensitive receptor areas in the vicinity of the mine are road users on the N14 and in the towns of Olifantshoek and Kathu. In addition, there are various farms and homesteads surrounding the proposed area.

Khumani currently has an ambient air and weather monitoring programme that includes dust fall monitoring, Particulate Matter 10 microns (PM10) and meteorological monitoring. Dust fallout is measured at:

- Khumani has 15 single fall out dust monitoring points.

PM10 monitoring is conducted at:

- Seven (7) PM10 monitoring locations (E-Samplers manufactured by Met One Instruments, Inc.) that are located at strategic locations to capture ambient concentration of particulate matter on mine premises (five (5) instruments are co-located with dust monitoring points, while two (2) are independent, stand-alone sites).
- Three (3) monitoring locations with handheld instrument (SKC Deployable Particulate Sampler System with Portable Air Kit for 24-hour sampling) once a month for 24 hours.

A meteorological Station (EM-02-WXT weather station with Vaisala all-weather sensor) measures temperature, relative humidity, rainfall, hail, barometric pressure, as well as wind direction, wind speed, and wind gusts via ultrasonic anemometer. The station is located in the Salvage Yard on the farm Parson (coordinates: 27°51'23.05"S; 22°58'34.59"E), east of the Dingleton Road.

1.g.iii.1.j Noise

The noise description was from the previous Khumani EIA/ EMPr as part of the EMPr Amendment (2011).

The region in which the proposed infrastructure are to be established is characterised by the following environments:

- A rural farming community where the farmsteads are located at large distances apart;
- The existing large opencast operation at Kumba;
- The existing opencast operation at Khumani; and
- The N14 and the railway lines that cross the area.

Areas in the proximity of mining activities will already be subjected to the noise emissions from diesel-powered equipment and other mining processes as a result of existing mining infrastructure.

The major sources of noise from the current mining operations are:

- The diesel powered equipment, such as bulldozers, FELs, construction and haul trucks used during both the construction and operational periods of the mine;
- The drilling of rock inside the open pit;
- The handling of material inside the pit, e.g. the loading of haul trucks;
- The hauling of ore and waste rock from the open pit to the surface;
- The dumping of ore and waste rock at the crushing plant and on the waste rock dumps respectively. During this process the use of reverse warning hooters may be audible over long distances, particularly during the night; and
- The crushing and screening of ore in the plant area.

Limited noise may result from the proposed infrastructure, although this may be considered to be insignificant as the proposed location is already surrounded by mining activities.

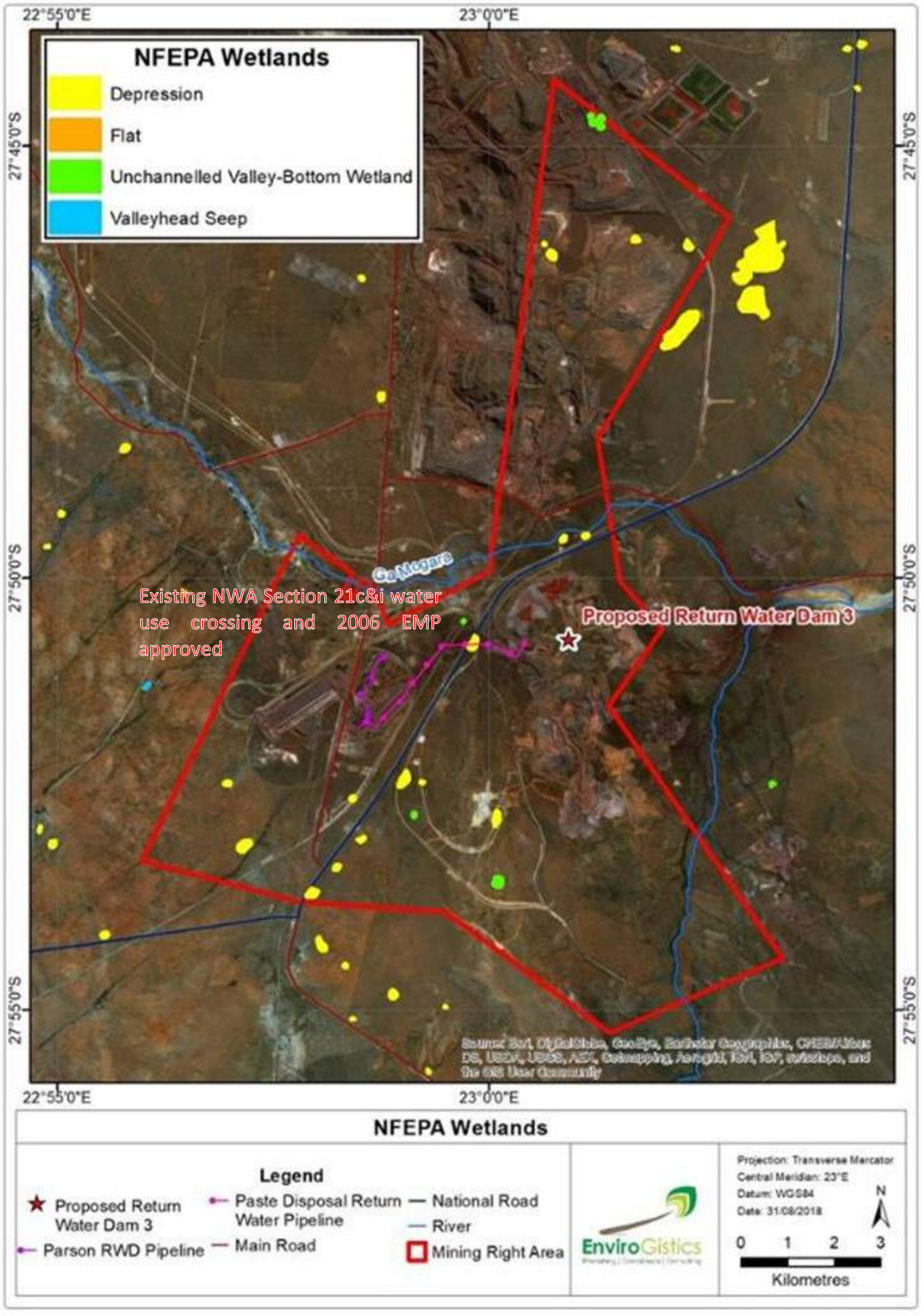


Figure 26: NFEPA Wetlands and Rivers

1.g.iii.1.k Cultural and Heritage Setting

A Heritage Impact Assessment was undertaken during 2017 for the Khumani Silo Relocation Project. Although the projects in question are located in mostly cleared areas, which have been subjected to specialist studies during the development of the original 2006 EMPr for the mine, the general cultural and heritage setting is presented.

Stone Age

South Africa has a long and complex Stone Age sequence of more than 2 million years. The broad sequence includes the Later Stone Age, the Middle Stone Age and the Earlier Stone Age. Each of these phases contains sub-phases or industrial complexes, and within these we can expect regional variation regarding characteristics and time ranges. For Cultural Resources Management purposes it is often only expected/ possible to identify the presence of the three main phases. Yet sometimes the recognition of cultural groups, affinities or trends in technology and/or subsistence practices, as represented by the sub-phases or industrial complexes, is achievable (Lombard, 2011). The three main phases can be divided as follows:

- Later Stone Age, associated with Khoi and San societies and their immediate predecessors. Recently to ~30 thousand years ago.
- Middle Stone Age, associated with *Homo sapiens* and archaic modern humans. 30-300 thousand years ago.
- Earlier Stone Age, associated with early *Homo* groups such as *Homo habilis* and *Homo erectus*. 400 000-> 2 million years ago.

The larger region surrounding the mine has a wealth of pre-colonial archaeological sites (Morris & Beaumont, 2004). Famous sites in the region include the world renowned Wonderwerk Cave to the north of the study area. Closer to Kuruman, two shelters on the northern and southern faces of GaMohaan (in the Kuruman Hills northwest of the town) contain Later Stone Age remains and rock paintings. Rock art is known to occur at Danielskuil to the north east and on Carter Block (Morris, 2008). Middle Stone Age material is on record in the area around the mine.

Archaeological surveys have shown rocky outcrops and hills, drainage lines, riverbanks and confluences to be prime localities for archaeological finds and specifically Stone Age sites, as these areas where utilised for settlement of base camps close to water and hunting ranges.

Iron Age

Iron Age expansion southwards past Kuruman into the Ghaap plato and towards Postmasburg dates to the 1600's (Humphreys, 1976; Thackeray, 1983). Definite dates for Tswana presence in the Postmasburg area are around 1805 when Lichtenstein visited the area and noted the mining activities of the Tswana (probably the Thlaping) tribes in the area. The Thlaro and Thlaping settled the area from Campbell in the east to Postmasburg and towards the Langeberg close to Olifantshoek in the north west before 1770 (Snyman, 1988). The Korana expansion after 1770 started to drive the Thlaro and Thlaping further north towards Kuruman (Shillington, 1985).

Anglo-Boer War

There are no battlefields or concentration camp sites close to Khumani.

Cultural Landscape

The mine was constructed from October 2006 onwards; prior to this the area was undeveloped and characterised by sparse vegetation. The surrounding area have been characterised by intensive mining activities.

Paleontological Assessment

According to the paleontological specialist study undertaken during June 2017, the development footprint is underlain by Palaeoproterozoic Gamagara Formation sediments that are not considered to be paleontologically sensitive.

The site is capped by superficial (Quaternary) deposits considered to be of low to very low palaeontological sensitivity, because the impact area is degraded and not situated within or near pan, alluvial or spring deposits (considered to be potentially fossiliferous in the region).

1.g.iii.1.l Socio-Economic Setting

Khumani is located within the Northern Cape Province and falls within two Local and District Municipalities. The farm Mokaning is situated within the Tsantsabane Local Municipality (NC085), which forms part of the ZF Mgcawu District Municipality (formerly known as the Siyanda District Municipality). The farms Parson, Bruce and King are

situated within the Gamagara Local Municipality (NC01B1), which forms part of the John Taolo Gaetsewe District Municipality (formerly known as the Kgalagadi District Municipality).

In order to assess the potential impact of the proposed project, it is important to consider the particular province, district municipalities, and local municipalities as well as the nearby towns in a holistic way.

Population

The population size (persons) for the Gamagara Municipality increased by 25.47% over the 1995 to 2011 time period, whereas the John Taolo Gaetsewe District Municipality only grew by 12.49% over the same period. Households have also grown over the 1995 to 2011 time period, with the Gamagara Local Municipality showing a 30.36% increase and the John Taolo Gaetsewe District Municipality a 27.23% increase.

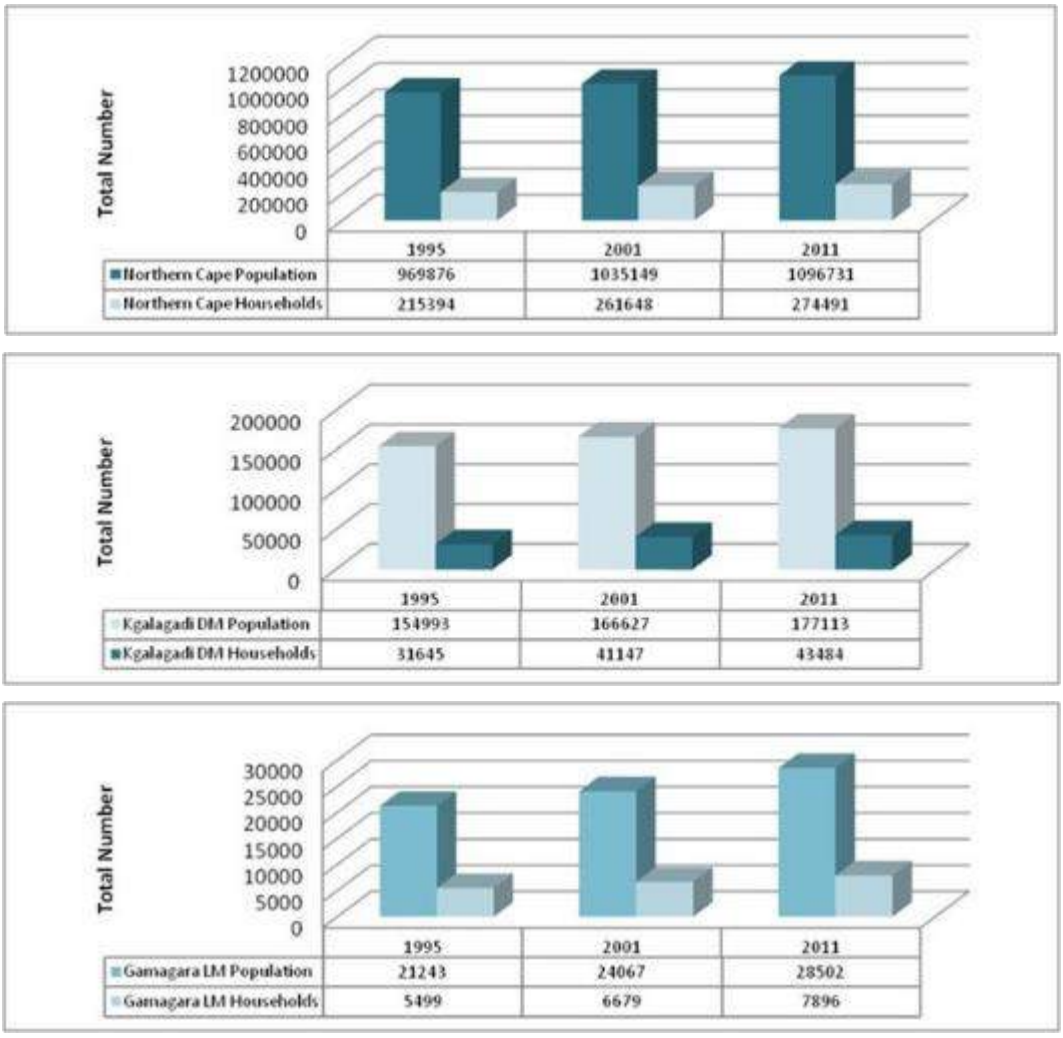


Figure 27: Population and household size (1995 – 2011)

Age

It is important to assess the age distribution of persons in order to determine both the current and future needs of an area. Age is an important indicator as it relates to education, skills and dependency. A young population may require an improved educational system, whereas an older society may need an accented focus on healthcare. The largest percentage of people in the Gamagara Local Municipality (71.9%) fall within the working age category (16-64 years of age). 25.5% of the population, that do not form part of the Economically Active Population of the area is between the age of 0 and 14. The elderly population forms 2.5% of the municipality's population (Statistics South Africa, census 2011).

Education

The largest percentage (89,5%) of the Gamagara Local Municipality population has obtained some form of primary schooling. 24.9% of the population has attained matric and a further 3.6% has higher education.

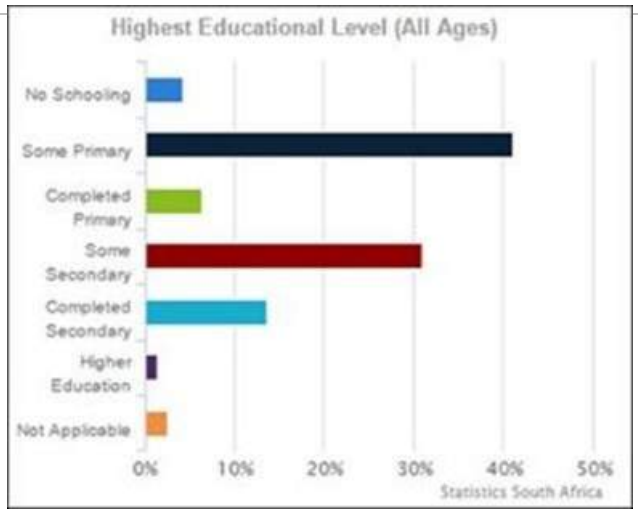


Figure 28: Education Level (2011)

Spatial Development Framework (SDF)

According to the IDP of the Gamaraga Local Municpality, the SDF also indicates the impact of development activities planned in this document on the environment and rate impacts as low, medium and high. According to the National Biodiversity Strategy (NBS), biodiversity considerations are to be integrated into all other strategies and plans at local government level, such as poverty eradication and developmental programmes. The NBS provides the map for achieving the biodiversity related objectives contained, i.e. reducing the rate of loss of biodiversity by 2010. The goal of the NBS was therefore always to conserve and manage biodiversity to ensure sustainable benefits to the people of South Africa, through co-operation and partnerships that build on strengths and opportunities.

According to the National Spatial Biodiversity Assessment (NSBA), Tsantsabane and the broader ZF Mqcawu District was not identified as a priority with regard to biodiversity. However, it continues to be important to address the issue, since biodiversity makes a substantial contribution to the livelihoods of rural communities, in the form of housing, fuel, food and medicines. The SDF also highlights that many people have become alienated from nature, through apartheid policies and processes like urbanization. Hence, much more needs to be done to make conservation more inclusive and relevant to people's lives.

With all the development happening in the area, the demands for water have increase as in the rest of the semi-arid province.

The area is rich in minerals which has historically been the mainstay of the area's economy. Iron and manganese mining is an important activity in the economy of the area. Haematite deposits in the form of ferriginised banded 15 ironstone occur as a cake or capping to the Gamagara hills which lies between Postmasburg and Sishen. The ore is very pure and typically consist of 95% ferric oxide. There are significant undeveloped mineral resources left in the area that can contribute to future economic growth in the area, depending on the future viability of exploiting the minerals. Large areas of unrehabilitated and poorly rehabilitated mining activities (current and closed) have a significant negative effect on the scenic environment in the area, especially in the mountainous areas.

Internal Strategic Perspective

According to the Lower Vaal Water Management Area: Overview of Water Resources Availability and Utilisation Report (2004), the Gross Domestic Product (GDP) of the Lower Vaal WMA was R9,8bn in 1997. The most important magisterial districts in terms of contribution to GDP in this WMA are shown below:

- Kimberley 29,6%;
- Postmasburg 14,8%;
- Lichtenburg 9,6%;
- Kuruman 8,9%; and
- Vryburg 8,3%.

The most important economic activities of the WMA are:

- Mining 23%;

- Government 16%;
- Trade 15%; and
- Agriculture 14%

The main agricultural activities identified include livestock and dryland cropping. Livestock includes beef and dairy cattle, goats, non-wooled sheep, pigs and ostriches. Crops grown are mainly maize, but also sunflower, cotton, groundnuts and vegetables. The mining activities in this WMA include mining for diamonds, iron ore, manganese and other minerals such as lime stone, dolomite and amphibole asbestos. Kimberlite diamonds are mined at the Finch Mine at Lime Acres, one of the most important diamond producing mines of the De Beers Company. Kimberley is also an important diamond mining area, which is known for its high quality diamonds. The Sishen Mine, currently the major supplier of iron ore in the country, is located in the Lower Vaal WMA. This mine has a mineable depth of 30 metres and was opened in 1953 as part of Iscor's expansion strategy. In 1997, it produced approximately 2 400 million ton iron ore per year. An increase in mining and transportation activities can be expected with the construction of the Sishen-Coega railway line that will link Sishen with the Coega initiative near Port Elizabeth. Other important mining areas includes Kudumane (iron, manganese and asbestos etc.), Ganyesa (diamonds, mica group clay and salt) and Taung (diamonds, limestone, dolomite and salt). Since manufacturing production is far less than mining production, it can be deduced that only a small percentage of beneficiation is done locally. This implies that a large percentage of raw mining products are exported to other areas for beneficiation. Lichtenburg is the largest manufacturing town in the WMA, where manufacturing includes cement and cheese factories. Kimberley is the second largest manufacturing town, but its output is half that of Lichtenburg.

The trade sector is concentrated in wholesale of primary products and related services to the community. Main products of trade in this WMA are:

1. diamonds (for export);
2. food retail related products; and
3. ostrich-related products.

1.g.iii.2 Type of Environment Affected by the Proposed Activity

Please refer to the preceding section detailing the environmental setting in which the mine is located. The proposed activities will be located in already disturbed areas but will still necessitate the following:

- Clearing of vegetation only where necessary and if required – less than 1ha – this may be minimal clearance along areas where upgrades to existing infrastructure will be required;
- Removal and stockpiling of soils only where necessary and if required;
- Shaping of the landscape; and
- Establishment of infrastructure.

These activities may therefore impact on the following:

- Groundwater Setting (establishment of waste related activities);
- Water Setting (establishment of activities and the change in runoff patterns);
- Ecological Settling (removal of ecology and potential spread of invasive species);
- Soils (removal of soils for stockpiling); and
- Topography (shaping).

1.g.iii.3 Description of the Current Land Uses

Land Capability

The Mispah Form soils can be classified as wilderness land or non-arable land. Although the remainder of the area is underlain by Plooysburg and Hutton Form soils, due to the variability of soil depth and the presence of isolated rock outcrops within these soils, as well as abundant to numerous scattered boulders on the surface, these soils are classified as low yield grazing land.

The site is located within the mining area and surrounded by infrastructure associated with the mining industry and as a result, has no specific land capabilities other than that of mining and mining related activities.

Land Use

Kumba Iron Ore Mine, a large opencast mining operation, is situated directly north of the farm Parson, northwest of the farm King and west of the farm Bruce. Besides the mining operations, other activities in the region include

livestock farming, small residential communities and business trade. The land use on site is currently mining and mining related operations. The main land uses in the mining right area are livestock grazing, game farming and mining.

The typical land types associated with the mining right area is illustrated in the figure below.

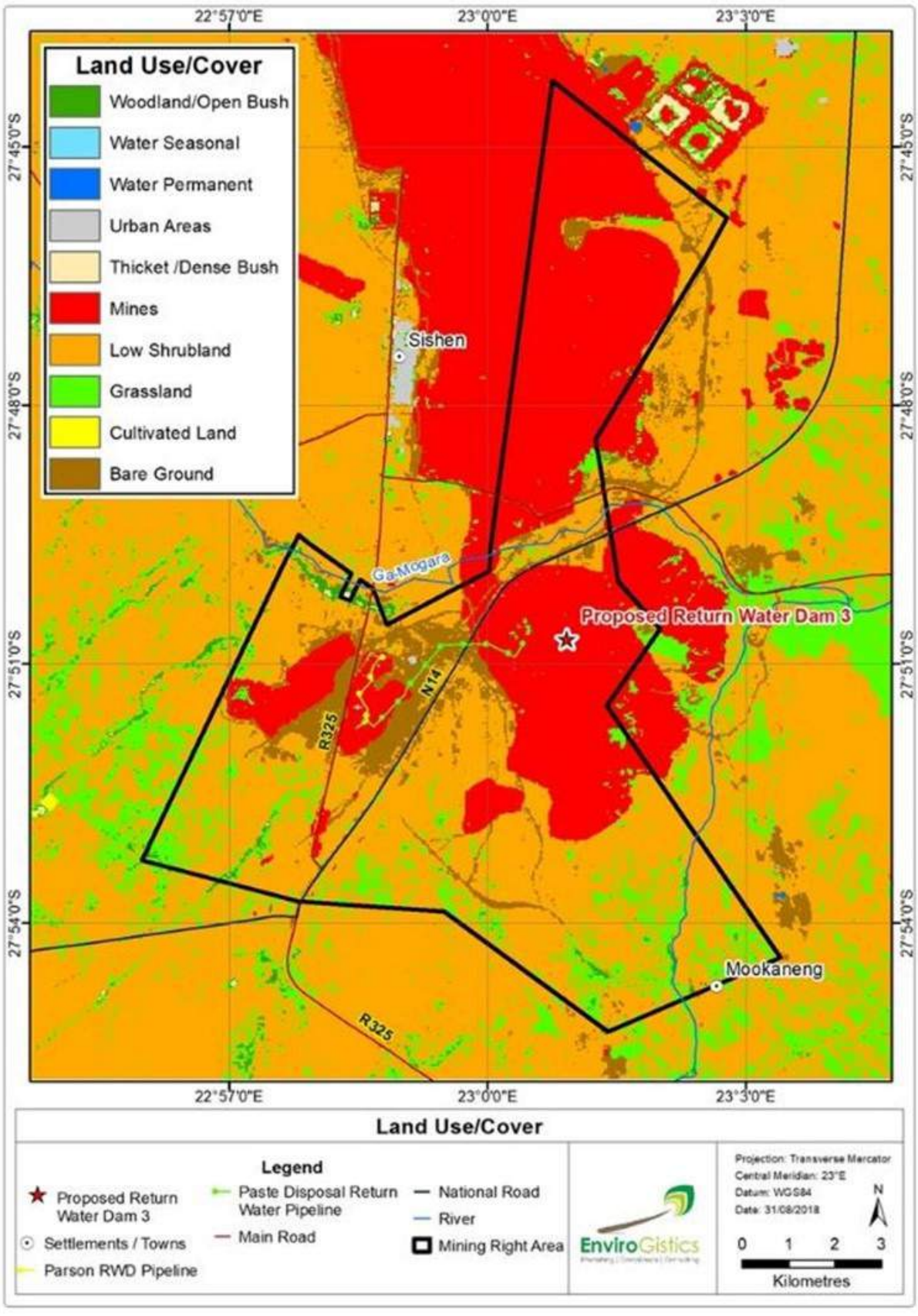


Figure 29: Land Cover within the study area

1.g.iii.4 Description of Specific Environmental Features and Infrastructure on Site

The following specific environmental features are present on site:

- The Gamagara River system is located more than 2km of the proposed new activities;
- According to the NFEPA Wetland database, an unchannelled valley bottom wetland is located about 650m from the proposed pipeline route, where it crosses the N14 via an existing culvert;
- A depression is indicated on the NFEPA Wetland database, but this is located on the existing culvert which crosses below the N14, and cannot be considered a natural depression as it is a man-made culvert underneath the main N14 highway; and
- The sites in question are located on existing cleared land and established mining infrastructure approved as part of the 2006 EMPr.

1.g.iii.5 Environmental and Current Land Use Map

Please refer to Figure 29.

1.g.iv Impacts and Risks identified, including the nature, significance, consequence, extent, duration and probability of the impacts, including the degree to which these impacts can be mitigated

1.g.iv.1 Typical Activities to be undertaken

Before the impact assessment can be done, the different activities must be identified, mapped and understood. The activities directly related to this impact assessment are listed in Table 8 discussed in the first section of the report.

Various phases of implementation have been considered in the identification of the activities to be assessed and includes:

- Pre-construction activities which would include fencing or demarcation of the construction sites, earth clearing activities (shaping of the footprint sites and topsoil and vegetation removal if required), and the training of personnel in environmental and safety legalities and requirements.
- During the construction phase, the appointed contractors will be responsible for the main earthworks, establishment of laydown areas, pipeline construction and upgrades, security checkpoints and surface infrastructure. It should be noted that the laydown areas will be established on areas which are demarcated for construction activities or within the existing mine infrastructure. During the construction phase an Environmental Control Officer (ECO) will be appointed to ensure that all activities are undertaken in line with the approved Environmental Authorisations.
- During the operational phase, all activities will be in place. The operational phase will involve the management and coordination of pipelines and water storage areas, the management and coordination of the Return Water Dam 3 within the overall Paste Disposal operation, the management of waste in and around the project areas and general environmental management and controls.
- The decommissioning and closure phase will be undertaken in line with the mine's overall closure commitments and will involve the removal of all infrastructure and the rehabilitation of the land to its end land use commitments.

The mining activities can be summarised as the following.

1. Planning Phase
    a. Legal Requirements (environmental and related permit applications); and
    b. Drafting of operational contracts and any required protocols and procedures (such as Emergency Preparedness, Health and Safety, Hydrocarbon Management, Incident Reporting, etc.).
2. Construction Phase
    a. Demarcation of areas approved for construction;
    b. Land and footprint clearance (topsoil stripping and stockpiling where present);
    c. Establishment of surface infrastructure; and
    d. Waste management.
3. Operational Phase

a. Operation of the facilities;
b. Ongoing investigations in terms of the optimised use of water in a closed water circuit; and
c. Waste management and handling.

4. Decommissioning/ closure
    a. Removing/ selling of all infrastructure;
    b. Dismantling and decommissioning of infrastructure and buildings, including product stockpiles bunded areas;
    c. Earth moving, shaping and ripping of ground;
    d. Self-succession/revegetation; and
    e. Cessation of Labour Contracts.

Based on the above activities, detailed tables are provided with all the identified impacts associated with the environmental authorisation application together with the significance before and after mitigation. Proposed mitigation measures are also provided for each identified impact. Please refer to Table 35 to Table 38 for the detailed table per mining phase of each listed impact.

1.g.iv.2 Methodology used in determining and ranking the Nature, Significance, Consequences, Extent, Duration and Probability of potential Environmental Impacts and Risks

In order to adequately assess and evaluate the impacts and benefits associated with the project it is necessary to use a methodology that could scientifically achieve this and to reduce the subjectivity involved in making such evaluations. For proper decision-making it is necessary to assess all legal requirements and clearly defined criteria in order to accurately determine the significance of the predicted impacts or benefits on the surrounding natural and social environment.

This section will aim to discuss the methodology to be followed to determine, assess and describe possible impacts as a result of project implementation. Impacts will be discussed in terms of the construction, operational and decommissioning/closure phases of the project. The evaluation of impacts is conducted in terms of the criteria discussed below. The various environmental impacts and benefits of this project will be discussed in terms of the nature of the impact, as well as the status, certainty, duration, magnitude, extent, intensity, frequency and significance. The significance rating of each impact will determine whether or not mitigation will be required.

The EIA will also aim to achieve the following:

- Provide an overall assessment of the social and biophysical environments affected by the proposed project;
- Assess the study area in terms of environmental criteria;
- Identify and recommend appropriate mitigation measures for potentially significant environmental impacts;
- Successfully analyse all public issues raised to date in order to recommend appropriate mitigation measures for all social and environmental related concerns; and
- Impacts and benefits are assessed before and after the application of mitigation measures.

The following section presents the criteria used to assess the potential impacts presented in the previous section.

1.g.iv.2.a Criteria of assigning significance to potential impacts

The evaluation of impacts is conducted in terms of the criteria detailed in Table 16 to Table 21. The various environmental impacts and benefits of this project are discussed in terms of impact status, extent, duration, probability, and intensity. Impact significance is regarded as the sum of the impact extent, duration, probability and intensity and a numerical rating system has been applied to evaluate impact significance. Therefore, an impact magnitude and significance rating is applied to rate each identified impact in terms of its overall magnitude and significance (Table 21).

In order to adequately assess and evaluate the impacts and benefits associated with the project, it was necessary to develop a methodology that would scientifically achieve this and to reduce the subjectivity involved in making such evaluations. To enable informed decision-making it is necessary to assess all legal requirements and clearly defined criteria in order to accurately determine the significance of the predicted impact or benefit on the surrounding natural and social environment.

1.g.iv.2.b Impact Status

The nature or status of the impact is determined by the conditions of the environment prior to construction and operation. A discussion on the nature of the impact will include a description of what causes the effect, what will be affected and how it will be affected. The nature of the impact can be described as negative, positive or neutral.

Table 16: Status of Impact

Rating	Description	Quantitative rating
Positive	A benefit to the receiving environment.	P
Neutral	No cost or benefit to the receiving environment.	-
Negative	A cost to the receiving environment.	N

1.g.iv.2.c Impact Extent

The extent of an impact is considered as to whether impacts are either limited in extent or if it affects a wide area or group of people. Impact extent can be site specific (within the boundaries of the development area), local, regional or national and/or international.

Table 17: Extent of Impact

Rating	Description	Quantitative rating
Low	Site Specific; Occurs within the site boundary.	1
Medium	Local; Extends beyond the site boundary; Affects the immediate surrounding environment (i.e. up to 5 km from the Project Site boundary).	2
High	Regional; Extends far beyond the site boundary; Widespread effect (i.e. 5 km and more from the Project Site boundary).	3
Very High	National and/or international; Extends far beyond the site boundary; Widespread effect.	4

1.g.iv.2.d Impact Duration

The duration of the impact refers to the time scale of the impact or benefit.

Table 18: Duration of Impact

Rating	Description	Quantitative rating
Low	Short term; Quickly reversible; Less than the project lifespan; 0 – 5 years.	1
Medium	Medium term; Reversible over time; Approximate lifespan of the project; 5 – 17 years.	2
High	Long term; Permanent; Extends beyond the decommissioning phase; >17 years.	3

1.g.iv.2.e Impact Probability

The probability of the impact describes the likelihood of the impact actually occurring.

Table 19: Probability of Impact

Rating	Description	Quantitative rating
Improbable	Possibility of the impact materializing is negligible; Chance of occurrence <10%.	1
Probable	Possibility that the impact will materialize is likely; Chance of occurrence 10 – 49.9%.	2
Highly Probable	It is expected that the impact will occur; Chance of occurrence 50 – 90%.	3
Definite	Impact will occur regardless of any prevention measures; Chance of occurrence >90%.	4
Definite and Cumulative	Impact will occur regardless of any prevention measures; Chance of occurrence >90% and is likely to result in in cumulative impacts	5

1.g.iv.2.f Impact Intensity

The intensity of the impact is determined to quantify the magnitude of the impacts and benefits associated with the proposed project.

Table 20: Intensity of Impact

Rating	Description	Quantitative rating
Maximum Benefit	Where natural, cultural and / or social functions or processes are positively affected resulting in the maximum possible and permanent benefit.	+ 5
Significant Benefit	Where natural, cultural and / or social functions or processes are altered to the extent that it will result in temporary but significant benefit.	+ 4
Beneficial	Where the affected environment is altered but natural, cultural and / or social functions or processes continue, albeit in a modified, beneficial way.	+ 3

Rating	Description	Quantitative rating
Minor Benefit	Where the impact affects the environment in such a way that natural, cultural and / or social functions or processes are only marginally benefited.	+ 2
Negligible Benefit	Where the impact affects the environment in such a way that natural, cultural and / or social functions or processes are negligibly benefited.	+ 1
Neutral	Where the impact affects the environment in such a way that natural, cultural and / or social functions or processes are not affected.	0
Negligible	Where the impact affects the environment in such a way that natural, cultural and / or social functions or processes are negligibly affected	- 1
Minor	Where the impact affects the environment in such a way that natural, cultural and / or social functions or processes are only marginally affected.	- 2
Average	Where the affected environment is altered but natural, cultural and / or social functions or processes continue, albeit in a modified way.	- 3
Severe	Where natural, cultural and / or social functions or processes are altered to the extent that it will temporarily cease.	- 4
Very Severe	Where natural, cultural and / or social functions or processes are altered to the extent that it will permanently cease.	- 5

1.g.iv.2.g Impact Significance

The impact magnitude and significance rating is utilised to rate each identified impact in terms of its overall magnitude and significance.

Table 21: Impact Magnitude and Significance Rating

Impact	Rating	Description	Quantitative rating
Positive	High	Of the highest positive order possible within the bounds of impacts that could occur.	+ 12 – 17
	Medium	Impact is real, but not substantial in relation to other impacts that might take effect within the bounds of those that could occur. Other means of achieving this benefit are approximately equal in time, cost and effort.	+ 6 – 11
	Low	Impacts is of a low order and therefore likely to have a limited effect. Alternative means of achieving this benefit are likely to be easier, cheaper, more effective and less time-consuming.	+ 1 – 5
No Impact	No Impact	Zero impact.	0
Negative	Low	Impact is of a low order and therefore likely to have little real effect. In the case of adverse impacts, mitigation is either easily achieved or little will be required, or both. Social, cultural, and economic activities of communities can continue unchanged.	- 1 – 5
	Medium	Impact is real, but not substantial in relation to other impacts that might take effect within the bounds of those that could occur. In the case of adverse impacts, mitigation is both feasible and fairly possible. Social cultural and economic activities of communities are changed but can be continued (albeit in a different form). Modification of the project design or alternative action may be required.	- 6 – 11
	High	Of the highest order possible within the bounds of impacts that could occur. In the case of adverse impacts, there is no possible mitigation that could offset the impact, or mitigation is difficult, expensive, time-consuming or a combination of these. Social, cultural and economic activities of communities are disrupted to such an extent that these come to a halt.	- 12 - 17

1.g.iv.3 Impacts and Risks identified

In addition to the specialist studies on the environmental considerations, the project also considered the potential impact discard rock could have, should this be used for road construction or parking areas. Prior to the presentation of the impact tables, the outcomes of the waste classification is presented in the section below.

1.g.iv.3.a Considering the leachability of Waste Rock and Discard Rock

Understanding the leachability of waste rock on site is important as this material will generally be used in the construction of side walls and surfacing of areas where proposed new activities will be established. A detailed waste characterisation study was undertaken by Future Flow (report dated 16 June 2016). The outcomes of the report are summarised below.

The leachable concentrations as determined during the leach testing are compared to the natural groundwater quality in order to determine the expected impact on the groundwater quality in the aquifers underlying and adjacent to the various surface stockpiles.

The leachable concentrations are used because although the total concentrations are higher, not all the minerals in the rock material will go completely into solution and therefore using the total concentration will lead to an overestimation of the impact. The leachable concentrations provide a realistic indication of the element concentrations that can be expected in the leachate that will emanate from the surface stockpiles.

The results show that:

- Chloride concentrations in the groundwater generally range between 5 and 45mg/L. Monitoring point BK17 indicate a chloride concentration of 162mg/L. Leach concentrations in all the samples except "Parson Discard B" (6 mg/L) are below 5mg/L. From this it can be said that it is not expected that the leachate will negatively impact on the chloride concentrations in the aquifers;
- Sulphate concentrations in the groundwater generally range between 5 and 20mg/L. Monitoring points BK12 and BK17 indicate sulphate concentrations of 300 and 279mg/L respectively. Leach concentrations in the samples range between 1 and mg/L. It is not expected that the leachate will negatively impact on the sulphate concentrations in the aquifers;
- Nitrate concentrations in the groundwater generally range between 30 and 80mg/L. Leach concentrations in the majority of the samples are <0.1 mg/L. In some samples it ranges up to 4mg/L. It is not expected that the leachate will negatively impact on the nitrate concentrations in the aquifers;
- Fluoride concentrations in the groundwater range between <0.1 and 0.8mg/L. Leach concentrations in the samples range between 0.05 and 0.1mg/L. It is not expected that the leachate will negatively impact on the fluoride concentrations in the aquifers;
- Silver concentrations in the groundwater was measured at <0.1mg/L for all the samples. Leach concentrations in all the samples are measured at <0.002mg/L. It is not expected that the leachate will negatively impact on the silver concentrations in the aquifers;
- Aluminium concentrations in all the groundwater monitoring points are measured at <0.009mg/L, except BK37 and BK36 (0.03 and 0.1mg/L respectively). Leach concentrations in the samples range between 0.2 and 0.4mg/L. It is expected that the leachate could have a negative impact on the aluminium concentrations in the aquifers;
- Barium concentrations in the natural groundwater are below detection limit (0.001mg/L). Leach concentrations range between 0.7 and 2.3mg/L. it is expected that the leachate will negatively impact on the barium concentrations in the aquifers;
- Calcium concentrations in the groundwater range between 50 and 150mg/L. Leach concentrations in the majority of the samples range between 2 and 24mg/L. It is not expected that there will be a negative impact on the calcium concentrations in the groundwater;
- Copper concentrations in the groundwater was measured at <0.005mg/L for all the samples. Leach concentrations in all the samples are measured at <0.02mg/L. It is not expected that the leachate will negatively impact on the copper concentrations in the aquifers;
- Iron concentrations in the groundwater generally range between 0.002 and 0.2mg/L. Leach concentrations in all of the samples are <0.05mg/L. It is not expected that the leachate will negatively impact on the iron concentrations in the aquifers;
- Potassium concentrations in the groundwater generally range between 0.1 and 6.5mg/L. Leach concentrations in all of the samples range between 4 and 13mg/L. It is not expected that the leachate will negatively impact on the potassium concentrations in the aquifers;
- Magnesium concentrations in the groundwater range between 30 and 100mg/L. Leach concentrations in the majority of the samples range between 0.6 and 4mg/L. Some individual samples indicate concentrations of 11 (King Waste Rock Dump (WRD) A), and 7.8mg/L at both King WRD B and Brice WRD B. At King WRD the average magnesium concentration is calculated at 9.4mg/L. It is not expected that the leachate will have a negative impact on the magnesium concentrations in the aquifers;

- Manganese concentrations in the groundwater range between <0.001 and 0.006mg/L in the majority of the samples. BK36 indicates a concentration of 0.11mg/L. Leach concentrations in the majority of the samples range between 0.1 and 0.4mg/L. The King Paste sample indicates a concentration of 1.7mg/L. It is expected that the leachate could have a negative impact on the magnesium concentrations in the aquifers, especially at the King Paste facility;
- Sodium concentrations in the groundwater generally range between 2 and 40mg/L, with 85mg/L measured at BK12, and 79mg/L measured at BK17. Leach concentrations range between 140 and 220mg/L. It is expected that the leachate will have a negative impact on the sodium concentrations in the aquifers;
- Nickel concentrations in the groundwater was measured at <0.003mg/L for all the samples, except BK36 (0.005mg/L). Leach concentrations in the majority of samples are measured at <0.005mg/L, with some individual samples showing concentrations of 0.006 (Bruce WRD A and Bruce BC11 B) and 0.007mg/L (King Paste). It is not expected that the leachate will have a notable negative impact on the nickel concentrations in the aquifers;
- Lead concentrations in the groundwater was measured at <0.01mg/L for all the samples. Leach concentrations in all the samples are measured at <0.01mg/L. It is not expected that the leachate will negatively impact on the lead concentrations in the aquifers;
- Vanadium concentrations in the majority of the groundwater monitoring points was measured at <0.002 to 0.006mg/L. BK31 and BK37 showed concentrations of 0.02 and 0.01 mg/L respectively. Leach concentrations in all the samples are measured at <0.001mg/L. It is not expected that the leachate will negatively impact on the copper concentrations in the aquifers; and
- Zinc concentrations in the groundwater was measured at <0.005mg/L for all the samples. Leach concentrations were measured at 0.02 to 0.04mg/L in the majority of the samples. Bruce BC11B showed a concentration of 0.31 mg/L. Together with Bruce BC11A an average zinc concentration of 0.175mg/L is calculated for the Bruce BC11 facility. King WRD A show a concentration of 0.13mg/L. Together with the King WRD B sample an average zinc concentration of 0.085mg/L is calculated for the King WRD facility. It is expected that the leachate will negatively impact on the zinc concentrations in the aquifers, especially around the Bruce BC11 (Old waste rock dump, mined by Kumba) and King WRD facilities.

The above can be summarised to conclude that based on the available groundwater quality data and the leach test results little impact is expected on the groundwater quality in the underlying and surrounding aquifers, except:

- All facilities have the potential to increase the aluminium and sodium concentrations due to seepage into the underlying aquifers. The resultant water will still comply with LCT0 guideline values;
- All facilities, except the BC11 facility, can be expected to have an impact on the barium concentrations in the groundwater. The barium concentrations are expected to increase up to 1.7 to 2.3mg/L over time as the plumes develop and ultimately the barium concentrations will exceed the LCT0 guidelines;
- The King Paste facility could pose some risk of increasing the manganese concentration in the underlying aquifers up to 1.7mg/L. This value exceeds the LCT0 guideline value;
- The Bruce BC11 and King WRD facilities could cause an increase in the zinc concentrations in the underlying aquifers. At the King WRD facility the leachate could exceed the LCT0 guideline value slightly (0.085mg/l vs 0.07mg/L). At the Bruce BC11 facility the impact could be more prominent, with concentrations increasing to 0.175mg/L (a factor of 2.5). These values still comply with the LCT0 guideline value of 5.0mg/L.

A hydrogeological assessment was undertaken in order to identify and quantify the impacts associated with the proposed expansion of infrastructure at Khumani Iron Ore Mine.

Khumani Mine has a projected life of mine to 2039. Iron or is mined via a series of pits situated on the Farms Bruce 544 and King 561. Waste rock dumps and, offices and stockpiles are located on the Parsons 564 and Mokaning 560.

The proposed infrastructure expansions include the following activities;

- The expansion of the Bruce overburden dump
- The expansion of the King/Mokaning overburden dump on King 561 and Mokaning 560.
- The development of low grade stockpile (Dump J) on King 561.
- Expansion of the stockpile and associated infrastructure on the Parsons 546.
- The key findings of the study are outlined below;

Groundwater Inflows & drawdown impacts

- The Bruce Pits are expected to reach a maximum mining elevation of 940 mamsl (270 mbgl) at BA 12 in 2039. Groundwater inflows to these pits are expected to begin in 2034. Based on the calibrated aquifer parameters, the inflows are expected to gradually increase to approximately 74 l/s (6400 m3/d) by 2039
- The King Pits are similarly projected to be mined up until 2039 and KM15, the deepest of the King pits, is projected to reach a maximum mining elevation of 930 mamsl or approximately 280 m below the pre-mining surface.
- Inflows at King are expected to begin in 2034 and gradually increase over time to a peak groundwater inflow rate in the order of 114 l/s.
- The maximum cumulative inflows to the pits are life of mine are expected to be in the order of 190 l/s. Which will be required to be abstracted from the open pits to ensure safe mining conditions.

These predictions are based on the calibrated numerical model developed for the evaluation of mine dewatering impacts on the catchment. The aquifer parameters (conductivity and storage) are based on calibration of the model against transient water levels collected at Khumani mine and aquifer parameters derived from testing in the broader catchment area. No aquifer tests have been conducted within the mining pits.

- Khumani Mine is located within a groundwater compartment which is bound by regionally extensive dolerite dykes. Water levels within the compartment are significantly impacted as a consequence of Sishen Iron ore mine dewatering which has been active within the compartment since 1976.
- Extensive investigations have found that there is limited drawdown in water levels beyond the dyke boundaries which are inferred to delineate the groundwater compartment. Based on the calibrated model developed for the catchment, it was demonstrated that the dewatering which will be required from the Khumani mine pits results in negligible addition impacts to receptors beyond the mine compartment.

Infrastructure expansion

- Mass transport simulations were run for in order to evaluate the existing impact associated with Khumani mine infrastructure and the additional impacts that could be expected with the expansion of the infrastructure on Bruce 544, King 561 and Parsons 564.
- Leach tests and water quality analysis associated with the Paste facility was undertaken in 2014 by GPT. The analyses demonstrated that the seepage from the Paste facility is not expected to adversely effect water quality in the underlying aquifers. Based on the constituents analysed, it is not expected that groundwater quality concentration beneath the Paste facility and other Khumani Mine infrastructure will not exceed Sans 241:2015 drinking water quality standards.
- A mass transport simulation was however undertaken in order to evaluate the pathway of seepage from existing a proposed infrastructure. It was demonstrated that the mass plumes associated with licenced infrastructure is not expected to impact receptors proximal to Khumani Mine during life of mine. Similarly, it was shown that the additional infrastructure will not result in impact on surrounding receptors during the operational phase.

Post closure impacts

- The water levels within the compartment containing the Khumani and Sishen Mines have been significantly impacted as a consequence of dewatering since 1976. Complete recover of water levels in the compartment will take over 300 years.
- Particle tracking associated with mine infrastructure was used to demonstrate the pathways and potential receptors that could potentially become impacted from seepage in the post operational phase. It was shown that after a 300 years of recovery no existing water users beyond the Khumani mine property are expected to be impacted by seepage from the Khumani mine infrastructure.

1.g.iv.4 The Positive and Negative Impacts that the Proposed Activity (in terms of the Initial Site Layout) and Alternatives will have on the Environment and the Community that may be affected

The proposed projects as part of this application are situated on the existing Khumani Mining Right Area. Mining activities have been present in this area since the 2009.

The mine has been investigating measures to optimise water management on site due to the fact that groundwater resources are mostly dewatered in the operational areas of the mine as a result of surrounding mining activities and water supply is purchased at high costs from the Sedibeng Water Supply Scheme, which is the main source of water supply to not only the mine, but also the surrounding towns, farmers and communities.

The following key positive impacts are foreseen:

- The operation of the mine due to a lawful construction of the activities will allow the mine to operate within the legal realm of the Environmental Legislation;
- The construction of Return Water Dam 3 will ensure that water can be optimally stored in the area and pumped to the Beneficiation Plant;
- It is pertinent for the mine to ensure that there is sufficient infrastructure on site to optimise water reuse within the process water circuit, as well as to allow for buffer storage capacity in periods where the Sedibeng Water Supply Scheme is not operational or supply lower volumes of water; and
- The location of the facilities will not require the removal of vegetation as it is contained within already disturbed footprint areas. Limited clearance may be required for the King Water Containment Facility depending on its final location, this will however be less than 1ha in area.

The key potential negative impacts which may/ will arise and for which management measures have been recommended are, but still require confirmation by specialists are:

- Construction activities may lead to an increase in dust emissions if not managed;
- By not maintaining the dams and pipelines spills can occur, which could lead to soil erosion and a loss of water; and
- By not maintaining the areas around the facilities, alien and invasive plant species can established.

<u>Planning Phase</u>

During the Planning phase, no specific impacts will take place directly, however, poor planning during this phase, could result in significant project delays. This could be due to environmental authorisations and other permits not being in place.

<u>Construction Phase</u>

Legal Compliance

Although unlikely, the impact could arise in terms of legal compliance should the WUL be delayed and the Return Water Dam 3 be constructed without approved WUL or designs.

Geology and Stability

The area where the Return Water Dam 3 is planned is characterised by underlying dolomites. The mine is continuously monitoring movement of strata in this area. Should detailed geotechnical studies not be undertaken and a full knowledge of the underlying strata not be known, a risk to the stability of the underlying dam structure could be present. The incorrect design principles and liner design could further contribute to this potential risk should seepage from the facility occur.

Topography and Soils

The construction of infrastructure and temporary stockpiles will not significantly alter the topography as the infrastructure is located on areas already levelled for mining activities.

The area where vegetation has established during the past years since initial construction may become more vulnerable to erosion once the vegetation is cleared for construction activities, and the soils will inevitably be exposed to wind and some surface runoff during intensive rainfall events.

If topsoil is stirpped, such must be stockpiled on surrounding areas can be eroded by wind and rain. The soil may be carried away during runoff if not protected. The cleared areas will be rehabilitated as part of ongoing rehabilitation, but full restoration of soils might only occur over a number of years, subsequent to the re-establishment of vegetation. Furthermore, improper stockpiling and soil compaction can result in soil sterilisation. Leaching can also occur, resulting in the loss of nutrients.

There is also a possibility that equipment might leak oil, thus causing surface spillages. The hydrocarbon soil contamination will render the soil useless unless it is remediated. The storage of fuels on site might have an impact on soil if the tanks that are available on site are not properly monitored and maintained to avoid leakages. There is the potential that contaminated soil can be carried through runoff to contaminate water resources and soil may be stockpiled for rehabilitation without the necessary storm water management systems in place. Soil pollution is therefore possible, but through mitigation it can be minimised or avoided.

The proposed mining and related infrastructure are not anticipated to result in a significant loss of agricultural land capability since the majority of the soils where mining-associated infrastructure is to occur are significantly disturbed and shallow and not suitable for agricultural production. These soils are therefore not considered to contribute to the provincial and national agricultural production grid.

Ecology (Flora)

The additional activities on site may further contribute to the establishment of alien and invader species if not well managed.

Surface Water

The release of contaminated water into the environment is unlikely as the Return Water Dam 3 is located within the overall dirty water system. The changes to water management due to the construction of the facility could however impact on the integrity of the existing system if not well managed.

Groundwater

- Damage to existing structures

Damage to the existing liners and underdrains associated with the existing Return Water Dams around the Paste Disposal Facility may lead to groundwater pollution and stability impacts. For this reason the facilities should be constructed under the supervision of a registered engineer.

- Oil and diesel spills

Uncontained and unmanaged oil and diesel spills associated with infrastructure development may result in contamination of the underlying aquifers if not well managed.

All oil and diesel storage and dispensing areas must be placed in adequately contained facilities to prevent spills. Any spills that may occur must be cleaned immediately to avoid groundwater contamination.

If the oil and diesel storage areas are sufficiently contained, the impact on groundwater will not be significant. Any impacts that may arise will be small (local) in extent and the impacts will be of short duration while the spills are cleaned up.

Heritage

Heritage sites are fixed features in the environment, occurring within specific spatial confines. Large portions of the project area are characterised by existing mining operations, no archaeological sites of significance were recorded during the previous heritage surveys undertaken for the mine.

Air Quality

Construction activities and material movement may temporarily result in dust dispersion.

<u>Operational Phase</u>

During the operational phase, the invasive activities would have been completed. The purpose of the proposed projects are to improve water management on site. However, with the operation of water containment dams and pipelines, measures are required to ensure that impacts are not encountered. Impacts could include:

- The implementation of the projects and the management of the structural integrity and water circulation could have a cumulative positive impact in terms of the mine's water requirements and reuse practices. This could result in a lesser dependency on the Sedibeng Water Supply Scheme and the possibility for shut downs during times when water from the Scheme is not available, thereby further contributing to the avoidance of potential economic losses;
- Unmanaged levels of water containment facilities and therefore overflows could lead to erosion and loss of water, as well as the siltation of the existing water containment facilities. Loss of structural integrity could take place by not undertaking GN 704 audits and engineering assessments. Damage to the existing liners and underdrains associated with the existing Return Water Dams around the Paste Disposal Facility may lead to groundwater pollution and stability impacts. For this reason the facilities should be constructed under the supervision of a registered engineer.
- Unmanaged pipelines could result in leaks and spills.
- Establishment of alien and invader species.

Decommissioning

The decommissioning activities are similar to what can be expected in the construction of the sites. However even with extensive mitigation, latent impacts on the receiving environment are deemed highly likely, specifically in terms of the ecological impacts should self-succession not take place and erosion is present.

As part of the proposed projects, various potential impacts have been identified in Table 35 to Table 38.

1.g.iv.5 The possible mitigation measures that could be applied and the level of risk

Detailed mitigation measures and recommendations have been included into this EIA report. Please refer to Table 35 to Table 38 for management measures. Some of the key management measures include:

- A legal assessment of all activities and future planned activities must be undertaken annually to ensure that all activities are authorised.
- The WUL and copy of the Environmental Authorisation must be available on site at all times.
- Construction areas must be clearly demarcated to control movement of personnel and vehicles, providing clear boundaries for construction sites in order to limit the spread of impacts. Markers and pegs will be erected and maintained along the boundaries of the working areas, access roads, haul roads and paths before commencing any work. If proved insufficient for control, these shall be replaced by fencing.
- Clean and dirty water separation as part of a Storm Water Management Plan must be implemented early in the construction phase, especially down-gradient of construction areas to ensure that the natural runoff patterns are impacted as little as possible.
- Ensure that all design drawings include effective erosion control measures.
- Alien and invasive plant species eradication should be implemented on site during all development phases.
- Equipment will be well maintained to reduce excessive noise creation.
- Ensure the required erosion protection measures are monitored and corrected where necessary.
- Storage of fuels and oils, the refuelling of vehicles and equipment maintenance must be limited to designated, bunded areas. Bunds to be 110% of volume of the materials stored.
- All workers must undergo an induction which includes environmental awareness training to make them aware of the environmental incident management procedures as well as the importance of complying with management measures.
- Any significant spills must be captured in the incident reports and must be reported to the relevant Departments (DMR and DWS).
- Water levels in the Return Water Dams should be monitored and should be maintained at a 0.8m freeboard.
- Pipeline flows should be recorded on the mine recording system (which should be active at any time) to determine when there may be a potential leak on a pipeline.
- All rehabilitated areas should be effectively fenced off to avoid access thereto by unauthorised parties up until full rehabilitation has been achieved.

1.g.iv.5.a Logistics and General Management

- A legal assessment of all activities and future planned activities must be undertaken annually to ensure that all activities are authorised.
- All necessary tree removal permits must be obtained where applicable.
- The WUL and copy of the Environmental Authorisation must be applied for and be available on site at all times.
- An open channel of consultation must be maintained throughout the construction activities.
- Construction areas must be clearly demarcated to control movement of personnel and vehicles, providing clear boundaries for construction sites in order to limit the spread of impacts. Markers and pegs will be erected and maintained along the boundaries of the working areas, access roads, haul roads and paths before commencing any work. If proved insufficient for control, these shall be replaced by fencing.
- Exemption in terms of GN 704 (Regulations 5 and 6) should be obtained from the DWS for the use of waste rock in the construction of the walls of the Return Water Dam 3 and other facilities, as well as the use of the Parson PCD for the storage of both storm water and process water from the Plant.

1.g.iv.5.b Water Management

- Clean and dirty water separation as part of a Storm Water Management Plan must be implemented early in the construction phase, especially down-gradient of construction areas to ensure that the natural runoff patterns are impacted as little as possible.
- Water levels in the containment facilities should be monitored and maintained at a 0.8m freeboard.
- Monitoring must be undertaken in line with the WUL.
- Hydrocarbons, chemicals and hazardous waste should be stored in suitably sized bunded areas, with a capacity not less than 110 percent of what is stored therein.
- Evaporation reduction measures should be implemented on at least the Buffer Dams and the Process Water Recovery Dam:
    - Various evaporation reduction technologies are available. Some of them are shown in the following figure.
        - Floating balls are the most common and provide evaporation reduction of between 70% and 90%. It is important to use balls that are weighted to prevent them from being lifted off the dam by strong winds.
        - Full covers are the most effective but are prohibitively expensive.
        - Hexagonal modules that automatically fit together are also available and can provide up to 90% evaporation reduction.
    - The cost of using evaporation reduction technology can be offset by Sedibeng water cost savings.

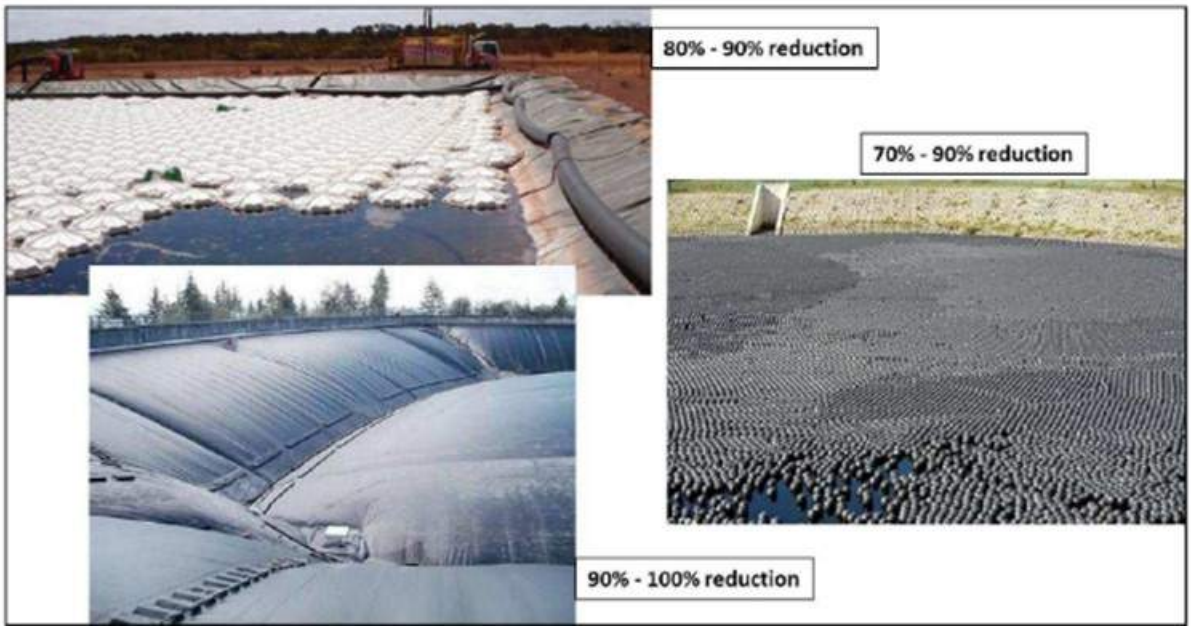


Figure 30: Typical Evaporation Reduction Technology available

1.g.iv.5.c Storm Water Management

The following recommendations were made in terms of the Storm Water Management Plan in addition to the projects being applied for:

- All waste rock dumps must be designed to comply with the mine's WUL and GN 704. Allthough approved and constructed, final closure designs are not available. For this reason new designs for these must be developed.
- The clean storm water diversion up gradient of the Paste Disposal Facility as approved in the WUL (with the associated culverts) should be formalised.
- The storm water channels that route storm water to the Bruce PCD (also known as the Storm Water Dam) should be concrete-lined to comply with the mine's water use licence. Alternatively, the licence conditions should be changed to allow for the current lining to remain in place. If the water quality parameter of concern is suspended solids, then a brick-lined channel will not result in ground water pollution.

1.g.iv.5.d Soil Management

- Soil Management (General):
  - Adhere to the Soil Stripping, Soil Stockpiling and Soil Management Plan as part of the original EMPr (Soil Utilisation Guideline).
  - Topsoil should be stockpiled on designated topsoil stockpiles, unless around linear infrastructure, where the topsoil could be stockpiled next to the linear structure.
  - Stockpiles should be revegetated (designed to allow self-succession) to establish a vegetation cover as an erosion control measure. These stockpiles should also be kept free of alien vegetation at all times to prevent loss of soil quality.
  - Temporary berms can be installed around stockpile areas whilst vegetation cover has not established to avoid soil loss through erosion; and
  - The recovered soils should be re-used to rehabilitate the mine footprint following mine closure as well as for concurrent rehabilitation where undertaken.
- Soil Erosion:
  - If possible, vegetation clearance and commencement of construction activities can be scheduled to coincide with low rainfall conditions when the erosive storm water and wind are anticipated to be low;
  - Bare soils can be regularly dampened with water to suppress dust during the construction phase, especially when strong wind conditions are predicted according to the local weather forecast;
  - All disturbed areas adjacent to the infrastructure areas can be re-vegetated with an indigenous grass mix, if necessary, to re-establish a protective cover and to minimise soil erosion and dust emission; and
  - Temporary erosion control measures may be used to protect the disturbed soils during the construction phase until adequate vegetation has established.
- Soil Compaction:
  - Vehicles may not traverse natural areas and must remain on existing disturbed areas as far as practically possible; and
  - If possible, vegetation clearance can be scheduled to coincide with low rainfall conditions when soil moisture is anticipated to be relatively low to avoid surface crusting and sealing of exposed soils.
- Soil Contamination Management:
  - A spill prevention and emergency spill response plan should be compiled to guide the construction works; and
  - An emergency response contingency plan should be put in place to address clean-up measures should a spill and/or a leak occur.
  - Alien and invasive plant eradication and control should be implemented on site.
  - Where vegetation cannot be established during the life of construction and operations, appropriate measures will be taken to control erosion. These will include grading of surfaces to prevent rapid run-off of storm water and/ or the use of energy dissipaters.
  - Equipment must be well maintained to reduce excessive noise creation.

1.g.iv.5.e Ecological Habitats (flora)

In order to minimise the impact to floral species, the following recommendations are made:

- As far as possible existing access roads are to be used to gain access to the construction sites in order to minimise the need for additional vegetation clearance;
- Spills and/or leaks from drill equipment must be immediately remedied and cleaned up so as to ensure that these chemicals do not enter into the surrounding environment;
- An Alien and Invasive Plant Control Plan and Erosion Control Plan must be developed and implemented during all phases of development, to lower the risk of erosion and the increase proliferation of alien and invasive plant species within the project areas;
- If natural succession of vegetation is not established within one rainy season, after rehabilitation, the disturbed areas and areas adjacent to the infrastructural areas must be revegetated with an indigenous grass mix, if necessary, to re-establish a protective cover, to minimise soil erosion and dust emission; and
- Alien floral species located in the project areas must be removed on a regular basis as part of maintenance activities according to the NEM:BA (Act No. 10 of 2004): Alien and Invasive Species Regulations (GN R864 of 2016).

1.g.iv.5.f Heritage Resources

- A chance encounter plan for heritage resources should be developed to guide personnel on the measures to implement should heritage resources be uncovered.

1.g.iv.5.g Waste Management

- Storage of fuels and oils, the refuelling of vehicles and equipment maintenance must be limited to designated, bunded areas. Bunds to be 110% of volume of the materials stored.
- All workers must undergo an induction which includes environmental awareness training to make them aware of the environmental incident management procedures as well as the importance of complying with management measures.
- Any significant spills must be captured in the incident reports and must be reported to the relevant department (DMR/ Catchment Management Agency (CMA)/ DWS).

1.g.iv.5.h Air Quality Management

- Dust Suppression will be undertaken where required.

Please refer to Table 14 of this report for the comments received by stakeholders and how these have been addressed.

Please refer to Table 35 to Table 38 for a broken down list of all management measures currently foreseen.

1.g.iv.6 Motivation where no alternatives sites exist

Please refer to Section 1.g.i.1 of this report.

1.g.v Statement motivating the preferred site

Please refer to Section 1.g.i.1 of this report.

1.h Full Description of the process undertaken to identify, assess and rank the impacts the activity will impose on the preferred site

In order to identify the potential impacts associated with the proposed activities the following steps were undertaken:

The stakeholder consultation process is undertaken in a manner to be interactive, providing landowners and identified stakeholders with the opportunity to provide input into the project. This is a key focus, as the surrounding land owners have capabilities of providing site specific information, which may not be available in desktop research material. Stakeholders are requested (as part of the BID) to provide their views on the project and any potential concerns which they may have. All comments and concerns received to date, have been captured and formulated into the impact assessment.

Previous environmental studies have been undertaken for a number of projects for mine within the study area, these include the MPRDA, EMPr, EMPr Alignment, various Basic Assessment Processes, etc. on the portions of land applicable to this project. The baseline studies and impact findings were incorporated into the development of the EIA report compilation.

- A detailed desktop investigation was undertaken to determine the environmental setting in which the project is located. Based on the desktop investigations various resources were used to determine the significance and sensitivity of the various environmental considerations. The desktop investigation involved the use of:
  - SANBI Biodiversity Geographic Information System (BGIS) Land Use Decision System (LUDS);
  - Geographic Information System (GIS) base maps;
  - DWS (previously the Department of Water Affairs/ Department of Water Affairs and Forestry) information documents such as the ISP;
  - Agricultural GIS (AGIS) database;
  - Municipal IDP;
  - Consultation with the DWS.
- Additional site-specific specialist studies were conducted to determine the risk of the proposed project on the environment which included:
  - Detailed Storm Water Management requirements;
  - Groundwater Impact Assessment.
- The rating of the identified impacts was undertaken in a quantitative manner as provided in Section 1.g.iv.2 (Impact Ratings). The ratings are undertaken in a manner to calculate the significance of each of the impacts. The EAP also assessed the outcomes of the calculation to determine whether the outcome reflects the perceived and actual views.

The identification of management measures are done based on the significance of the impacts and measures that have been considered appropriate and successful, specifically as Best Practical and Economical Options.

1.i Assessment of each identified potentially significant impact and risk

Please refer to Table 22 to Table 25 which presents the impacts assessed based on the Sections before. Please take note of the following abbreviations when assessing the tables:

- SbM: Significance before Mitigation
- SaM: Significance after Mitigation
- CbA: Can be Avoided
- R: Reversible
- Ir: Irreplaceable

Table 22: Potential Impacts and the calculated significance before and after management measures – Planning Phase

Name of Activity			Potential Impacts	Rating Prior to Measures							Mitigation Type	Rating Post Measures					
Activities	Project	Impact Area	Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	CbA, R, Ir	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM
Planning Phase																	
Legal Requirements (Environmental Permits)	1, 2, 3	Legal Compliance	Unlawful water and waste activities, which could lead to NWA Directives and Section 24G Rectification fines.	N	-4	-3	-2	-5	-14	CbA	A legal assessment of all activities and future planned activities must be undertaken annually to ensure that all activities are authorised. All legally appointed personnel responsible or involved in water use activities and activities associated with the Environmental Authorisations on site must receive training on the requirements of the Environmental Authorisations and relevant Environmental Legislation. Quarterly internal audits on the lawful implementation of the Environmental Authorisation must be undertaken during the construction phase, where after biannual audits can be undertaken once construction has been completed. A Water Use Licence (WUL) must be available on site at all times for all Section 21 Water Uses. The following buffers should be maintained: No activities may take place within the 1:100 year flood line of the Gamagara River.	P	4	3	5	5	17
Planning the Pipeline route	2	Landowner Relationships	Unlawful placement of activities	N	-2	-2	-3	-2	-9	CbA	Early consultation must be undertaken with the South African National Roads Agency Limited (SANRAL) to determine whether there are any specific requirements in the establishment of the additional pipeline through the existing culvert under the N14. An open channel of consultation must be maintained throughout the process. The Standard Operating Practices (SOP) and/or Contactors SOP for the establishment of the pipeline within the road reserve must be compiled.	N	-1	-1	-1	-1	-4

Table 23: Potential Impacts and the calculated significance before and after management measures – Construction Phase

Name of Activity	Project	Impact Area	Potential Impacts	Rating Prior to Measures							Mitigation Type	Rating Post Measures					
Activities			Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	CbA, R, Ir	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM
Construction Phase																	
Construction of the Return Water Dam 3		Legal Compliance	Unlawful or incorrect construction of the Return Water Dam 3.	N	-4	-3	-2	-5	-14	CbA	The Return Water Dam 3 footprint must be clearly demarcated. A suitably qualified engineer must be appointed to construct and/or oversee the construction of the Return Water Dam 3 and any other water containment facilities as stipulated in this EMPr. The approved design drawings must be available on site at all times. The Return Water Dam 3 must be constructed in terms of detailed designs signed off by a Registered Engineer. All WUL requirements must be adhered to in terms of the construction of the Return Water Dam 3. As built drawings must be submitted to the DWS and DMR upon completion of the facility. A Code of Practice (COP) must be developed during the construction phase for the operation of the Return Water Dam 3. An Emergency Preparedness Plan must be developed for any incident which may occur around the Paste Disposal Facility which may impact the integrity of the facility itself, as well as the existing Return Water Dams.	N	-1	-1	-1	-1	-4
		Geology	The area where the Return Water Dam 3 is planned is characterised by underlying dolomites. The mine is continuously monitoring movement of strata in this area.	N	-3	-3	-3	-4	-13	CbA	Ongoing monitoring of movement around the Paste Disposal Facility must continue. The Return Water Dam 3 must be constructed in terms of detailed designs signed off by a Registered Engineer and the on-site Geologist. An effective liner system should be implemented to ensure that no seepage from the facility occurs. Underdrainage systems must be in place to monitor the presence of seep.	N	-2	-1	-1	-1	-5
		Topography	No further impact is foreseen as the area is located within the Paste Disposal Footprint.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Soil and Land use	Contamination of soils as a result of a lack of sanitary services	N	-1	-2	-4	-4	-11	CbA	Chemical toilets must be readily available to employees where permanent infrastructure is not available.	N	-1	-2	-1	-1	-5

Name of Activity	Project	Impact Area	Potential Impacts	Rating Prior to Measures							Mitigation Type	Rating Post Measures					
Activities			Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	CbA, R, Ir	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM
											Licensed companies must be appointed to remove any contaminated material and or wastes to licensed landfill sites.						
		Ecology	The establishment of Alien and Invader Species.	N	-2	-3	-4	-4	-13	CbA	An alien and invasive plant species eradication programme will be developed and implemented to eradicate alien and invasive plants and to prevent new invasions during the ongoing mining operation. If natural succession of vegetation is not established within one rainy season after commencement of rehabilitation, the disturbed areas and areas adjacent to the infrastructural areas must be re-vegetated with an indigenous grass mix, if necessary, to re-establish a protective cover, to minimise soil erosion and dust emission. In the event that new areas, previously not altered due to mining activities are disturbed during the construction phase of the proposed projects, an ecological walk-over study must be undertaken to determine whether any protected or sensitive species are present. If such species are present, the required permits must be obtained.	N	-1	-1	-2	-1	-2
			The unmanaged disposal of waste, could result in the spread of invader species, as well as the influx of opportunistic species.	N	-2	-3	-3	-4	-12	CbA	Develop dedicated waste handling areas and prevent the spread of waste. Prevent access to rodents and opportunistic species. Develop dedicated waste handling areas, fit for purpose and prevent the spread of waste.	N	-1	-1	-2	-1	-5
		Surface Water	Release of Contaminated Water into the environment is unlikely as the Return Water Dam 3 is located within the overall dirty water system. The changes to water management due to the construction of the facility could however impact on the integrity of the existing system.	N	-1	-2	-2	-2	-7	CbA	Clean and dirty water separation systems should be upgraded in terms of the 2018 Water Studies undertaken by Geo Tail (Pty) Ltd. Measures should be implemented during the construction phase to ensure that excess silt is contained and not released into the water management area and thereby hampering its GN 704 compliance in terms of capacity and freeboard. Maintenance of all Storm Water Management systems must be undertaken regularly on site.	N	-1	-1	-2	-1	-5
		Groundwater	Damage to the existing liners and underdrains may lead to groundwater pollution	N	-2	-2	-2	-2	-8	CbA	The Return Water Dam 3 must be constructed in terms of detailed designs signed off by a Registered Engineer and the on-site Geologist.	N	-1	-1	-1	-1	-4

Name of Activity	Project	Impact Area	Potential Impacts	Rating Prior to Measures							Mitigation Type	Rating Post Measures					
Activities			Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	CbA, R, Ir	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM
											The facility should be constructed under the supervision of a Registered Engineer. Groundwater monitoring must continue in line with the requirements of the approved WUL.						
		Air Quality	Construction activities and material movement may temporarily result in dust dispersion.	N	-2	-1	-2	-1	-6	CbA	Maintain the current air quality monitoring stations that determine fallout and implemented respirable dust (PM10) monitoring that could arise from the mining activities. Implement dust suppression in and around the construction area where required.	N	-1	-1	-1	-1	-4
		Noise	The activities are located within the mining boundary, in proximity to the current King Plant and the operational Paste Disposal Facility. No impacts in terms of noise are anticipated.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Heritage	No further impact is foreseen as the area is located within the Paste Disposal Footprint, no clearance of soils or underlying material will be required. All activities will remain within approved footprints.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Socio-Economic	The Return Water Dam 3 is planned in terms of overall water management on site. The construction activities should have no impact on the Socio-Economic Setting in which the mine is located.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Construction of the new Storm Water Containment Facility on King		Legal Compliance	Unlawful or incorrect construction of the new Water Containment Facility tank.	N	-4	-3	-2	-5	-14	CbA	The footprint must be clearly demarcated. A suitably qualified engineer must be appointed to construct and/or oversee the construction of the Return Water Dam 3 and any other water containment facilities as stipulated in this EMPr. The facility will be constructed as a tank system and not an excavated dam.	N	-1	-1	-1	-1	-4

Name of Activity	Project	Impact Area	Potential Impacts	Rating Prior to Measures							Mitigation Type	Rating Post Measures					
Activities			Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	CbA, R, Ir	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM
											All WUL requirements must be adhered to in terms of the construction of the King Water Containment Facility tank.						
		Geology	No impact is foreseen.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Topography	No further impact is foreseen as the area is located within the approved mining area.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Soil and Land use	Contamination of soils as a result of a lack of sanitary services	N	-1	-2	-4	-4	-11	CbA	Chemical toilets must be readily available to employees where permanent infrastructure is not available. Licensed companies must be appointed to remove any contaminated material and or wastes to licensed landfill sites.	N	-1	-2	-1	-1	-5
			Clearing vegetation will result in the exposure of soil, which may in turn lead to soil erosion.	N	-1	-2	-4	-4	-11	CbA	Ensure the required erosion protection measures are monitored and corrected where necessary. Natural vegetation establishment (self-succession) will be encouraged on cleared areas and topsoil stockpiles. If natural succession of vegetation is not established within one rainy season, after rehabilitation, the disturbed areas and areas adjacent to the infrastructural areas must be re-vegetated with an indigenous grass mix, if necessary, to re-establish a protective cover, to minimise soil erosion and dust emission. The mine will investigate an appropriate seed mix for the rehabilitation purposes should self-succession not establish on rehabilitated sites.	N	-1	-2	-2	-1	-6

Name of Activity	Project	Impact Area	Potential Impacts	Rating Prior to Measures							Mitigation Type	Rating Post Measures					
Activities			Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	CbA, R, Ir	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM
											If possible, vegetation clearance and commencement of construction activities can be scheduled to coincide with low rainfall conditions when the erosive storm water and wind are anticipated to be low. No construction or project related activities may be undertaken outside of the demarcated areas.						
		Ecology	The establishment of alien and invasive plant species.	N	-2	-3	-4	-4	-13	CbA	An alien and invasive plant species eradication programme will be developed and implemented to eradicate alien and invasive plants and to prevent new invasions during the ongoing mining operation. If natural succession of vegetation is not established within one rainy season after commencement of rehabilitation, the disturbed areas and areas adjacent to the infrastructural areas must be re-vegetated with an indigenous grass mix, if necessary, to re-establish a protective cover, to minimise soil erosion and dust emission. In the event that new areas, previously not altered due to mining activities, are cleared as part of the construction of the proposed projects, an ecological walk-over study must be undertaken to determine whether any protected or sensitive species are present. If such species are present, the required permits must be obtained.	N	-1	-1	-2	-1	-2
			The unmanaged disposal of waste, could result in the spread of invader species, as well as the influx of opportunistic species.	N	-2	-3	-3	-4	-12	CbA	Develop dedicated waste handling areas and prevent the spread of waste. Prevent access to rodents and opportunistic species. Develop dedicated waste handling areas, fit for purpose and prevent the spread of waste.	N	-1	-1	-2	-1	-5
		Surface Water	Release of Contaminated Water into the environment is unlikely as the containment facility is located within the overall dirty water system. The changes to water management due to the construction of the facility could however impact on the integrity of the existing system.	N	-1	-2	-2	-2	-7	CbA	Clean and dirty water separation systems should be upgraded in terms of the 2018 Water Studies undertaken by Geo Tail (Pty) Ltd. Measures should be implemented during the construction phase to ensure that excess silt is contained and not released into the water management area and thereby hampering its GN 704 compliance in terms of capacity and freeboard. Maintenance of all Storm Water Management systems must be undertaken regularly on site.	N	-1	-1	-2	-1	-5

Name of Activity	Project	Impact Area	Potential Impacts	Rating Prior to Measures							Mitigation Type	Rating Post Measures					
Activities			Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	CbA, R, Ir	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM
		Groundwater	No impact is foreseen as the facility will be a tank structure.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Air Quality	Construction activities and material movement may temporarily result in dust dispersion.	N	-2	-1	-2	-1	-6	CbA	Maintain the current air quality monitoring stations that determine fallout and implemented respirable dust (PM10) monitoring that could arise from the mining activities. Implement dust suppression in and around the construction area where required.	N	-1	-1	-1	-1	-4
		Noise	The activities are located within the mining boundary, in proximity to the current King Plant and the operational Paste Disposal Facility. No impacts in terms of noise are anticipated.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Heritage	No further impact is foreseen as the area is located within the Paste Disposal Footprint, no clearance of soils or underlying material will be required. All activities will remain within approved footprints.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Socio-Economic	The Return Water Dam 3 is planned in terms of overall water management on site. The construction activities should have no impact on the Socio-Economic Setting in which the mine is located.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Construction of the Pipelines		Geology	No impact is foreseen to take place on geology as a result of the pipeline construction.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Topography	No further impact is foreseen as the area is located within the existing buffer in which pipelines are located to and from the Paste Disposal Facility.	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Name of Activity	Project	Impact Area	Potential Impacts	Rating Prior to Measures							Mitigation Type	Rating Post Measures					
Activities			Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	CbA, R, Ir	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM
		Soil and Land use	No further impact is foreseen as the area is located within the existing linear corridor in which pipelines are located to and from the Paste Disposal Facility. However the construction phase may involve the use of hydrocarbons in the establishment of the pipeline structures. Vehicle movement in the area could also lead to soil contamination if not well managed. The presence of people in this area could lead to an increase in littering.	N	-1	-2	-4	-4	-11	CbA	Vehicles and machinery will be regularly maintained. Maintenance programmes will be established and implemented. Storage of fuels and oils, the refuelling of vehicles and equipment maintenance must be limited to designated, bunded areas (bunds to be 110% of volume of the materials stored). Chemicals and hazardous material must be stored in suitable containers, fit for purpose and in line with SDS requirements. A spill kit must be provided to be used in the event of a spill. If a spill occurs, the contaminated soil must be removed immediately. Contaminated soil must be stored according to best practices until it can be disposed of at a suitably licensed facility. All workers must undergo an induction which includes environmental awareness training to make them aware of the environmental incident management procedures as well as the importance of complying with management measures. Hazardous waste should be removed by a licensed hazardous waste removal company and taken to a suitable and licensed landfill site. Documentation of removal and safe disposal must be kept on record and in good order. A detailed waste management strategy will be established and implemented, which will clearly demarcate the containments for different waste streams.	N	-1	-1	-2	-2	-6
			Contamination of soils as a result of a lack of sanitary services	N	-1	-2	-4	-4	-11	CbA	Chemical toilets must be readily available to employees where permanent infrastructure is not available. Licensed companies must be appointed to remove any contaminated material and or wastes to licensed landfill sites.	N	-1	-2	-1	-1	-5
		Ecology	The establishment of alien and invasive plant species.	N	-2	-3	-4	-4	-13	CbA	An alien and invasive plant species eradication programme will be developed and implemented to eradicate alien and invasive plants and to prevent new invasions during the ongoing mining operation. If natural succession of vegetation is not established within one rainy season after commencement of	N	-1	-1	-2	-1	-2

Name of Activity	Project	Impact Area	Potential Impacts	Rating Prior to Measures							Mitigation Type	Rating Post Measures					
Activities			Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	CbA, R, Ir	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM
											rehabilitation, the disturbed areas and areas adjacent to the infrastructural areas must be re-vegetated with an indigenous grass mix, if necessary, to re-establish a protective cover, to minimise soil erosion and dust emission. In the event that new areas, previously not altered due to mining activities are disturbed as part of the construction activities, an ecological walk-over study must be undertaken to determine whether any protected or sensitive species are present. If such species are present, the required permits must be obtained.						
			The unmanaged disposal of waste, could result in the spread of invader species, as well as the influx of opportunistic species.	N	-2	-3	-3	-4	-12	CbA	Develop dedicated waste handling areas and prevent the spread of waste. Prevent access to rodents and opportunistic species. Develop dedicated waste handling areas, fit for purpose and prevent the spread of waste.	N	-1	-1	-2	-1	-5
		Surface Water	No impacts are foreseen to take place on surface water, as the pipeline route is not located in close vicinity of watercourses.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Groundwater	No impact is foreseen to take place on groundwater resources as a result of the pipeline construction.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Air Quality	No impact is foreseen to take place on ambient air quality conditions as a result of the pipeline construction.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Noise	No impact is foreseen to take place on ambient noise conditions as a result of the pipeline construction.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Heritage	No further impact is foreseen as the area is located within the existing buffer constructed for pipelines, to and from the Paste Disposal Facility. No clearance of soils or underlying material will be required. All activities will	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Name of Activity	Project	Impact Area	Potential Impacts	Rating Prior to Measures							Mitigation Type	Rating Post Measures					
Activities			Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	CbA, R, Ir	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM
			remain within approved footprints.														
		Socio-Economic	The construction activities should have no impact on the Socio-Economic Setting in which the mine is located.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upgrade of approved Water Use Licence Activities	3	Legal Compliance	Unlawful or incorrect construction of the Water Management Systems	N	-4	-3	-2	-5	-14	CbA	The upgrade sites must be clearly demarcated. The approved design drawings must be available on site at all times. The upgrades to approved Water Uses must be undertaken in terms of detailed designs signed off by a Registered Engineer. All WUL requirements must be adhered to in terms of the upgrade of the facilities. As built drawings must be submitted to the DWS and DMR upon completion of the upgrades. A COP must be developed during the construction phase for the operation of the Water Storage Facilities and approved Mine Residue Facilities in line with the overall Water Conservation and Management requirements as identified in the 2018 Water Studies by Geo Tail (Pty) Ltd or subsequent approved amendments thereto. An Emergency Preparedness Plan must be developed for any incident which may occur around the Paste Disposal Facility which may impact the integrity of the Facility itself, as well as the existing Return Water Dams.	N	-1	-1	-1	-1	-4
		Geology	No impacts are foreseen on the geological conditions of the area. As the upgrades are limited to the areas considered on the lavas and not the dolomites.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Topography	No further impact is foreseen as the sites will be located in areas already designed for water containment purposes.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Soil and Land use	No further impact is foreseen as the sites will be located in areas already designed for water containment purposes	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Name of Activity	Project	Impact Area	Potential Impacts	Rating Prior to Measures							Mitigation Type	Rating Post Measures					
Activities			Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	CbA, R, Ir	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM
			or within existing borrow pits.														
		Ecology	The establishment of alien and invasive plant species.	N	-2	-3	-4	-4	-13	CbA	An alien and invasive plant species eradication programme will be developed and implemented to eradicate alien and invasive plants and to prevent new invasions during the ongoing mining operation. If natural succession of vegetation is not established within one rainy season, after commencement of rehabilitation, the disturbed areas and areas adjacent to the infrastructural areas must be re-vegetated with an indigenous grass mix, if necessary, to re-establish a protective cover, to minimise soil erosion and dust emission.	N	-1	-1	-2	-1	-2
		Surface Water	Release of Contaminated Water into the environment is unlikely as the water containment dams are located within the overall dirty water system. The changes to water management due to the construction of the facility could however impact on the integrity of the existing system.	N	-1	-2	-2	-2	-7	CbA	Clean and dirty water separation systems should be upgraded in terms of the 2018 Water Studies. Measures should be implemented during the construction phase to ensure that excess silt is contained and not released into the existing water uses and thereby hampering its GN 704 compliance in terms of capacity and freeboard. Maintenance of all Storm Water Management systems must be undertaken regularly on site.	N	-1	-1	-2	-1	-5
		Groundwater	Damage to the existing liners or incorrect upgrades (not in line with approved designs) of the facilities lead to groundwater pollution	N	-2	-2	-2	-2	-8	CbA	The upgrade of the facilities must be constructed in terms of detailed designs signed off by a Registered Engineer. Groundwater monitoring must continue in line with the requirements of the approved WUL.	N	-1	-1	-1	-1	-4
		Air Quality	Construction activities and material movement may temporarily result in dust dispersion.	N	-2	-1	-2	-1	-6	CbA	Maintain the current air quality monitoring stations that determine fallout and implemented respirable dust (PM10) monitoring that could arise from the mining activities. Implement dust suppression in and around the construction area where required.	N	-1	-1	-1	-1	-4
		Noise	The activities are located within the mining boundary, in proximity to the current Parson and Bruce Plants. An increase in construction activities around existing water containment	N	-1	-2	-3	-2	-8	CbA	Equipment should be well maintained to reduce excessive noise creation. Activities should remain within the demarcated sites. Activities will be restricted to the day time.	N	-1	-2	-2	-1	-6

Name of Activity	Project	Impact Area	Potential Impacts	Rating Prior to Measures							Mitigation Type	Rating Post Measures					
Activities			Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	CbA, R, Ir	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM
			structures, could lead to an increase in noise levels in the area.														
		Heritage	No further impact is foreseen as the area is located within the approved mining footprints, no clearance of soils or underlying material will be required. All activities will remain within approved footprints.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Socio-Economic	The upgrade of the Water Containment Structures are planned in terms of overall water management on site. The construction activities should have no impact on the Socio-Economic Setting in which the mine is located.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Waste Management and Handling Hydrocarbon spills within the Mining Area and the management of Domestic and Hazardous Waste	1, 2, 3	Geology	No direct impact.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Topography	No direct impact.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Soils	Contamination of soil resources due to hydrocarbon spills.	N	-1	-2	-4	-4	-11	CbA	Storage of fuels and oils, the refuelling of vehicles and equipment maintenance must be limited to designated, bunded areas (bunds to be 110% of volume of the materials stored). All fuels and soils must be stored in appropriate containers. Chemicals and hazardous material must be stored in suitable containers, fit for purpose and in line with Safety Data Sheet (SDS) requirements. Where drip trays are too small, specially prepared, non-pervious bunds with solution trenches must be used to capture spillages Oils and potentially hazardous materials must be disposed of at a licensed facility and waste certificates obtained. A spill kit must be provided to be used in the event of a spill. If a spill occurs, the contaminated soil must be removed immediately. Contaminated soil must be	N	-1	-2	-1	-1	-5

Name of Activity	Project	Impact Area	Potential Impacts	Rating Prior to Measures							Mitigation Type	Rating Post Measures					
Activities			Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	CbA, R, Ir	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM
											stored according to best practices until it can be disposed of at a suitably licensed facility. Safety signage must be used at designated storage areas. All workers must undergo an induction which includes environmental awareness training to make them aware of the environmental incident management procedures as well as the importance of complying with management measures.						
			Contamination of soils as a result of a lack of sanitary services	N	-1	-2	-4	-4	-11	CbA	Chemical toilets must be readily available to employees where permanent infrastructure is not available. Licensed companies must be appointed to remove any contaminated material and or wastes to licensed landfill sites.	N	-1	-2	-1	-1	-5
			Handling of building rubble	N	-2	-2	-1	-2	-7	CbA	Building rubble must be disposed of in line with the requirements of the NEM:WA. Waste management training must be implemented on site. Clear signs informing staff of waste management practices must be implemented on site. All waste must be removed by licensed contractors and disposed of at a licensed landfill site or be disposed of at a licensed landfill site. As a duty of care and the cradle to grave principles, the mine should regularly inspect disposal sites to ensure that best practices are implemented. Recycling practices must be investigated and implemented on site where practical.	N	-1	-1	-1	-2	-5
		Ecology	The unmanaged disposal of waste, could result in the spread of invader species, as well as the influx of opportunistic species.	N	-2	-3	-3	-4	-12	CbA	Develop dedicated waste handling areas; prevent access to rodents and opportunistic species; prevent the spread of waste. Develop dedicated waste handling areas, fit for purpose and prevent the spread of waste.	N	-1	-1	-2	-1	-5
		Surface Water	Handling of Hazardous Waste within workshops, water containment facilities and	N	-3	-2	-2	-4	-11	CbA	Clean and dirty water separation systems should be incorporated in terms of the SWMP or any approved update thereafter.	N	-1	-1	-2	-2	-6

Name of Activity	Project	Impact Area	Potential Impacts	Rating Prior to Measures							Mitigation Type	Rating Post Measures					
Activities			Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	CbA, R, Ir	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM
			general mine area could contaminate the dirty water storage areas. The water is then reused in the system and could have impacts on the integrity of the storm water system and also the production.								A detailed waste management strategy will be established and implemented, which will clearly demarcate the containments for different waste streams.						
											Waste management training must be implemented on site.						
											Clear signs informing staff of waste management practices must be implemented on site.						
											Hazardous waste handling should only take place within bunded and/or lined areas.						
											Hazardous waste should be removed by a licensed removal company and taken to a suitable and licensed landfill site.						
											Clean spills should spills occur, within 24 hours.						
											Documentation of removal and safe disposal must be available on site.						
											The mine will adopt a cradle-to grave approach to ensure that the waste is removed and disposed of in a legally compliant manner.						
											Notify the relevant regulatory authorities in the event of the occurrence of a reportable incident.						
											Weekly inspections of Storm Water Management systems must be undertaken. Any blockages or maintenance requirements must be documented and an action plan developed.						
			Handling and Storing of Domestic Waste should have no impact on the surface water resources due to the location of the facility. However, incorrect disposal of waste could hamper the integrity of the storm water system.	N/A	-1	-2	-3	-3	-9	CbA	Clean and dirty water separation systems should be incorporated in terms of the SWMP or any approved update thereafter.	N	-1	-1	-2	-1	-5
											Waste management training must be implemented on site.						
											Weekly inspections of Storm Water Management systems must be undertaken. Any blockages or maintenance requirements must be documented and an action plan developed.						
											Clear signs informing staff of waste management practices must be implemented on site.						
											Access control must be strictly enforced.						
											Waste should be disposed of by licensed companies to licensed facilities.						
											Recycling practices must be investigated and implemented on site.						

Name of Activity	Project	Impact Area	Potential Impacts	Rating Prior to Measures							Mitigation Type	Rating Post Measures					
Activities			Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	CbA, R, Ir	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM
		Groundwater	Large scale hydrocarbon spills could be present at the mining area	N	-3	-1	-4	-4	-12	CbA	Clean and dirty water separation systems should be incorporated in terms of the SWMP. No activities associated with hydrocarbons and/or chemicals may be undertaken outside of an effectively designed and contained area. All used oils must be removed from site by a licensed company and disposed of at a suitably licensed site. Any spills occurring during the collection process must be cleaned up immediately. Any significant spills must be captured in the incident reports and must be reported to the relevant department (LDEDET, Catchment Management Agency/DWS). All equipment and machinery should be kept in good working order. A clean up procedure (i.e. Works Instruction) must be in place. Clean spills, if spills occur, within 24 hours.	N	-2	-1	-2	-1	-6
			Handling or Hazardous Waste within workshops and general mine area.	N	-2	-2	-2	-4	-10	CbA	Clean and dirty water separation systems should be incorporated in terms of the 2018 SWMP or any approved update thereafter. The workshop should be designed with the suitable waste containment measures (berms, sumps, oil separators). Waste management training must be implemented on site. Clear signs informing staff of waste management practices must be implemented on site. Hazardous waste handling should only take place within bunded and/or lined areas, with a capacity of at least 110% of the volume stored. Hazardous waste should be removed by a licensed removal company and taken to a suitable and licensed landfill site. Documentation of removal and safe disposal must be available on site.	N	-1	-1	-2	-2	-6
			Handling and Storing of Domestic Waste	N	-2	-2	-1	-2	-7	CbA	Clean and dirty water separation systems should be incorporated in terms of the SWMP or any approved update thereafter. Waste management training must be implemented on site. Clear signs informing staff of waste management practices must be implemented on site.	N	-1	-1	-1	-2	-5

Name of Activity			Potential Impacts	Rating Prior to Measures							Mitigation Type	Rating Post Measures					
Activities	Project	Impact Area	Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	CbA, R, Ir	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM
											All waste must be removed by licensed contractors and disposed of at a licensed landfill site.						
											As a duty of care and the cradle to grave principles, the mine should regularly inspect disposal site to ensure that best practices are implemented.						
											Recycling practices must be investigated and implemented on site where practical.						
											Groundwater monitoring must be undertaken in such a manner as to ensure that any potential impacts from the landfill site can be detected.						
		Air Quality	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Heritage	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Noise	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Visual	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Social	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 24: Potential Impacts and the calculated significance before and after management measures – Operational Phase

Name of Activity			Potential Impacts	Rating Prior to Measures							Mitigation Type	Rating Post Measures					
Activities	Project	Impact Area	Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	CbA, R, Ir	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM
Operational Phase																	
Operating of Dirty Water Containment Facilities (Return Water Dam 3 and all other upgrades)	1, 3	Geology	The area where the Return Water Dam 3 will be established is characterised by underlying dolomites. The mine is continuously monitoring movement of strata in this area.	N	-3	-3	-3	-4	-13	CbA	Ongoing monitoring of movement around the Paste Disposal Facility must continue.	N	-2	-1	-1	-1	-5
											Regular dolomitic studies must be undertaken by the mine to determine the underlying conditions of the containment areas located over the dolomitic aquifers.						
											Leak detection must be undertaken to determine the integrity of the Return Water Dam 3.						
											The effective liner system should be continuously monitored on all water containment facilities.						
		Topography	No further impact is foreseen.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Soil and Land use	Overflow of facilities could lead to erosion of soil resources.	N	-1	-2	-3	-2	-8	CbA	Dam levels should be monitored and should be maintained at a 0.8m freeboard and within GN 704 requirements.	N	-1	-2	-1	-1	-5

Name of Activity			Potential Impacts	Rating Prior to Measures							Mitigation Type	Rating Post Measures					
Activities	Project	Impact Area	Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	CbA, R, Ir	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM
											Water structures should be monitored to ensure the integrity of these facilities. Any erosion present on the slopes or surrounds of containment facilities should be immediately rehabilitated.						
		Ecology	The establishment of alien and invasive plant species.	N	-2	-3	-4	-4	-13	CbA	The alien and invasive plant species eradication plan will be implemented continuously. If natural succession of vegetation is not established within one rainy season, after commencement of rehabilitation, the disturbed areas and areas adjacent to the infrastructural areas must be re-vegetated with an indigenous grass mix, if necessary, to re-establish a protective cover, to minimise soil erosion and dust emission.	N	-1	-1	-2	-1	-2
		Surface Water	Overflow of Dams resulting in contamination of surrounding water resources. No surface water resources are in close vicinity to the mining operations and therefore such impact unlikely of occurring.	N	-1	-2	-3	-2	-8	CbA	Dam levels should be monitored and should be maintained at a 0.8m freeboard and within GN 704 requirements. Evaporation controls should be implemented on the Process Water Recovery Dam at the Plant and the Buffer Dams. Operational procedures must be implement to ensure the optimise operation of the water containment structures to ensure efficient reuse of water. Level meters must be put in place and be maintained. Measurements of water return to the Beneficiation Plant must be kept for auditing purposes and to feed into the Water Balance. The water circuit must be managed at one central location to ensure that there is integration between the plant, Paste Disposal Facility, and general surface water needs and requirements. Automated pumps must be implemented at the Return Water Dams and Storm Water Dams where indicated in the Geo Tail (Pty) Ltd water study to ensure that water can be pumped to the Beneficiation Plant when certain levels are met. The Water Balance must be updated annually, with a strong focus on improving the management of the internal water circuit on site. No change in the design or operation of the facilities may be undertaken without the approved of the relevant government department.	N	-1	-2	-1	-1	-5

Name of Activity	Project	Impact Area	Potential Impacts	Rating Prior to Measures							Mitigation Type	Rating Post Measures					
Activities			Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	CbA, R, Ir	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM
											Any significant spills must be captured in the incident reports and must be reported to the relevant department (DMR, CMA/ DWS).						
		Groundwater	Damage to the existing liners and underdrains may lead to groundwater pollution	N	-2	-2	-2	-2	-8	CbA	Leak detection must be undertaken to determine the integrity of the Return Water Dam 3. The effective liner system should be continuously monitored on all water containment facilities. Groundwater monitoring must continue in line with the requirements of the approved WUL.	N	-1	-1	-1	-1	-4
		Air Quality	No impact on the ambient air quality conditions are foreseen as a result of the operation of the water containment facilities.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Noise	No impact on the ambient noise levels are foreseen as a result of the operation of the water containment facilities.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Heritage	No further impact is foreseen as the area is located within the Paste Disposal Footprint, no clearance of soils or underlying material will be required. All activities will remain within approved footprints.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Socio-Economic	The operational aspect of the water containment facilities should have a positive impact on the socio-economic conditions, as the opportunity exists for the mine to reuse its internal water resources optimally and not depend on the Sedibeng Pipeline on a 100% basis. This will allow for the mine to plan towards periods where water shutdowns may be experienced and during which times the mine can then continue to operate.	P	3	1	2	3	9	-	Level meters must be put in place and be maintained. Measurements of water return to the Beneficiation Plant must be kept for auditing purposes and to feed into the Water Balance. The water circuit must be managed at one central location to ensure that there is integration between the Plant, Paste Disposal Facility, and general surface water needs and requirements. Automated pumps must be implemented at the Return Water Dams and Storm Water Dams where indicated in the Geo Tail (Pty) Ltd water study to ensure that water can be pumped to the Beneficiation Plant when certain levels are met. For this purpose level meters must be put in place. Evaporation controls should be implemented on the Process Water Recovery Dam at the Plant and the Buffer Dams/ Return Water Dams and any other dam	P	3	3	5	5	16

Name of Activity			Potential Impacts	Rating Prior to Measures							Mitigation Type	Rating Post Measures					
Activities	Project	Impact Area	Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	CbA, R, Ir	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM
											deemed necessary by the person responsible for water management on site. The Water Balance must be updated annually, with a strong focus on improving the management of the internal water circuit on site.						
Operating of Pipeline	1, 3	Geology	No impact is foreseen to take place on geology as a result of the pipeline operation.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Topography	No further impact is foreseen as a result of the pipeline operation.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Soil and Land use	Spills along pipelines could contaminate or impact on the conditions of soils through soil erosion.	N	-2	-2	-4	-2	-10	CbA	Regular monitoring must be undertaken through walk-abouts to ensure that the mine is aware of any leaks along the pipelines. Where erosion is present this must be rehabilitated as soon as practically possible. Where leaks are present measures must be implemented to contain and reduce the volumes of loss of water by either shutting down the pipeline or any other measure economically viable at that time of the operation. Water leaks must be rectified and fixed within 12 hours from occurrence. Any leaks must be documented on the IsoMetrix system, no matter the quantity thereof. This will ensure that recurrences or areas where maintenance are required are identified proactively prior to a serious encounter. A detailed water management and system maintenance procedure must be implemented on site, documenting the responsible persons, actions required on a daily, weekly, monthly or annual basis as well as recording requirements.	N	-1	-1	-2	-2	-6
		Ecology	The establishment of alien and invasive plant species.	N	-2	-3	-4	-4	-13	CbA	The alien and invasive plant species eradication plan will be implemented continuously. If natural succession of vegetation is not established within one rainy season, after commencement of rehabilitation, the disturbed areas and areas adjacent to the infrastructural areas must be re-vegetated with an indigenous grass mix, if necessary, to re-establish a protective cover, to minimise soil erosion and dust emission.	N	-1	-1	-2	-1	-2

Name of Activity			Potential Impacts	Rating Prior to Measures							Mitigation Type	Rating Post Measures					
Activities	Project	Impact Area	Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	CbA, R, Ir	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM
		Surface Water	No impacts are foreseen to take place on surface water, as the pipeline route is not located in close vicinity of watercourses.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Groundwater	Although unlikely spills along pipelines could contaminate or impact on the conditions of groundwater resources if left unmanaged.	N	-1	-3	-1	-2	-7	CbA	Regular monitoring must be undertaken through walk-abouts to ensure that the mine is aware of any leaks along the pipelines. Where erosion is present this must be rehabilitated as soon as practically possible. Where leaks are present measures must be implemented to contain and reduce the volumes of loss of water by either shutting down the pipeline or any other measure economically viable at that time of the operation. Water leaks must be rectified and fixed within 12 hours from occurrence. Any leaks must be documented on the IsoMetrix system, no matter the quantity thereof. This will ensure that recurrences or areas where maintenance are required are identified proactively prior to a serious encounter. A detailed water management and system maintenance procedure must be implemented on site, documenting the responsible persons, actions required on a daily, weekly, monthly or annual basis as well as recording requirements.	N	-1	-1	-1	-1	-4
		Air Quality	No impact on the ambient air quality conditions are foreseen as a result of the operation of the water containment facilities.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Noise	No impact on the ambient noise levels are foreseen as a result of the operation of the water containment facilities.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Heritage	No further impact is foreseen as the area is located within the Paste Disposal Footprint, no clearance of soils or underlying material will be required. All activities will	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Name of Activity	Project	Impact Area	Potential Impacts	Rating Prior to Measures							Mitigation Type	Rating Post Measures					
Activities			Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	CbA, R, Ir	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM
			remain within approved footprints.														
		Socio-Economic	The operational aspect of the water containment facilities should have a positive impact on the socio-economic conditions, as the opportunity exists for the mine to reuse its internal water resources optimally and reduce the dependency of the Mine on the Sedibeng Water Supply Scheme . This will allow for the mine to plan towards periods where water shutdowns may be experienced and during which times the mine can then continue to operate.	P	3	1	2	3	9	-	Level meters must be put in place and be maintained. Measurements of water return to the Beneficiation Plant must be kept for auditing purposes and to feed into the Water Balance. The water circuit must be managed at one central location to ensure that there is integration between the Plant, Paste Disposal Facility, and general surface water needs and requirements. Automated pumps must be implemented at the Return Water Dams and Storm Water Dams where indicated in the Geo Tail (Pty) Ltd Water Study to ensure that water can be pumped to the Beneficiation Plant when certain levels are met. For this purpose level meters must be put in place. Evaporation controls should be implemented on the Process Water Recovery Dam at the Plant and the Buffer Return Water Dams and any other dam deemed necessary by the person responsible for water management on site. The Water Balance must be updated annually, with a strong focus on improving the management of the internal water circuit on site.	P	3	3	5	5	16
Waste Management and Handling Hydrocarbon spills within the Mining Area and the management of Domestic and Hazardous Waste	1, 2, 3	Geology	No direct impact.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Topography	No direct impact.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Soils	Contamination of soil resources due to hydrocarbon spills.	N	-1	-2	-4	-4	-11	CbA	Storage of fuels and oils, the refuelling of vehicles and equipment maintenance must be limited to designated, bunded areas (bunds to be 110% of volume of the materials stored). All fuels and soils must be stored in appropriate containers. Chemicals and hazardous material must be stored in suitable containers, fit for purpose and in line with SDS requirements. Where drip trays are too small, specially prepared, non-pervious bunds with solution trenches must be used to capture spillages.	N	-1	-2	-1	-1	-5

Name of Activity	Project	Impact Area	Potential Impacts	Rating Prior to Measures							Mitigation Type	Rating Post Measures					
Activities			Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	CbA, R, Ir	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM
											Oils and potentially hazardous materials must be disposed of at a licensed facility and waste certificates obtained. A spill kit must be provided to be used in the event of a spill. If a spill occurs, the contaminated soil must be removed immediately. Contaminated soil must be stored according to best practices until it can be disposed of at a suitably licensed facility. Safety signage must be used at designated storage areas. All workers must undergo an induction which includes environmental awareness training to make them aware of the environmental incident management procedures as well as the importance of complying with management measures.						
			Contamination of soils as a result of a lack of sanitary services	N	-1	-2	-4	-4	-11	CbA	Chemical toilets must be readily available to employees where permanent infrastructure is not available. Licensed companies must be appointed to remove any contaminated material and or wastes to licensed landfill sites.	N	-1	-2	-1	-1	-5
		Ecology	The unmanaged disposal of waste could result in the spread ofalien and invader species, as well as the influx of opportunistic species.	N	-2	-3	-3	-4	-12	CbA	Develop dedicated waste handling areasprevent the spread of waste. Prevent access to rodents and opportunistic species. Develop dedicated waste handling areas, fit for purpose and prevent the spread of waste.	N	-1	-1	-2	-1	-5
		Surface Water	Handling of Hazardous Waste within workshops, water containment facilities and general mine area could contaminate the dirty water storage areas. The water is then reused in the system and could have impacts on the integrity of the storm water system and also the production.	N	-3	-2	-2	-4	-11	CbA	Clean and dirty water separation systems should be incorporated in terms of the SWMP or any approved update thereafter. A detailed waste management strategy will be established and implemented, which will clearly demarcate the containments for different waste streams. Waste management training must be implemented on site. Clear signs informing staff of waste management practices must be implemented on site. Hazardous waste handling should only take place within bunded and/or lined areas.	N	-1	-1	-2	-2	-6

Name of Activity			Potential Impacts	Rating Prior to Measures							Mitigation Type	Rating Post Measures					
Activities	Project	Impact Area	Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	CbA, R, Ir	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM
											Hazardous waste should be removed by a licensed removal company and taken to a suitable and licensed landfill site. Clean spills, should spills occur, within 24 hours. Documentation of removal and safe disposal must be available on site. The mine will adopt a cradle-to grave approach to ensure that the waste is removed and disposed of in a legally compliant manner. Notify the relevant regulatory authorities in the event of the occurrence of a reportable incident. Weekly inspections of Storm Water Management Systems must be undertaken. Any blockages or maintenance requirements must be documented and an action plan developed.						
			Handling and Storing of Domestic Waste should have no impact on the surface water resources due to the location of the facility. However, incorrect disposal of waste could hamper the integrity of the storm water system.	N/A	-1	-2	-3	-3	-9	CbA	Clean and dirty water separation systems should be incorporated in terms of the SWMP or any approved update thereafter. Waste management training must be implemented on site. Weekly inspections of Storm Water Management Systems must be undertaken. Any blockages or maintenance requirements must be documented and an action plan developed. Clear signs informing staff of waste management practices must be implemented on site. Access control must be strictly enforced. Waste should be disposed of by licensed companies to licensed facilities. Recycling practices must be investigated and implemented on site.	N	-1	-1	-2	-1	-5
		Groundwater	Large scale hydrocarbon spills could be present at the mining area	N	-3	-1	-4	-4	-12	CbA	Clean and Dirty water separation systems should be incorporated in terms of the SWMP. No activities associated with hydrocarbons and/or chemicals may be undertaken outside of an effectively designed and contained area. All used oils must be removed from site by a licensed company and disposed of at a suitably licensed site. Any spills occurring during the collection process must be cleaned up immediately. Any significant spills must be captured in the incident reports and must be reported to the relevant department (LDEDET, CMA/DWS).	N	-2	-1	-2	-1	-6

Name of Activity			Potential Impacts	Rating Prior to Measures							Mitigation Type	Rating Post Measures					
Activities	Project	Impact Area	Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	CbA, R, Ir	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM
											All equipment and machinery should be kept in good working order. A clean up procedure (i.e. Works Instruction) must be in place. Clean spills, if spills occur, within 24 hours.						
			Handling of Hazardous Waste within workshops and general mine area.	N	-2	-2	-2	-4	-10	CbA	Clean and Dirty water separation systems should be incorporated in terms of the SWMP or any approved update thereafter. The workshop should be designed with the suitable waste containment measures (berms, sumps, oil separators). Waste management training must be implemented on site. Clear signs informing staff of waste management practices must be implemented on site. Hazardous waste handling should only take place within bunded and/or lined areas, with a capacity of at least 110% of the volume stored. Hazardous waste should be removed by a licensed removal company and taken to a suitable and licensed landfill site. Documentation of removal and safe disposal must be available on site.	N	-1	-1	-2	-2	-6
			Handling and Storing of Domestic Waste	N	-2	-2	-1	-2	-7	CbA	Clean and dirty water separation systems should be incorporated in terms of the SWMP or any approved update thereafter. Waste management training must be implemented on site. Clear signs informing staff of waste management practices must be implemented on site. All waste must be removed by licensed contractors and disposed of at a licensed landfill site. As a duty of care and the cradle to grave principles, the mine should regularly inspect disposal site to ensure that best practices are implemented. Recycling practices must be investigated and implemented on site where practical. Groundwater monitoring must be undertaken in such a manner as to ensure that any potential impacts from the landfill site can be detected.	N	-1	-1	-1	-2	-5
		Air Quality	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Heritage	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Name of Activity			Potential Impacts	Rating Prior to Measures							Mitigation Type	Rating Post Measures					
Activities	Project	Impact Area	Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	CbA, R, Ir	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM
		Noise	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Visual	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Social	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 25: Potential Impacts and the calculated significance before and after management measures – Decommissioning Phase

Name of Activity			Potential Impacts	Rating Prior to Measures							Mitigation Type	Rating Post Measures					
Activities	Project	Impact Area	Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	CbA, R, Ir	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM
Decommissioning Phase																	
Legal Requirements (Environmental Permits)	1, 2, 3	Legal Compliance	Unlawful activities could lead to NWA Directives and Section 24G Rectification fines.	N	-4	-3	-2	-5	-14	CbA	A legal assessment of all activities must be undertaken annually to ensure that all are licensed. A detailed closure plan must be developed and submitted to the relevant departments for approval. All legally appointed personnel responsible or involved in activities on site must receive training on the requirements of the Environmental Authorisations and EMPr's. Quarterly decommissioning must be undertaken, on the lawful implementation of the Environmental Authorisation. Environmental Authorisations and WUL must be available on site at all times. The legal register must be updated to indicate all updated activities.	P	4	3	5	5	17
Dismantling and decommissioning of the pipeline and ancillary infrastructure of the dams	1, 2, 3	Geology	No direct impact	-	-	-	-	-	-	-	-		-	-	-	-	-
		Topography	Removal of infrastructure may impact on the topography.	N	-2	-3	-4	-4	-13	R	Linear infrastructure constructed by the mine 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 the Integrated Development Plan (IDP) of the area and the local authorities. Ensure the entire site remains fenced for the duration of rehabilitation. Retain security access control to the site for the duration of rehabilitation. All fixed assets that can be profitably removed will be removed for salvage or resale (the salvage and resale	P	3	3	4	4	14

Name of Activity			Potential Impacts	Rating Prior to Measures							Mitigation Type	Rating Post Measures					
Activities	Project	Impact Area	Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	CbA, R, Ir	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM
											value have however not been incorporated into the closure cost estimate as per the legislative requirements).						
											All surface structures, infrastructure and 'hard surfaces' (*inter alia* redundant pump equipment, etc.) are to be demolished and removed from the disturbed mine footprint, unless an alternative/ continued use for any such items is agreed upon, in writing, with the DMR.						
											All surface infrastructure would be demolished and removed to a depth of at least 1m. Any infrastructure below 1m will be sealed, made safe and left *in situ*.						
											All fences erected around the infrastructure be dismantled and either disposed of at a permitted disposal site or sold off as scrap (provided that 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.						
											Water pollution control structures will remain until the completion of all demolition and associated rehabilitation activities where after these will be rehabilitated.						
		Soil, Land Use and Land Capability	Spills around decommissioning areas (hydrocarbons and paste) may result in the contamination of soils.	N	-1	-2	-4	-4	-11	CbA	Draw up a plan clearly defining the area where the removal of infrastructure should take place. Implement the plan with sufficient measures in place not to compact new areas.	N	-1	-2	-1	-1	-5
											All hazardous waste should be disposed of at licensed and fit-for-purpose areas and safe disposal records should be kept on file.						
											Any hydrocarbon, effluent or other contaminants should be collected and the soils remediated immediately.						
			Contamination of soils as a result of a lack of sanitary services	N	-1	-2	-4	-4	-11	CbA	Chemical toilets must be readily available to contractors. Licensed companies must be appointed to remove any contaminated material and or wastes to licensed landfill sites.	N	-1	-2	-1	-1	-5

Name of Activity			Potential Impacts	Rating Prior to Measures							Mitigation Type	Rating Post Measures					
Activities	Project	Impact Area	Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	CbA, R, Ir	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM
			Loss of soils due to decommissioning activities present on site.	N	-1	-2	-4	-4	-11	CbA	Draw up a plan clearly defining the area where the removal of infrastructure should take place. Implement the plan with sufficient measures in place not to compact new areas. Compacted soils adjacent to the infrastructure footprint can be lightly ripped to alleviate compaction where required. Implement a strict penalty fine system for rule breaking with regard to vehicular movement. Maintain clean and dirty water systems and undertake regular monitoring and maintenance thereof.	N	-1	-2	-1	-1	-5
		Ecology	The establishment of alien and invasive plant species.	N	-2	-3	-4	-4	-13	CbA	The Alien and Invasive Plant species eradication plan will be implemented continuously. If natural succession of vegetation is not established within one rainy season, after commencement of rehabilitation, the disturbed areas and areas adjacent to the infrastructural areas must be re-vegetated with an indigenous grass mix, if necessary, to re-establish a protective cover, to minimise soil erosion and dust emission.	N	-1	-1	-2	-1	-2
		Surface Water	Erosion control over rehabilitated areas and the prevention of erosion gullies.	N	-1	-1	-4	-2	-8	CbA	The topography of all disturbed areas must be shaped in such a manner that the surrounding natural area blends naturally with the rehabilitated areas well as to be free-draining. This will reduce soil erosion and improve natural re-vegetation.	N	-1	-1	-2	-2	-6
			Contamination of surface water as a result of removal of infrastructure.	N	-2	-2	-4	-3	-11	CbA	The detailed waste management strategy implemented during the construction and operation phases must be continuously implemented throughout the closure and decommissioning phase. Contaminated water from the water containment facilities should be reused in the plant system as long as possible and left to evaporate. No unlawful discharge of water will be allowed.	N	-1	-1	-2	-2	-6
			Rubble and waste from site could pollute runoff.	N	-1	-1	-4	-2	-8	CbA	All wastes required should be removed to licensed waste disposal facilities and by licensed companies.	N	-1	-1	-2	-2	-6
		Groundwater	Decommissioning and removal of facilities could	N	-2	-3	-2	-2	-9	CbA	No water may be discharged into watercourses, if this water has not been treated to the correct quality OR	P	2	3	4	5	14

Name of Activity			Potential Impacts	Rating Prior to Measures							Mitigation Type	Rating Post Measures					
Activities	Project	Impact Area	Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	CbA, R, Ir	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM
			lead to the infiltration of dirty water to groundwater resources.								if approval from the DWS for such activity has not been obtained. Once the dams are empty, any silt remaining in the dams should be disposed of on the Paste Disposal Facility and/or approved Mine Residue Facilities. The Return Water Dams should be demolished, and the liner and rubble should be classified to determine the type of landfill site suitable to cater for this material. Groundwater monitoring must continue up until closure is obtained.						
		Heritage	No direct impact	-	-	-	-	-	-	-	-		-	-	-	-	-
		Visual	Fugitive dust emissions as a result of infrastructure removal and associated exposed/bare areas may have an impact in terms of air quality and visual characteristics.	N	-2	-2	-4	-3	-11	CbA	The dust monitoring network and dust suppression programme established during the construction phase of the project will be maintained throughout the decommissioning/ closure phase of the mine. With respect to road dust levels, it is recommended to limit vehicle speeds, especially during high risk periods of high winds, high temperature and low humidity. Establish and implement a dust suppression plan in consultation with the Environmental Control Officer (ECO) and an air quality specialist as part of the contractor's responsibility.	N	-2	-1	-3	1	-5
		Air Quality	All activities associated with the removal of infrastructure and rehabilitation has the potential to release dust.	N	-2	-2	-4	1	-7	CbA	The dust monitoring network and dust suppression programme established during the construction phase of the project will be maintained throughout the closure phase of the mine. With respect to haul road dust levels, it is recommended to limit vehicle speeds, especially during high risk periods of high winds, high temperature and low humidity.	N	-2	-1	-3	1	-5
		Noise	All activities associated with the removal of infrastructure and rehabilitation has the potential to generate noise.	N	-2	-2	-4	1	-7	CbA	The removal of all infrastructure is to take place during daytime periods only. Where noise becomes a nuisance, management measures will be investigated and implemented to address these.	n	-2	-1	-3	1	-5
		Social	No direct impact, however communication is important.	N	-2	-2	-4	1	-7	-	Local residents, with the focus on the surrounding landowners, should receive accurate information	N	-2	-1	-3	1	-5

Name of Activity			Potential Impacts	Rating Prior to Measures							Mitigation Type	Rating Post Measures					
Activities	Project	Impact Area	Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	CbA, R, Ir	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM
											with regards to the project status, timeframes for decommissioning and other relevant information about issues that could influence their daily living and movement patterns.						
Earth Moving, shaping and ripping of ground	1, 2, 3	Geology	No direct impact	-	-	-	-	-	-	-	-		-	-	-	-	-
		Topography	The shaping of the site should be undertaken in such a manner that it improves the overall topography of the site.	P	1	3	4	5	13	R	Pre-mining topography should be reasonably restored through shaping and landscaping, such that the topography of rehabilitated areas will ultimately be commensurate with that of adjacent, non-disturbed areas. The final shaping should be viable to allow for final post mining land use. If possible ensure a continuation of the premining surface drainage pattern.	P	1	3	5	5	14
		Soils	Soil erosion	N	-6	-3	-4	-3	-16	CbA	Re-vegetate as soon as possible if self-succesion is not succesfull.	N	-2	-1	-3	1	-5
			Ripping and topsoil replacement will restore the soil physical characteristics prior to re-vegetation.	P	1	3	4	5	13	CbA	Compacted soils will be ripped and topsoil will be replaced if the latter is deemed necessary for effective vegetation. 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 mine will encourage self-succession of vegetation, if this does not take place effectively a re-vegetation project will be implemented.	P	1	3	5	5	14
		Terrestrial Ecology (Fauna & Flora)	The rehabilitation of the site will allow reestablishment of natural vegetation.	P	1	2	3	4	10	CbA	Compacted soils will be ripped and topsoil will be replaced if the latter is deemed necessary for effective vegetation. 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. The soil fertility status should be determined by soil chemical analysis after levelling and before seeding/re-vegetation if deemed applicable. On-going alien and invasive floral species control is required through all phases of rehabilitation. 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.		3	3	3	4	13

Name of Activity			Potential Impacts	Rating Prior to Measures							Mitigation Type	Rating Post Measures					
Activities	Project	Impact Area	Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	CbA, R, Ir	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM
		Wetland	No direct impact	-	-	-	-	-	-	-	Access to rehabilitated areas should be restricted to vehicles/ machinery specifically required for the implementation of the decommissioning/ closure plan.		-	-	-	-	-
		Surface Water	Runoff from rehabilitated areas will impact on watercourses especially during intensive rainstorms especially if the area are not free draining.	N	-2	-1	-3	1	-5	CbA	- The areas will be shaped to be free draining in line with the approved SWMP.	P	3	3	3	4	13
		Groundwater	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Heritage	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Visual	The rehabilitation (ripping, topsoil replacement and landscaping) will remove the visual incongruity.	P	2	4	4	1	11	CbA	An overall visual improvement will be noticed once all mining related infrastructure has been demolished and the area has been shaped and self-succession has occurred. Demarcate the decommissioning area and limit the decommissioning activities as far as possible. Final shaping will be implemented such that the final profile of the rehabilitated areas are formed to emulate natural contours of the area. Foundations will be removed to a depth of 0.5m below the surface and the area rehabilitated. All material recovered from the demolition of buildings and/or structures will either be transported to a permitted disposal site, or made available to the local community as building materials (provided they are in a satisfactory condition following demolition). Linear infrastructure constructed by the mine (i.e. pipelines) will be removed if it proves to inhibit land use at decommissioning.	P	2	4	4	3	13
		Air Quality	All activities associated with the removal of infrastructure	N	-2	-2	-4	1	-7	CbA	All fences erected around the mine will be dismantled and disposed of at a permitted disposal site. Dust sampling will be undertaken on a monthly basis.	N	-2	-1	-3	1	-5

Name of Activity	Project	Impact Area	Potential Impacts	Rating Prior to Measures							Mitigation Type	Rating Post Measures					
Activities			Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	CbA, R, Ir	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM
			has the potential to release dust.								Monthly monitoring reports will be generated by the mine or through a suitably qualified air quality specialist.						
		Noise	All activities associated with the removal of infrastructure and rehabilitation has the potential to generate noise.	N	-2	-1	-4	3	-4	CbA	In the event that air quality or dust issues are identified based on the monitoring programme, an independent specialist should be appointed to determine the best course of action to ameliorate the situation. The removal of all infrastructure is to take place during daytime periods only. Where noise becomes a nuisance, management measures will be investigated and implemented to address these. Machinery with low noise levels and maintained in a good order to be used and to comply with the International Finance Corporation's (IFC) Health and Safety Regulations. Speed control measures will be implemented by the mine through the placement of adequate signage. Implement a penalty system for non-compliance to speed control measures and ensure that all workers are made aware of the penalty systems.	N	-2	-1	-3	1	-5
		Social	No direct impact	-	-	-	-	-	-	-	Gravel roads to be maintained in as good and smooth a condition as possible.		-	-	-	-	-
Waste Management and decommissioning of hazardous (also fuels) substances	1, 2, 3	Geology	No direct impact	-	-	-	-	-	-	-	-		-	-	-	-	-
		Topography	No direct impact	-	-	-	-	-	-	-	-		-	-	-	-	-
		Soil, Land Use and Land Capability	Spills around the diesel storage areas and product stockpiles may result in the contamination of soils.	N	-1	-2	-4	-4	-11	CbA	Any hydrocarbon, effluent or other contaminants should be collected and the soils remediated immediately.	N	-1	-2	-1	-1	-5
			Handling of Building Rubble	N	-2	-2	-2	-3	-9	CbA	Documentation of removal and safe disposal must be available on site. All infrastructure will be removed and rehabilitated, should no alternative use be found for the structures. Foundations will be removed to a depth of 0.5m below surface.	N	-1	-1	-2	-2	-6
		Terrestrial Ecology	No direct impact	-	-	-	-	-	-	-	A contaminated land assessment should be undertaken at all areas where diesel was stored, as well as where fuel pipelines were placed.	-	-	-	-	-	-

Name of Activity			Potential Impacts	Rating Prior to Measures							Mitigation Type	Rating Post Measures					
Activities	Project	Impact Area	Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	CbA, R, Ir	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM
		(Fauna & Flora)															
		Wetland	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Groundwater	Handling or Hazardous Waste within workshops and general mine area.	N	-2	-2	-2	-4	-10	CbA	- Clean and dirty water separation systems should be incorporated in terms of the Geo Tail (Pty) Ltd water study recommendations or any approved update thereafter. Waste management training must be implemented on site. Clear signs informing staff of waste management practices must be implemented on site. Hazardous waste handling should only take place within bunded and/or lined areas. Hazardous waste should be removed by a licensed hazardous waste removal company and taken to a suitable and licensed landfill site.	N	-1	-1	-2	-2	-6
			Handling of Building Rubble	N	-2	-2	-2	-3	-9	CbA	Documentation of removal and safe disposal must be available on site. All infrastructure will be removed and rehabilitated, should no alternative use be found for the structures. Foundations will be removed to a depth of 0.5m below surface.	N	-1	-1	-2	-2	-6
			Handling and Storing of Domestic Waste	N	-3	-3	-3	-3	-12	CbA	All building rubble will follow the waste hierarchy and will therefore either be sold for reuse where possible and as a last option be disposed of at a licensed facility suitable for such waste in line with the NEM:WA. Clean and dirty water separation systems should be maintained. Waste management training must be implemented on site. Clear signs informing staff of waste management practices must be implemented on site. Groundwater monitoring must be undertaken in such a manner as to ensure that any potential impacts from the site can be detected. Recycling practices must be investigated and implemented on site.	N	-2	-3	-2	-2	-9

Name of Activity			Potential Impacts	Rating Prior to Measures							Mitigation Type	Rating Post Measures					
Activities	Project	Impact Area	Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	CbA, R, Ir	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM
		Surface Water	Handling of Hazardous Waste within workshops and general mine area could contaminate the dirty water storage areas. The water is then reused in the system and could have impacts on the integrity of the storm water system and also the production.	N	-3	-2	-2	-4	-11	CbA	Clean and dirty water separation systems should be maintained up until closure. Waste management training must be implemented on site. Clear signs informing staff of waste management practices must be implemented on site. Hazardous waste handling should only take place within bunded and/or lined areas. Hazardous waste and contaminated materials should be removed by a licensed hazardous waste removal company and taken to a suitable and licensed landfill site. Documentation of removal and safe disposal must be available on site.	N	-1	-1	-2	-2	-6
			Handling and Storing of Domestic Waste should have no impact on the surface water resources due to the location of the facility. However, incorrect disposal of waste could hamper the integrity of the storm water system.	N/A	-1	-2	-3	-3	-9	CbA	Weekly inspections of Storm Water Management systems must be undertaken. Any blockages or maintenance requirements must be documented and an action plan developed. Clean and dirty water separation systems should be maintained up until closure. Waste management training must be implemented on site. Weekly inspections of Storm Water Management systems must be undertaken. Any blockages or maintenance requirements must be documented and an action plan developed. Clear signs informing staff of waste management practices must be implemented on site. Recycling practices must be investigated and implemented on site. Building rubble must be disposed of in line with the requirements of the NEM:WA. Access control must be strictly enforced.	N	-1	-1	-2	-1	-5

Name of Activity			Potential Impacts	Rating Prior to Measures							Mitigation Type	Rating Post Measures					
Activities	Project	Impact Area	Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	CbA, R, Ir	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM
		Air Quality	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Heritage	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Visual	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Air Quality	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Noise	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Social	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-	-

1.j Summary of Specialist Reports

For the purposes of the environmental authorisation related to this application, numerous detailed specialist studies were undertaken. Please refer to Appendix 6 for these reports. The table below presents a concise snapshot of what the outcomes of these studies.

Table 26: Summary of findings from specialist studies undertaken

List of studies undertaken	Recommendations of specialist reports	Specialist recommendations that have been included in the EIA report	Reference to applicable section of report where specialist recommendations have been included.
Storm Water Management	The following recommendations were stipulated in the hydrological report: o Various evaporation reduction technologies are available and should be implemented on site;	All recommendations	Refer to Sections 1.d.ii.1; 1.d.ii.2; 1.d.ii.3.b; 1.g.iv.5.b; 1.g.iv.5.c; 1.d.ix; and Annexure 6.

List of studies undertaken	Recommendations of specialist reports	Specialist recommendations that have been included in the EIA report	Reference to applicable section of report where specialist recommendations have been included.
	• Implementation of additional water containment or increase to water containment facilities on the farm Parson: o The return capacity from the Parson Storm Water Dam should be increased to at least 100m³/hr., although a return capacity of 150m³/hr. to 200m³/hr. would provide greater operational flexibility in the medium to long term. o The return capacity from the Loadout Storm Water Dam should be increased to at least 30m³/hr. o Four excavations near the existing Gamagara Potable Water Tank 2 and 3 reservoirs can also provide suitable locations for additional water storage reservoirs. The excavations have already been made and limited earthworks would be required to utilize them as water storage facilities. They would require HDPE lining to prevent seepage losses and the use of evaporation protection is strongly recommended. o The process recovery dam appears to have a capacity of 90 000m³. Each thickener has a 45 000m³ capacity. Based on discussions with many staff, no more than 30 000m³ capacity will generally be required for thickener dumping. Up to 60 000m³ of storage can therefore be utilized for additional water storage. It is recommended that evaporation reduction infrastructure be employed on the Process Recovery Dam if it is to be used for long term water storage. • Implementation of additional water containment or increase to water containment facilities on the farm King: o The King Braithwaite tank must be replaced or repaired. o The pipeline that returns water to the Parson Plant must have a capacity of 1 200m³/hr., although 1 500m³/hr. is ideal. o Process water may not be stored in the King Paste Disposal Facility return water dams. A separate water storage facility must be constructed to serve this purpose. • The King PDF return water system should be split into two dedicated systems o Upgrade of Storm Water Management Measures on site: o All waste rock dumps must be designed to comply with the mine's water use licence and o GN 704. This will required new designs for many, if not all of Khumani's waste rock dumps. o At Bruce, the storm water channels that route storm water to the PCD should be concrete-lined to comply with the mine's water use licence. Alternatively, the licence conditions should be changed to allow for the current lining to remain in place. If the water quality parameter of concern is suspended solids, then a brick-lined channel will not result in ground water pollution. o Storm water controls must be put in place around the discard dump at the loadout area. These can be earth walled paddocks as per the original design intent.	have been included into this report. The only not included is the additional paddocks implemented around the Discard Dump, as such paddocks are already in place (see Photo 1).	
Hydrogeological Impact Prediction	• Water Levels o Presently Khumani mine does not intersect the water table at its various operations and as such does not require any dewatering. In addition, to date, all water supplied to the mine is via the Sedibeng network and hence groundwater has not to date been relied upon. o Khumani Mine monitored two boreholes on the farm Parson. These boreholes are located on the western side of the dolerite dyke which has been previously identified to act as a boundary to the SIOM groundwater compartment. Water levels at PBW1 and PBW4 have been monitored on a monthly basis from 2010 to present. The recent water levels in these boreholes are approximately 7.5 and 12.6 mbgl respectively. o The water levels in these boreholes are shown to fluctuate with seasonal recharge events and have, in particular, shown a substantial water level rise following high rainfall and associated recharge in December 2016/January 2017. The most recent water levels at these boreholes are shallower than those measured in 2010, which indicates that these are not significantly impacted upon by surrounding dewatering. o King monitoring boreholes are located on the lava and are proximal to the dyke which is inferred to behave as compartment boundary limiting drawdown in water levels beyond the dyke. The trendlines for these boreholes	Impacts have been determined to be negligible and no additional management measures have been recomende by the specisliat. The EAP has recommended ongoing waste classification in terms of the	Refer to Sections 1.h.i and 1.i.

List of studies undertaken	Recommendations of specialist reports	Specialist recommendations that have been included in the EIA report	Reference to applicable section of report where specialist recommendations have been included.
	shows a declining trend which is inferred to indicate the effects of surrounding dewatering practices. However, the effects of surrounding dewatering at these boreholes is not yet greater than the effects of recharge and consequently seasonal fluctuation is apparent. The KMON1 and KMON2 boreholes are located on the Northern part of the King Farm King in close proximity to the Paste Dam and the KMO2 pit respectively. Both boreholes show a decreasing trend throughout the monitoring period as a consequence of dewatering from the surrounding environment. • Water Quality o Parsons farm is not dewatered due to the a regionally extensive dyke which traverses King. Consequently, potential contamination of the shallow aquifer is required to be monitored. East of the Dyke on King and Bruce, the shallow aquifers are dewatered and monitoring of the upper aquifer is irrelevant. o The baseline was established at PBE01, BKM3D, PBW01 and PBW04 in 2007.With exception of PBE01, It is evident from the baseline that water quality at the sampling points typically has a low salt load and is representative of unimpacted groundwater. The salt loads and the macro chemistry of the PBE01 varies from the other sites monitored. While all other boreholes represent the Ongeluk lava, PBE-01 is drilled into outcropping diamictite of the Makganyene formation which may explain the markedly different macro chemistry at this site. Based on the study, it is inferred that there have been no significant changes to the characteristics of groundwater chemistry in proximity of the monitoring boreholes during the operational phase. • Impact Prediction o Inflows to the Bruce Pit Area is projected to begin in 2034. Based on the calibrated aquifer parameters, the inflows are expected to gradually increase to approximately 74 l/s (6400 m3/d) by 2039; o Inflows into the King Pits are expected to begin in 2024. The pit cross cuts a north south structure which appears to create a step in water levels in the pit area, inflows are expected to initiate in the western pit area. The inflows to King Pit are expected to gradually increase and are to peak at approximately 114 l/s. o Limited drawdown is expected beyond the compartment boundaries delineated by dykes. No water users beyond the catchment area are expected to become impacted during the operational period as a consequence of mine dewatering. o As part of a 2014 study undertaken by Geo Pollution Technologies (GPT REF: KHU-12-319), the onsite waste was characterised, and the contamination potential was assessed. As part of this investigation a leach test was undertaken on a paste sample and water associated with the Paste facility was sampled and assessed. It was found that material is considered unlikely to generate contamination under the natural geochemical conditions in the paste facility. The sampled paste water does not indicate any contamination potential in terms of the constituents analysed. The source terms associated with the stockpiles and waste rock dumps are not characterised but are assumed to have similar characteristics to that of the paste facility. o The water levels beneath the various waste facilities are summarised below: ▪ Overburden dump: Water levels beneath the overburden are approximately 150 mbgl and expected to increase even deeper by LoM. ▪ Paste Facility & Waste Rock Dump KM02: Water levels in vicinity of the past facility are currently over 120 mbgl. ▪ Dump H& J and waste rock dump KM12: Water levels on the farm king below these facilities exceeds 120 m. ▪ Stockpile on Parsons: the depth to groundwater beneath the existing stockpile on Parsons is in the order of 4 -6 mbgl. o It is evident from the summary above, the seepage from the facilities on the farms Bruce and King would need to travel over a 100m through the unsaturated zone before entering the groundwater system.	NEM:WA, update of the numerical groundwater model as per the WUL and ongoing groundwater monitoring.	

List of studies undertaken	Recommendations of specialist reports	Specialist recommendations that have been included in the EIA report	Reference to applicable section of report where specialist recommendations have been included.
	○ Post closure seepage from mining infrastructure will be contained within the compartment for up to 300 years as the water levels rebound. Only after rebound will seepage from Waste rock and the Paste facility migrate toward surface water receptors such as the Gamagara River. The seepage quality is not however expected to have any constituents of concern which exceed drinking water quality guidelines and consequently the post closure impact resulting from seepage are considered to be negligible.		

1.k Environmental Impact Statement

1.k.i Summary of the key findings of the EIA

In 2007, Khumani was granted a mining right and mine construction began shortly thereafter. Production at the mine started in 2008. Khumani has the capacity to mine approximately 16 million tons of iron ore per annum, which is mined from a series of opencast pits by conventional mining methods such as drilling, blasting and loading into trucks for haulage to the crushers. To date no dewatering has been required from Khumani mine to ensure safe mining conditions. Water supply for processing has been supplied by Sedibeng Water Board via the Vaal/ Gamagara Pipeline.

Khumani currently has an approved WUL (Reference 10/D41J/BC1J/2122 dated 16 March 2013). In addition, the mine has another WUL (Reference 719242, dated 27 November 2008), which was repealed by the 2013 WUL. Both of these WULs allow the mine to abstract groundwater for safe mining conditions (Section 21(j) water use - abstraction of water at 432 000m^3/annum for safe mining purposes) once the mine intercepts groundwater through its opencast pit operations. Current studies foresee these activities to be required from 2035.

In 2015 water supply shortages were experienced at the mine and an augmentation project was initiated in consultation with the DWS, Kimberley, to site, drill and test boreholes suitable for supplying the water requirements of the mine in periods when the Sedibeng Water Supply Scheme cannot meet the requirement. The lack of water supply during the October to January period every year results in significant production losses with the processing plant coming to a halt.

For this reason, the mine is investigating the implementation of four boreholes on Portion RE of the farm Bruce, located within the mining area. It is the intention of the mine to abstract a combined volume of approximately 456 192m^3 (at 44l/s) of groundwater from these boreholes during the four (4) month period. During the consultation phase with stakeholders in 2017, the stakeholders voiced concern regarding further water abstraction in the catchment. The mine therefore committed to undertake further water studies to first identify measures to optimise water internally.

The activities applied for in terms of this application (specifically the new activities: Return Water Dam 3, Water Containment Facility, two new pipelines) is considered to optimise the internal water flow within the mining circuit. If this project is not approved, the mine will continue to experience shortage of water supply during certain times of the year, and lose the opportunity to implement sound Water Conservation and Demand Management Practices.

The new activities being applied for will be located in existing disturbed or cleared areas, where ancillary infrastructure is present. The Return Water Dam 3 will be located in the Paste Disposal Facility footprint area, and the pipelines will follow an existing linear corridor.

The activities relating to the WUL Amendment are approved activities in terms of Environmental Authorisations and therefore No Go conditions are not relevant.

According to the assessment carried out by the EAP the majority of the impacts can be reduced to a medium to low significance with the appropriate mitigation measures in place. This is specifically due to the fact that the mine has committed to the incorporation of the specialist recommendations into their water management system.

The overall project as presented in this report is therefore presented with the view of improving water management and reducing water usage on site by improving water circulation.

The following mitigation measures are crucial and should form part of the Environmental Authorisation to ensure that the applicant manages impacts adequately:

- The laydown areas will only be placed in areas which are demarcated for permanent activity or existing disturbed areas to ensure that no additional areas are disturbed.
- It must be ensured that all design drawings include effective erosion control measures;
- The mine must adhere to the proposed Storm Water Management Plan in Annexure 6.
- It must be ensure that training on the EIA and EMPr, as well as the WUL and the final decision by the DMR is given to all contractors and employees directly involved in the planning, construction and operation of the projects in question;
- Adhere to all management measures and actions presented in this report;

- No activities which require WULs or approval from the DWS may commence without the necessary authorisations; and
- Ongoing monitoring of geological structures (dolomite specific) must be undertaken within the Paste Disposal Facility and associated infrastructure area. This must be combined by annual reports on structural stability undersigned by the mine geologist and appointed engineer managing the Paste Disposal Facility.

Below, please find a summary of the key findings pertaining to the environmental authorisation application based on the outcomes of the specialist investigations:

1.k.i.1 Other Licence Requirements

Khumani has a WUL in place, however an updated Water Use Licence Application (WULA) has not yet been submitted. A WULA will be submitted prior to the commencement of the proposed project. No activities will be undertaken without the necessary approvals.

The WULA will be an update of the overall mine WUL to correct all changes and administrative errors. For this project, the following activities may trigger water uses as indicated:

- Section 21(b) for the storage of water;
- Section 2(c) & (i) for water uses which have been approved in terms of the Permit 21/2016 (such as Bruce Low Grade ROM Stockpile expansion and the Parson Discard Dump expansion);
- GN 704 exemption for the approved backfilling of opencast pits, but also for the use of waste rock in the construction of safety berms, surfaces and embankments, as well as the storage of storm water and process water in the Process Water Dams (such as on Parson);
- Section 21(g) for the construction of the Return Water Dam 3, additional Buffer Dam, King Water Containment Facility and various water uses previously not included in the WUL (such as sewage treatment facilities below NEMA thresholds).

1.k.i.2 Project Specific Statements

1.k.i.2.a Project 1: Construction of Return Water Dam 3 and the Water Containment Facility on King

Alternatives:

Increasing the capacity of the existing Return Water Dam 1 was considered. The operation received an updated WUL (Reference 10/D41J/BC1J/2122) for Section 21(a), Section 21(c) & (i), Section 21(g) and Section 21(j) water uses on 16 March 2013. One of the activities approved in the 2013 WUL, is the Paste Disposal Decant Dam (i.e. Surge Dam/ Return Water Dam 2). This activity is approved as the Decant Dam (Activity 8 on page 18 of the WUL).

The current capacity of the facility is 49 000m³ (approved at 1 152 094m³/a disposal). The initial intention of the mine was to expand the capacity of this dam. The expansion would have resulted in an increase in the capacity of the facility to about 180 000m³. The concern was the large storage capacity in one facility close to the Paste Disposal Facility. The mine therefore initiated the investigation of optimising pumping capacities to and from the Paste Disposal Facility and as a result identified the opportunity to construct a smaller facility up gradient of the Return Water Dam 2, which will aid in the water storage management around the Paste Disposal Facility. For this reason the development of Return Water Dam 3 was considered as a more suitable alternative based on the management of the facilities (water volume storage) and the pumping of water between facilities, as well as safety considerations on the facility.

As mentioned before, Khumani has been operational since 2007. The mine has been investigating measures to optimise water management on site due to the fact that groundwater resources are mostly dewatered in the operational areas of the mine as a result of surrounding mining activities. Water supply is purchased at high costs from the Sedibeng Water Supply Scheme via the Vaal/ Gamagara Pipeline, which is the main source of water supply to not only the mine, but also the surrounding towns, farmers and communities.

As a result, the mine has identified various projects to aid in optimising the internal water circuit, which relates to the proposed Return Water Dam 3 and new pipeline infrastructure.

In terms of the King Water Containment Facility, the design considered the design considered was either a civil constructed dam or a concrete tank. The final outcome is the construction of a concrete tank, which will allow for proper water management and a reduction in evaporation.

The only alternative to consider would be to operate in terms of the status quo, which presents water constraints during four months of the year (October to January) when the Sedibeng water supply is not consistent, or to apply for the use of groundwater, which has raised concerns during initial consultation processes in 2017.

1.k.i.2.b Project 2: Pipelines

Alternatives:

No alternatives are applicable as the pipelines are designed in line with the current infrastructure design successfully utilised on site and according to the required throughput capacities identified as part of the hydrological study.

1.k.i.2.c Project 3: Update of the WUL 2013

Alternatives:

No alternatives are applicable, as the activities in question are already established, and/or approved in terms of Environmental Authorisations. No technological alternatives are relevant to the three projects, with the exception of evaporation control measures in the determination of storage capacities on site.

As mentioned before, the mine experiences periods of water shortages from October to January, which result in plant stoppages and economic losses. The proposed solution to reduce plant stoppages due to water shortages involves increasing the capacity of Sedibeng or process water stored on the mine. Extra storage on the mine will insulate the Parson Plant from unstable Sedibeng water supply and King returns. The current storage volumes have been shown to be inadequate and result in approximately 10% lost production hours.

At current production targets, this loss can be made up by various methods to allow for production targets to still be met.

Two sets of abstractions were analysed – a high abstraction peaking at 480m³/day (20m³/hr) during the typical high flow months, and a low abstraction peaking at 360m³/day (15m³/hr) during the typical high flow months.

In addition to the two abstraction scenarios, the effect of evaporation reduction on the additional water storage reservoir was analysed. It is assumed that no evaporation protection is added to other water reservoirs on the mine. The effect of a 70% evaporation reduction and no evaporation reduction was analysed. Evaporation reduction methods are described in Section 1.g.iv.5.b of this report.

1.k.i.3 Impacts and Management Measures

The key impacts and management measures for the activities in question are:

Main Impacts Identified:

- Unlawful or incorrect construction of the Water Management infrastructure
- The area where the Return Water Dam 3 is planned is characterised by underlying dolomites. The mine is continuously monitoring movement of strata in this area.
- The Return Water Dam 3 and other water management activities or facilities are planned in terms of overall water management on site. The construction activities should have no impact on the Socio-Economic Setting in which the mine is located.
- Release of Contaminated Water into the environment is unlikely as the water facilities (current and new) are located within the overall dirty water system. The changes to water management due to the construction of the facility (Return Water Dam 3) could however impact on the integrity of the existing system.
- The establishment of alien and invasive plant species.
- Damage to the existing liners or incorrect upgrades (not in line with approved designs) of the facilities lead to groundwater pollution.
- Construction activities and material movement may temporarily result in dust dispersion.
- The activities are located within the mining boundary, in proximity to the current Parson and Bruce Plants. An increase in construction activities around existing water containment structures, could lead to an increase in noise levels in the area.
- The unmanaged disposal of waste, could result in the spread of invader species, as well as the influx of opportunistic species.
- Contamination of soils as a result of a lack of sanitary services.

- No further impact is foreseen as the area where the pipelines are planned are located within the existing buffer in which pipelines are located to and from the Paste Disposal Facility. However the construction phase may involve the use of hydrocarbons in the establishment of the pipeline structures. Vehicle movement in the area could also lead to soil contamination if not well managed. The presence of people in this area could lead to an increase in littering.

Main Management Measures:

- A legal assessment of all activities and future planned activities must be undertaken annually to ensure that all activities are authorised.
- All legally appointed personnel responsible or involved in water use activities and activities associated with the Environmental Authorisations on site must receive training on the requirements of the Environmental Authorisations and relevant Environmental Legislation.
- Early consultation must be undertaken with the South African National Roads Agency Limited (SANRAL) to determine whether there are any specific requirements in the establishment of the additional pipeline within the existing culvert under the N14.
- The Standard Operating Practices (SOP) and/or Contactors SOP for the establishment of the pipeline within the road reserve must be compiled.
- A Code of Practice (COP) must be developed during the construction phase for the operation of the water storage facilities and all existing, approved mine residue facilities in line with the overall water conservation and management requirements as identified in the 2018 Water Studies by Geo Tail (Pty) Ltd or subsequent approved amendments thereto.
- An Emergency Preparedness Plan must be developed for any incident which may occur around the Paste Disposal Facility which may impact the integrity of the Facility itself, as well as the existing Return Water Dams.
- Quarterly internal audits on the lawful implementation of the Environmental Authorisation must be undertaken during the construction phase, where after biannual audits can be undertaken once construction has been completed.
- A copy of the WUL must be available on site at all times for all Section 21 water uses.
- No development activities may take place within the 1:100 year flood line of the Gamagara River.
- The Return Water Dam 3 footprint must be clearly demarcated.
- The Return Water Dam 3 must be constructed in terms of detailed designs signed off by a Registered Engineer and the on-site Geologist.The approved design drawings must be available on site at all times.
- A suitably qualified engineer must be appointed to construct and/or oversee the construction of the Return Water Dam 3 and any other water containment facilities as stipulated in the EMPr.
- A COP must be developed during the construction phase for the operation of the Return Water Dam 3.
- As built drawings must be submitted to the DWS and DMR upon completion of the facility.
- All WUL requirements must be adhered to in terms of the construction of the Return Water Dam 3.
- The upgrades and amendment to the approved water uses must be undertaken in terms of detailed designs signed off by a Registered Engineer.
- The King Water Containment Facility will be constructed as a tank system and not an excavated dam.
- Ongoing monitoring of movement around the Paste Disposal Facility must continue.
- The Return Water Dam 3 must be constructed in terms of detailed designs signed off by a Registered Engineer and the on-site Geologist.
- An effective liner system should be implemented to ensure that no seepage from the facility occurs.
- Underdrainage systems must be in place to monitor the presence of seep.
- Evaporation controls should be implemented on the existing Process Water Dam at theBeneficiation Plant and the Buffer Return Water Dams.
- Chemical toilets must be readily available to employees where permanent infrastructure is not available.
- Licensed companies must be appointed to remove any contaminated material and or wastes to licensed landfill sites.
- An alien and invasive plant species eradication programme must be developed and implemented to eradicate alien and invasive plants and to prevent new invasions during the ongoing mining operation.
- In terms of revegetation, if natural succession of vegetation is not established within one rainy season after commencement of rehabilitation, the disturbed areas and areas adjacent to the infrastructural areas must be re-vegetated with an indigenous grass mix, if necessary, to re-establish a protective cover and to minimise soil erosion and dust emission.

- In the event that new areas, previously not altered due to mining activities, are impacted by the proposed projects, an ecological walk-over study must be undertaken to determine whether any protected or sensitive species are present. If such species are present, the required permits must be obtained.
- Dedicated waste handling areas must be developed and the spread of waste and access to rodents and opportunistic species prevented.
- Clean and dirty water separation systems should be upgraded in terms of the Water Studies undertaken by Geo Tail (Pty) Ltd.
- Measures should be implemented during the construction phase to ensure that excess silt is contained and not released into the water management area and thereby hampering its GN 704 compliance in terms of capacity and freeboard.
- Maintenance of all Storm Water Management systems must be undertaken regularly on site.
- Groundwater monitoring must continue in line with the requirements of the approved WUL.
- The current air quality monitoring stations that determine fallout must be maintained and respirable dust (PM10) monitoring that could arise from the mining activities must be maintained.
- Implement dust suppression in and around the construction area where required.
- Vehicles and machinery must be regularly maintained. Maintenance programmes will be established and implemented.
- Storage of fuels and oils, the refuelling of vehicles and equipment maintenance must be limited to designated, bunded areas (bunds to be 110% of volume of the materials stored).
- Chemicals and hazardous material must be stored in suitable containers, fit for purpose and in line with Safety Data Sheet (SDS) requirements.

1.k.ii Final Site Map

Key aspects of the specialist studies were considered in the finalisation of the final site map, i.e. based on the recommendations of the hydrologist and engineer developing the Paste Disposal Facility. The final site map for the new activities are presented in the following figure.

For the new water uses please refer to the following figures:

- Figure 12 to Figure 15.

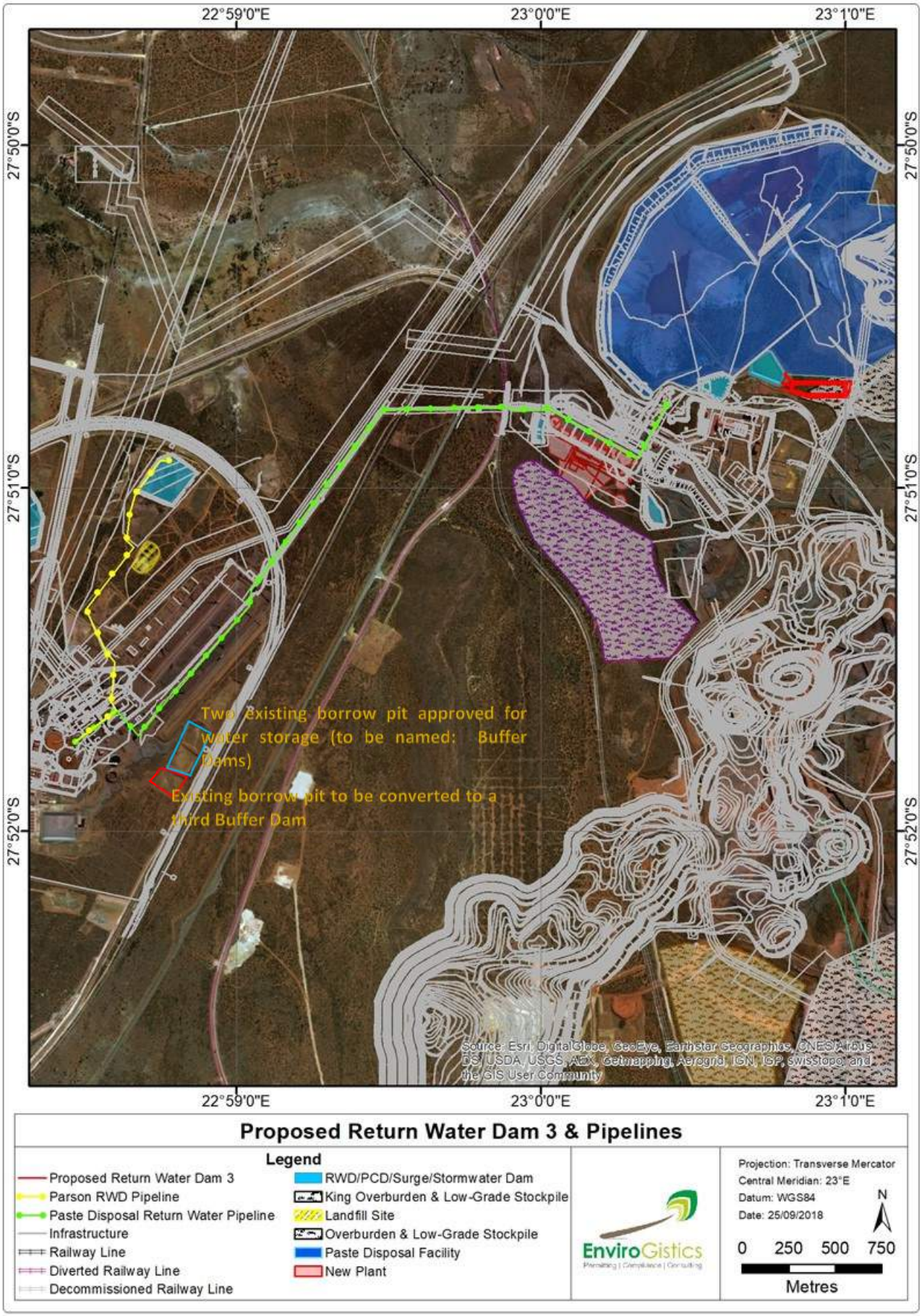


Figure 31: Final Site Map

1.k.iii Summary of the Positive and Negative implication and risk of the proposed activity and identified alternatives

The proposed projects as part of this application are situated on the existing Khumani Mining Right Area. Mining activities have been present in this area since the 2009.

The mine has been investigating measures to optimise water management on site due to the fact that groundwater resources are mostly dewatered in the operational areas of the mine as a result of surrounding mining activities and water supply is purchased at high costs from the Sedibeng Water Supply Scheme, which is the main source of water supply to not only the mine, but also the surrounding towns, farmers and communities.

The following key positive impacts are foreseen:

- The operation of the mine due to a lawful construction of the activities will allow the mine to operate within the legal realm of the Environmental Legislation;
- The construction of Return Water Dam 3 will ensure that water can be optimally stored in the area and pumped to the Beneficiation Plant;
- It is pertinent for the mine to ensure that there is sufficient infrastructure on site to optimise water reuse within the process water circuit, as well as to allow for buffer storage capacity in periods where the Sedibeng Water Supply Scheme is not operational or supply lower volumes of water; and
- The location of the facilities will not require the removal of vegetation as it is contained within already disturbed footprint areas. Limited clearance may be required for the King Water Containment Facility depending on its final location, this will however be less than 1ha in area.

The key potential negative impacts which may/ will arise and for which management measures have been recommended are:

- Construction activities may lead to an increase in dust emissions if not managed;
- By not maintaining the dams and pipelines spills can occur, which could lead to soil erosion and a loss of water; and
- By not maintaining the areas around the facilities, alien and invasive plant species can established.

<u>Planning Phase</u>

During the Planning phase, no specific impacts will take place directly, however, poor planning during this phase, could result in significant project delays. This could be due to environmental authorisations and other permits not being in place.

<u>Construction Phase</u>

Legal Compliance

Although unlikely, the impact could arise in terms of legal compliance should the WUL be delayed and the Return Water Dam be constructed without approved WUL or designs.

Geology and Stability

The area where the Return Water Dam 3 is planned is characterised by underlying dolomites. The mine is continuously monitoring movement of strata in this area. Should detailed geotechnical studies not be undertaken and a full knowledge of the underlying strata not be known, a risk to the stability of the underlying dam structure could be present. The incorrect design principles and liner design could further contribute to this potential risk should seepage from the facility occur.

Topography and Soils

The construction of infrastructure and stockpiles will not significantly alter the topography as the infrastructure is located on areas already levelled for mining activities.

The area where vegetation has established during the past years since initial construction may become more vulnerable to erosion once the vegetation is cleared for construction activities, and the soils will inevitably be exposed to wind and some surface runoff during intensive rainfall events.

The topsoil that is stripped and piled on surrounding areas can be eroded by wind and rain. The soil may be carried away during runoff if not protected. The cleared areas will be rehabilitated as part of ongoing rehabilitation, but full restoration of soils might only occur over a number of years, subsequent to the re-establishment of vegetation.

Furthermore, improper stockpiling and soil compaction can result in soil sterilisation. Leaching can also occur, resulting in the loss of nutrients.

There is also a possibility that equipment might leak oil, thus causing surface spillages. The hydrocarbon soil contamination will render the soil useless unless it is remediated. The storage of fuels on site might have an impact on soil if the tanks that are available on site are not properly monitored and maintained to avoid leakages. There is the potential that contaminated soil can be carried through runoff to contaminate water resources and soil may be stockpiled for rehabilitation without the necessary storm water management systems in place. Soil pollution is therefore possible, but through mitigation it can be minimised or avoided.

The proposed mining and related infrastructure are not anticipated to result in a significant loss of agricultural land capability since the majority of the soils where mining-associated infrastructure is to occur are significantly disturbed and shallow and not suitable for agricultural production. These soils are therefore not considered to contribute to the provincial and national agricultural production grid.

Ecology (Flora)

The additional activities on site, may further contribute to the establishment of alien and invader species if not well managed.

Surface Water

The release of contaminated water into the environment is unlikely as the Return Water Dam 3 is located within the overall dirty water system. The changes to water management due to the construction of the facility could however impact on the integrity of the existing system if not well managed.

Groundwater

- Damage to existing structures

Damage to the existing liners and underdrains associated with the existing Return Water Dams around the Paste Disposal Facility may lead to groundwater pollution and stability impacts. For this reason the facilities should be constructed under the supervision of a registered engineer.

- Oil and diesel spills

Uncontained and unmanaged oil and diesel spills associated with infrastructure development may result in contamination of the underlying aquifers if not well managed.

All oil and diesel storage and dispensing areas must be placed in adequately contained facilities to prevent spills. Any spills that may occur must be cleaned immediately to avoid groundwater contamination.

If the oil and diesel storage areas are sufficiently contained, the impact on groundwater will not be significant. Any impacts that may arise will be small (local) in extent and the impacts will be of short duration while the spills are cleaned up.

Heritage

Heritage sites are fixed features in the environment, occurring within specific spatial confines. Large portions of the project area are characterised by existing mining operations, no archaeological sites of significance were recorded during the previous heritage surveys undertaken for the mine.

Air Quality

Construction activities and material movement may temporarily result in dust dispersion.

<u>Operational Phase</u>

During the operational phase, the invasive activities would have been completed. The purpose of the projects proposed are to improved water management on site. However, with the operation of water containment dams and pipelines, measures are required to ensure that impacts are not encountered. Impacts could include:

- The implementation of the projects and the management of the structural integrity and water circulation could have a cumulative positive impact in terms of the mines water requirements and reuse practices. This could result in a lesser dependency on the Sedibeng Water Supply Scheme and the possibility for shut downs during times when water from the Scheme is not available, thereby further contributing to the avoidance of potential economic losses;

- Unmanaged levels of water containment facilities and therefore overflows which could lead to erosion and loss of water, as well as the siltation of the existing water containment facilities. Unmanaged structural integrity by not undertaking GN 704 audits and engineering assessments. Damage to the existing liners and underdrains associated with the existing Return Water Dams around the Paste Disposal Facility may lead to groundwater pollution and stability impacts. For this reason the facilities should be constructed under the supervision of a registered engineer.
- Unmanaged pipelines which could result in leaks and spills.
- Establishment of alien and invader species.

Decommissioning

The decommissioning activities are similar to what can be expected in the construction of the sites. However even with extensive mitigation, latent impacts on the receiving environment are deemed highly likely, specifically in terms of the ecological impacts should self-succession not take place and erosion is present.

As part of the proposed projects, various potential impacts have been identified in Table 35 to Table 38.

Based on the outcomes of the specialist studies, and the incorporation of the management measures, the initial site layout has been amended to include all water management requirements. No fatal flaws have been triggered by the proposed activities. The site layout is based on the requirements of the Paste Disposal Facility Engineer and the appointed Hydrologist to optimise water management and use on site.

1.l Proposed Impact Management Objectives and the Impact Management Outcomes for inclusion in the EMPr

The following objectives must be aimed upon in order to achieve the impact management outcomes:

Planning Phase

The following aspects with its associated objectives have been considered during the planning phase:

- Legal Planning
  - To operate within the enviro-legal ambits of South Africa; and
  - To be aware of the latest environmental legal requirements.
- Integrated Mine Development Planning
  - Comply with the DWS Best Practice Guidelines;
  - Comply with the requirements of the approved EMPr and Environmental Authorisation;
  - Ensure that all relevant departments (Geology, Production, Engineering and Safety, Health, Environment and Quality (SHEQ)) are aware of the conditions and requirements of the EMPr and Environmental Authorisation; and
  - Ensure that a communication forum and integrated meetings are in place between the above-mentioned departments, to ensure that environmental requirements are identified proactively to ensure optimal, timeous and lawful mining activities can be undertaken.
- Stakeholder Consultation and Economic Development:
  - Ensure that the activities of surrounding mines are not negatively impacted upon as a result of the proposed projects.

Construction Phase:

- Only commence with construction when all required environmental and water permits/ licences and other Environmental Authorisations have been obtained.
- Reduce site clearance activities as far as practically possible;
- Comply with the DWS Best Practice Guidelines;
- Remain within the ambits of the approved mining layout and activity description of the approved EMPr and Environmental Authorisation;
- Comply with the requirements of the approved EMPr and Environmental Authorisation;
- Ensure that all relevant departments (Geology, Production, Engineering and SHEQ) are aware of the conditions and requirements of the EMPr and Environmental Authorisation;
- Ensure that all relevant departments are aware of the enviro-legal requirements pertaining to mining operations to ensure prudent mine planning;

- Ensure that a communication forum and integrated meetings are in place between the above-mentioned departments, to ensure that environmental requirements are identified proactively to ensure optimal, timeous and lawful mining activities can be undertaken;
- Ongoing optimisation of Water Demand and Conservation on site;
- Maintain and open and transparent relationship with the regulatory authorities;
- Prohibit unauthorised access to site and/or designated mining area without the necessary induction; and
- Induction to be updated and in line with all enviro-legal regulatory requirements.

Operational Phase

- Operation of all mining infrastructure and activities
- Environmental Objectives
    - 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;
    - Annual Rehabilitation Plans will be developed and implemented on site;
    - Remain within the ambits of the approved mining layout and activity description of the approved EMPr and Environmental Authorisation;
    - Operate facilities towards and/or within a practical design with closure in mind;
    - Operate the water management circuit on site to increase efficiency and reduce the need for maintenance of these facilities;
    - Soils and land capability:
        - Protect soil resources and surrounding land capability; and
        - Limit the occurrence of erosion on site.
    - Ecology:
        - Limit the presence of alien and invasive species on site;
        - Limit the impact of the facilities on the ecological setting of the area; and
        - Limit access of fauna and avifauna to the area.
    - Protect soil resources and surrounding land capability;
- Hydrocarbon Management
    - Ensure that vehicles are maintained and in good working condition;
    - Ensure that workshops are designed to accommodate the maintenance and servicing of mine vehicles within contained footprints;
    - Ensure that the mine operates within a defined clean and dirty water system;
    - Ensure that the necessary oil separation system and catchment areas are in place and maintained;
    - Ensure that all hydrocarbons are stored in a manner which will prevent any harm to the environment;
    - Prevent spillages of hydrocarbons;
    - Capture, contain and manage any spillage;
    - Rnsure that any area which has been affected by a hydrocarbon spill is suitably rehabilitated and monitored until rehabilitation efforts have been successful; and
    - Protect the groundwater resources to ensure that limited to no impact on groundwater resources occur as a result of the mining operations.
- Handing and Storing of Waste
    - The hierarchy of waste management should be implemented on site, in line with the NEM:WA;
    - Ensure that storage takes place in such a manner as not to cause any pollution to the environment;
    - All wastes (hazardous and domestic) to be disposed of at licensed facilities;
    - The cradle to grave principle must be implemented;
    - No hazardous waste (including Mine Residue Stockpiles as defined as such) may be removed from site, without the necessary approval from the regulatory authorities;
    - Ensure that temporary storage facilities comply with best practice guidelines;
    - Prevent any pollution of water resources by ensuring that an effective surface runoff control system is in place;
    - Prevent, contain and clean up any spillages; and
    - Ensure that all facilities are monitored and maintained on a regular basis.
- Ongoing Research
    - The NEMA Regulations promulgated to regulate the Financial Provision has resulted in mining operations having to reconsider the implementation of ongoing rehabilitation into the

operational plans of the mine. Ongoing research into rehabilitation at the Mine will involve the following:

- Undertaking of an Impact Prediction Model as part of the Groundwater model to determine any changes in the 2006 EMPr assessments in terms of the impact of Mine Residue Facilities on the groundwater resources, if any;
- Strategic plan on how the mine can more efficiently mine resources optimally by ongoing exploration activities.
- Development of a Water Conservation and Demand Management Plan and the annual update thereof.
- To be transparent and practise effective communication; in order to maintain good relationships with all interested and affected parties

Rehabilitation objectives:

The proposed final land use would be to return the area to near pre-mining conditions, where residual impacts will be minimised and the area is left with no safety threat to humans or animals. This would include demolishing surface infrastructure that will not be handed over to a third party and promoting the growth of vegetation. It is evident that the re-establishment of this vegetation biome on site will not be difficult as areas that have already undergone rehabilitation have seen a large success in terms of the revegetation.

The specific closure objectives for Khumani are:

- To operate within the enviro-legal ambits of South Africa;
- To be aware of the latest environmental legal requirements;
- To prevent the sterilisation of any future potential ore reserves;
- Limit the impact of the activities on the Ecological Setting of the area by actively managing Offset areas;
- Operate the water management circuit on site to increase mining efficiency and reduce the need for maintenance of these facilities;
- Limit the loss of soils as far as possible and ensure that the integrity remains during stockpiling for the purposes of successful rehabilitation;
- Protect the soil resources within the area in which the mine operates;
- Remain within the designated area demarcated for activities;
- Remain within the National Environmental Management: Air Quality Act , 2004 (NEM:AQA), Dust Regulation guidelines for rural communities;
- Protect heritage resources for future generations;
- Protect fauna and flora;
- Protect the groundwater resources to ensure that limited to no impact on groundwater resources occur as a result of the mining operations;
- Follow the waste hierarchy approach;
- Protect the integrity of the Storm Water Management System;
- Restore the area to its intended final land use.

The key aim of decommissioning and closure is to ensure that all the significant impacts are ameliorated. All rehabilitated areas should be left in a stable, self-sustainable state. Specific objectives associated with this application include:

Rehabilitation of Linear Infrastructure (Pipelines) (for this project specific to the pipelines for water supply)

- Linear infrastructure constructed by the mine will be removed if it proves to inhibit land use at decommissioning. The soils and land capability will be rehabilitated to near pre-mining conditions.
- All concrete lined drainage channels and sumps will be demolished and removed;
- 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.
- Removal of all signage, fencing, shade structures, traffic barriers, etc.;
- All potentially contaminated soils are to be identified and should be removed and remediated;
- All power and water services to be disconnected and certified as safe prior to commencement of any demolition works;
- Salvageable equipment will be removed and transported offsite prior to the commencement of demolition;

- Concrete slabs and footings will be broken and buried on site. The concrete (and metal) will be broken up and disposed of in the opencast pits as part of rehabilitation;
- Revegetate where self-succession has not been successful;
- Monitor and maintain vegetation establishment;
- Remove alien invasive vegetation; and
- Prevent access of people/machinery/vehicles/grazing animals on newly rehabilitated land to allow regeneration of vegetation and reduce erosion.

Detailed mitigation measures and recommendations have been included into this EIA report. Please refer to Table 35 to Table 38 for management measures which will be further assessed and confirmed by the specialist investigations. Some of the key management measures currently foreseen include:

- A legal assessment of all activities and future planned activities must be undertaken annually to ensure that all activities are authorised.
- The WUL must be available on site at all times.
- Construction areas must be clearly demarcated to control movement of personnel and vehicles, providing clear boundaries for construction sites in order to limit the spread of impacts. Markers and pegs will be erected and maintained along the boundaries of the working areas, access roads, haul roads and paths before commencing any work. If proved insufficient for control, these shall be replaced by fencing.
- Clean and dirty water separation as part of a Storm Water Management Plan must be implemented early in the construction phase, especially down-gradient of construction areas to ensure that the natural runoff patterns are impacted as little as possible.
- Ensure that all design drawings include effective erosion control measures.
- Alien and invasive plant species eradication should be implemented on site during all development phases.
- Equipment will be well maintained to reduce excessive noise creation.
- Ensure the required erosion protection measures are monitored and corrected where necessary.
- Storage of fuels and oils, the refuelling of vehicles and equipment maintenance must be limited to designated, bunded areas. Bunds to be 110% of volume of the materials stored.
- All workers must undergo an induction which includes environmental awareness training to make them aware of the environmental incident management procedures as well as the importance of complying with management measures.
- Any significant spills must be captured in the incident reports and must be reported to the relevant department (DMR and DWS).
- Water levels in the Return Water Dams should be monitored and should be maintained at a 0.8m freeboard.
- Pipelines flows should be recorded on mine recording system (active at any time) to determine when there may be a potential leak on a pipeline.
- All rehabilitated areas should be effectively fenced off to avoid access thereto by unauthorised parties up until full rehabilitation has been achieved.

<u>Logistics and General Management</u>

- A legal assessment of all activities and future planned activities must be undertaken annually to ensure that all activities are authorised.
- All necessary tree removal permits must be obtained where applicable.
- The WUL and copy of the Environmental Authorisation must be applied for and be available on site at all times.
- An open channel of consultation must be maintained throughout the construction activities.
- Construction areas must be clearly demarcated to control movement of personnel and vehicles, providing clear boundaries for construction sites in order to limit the spread of impacts. Markers and pegs will be erected and maintained along the boundaries of the working areas, access roads, haul roads and paths before commencing any work. If proved insufficient for control, these shall be replaced by fencing.
- Exemption in terms of GN 704 (Regulations 5 and 6) should be obtained from the DWS for the use of waste rock in the construction of the walls of the Return Water Dam 3 and other facilities, as well as the use of the Parson PCD for the storage of both storm water and process water from the Plant.

<u>Water Management</u>

- Clean and dirty water separation as part of a Storm Water Management Plan must be implemented early in the construction phase, especially down-gradient of construction areas to ensure that the natural runoff patterns are impacted as little as possible.
- Water levels in the containment facilities should be monitored and maintained at a 0.8m freeboard.
- Monitoring must be undertaken in line with the WUL.
- Hydrocarbons, chemicals and hazardous waste should be stored in suitably sized bunded areas, with a capacity not less than 110 percent of what is stored therein.
- Evaporation reduction measures should be implemented on at least the Buffer Dams and the Process Water Recovery Dam:
    - Various evaporation reduction technologies are available. Some of them are shown in the following figure.
        - Floating balls are the most common and provide evaporation reduction of between 70% and 90%. It is important to use balls that are weighted to prevent them from being lifted off the dam by strong winds.
        - Full covers are the most effective but are prohibitively expensive.
        - Hexagonal modules that automatically fit together are also available and can provide up to 90% evaporation reduction.

Storm Water Management

The following recommendations were made in terms of the Storm Water Management Plan in addition to the projects being applied for:

- All waste rock dumps must be designed to comply with the mine's WUL and GN 704. Allthough approved and constructed, final closure designs are not available. For this reason new designs for these must be developed.
- The clean storm water diversion up gradient of the Paste Disposal Facility as approved in the WUL (with the associated culverts) should be formalised.

The storm water channels that route storm water to the Bruce PCD (also known as the Storm Water Dam) should be concrete-lined to comply with the mine's water use licence. Alternatively, the licence conditions should be changed to allow for the current lining to remain in place. If the water quality parameter of concern is suspended solids, then a brick-lined channel will not result in ground water pollution.

Soil Management

- Soil Management (General):
    - Adhere to the Soil Stripping, Soil Stockpiling and Soil Management Plan as part of the original EMPr (Soil Utilisation Guideline).
    - Topsoil should be stockpiled on designated topsoil stockpiles, unless around linear infrastructure, where the topsoil could be stockpiled next to the linear structure.
    - Stockpiles should be revegetated (designed to allow self-succession) to establish a vegetation cover as an erosion control measure. These stockpiles should also be kept free of alien vegetation at all times to prevent loss of soil quality.
    - Temporary berms can be installed around stockpile areas whilst vegetation cover has not established to avoid soil loss through erosion; and
    - The recovered soils should be re-used to rehabilitate the mine footprint following mine closure as well as for concurrent rehabilitation where undertaken.
- Soil Erosion:
    - If possible, vegetation clearance and commencement of construction activities can be scheduled to coincide with low rainfall conditions when the erosive storm water and wind are anticipated to be low;
    - Bare soils can be regularly dampened with water to suppress dust during the construction phase, especially when strong wind conditions are predicted according to the local weather forecast;
    - All disturbed areas adjacent to the infrastructure areas can be re-vegetated with an indigenous grass mix, if necessary, to re-establish a protective cover and to minimise soil erosion and dust emission; and
    - Temporary erosion control measures may be used to protect the disturbed soils during the construction phase until adequate vegetation has established.
- Soil Compaction:

- Vehicles may not traverse natural areas and must remain on existing disturbed areas as far as practically possible; and

- Soil Contamination Management:
  - A spill prevention and emergency spill response plan should be compiled to guide the construction works; and
  - An emergency response contingency plan should be put in place to address clean-up measures should a spill and/or a leak occur.
  - Alien and invasive plant eradication and control should be implemented on site.
  - Where vegetation cannot be established during the life of construction and operations, appropriate measures will be taken to control erosion. These will include grading of surfaces to prevent rapid run-off of storm water and/ or the use of energy dissipaters.
  - Equipment must be well maintained to reduce excessive noise creation.

Ecological Habitats

In order to minimise the impact to floral species, the following recommendations are made:

- As far as possible existing access roads are to be used to gain access to the construction sites in order to minimise the need for additional vegetation clearance;
- Spills and/or leaks from drill equipment must be immediately remedied and cleaned up so as to ensure that these chemicals do not enter into the surrounding environment;
- An Alien and Invasive Plant Control Plan and Erosion Control Plan must be developed and implemented during all phases of development, to lower the risk of erosion and the increase proliferation of alien and invasive plant species within the project areas;
- If natural succession of vegetation is not established within one rainy season, after rehabilitation, the disturbed areas and areas adjacent to the infrastructural areas must be revegetated with an indigenous grass mix, if necessary, to re-establish a protective cover, to minimise soil erosion and dust emission; and
- Alien floral species located in the project areas must be removed on a regular basis as part of maintenance activities according to the NEM:BA (Act No. 10 of 2004): Alien and Invasive Species Regulations (GN R864 of 2016).

Heritage Resources

- A chance encounter plan for heritage resources should be developed to guide personnel on the measures to implement should heritage resources be uncovered

Waste Management

- Storage of fuels and oils, the refuelling of vehicles and equipment maintenance must be limited to designated, bunded areas. Bunds to be 110% of volume of the materials stored.
- All workers must undergo an induction which includes environmental awareness training to make them aware of the environmental incident management procedures as well as the importance of complying with management measures.
- Any significant spills must be captured in the incident reports and must be reported to the relevant department (DMR/ Catchment Management Agency (CMA)/ DWS).

Air Quality Management

- Dust Suppression will be undertaken where required.

1.m Final Proposed Alternatives

Please refer to section 1.g for the alternatives considered. Consideration of alternatives resulted in the following:

- Implementation of additional water storage facilities from the Storm Water Management Report (such as the additional Buffer Storage Dam); and
- Inclusion of Evaporation Control Measures on specific Water Containment Facilities.

1.n Aspects for inclusion as conditions of the Environmental Authorisation

This EMPr has been complied to present all the required management measures, actions, monitoring requirements and closure objectives to ensure that the impact of this project be limited to meet the final objectives listed in this document.

The following mitigation measures are crucial and should form part of the environmental authorisation to ensure that the applicant manages impacts adequately:

- The management measures and actions as presented in the EMPr must be implemented and adhered to on site;
- An ECO should be appointed during the construction phases to monitor the implementation of the EMPr;
- The Monitoring Programme and Reporting Programme (internal and external audits) should be adhered to;
- Ensure that all design drawings include effective erosion control measures;
- Adhere to the proposed conceptual Storm Water Management Plan contained in the Hydrological Report and also stipulated in Section 1.g.iv.5;
- Ensure that training on the EIA and EMPr and the final decision by the DMR is given to all contractors and employees directly involved in the planning, construction and operation of the projects in question;
- Adhere to all management measure and actions presented in this report;
- No activities which requires WULs or approval from the DWS may commence without the necessary authorisations;
- Evaporation prevention techniques should be investigated and implemented on specifically the Buffer Dams and the Process Water Recovery Dam; and
- If natural succession of vegetation is not established within one rainy season, after rehabilitation, the disturbed areas and areas adjacent to the infrastructural areas must be revegetated with an indigenous grass mix, if necessary, to re-establish a protective cover, to minimise soil erosion and dust emission.

1.o Description of any Assumptions, Uncertainties and Gaps in Knowledge

In each of the specialist reports contained in Annexure 6, the relevant assumptions and gaps have been listed. None of the assumptions listed resulted in uncertainty in terms of the outcomes of the specialist studies and therefore the EAP is confident that the management measures presented in this report will be suitable for achieving the environmental objectives.

The groundwater study will be included into the final EIA Report, however this study is supplementary to this project and should not have any changing results on the outcomes of the report.

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

1.p.i Reasons why the activity should be authorised or not

The project in question is a Water Management Improvement project. The overall aim of the project is to optimise water usage on site, and thereby limiting constraints on the existing Sedibeng Water Supply Scheme over time.

It is the opinion of the EAP that this EIA and EMPr provides the necessary and relevant information required in order to implement the principles of Integrated Environmental Management so as to ensure that the best long-term use of the soil, ecological and aquatic resources in the project area will be made in support of the principle of sustainable development. Recommendations of the EAP and specialists have been considered favourably by the applicant and the final project plan has incorporated these recommendations.

If the proposed management and mitigation measures are not properly applied or if the applicant intentionally disregards any of these measures, it will negatively affect the environment and have potential consequences and for this reason it is important that the recommendations for conditions for inclusion as presented in Section**Error! Reference source not found.** be included should the Environmental Authorisation be considered favourably by the Competent Authority.

No fatal flaws based on the final layout have been identified.

It is recommended that, the proposed development be considered **favourably** provided that the recommended management measures for the identified impacts, monitoring requirements and auditing protocols are adhered to.

1.p.ii Conditions that must be included in the authorisation

As presented before the following mitigation measures are crucial and should form part of the environmental authorisation to ensure that the applicant manages impacts adequately:

- The management measures and actions as presented in the EMPr must be implemented and adhered to on site;
- An ECO should be appointed during the construction phases to monitor the implementation of the EMPr;
- The Monitoring Programme and Reporting Programme (internal and external audits) should be adhered to;
- Ensure that all design drawings include effective erosion control measures;
- Adhere to the proposed conceptual Storm Water Management Plan contained in the Hydrological Report and also stipulated in Section 1.g.iv.5;
- Ensure that training on the EIA and EMPr and the final decision by the DMR is given to all contractors and employees directly involved in the planning, construction and operation of the projects in question;
- Adhere to all management measure and actions presented in this report;
- No activities which requires WULs or approval from the DWS may commence without the necessary authorisations;
- Evaporation prevention techniques should be investigated and implemented on specifically the Buffer Dams and the Process Water Recovery Dam; and
- If natural succession of vegetation is not established within one rainy season, after rehabilitation, the disturbed areas and areas adjacent to the infrastructural areas must be revegetated with an indigenous grass mix, if necessary, to re-establish a protective cover, to minimise soil erosion and dust emission.

1.q Period for which the Environmental Authorisation is required

The Environmental Authorisation is required for the life of mine, which is in excess of 30 years.

1.r Undertaking

The undertaking by the Application to meet the requirements of this section is provided in Part B (EMPr) and is applicable to both the EIA report and EMPr.

1.s Financial Provision

The amount that is required to both manage and rehabilitate the environment in respect of rehabilitation of the three projects is R853 892.84 (excluding VAT).

Table 27: Financial Provision

Rehabilitation of Return Water Dam, Pipelines and Water Storage Facility				
Rip and shape remaining disturbed surfaces	m^2	20050,00	R 3,62	R 72 581,00
Cut to fill obtained from waste rock dump	m^3	10000,00	R 26,88	R 268 800,00
Dismantling of pipeline within existing disturbed area	m	7200,00	R 51,70	R 372 240,00
Water Storage Facility (Concrete)	m^2	50,00	R 200,34	R 10 017,00
			Subtotal	R 723 638,00
Management and Administration				
Preliminary & General (6%) - as part of the overall financial provision P&Gs				R 43 418,28
Contingency (10%)				R 72 363,80
Health & Safety				R 14 472,76
			Total (ZAR)	**R 853 892,84**

1.s.i Explain how the aforesaid amount was derived

1.s.i.1 Appointed Specialist

GlobeSight (Pty) Ltd was appointed by EnviroGistics on behalf of Khumani to complete the financial provision assessment for the rehabilitation and closure of the overall mine during the latter part of 2018. The rates as calculated and used for the assessment was utilised in formalising this projects financial provision requirements. Please refer to Annexure 7 for the detailed assessment undertaken during 2018.

The following sections presents the key considerations in how the financial provision amount was derived:

1.s.i.2 Philosophy and Legal Considerations

Successful closure depends on setting, continually reviewing and validating and finally meeting closure goals that align with company and stakeholder requirements. There should be minimal residual risk to the environment, and the community should realise benefits that will continue to exist without further involvement from the company. This philosophy was considered in the development of the financial provision for the current mine, life of mine and proposed projects.

The vision of mine closure should be to ensure that a process is established to guide all decisions and actions during a mine's life such that:

- Future public health and safety are not compromised;
- Environmental resources are not subject to physical and chemical deterioration;
- The post-mining use of the site is beneficial and sustainable in the long-term;
- Any adverse socio-economic impacts are minimised; and
- The opportunity is taken to maximize socio-economic benefits.

The above vision has been incorporated in the development of the management measures for the proposed projects as presented in the closure objectives (see Section 1.l).

In order to derive the financial provision, the following legislation was also considered:

Table 28: Financial Provision Legislation

Applicable legislation and guidelines	Details
Constitution of the Republic of South Africa, 1996 (Act No. 108 of 1996)	Section 24 of the Constitution states that everyone has the right to an environment that is not harmful to their health or well-being and to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures, that –
	a) Prevent pollution and ecological degradation;
	b) Promote conservation; and
	c) Secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development
The Conservation of Agricultural Resources, 1983 (Act No. 43 of 1983)	The Conservation of Agricultural Resources Act, 43 of 1983 (CARA) states that the degradation of the agricultural potential of soil is illegal; and
	The CARA requires that protection of land against soil erosion and the prevention of water logging and salinization of soils means of suitable soil conservation works to be constructed and maintained.

Applicable legislation and guidelines	Details
Mineral and Petroleum Resource Development Act. 2002 (Act No. 28 of 2002)	The MPRDA sets out the requirements relating to the development of the nation's mineral and petroleum resources. It also aims to ensure the promotion of economic and social development through exploration and mining related activities; Section 41 (1) of the MPRDA has been repealed and in terms of Section 24P in the NEMA as amended which provides that the holder of a mining right must make financial provision for rehabilitation of negative environmental impacts. The financial provision must guarantee the availability of sufficient funds to undertake the- a) Rehabilitation of the adverse environmental impacts of the listed or specified activities; b) Rehabilitation of the impacts of the prospecting, exploration, mining or production activities, including the pumping and treatment of polluted or extraneous water; c) Decommissioning and closure of the operations; d) Remediation of latent or residual environmental impacts which become known in the future; e) Removal of building structures and other objects; and/or f) Remediation of any other negative environmental impacts. In addition to Section 24P, the Regulations pertaining to the financial provision for prospecting, exploration, mining or production operations were promulgated on the 20 November 2015 (Government Notice No. 1147 published in GG 39425). Regulation 11 of the Financial Provision Regulations requires a holder of a Mining Right to determine the quantum of the financial provision through detailed itemisation of all activities and costs, calculated based on the actual costs of implementation of the measures required for: a) Annual rehabilitation, as reflected in Annual Rehabilitation Plans; b) Final rehabilitation, decommissioning and closure of the mining operations as per the Rehabilitation and Closure Plans (RCPs) which includes the findings of the Environmental Risk Assessment (ERA); and c) Remediation of latent or residual environmental impacts as identified in the ERA.
National Environmental Management Act, 1998 (Act No. 107 of 1998)	The NEMA, as amended was set in place in accordance with Section 24 of the Constitution of the Republic of South Africa. Certain environmental principles under NEMA have to be adhered to, to inform decision making for issues affecting the environment. Sections 24 (1)(a) and (b) of NEMA state that: *The potential impact on the environment and socio-economic conditions of activities that require authorisation or permission by law and which may significantly affect the environment, must be considered, investigated and assessed prior to their implementation and reported to the organ of state charged by law with authorizing, permitting, or otherwise allowing the implementation of an activity.*
National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004)	NEM:BA regulates the management and conservation of the biodiversity of South Africa within the framework provided under NEMA. This Act also regulates the protection of species and ecosystems that require national protection and also takes into account the management of alien and invasive species. This Act works in accordance to the framework set under NEMA. The following regulations which have been promulgated in terms of the NEM:BA are also of relevance: ▪ Alien and Invasive Species Lists, 2016; ▪ NEM:BA: Threatened and Protected Species Regulations; and ▪ National list of Ecosystems Threatened and in need of Protection under Section 52(1) (a) of NEM:BA(GG 34809, GN R.1002, 9 December 2011).
National Water Act, 1998 (Act No. 36 of 1998)	The NWA provides for the sustainable and equitable use and protection of water resources. It is founded on the principle that the National Government has overall responsibility for and authority over water resource management, including the equitable allocation and beneficial use of water in the public interest, and that a person can only be entitled to use water if the use is permissible under the NWA.
National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004)	According to the NEM:AQA the DEA, the provincial environmental departments and local authorities (district and local municipalities) are separately and jointly responsible for the implementation and enforcement of various aspects of NEM:AQA. A fundamental aspect of the new approach to the air quality regulation, as reflected in the NEM:AQA is the establishment of National Ambient Air Quality Standards (NAAQS) (GN R 1210 of 2009). These standards provide the goals for air quality management plans and also provide the benchmark by which the effectiveness of these management plans is measured.

1.s.i.3 Post-Closure Land Use

Another important consideration in the determination of the financial provision is the post-closure land use commitment. Post-closure land use is determined in consultation with stakeholders so that the post closure land use meets the requirements of the stakeholders, within the context of the closure plan. This activity is undertaken for the whole mine lease area affected by mining activities and integrates stakeholder requirements with risk mitigation.

The proposed final land use would be to return the area to as close as possible to pre-mining conditions as committed to in the various EMPr's preceding this application. This would include demolishing surface infrastructure that will not be handed over to a third party and promoting the growth of the endemic vegetation. It is evident that the re-establishment of this vegetation biome on site will not be difficult as areas that have already undergone rehabilitation have seen a large success in terms of the revegetation.

It should be noted that the closure plan may be revised as the mine production progresses; this will ensure that the mine operation take advances in technology and rehabilitation methods into consideration.

1.s.i.4 Methodology and Approach to the Financial Provision Calculation

The following approach was adopted to derive the financial provision (please refer to Annexure 7) for a detailed final rehabilitation and costing plan for the current mining infrastructure (excluding the proposed projects):

2018 Closure Cost Methodology

The overarching approach adopted during the 2018 evaluation (on which the current rates for the proposed projects are based upon) broadly involved conducting a site investigation during which visual observations were made and interviews were held with key personnel and a comprehensive review and scrutiny of applicable scientific and technical reports including related information. From this a costing strategy and framework was developed to ultimately compile a detailed independent rehabilitation and closure solution for the purposes of the action plan and the cost estimate.

The development of site specific costs for final rehabilitation, decommissioning and closure involved the following sequence of evaluations:

- A site assessment to determine changes from the previous assessment (1.5 days in this case);
- Compilation of a dedicated photographic record;
- Collection of recently developed and scaled aerial photography (obtained from the survey department);
- Adaptation of the base Bill of Quantities (BoQ) (November 2016) by a civil engineer, utilising observations made during the site inspection and individual measurements made from the scaled aerial photographs per rehabilitation and closure component;
- Identification of the respective closure components as per the EMPr Closure objectives (see Section 1.l).
- Identification of the prescribed post mining land use requirement for each closure component (see Section 1.l, as well as Table 39 provided for in the EMPr – Part B).
- Compilation of a list of activities/actions, referred to as items, to be implemented to achieve the desired post mining land use objective for each closure component – refer to the following table.
- Rehabilitation and closure costs were then determined by undertaking the following:
    - Selection of the most appropriate equipment/plant type, capacity, time requirement, operator efficiency, fuel requirement, distance of travel, angle of route and height of infrastructure applicable to each item to derive actual costs for each item individually.
    - Then, for the purposes of auditable calculations, unit rates are derived mathematically using total item cost divided by the respective item quantity.
    - Important to note is that decommissioning and rehabilitation activities are almost entirely engineering projects in themselves, therefore the approach to price the project and then to relay the cost estimate information into an auditable format for the purposes of external review and verification.
- The cost estimate is derived in the same way as when the rights holder requests a quotation from an external contractor.

Table 29: Itemised actions and unit rates

ITEMISED RATES FOR DECOMISSIONING AND REHABILITATION (2018) - KHUMANI IRON ORE MINE				
Ref No.	**Cost Item**	**Rate**	**Unit**	**Action Description**
1	**Steel Infrastructure**			
1,1	Dismantle steel structure high with heavy internal steel to salvage yard	R 361,90	m^2	Includes all structural steel, pipes, gantries, containers requiring 100T crane (I.e. large vehicle workshops)
1,2	Dismantle medium height steel buildings/structures to salvage yard	R 305,03	m^2	Includes all structural steel, pipes, gantries, containers & conveyors requiring 25T crane
2	**Concrete Infrastructure**			
2,1	Demolish all reinforced concrete foundations/bases/slabs/floors	R 200,34	m^2	Includes cut to fill on site.
4	**Brick Structures**			
4,1	Demolish brick structure, load and spoil (on site)	R 101,33	m^2	Includes pre-stripping, demolishment and spoil to site. Foundations to 1m below surface.
6	**Waste Removal/Disposal**			
6,3	Cut hazardous material to hazardous disposal site	R 1 460,53	m^3	Hydrocarbon contaminated materials, asbestos, medical waste.

ITEMISED RATES FOR DECOMISSIONING AND REHABILITATION (2018) - KHUMANI IRON ORE MINE				
Ref No.	**Cost Item**	**Rate**	**Unit**	**Action Description**
7	**Piping, cables & lines**			
7,1	Dismantle and remove piping on surface to stockpile	R 51,70	m	Remove piping on surface, cut to stockpile. Assume 40 days for completion.
7,2	Dismantle and remove overhead powerlines to stockpile	R 3,83	m	Remove overhead powerlines, cut to stockpile. Assume 20 days for completion.
7,3	Dismantle and remove communication lines on surface to stockpile	R 3,83	m	Remove communication lines on surface, cut to stockpile. Assume 20 days for completion.
8	**Roads**			
8,2	Demolish unsurfaced haul roads, rip and shape	R 11,37	m^2	Extended width haul roads (avg. width 18-20m). Rip to 500mm depth.
8,3	Demolish surfaced (tarred) roads, rip and shape	R 11,37	m^2	Remove tar surface to stockpile on-site. 10km free haul limit.
8,4	Topsoil spreading onto haul road footprints	R 19,65	m^3	Load, haul, tip & spread (150mm) onto haul road footprints. Free-haul distance = 7km.
9	**Fences**			
9,1	Removal of fences (post closure), cut to stockpile	R 36,19	m	Remove fences to salvage stockpile
10	**Railway Lines**			
10,1	Rip and shape ballast footprint (Old TFR)	R 3,62	m	Rip & shape ballast footprint. Rip to 100mm depth.
10,2	Remove rails, sleepers and ballast	R 139,69	m	8m lengths cut to salvage yard. Cut sleepers to spoil. Cut ballast to spoil.
10,3	Topsoil spreading onto rail footprint	R 19,65	m^3	Load, haul, tip & spread (150mm) onto rail footprints. Free-haul distance = 7km.
11	**Water Management**			
11,1	Cut casing and cap borehole	R 3 102,00	Item	Cut casing to 300mm below surface and install concrete cap & plinth
14	**Earth Works**			
14,1	Containment berms (dumps)	R 26,55	m	50m x 50m paddocks on dump surface.
14,2	Shaping waste dump slopes	R 18,20	m^3	Shape slopes to 1:3.
14,3	Topsoil spreading over dump surface	R 26,02	m^3	Load, haul, tip & spread (150mm) onto area. SG = 2.2. Free-haul distance = 5km.
14,4	Enviro Berm	R 318,47	m	3.5m effective height, 2.6m width, with cut-off trench in front (1.5mx1.5m).
14,5	Rip and shape remaining disturbed surfaces	R 3,62	m^2	Rip & shape generally flat surfaces which have undergone footprint disturbance. Assume 50% of area requirement. Rip to 100mm depth.
14,6	Topsoil spreading over area	R 19,65	m^3	Load, haul, tip & spread (150mm) onto area. Free-haul distance = 7km.
14,7	Cut to fill from waste rock dump	R 26,88	m^3	Fill 0.5m layer on top of paste facility - shape for drainage
19	**Environmental Management**			
19,1	Surface Water Quality Monitoring	R 258 086,40	Annum	Based on current expenditure incurred by Khumani for this service.
19,2	Groundwater Quality Monitoring	R 62 040,00	Annum	Based on current expenditure incurred by Khumani for this service.
19,3	Air Quality Monitoring (PM2.5 & MP10)	R 43 428,00	Annum	Based on current expenditure incurred by Khumani for this service.
19,4	Vegetation establishment & Distribution Monitoring	R 72 380,00	Annum	Monthly site inspection (year 1), quarterly site inspections (years 2 & 3)
19,5	Land Stability Monitoring	R 113 740,00	Annum	Monthly site inspection (year 1), quarterly site inspections (years 2 & 3)
19,6	Dust suppression	R 310 200,00	Annum	Water tanker for dust dispersion reduction and management
19,9	Social & Labour Plan Commitments	R 517 000,00	Item	
19,10	Post rehabilitation maintenance	R 4 136 000,00	Annum	Contractor yard, site office, 1x ADT, 1x Excavator, 1x Dozer

1.s.ii Confirm that this amount can be provided for from operating expenditure.

It is confirmed that the amount for outstanding rehabilitation can be provided from operating expenditure.

1.t Deviations from the approved Scoping Report and Plan of Study

1.t.i Deviations from the methodology used in determining the significance of potential environmental impacts and risks

The methodology to rate the impacts and risks associated with the proposed project detailed in this EIA report have not deviated from those described in the Scoping Report.

No deviation in activities have taken place from the Scoping Report. The EMPr however, provides more detail in terms of the WUL Activities which will be included into the WUL Application to be submitted to the DWS. These activities do not trigger specific listing notices in terms of construction (except for the new Return Water Dam 3 and King Water Containment Facility – discussed in the Scoping Report), but rather the upgrade and formalisation of existing activities on site, for which the following listed activities are triggered:

NEMA Government Notice 983 (amended 2017 in Government Notice 327), Listing Notice 1:

- Activity 34: The expansion of existing facilities or infrastructure for any process or activity where such expansion will result in the need for a permit or licence or an amended permit or licence in terms of national or provincial legislation governing the release of emissions, effluent or pollution, excluding— (i) where the facility, infrastructure, process or activity is included in the list of waste management activities published in terms of section 19 of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) in which case the National Environmental Management: Waste Act, 2008 applies.

NEMA Government Notice 984 (amended in Government Notice 325), Listing Notice 2:

- Activity 6: The development of facilities or infrastructure for any process or activity which requires a permit or licence or an amended permit or licence in terms of national or provincial legislation governing the generation or release of emissions, pollution or effluent.

1.t.ii Motivation of the deviation

No deviations from the methodology proposed in the Scoping Report.

More detail regarding WUL activities, is based on the fact that further water studies have been undertaken as presented in Annexure 6: Specialist Reports.

1.u Other information required by the Competent Authority

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

1.u.i.1 Impact on the socio-economic conditions of any directly affected person

The project involves the internal improvement of water management infrastructure on site. The only activities which may impact on socio-economic conditions are the following:

By not implementing the proposed projects, the mine will be avoided the opportunity to improve water management and circulation on site. The project involves:

- Improving and formalising existing water storage activities (i.e. buffer dams, PCD and storm water dams);
- Construction of additional Paste Disposal Facility return water infrastructure by constructing the Return Water Dam 3;
- Implementing evaporation control measures, such as covers (balls) on specifically identified dams (PCD, Process Water Recovery Dam, Buffer Dams) or as determined by the hydrologist and environmental department on site;
- Improving and formalisation of piping and pumping infrastructure between key water use and storage activities (such as the Plant, as well as the Paste Disposal Facility and the Plant and the Parson PCD).

The mine is fully dependent on the Sedibeng Water Supply Scheme which is a highly strained water scheme. During the periods of October to January the mine experience various encounters where water is not supplied by the scheme, which results in plan shut down. This latter cumulative result has an economic impact on production and iron ore supply to markets.

In general (and not specific to this project only), from a social perspective, the following objectives and measures should be included as part of the Social Management Plan (SMP) as part of the (EMPr).

Maximise Employment Opportunities and Limit Skills Inequities

Objective	Maximise local employment opportunities and limit skills inequities associated with the construction and operation

Mitigation: Action/control	Responsibility	Timeframe
Prioritise local labour in the recruitment process as part of the company's own recruitment policy or as part of contractor management plan during construction and operations	Human resources /Social and Labour Plan (SLP) officer	Before construction activities commences
Meet the targets of mining legislation and the relevant mining charter for employment of Historically Disadvantaged South Africans (HDSA) in management positions and core skills	Human resources /SLP officer	Before construction activities commences
Put a procurement strategy as well as a contractor management plan (if relevant) in place to ensure that as close to 100% as possible local employment target in terms of unskilled labour is met	Human resources /SLP officer	Before construction activities commences
Up-skill the local labour force as per SLP	Human resources /SLP officer	Before construction activities commences
Develop a database of goods and services that could potentially be outsourced to the local community	Supply chain management	Before construction activities commences
Where local contractors are used, put a contractor management plan in place (if relevant) to ensure that the local employment and procurement targets of the operations are met	Supply chain management	Before construction activities commences
Performance Indicator	% local labour employed in different skill categories % HDSA in management positions Training programmes completed by local labour force % of goods and services procured from local community by type of product	
Monitoring	Annually as per SLP and procurement strategies	

Minimise external costs for the local community

Objective	**Minimise external costs for the local community**	
Mitigation: Action/control	**Responsibility**	**Timeframe**
Participate on a regular basis in the local business chambers and/or mining forums and address issues that could negatively impact on the area	Environmental Officer	During construction phase
Performance Indicator	The number of community complaints received and resolved The number of chamber meetings attended, complaints received and resolved	
Monitoring	Per quarter (4 times a year)	

Minimise the negative economic impacts related to mine closure

Objective	**Minimise the negative economic impacts related to mine closure**	
Mitigation: Action/control	**Responsibility**	**Timeframe**
As per the requirements of the SLP, develop mechanisms to assist employees, prior to retrenchment date in the transition phase after closure of the operations including portable skilled development programmes during the operational phase of the mine, providing assistance in accessing available and suitable jobs with other local mines or companies etc.	Human resources/ SLP officer	During operations/ before closure
Focus on non-core related local supply links during the operational phases of the mine to facilitate easier transitioning of local suppliers to other costumers	Supply chain/procurement	During construction
Plan community projects with an exit strategy of which beneficiaries are aware of	SLP officer, corporate social investment programme	During operations/ before closure
Performance Indicator	% spending on non-core mining local inputs % of employees that receive portable skills training % of retrenched employees placed in alternative employment Exit strategies for every community investment programme	

Monitoring	Annually/ just before closure

1.u.i.2 Impact on any National Estate referred to in Section 3(2) of the National Heritage Resources Act

All impacts on heritage conditions have been assessed in the 2005 and 2017 Heritage Impact Assessment (Annexure 6). Based on the available information, no unmitigated/ permanent impact on the natural estate will take place as part of this project as the projects are upgrades and formalisation of existing infrastructure planned on existing disturbed areas.

1.v Other Matters required in terms of sections 24(4)(a) and (b) of the Act

> The EAP managing the application must provide the competent authority with detailed, written proof of an investigation as required by section 24(4)(b)(i) of the Act and motivation if no reasonable or feasible alternatives, as contemplated in sub-regulation 22(2)(h), exist.

Information regarding the baseline and potential impacts for this project, is based on the existing information available, discussions with stakeholders (refer to Annexure 4), specialists (Annexure 6), the applicant and discussions with authorities (Annexure 4). The EAP has included all identified impacts, based on the current scope of the project, in this EIA and has assigned appropriate management measures to reduce and manage each identified impact, which are included in this EMPr.

PART B

ENVIRONMENTAL MANAGEMENT PROGRAMME REPORT

1.a Contact Person and Correspondence Address

1.a.i Details of the Environmental Assessment Practitioner (EAP)

Table 30: Details of EAP

Name	Tanja Bekker
Designation	Environmental Assessment Practitioner
Postal Address	PO Box 22014, Helderkruin, 1733
Physical Address	21 Gladiolus Street, Roodekrans, 1724
Telephone Number	+27 (0) 82 412 1799
Cell Phone Number	+27 (0) 82 412 1799
Fax Number:	+ 27 (0) 86 551 5233
Email Address	tanja@envirogistics.co.za

1.a.ii Expertise of the EAP

The following table presents a summary of the EAP's experience:

Table 31: Experience of EAP

Name	Position	Qualification	Professional Registrations	Experience
Tanja Bekker	Principal Practitioner	M.Sc. Environmental Management (RAU), now Johannesburg University)	Certified member of the Environmental Assessment Practitioners Association of South Africa (October 2013) Registered with the South African Council of National Scientific Professions (SACNASP: Pr.Sci.Nat. Reg No. 400198/09) Member of International Association of Impact Assessors (IAIA) Member of the Environmental Law Association of South Africa	15 Years

Please refer to Annexure 2 for the EAPs Curriculum Vitae.

Education

B.Sc. Earth Sciences (Geography & Geology) – RAU (University of Johannesburg)
B.Sc. Geography Honours - RAU (University of Johannesburg)
M.Sc. Environmental Management - RAU (University of Johannesburg)

Career Enhancing Courses

ISO 14000 Lead Auditors Course (WTH Management)
Certificate in Project Management (Pretoria University)
Management Advance Programme (MAP 81) (Wits Business School)

Professional Affiliations

Certified member of Environmental Assessment Practitioners Association of South Africa
Certified ISO 14001 Environmental Management System Auditor
Registered as a Professional Natural Scientist,
Member of the South African affiliate of the International Association for Impact Assessment
Member of the Environmental Law Association of South Africa (ELA).

Summary of the EAP's past experience

Ms. Bekker is registered as a Professional Natural Scientist in the field of Environmental Science with the South African Council for Natural Scientific Professions (SACNASP) Board and is also a Certified Environmental Assessment Practitioner (EAP) with the Interim Certification Board of Environmental Assessment Practitioners of South Africa (EAPSA), a legal requirement stipulated by NEMA. She is further certified as an ISO 14001 Lead Auditor. Her qualifications include BSc. Earth Sciences (Geology and Geography), BSc. Hons. Geography, and MSc. Environmental Management. In addition to these tertiary qualifications, she obtained a Certificate in Project Management, and completed the Management Advancement Programme at Wits Business School.

With more than 15 years' working experience in environmental management and the consulting industry and managing various Large Account Clients, she understands the South African Regulatory System, and can advise clients with due diligence on their environmental regulatory requirements and offer a solution driven service to their project life cycle. She is equipped with exceptional project management and coordination skills, which especially enhances the service she offers clients within the environmental permitting system.

Her key focus is environmental management and compliance with extensive experience in the mining industry. Project Management and Coordination of projects form a critical component of her duties, which include project planning, initiation of projects, client, authority and stakeholder consultation, specialist coordination, budget control, process control, quality control and timeframe management. Her interest lies in a client advisory capacity, being involved during due diligence investigations, pre-project development and assisting the client and engineering team in adding value to develop the project in an environmentally sustainable manner, considering client costs and liabilities, as well as considering the implication of environmental authorisation conditions and requirements on project deliverables. Her involvement in projects has spanned over the project life cycle from Due Diligence Investigations, Pre-Feasibility Investigations, Prospecting Right Applications, Mining Right Applications, Environmental Reporting and implementation and auditing of Environmental Management Plans and Authorisations.

1.a.iii Details of the Applicant

Khumani Iron Ore Mine (hereafter referred to as “Khumani” or “the mine”), located near Kathu in the Northern Cape Province, is owned by Associated Manganese Mines of South Africa Limited (“Assmang”).

Khumani has an approved Mining Right, granted by the Department of Mineral Resources (hereafter referred to as the “DMR”) in January 2007 for activities associated with the mining of iron ore. Khumani comprises four (4) farms, namely Parson 564 (including Police Camp 692) (Portions 0, 2, 8 and 9), King (Portion RE), Bruce 544 (Portion RE) and Mokaning 560 (Portions 0, 1, 2, 3, and 4), hereafter referred to as “Parson”, “King”, “Bruce” and “Mokaning” respectively.

The Mining Right is located over portions of the farms King, Bruce and Mokaning. The overall mining area, however, also includes the farm Parson, where the plant infrastructure, product and low grade stockpiles, an explosives magazine and main offices are situated. The farm Parson does not form part of the mining right and therefore no mining activities are undertaken over this farm.

Construction activities at Khumani commenced during June 2006, with an environmental approval in terms of the Environment Conservation Act, 1989 (Act No. 73 of 1989) (hereafter referred to as the “ECA”), while operational activities on the farm Bruce commenced during May 2007.

Khumani is an opencast Iron Ore Mine and is classified in terms of the DMR as a Primary Risk Class: A, which relates to the mining of base metals (including Iron Ore) for a Large Mining Operation, which includes a mine, mine waste, plant and plant waste.

The mining operations include opencast mining operations, within seven (7) Opencast Pits, from where the Run of Mine (ROM) is trucked to a primary crusher and transported via conveyor to the secondary and tertiary crushers, with the latter located at the Beneficiation Plant on the farm Parson. Material is washed and screened in the Beneficiation Plant, where the final product is stockpiled for rail transport to either Saldanha for export (via the OREX Line) or Port Elizabeth for local markets (via Transnet Fright Rail (TFR)). Waste rock (or low-grade material) is placed on, what will in future be named the Low Grade Stockpiles, and earmarked for reprocessing in the future, depending on market requirements. Waste material from the beneficiation process is pumped through a series of thickeners to the Paste Disposal Facility located on the farm King. Additional ancillary mine infrastructure has been constructed, such as the main offices, access roads, haul roads, power lines, fences for security purposes, etc. The mine has, over the past number of years, invested in the delineation of its primary catchment areas for the purposes of designing a detailed clean and dirty water management system for the mine. One of the key purposes of this system is water conservation. The area in which the mine is located is characterised as a water negative environment, i.e. evaporation exceeds precipitation. The mine is committed to reuse as much water as possible, not only from an environmental and sustainable viewpoint, but also due to the fact that the mine is reliant on purchasing water from the Sedibeng Water Supply Scheme, which is currently considered to be an unreliable source of water supply, having often resulted in the mine not having access to water. Water from the storm water system is utilised as a dust suppressant over roads, in combination with roads also being treated with a dust suppressant (at this time supplied by E-Cat).

The mining infrastructure associated with each farm of the Mining Right is detailed as follows:

Parson:

- Rapid Load-Out Facility;
- Product Stockpile Area;
- ROM Stockpile Area;
- Discard Stockpile (to be known as the Low Grade ROM Stockpile);
- Plant Area (Original Beneficiation Plant and the Wet, High-Intensity Magnetic Separation (WHIMS) Plant);
- Plant Offices;
- Third Party Stockpile Area
- Workshop Areas;
- Explosives Magazine (operated by Sasol Nitro);
- Sewage Facilities;
- Conveyors;
- Storm Water Management Infrastructure (channels and dam);
- Borrow Pits; and
- Contractor Workshop Areas.

Bruce:

- Primary Crusher;
- Secondary Crusher;
- Mine Workshops;
- Offices;
- Overland Conveyors;
- Sewage Facilities;
- Contractor Workshop Areas;
- Opencast Operations (five main Opencast Pits – BA05, BB01, BC01, BC02 and BC03);
- Topsoil Stockpile;
- Barrier Pillar Mining operations;
- Panhandle Dump;
- Low Grade ROM Stockpile (Waste Rock Dump); and
- Storm Water Management infrastructure (channels and dam).

King/ Mokaning:

- Paste Disposal Facility;
- Topsoil Stockpile;
- Low Grade ROM Stockpile;
- Waste Rock Dump;
    - A second Waste Rock Dump is planned in the near future. The mine is currently in the process of undertaking an Environmental Authorisation Process for the second Waste Rock Dump.
- Contractor Workshop Areas;
- Opencast Pits (two main Opencast Pits – KM01 and KM02);
- Primary and Secondary Crusher;
- Sewage Facilities;
- The TFR Diversion has been completed and the decommissioned Port Elizabeth Railway Line is being dismantled;
- River Diversion associated with the TFR Diversion;
- Mine Workshops; and
- Offices.

Linear Activities Connecting the Farms Include:

- Conveyors;
- Roads; and
- Power lines.

Table 32: Details of Applicant

Project applicant:	Assmang (Pty) Ltd: Khumani Iron Ore Mine
Registration no (if any):	1935/007343/06
Trading name (if any):	Assmang (Pty) Limited - Khumani Iron Ore Mine
Responsible Person, (e.g. Director, CEO, etc.):	Mr Dirk Coetzee
Contact person:	Mr Dirk Coetzee
Physical address:	Khumani Iron Ore Mine, Kathu, Northern Cape Province, 15km south of Kathu, along the N14
Postal address:	Private Bag X503, Kathu, Northern Cape Province, 8446
Postal code:	8446
Telephone:	+27 (0) 53 723 8090
E-mail:	Dirk.Coetzee@assmang.co.za
Cell Phone Number	+27 (0) 83 459 7580
Fax:	+27 (0) 53 723 8599

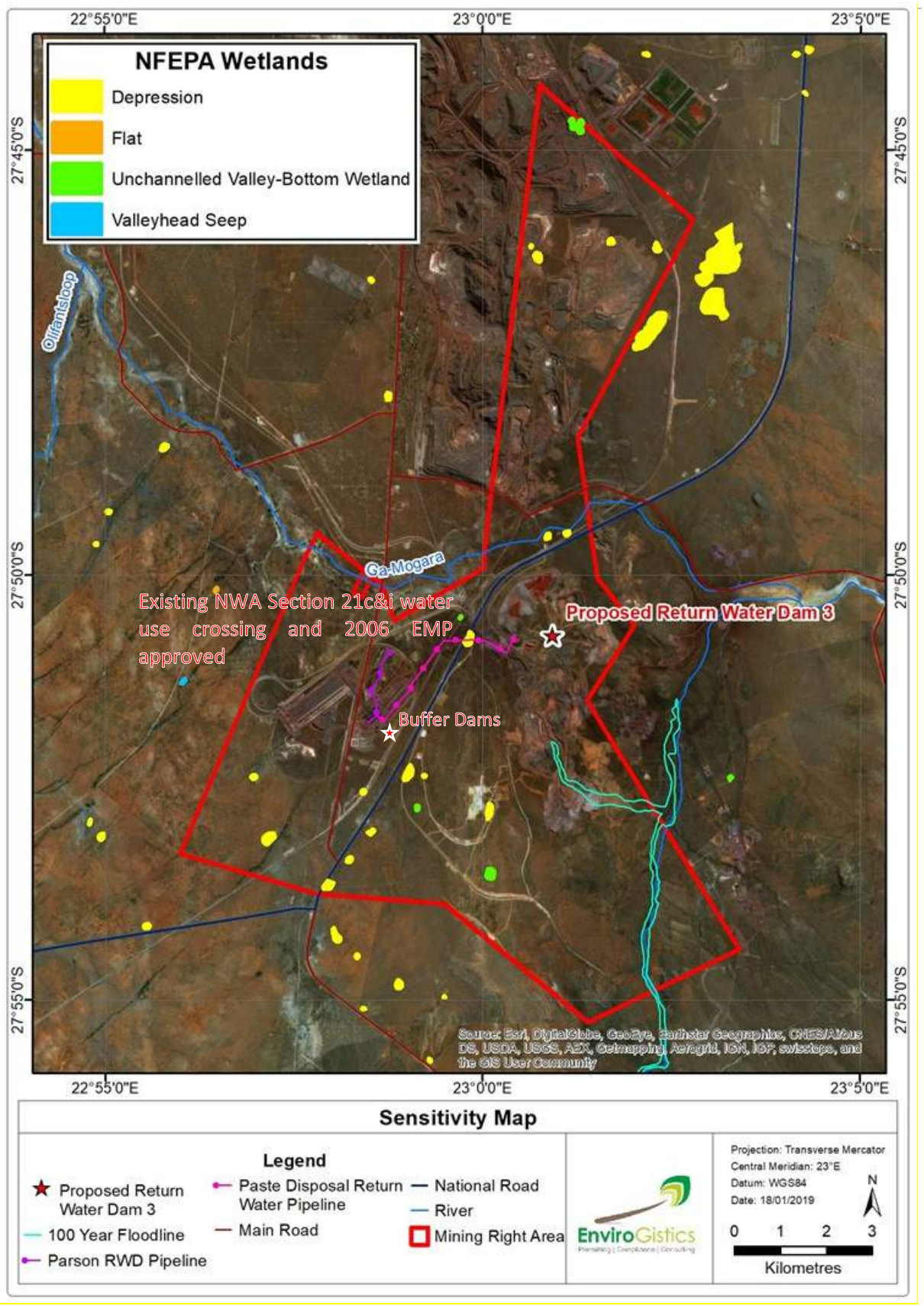
1.b Description of the Aspects of the Activity

The activities associated with this EMPr is presented in Section 1.d of Part A of this report. The specific aspects associated with the activities are presented in Section 1.g.iv.1.

1.c Composite Map

Refer to the following figures for the sensitivities assessed:

- Figure 26: NFEPA Wetlands and Rivers;
- Figure 29: Land Cover within the study area; and
- Figure 31: Final Site Map.


NFEPA Wetlands
Depression
Flat
Unchannelled Valley-Bottom Wetland
Valleyhead Seep
22°55'0"E
23°0'0"E
23°5'0"E
27°45'0"S
27°50'0"S
27°55'0"S
Olifantsloop
Ga-Mogara
Existing NWA Section 21c&i water use crossing and 2006 EMP approved
Proposed Return Water Dam 3
Buffer Dams
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community
Sensitivity Map
Legend
Proposed Return Water Dam 3
100 Year Floodline
Parson RWD Pipeline
Paste Disposal Return Water Pipeline
Main Road
National Road
River
Mining Right Area
EnviroGistics
Projection: Transverse Mercator
Central Meridian: 23°E
Datum: WGS84
Date: 18/01/2019
N
0 1 2 3
Kilometres

1.d Description of Impact Management Objectives including management statement

1.d.i Determination of closure objectives

The proposed final land use would be to return the area to near pre-mining conditions, where residual impacts will be minimised and the area is left with no safety threat to humans or animals. This would include demolishing surface infrastructure that will not be handed over to a third party and promoting the growth of vegetation. It is evident that the re-establishment of this vegetation biome on site will not be difficult as areas that have already undergone rehabilitation have seen a large success in terms of the revegetation.

Please refer to Section 1.l in Part A for the detailed list of objectives.

1.d.ii The process for managing any environmental damage, pollution, pumping and treatment of extraneous water or ecological degradation as a result of undertaking a listed activity

Please refer to Table 22 to Table 25 for a detailed list of all impacts and management measures. The following section describes general rehabilitation strategies to assist with mine wide rehabilitation.

Water Resources:

Management of the water and aquatic resources typically should include the following:

- Demolition footprint must be clearly demarcated and no related activities, including the movement of vehicles, must be permitted to occur outside of the footprint area;
- All related waste and rubble must be removed from site and disposed of according to relevant SABS standards. No waste must be permitted to enter freshwater resources;
- Effects such as erosion must be monitored and managed;
- All areas affected by stockpiling during the operational phase of the mine should be rehabilitated and stabilised using cladding or a suitable grass mix to prevent sedimentation of the freshwater resources in the area;
- Upon closure all roads which are no longer required, as well as all unnecessary mining infrastructure (including temporary structures) should be removed to minimise the impacts on the aquatic resources of the area beyond the life of mine. Compacted soils should be ripped and revegetated with indigenous vegetation to prevent erosion, sheet runoff, and discourage the establishment of alien floral species post-closure;
- All affected areas should be resloped and dressed with topsoil where necessary and reseeded with indigenous grasses if self-succession is not achieved;
- It is critical that ongoing monitoring of alien vegetation is maintained post-closure, as proliferation of alien vegetation in the demolition areas is expected; and
- Ongoing water monitoring should take place throughout the closure phase of the mine and should continue into the post closure phase to define latent impacts that need to be mitigated

Soil Management

Soil management measures typically include the following:

- The rehabilitated areas should be profiled to replicate natural landforms;
- When there is insufficient soil material for use, select suitable sub surface materials (i.e. those that are neither saline nor sodic) to use as a substitute for soil when covering rehabilitated areas; and
- Ensure organic content is sufficient to sustain microbial activity, encourage infiltration, limit runoff and improve soil stability. Despite not being practical, mulch with grass clippings (cut when seed content is at its highest) as an attempt to provide a seed bank.

Shaping and Levelling

Disturbed areas should be shaped and levelled to create a gently sloping, free-draining topography.

Soil Compaction Alleviation

In order to alleviate or reduce soil compaction the following should take place:

- Rip all disturbed footprints and heavily compacted areas (hard pans, access roads);

- Soil should be ripped when moist to allow for maximum alleviation of compaction; and
- Soils should be moved and/or replaced when they are dry to minimise compaction.

Erosion Control

The following should be done as part of erosion control on rehabilitated land:

- Unnecessary disturbance and vegetation removal should be avoided and prevented;
- Pre-development drainage patterns should be reinstated as far possible; and
- Rehabilitated areas should be monitored for erosion.

Vegetation Establishment

The establishment of natural vegetation is a necessary component of the decommissioning and rehabilitation phase. The overall objectives for the establishment of natural vegetation of reshaped areas are to:

- Prevent erosion;
- Avoid soil loss;
- Restore the land to the agreed land capability;
- Reduce sedimentation into aquatic ecosystems such as rivers and streams;
- Re-establish ecosystem processes (succession) to ensure that a sustainable land use can be established without requiring excessive fertiliser additions; and
- Restore the biodiversity of the area as far as possible.

In order to ensure vegetation establishment, the following should be done:

- Rehabilitated areas should be properly prepared;
- Growth properties should be improved by the addition of organic matter and fertiliser, if required.

Alien and Invasive Species Management

- There must be no planting of alien plants within the mining area;
- The transportation of soils or other substrates infested with alien species should be strictly controlled;
- Benefits to local communities as a result of the alien and invasive plant species control programme should be maximised by not only ensuring that local labour is employed, but by also ensuring that cleared alien trees are treated as a valuable wood resource that can be utilised; and
- Regular vegetation monitoring of the site should take place.

Table 33: Environmental Relinquishment Criteria per environmental aspect

Environmental Aspect	Closure criteria	Monitoring Requirement	Reporting Requirement
Biodiversity	Ensure establishment of vegetation has a basal cover of a reference site 3 years post-closure and that it is self-sustaining and can be measured over a 3 year period after mine closure, indicating that natural succession has occurred.	Quarterly vegetation monitoring and rehabilitation monitoring.	Vegetation Monitoring Reports
Groundwater	Groundwater qualities after mine closure need to comply with the qualities as stipulated in the WUL and the appropriate standards set by the DWS and South African National Standards (SANS).	Quarterly groundwater monitoring for 3 years after mine closure.	Groundwater Monitoring Reports
Surface Water	Surface water qualities after mine closure need to comply with the qualities as stipulated in the WUL and the appropriate standards set by the DWS and SANS.	Quarterly surface water monitoring for 3 years after mine closure.	Surface Water Monitoring Reports
Social	Engagement with stakeholders and employees regarding closure related aspect and formulisation of a retrenchment and downscaling policy demonstrating training initiatives and skills development assisting in employees being upskilled, which would help individuals to seek for alternative employment at the time of closure.	Engagement, training and skills development policies during operational phase.	Records of correspondence, training matrices and records of training.

Environmental Aspect	Closure criteria	Monitoring Requirement	Reporting Requirement
Air Quality	Dust must comply with the minimum standards and limits as set by the NEM:AQA and applicable regulations and guidelines.	Monthly air quality monitoring during the decommissioning and rehabilitation phase.	Air Quality Monitoring Reports
Soil, Land Capability and Land Use	Post land use mining assessment to determine status of rehabilitated areas with respect to soil quality and that rehabilitated areas have been rehabilitated to an agreed upon land use. In addition to the above, inspections should be undertaken to identify areas of erosion and that erosion measures have been constructed.	Quarterly soil chemistry and physical properties analysis during the rehabilitation phase. Quarterly soil erosion monitoring during the rehabilitation phase.	Soil Quality and Erosion Monitoring Reports
Erosion	Implementation or construction of erosion control measures.	Geotechnical and hydrological studies of existing structures. Evidence in rehabilitation report that appropriate risk assessment has been	Erosion Monitoring Reports
Safety	Ensure dangerous mining areas, such as open quarry areas, have been appropriately bunded and appropriate signage erected.	Visual inspections and sign off report by a registered engineer.	Signed off report by registered engineer.

Please refer to Table 34 for the rehabilitation requirements for each of the project areas.

The following table presents the relinquishment requirement in terms of the infrastructure:

Table 34: Infrastructural Relinquishment Criteria

	Components	Objectives & Specifications (per EMPr and engineering principals)
1	**Topography**	Shape to blend in with surrounding topography
2	**Roads**	
	Access Roads (gravel)	Rip, shape, topsoil, self-revegetate
	Haul Roads (gravel & treated for dust allaying)	Rip, shape, topsoil, self-revegetate
	Tarred Roads (bituminous tar)	Strip top layer to 500mm below surface. Dispose bituminous contents safely. Shape, rip, and cover with topsoil for revegetation/self-vegetation.
3	**Salvageable items**	Remove steel, recoverable building materials, equipment and fittings to salvage stockpile(s).
4	**Steel Structures**	Dismantle to salvage stockpile
5	**Brick Structures**	Dismantle to salvage stockpile.
6	**Foundations, cables and pipes**	Remove to 1m below surface. Deeper than 1m remains in place.
7	**Concrete structures**	Dismantle to spoil
8	**Railway lines**	Dismantle steel & sleepers to stockpile, ballast to spoil
9	**Power lines**	Dismantle to salvage stockpile
10	**Pipe lines**	Dismantle to salvage stockpile
11	**Fencing**	Remove redundant to salvage stockpile
12	**Materials balance (i.e. topsoil on site)**	Four (4) topsoil stockpiles available on site
13	**Hazardous waste disposal (transport and disposal site location)**	Collect & dispose at Holfontein Landfill Site
14	**Slope angles on dumps**	18 degrees (per 2006 EMPr). Include berms/terraces for runoff velocity reduction where necessary. Refer page 6-115 of EMPr (2006). Also cover with 150mm topsoil.
15	**Open pits**	Backfill if viable, alternatively enviro berm with thorn bush vegetation cover. Upstream diversion to remain in place for open voids.
16	**Tailings Storage Facility**	Slope angles of 1:3, benches 6-10m. Topsoil cover (150mm) and revegetate.
17	**Backfill vs enviro berm**	Per mine plan
18	**Product stockpiles**	Sale first, alternatively use material as backfill

Components		Objectives & Specifications (per EMPr and engineering principals)
19	**Earthworks (load & haul, doze, shape, topsoil spread, survey etc.)**	Specified by Civils Engineer during evaluation
20	**Science/Risk (EMPr, WUL etc.)**	
	Surface water	Water diversion to remain in place
	Waste disposal (inert, domestic & hazardous)	Subject to waste classification
	Dust control during rehab & closure phase	Allow for dust suppression
	Groundwater	Recharge into backfilled voids post rehabilitation should be encouraged
	Vegetative screening	Plant trees and shrubs along southern side of N14's view towards Paste Disposal Facility
21	**Mine Plan correlation**	Yes
22	**Regulation (laws, regulations & guidelines)**	Refer to applicable section in report
23	**Post-closure risk (groundwater contamination etc.)**	None at present
24	**Post closure land use and land capability**	Grazing land, apart from paste facility and opencast voids
25	**Social & Labour Plan**	Yes

1.d.iii Potential risk of Acid Mine Drainage

According to the 2006 EMPr, no acid-mine drainage reactions are expected because neither carbonaceous nor base metal materials occur in sufficient volumes to cause an impact. The *in situ* ore and host rock are chemically inert and ion exchange and accompanying groundwater contamination do not occur.

1.d.iv Steps taken to investigate, assess, and evaluate the impact of acid mine drainage

Please refer to the section above.

1.d.v Engineering or mine design solutions to be implemented to avoid or remedy acid mine drainage

Please refer to the sections above. Based on the specialist studies there are no acid mine drainage expected from activities taking place on site.

1.d.vi Measures that will be put in place to remedy any residual or cumulative impact that may result from acid mine drainage.

Please refer to the sections above. Based on the specialist studies there are no acid mine drainage expected from activities taking place on site.

1.d.vii Volumes and rate of water use required for the mining, trenching or bulk sampling operation.

No additional water requirements are associated with this Environmental Authorisation, the project allows for the optimisation of the internal water circuit.

All water to be sourced will arise from the Sedibeng Pipeline Scheme for the purposes of the current mining operation. The purpose of this project is to optimise the reuse of water within the mining process.

1.d.viii Has a water use licence has been applied for?

A Water Use Licence Application (WULA) has not yet been submitted. A WULA will be submitted prior to the commencement of the proposed project. No activities will be undertaken without the necessary approvals.

The WUL will not only cater for this project, but will be an update of the overall mine WUL to correct all changes and administrative errors. For this project, the following activities may trigger water uses:

- GN 704 exemption for the use of discard rock in the construction of the Return Water Dam walls and upgrade of existing facilities, as well as the storage of process water and storm water in the Parson PCD;
- Section 21(g) for the backfilling of opencast pits as part of rehabilitation practices as approved in the EMPr;
- Section 21(g) for the storage of water in the new Return Water Dam 3 and King Water Containment Facility; and
- Various amendments due to the upgrade of existing facilities on site.

1.d.ix Impacts to be mitigated in their respective phases

Please refer to Table 8 for the discussion on the sizes of disturbance.

Table 35: Impacts to be mitigated in their respective phases (Planning Phase)

Name of Activity	Project	Impact Area	Potential Impacts	Rating	Mitigation Type	Rating	Performance Objectives	Goals	Time Period for Implementation				Action Plan			
Activities				SbM	Mitigation Measures	SaM			Short Term (1-12 mth)	Medium Term (1-5 yr.)	Long Term (5 yr. +)	LoM	Compliance with Standard	Functional Requirements for Monitoring	Responsibility	Monitoring and Reporting Frequency
Planning Phase																
Legal Requirements (Environmental Permits)	1, 2, 3	Legal Compliance	Unlawful water and waste activities, which could lead to NWA Directives and Section 24G Rectification fines.	-14	A legal assessment of all activities and future planned activities must be undertaken annually to ensure that all activities are authorised.	17	To operate within the enviro-legal ambits of South Africa.	Ensure that all activities undertaken by the mine are lawful with the required environmental licences in place.				x	Compliance in terms of Regulatory Requirements and the implementation of the EMPr.	Appointment of an Independent Environmental Control Officer to assess compliance with the EMPr.	Independent ECO	Monthly for the construction phase. Thereafter annual external audits can be undertaken. Monthly update of legal register.
					All legally appointed personnel responsible or involved in water use activities and activities associated with the Environmental Authorisations on site must receive training on the requirements of the Environmental Authorisations and relevant Environmental Legislation.		To be aware of the latest environmental legal requirements. Proactive knowledge of potential system errors and/or constraints will avoid potential non-compliance or process delays.	All Departments responsible for development of the mine and associated capital projects, must understand the requirements of the environmental legislation and approved Environmental Authorisations and must include such into their planning processes. Operational Environmental Management System that addresses the needs and responsibilities of all departments.				x	Compliance in terms of Regulatory Requirements and the implementation of the EMPr.	Monthly environmental meetings must be implemented to discuss the mining plan, implementation thereof, implication on current Environmental Regulations and potential constraints and liabilities. Minutes must be kept of these meetings and action plans with responsibilities must be drafted. The following must be placed at the site and is applicable to all activities: • Relevant Legislation; • Acts;	SHEQ Department to Coordinate	Monthly Environmental Meetings. Monthly update of legal register. Regular updates of Code of Practices (COPs) and Strategic Operating Plans (SOPs). Annual induction which includes the relevant contents of Environmental Authorisations, approved Environmental Reports and applicable Environmental Legislation. No Go zones map - immediately
					Quarterly internal audits on the lawful implementation of the Environmental Authorisation must be undertaken during the construction phase, where after biannual audits can be undertaken once construction has been completed.											

Name of Activity				Rating	Mitigation Type	Rating			Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	Performance Objectives	Goals	Short Term (1-12 mth)	Medium Term (1-5 yr.)	Long Term (5 yr. +)	LoM	Compliance with Standard	Functional Requirements for Monitoring	Responsibility	Monitoring and Reporting Frequency
					A Water Use Licence (WUL) must be available on site at all times for all Section 21 Water Uses.									• Regulations • COP's • SOP's Management and staff must be trained to understand the contents of these documents and to adhere thereto Environmental Awareness training must be provided to employees. A site layout with all the No Go zones should be compiled.		
					The following buffers should be maintained: No activities may take place within the 1:100 year flood line of the Gamagara River.		Protection of sensitive environments.	Protection of sensitive environments.				x				
Planning the Pipeline route	2	Landowner Relationships	Unlawful placement of activities	-9	Early consultation must be undertaken with the South African National Roads Agency Limited (SANRAL) to determine whether there are any specific requirements in the establishment of the additional pipeline within the existing culvert under the N14.	-4	Maintain good relationship with surrounding mines. Operate within the restrictions set by the SANRAL.	Approved operating procedures, safety files and communication structure and compliance thereto. Management of impacts on road users during construction, operational and decommissioning phases.				x	Continuation of economic activities in the areas of construction. Compliance with Health and Safety Requirements. Compliance with Environmental Authorisations. Compliance with the national Roads Regulations and specific SANRAL requirements.	Initiate discussions with SANRAL regarding the procedures for the procedures and requirements for accessing their surface rights areas.	Engineering Manager	Immediately
					An open channel of consultation must be maintained throughout the process.									Development of code of Practices and Health and Safety Requirements.	SHEQ Department to Coordinate	Immediately
					The SOPs and/or Contactors SOP for the establishment of the pipeline within the road reserve must be compiled.									Maintain discussions and feedback meetings with the impacted parties and maintain records of such consultation.	Engineering Manager.	Quarterly, and more regularly if required.

Table 36: Impacts to be mitigated in their respective phases (Construction Phase)

Name of Activity	Project	Impact Area	Potential Impacts	Rating	Mitigation Type	Rating	Performance Objectives	Goals	Time Period for Implementation				Action Plan			
Activities			Potential Impacts	SbM	Mitigation Measures	SaM			Short Term (1-12 mth)	Medium Term (1-5 yr.)	Long Term (5 yr. +)	LoM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
Construction Phase																
Construction of the Return Water Dam 3		Legal Compliance	Unlawful or incorrect construction of the Return Water Dam 3.	-14	The Return Water Dam 3 footprint must be clearly demarcated. A suitably qualified engineer must be appointed to construct and/or oversee the construction of the Return Water Dam 3 and any other water containment facilities as stipulated in this EMPr. The approved design drawings must be available on site at all times. The Return Water Dam 3 must be constructed in terms of detailed designs signed off by a Registered Engineer. All WUL requirements must be adhered to in terms of the construction of the Return Water Dam 3. As built drawings must be submitted to the DWS and DMR upon completion of the facility. A Code of Practice (COP) must be developed during the construction phase for the operation of the Return Water Dam 3. An Emergency Preparedness Plan must be developed for any incident which may occur around the Paste Disposal Facility which may impact the	-4	Construction of the facilities in terms of designs approved by the DWS.	Ensure that all activities undertaken by the mine are lawful with the required environmental licences in place.	x				Construction of facility in terms of approved Civil Designs. Construction of facilities in terms of the requirements as set out in Government Notices GN 704 of 1999 or as per exemptions granted by the DWS.	Regular meetings must be held during the construction phase between the engineering team and the SHEQ Department to ensure that the design and construction are undertaken in line with the EMPr and WUL requirements. Weekly inspections must be undertaken by the SHEQ Department during the construction phase, with all observations and findings documented and action plans developed for areas of non-compliance.	SHEQ Department to Coordinate	Meetings between departments bimonthly. Internal inspections weekly.

Name of Activity	Project	Impact Area	Potential Impacts	Rating	Mitigation Type	Rating	Performance Objectives	Goals	Time Period for Implementation				Action Plan			
Activities			Potential Impacts	SbM	Mitigation Measures	SaM			Short Term (1-12 mth)	Medium Term (1-5 yr.)	Long Term (5 yr. +)	LoM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
					integrity of the facility itself, as well as the existing Return Water Dams.											
		Geology	The area where the Return Water Dam 3 is planned is characterised by underlying dolomites. The mine is continuously monitoring movement of strata in this area.	-13	Ongoing monitoring of movement around the Paste Disposal Facility must continue. The Return Water Dam 3 must be constructed in terms of detailed designs signed off by a Registered Engineer and the on-site Geologist. An effective liner system should be implemented to ensure that no seepage from the facility occurs. Underdrainage systems must be in place to monitor the presence of seep.	-5	Operations of water containment and waste containment facilities within a stable environment.	No seepage or incidents of failure of facilities.				x	Ongoing monitoring of movement underlying the Paste Disposal Facility. Regular update of dolomitic reports in conjunction with movement results.	Maintenance and operation of movement beacons. Dolomitic Reports. Regular meetings must be held throughout the life cycle of the facility between the mining team and the SHEQ Department to ensure that the design and construction are undertaken in line with the EMPr and WUL requirements.	Mining Department and SHEQ Department	Maintenance and operation of beacons - ongoing. Dolomitic reports annually or as agreed to between the mine and the DMR/ DWS. Meetings between departments quarterly.
		Topography	No further impact is foreseen as the area is located within the Paste Disposal Footprint.	-	-	-	-									
		Soil and Land use	Contamination of soils as a result of a lack of sanitary services	-11	Chemical toilets must be readily available to employees where permanent infrastructure is not available. Licensed companies must be appointed to remove any contaminated material and or wastes to licensed landfill sites.	-5	Protecting of soil integrity.	Zero presence of contaminated land due to early detection and implementation of actions.	x	-	-	-	Soil Integrity	Contracts must be in place for the provision of chemical toilets where required. Removal companies must have the necessary contracts and permits in place.	SHEQ Department	Daily internal inspections. Annual review of supply and removal companies contracts and permits.

Name of Activity	Project	Impact Area	Potential Impacts	Rating	Mitigation Type	Rating	Performance Objectives	Goals	Time Period for Implementation				Action Plan			
Activities			Potential Impacts	SbM	Mitigation Measures	SaM			Short Term (1-12 mth)	Medium Term (1-5 yr.)	Long Term (5 yr. +)	LoM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
		Ecology	The establishment of alien and invasive plant species.	-13	An alien and invasive plant species eradication programme will be developed and implemented to eradicate alien and invasive plants and to prevent new invasions during the ongoing mining operation. If natural succession of vegetation is not established within one rainy season after commencement of rehabilitation, the disturbed areas and areas adjacent to the infrastructural areas must be re-vegetated with an indigenous grass mix, if necessary, to re-establish a protective cover, to minimise soil erosion and dust emission. In the event that new areas, previously not altered due to mining activities, an ecological walk-over study must be undertaken to determine whether any protected or sensitive species are present. If such species are present, the required permits must be obtained.	-2	Limit the impact of the mining operation on the Ecological Setting of the area.	Reduce the presence of invader species by 90% on site.				x	Invasion of Alien and Weed Vegetation.	An alien and invasive plant species Alien and Invasive Eradication Plan must be implemented on site. This must be undertaken prior to the growing season. An ecological study should be undertaken to determine the status of revegetation on the site especially around the rehabilitated areas.	SHEQ Department and a Specialised Ecologist.	Weed monitoring (monthly) Weed eradication (annually or as required) Ecological Study (every second year))
			The unmanaged disposal of waste, could result in the spread of invader	-12	Develop dedicated waste handling areas; prevent access to rodents and opportunistic species; prevent the spread of waste.	-5	Proper waste management practices on site.	No unlawful disposal of waste. Registration of all waste handling and/or storage areas on site.	x			x	Ongoing Rehabilitation	Ongoing waste classification and management processes to be implemented. Updated waste	SHEQ Department	SHEQ: Weekly inspections. Regular update in terms of procedure

Name of Activity	Project	Impact Area	Potential Impacts	Rating	Mitigation Type	Rating	Performance Objectives	Goals	Time Period for Implementation				Action Plan			
Activities			Potential Impacts	SbM	Mitigation Measures	SaM			Short Term (1-12 mth)	Medium Term (1-5 yr.)	Long Term (5 yr. +)	LoM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
			species, as well as the influx of opportunistic species.		Develop dedicated waste handling areas, fit for purpose and prevent the spread of waste.									inventory to be available on site. Waste Management and Handling Procedure to be available on site and updated regularly.		requirements. Waste Classification of Waste Rock every five (5) years.
		Surface Water	Release of Contaminated Water into the environment is unlikely as the Return Water Dam 3 is located within the overall dirty water system. The changes to water management due to the construction of the facility could however impact on the integrity of the existing system.	-7	Clean and Dirty water separation systems should be upgraded in terms of the 2018 Water Studies undertaken by Geo Tail (Pty) Ltd. Measures should be implemented during the construction phase to ensure that excess silt is contained and not released into the water management area and thereby hampering its GN 704 compliance in terms of capacity and freeboard. Maintenance of all Storm Water Management systems must be undertaken regularly on site.	-5	Limit the impact of the mining operation within the overall water catchment. Optimise the reuse of water in the mining area.	Improved the reuse of water within the system by at least 10% in the first year of the implementation of the Return Water Dam and other water circuit infrastructure such as the development of the pipelines from the Pollution Control Dam at Parson Plant. Achieve 100% compliance to the water quality objectives as agreed to between the mine and the DWS based on the discussions within this IWWMP.	x	x			Quality of water within the overall water catchment and internal water circuit.	The water quality (constituents listed in the WUL) of the dam must be monitored monthly and records must be kept of these result in a centralised system. Analysis of results must be undertaken by an accredited laboratory. Regular inspections must be undertaken to ensure that the facility is operated in line with the GN 704 (1999) requirements.	SHEQ Department and Hydrologist	Annual GN 704 Audits by a Hydrologist. Monthly surface water quality monitoring or as stipulated in the WUL..
		Groundwater	Damage to the existing liners and underdrains may lead to groundwater pollution	-8	The Return Water Dam 3 must be constructed in terms of detailed designs signed off by a Registered Engineer and the on-site Geologist. The facility should be constructed under the	-4	Limit the impact of the mining operation within the overall water catchment.	Achieve 100% compliance to the water quality objectives as agreed to between the mine and the DWS.	x	x			Quality of water within the overall water catchment and internal water circuit.	The groundwater quality (constituents listed in the WUL) must be monitored quarterly and records must be kept of these	SHEQ Department and Hydrogeologist	Quarterly groundwater monitoring or as stipulated in the WUL.. Annual numerical models or as

Name of Activity	Project	Impact Area	Potential Impacts	Rating	Mitigation Type	Rating	Performance Objectives	Goals	Time Period for Implementation				Action Plan			
Activities			Potential Impacts	SbM	Mitigation Measures	SaM			Short Term (1-12 mth)	Medium Term (1-5 yr.)	Long Term (5 yr. +)	LoM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
					supervision of a Registered Engineer.									result in a centralised system. Analysis of results must be undertaken by an accredited laboratory. Annual inspection reports on the integrity of the facility as a component of the Paste Disposal Facility should be undertaken. Numerical groundwater models must be used to determine the movement of any potential pollution plume.		stipulated in the WUL. Annual inspection report on the Paste Disposal Facility and associated Return Water Dams to be undertaken by a suitably qualified engineer.
					Groundwater monitoring must continue in line with the requirements of the approved WUL.											
		Air Quality	Construction activities and material movement may temporarily result in dust dispersion.	-6	Maintain the current air quality monitoring stations that determine fallout and implemented respirable dust (PM10) monitoring that could arise from the mining activities.	-4	Recording of dust fall out to determine trends.	Meeting ambient dust fall out limits in terms of applicable NEM:AQA Regulations.	x			x	National Dust Regulation Compliance.	Dust dispersion will be monitored in line with the current dust monitoring programme	SHEQ Department.	Monthly Monitoring with Annual Reporting.
					Implement dust suppression in and around the construction area where required.											
		Noise	The activities are located within the mining boundary, in proximity to the current King Plant and	-	-	-	-	-	-	-	-	-	-	-	-	-

Name of Activity	Project	Impact Area	Potential Impacts	Rating	Mitigation Type	Rating	Performance Objectives	Goals	Time Period for Implementation				Action Plan			
Activities			Potential Impacts	SbM	Mitigation Measures	SaM			Short Term (1-12 mth)	Medium Term (1-5 yr.)	Long Term (5 yr. +)	LoM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
			the operational Paste Disposal Facility. No impacts in terms of noise are anticipated.													
		Heritage	No further impact is foreseen as the area is located within the Paste Disposal Footprint, no clearance of soils or underlying material will be required. All activities will remain within approved footprints.	-	-	-	-	-	-	-	-	-	-	-	-	-
		Socio-Economic	The Return Water Dam 3 is planned in terms of overall water management on site. The construction activities should have no impact on the Socio-Economic Setting in which the mine is located.	-	-	-	-	-	-	-	-	-	-	-	-	-
Construction of the new Storm Water Containment Facility on King		Legal Compliance	Unlawful or incorrect construction of the new King Water	-14	The footprint must be clearly demarcated. A suitably qualified engineer must be appointed to construct and/or oversee the	-4	Construction of the facilities in terms of designs approved by the DWS.	Ensure that all activities undertaken by the mine are lawful with the required	x				Construction of facilities in terms of the requirements as set out in Government	Weekly inspections must be undertaken by the SHEQ Department during the	SHEQ Department to Coordinate	Meetings between departments bimonthly. Internal

Name of Activity	Project	Impact Area	Potential Impacts	Rating	Mitigation Type	Rating	Performance Objectives	Goals	Time Period for Implementation				Action Plan			
Activities			Potential Impacts	SbM	Mitigation Measures	SaM			Short Term (1-12 mth)	Medium Term (1-5 yr.)	Long Term (5 yr. +)	LoM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
			Containment Facility.		construction of the Return Water Dam 3 and any other water containment facilities as stipulated in this EMPr. The facility will be constructed as a tank system and not an excavated dam. All WUL requirements must be adhered to in terms of the construction of the tank.			environmental licences in place.					Notices GN 704 of 1999 or as per exemptions granted by the DWS.	construction phase, with all observations and findings documented and action plans developed for areas of non-compliance.		inspections weekly.
		Geology	No impact is foreseen.	-	-	-	-									
		Topography	No further impact is foreseen as the area is located within the approved mining area.	-	-	-	-									
		Soil and Land use	Contamination of soils as a result of a lack of sanitary services	-11	Chemical toilets must be readily available to employees where permanent infrastructure is not available. Licensed companies must be appointed to remove any	-5	Protecting of soil integrity.	Zero presence of contaminated land due to early detection and implementation of actions.	x	-	-	-	Soil Integrity	Contracts must be in place for the provision of chemical toilets where required. Removal companies must have the necessary	SHEQ Department	Daily internal inspections. Annual review of supply and removal companies contracts and permits.

Name of Activity	Project	Impact Area	Potential Impacts	Rating	Mitigation Type	Rating	Performance Objectives	Goals	Time Period for Implementation				Action Plan			
Activities			Potential Impacts	SbM	Mitigation Measures	SaM			Short Term (1-12 mth)	Medium Term (1-5 yr.)	Long Term (5 yr. +)	LoM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
					contaminated material and or wastes to licensed landfill sites.									contracts and permits in place.		
			Clearing vegetation will result in the exposure of soil, which may in turn lead to soil erosion.	-11	Ensure the required erosion protection measures are monitored and corrected where necessary. Natural vegetation establishment (self-succession) will be encouraged on cleared areas, and topsoil stockpiles. If natural succession of vegetation is not established within one rainy season, after rehabilitation, the disturbed areas and areas adjacent to the infrastructural areas must be re-vegetated with an indigenous grass mix, if necessary, to re-establish a protective cover, to minimise soil erosion and dust emission. The mine will investigate an appropriate seed mix for the rehabilitation purposes should self-succession not establish on rehabilitated sites. If possible, vegetation clearance (if required) and commencement of construction activities can be scheduled to coincide with low rainfall conditions when the erosive storm water and wind are anticipated to be low.	-6	Limit the loss of soils as far as possible and ensure that the integrity remains during stockpiling for the purposes of successful rehabilitation. Protect the soil resources within the area in which the mine operates.	The integrity of the soils stockpiled must remain suitable for the purposes of rehabilitation.	x			x	Soil Erosion and incorrect stockpiling of topsoil.	Appointment of an Independent Environmental Control Officer to assess compliance with the EMPr. The SHEQ department should undertake ongoing site monitoring to determine whether activities on site are undertaken in accordance with the EMPr Requirements. Erosion protection measures should be implemented and monitored on areas identified. Photographic records of assessments must be kept.	Independent ECO and SHEQ Department.	ECO: Monthly for the construction phase. Thereafter annual external audits can be undertaken. SHEQ: Weekly monitoring

Name of Activity	Project	Impact Area	Potential Impacts	Rating	Mitigation Type	Rating	Performance Objectives	Goals	Time Period for Implementation				Action Plan			
Activities			Potential Impacts	SbM	Mitigation Measures	SaM			Short Term (1-12 mth)	Medium Term (1-5 yr.)	Long Term (5 yr. +)	LoM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
					No construction or project related activities may be undertaken outside of the demarcated areas.											
		Ecology	The establishment of alien and invasive plant species.	-13	An alien and invasive plant species eradication programme will be developed and implemented to eradicate alien and invasive plants and to prevent new invasions during the ongoing mining operation. If natural succession of vegetation is not established within one rainy season after commencement of rehabilitation, the disturbed areas and areas adjacent to the infrastructural areas must be re-vegetated with an indigenous grass mix, if necessary, to re-establish a protective cover, to minimise soil erosion and dust emission. In the event that new areas, previously not altered due to mining activities, an ecological walk-over study must be undertaken to determine whether any protected or sensitive species are present. If such species are present, the required permits must be obtained.	-2	Limit the impact of the mining operation on the Ecological Setting of the area.	Reduce the presence of invader species by 90% on site.				x	Invasion of Alien and Weed Vegetation.	An alien and invasive plant species Alien and Invasive Eradication Plan must be implemented on site. This must be undertaken prior to the growing season. An ecological study should be undertaken to determine the status of revegetation on the site especially around the rehabilitated areas.	SHEQ Department and a Specialised Ecologist.	Weed monitoring (monthly) Weed eradication (annually or as required) Ecological Study (every second year))
			The unmanaged disposal of	-12	Develop dedicated waste handling areas; prevent access to	-5	Proper waste management	No unlawful disposal of waste.	x			x	Ongoing Rehabilitation	Ongoing waste classification and management	SHEQ Department	SHEQ: Weekly inspections.

Name of Activity	Project	Impact Area	Potential Impacts	Rating	Mitigation Type	Rating	Performance Objectives	Goals	Time Period for Implementation				Action Plan			
Activities			Potential Impacts	SbM	Mitigation Measures	SaM			Short Term (1-12 mth)	Medium Term (1-5 yr.)	Long Term (5 yr. +)	LoM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
			waste, could result in the spread of invader species, as well as the influx of opportunistic species.		rodents and opportunistic species; prevent the spread of waste. Develop dedicated waste handling areas, fit for purpose and prevent the spread of waste.		practices on site.	Registration of all waste handling and/or storage areas on site.						processes to be implemented. Updated waste inventory to be available on site. Waste Management and Handling Procedure to be available on site and updated regularly.		Regular update in terms of procedure requirements. Waste Classification of Waste Rock every five (5) years.
		Surface Water	Release of Contaminated Water into the environment is unlikely as the containment facility is located within the overall dirty water system. The changes to water management due to the construction of the facility could however impact on the integrity of the existing system.	-7	Clean and Dirty water separation systems should be upgraded in terms of the 2018 Water Studies undertaken by Geo Tail (Pty) Ltd. Measures should be implemented during the construction phase to ensure that excess silt is contained and not released into the water management area and thereby hampering its GN 704 compliance in terms of capacity and freeboard. Maintenance of all Storm Water Management systems must be undertaken regularly on site.	-5	Limit the impact of the mining operation within the overall water catchment. Optimise the reuse of water in the mining area.	Improved the reuse of water within the system by at least 10% in the first year of the implementation of the Return Water Dam and other water circuit infrastructure such as the development of the pipelines from the Pollution Control Dam at Parson Plant. Achieve 100% compliance to the water quality objectives as agreed to between the mine and the DWS.	x	x			Quality of water within the overall water catchment and internal water circuit.	The water quality (constituents listed in the WUL) of the dam must be monitored monthly and records must be kept of these result in a centralised system. Analysis of results must be undertaken by an accredited laboratory. Regular inspections must be undertaken to ensure that the facility is operated in line with the GN 704 (1999) requirements.	SHEQ Department and Hydrologist	Annual GN 704 Audits by a Hydrologist. Monthly surface water quality monitoring or as stipulated in the WUL.
		Groundwater	No impact is foreseen as the facility will be a tank structure.	-	-	-	-									
		Air Quality	Construction activities and material movement	-6	Maintain the current air quality monitoring stations that determine fallout and	-4	Recording of dust fall out to determine trends.	Meeting ambient dust fall out limits in terms of applicable	x			x	National Dust Regulation Compliance.	Dust dispersion will be monitored in line with the current dust	SHEQ Department.	Monthly Monitoring with Annual Reporting.

Name of Activity	Project	Impact Area	Potential Impacts	Rating	Mitigation Type	Rating	Performance Objectives	Goals	Time Period for Implementation				Action Plan			
Activities			Potential Impacts	SbM	Mitigation Measures	SaM			Short Term (1-12 mth)	Medium Term (1-5 yr.)	Long Term (5 yr. +)	LoM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
			may temporarily result in dust dispersion.		implemented respirable dust (PM10) monitoring that could arise from the mining activities. Implement dust suppression in and around the construction area where required.			NEM:AQA Regulations.						monitoring programme		
		Noise	The activities are located within the mining boundary, in proximity to the current King Plant and the operational Paste Disposal Facility. No impacts in terms of noise are anticipated.	-	-	-	-	-	-	-	-	-	-	-	-	-
		Heritage	No further impact is foreseen as the area is located within the Paste Disposal Footprint, no clearance of soils or underlying material will be required. All activities will remain within approved footprints.	-	-	-	-	-	-	-	-	-	-	-	-	-
		Socio-Economic	The Return Water Dam 3 is planned in terms of	-	-	-	-	-	-	-	-	-	-	-	-	-

Name of Activity	Project	Impact Area	Potential Impacts	Rating	Mitigation Type	Rating	Performance Objectives	Goals	Time Period for Implementation				Action Plan			
Activities			Potential Impacts	SbM	Mitigation Measures	SaM			Short Term (1-12 mth)	Medium Term (1-5 yr.)	Long Term (5 yr. +)	LoM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
			overall water management on site. The construction activities should have no impact on the Socio-Economic Setting in which the mine is located.													
Construction of the Pipelines		Geology	No impact is foreseen to take place on geology as a result of the pipeline construction.	-	-	-	-	-	-	-	-	-	-	-	-	-
		Topography	No further impact is foreseen as the area is located within the existing buffer in which pipelines are located to and from the Paste Disposal Facility.	-	-	-	-	-	-	-	-	-	-	-	-	-
		Soil and Land use	No further impact is foreseen as the area is located within the existing buffer in which pipelines are located to and from the Paste Disposal Facility. However the construction	-11	Vehicles and machinery will be regularly maintained. Maintenance programmes will be established and implemented. Storage of fuels and oils, the refuelling of vehicles and equipment maintenance must be limited to designated, bunded (bunds to be 110% of volume of the	-6	Protecting of soil integrity.	Zero presence of contaminated land due to early detection and implementation of actions.	x			x	Soil Pollution Prevention	The SHEQ department should undertake ongoing site monitoring to determine whether activities on site are undertaken in accordance with the EMPr Requirements. This should be undertaken by means of a	SHEQ Department	ECO: Annual external audits can be undertaken. SHEQ: Weekly monitoring.

Name of Activity	Project	Impact Area	Potential Impacts	Rating	Mitigation Type	Rating	Performance Objectives	Goals	Time Period for Implementation				Action Plan			
Activities			Potential Impacts	SbM	Mitigation Measures	SaM			Short Term (1-12 mth)	Medium Term (1-5 yr.)	Long Term (5 yr. +)	LoM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
			phase may involve the use of hydrocarbons in the establishment of the pipeline structures. Vehicle movement in the area could also lead to soil contamination if not well managed. The presence of people in this area could lead to an increase in littering.		materials stored) areas.									thorough site visit, record keeping of findings in a checklist format, issuing of non-conformances to responsible parties, listing thereof on the Isometrics or similar reporting system and feedback to the management team.		
					Chemicals and hazardous material must be stored in suitable containers, fit for purpose and in line with SDS requirements.											
					A spill kit must be provided to be used in the event of a spill.									Ensure that a Hydrocarbon Management Procedure and Spill Prevention and Emergency Spill Response Plan is available on site and updated regularly.		Regular update in terms of procedure requirements.
					If a spill occurs, the contaminated soil must be removed immediately. Contaminated soil must be stored according to best practices until it can be disposed of at a suitably licensed facility.		Awareness creation on site regarding duty of care and waste management.									
					All workers must undergo an induction which includes environmental awareness training to make them aware of the environmental incident management procedures as well as the importance of complying with management measures.											
					Hazardous waste should be removed by a licensed hazardous waste removal company and taken to									Induction with the view on creating environmental awareness.		Annually for permanent staff. Start of each

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					a suitable and licensed landfill site. Documentation of removal and safe disposal must be kept on record and in good order. A detailed waste management strategy will be established and implemented, which will clearly demarcate the containments for different waste streams.											visit for contractors.
			Contamination of soils as a result of a lack of sanitary services	-11	Chemical toilets must be readily available to employees where permanent infrastructure is not available. Licensed companies must be appointed to remove any contaminated material and or wastes to licensed landfill sites.	-5	Protecting of soil integrity.	Zero presence of contaminated land due to early detection and implementation of actions.	x	-	-	-	Soil Integrity	Contracts must be in place for the provision of chemical toilets where required. Removal companies must have the necessary contracts and permits in place.	SHEQ Department	Daily internal inspections. Annual review of supply and removal companies contracts and permits.
		Ecology	The establishment of alien and invasive plant species.	-13	An alien and invasive plant species eradication programme will be developed and implemented to eradicate alien and invasive plants and to prevent new invasions during the ongoing mining operation. If natural succession of vegetation is not established within one rainy season after commencement of rehabilitation, the disturbed areas and areas adjacent to the infrastructural areas must be re-vegetated	-2	Limit the impact of the mining operation on the Ecological Setting of the area.	Reduce the presence of alien and invasive plant species by 90% on site.				x	Invasion of Alien and Weed Vegetation.	A Alien and Invasive Eradication Plan must be implemented on site. This must be undertaken prior to the growing season. An ecological study should be undertaken to determine the status of revegetation on the site especially around the rehabilitated areas.	SHEQ Department and a Specialised Ecologist.	Weed monitoring (monthly) Weed eradication (annually or as required) Ecological Study (every second year))

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Activities			Potential Impacts	SbM	Mitigation Measures	SaM			Short Term (1-12 mth)	Medium Term (1-5 yr.)	Long Term (5 yr. +)	LoM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
					with an indigenous grass mix, if necessary, to re-establish a protective cover, to minimise soil erosion and dust emission. In the event that new areas, previously not altered due to mining activities are disturbed by the proposed activities, an ecological walk-over study must be undertaken to determine whether any protected or sensitive species are present. If such species are present, the required permits must be obtained.											
			The unmanaged disposal of waste, could result in the spread of invader species, as well as the influx of opportunistic species.	-12	Develop dedicated waste handling areas; prevent access to rodents and opportunistic species; prevent the spread of waste. Develop dedicated waste handling areas, fit for purpose and prevent the spread of waste.	-5	Proper waste management practices on site.	No unlawful disposal of waste. Registration of all waste handling and/or storage areas on site.	x			x	Ongoing Rehabilitation	Ongoing waste classification and management processes to be implemented. Updated waste inventory to be available on site. Waste Management and Handling Procedure to be available on site and updated regularly.	SHEQ Department	SHEQ: Weekly inspections. Regular update in terms of procedure requirements. Waste Classification of Waste Rock every five (5) years.
		Surface Water	No impacts are foreseen to take place on surface water, as the pipeline route is not located in close vicinity of watercourses.	-	-	-	-	-	-	-	-	-	-	-	-	-

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		Groundwater	No impact is foreseen to take place on groundwater resources as a result of the pipeline construction.	-	-	-	-	-	-	-	-	-	-	-	-	-
		Air Quality	No impact is foreseen to take place on ambient air quality conditions as a result of the pipeline construction.	-	-	-	-	-	-	-	-	-	-	-	-	-
		Noise	No impact is foreseen to take place on ambient noise conditions as a result of the pipeline construction.	-	-	-	-	-	-	-	-	-	-	-	-	-
		Heritage	No further impact is foreseen as the area is located within the existing buffer constructed for pipelines, to and from the Paste Disposal Facility. No clearance of soils or underlying material will be required. All activities will remain within approved footprints.	-	-	-	-	-	-	-	-	-	-	-	-	-

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		Socio-Economic	The construction activities should have no impact on the Socio-Economic Setting in which the mine is located.	-	-	-	-	-	-	-	-	-	-	-	-	-
Upgrade of approved Water Use Licence Activities	3	Legal Compliance	Unlawful or incorrect construction of the Water Management Systems	-14	The upgrade sites must be clearly demarcated.	-4	-	-	-	-	-	-	-	-	-	
					The approved design drawings must be available on site at all times.											
					The upgrades to approved Water Uses must be undertaken in terms of detailed designs signed off by a Registered Engineer.											
					All WUL requirements must be adhered to in terms of the upgrade of the facilities.											
					As built drawings must be submitted to the DWS and DMR upon completion of the upgrades.											
					A COP must be developed during the construction phase for the operation of the Water Storage Facilities and Mine Residue Facilities in line with the overall Water Conservation and Management requirements as identified in the 2018 Water Studies by Geo Tail (Pty) Ltd or subsequent approved amendments thereto.											

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					An Emergency Preparedness Plan must be developed for any incident which may occur around the Paste Disposal Facility which may impact the integrity of the Facility itself, as well as the existing Return Water Dams.											
		Geology	No impacts are foreseen on the geological conditions of the area. As the upgrades are limited to the areas considered on the lavas and not the dolomites.	-	-	-	-	-	-	-	-	-	-	-	-	
		Topography	No further impact is foreseen as the sites will be located in areas already designed for water containment purposes.	-	-	-	-									
		Soil and Land use	No further impact is foreseen as the sites will be located in areas already designed for water containment purposes or within existing borrow pits.	-	-	-	-	x			x	Soil Erosion and incorrect stock piling of topsoil.	Appointment of an Independent ECO to assess compliance with the EMPr. The SHEQ department should undertake ongoing site monitoring to determine whether	Independent ECO and SHEQ Department.	ECO: Monthly for the construction phase. Thereafter annual external audits can be undertaken. SHEQ: Weekly monitoring	ECO: Monthly for the construction phase. Thereafter annual external audits can be undertaken. SHEQ: Weekly monitoring

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Activities			Potential Impacts	SbM	Mitigation Measures	SaM			Short Term (1-12 mth)	Medium Term (1-5 yr.)	Long Term (5 yr. +)	LoM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
													activities on site are undertaken in accordance with the EMPr Requirements. Erosion protection measures should be implemented and monitored on areas identified. Photographic records of assessments must be kept.			
		Ecology	The establishment of alien and invasive plant species.	-13	An alien and invasive plant species eradication programme will be developed and implemented to eradicate alien and invasive plants and to prevent new invasions during the ongoing mining operation. If natural succession of vegetation is not established within one rainy season, after commencement of rehabilitation, the disturbed areas and areas adjacent to the infrastructural areas must be re-vegetated with an indigenous grass mix, if necessary, to re-establish a protective cover, to minimise soil erosion and dust emission.	-2	Limit the impact of the mining operation on the Ecological Setting of the area.	Reduce the presence of alien and invasive plant species by 90% on site.	x			x	Invasion of Alien and Weed Vegetation.	An alien and invasive plant species eradication plan Alien and Invasive Eradication Planmust be implemented on site. This must be undertaken prior to the growing season. An ecological study should be undertaken to determine the status of revegetation on the site especially around the rehabilitated areas.	SHEQ Department and a Specialised Ecologist.	Weed monitoring (monthly) Weed eradication (annually or as required) Ecological Study (every second year))
		Surface Water	Release of Contaminated Water into the	-7	Clean anddDirty water separation systems should be upgraded in	-5	Limit the impact of the mining operation	Improved the reuse of water within the system	x	x			Quality of water within the overall	The water quality (constituents listed in the WUL)	SHEQ Department and Hydrologist	Annual GN 704 Audits by a Hydrologist.

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Activities			Potential Impacts	SbM	Mitigation Measures	SaM			Short Term (1-12 mth)	Medium Term (1-5 yr.)	Long Term (5 yr. +)	LoM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
			environment is unlikely as the water containment dams are located within the overall dirty water system. The changes to water management due to the construction of the facility could however impact on the integrity of the existing system.		terms of the 2018 Water Studies undertaken by Geo Tail (Pty) Ltd. Measures should be implemented during the construction phase to ensure that excess silt is contained and not released into the existing water uses and thereby hampering its GN 704 compliance in terms of capacity and freeboard. Maintenance of all Storm Water Management systems must be undertaken regularly on site.		within the overall water catchment. Optimise the reuse of water in the mining area.	by at least 10% in the first year of the implementation of the Return Water Dam and other water circuit infrastructure such as the development of the pipelines from the Pollution Control Dam at Parson Plant. Achieve 100% compliance to the water quality objectives as agreed to between the mine and the DWS based on the discussions within this IWWMP.					water catchment and internal water circuit.	of the dam must be monitored monthly and records must be kept of these result in a centralised system. Analysis of results must be undertaken by an accredited laboratory. Regular inspections must be undertaken to ensure that the facility is operated in line with the GN 704 (1999) requirements.		Monthly surface water quality monitoring or as stipulated in the WUL.
		Groundwater	Damage to the existing liners or incorrect upgrades (not in line with approved designs) of the facilities lead to groundwater pollution	-8	The upgrade of the facilities must be constructed in terms of detailed designs signed off by a Registered Engineer. Groundwater monitoring must continue in line with the requirements of the approved WUL.	-4	Limit the impact of the mining operation within the overall water catchment.	Achieve 100% compliance to the water quality objectives as agreed to between the mine and the DWS.	x	x			Quality of water within the overall water catchment and internal water circuit.	The groundwater quality (constituents listed in the WUL) must be monitored quarterly and records must be kept of these result in a centralised system. Analysis of results must be undertaken by an accredited laboratory. Annual inspection reports on the integrity of the facility as a component of the Paste	SHEQ Department and Hydrogeologist	Quarterly groundwater monitoring or as stipulated in the WUL. Annual numerical models or as stipulated in the WUL. Annual inspection report on the Paste Disposal Facility and associated Return Water Dams to be undertaken by a suitably

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														Disposal Facility should be undertaken. Numerical groundwater models must be used to determine the movement of any potential pollution plume.		qualified engineer.
		Air Quality	Construction activities and material movement may temporarily result in dust dispersion.	-6	Maintain the current air quality monitoring stations that determine fallout and implemented respirable dust (PM10) monitoring that could arise from the mining activities. Implement dust suppression in and around the construction area where required.	-4	Recording of dust fall out to determine trends.	Meeting ambient dust fall out limits in terms of applicable NEM:AQA Regulations.	x			x	National Dust Regulation Compliance.	Dust dispersion will be monitored in line with the current dust monitoring programme	SHEQ Department.	Monthly Monitoring with Annual Reporting.
		Noise	The activities are located within the mining boundary, in proximity to the current Parson and Bruce Plants. An increase in construction activities around existing water containment structures, could lead to an increase in noise levels in the area.	-8	Equipment will be well maintained to reduce excessive noise creation. Activities should remain within the demarcated sites. Activities will be restricted to the day time.	-6	Limit the impact of the mining operation on the Ecological Setting of the area. Remain within the current ambient character of the site.	Remain within the regulated guidelines and limits as required by the Mine Health and Safety Act. Zero complaints from surrounding landowners regarding noise levels	x			x	Elevated Noise Levels.	Ambient noise monitoring should be undertaken in line with the current mines monitoring programme. Biodiversity Action Plans should be continued and assessed/audited.	SHEQ Department. Ecologist	Once a month (during the day and during the night). Annual assessments and audits.
		Heritage	No further impact is	-	-	-	-									

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			foreseen as the area is located within the approved mining footprints, no clearance of soils or underlying material will be required. All activities will remain within approved footprints.													
		Socio-Economic	The upgrade of the Water Containment Structures are planned in terms of overall water management on site. The construction activities should have no impact on the Socio-Economic Setting in which the mine is located.	-	-	-	-									
Waste Management and Handling Hydrocarbon spills within the Mining Area and the management of Domestic and Hazardous Waste	1, 2, 3	Geology	No direct impact.	-	-	-	-	-	-	-	-	-	-	-	-	-
		Topography	No direct impact.	-	-	-	-	-	-	-	-	-	-	-	-	-
		Soils	Contamination of soil resources due to hydrocarbon spills.	-11	Storage of fuels and oils, the refuelling of vehicles and equipment maintenance must be limited to designated, bunded (bunds to be 110% of volume of the materials stored) areas.	-5	Protecting of soil integrity.	Zero presence of contaminated land due to early detection and implementation of actions.	x			x	Soil Pollution Prevention	The SHEQ department should undertake ongoing site monitoring to determine whether activities on site are undertaken in accordance with	SHEQ Department	ECO: Annual external audits can be undertaken. SHEQ: Weekly monitoring.

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Activities			Potential Impacts	SbM	Mitigation Measures	SaM			Short Term (1-12 mth)	Medium Term (1-5 yr.)	Long Term (5 yr. +)	LoM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
					All fuels and soils must be stored in appropriate containers.									the EMPr Requirements. This should be undertaken by means of a thorough site visit, record keeping of findings in a checklist format, issuing of non-conformances to responsible parties, listing thereof on the Isometrics or similar reporting system and feedback to the management team.		
					Chemicals and hazardous material must be stored in suitable containers, fit for purpose and in line with SDS requirements.											
					Where drip trays are too small, specially prepared, non-pervious bunds with solution trenches must be used to capture spillages											
					Oils and potentially hazardous materials must be disposed of at a licensed facility and waste certificates obtained.									Ensure that a Hydrocarbon Management Procedure and Spill Prevention and Emergency Spill Response Plan is available on site and updated regularly.		Regular update in terms of procedure requirements.
					A spill kit must be provided to be used in the event of a spill.											
					If a spill occurs, the contaminated soil must be removed immediately. Contaminated soil must be stored according to best practices until it can be disposed of at a suitably licensed facility.		Awareness creation on site regarding duty of care and waste management.							Induction with the view on creating environmental awareness.		Annually for permanent staff. Start of each visit for contractors.
					Safety signage must be used at designated storage areas.											

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					All workers must undergo an induction which includes environmental awareness training to make them aware of the environmental incident management procedures as well as the importance of complying with management measures.											
			Contamination of soils as a result of a lack of sanitary services	-11	Chemical toilets must be readily available to employees where permanent infrastructure is not available. Licensed companies must be appointed to remove any contaminated material and or wastes to licensed landfill sites.	-5	Protecting of soil integrity.	Zero presence of contaminated land due to early detection and implementation of actions.	x			x	Soil Integrity	Contracts must be in place for the provision of chemical toilets where required. Removal companies must have the necessary contracts and permits in place.	SHEQ Department	Daily internal inspections. Annual review of supply and removal companies contracts and permits.
			Handling of building Rubble	-7	Building rubble must be disposed of in line with the requirements of the NEM:WA. Waste management training must be implemented on site. Clear signs informing staff of waste management practices must be implemented on site. All waste must be removed by licensed contractors and disposed of at a licensed landfill site or be disposed of at a licensed landfill site. As a duty of care and the cradle to grave principles, the mine should regularly	-5		Maintain a 100% accurate recording of waste and submission of such recording to the Department.	x			x				

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					inspect disposal site to ensure that best practices are implemented. Recycling practices must be investigated and implemented on site where practical.			Maintain daily covering of the landfill site.	x			x				
		Ecology	The unmanaged disposal of waste, could result in the spread of invader species, as well as the influx of opportunistic species.	-12	Develop dedicated waste handling areas; prevent access to rodents and opportunistic species; prevent the spread of waste. Develop dedicated waste handling areas, fit for purpose and prevent the spread of waste.	-5	Proper waste management practices on site.	No unlawful disposal of waste. Registration of all waste handling and/or storage areas on site.	x			x	Ongoing Rehabilitation	Ongoing waste classification and management processes to be implemented. Updated waste inventory to be available on site. Waste Management and Handling Procedure to be available on site and updated regularly.	SHEQ Department	SHEQ: Weekly inspections. Regular update in terms of procedure requirements. Waste Classification of Waste Rock every five (5) years.
		Surface Water	Handling of Hazardous Waste within workshops, water containment facilities and general mine area could contaminate the dirty water storage areas. The water is then reused in the system and could have impacts on the	-11	Clean and Dirty water separation systems should be incorporated in terms of the 2018 SWMP or any approved update thereafter. A detailed waste management strategy will be established and implemented, which will clearly demarcate the containments for different waste streams. Waste management training must be implemented on site.	-6	Protect the integrity of the Storm Water Management System.	Aim to achieve a zero-spill record.	x	x			Surface Water Pollution & Soil Assessments.	To ensure a proactive approach, the SHEQ department should undertake ongoing site monitoring to determine whether activities on site are undertaken in accordance with the EMPr Requirements. The water quality (constituents	SHEQ Department	Assessments: Weekly. Monitoring: As per approved WUL Reporting of incidents in terms of Environmental Authorisations, but generally within 24 hours of occurrence. Update of the Incident

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			integrity of the storm water system and also the production.		Clear signs informing staff of waste management practices must be implemented on site.									listed in the WUL) must be monitored and records must be kept of these result in a centralised system. Analysis of results must be undertaken by an accredited laboratory. An incident reporting procedures should be available on site and definitions must be developed to determine when an incident is reportable. Reportable incidents should be reported to the Regulatory Authority as per the regulatory requirements, as well as stipulations as part of the WUL and Environmental Authorisations.		Reporting Procedure in terms of the procedure requirements.
					Hazardous waste handling should only take place within bunded and/or lined areas.			Maintain a 100% safe disposal record on the disposal of hazardous waste.								
					Hazardous waste should be removed by a licensed removal company and taken to a suitable and licensed landfill site.											
					Clean spills, if occur within 24 hours.											
					Documentation of removal and safe disposal must be available on site.											
					The mine will adopt a cradle-to grave approach to ensure that the waste is removed and disposed of in a legally compliant manner.			Provide training to all staff on best practices regarding waste management every year.								
					Notify the relevant regulatory authorities in the event of the occurrence of a reportable incident.											
					Weekly inspections of Storm Water Management Systems must be undertaken. Any blockages or maintenance requirements must be documented and an action plan developed.											
			Handling and Storing of Domestic Waste should have no	-9	Clean and Dirty water separation systems should be incorporated in terms of the 2018 SWMP or any	-5	Protect the integrity of the Storm Water Management System.	Maintain a 100% compliance with the conditions of the NEM:WA Permit on site for	x							

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			impact on the surface water resources due to the location of the facility. However, incorrect disposal of waste could hamper the integrity of the storm water system.		approved update thereafter. Waste management training must be implemented on site. Weekly inspections of Storm Water Management Systems must be undertaken. Any blockages or maintenance requirements must be documented and an action plan developed. Clear signs informing staff of waste management practices must be implemented on site. Access control must be strictly enforced. Waste should be disposed of by licensed companies to licensed facilities. Recycling practices must be investigated and implemented on site.			the Domestic Landfill Sites.								
		Groundwater	Large scale hydrocarbon spills could be present at the mining area	-12	Clean and Dirty water separation systems should be incorporated in terms of the 2018 SWMP or as updated. No activities associated with hydrocarbons and/or chemicals may be undertaken outside of an effectively designed and contained area. All used oils must be removed from site by a licensed company and disposed of at a suitably licensed site. Any spills occurring during the collection process must be	-6	Protect the groundwater resources to ensure that limited to no impact on groundwater resources occur as a result of the mining operations.	Achieve 100% compliance to the water quality objectives as agreed to between the mine and the DWS.	x	x		x	Groundwater Pollution and potential trends & Soil Assessments.	To ensure a proactive approach, the SHEQ department should undertake ongoing site monitoring to determine whether activities on site are undertaken in accordance with the EMPr Requirements. The groundwater quality (constituents listed in the WUL)	SHEQ Department	Assessments: Weekly. Monitoring: As per approved WUL

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					cleaned up immediately.									must be monitored monthly and records must be kept of these result in a centralised system. Analysis of results must be undertaken by an accredited laboratory.		
					Any significant spills must be captured in the incident reports and must be reported to the relevant department (LDEDET, Catchment Management Agency/DWS).											
					All equipment and machinery should be kept in good working order.											
					A clean up procedure (i.e. Works Instruction) must be in place. Clean spills, if occur within 24 hours.											
			Handling or Hazardous Waste within workshops and general mine area.	-10	Clean and Dirty water separation systems should be incorporated in terms of the 2018 SWMP or any approved update thereafter.	-6										
					The workshop should be designed with the suitable waste containment measures (berms, sumps, oil separators).			Maintain a 100% safe disposal record on the disposal of hazardous waste.	x							
					Waste management training must be implemented on site.											
					Clear signs informing staff of waste management practices must be implemented on site.											
					Hazardous waste handling should only take place within bunded and/or lined areas, with a capacity of at least 110% of the volume stored.											

Name of Activity	Project	Impact Area	Potential Impacts	Rating	Mitigation Type	Rating	Performance Objectives	Goals	Time Period for Implementation				Action Plan			
Activities			Potential Impacts	SbM	Mitigation Measures	SaM			Short Term (1-12 mth)	Medium Term (1-5 yr.)	Long Term (5 yr. +)	LoM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
					Hazardous waste should be removed by a licensed removal company and taken to a suitable and licensed landfill site.											
					Documentation of removal and safe disposal must be available on site.											
			Handling and Storing of Domestic Waste	-7	Clean and Dirty water separation systems should be incorporated in terms of the 2018 SWMP or any approved update thereafter.	-5		Maintain a 100% accurate recording of waste and submission of such recording to the Department.	x	x		x				
					Waste management training must be implemented on site.											
					Clear signs informing staff of waste management practices must be implemented on site.											
					All waste must be removed by licensed contractors and disposed of at a licensed landfill site.											
					As a duty of care and the cradle to grave principles, the mine should regularly inspect disposal site to ensure that best practices are implemented.											
					Recycling practices must be investigated and implemented on site where practical.											
					Groundwater monitoring must be undertaken in such a manner as to ensure that any potential impacts from the			Maintain daily covering of the landfill site.	x			x				

Name of Activity	Project	Impact Area	Potential Impacts	Rating	Mitigation Type	Rating	Performance Objectives	Goals	Time Period for Implementation				Action Plan			
Activities			Potential Impacts	SbM	Mitigation Measures	SaM			Short Term (1-12 mth)	Medium Term (1-5 yr.)	Long Term (5 yr. +)	LoM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
					landfill site can be detected.											
		Air Quality	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-
		Heritage	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-
		Noise	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-
		Visual	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-
		Social	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 37: Impacts to be mitigated in their respective phases (Operational Phase)

Name of Activity	Project	Impact Area	Potential Impacts	Rating	Mitigation Type	Rating	Performance Objectives	Goals	Time Period for Implementation				Action Plan			
Activities			Potential Impacts	SbM	Mitigation Measures	SaM			Short Term (1-12 mth)	Medium Term (1-5 yr.)	Long Term (5 yr. +)	LoM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
Operational Phase																
Operating of Dirty Water Containment Facilities (Return Water Dam 3 and all other upgrades)	1, 3	Geology	The area where the Return Water Dam 3 will be established is characterised by underlying dolomites. The mine is continuously monitoring movement of strata in this area.	-13	Ongoing monitoring of movement around the Paste Disposal Facility must continue. Regular dolomitic studies must be undertaken by the mine to determine the underlying conditions of the containment areas located over the dolomitic aquifers. Leak detection must be undertaken to determine the integrity of the Return Water Dam 3. The effective liner system should be continuously monitored on all water containment facilities.	-5	Operations of water containment and waste containment facilities within a stable environment.	No seepage or incidents of failure of facilities.				x	Ongoing monitoring of movement underlying the Paste Disposal Facility. Regular update of dolomitic reports in conjunction with movement results.	Maintenance and operation of movement beacons. Dolomitic Reports. Regular meetings must be held throughout the life cycle of the facility between the mining team and the SHEQ Department to ensure that the design and construction are undertaken in line with the EMPr and WUL requirements.	Mining Department and SHEQ Department	Maintenance and operation of beacons - ongoing. Dolomitic reports annually or as agreed to between the mine and the DMR/DWS. Meetings between departments quarterly.

Name of Activity	Project	Impact Area	Potential Impacts	Rating	Mitigation Type	Rating	Performance Objectives	Goals	Time Period for Implementation				Action Plan			
Activities			Potential Impacts	SbM	Mitigation Measures	SaM			Short Term (1-12 mth)	Medium Term (1-5 yr.)	Long Term (5 yr. +)	LoM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
		Topography	No further impact is foreseen.	-	-	-	-									
		Soil and Land use	Overflow of facilities could lead to erosion of soil resources.	-8	Dam levels should be monitored and should be maintained at a 0.8m freeboard and within GN 704 requirements. Water structures should be monitored to ensure the integrity of these facilities. Any erosion present on the slopes or surrounds of containment facilities should be immediately rehabilitated.	-5	Operate storage facilities to ensure no overflows take place.	0% spills must be maintained				x	Surface water contamination and Erosion prevention.	The water quality (constituents listed in the WUL) of the dam must be monitored monthly and records must be kept of these result in a centralised system. Analysis of results must be undertaken by an accredited laboratory.	SHEQ Department	Monthly
		Ecology	The establishment of alien and invasive plant species.	-13	The Alien and Invasive Plant species eradication plan will be implemented continuously. If natural succession of vegetation is not established within one rainy season, after commencement of rehabilitation, the disturbed areas and areas adjacent to the infrastructural areas must be re-vegetated with an indigenous grass mix, if necessary, to re-establish a protective cover, to minimise soil erosion and dust emission.	-2	Limit the impact of the mining operation on the Ecological Setting of the area.	Reduce the presence of invader species by 90% on site.	x			x	Invasion of Alien and Weed Vegetation.	A Alien and Invasive Eradication Plan must be implemented on site. This must be undertaken prior to the growing season. An ecological study should be undertaken to determine the status of revegetation on the site especially around the rehabilitated areas.	SHEQ Department and a Specialised Ecologist.	Weed monitoring (monthly) Weed eradication (annually or as required) Ecological Study (every second year))
		Surface Water	Overflow of Dams resulting in	-8	Dam levels should be monitored and should be	-5	Operate storage facilities to ensure no	0% spills must be maintained.				x	Surface water contaminatio	The water quality (constituents listed in the WUL) of the	SHEQ Department	Monthly

Name of Activity	Project	Impact Area	Potential Impacts	Rating	Mitigation Type	Rating	Performance Objectives	Goals	Time Period for Implementation				Action Plan			
Activities			Potential Impacts	SbM	Mitigation Measures	SaM			Short Term (1-12 mth)	Medium Term (1-5 yr.)	Long Term (5 yr. +)	LoM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
			contamination of surrounding water resources. No surface water resources are in close vicinity to the mining operations and therefore such impact unlikely of occurring.		maintained at a 0.8m freeboard and within GN 704 requirements. Evaporation controls should be implemented on the Process Water Recovery Dam at the Plant and the Buffer Return Water Dams. Operational Procedures must be implement to ensure the optimise operation of the water containment structures to ensure efficient reuse of water. Level meters must be put in place and be maintained. Measurements of water return to the Beneficiation Plant must be kept for auditing purposes and to feed into the Water Balance. The water circuit must be managed at one central location to ensure that there is integration between the plant, Paste Disposal Facility, and general surface water needs and requirements. Automated pumps must be implemented at the Return Water Dams and Storm Water Dams where indicated in the Geo Tail (Pty) Ltd water		overflows take place.	Improved the reuse of water within the system by at least 10% in the first year of the implementation of the Return Water Dam and other water circuit infrastructure such as the development of the pipelines from the Pollution Control Dam at Parson Plant. Reduce evaporation by at least 60%.				n and Erosion prevention.	dam must be monitored monthly and records must be kept of these result in a centralised system. Analysis of results must be undertaken by an accredited laboratory.		

Name of Activity	Project	Impact Area	Potential Impacts	Rating	Mitigation Type	Rating	Performance Objectives	Goals	Time Period for Implementation				Action Plan			
Activities			Potential Impacts	SbM	Mitigation Measures	SaM			Short Term (1-12 mth)	Medium Term (1-5 yr.)	Long Term (5 yr. +)	LoM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
					study to ensure that water can be pumped to the Beneficiation Plant when certain levels are met.											
					The Water Balance must be updated annually, with a strong focus on improving the management of the internal water circuit on site.											
					No change in the design or operation of the facilities may be undertaken without the approved of the relevant government department.											
					Any significant spills must be captured in the incident reports and must be reported to the relevant department (DMR, Catchment Management Agency/ DWS).											
		Groundwater	Damage to the existing liners and underdrains may lead to groundwater pollution	-8	Leak detection must be undertaken to determine the integrity of the Return Water Dam 3.	-4	No deterioration on the water catchment as a result of the water containment facilities.	Achieve 100% compliance to the water quality objectives as agreed to between the mine and the DWS.		x		x	Groundwater Pollution and potential trends.	The groundwater quality (constituents listed in the WUL) must be monitored monthly and records must be kept of these result in a centralised system. Analysis of results must be undertaken by an accredited laboratory	SHEQ Department	Quarterly
					The effective liner system should be continuously monitored on all water containment facilities.											
					Groundwater monitoring must continue in line with the											

Name of Activity	Project	Impact Area	Potential Impacts	Rating	Mitigation Type	Rating	Performance Objectives	Goals	Time Period for Implementation				Action Plan			
Activities			Potential Impacts	SbM	Mitigation Measures	SaM			Short Term (1-12 mth)	Medium Term (1-5 yr.)	Long Term (5 yr. +)	LoM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
					requirements of the approved WUL.											
		Air Quality	No impact on the ambient air quality conditions are foreseen as a result of the operation of the water containment facilities.	-	-	-	-	-	-	-	-	-	-	-	-	-
		Noise	No impact on the ambient noise levels are foreseen as a result of the operation of the water containment facilities.	-	-	-	-	-	-	-	-	-	-	-	-	-
		Heritage	No further impact is foreseen as the area is located within the Paste Disposal Footprint, no clearance of soils or underlying material will be required. All activities will remain within approved footprints.	-	-	-	-	-	-	-	-	-	-	-	-	-
		Socio-Economic	The operational aspect of the water containment facilities should have a positive impact on the socio-	9	Level meters must be put in place and be maintained. Measurements of water return to the Beneficiation Plant must be kept for auditing purposes and to feed into the Water Balance.	16	Reduce the requirement and dependence on the Sedibeng Water Supply Scheme.	Improved the reuse of water within the system by at least 10% in the first year of the implementation of the Return Water Dam and other water		x		x	Appointment of a suitably qualified person responsible for the overall water optimisation and management	Appointed Water Management Personnel. Coordinated by the Engineering Department.	Daily tracking of water consumption and use within the water circuit. Regular meetings between SHEQ,	Appointment of Responsible Water Management Individual - within six months of the approval of the WUL.

Name of Activity	Project	Impact Area	Potential Impacts	Rating	Mitigation Type	Rating	Performance Objectives	Goals	Time Period for Implementation				Action Plan			
Activities			Potential Impacts	SbM	Mitigation Measures	SaM			Short Term (1-12 mth)	Medium Term (1-5 yr.)	Long Term (5 yr. +)	LoM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
			economic conditions, as the opportunity exists for the mine to reuse its internal water resources optimally and not depend on the Sedibeng Pipeline on a 100% basis. This will allow for the mine to plan towards periods where water shutdowns may be experienced and during which times the mine can then continue to operate.		The water circuit must be managed at one central location to ensure that there is integration between the Plant, Paste Disposal Facility, and general surface water needs and requirements.			circuit infrastructure such as the development of the pipelines from the Pollution Control Dam at Parson Plant. Reduce evaporation by at least 60%.					on site. Implementation of a central water management system, where water usage and optimisation is managed and recorded. Ongoing investigation of techniques and measures to improve on Water Conservation and Demand on site. Development of a detailed water management and system maintenance procedure must be implemented on site, documenting the responsible persons, actions required on a daily, weekly, monthly or annual basis as well as recording requirements ..		Engineering and Mining Departments to assess areas of concern and areas of improvement in terms of Water Conservation and Demand Management on site, and the development of action plans to improve on gaps identified. Development of water management and system maintenance procedure to be developed within two months from the approval of the Environmental Authorisation.	Implementation of a dynamic water management system on site - within a year of the approval of the WUL. Water Recording - Daily Water Management Meetings - Monthly
					Automated pumps must be implemented at the Return Water Dams and Storm Water Dams where indicated in the Geo Tail (Pty) Ltd water study to ensure that water can be pumped to the Beneficiation Plant when certain levels are met. For this purpose level meters must be put in place.											
					Evaporation controls should be implemented on the Process Water Recovery Dam at the Plant and the Buffer Return Water Dams and any other dam deemed necessary by the person responsible for water management on site.											
					The Water Balance must be updated annually, with a strong focus on improving the management of the internal water circuit on site.											

Name of Activity	Project	Impact Area	Potential Impacts	Rating	Mitigation Type	Rating	Performance Objectives	Goals	Time Period for Implementation				Action Plan			
Activities			Potential Impacts	SbM	Mitigation Measures	SaM			Short Term (1-12 mth)	Medium Term (1-5 yr.)	Long Term (5 yr. +)	LoM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
Operating of Pipeline	1, 3	Geology	No impact is foreseen to take place on geology as a result of the pipeline operation.	-	-	-	-	-	-	-	-	-	-	-	-	
		Topography	No further impact is foreseen as a result of the pipeline operation.	-	-	-	-									
		Soil and Land use	Spills along pipelines could contaminate or impact on the conditions of soils through soil erosion.	-10	Regular monitoring must be undertaken through walk-abouts to ensure that the mine is aware of any leaks along the pipelines. Where erosion is present this must be rehabilitated as soon as practically possible. Where leaks are present measures must be implemented to contain and reduce the volumes of loss of water by either shutting down the pipeline or any other measure economically viable at that time of the operation. Water Leaks must be rectified and fixed within 12 hours from occurrence. Any leaks must be documented on the IsoMetrix system, no matter the quantity thereof. This will ensure that recurrences or	-6	Protection of the integrity of soil resources and the avoidance of soil pollution. Protection of water as a resource by avoiding unnecessary spillage.	Reduce the presence or erosion. Proactively manage potential leaks or incidents from occurring.			x	Soil Erosion and incorrect stock piling of topsoil.	The SHEQ department should undertake ongoing site monitoring to determine whether activities on site are undertaken in accordance with the EMPr Requirements. Erosion protection measures should be implemented and monitored on areas identified. Photographic records of assessments must be kept. Development of a detailed water management	SHEQ Department and Engineering Department.	SHEQ: Bi-monthly monitoring Engineering: Daily site walk abouts.	ECO: Monthly for the construction phase. Thereafter annual external audits can be undertaken. SHEQ: Weekly monitoring

Name of Activity	Project	Impact Area	Potential Impacts	Rating	Mitigation Type	Rating	Performance Objectives	Goals	Time Period for Implementation				Action Plan			
Activities			Potential Impacts	SbM	Mitigation Measures	SaM			Short Term (1-12 mth)	Medium Term (1-5 yr.)	Long Term (5 yr. +)	LoM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
					areas where maintenance are required are identified proactively prior to a serious encounter. A detailed water management and system maintenance procedure must be implemented on site, documenting the responsible persons, actions required on a daily, weekly, monthly or annual basis as well as recording requirements.								and system maintenance procedure must be implemented on site, documenting the responsible persons, actions required on a daily, weekly, monthly or annual basis as well as recording requirements . This procedure should further indicate the visual inspections required during the daily walk abouts along pipeline routes and pumps.			
		Ecology	The establishment of alien and invasive plant species.	-13	The Alien and Invasive Plant species eradication plan will be implemented continuously. If natural succession of vegetation is not established within one rainy season, after commencement of rehabilitation, the disturbed areas and areas adjacent to the infrastructural areas must be re-vegetated with an	-2	Limit the impact of the mining operation on the Ecological Setting of the area.	Reduce the presence of invader species by 90% on site.	x			x	Invasion of Alien and Weed Vegetation.	An alien and invasive plant species eradication plan Alien and Invasive Eradication Planmust be implemented on site. This must be undertaken prior to the growing season. An ecological study should be undertaken to determine the status of revegetation on the site especially	SHEQ Department Specialised Ecologist.	Weed monitoring (monthly) Weed eradication (annually or as required) Ecological Study (every second year))

Name of Activity	Project	Impact Area	Potential Impacts	Rating	Mitigation Type	Rating	Performance Objectives	Goals	Time Period for Implementation				Action Plan			
Activities			Potential Impacts	SbM	Mitigation Measures	SaM			Short Term (1-12 mth)	Medium Term (1-5 yr.)	Long Term (5 yr. +)	LoM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
					indigenous grass mix, if necessary, to re-establish a protective cover, to minimise soil erosion and dust emission.									around the rehabilitated areas.		
		Surface Water	No impacts are foreseen to take place on surface water, as the pipeline route is not located in close vicinity of watercourses.	-	-	-	-	-	-	-	-	-	-	-	-	-
		Groundwater	Although unlikely spills along pipelines could contaminate or impact on the conditions of groundwater resources if left unmanaged.	-7	Regular monitoring must be undertaken through walk-abouts to ensure that the mine is aware of any leaks along the pipelines. Where erosion is present this must be rehabilitated as soon as practically possible. Where leaks are present measures must be implemented to contain and reduce the volumes of loss of water by either shutting down the pipeline or any other measure economically viable at that time of the operation. Water Leaks must be rectified and fixed within 12 hours from occurrence. Any leaks must be documented on the IsoMetrix system,	-4	Protection of water as a resource by avoiding unnecessary spillage.	Limit potential occurrences for pollution. Proactively manage potential leaks or incidents from occurring.			x	Groundwater quality management.	Coordinated by SHEQ Department.	SHEQ Department - Quarterly	SHEQ: Bi-monthly monitoring Engineering: Daily site walk abouts.	Quarterly

Name of Activity	Project	Impact Area	Potential Impacts	Rating	Mitigation Type	Rating	Performance Objectives	Goals	Time Period for Implementation				Action Plan			
Activities			Potential Impacts	SbM	Mitigation Measures	SaM			Short Term (1-12 mth)	Medium Term (1-5 yr.)	Long Term (5 yr. +)	LoM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
					no matter the quantity thereof. This will ensure that recurrences or areas where maintenance are required are identified proactively prior to a serious encounter. A detailed water management and system maintenance procedure must be implemented on site, documenting the responsible persons, actions required on a daily, weekly, monthly or annual basis as well as recording requirements.											
		Air Quality	No impact on the ambient air quality conditions are foreseen as a result of the operation of the water containment facilities.	-	-	-	-	-	-	-	-	-	-	-	-	-
		Noise	No impact on the ambient noise levels are foreseen as a result of the operation of the water containment facilities.	-	-	-	-	-	-	-	-	-	-	-	-	-
		Heritage	No further impact is foreseen as the area is located within the Paste	-	-	-	-	-	-	-	-	-	-	-	-	-

Name of Activity	Project	Impact Area	Potential Impacts	Rating	Mitigation Type	Rating	Performance Objectives	Goals	Time Period for Implementation				Action Plan			
Activities			Potential Impacts	SbM	Mitigation Measures	SaM			Short Term (1-12 mth)	Medium Term (1-5 yr.)	Long Term (5 yr. +)	LoM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
			Disposal Footprint, no clearance of soils or underlying material will be required. All activities will remain within approved footprints.													
		Socio-Economic	The operational aspect of the water containment facilities should have a positive impact on the socio-economic conditions, as the opportunity exists for the mine to reuse its internal water resources optimally and not depend on the Sedibeng Pipeline on a 100% basis. This will allow for the mine to plan towards periods where water shutdowns may be experienced and during which times the mine can then continue to operate.	9	Level meters must be put in place and be maintained. Measurements of water return to the Beneficiation Plant must be kept for auditing purposes and to feed into the Water Balance. The water circuit must be managed at one central location to ensure that there is integration between the Plant, Paste Disposal Facility, and general surface water needs and requirements. Automated pumps must be implemented at the Return Water Dams and Storm Water Dams where indicated in the Geo Tail (Pty) Ltd water study to ensure that water can be pumped to the Beneficiation Plant when certain levels are met. For this purpose level meters must be put in place.	16	Reduce the requirement and dependence on the Sedibeng Water Supply Scheme.	Improved the reuse of water within the system by at least 10% in the first year of the implementation of the Return Water Dam and other water circuit infrastructure such as the development of the pipelines from the Pollution Control Dam at Parson Plant. Reduce evaporation by at least 60%.		x		x	Appointment of a suitably qualified person responsible for the overall water optimisation and management on site. Implementation of a central water management system, where water usage and optimisation is managed and recorded. Ongoing investigation of techniques and measures to improve on Water Conservation and Demand on site. Development of a detailed water	Appointed Water Management Personnel. Coordinated by the Engineering Department.	Daily tracking of water consumption and use within the water circuit. Regular meetings between SHEQ, Engineering and Mining Departments to assess areas of concern and areas of improvement in terms of Water Conservation and Demand Management on site, and the development of action plans to improve on gaps identified. Development of water management and system maintenance procedure to be developed within two months from the approval of	Appointment of Responsible Water Management Individual - within a six months of the approval of the WUL. Implementation of a dynamic water management system on site - within a year of the approval of the WUL. Water Recording - Daily Water Management Meetings - Monthly

Name of Activity	Project	Impact Area	Potential Impacts	Rating	Mitigation Type	Rating	Performance Objectives	Goals	Time Period for Implementation				Action Plan			
Activities			Potential Impacts	SbM	Mitigation Measures	SaM			Short Term (1-12 mth)	Medium Term (1-5 yr.)	Long Term (5 yr. +)	LoM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
					Evaporation controls should be implemented on the Process Water Recovery Dam at the Plant and the Buffer Return Water Dams and any other dam deemed necessary by the person responsible for water management on site.								management and system maintenance procedure must be implemented on site, documenting the responsible persons, actions required on a daily, weekly, monthly or annual basis as well as recording requirements.		the Environmental Authorisation.	
					The Water Balance must be updated annually, with a strong focus on improving the management of the internal water circuit on site.											
		Geology	No direct impact.	-	-	-	-	-	-	-	-	-	-	-	-	-
		Topography	No direct impact.	-	-	-	-	-	-	-	-	-	-	-	-	-
Waste Management and Handling Hydrocarbon spills within the Mining Area and the management of Domestic and Hazardous Waste	1, 2, 3	Soils	Contamination of soil resources due to hydrocarbon spills.	-11	Storage of fuels and oils, the refuelling of vehicles and equipment maintenance must be limited to designated, bunded (bunds to be 110% of volume of the materials stored) areas.	-5	Protecting of soil integrity.	Zero presence of contaminated land due to early detection and implementation of actions.	x			x	Soil Pollution Prevention	The SHEQ department should undertake ongoing site monitoring to determine whether activities on site are undertaken in accordance with the EMPr Requirements. This should be undertaken by means of a thorough site visit, record keeping of findings in a checklist format, issuing of non-conformances to responsible parties, listing thereof on the Isometrics or similar reporting system and feedback to the management team.	SHEQ Department	ECO: Annual external audits can be undertaken. SHEQ: Weekly monitoring.
					All fuels and soils must be stored in appropriate containers.											
					Chemicals and hazardous material must be stored in suitable containers, fit for purpose and in line with SDS requirements.											

Name of Activity	Project	Impact Area	Potential Impacts	Rating	Mitigation Type	Rating	Performance Objectives	Goals	Time Period for Implementation				Action Plan			
Activities			Potential Impacts	SbM	Mitigation Measures	SaM			Short Term (1-12 mth)	Medium Term (1-5 yr.)	Long Term (5 yr. +)	LoM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
					Where drip trays are too small, specially prepared, non-pervious bunds with solution trenches must be used to capture spillages											
					Oils and potentially hazardous materials must be disposed of at a licensed facility and waste certificates obtained.									Ensure that a Hydrocarbon Management Procedure and Spill Prevention and Emergency Spill Response Plan is available on site and updated regularly.		Regular update in terms of procedure requirements.
					A spill kit must be provided to be used in the event of a spill.		Awareness creation on site regarding duty of care and waste management.							Induction with the view on creating environmental awareness.		Annually for permanent staff. Start of each visit for contractors.
					If a spill occurs, the contaminated soil must be removed immediately. Contaminated soil must be stored according to best practices until it can be disposed of at a suitably licensed facility.											
					Safety signage must be used at designated storage areas.											
					All workers must undergo an induction which includes environmental awareness training to make them aware of the environmental incident management											

Name of Activity	Project	Impact Area	Potential Impacts	Rating	Mitigation Type	Rating	Performance Objectives	Goals	Time Period for Implementation				Action Plan			
Activities			Potential Impacts	SbM	Mitigation Measures	SaM			Short Term (1-12 mth)	Medium Term (1-5 yr.)	Long Term (5 yr. +)	LoM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
					procedures as well as the importance of complying with management measures.											
			Contamination of soils as a result of a lack of sanitary services	-11	Chemical toilets must be readily available to employees where permanent infrastructure is not available. Licensed companies must be appointed to remove any contaminated material and or wastes to licensed landfill sites.	-5	Protecting of soil integrity.	Zero presence of contaminated land due to early detection and implementation of actions.				x	Soil Integrity	Contracts must be in place for the provision of chemical toilets where required. Removal companies must have the necessary contracts and permits in place.	SHEQ Department	Daily internal inspections. Annual review of supply and removal companies contracts and permits.
		Ecology	The unmanaged disposal of waste, could result in the spread of invader species, as well as the influx of opportunistic species.	-12	Develop dedicated waste handling areas; prevent access to rodents and opportunistic species; prevent the spread of waste. Develop dedicated waste handling areas, fit for purpose and prevent the spread of waste.	-5	Proper waste management practices on site.	No unlawful disposal of waste. Registration of all waste handling and/or storage areas on site.	x			x	Ongoing Rehabilitation	Ongoing waste classification and management processes to be implemented. Updated waste inventory to be available on site. Waste Management and Handling Procedure to be available on site and updated regularly.	SHEQ Department	SHEQ: Weekly inspections. Regular update in terms of procedure requirements. Waste Classification of Waste Rock every five (5) years.
		Surface Water	Handling of Hazardous Waste within workshops, water containment facilities and general mine area could contaminate the dirty water storage areas. The water is then reused in the	-11	Clean and Dirty water separation systems should be incorporated in terms of the 2018 SWMP or any approved update thereafter. A detailed waste management strategy will be established and implemented, which will clearly demarcate the	-6	Protect the integrity of the Storm Water Management System.	Aim to achieve a zero-spill record.	x	x			Surface Water Pollution & Soil Assessments.	To ensure a proactive approach, the SHEQ department should undertake ongoing site monitoring to determine whether activities on site are undertaken in accordance with the EMPr Requirements. The water quality (constituents listed in the WUL) must be	SHEQ Department	Assessments: Weekly. Monitoring: As per approved WUL. Reporting of incidents in terms of Environmental Authorisations, but generally within 24 hours of occurrence.

Name of Activity	Project	Impact Area	Potential Impacts	Rating	Mitigation Type	Rating	Performance Objectives	Goals	Time Period for Implementation				Action Plan			
Activities			Potential Impacts	SbM	Mitigation Measures	SaM			Short Term (1-12 mth)	Medium Term (1-5 yr.)	Long Term (5 yr. +)	LoM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
			system and could have impacts on the integrity of the storm water system and also the production.		containments for different waste streams. Waste management training must be implemented on site. Clear signs informing staff of waste management practices must be implemented on site. Hazardous waste handling should only take place within bunded and/or lined areas. Hazardous waste should be removed by a licensed removal company and taken to a suitable and licensed landfill site. Clean spills, if occur within 24 hours. Documentation of removal and safe disposal must be available on site. The mine will adopt a cradle-to grave approach to ensure that the waste is removed and disposed of in a legally compliant manner. Notify the relevant regulatory authorities in the event of the occurrence of a reportable incident. Weekly inspections of Storm Water Management			Maintain a 100% safe disposal record on the disposal of hazardous waste. Provide training to all staff on best practices regarding waste management every year.						monitored and records must be kept of these result in a centralised system. Analysis of results must be undertaken by an accredited laboratory. An incident reporting procedures should be available on site and definitions must be developed to determine when an incident is reportable. Reportable incidents should be reported to the Regulatory Authority as per the regulatory requirements, as well as stipulations as part of the WUL and Environmental Authorisations.		Update of the Incident Reporting Procedure in terms of the procedure requirements.

Name of Activity	Project	Impact Area	Potential Impacts	Rating	Mitigation Type	Rating	Performance Objectives	Goals	Time Period for Implementation				Action Plan			
Activities			Potential Impacts	SbM	Mitigation Measures	SaM			Short Term (1-12 mth)	Medium Term (1-5 yr.)	Long Term (5 yr. +)	LoM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
					Systems must be undertaken. Any blockages or maintenance requirements must be documented and an action plan developed.											
			Handling and Storing of Domestic Waste should have no impact on the surface water resources due to the location of the facility. However, incorrect disposal of waste could hamper the integrity of the storm water system.	-9	Clean and Dirty water separation systems should be incorporated in terms of the 2018 SWMP or any approved update thereafter.	-5	Protect the integrity of the Storm Water Management System.	Maintain a 100% compliance with the conditions of the NEM:WA Permit on site for the Domestic Landfill Sites.	x							
					Waste management training must be implemented on site.											
					Weekly inspections of Storm Water Management Systems must be undertaken. Any blockages or maintenance requirements must be documented and an action plan developed.											
					Clear signs informing staff of waste management practices must be implemented on site.											
					Access control must be strictly enforced.											
					Waste should be disposed of by licensed companies to licensed facilities.											
					Recycling practices must be investigated and implemented on site.											
		Groundwater	Large scale hydrocarbon	-12	Clean and Dirty water separation	-6	Protect the groundwater	Achieve 100% compliance to	x	x		x	Groundwater Pollution and	To ensure a proactive approach,	SHEQ Department	Assessments: Weekly.

Name of Activity	Project	Impact Area	Potential Impacts	Rating	Mitigation Type	Rating	Performance Objectives	Goals	Time Period for Implementation				Action Plan			
Activities			Potential Impacts	SbM	Mitigation Measures	SaM			Short Term (1-12 mth)	Medium Term (1-5 yr.)	Long Term (5 yr. +)	LoM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
			spills could be present at the mining area		systems should be incorporated in terms of the 2018 SWMP, or amendment thereto No activities associated with hydrocarbons and/or chemicals may be undertaken outside of an effectively designed and contained area. All used oils must be removed from site by a licensed company and disposed of at a suitably licensed site. Any spills occurring during the collection process must be cleaned up immediately. Any significant spills must be captured in the incident reports and must be reported to the relevant department (LDEDET, Catchment Management Agency/DWS). All equipment and machinery should be kept in good working order. A clean up procedure (i.e. Works Instruction) must be in place. Clean spills, if occur within 24 hours.		resources to ensure that limited to no impact on groundwater resources occur as a result of the mining operations.	the water quality objectives as agreed to between the mine and the DWS based on the discussions within this IWWMP.					potential trends & Soil Assessments.	the SHEQ department should undertake ongoing site monitoring to determine whether activities on site are undertaken in accordance with the EMPr Requirements. The groundwater quality (constituents listed in the WUL) must be monitored monthly and records must be kept of these result in a centralised system. Analysis of results must be undertaken by an accredited laboratory.		Monitoring: As per approved WUL
			Handling or Hazardous Waste within workshops	-10	Clean and Dirty water separation systems should be incorporated in	-6										

Name of Activity	Project	Impact Area	Potential Impacts	Rating	Mitigation Type	Rating	Performance Objectives	Goals	Time Period for Implementation				Action Plan			
Activities			Potential Impacts	SbM	Mitigation Measures	SaM			Short Term (1-12 mth)	Medium Term (1-5 yr.)	Long Term (5 yr. +)	LoM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
			and general mine area.		terms of the 2018 SWMP or any approved update thereafter.											
					The workshop should be designed with the suitable waste containment measures (berms, sumps, oil separators).											
					Waste management training must be implemented on site.											
					Clear signs informing staff of waste management practices must be implemented on site.			Maintain a 100% safe disposal record on the disposal of hazardous waste.	x							
					Hazardous waste handling should only take place within bunded and/or lined areas, with a capacity of at least 110% of the volume stored.											
					Hazardous waste should be removed by a licensed removal company and taken to a suitable and licensed landfill site.											
					Documentation of removal and safe disposal must be available on site.											
			Handling and Storing of Domestic Waste	-7	Clean and Dirty water separation systems should be incorporated in terms of the 2018 SWMP or any approved update thereafter.	-5		Maintain a 100% accurate recording of waste and submission of such recording to the Department.	x	x		x				
					Waste management training must be											

Name of Activity	Project	Impact Area	Potential Impacts	Rating	Mitigation Type	Rating	Performance Objectives	Goals	Time Period for Implementation				Action Plan			
Activities			Potential Impacts	SbM	Mitigation Measures	SaM			Short Term (1-12 mth)	Medium Term (1-5 yr.)	Long Term (5 yr. +)	LoM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
					implemented on site.											
					Clear signs informing staff of waste management practices must be implemented on site.											
					All waste must be removed by licensed contractors and disposed of at a licensed landfill site.											
					As a duty of care and the cradle to grave principles, the mine should regularly inspect disposal site to ensure that best practices are implemented.											
					Recycling practices must be investigated and implemented on site where practical.											
					Groundwater monitoring must be undertaken in such a manner as to ensure that any potential impacts from the landfill site can be detected.			Maintain daily covering of the landfill site.	x			x				
		Air Quality	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-
		Heritage	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-
		Noise	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-
		Visual	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-
		Social	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 38: Impacts to be mitigated in their respective phases (Decommissioning Phase)

Name of Activity	Project	Impact Area	Potential Impacts	Rating	Mitigation Type	Rating	Performance Objectives	Goals	Time Period for Implementation				Action Plan			
Activities			Potential Impacts	SbM	Mitigation Measures	SaM			Short Term (1-12 mth)	Medium Term (1-5 yr.)	Long Term (5 yr. +)	LoM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
Decommissioning Phase																
Legal Requirements (Environmental Permits)	1, 2, 3	Legal Compliance	Unlawful activities could lead to NWA Directives and Section 24G Rectification fines.	-14	A legal assessment of all activities must be undertaken annually to ensure that all are licensed.	17	To operate within the enviro-legal ambits of South Africa.	Ensure that all activities undertaken by the mine are lawful with the required environmental licences in place.			x		Compliance in terms of Regulatory Requirements and the implementation of the EMPr.	Appointment of an Independent ECO to assess compliance with the EMPr. Quarterly (construction); Biannually (after construction) internal audits must be undertaken during the construction phase, where after biannual internal audits can be undertaken, to ensure compliance with the Environmental Authorisation and EMPr. This should be undertaken by means of a thorough site visit, record keeping of findings in a checklist format, issuing of non-conformances to responsible parties, listing thereof on the Isometrics or similar reporting system and feedback to the management team.	Independent ECO & SHEQ	ECO: Weekly; SHEQ: Daily
					A detailed closure plan must be developed and submitted to the relevant departments for approval.		To be aware of the latest environmental legal requirements.	Ensure that all environmental authorisations on site is implemented on site and ongoing monitoring of compliance are undertaken to reach 100% compliance.								
					All legally appointed personnel responsible or involved in activities on site must receive training on the requirements of the Environmental Authorisations and EMPs			All Departments responsible for development of the mine, must understand the requirements of the environmental legislation and must involve this into their planning processes.								
					Quarterly decommissioning must be undertaken, on the lawful implementation of the Environmental Authorisation											
					Environmental Authorisations must be available on site at all times.											
					The legal register must be updated											

Name of Activity	Project	Impact Area	Potential Impacts	Rating	Mitigation Type	Rating	Performance Objectives	Goals	Time Period for Implementation				Action Plan			
Activities			Potential Impacts	SbM	Mitigation Measures	SaM			Short Term (1-12 mth)	Medium Term (1-5 yr.)	Long Term (5 yr. +)	LoM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
					to indicate all updated activities.											
	1, 2, 3	Geology	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-
Dismantling and decommissioning of the pipeline and ancillary infrastructure of the dams		Topography	Removal of infrastructure may impact on the topography.	-13	Linear infrastructure constructed by the mine 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 the Integrated Development Plan of the area and the local authorities. Ensure the entire site remains fenced for the duration of rehabilitation. Retain security access control to the site for the duration of rehabilitation. 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)	14	Lawful removal of all infrastructure. Achieving final land use objectives.	Availability of safe disposal certificates. Free draining environment, with successful self-succession establishment.				x	Waste Disposal Ongoing Rehabilitation	Audits on safe disposal records and inspections at disposal sites. Inspections in terms of compliance with EMPr commitments.	SHEQ Department	Monthly inspection of waste disposal records Biannual inspections of disposal sites Weekly inspections of rehabilitation progress.

Name of Activity	Project	Impact Area	Potential Impacts	Rating	Mitigation Type	Rating	Performance Objectives	Goals	Time Period for Implementation				Action Plan			
Activities			Potential Impacts	SbM	Mitigation Measures	SaM			Short Term (1-12 mth)	Medium Term (1-5 yr.)	Long Term (5 yr. +)	LoM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
					All surface structures, infrastructure and 'hard surfaces' (*inter alia* redundant pump equipment, etc.) are to be demolished and removed from the disturbed mine footprint, unless an alternative/ continued use for any such items is agreed upon, in writing, with the DMR.											
					All surface infrastructure would be demolished and removed to a depth of at least 1m. Any infrastructure below 1m will be sealed, made safe and left *in situ*.											
					All fences erected around the infrastructure be dismantled and either disposed of at a permitted disposal site or sold off as scrap (provided that 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											

Name of Activity	Project	Impact Area	Potential Impacts	Rating	Mitigation Type	Rating	Performance Objectives	Goals	Time Period for Implementation				Action Plan			
Activities			Potential Impacts	SbM	Mitigation Measures	SaM			Short Term (1-12 mth)	Medium Term (1-5 yr.)	Long Term (5 yr. +)	LoM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
					maintained as and when required.											
					Water pollution control structures will remain until the completion of all demolition and associated rehabilitation activities where after these will be rehabilitated.											
		Soil, Land Use and Land Capability	Spills around decommissioning areas (hydrocarbons and paste) may result in the contamination of soils.	-11	Draw up a plan clearly defining the area where the removal of infrastructure should take place. Implement the plan with sufficient measures in place not to compact new areas.	-5	Protection of Soil Integrity.	Zero presence of contaminated land due to early detection and implementation of actions.				x	Soil Integrity	Appointment of an Independent ECO to assess compliance with the EMPr. The SHEQ department should undertake ongoing site monitoring to determine whether activities on site are undertaken in accordance with the EMPr Requirements. This should be undertaken by means of a thorough site visit, record keeping of findings in a checklist format, issuing of non-conformances to responsible parties, listing thereof on the Isometrics or similar reporting system and feedback to the management team.	SHEQ Department	Annual External Audit. Daily internal inspections. Recording of incidents when occurring.
					All hazardous waste should be disposed of at licensed and fit-for-purpose areas and safe disposal records should be kept on file.											
					Any hydrocarbon, effluent or other contaminants should be collected and the soils remediated immediately.											
			Contamination of soils as a result of a lack of sanitary services	-11	Chemical toilets must be readily available to contractors. Licensed companies must be appointed to remove any contaminated material and or	-5		Zero presence of contaminated land due to early detection and implementation of actions.				x	Soil Integrity	Contracts must be in place for the provision of chemical toilets where required. Removal companies must have the necessary contracts and permits in place.	SHEQ Department	Daily internal inspections Annual review of supply and removal companies contracts and permits.

Name of Activity	Project	Impact Area	Potential Impacts	Rating	Mitigation Type	Rating	Performance Objectives	Goals	Time Period for Implementation				Action Plan			
Activities			Potential Impacts	SbM	Mitigation Measures	SaM			Short Term (1-12 mth)	Medium Term (1-5 yr.)	Long Term (5 yr. +)	LoM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
					wastes to licensed landfill sites.											
			Loss of soils due to decommissioning activities present on site.	-11	Draw up a plan clearly defining the area where the removal of infrastructure should take place. Implement the plan with sufficient measures in place not to compact new areas.	-5		Maintaining soil integrity, with successful vegetation establishment.				x	Soil Erosion and incorrect stockpiling of topsoil.	Appointment of an Independent Environmental Control Officer to assess compliance with the EMPr. The SHEQ department should undertake ongoing site monitoring to determine whether activities on site are undertaken in accordance with the EMPr Requirements.	Independent ECO and SHEQ Department.	ECO: Annual external audits can be undertaken. SHEQ: Weekly monitoring
					Compacted soils adjacent to the infrastructure footprint can be lightly ripped to alleviate compaction where required.											
					Implement a strict penalty fine system for rule breaking with regard to vehicular movement.											
					Maintain Clean and Dirty water systems and undertake regular monitoring and maintenance thereof.								Soil integrity analysis	Assessment of the fertility of Soils	Soil Scientist	Prior to placement of soils.
		Ecology	The establishment of alien and invasive plant species.	-13	The Alien and Invasive Plant species eradication plan will be implemented continuously.	-2	Limit the impact of the mining operation on the Ecological Setting of the area.	Reduce the presence of invader species by 90% on site.	x			x	Invasion of Alien and Weed Vegetation.	A Alien and Invasive Eradication Plan must be implemented on site. This must be undertaken prior to the growing season. An ecological study should be undertaken to determine the status	SHEQ Department and a Specialised Ecologist.	Weed monitoring (monthly) Weed eradication (annually or as required) Ecological Study (every second year))
					If natural succession of vegetation is not established within											

Name of Activity	Project	Impact Area	Potential Impacts	Rating	Mitigation Type	Rating	Performance Objectives	Goals	Time Period for Implementation				Action Plan			
Activities			Potential Impacts	SbM	Mitigation Measures	SaM			Short Term (1-12 mth)	Medium Term (1-5 yr.)	Long Term (5 yr. +)	LoM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
					one rainy season, after commencement of rehabilitation, the disturbed areas and areas adjacent to the infrastructural areas must be re-vegetated with an indigenous grass mix, if necessary, to re-establish a protective cover, to minimise soil erosion and dust emission.									of revegetation on the site especially around the rehabilitated areas.		
		Surface Water	Erosion control over rehabilitated areas and the prevention of erosion gullies.	-8	The topography of all disturbed areas must be shaped in such a manner that the surrounding natural area blends naturally with the rehabilitated areas well as to be free-draining. This will reduce soil erosion and improve natural re-vegetation.	-6	Protect the water resources within the area in which the mine operates.	Maintenance of storm water management systems. Meeting the conditions in terms of Section 21(c) & (i) of the WUL.				x	Surface Water Pollution & Soil Assessments.	To ensure a proactive approach, the SHEQ department should undertake ongoing site monitoring to determine whether activities on site are undertaken in accordance with the EMPr Requirements. The water quality (constituents listed in the WUL) must be monitored monthly and records must be kept of these result in a centralised system. Analysis of results must be undertaken by an accredited laboratory. Monitoring of the effectiveness of the rehabilitation programme must be undertaken. This should be undertaken by means of weekly	SHEQ Department	Assessments: Weekly. Surface Water Monitoring: Monthly Groundwater Monitoring: Quarterly
			Contamination of surface water as a result of removal of infrastructure.	-11	The detailed waste management strategy implemented during the construction and operation phases must be continuously implemented throughout the closure and decommissioning phase.	-6										

Name of Activity	Project	Impact Area	Potential Impacts	Rating	Mitigation Type	Rating	Performance Objectives	Goals	Time Period for Implementation				Action Plan			
Activities			Potential Impacts	SbM	Mitigation Measures	SaM			Short Term (1-12 mth)	Medium Term (1-5 yr.)	Long Term (5 yr. +)	LoM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
					Contaminated water from the water containment facilities should be reused in the plant system as long as possible and left to evaporate. No unlawful discharge of water will be allowed.									inspections and keeping a photographic record.		
			Rubble and waste from site could pollute runoff.	-8	All wastes required should be removed to licensed waste disposal facilities and by licensed companies.	-6										
		Groundwater	Decommissioning and removal of facilities could lead to the infiltration of dirty water to groundwater resources.	-9	No water may be discharged into watercourses, if this water has not been treated to the correct quality OR if approval from the DWS for such activity has not been obtained.	14	Develop the area to its intended final land use.	Obtain buy in from stakeholders on the intended final land use.				x	Groundwater Pollution and potential trends & Soil Assessments.	To ensure a proactive approach, the SHEQ department should undertake ongoing site monitoring to determine whether activities on site are undertaken in accordance with the EMPr Requirements. The groundwater quality (constituents listed in the WUL) must be monitored monthly and records must be kept of these result in a centralised system. Analysis of results must be undertaken by an accredited laboratory		
					Once the dams are empty, any silt remaining in the dams should be disposed of on the Paste Disposal Facility and/or approved Mine Residue Facilities.			Implement an action plan to systematically plan for closure.								
					The Return Water Dams should be demolished, and the liner and rubble should be classified to determine the type of landfill		Protect the groundwater resources to ensure that limited to no impact on groundwater resources	Achieve 100% compliance to the water quality objectives as agreed to between the mine and the DWS based on								

Name of Activity	Project	Impact Area	Potential Impacts	Rating	Mitigation Type	Rating	Performance Objectives	Goals	Time Period for Implementation				Action Plan			
Activities			Potential Impacts	SbM	Mitigation Measures	SaM			Short Term (1-12 mth)	Medium Term (1-5 yr.)	Long Term (5 yr. +)	LoM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
					site suitable to cater for this material. Groundwater monitoring must continue up until closure is obtained.		occur as a result of the mining operations.	the discussions within this IWWMP.								
		Heritage	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-
		Visual	Fugitive dust emissions as a result of infrastructure removal and associated exposed/bare areas may have an impact in terms of air quality and visual characteristics.	-11	The dust monitoring network and dust suppression programme established during the construction phase of the project will be maintained throughout the decommissioning/ closure phase of the mine. With respect to road dust levels, it is recommended to limit vehicle speeds, especially during high risk periods of high winds, high temperature and low humidity. Establish and implement a dust suppression plan in consultation with the Environmental Control Officer and an air quality specialist as part of the contractor's responsibility.	-5	Remain within the regulated guidelines and limits.	Recording of dust fall out to determine trends.				x	Comply with the National Dust Regulations.	Dust dispersion will be monitored as part of the overall mine dust monitoring programme.	SHEQ Department.	Monthly Monitoring with Annual Reporting.
		Air Quality	All activities associated with	-7	The dust monitoring	-5	Remain within the regulated	Recording of dust fall out to				x		Dust dispersion will be monitored as part	SHEQ Department.	Monthly Monitoring with

Name of Activity	Project	Impact Area	Potential Impacts	Rating	Mitigation Type	Rating	Performance Objectives	Goals	Time Period for Implementation				Action Plan			
Activities			Potential Impacts	SbM	Mitigation Measures	SaM			Short Term (1-12 mth)	Medium Term (1-5 yr.)	Long Term (5 yr. +)	LoM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
			the removal of infrastructure and rehabilitation has the potential to release dust.		network and dust suppression programme established during the construction phase of the project will be maintained throughout the closure phase of the mine. With respect to haul road dust levels, it is recommended to limit vehicle speeds, especially during high risk periods of high winds, high temperature and low humidity.		guidelines and limits.	determine trends.						of the overall mine dust monitoring programme.		Annual Reporting.
								Meeting ambient dust fall out limits in terms of applicable NEM:AQA Regulations.				x	Comply with the National Dust Regulations.			
		Noise	All activities associated with the removal of infrastructure and rehabilitation has the potential to generate noise.	-7	The removal of all infrastructure is to take place during daytime periods only.	-5	Remain within the regulated guidelines and limits.	Machinery with low noise levels and maintained in a good order to be used and to comply with the IFC's Health and Safety Regulations.				x	Noise Monitoring.	Adjacent landowners will be informed of the planned dates of the significant demolition activities where applicable. Daily noise monitoring will be undertaken in the areas where high levels of noise take place during decommissioning.	SHEQ Department.	Ongoing consultation with surrounding landowners. Daily noise monitoring.
					Where noise becomes a nuisance, management measures will be investigated and implemented to address these.			Health and Safety Regulations in terms of noise monitoring should be met.				x				
		Social	No direct impact, however communication is important.	-7	Local residents, with the focus on the surrounding landowners, should receive accurate information with regards to the	-5	Remain within the regulated guidelines and limits.	The community forum established should continue, through which issues can be addressed, and a representative				x	Ongoing stakeholder consultation	Adjacent landowners will be informed of the planned dates of the significant demolition activities where applicable.	SHEQ Department.	Ongoing consultation with surrounding landowners.

Name of Activity	Project	Impact Area	Potential Impacts	Rating	Mitigation Type	Rating	Performance Objectives	Goals	Time Period for Implementation				Action Plan			
Activities			Potential Impacts	SbM	Mitigation Measures	SaM			Short Term (1-12 mth)	Medium Term (1-5 yr.)	Long Term (5 yr. +)	LoM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
					project status, timeframes for decommissioning and other relevant information about issues that could influence their daily living and movement patterns.			from Khumani should become involved.								
Earth Moving, shaping and ripping of ground	1, 2, 3	Geology	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-
		Topography	The shaping of the site should be undertaken in such a manner that it improves the overall topography of the site.	13	Pre-mining topography should be reasonably restored through shaping and landscaping, such that the topography of rehabilitated areas will ultimately be commensurate with that of adjacent, non-disturbed areas. The final shaping should be viable to allow for final post mining land use. If possible ensure a continuation of the premining surface drainage pattern.	14	Develop the area to its intended final land use.	Implement an action plan to systematically plan for closure.				x	Final Land use	An operational rehabilitation plan must be implemented and audited by the SHEQ department.	SHEQ Department.	Monthly monitoring.
		Soils	Soil erosion	-16	Re-vegetate as soon as possible.	-5	Develop the area to its intended final land use.	Continuous rehabilitation of the decommissioning area will be conducted in line with the Best Practice Guidelines			x	x	Soil Erosion and incorrect stockpiling of topsoil.	Erosion protection measures should be implemented and monitored on areas identified. Photographic records of assessments must be kept.	Independent ECO and SHEQ Department.	ECO: Weekly for the decommissioning phase. Thereafter annual external audits can be undertaken. SHEQ: Weekly monitoring
			Ripping and topsoil replacement will restore the soil physical characteristics prior to re-vegetation.	13	Compacted soils will be ripped and topsoil will be replaced if the latter is deemed necessary for effective vegetation.	14										

Name of Activity	Project	Impact Area	Potential Impacts	Rating	Mitigation Type	Rating	Performance Objectives	Goals	Time Period for Implementation				Action Plan			
Activities			Potential Impacts	SbM	Mitigation Measures	SaM			Short Term (1-12 mth)	Medium Term (1-5 yr.)	Long Term (5 yr. +)	LoM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
					Where sites have been alienated of vegetation or where soils have been compacted or covered with concretes, these sites will be ripped and ploughed.			released by the DWA.								Pedologist: Weekly assessment of soil rehabilitation.
					The mine will encourage self-succession of vegetation, if this does not take place effectively a re-vegetation project will be implemented.											
		Terrestrial Ecology (Fauna & Flora)	The rehabilitation of the site will allow reestablishment of natural vegetation.	10	Compacted soils will be ripped and topsoil will be replaced if the latter is deemed necessary for effective vegetation. 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. The soil fertility status should be determined by soil chemical analysis after levelling and before seeding/re-vegetation if	13	Protect the Ecology within which the mine operates	Free draining environment with successful self-succession in place.			x		Invasion of Alien and Weed Vegetation.	A Alien and Invasive Eradication Plan must be implemented on site. This must be undertaken prior to the growing season. An ecological study should be undertaken to determine the status of revegetation on the site especially around the rehabilitated areas.	SHEQ Department and a Specialised Ecologist.	Weed monitoring (monthly); Weed eradication (annually or as required); Ecological Study (every second year))

Name of Activity	Project	Impact Area	Potential Impacts	Rating	Mitigation Type	Rating	Performance Objectives	Goals	Time Period for Implementation				Action Plan			
Activities			Potential Impacts	SbM	Mitigation Measures	SaM			Short Term (1-12 mth)	Medium Term (1-5 yr.)	Long Term (5 yr. +)	LoM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
					deemed applicable. On-going alien and invasive floral species control is required through all phases of rehabilitation. 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.											
		Wetland	No direct impact	-	Access to rehabilitated areas should be restricted to vehicles/ machinery specifically required for the implementation of the decommissioning/ closure plan.	-	-	-	-	-	-	-	-	-	-	-
		Surface Water	Runoff from rehabilitated areas will impact on watercourses especially during intensive rainstorms especially if the area are not free draining.	-5	- The areas will be shaped to be free draining in line with the approved storm water management plan.	13	Protect the water resources within the area in which the mine operates.	Continuous rehabilitation of the decommissioning area will be conducted in line with the Best Practice Guidelines released by the DWA.	x				Surface Water Pollution & Soil Assessments.	To ensure a proactive approach, the SHEQ department should undertake ongoing site monitoring to determine whether activities on site are undertaken in accordance with the EMPr Requirements. The water quality (constituents listed in the WUL) must be	SHEQ Department	Assessments: Weekly. Monitoring: Monthly

Name of Activity	Project	Impact Area	Potential Impacts	Rating	Mitigation Type	Rating	Performance Objectives	Goals	Time Period for Implementation				Action Plan			
Activities			Potential Impacts	SbM	Mitigation Measures	SaM			Short Term (1-12 mth)	Medium Term (1-5 yr.)	Long Term (5 yr. +)	LoM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
														monitored monthly and records must be kept of these result in a centralised system. Analysis of results must be undertaken by an accredited laboratory. Monitoring of the effectiveness of the rehabilitation programme must be undertaken. This should be undertaken by means of weekly inspections and keeping a photographic record.		
		Groundwater	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-
		Heritage	No direct impact	-		-	-	-	-	-	-	-	-	-	-	-
		Visual	The rehabilitation (ripping, topsoil replacement and landscaping) will remove the visual incongruity.	11	- An overall visual improvement will be noticed once all mining related infrastructure has been demolished and the area has been shaped and self-succession has occurred. Demarcate the decommissioning area and limit the	13	Successful establishment of vegetation.	Remain within the designated area demarcated for activities. Remain within the National Environmental Management: Air Quality Act, 2004 Dust Regulation guidelines for rural communities.				x	Comply with the National Dust Regulations.	Dust dispersion will be monitored as part of the overall mine dust monitoring programme.	SHEQ Department.	Monthly Monitoring with Annual Reporting.

Name of Activity	Project	Impact Area	Potential Impacts	Rating	Mitigation Type	Rating	Performance Objectives	Goals	Time Period for Implementation				Action Plan			
Activities			Potential Impacts	SbM	Mitigation Measures	SaM			Short Term (1-12 mth)	Medium Term (1-5 yr.)	Long Term (5 yr. +)	LoM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
					decommissioning activities as far as possible.											
					Final shaping will be implemented such that the final profile of the rehabilitated areas are formed to emulate natural contours of the area.								Vegetation Establishment.	An ecological study should be undertaken to determine the status of revegetation on the site especially around the rehabilitated areas.	SHEQ Department	Monthly
					Foundations will be removed to a depth of 1 m below the surface and the area rehabilitated.											
					All material recovered from the demolition of buildings and/or structures will either be transported to a permitted disposal site, or made available to the local community as building materials (provided they are in a satisfactory condition following demolition).											
					Linear infrastructure constructed by the mine (i.e. pipelines) will be removed if it proves to inhibit land use at decommissioning.											
		Air Quality	All activities associated with the removal of	-7	All fences erected around the mine will be dismantled	-5	No concerns raised by surrounding	Remain within the designated	x			x	Dust dispersion.	Dust dispersion will be monitored as part of the overall mine	SHEQ Department.	Monthly Monitoring with

Name of Activity	Project	Impact Area	Potential Impacts	Rating	Mitigation Type	Rating	Performance Objectives	Goals	Time Period for Implementation				Action Plan			
Activities			Potential Impacts	SbM	Mitigation Measures	SaM			Short Term (1-12 mth)	Medium Term (1-5 yr.)	Long Term (5 yr. +)	LoM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
			infrastructure has the potential to release dust.		and disposed of at a permitted disposal site. Dust sampling will be undertaken on a monthly basis. Monthly monitoring reports will be generated by the mine or through a suitably qualified air quality specialist.		landowners regarding air quality.	area demarcated for activities. Remain within the National Environmental Management: Air Quality Act, 2004 Dust Regulation guidelines for rural communities.						dust monitoring programme.		Annual Reporting.
		Noise	All activities associated with the removal of infrastructure and rehabilitation has the potential to generate noise.	-4	In the event that air quality or dust issues are identified based on the monitoring programme, an independent specialist should be appointed to determine the best course of action to ameliorate the situation. The removal of all infrastructure is to take place during daytime periods only. Where noise becomes a nuisance, management measures will be investigated and implemented to address these. Machinery with low noise levels and maintained in a good order to be used and to comply with the	-5	No concerns raised by surrounding landowners regarding air quality.	Remain within the designated area demarcated for activities. Remain within the National Environmental Management: Air Quality Act, 2004 Dust	x			x	Noise Monitoring.	Adjacent landowners will be informed of the planned dates of the significant demolition activities where applicable. Daily noise monitoring will be undertaken in the areas where high levels of noise take place during decommissioning.	SHEQ Department.	Ongoing consultation with surrounding landowners. Daily noise monitoring.

Name of Activity	Project	Impact Area	Potential Impacts	Rating	Mitigation Type	Rating	Performance Objectives	Goals	Time Period for Implementation				Action Plan			
Activities			Potential Impacts	SbM	Mitigation Measures	SaM			Short Term (1-12 mth)	Medium Term (1-5 yr.)	Long Term (5 yr. +)	LoM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
					International Finance Corporation's (IFC) Health and Safety Regulations.			Regulation guidelines for rural communities.								
					Speed control measures will be implemented by the mine through the placement of adequate signage.											
					Implement a penalty system for non-compliance to speed control measures and ensure that all workers are made aware of the penalty systems.											
		Social	No direct impact	-	Gravel roads to be maintained in as good and smooth a condition as possible.	-	-	-	-	-	-	-	-	-	-	-
		Geology	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-
		Topography	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-
Waste Management and decommissioning of hazardous (also fuels) substances	1, 2, 3	Soil, Land Use and Land Capability	Spills around the diesel storage areas and product stockpiles may result in the contamination of soils.	-11	-	-5	Protection of Soil Integrity to achieve final land use objectives.	Zero presence of contaminated land due to early detection and implementation of actions.			x		Protection of Soil Resources.	Compliance with contaminated land objectives and limits.	SHEQ Department	Ongoing
					Any hydrocarbon, effluent or other contaminants should be collected and the soils remediated immediately.											
			Handling of Building Rubble	-9	Documentation of removal and safe disposal must be available on site.	-6										
					All infrastructure will be removed and rehabilitated, should no alternative use be found for the structures.											

Name of Activity	Project	Impact Area	Potential Impacts	Rating	Mitigation Type	Rating	Performance Objectives	Goals	Time Period for Implementation				Action Plan			
Activities			Potential Impacts	SbM	Mitigation Measures	SaM			Short Term (1-12 mth)	Medium Term (1-5 yr.)	Long Term (5 yr. +)	LoM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
					Foundations will be removed to a depth of 0.5m below surface.											
		Terrestrial Ecology (Fauna & Flora)	No direct impact	-	A contaminated land assessment should be undertaken at all areas where diesel was stored, as well as where fuel pipelines were placed.	-	-	-	-	-	-	-	-	-	-	-
		Wetland	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-
		Groundwater	Handling or Hazardous Waste within workshops and general mine area.	-10	-	-6	Protect the groundwater resources to ensure that limited to no impact on groundwater resources occur as a result of the mining operations.	Achieve 100% compliance to the water quality objectives as agreed to between the mine and the DWS based on the discussions within this IWWMP.		x		x	Groundwater Pollution and potential trends.	The groundwater quality (constituents listed in the WUL) must be monitored monthly and records must be kept of these result in a centralised system. Analysis of results must be undertaken by an accredited laboratory.	SHEQ Department	Biannually
					Clean and dirty water separation systems should be incorporated in terms of the Geo Tail (Pty) Ltd water study recommendations or any approved update thereafter.											
					Waste management training must be implemented on site.			Maintain a 100% safe disposal record on the disposal of hazardous waste.				x				
					Clear signs informing staff of waste management practices must be implemented on site.											
					Hazardous waste handling should only take place within bunded and/or lined areas.											
					Hazardous waste should be removed by a licensed											

Name of Activity	Project	Impact Area	Potential Impacts	Rating	Mitigation Type	Rating	Performance Objectives	Goals	Time Period for Implementation				Action Plan			
Activities			Potential Impacts	SbM	Mitigation Measures	SaM			Short Term (1-12 mth)	Medium Term (1-5 yr.)	Long Term (5 yr. +)	LoM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
					hazardous waste removal company and taken to a suitable and licensed landfill site.											
			Handling of Building Rubble	-9	Documentation of removal and safe disposal must be available on site.	-6										
					All infrastructure will be removed and rehabilitated, should no alternative use be found for the structures.											
					Foundations will be removed to a depth of 0.5m below surface.			Implement and operate a detailed waste manifest on site and maintain a 100% safe disposal record on the disposal of waste on site.			x	x				
			Handling and Storing of Domestic Waste	-12	All building rubble will follow the waste hierarchy and will therefore either be sold for reuse where possible and as a last option be disposed of at a licensed facility suitable for such waste in line with the NEM:WA.	-9		Achieve 100% compliance to the water quality objectives as agreed to between the mine and the DWS based on the discussions within this IWWMP.		x		x				
					Clean and Dirty water separation systems should be maintained.											
					Waste management training must be implemented on site.			Maintain a 100% compliance with the conditions of the ECA permit				x				

Name of Activity	Project	Impact Area	Potential Impacts	Rating	Mitigation Type	Rating	Performance Objectives	Goals	Time Period for Implementation				Action Plan			
Activities			Potential Impacts	SbM	Mitigation Measures	SaM			Short Term (1-12 mth)	Medium Term (1-5 yr.)	Long Term (5 yr. +)	LoM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
					Clear signs informing staff of waste management practices must be implemented on site.			for the landfill site.								
					Groundwater monitoring must be undertaken in such a manner as to ensure that any potential impacts from the site can be detected.			Maintain a 100% accurate recording of waste and submission of such recording to the Department.				x				
					Recycling practices must be investigated and implemented on site.			Maintain daily covering of the landfill site.	x			x				
		Surface Water	Handling of Hazardous Waste within workshops and general mine area could contaminate the dirty water storage areas. The water is then reused in the system and could have impacts on the integrity of the storm water system and also the production.	-11	Clean and Dirty water separation systems should be maintained up until closure.	-6	Develop the area to its intended final land use.	Maintain the SWMP on site.				x	Surface Water Pollution & Soil Assessments.	To ensure a proactive approach, the SHEQ department should undertake ongoing site monitoring to determine whether activities on site are undertaken in accordance with the EMPr Requirements. The water quality (constituents listed in the WUL) of the dam must be monitored monthly and records must be kept of these result in a centralised system. Analysis of results must be undertaken by an accredited laboratory.	SHEQ Department	Assessments: Weekly. Monitoring: Monthly
					Waste management training must be implemented on site.			Maintain a 100% no-spill record.				x				
					Clear signs informing staff of waste management practices must be implemented on site.			Clean spills, if occur witan 24 hours.				x				
					Hazardous waste handling should only take place within bunded and/or lined areas.			Maintain a 100% safe disposal record on the disposal of hazardous waste.				x				
					Hazardous waste and contaminated materials should be removed by a licensed			Provide training to all staff on best practices regarding waste management every year.	x			x				

Name of Activity	Project	Impact Area	Potential Impacts	Rating	Mitigation Type	Rating	Performance Objectives	Goals	Time Period for Implementation				Action Plan			
Activities			Potential Impacts	SbM	Mitigation Measures	SaM			Short Term (1-12 mth)	Medium Term (1-5 yr.)	Long Term (5 yr. +)	LoM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
					hazardous waste removal company and taken to a suitable and licensed landfill site.											
					Documentation of removal and safe disposal must be available on site.											
			Handling and Storing of Domestic Waste should have no impact on the surface water resources due to the location of the facility. However, incorrect disposal of waste could hamper the integrity of the storm water system.	-9	Weekly inspections of Storm Water Management Systems must be undertaken. Any blockages or maintenance requirements must be documented and an action plan developed.	-5		Maintain a 100% compliance with the conditions of the ECA permit for the landfill site.	x			x				
					Clean and Dirty water separation systems should be maintained up until closure.											
					Waste management training must be implemented on site.											
					Weekly inspections of Storm Water Management Systems must be undertaken. Any blockages or maintenance requirements must be documented and an action plan developed.											
					Clear signs informing staff of waste											

Name of Activity	Project	Impact Area	Potential Impacts	Rating	Mitigation Type	Rating	Performance Objectives	Goals	Time Period for Implementation				Action Plan			
Activities			Potential Impacts	SbM	Mitigation Measures	SaM			Short Term (1-12 mth)	Medium Term (1-5 yr.)	Long Term (5 yr. +)	LoM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
					management practices must be implemented on site.											
					Recycling practices must be investigated and implemented on site.			Maintain daily covering of the landfill site up until final covering.	x			x				
					Building rubble must be disposed of in line with the requirements of the NEM:WA.											
					Access control must be strictly enforced.			Self-succession of vegetation should establish within the first rainy season after construction has been completed.	x			x				
		Air Quality	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-
		Heritage	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-
		Visual	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-
		Air Quality	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-
		Noise	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-
		Social	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-

1.e Impact Management Outcomes

Please refer to Table 35 to Table 38 for the impact management outcomes.

1.f Impact Management Actions

Please refer to Table 35 to Table 38 for the action plan recommended.

1.g Financial Provision

1.g.i Determination of Financial Provision

1.g.i.1 Describe the closure objectives and the extent to which they have been aligned to the baseline environment described under Regulation 22(2)(d) as described in 2.4 herein

The proposed final land use would be to return the area to an area near pre-mining conditions, where residual impacts will be minimised and the area left with no safety threat to humans or animals, as committed to in the various EMPr's preceding this application. This would include demolishing surface infrastructure that will not be handed over to a third party and promoting the growth of vegetation. It is evident that the re-establishment of this vegetation biome on site will not be difficult as areas that have already undergone rehabilitation have seen a large success in terms of the revegetation.

Please refer to Section 1.d.i for the detailed discussion of the closure objectives. The management measures as presented in the EMPr has been developed to give effect to the end land use and closure objectives.

1.g.i.2 Confirm specifically that the environmental objectives in relation to closure have been consulted with landowner and interested and affected parties

Please refer to Part A, for the detailed discussion regarding I&AP Consultation. The detailed issues and response report is attached to Annexure 4. The draft EIA report and EMPr will be made available electronically to all stakeholders and in hard copy to all commenting authorities.

1.g.i.3 Provide a rehabilitation plan that describes and shows the scale and aerial extent of the main mining activities, including the anticipated mining area at the time of closure

As presented in Part A of this document, the following table presents the key closure requirements:

The following table specifically highlights closure actions important to the proposed activities:

Table 39: Summary of Rehabilitation and Closure Actions for Khumani Mine as a whole

	Requirement	Target	Responsible Person	Timeframes
	General Surface Rehabilitation			
A	**Planning**			
A1	The closure plan will be reviewed during the life of the mine (closure, operational and decommissioning phases) as part of the NEMA Regulations for financial provision.	Legal closure review compliance.	Environmental Specialist	Annually during operational phase.
A2	Notify the DMR of intended cessation of mining activities and rehabilitation in accordance with the NEMA.	Notification	Environmental Department	Five years prior to closure.
A3	Apply for the necessary Environmental Authorisation for the decommissioning of activities in terms of the NEMA, NEM:WA and NWA.	Environmental Authorisation.	Environmental Department	At least 2 years prior to intended decommissioning.
A4	Appoint a project manager to oversee the process.	Appointment of suitably qualified project manager.	Mine Manager	Prior to the commencement of closure planning and implementation.

	Requirement	Target	Responsible Person	Timeframes
A5	Where still present, materials containing asbestos must be identified and removed by a person competent to do so. Asbestos waste must be disposed of to an appropriately licensed facility.	Disposal of waste in terms of Asbestos regulations and the NEM:WA.	Engineering Manager and Environmental Department.	Demolition phase
A6	Identify any protected species that may require permitting prior to disturbing.	Biodiversity Permits	Environmental Specialist	Prior to commencement of rehabilitation.
A7	A storm water management plan (clean and dirty water separation) for the purposes of rehabilitating towards the final land use should be developed.	Free draining environment	Hydrologist/Engineer	Prior to commencement of rehabilitation.
A8	If any archaeological artefacts of potential significance are identified at any stage, work must cease and SAHRA must be notified for instruction on how to proceed.	Protection of artefacts	Environmental Specialist	Ongoing
B	**Removal of Surface Infrastructure and Structures**			
B1	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 DMR purpose	Documentation of rehabilitation process.	Environmental Department	Ongoing
B2	All temporary buildings (pre-fabricated buildings) should be removed and their footprints rehabilitated.	Surface rights area cleared up of all mining related infrastructure and structures.	Project Manager	Ongoing
B3	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)	Surface rights area cleared up of all mining related infrastructure and structures.	Project Manager	Ongoing
B4	All surface structures, infrastructure and 'hard surfaces' (inter alia, redundant surfaced roads, parking and paved areas) are to be demolished and removed from the disturbed mine footprint; unless an alternative/continued use for any such items is agreed upon, in writing, with the DMR.	Surface rights area cleared up of all mining related infrastructure and structures.	Project Manager	Ongoing
B5	Any item that has no salvage value to the mine but could be of value to individuals will be treated as waste, unless otherwise defined in terms of the NEM:WA	Surface rights area cleared up of all mining related infrastructure and structures.	Project Manager	Ongoing
B6	All structures will be demolished, terracing removed and foundations demolished to 1m or as stipulated in the closure objectives (500mm for roads) below the original ground level	No remaining sub-surface structures that may impede further phases of rehabilitation or vegetation establishment.	Project Manager	Ongoing
B7	Dismantle and remove redundant fencing for salvage	Surface rights area cleared up of all mining related infrastructure and structures.	Project Manager	Ongoing
B8	Water pollution control structures will remain until the completion of all demolition and associated rehabilitation activities where after these will be rehabilitated.	Free draining environment	Hydrologist/Engineer	Prior to commencement of rehabilitation.
B9	The soils beneath any structures used for the bulk storage of hazardous substances (i.e. bulk fuel and oil storage facilities, oil-water separators/sumps), must be made subject to a hydrocarbon contamination screening exercise undertaken by a suitably qualified, independent, professional.	Documented proof of contamination assessments on record. Compliance with any further recommendations from appointed specialist prior to further rehabilitation of contaminated site(s).	Project Manager	Ongoing
C	**Soil Preparation**			
C1	Where sites have been alienated of vegetation or where soils have been compacted or covered with concretes, these sites will be ripped and shaped.	No topsoil replacement on compacted soil horizons.	Project Manager	Ongoing
C2	The topsoil and subsoils (or identified gravel topsoil mixture) 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-	Replacement of fertile topsoil.	Environmental Scientist	Ongoing

	Requirement	Target	Responsible Person	Timeframes
	succession of vegetation, if this does not take place effectively a revegetation project will be implemented			
C3	On-going alien and invasive floral species control is required through all phases of rehabilitation.	No establishment of alien or invasive species.	Environmental Scientist	Ongoing inspections.
C4	Pre-mining topography should be reasonably restored through shaping and landscaping, such that the topography of rehabilitated areas will ultimately be commensurate with that of adjacent, non-disturbed areas.	No evidence of significant alteration.	Project Manager	Ongoing
C5	The areas will be landscaped to be free draining in line with the approved storm water management plan.	Area to be fee draining	Project Manager	Ongoing
C6	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	Successful vegetation establishment	Ecologist	Ongoing inspections.
C7	Appropriate erosion control measures (i.e. contour banks) must be taken where required	No evidence of significant alteration.	Project Manager	Ongoing
C8	Care should be taken in choosing a method/machinery to implement C4 and C5 above, such that ripped soils are not compacted through efforts to appropriately shape the disturbed sites.	No topsoil replacement on compacted soil horizons.	Project Manager	Ongoing
C9	Access to rehabilitated areas should be restricted to vehicles/machinery specifically required for the implementation of the closure plan.	No unauthorised access.	Project Manager	Ongoing
D	**Soil and Vegetation replacement**			
D1	A topsoil/gravel mixture should be replaced over all rehabilitated area. Where topsoil is insufficient, subsoil must be treated in accordance with the specification of a soil specialist.	Replacement of fertile topsoil.	Environmental Scientist	Ongoing
D2	Topsoil should be screened, as necessary, to remove any foreign objects, rocks, etc., prior to the replacement thereof.	Replacement of topsoil that is fit for purpose.	Project Manager	Ongoing
D3	Any areas with slope ≥ 3° should be inspected weekly for signs of topsoil erosion following the replacement thereof, and appropriate action taken to curb any problematic areas.	No evidence of significant alteration.	Project Manager	Ongoing
D4	Self-succession should be encouraged. One rainy season will be allowed for self-succession to take place.	Successful vegetation establishment	Ecologist	Ongoing inspections.
D5	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.	Successful vegetation establishment	Ecologist	Ongoing inspections.
D6	No grazing on rehabilitated areas is to occur within three years of reseeding completion, should reseeding be undertaken..	Documentation of rehabilitation process.	Project Manager	Three years from re-seeding.
E	**Disposal of Material**			
E1	Waste will be classified in terms of the NEM:WA to determine the required waste disposal strategies.	Classification of waste in terms of the NEM:WA	Environmental Specialist	Prior to the commencement of closure planning and implementation.
E2	Rubble will be disposed of at a suitable site which will be rehabilitated once it serves its purpose. This activity should also comply with the relevant NEM:WA requirements	Safe disposal certificates.	Environmental Department	Ongoing
E3	All types of waste shall be removed entirely from the area and appropriately dealt with in respect of the general waste handling procedure	Safe disposal certificates.	Environmental Department	Ongoing

	Requirement	Target	Responsible Person	Timeframes
E4	Inert ceramics such as bricks, concrete, gravel etc. will be used as backfill or disposed of in a permitted waste disposal site.	Disposal of waste in terms of the NEM:WA.	Environmental Department	Ongoing
E5	Inert waste, which is more than 1m underground, such as pipes will be left in place.	Disposal of waste in terms of the NEM:WA.	Environmental Department	Ongoing
E6	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	Disposal of waste in terms of the NEM:WA.	Environmental Department	Ongoing
F	**Ongoing monitoring and maintenance**			
F1	All rehabilitated areas will be fenced off up until the area is regarded as stable	No unauthorised access.	Project Manager	Ongoing
F2	All illegal invader plants and weeds shall be dealt with as required in terms of the relevant legislation	No establishment of alien or invasive species.	Environmental Scientist	Ongoing inspections.
F3	External, independent, 'Mine Rehabilitation' compliance audits must be undertaken by a competent auditor for all areas where rehabilitation is being implemented at the mine at least quarterly. Audit to at least document compliance with this plan, as well as any other relevant provisions of the EMPr revision approval by the DMR.	Compliance with closure plan	External Auditor	Quarterly
F4	The mine should undertake monthly internal compliance audits for all areas where rehabilitation is being implemented at the Mine.	Compliance with closure plan	Environmental Department	Monthly
F5	Monitoring and maintenance of 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.	Compliance with closure plan with at least 90% sustainable establishment of vegetation.	Environmental Department	Ongoing
	Specific Infrastructure Requirements			
G	**Product Stockpiles**			
G1	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.	Optimal use of economically viable resources.	Mine Manager and Geologist.	Ongoing
G2	General Surface rehabilitation in terms of Part C and Part D will be implemented.	Successful implementation of General Rehabilitation Requirements.	Environmental Department	Ongoing
H	**Mine Residue Facilities**			
H1	Where possible Mine Residue Stockpiles, as indicated in the approved EMPr will be reworked.	Optimal use of economically viable resources. Implementation of the waste reduction hierarchy.	Project Manager, Environmental Department.	Ongoing
H2	The slopes of the waste rock dumps will be shaped to be stable and that the structure blends into the surrounding environment. An overall gradient of 1:3 should be achieved for the mine residue and waste rock dumps. 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.	Ultimate compliance to the final land use requirements - free draining suitable for grazing land.	Project Manager, Civil Engineer	Ongoing, at least 2 years after final deposition of waste on site.
H3	Engineering design drawings for shaping and closure of the Mine Residue facilities, as developed by a competent civil engineer, must be submitted	Ultimate compliance to the final land use requirements.	Project Manager, Civil Engineer	Once-Off

	Requirement	Target	Responsible Person	Timeframes
	to the DWS and DMR for written approval prior to commencing with the closure thereof.			
H4	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	Free draining environment	Hydrologist/Engineer	Prior to commencement of rehabilitation.
H5	Terraces and berms will be implemented to encourage the self-succession of vegetation and the reduced potential for erosion	Slope stability and effective plant establishment with no signs of erosion.	Project Manager, Environmental Department.	Ongoing
H6	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	Slope stability and effective plant establishment with no signs of erosion.	Project Manager, Environmental Department.	Ongoing
H7	The re-vegetation process will be monitored and encouraged until the area is regarded as stable	Slope stability and effective plant establishment with no signs of erosion.	Project Manager, Environmental Department.	Ongoing
H8	The waste rock dump will be fenced off until the vegetation is stable and the rehabilitation is regarded to be finalised	No unauthorised access.	Project Manager	Ongoing
I	**Paste Disposal Facility**			
I1	The slopes of the slimes dams will be shaped to be stable and that the structure blends into the surrounding environment	Ultimate compliance to the final land use requirements - free draining suitable for grazing land.	Project Manager, Civil Engineer	Ongoing, at least 2 years after final deposition of waste on site.
I2	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	No evidence of significant alteration.	Project Manager	Ongoing
I3	Terraces and berms will be implemented to encourage the self-succession of vegetation and the reduced potential for erosion	Slope stability and effective plant establishment with no signs of erosion.	Project Manager, Environmental Department.	Ongoing
I4	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	Slope stability and effective plant establishment with no signs of erosion.	Project Manager, Environmental Department.	Ongoing
I5	The re-vegetation process will be monitored and encouraged until the area is regarded as stable	Slope stability and effective plant establishment with no signs of erosion.	Project Manager, Environmental Department.	Ongoing
I6	The dam will be fenced off until the vegetation is stable and the rehabilitation is regarded to be finalised	No unauthorised access.	Project Manager	Ongoing
J	**Opencast Pits**			
J1	The opencast pits will be backfilled as part of the operational phase. The aim and objective of the final land use will be to limit any open voids. However, should it be found that opencast pit voids remain at the end of the mining operations, the following points will be initiated.	Ultimate compliance to the final land use requirements sheep and goat unit).	Project Manager, Civil Engineer	Ongoing, at least 2 years after final deposition of waste on site.
J2	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	No unauthorised access.	Project Manager	Ongoing
J3	The enviro-berms will be covered with indigenous thorny vegetation	No unauthorised access.	Project Manager	Ongoing
J4	The outside slopes will be landscaped to be free draining	Ultimate compliance to the final land use requirements	Project Manager, Civil Engineer	Ongoing
J5	The surrounding topography of the area will be designed in such a manner as to allow storm water to run around the facility.	Free draining environment	Hydrologist/Engineer	Prior to commencement of rehabilitation.
J6	The topsoil and subsoils (or appropriate topsoil/gravel mixture) 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	Slope stability and effective plant establishment with no signs of erosion.	Project Manager, Environmental Department.	Ongoing

	Requirement	Target	Responsible Person	Timeframes
	place effectively a revegetation project will be implemented			
J7	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	Slope stability and effective plant establishment with no signs of erosion.	Project Manager, Environmental Department.	Ongoing
J8	Appropriate erosion control measures (i.e. contour banks) must be taken where required	Slope stability and effective plant establishment with no signs of erosion.	Project Manager, Environmental Department.	Ongoing
J9	All rehabilitated areas will be fenced off up until the area is regarded as stable	No unauthorised access.	Project Manager	Ongoing
J10	All illegal invader plants and weeds shall be dealt with as required in terms of the relevant legislation	No establishment of alien or invasive species.	Environmental Scientist	Ongoing inspections.
K	**Clean and dirty water systems**			
K1	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	Protection of water integrity.	Project Manager	Ongoing
	The soils and sediment, contained in the dams, must be made subject to a hydrocarbon contamination screening and waste classification exercise undertaken by a suitably qualified, independent, and professional.	Documented proof of contamination assessments on record. Compliance with any further recommendations from appointed specialist prior to further rehabilitation of contaminated site(s).	Project Manager	Ongoing
K2	Silt and sediment contained in these facilities should be disposed of onto the licensed Slimes Dam if classification proves allowed. If the material is regarded as hazardous with a contamination potential, lawful disposal of such material should be undertaken at a licensed facility.	Lawful disposal of waste.	Project Manager	Ongoing
K3	Proceed with general surface rehabilitation Part B-F.	Successful implementation of General Rehabilitation Requirements.	Environmental Department	Ongoing
L	**General Landfill**			
L1	The landfill on site should be backfilled during the life of mine. If space remains, then inert waste from demolition must be used to backfill the landfill to the height of the surrounding land profile.	Free draining environment	Hydrologist/Engineer	Prior to commencement of rehabilitation.
L2	The natural recharge over the landfill site should be reduced by the compaction of the area and vegetation of the site.	Free draining environment	Hydrologist/Engineer	Prior to commencement of rehabilitation.
	A storm water management system will be designed and implemented around the facility to reduce runoff over this system.	Reduce recharge.	Civil Engineer.	Prior to the commencement of closure planning and implementation.
L3	Engineering design drawings for capping and closure of the aforementioned facilities, as developed by a competent civil engineer, must be submitted to the DWS and DMR for written approval prior to commencing with the closure thereof.	Ultimate compliance to the final land use requirements	Project Manager, Civil Engineer	Once-Off

1.g.i.4 Explain why it can be confirmed that the rehabilitation plan is compatible with the closure objectives.

The rehabilitation requirements stipulated in this EMPr is based on current approved closure conditions as approved in the mine's overall approved EMPr, as well as the input of various specialist studies as discussed in this report.

The rehabilitation measures requires:

- Removal of infrastructure;
- Sloping of areas to be free draining where possible;
- Replacement of topsoil;
- Allowance for self-succession, but where this is not possible, the implementation of a revegetation programme.

1.g.i.5 Calculate and state the quantum of the financial provision required to manage and rehabilitate the environment in accordance with the applicable guideline

The amount that is required to both manage and rehabilitate the environment in respect of rehabilitation is R 853 892.84 (excluding VAT). Please refer to Section 1.s of Part A for a discussion on the financial provision.

1.g.i.6 Confirm that the financial provision will be provided as determined.

It is hereby confirmed that the financial provision will be provided as determined. All areas disturbed will be included in the financial provision as calculated during the annual evaluation and will be updated and provided for annually as per the required Regulations.

1.h Mechanisms for monitoring compliance with and performance assessment against the EMPr and reporting thereon

The following sections present the monitoring requirements of the mine.

1.h.i Water Monitoring Programme

The following table presents the mines groundwater, surface water and air quality monitoring programme:

Table 40: Monitoring Programme

#	Element:	Frequency of Monitoring:	Total # of monitoring points:	Names:	Coordinates						Reporting (Internal/ External):	Frequency of Reporting:
					Latitude (S):			Longitude (E):				
					dd	mm	ss.ssss	dd	mm	ss.ssss		
1	**Fall-out Dust**	Monthly	15	2	27,00	53,00	50.313	23	0	38.139	Internal External	Monthly Annual
				3	27	53	37.924	23	1	43.334		
				6	27	51	30.915	22	59	20.059		
				7	27	49	40,436	23	1	0,012		
				8	27	47	39.157	23	1	41.637		
				9	27	53	45.271	22	57	51.614		
				11	27	49	51,423	22	57	37,766		
				12	27	50	7,598	22	59	8,625		
				13	27	51	51.668	22	56	39.831		
				14	27	50	30.546	23	1	48.061		
				16	27	50	5,152	22	58	32.670		
				17	27	49	8.806	23	0	36.990		
				20	27	47	49,431	23	0	27,661		
				21	27	45	49.270	23	1	4,887		
				22	27	48	21.390	23	1	12,973		
2	**PM10**	Monthly	3	K/H	27	53	45.250	22	58	48.286	Internal	Monthly
				H/M	27	49	51.673	22	57	46.056		
				M/R	27	50	55.384	22	58	46.892		
3	**E-Sampler**	Monthly	7	2	27	53	50.306	23	0	42.726	Internal	Monthly
				11	27	49	51.473	22	57	41.808		
				12	27	50	27.662	22	59	13.034		
				14	27	50	30.546	23	1	51.939		
				15	27	50	59.649	23	0	10.243		
				17	27	49	8,806	23	0	33.990		
				18	27	51	53.401	22	58	30.736		
4	**Ambient Noise**	Monthly	3	N1	27	52	59.012	22	57	58.822	Internal	Monthly
				N2	27	50	5.431	22	57	57.887		
				N3	27	50	10.606	22	58	59.723		
5	**Soil Sampling**		12	S1.1	27	54	19.350	23	1	4.060		

#	Element:	Frequency of Monitoring:	Total # of monitoring points:	Names:	Coordinates						Reporting (Internal/ External):	Frequency of Reporting:
					Latitude (S):			Longitude (E):				
					dd	mm	ss.ssss	dd	mm	ss.ssss		
		Monthly for a six month period		S1.2	27	54	7.550	23	0	57.210	Internal External	Monthly 6 Monthly
				S2	27	49	34.080	23	0	23.940		
				S3	27	49	28.840	23	0	44.130		
				S4	27	50	47.080	22	59	52.670		
				S5	27	53	49.430	23	0	7.840		
				S6	27	50	17.270	23	0	8.500		
				S7	27	50	6.660	23	0	18.780		
				S8	27	49	53.710	23	0	45.840		
				S9	27	50	39.000	22	58	55.100		
				S10	27	50	34.700	22	59	5.900		
				S11	27	50	23.900	22	59	40.100		
6	**Surface Water**	Every 2nd month	4	Bruce Storm water	27	49	12.844	23	0	53.523	Internal External	Every 2nd Month Quarterly
				Load-out Storm water	27	51	1.549	22	58	14.439		
				Parson PCD	27	50	55.336	2	58	51.536		
				Process water	27	551	43.965	22	58	26.439		
7	**Ground Water**	Every 2nd month	11	Markram	27	50	19.739	22	59	5.577	Internal External	Every 2nd Month Quarterly
				PBW01	27	50	34.342	22	57	41.909		
				PBE01	27	51	4.483	22	59	0.628		
				King 2	27	51	20.227	23	0	4.304		
				PBW04	27	52	8.805	22	57	30.451		
				VK1/49	27	52	0.438	22	58	50.498		
				BKM3D	27	52	39.260	22	58	45.346		
				AGK2/87	27	53	5.557	22	59	14.103		
				BKM04	27	52	35.550	23	1	39.829		
				Kraal	27	52	50.885	23	1	34.324		
				AMK1/47	27	53	31.545	22	59	32.375		
8	**Biomonitoring**	Every 2nd year	8	Env1	27	49	57.49	22	57	55.55	Internal External	Every 2nd Year
					27	49	57.72	22	57	55.22		
					27	49	57.98	22	57	55.60		
					27	49	57.75	22	57	55.99		
				Env2	27	50	16.80	22	59	31.48		
					27	50	16.56	22	59	31.64		
					27	50	16.40	22	59	31.28		
					27	50	16.71	22	59	31.08		
				Env3	27	49	54.54	23	0	56.57		
					27	49	55.01	23	0	56.43		
					27	45	54.91	23	0	56.03		
					27	49	54.56	23	0	56.19		
				Env4	27	50	34.54	23	1	50.51		
					27	50	34.40	23	1	50.83		
					27	50	34.59	23	1	50.94		
					27	50	34.78	23	1	50.76		
				Env5	27	53	22.96	22	56	56.72		
					27	53	23.28	22	56	56.52		
					27	53	23.02	22	56	56.21		
					27	53	22.73	22	56	56.50		
				Env6	27	52	54.96	22	59	12.07		
					27	52	55.03	22	59	12.33		
					27	52	55.38	22	59	12.26		
					27	52	55.31	22	59	11.93		
				Env7	27	53	40.37	23	0	48.63		
					27	53	40.53	23	0	48.47		
					27	53	40.19	23	0	48.29		
					27	53	40.03	23	0	48.60		
				Env8	27	54	31.42	23	2	34.54		
					27	54	31.69	23	2	34.78		
					27	54	31.91	23	2	34.44		
					27	54	31.66	23	2	34.28		

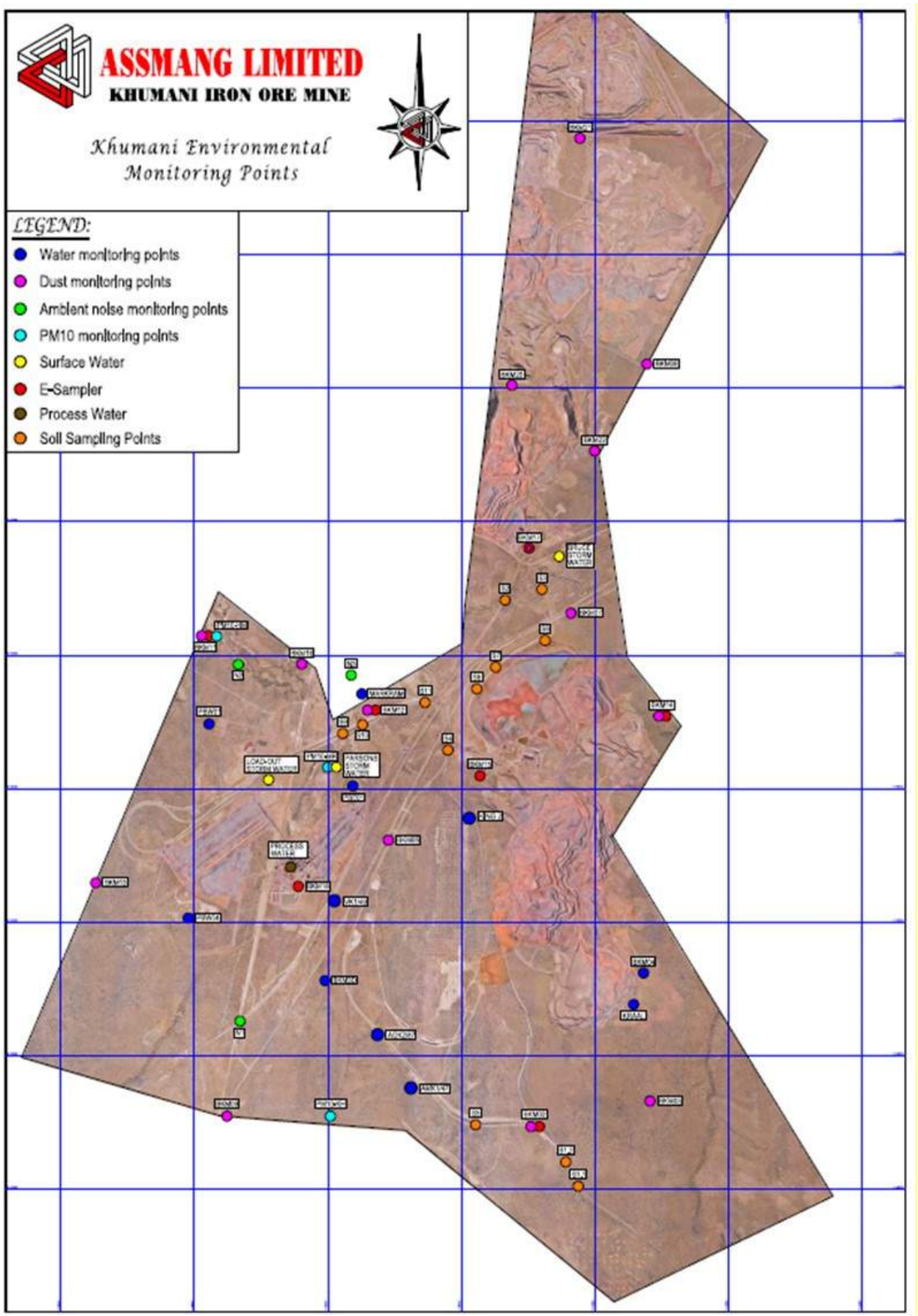

Figure 32: Monitoring Points

1.h.ii Storm Water and Clean and Dirty Water Infrastructure

The monitoring of surface water management infrastructure must be undertaken as follows:

- Annual GN 704 audits must be undertaken by a qualified hydrologist;
- Silt traps must be inspected monthly during the wet season (September – April). A record must be kept with regards to the remaining capacity and when the next cleaning action is required;
- Record each time the a silt trap is emptied/ dredged of sediment;
- The integrity of all dirty water containment structures need to be inspected on an annual basis;
- A maintenance programme will be followed as part of the storm water and clean and dirty water infrastructure monitoring; and
- An updated plan of the layout of the storm water channels and silt traps must be kept.

The following principles should form part of the storm water management monitoring programme:

- Design capacities of dirty water containment facilities should be maintained;
- Clean and dirty water separation systems should be maintained i.e. control of blockages, overflows, erosion and pollution;
- Emergency procedures should be developed for the site and these should be clearly defined and documented;
- Should an emergency occur, it should be thoroughly investigated, the magnitude should be quantified (volume and discharge rate and quality), impact determined (on downstream receiving water bodies), and the circumstances which caused them;
- Regular inspections should be undertaken of the facilities in order to monitor the condition of each facility. This includes the undertaking of pro-active maintenance and replacement;
- Inspections should be undertaken by an appropriate qualified and experienced person (engineer) in liaison with operators;
- Facilities must be maintained as to operate at design capacity and with the efficiency and effectiveness initially intended and required to meet objectives. Maintenance include desilting of the dams, clearance of alien vegetation and de-scaling of pipes;
- Erosion, damage to pipelines, build-up of sediment should be visually inspected. Inspections should be used to alert mine personnel as to prevent emergencies and ensure that corrective response measures are taken timeously;
- Operational monitoring should include flow monitoring (as part of the water balance), assessment of hydraulic integrity of all pipelines, monitoring of water levels and quality, rainfall measurements and assessment or monitoring of silt build-up; and
- Personnel at the mine need to be allocated the responsibility of managing the different components of the SWMP and its associated infrastructure.

1.h.iii Waste Monitoring

On 2 June 2014 the NEM:WA came into force. With various amendments brought by this amendment, the most significant, and still most controversial change is the blanket inclusion of mine residue stockpiles as hazardous waste under the Schedule 3: Defined Wastes Definitions. Section 4 of the Act has also been amended to remove the previous exclusion of mine residue deposits and stockpiles from the Act's ambit. Mine residue facilities (deposits and stockpiles) are accordingly no longer governed by the MPRDA, but are subject to all the provisions of the NEM:WA.

Schedule 3: Defined Wastes have been broken down into two categories: Category A being hazardous wastes and category B being general wastes. Under Category a (hazardous wastes) the Act makes allowance for "Wastes resulting from exploration, mining, quarrying, and physical and chemical treatment of minerals".

In order to attempt to understand the implications of this on a mining operation, it is important to ensure that the definitions of all the relevant terminologies are defined:

- Hazardous waste: means "any waste that contains organic or inorganic elements or compounds that may, owning to the inherent physical, chemical or toxicological characteristic of that waste, have a detrimental impact on health and the environment and includes hazardous substances, materials or objects within business waste, residue deposits and residue stockpiles."
- Residue deposits: means "any residue stockpile remaining at the termination, cancellation or expiry of a prospecting right, mining right, mining permit, exploration right or production right."

- Residue stockpile: means "any debris, discard, tailings, slimes, screening, slurry, waste rock, foundry sand, mineral processing plant waste, ash or any other product derived from or incidental to a mining operation and which is stockpiled, stored or accumulated within the mining area for potential re-use, or which is disposed of, by the holder of a mining right, mining permit or, production right or an old order right, including historic mines and dumps created before the implementation of this Act."

Various regulations have been drafted in support of the NEM:WA, some of which are already in effect, and then there are also those still proposed.

Chapter 9 of the above-mentioned Regulations stipulates the requirements for a motivation for and consideration of listed Waste Management Activities that do not require a Waste Management Licence. The motivation must:

- Demonstrate that the waste management activity can be implemented without unacceptable impacts on, or risk to, the environment or health;
- Must provide a description of the waste;
- Description of waste minimisation or waste management plans; and
- Description of potential impacts, etc.

The transitional provisions under Chapter 6 of these Regulations prescribe timeframes in which all wastes must be classified within 18 months from the date of commencement of these regulations (23 August 2013) and every five years thereafter or should the process be changed or altered.

For the above purposes, Khumani must implement and undertake a Waste Classification System in accordance with the NEM:WA.

1.h.iv Air Quality Monitoring

Khumani currently has an ambient air and weather monitoring programme that includes dust fall monitoring, Particulate Matter 10 microns (PM10) and meteorological monitoring. Dust fallout is measured at:

- Eight (8) unique locations using single dust monitoring units (all situated within mine premises).
- Four (4) directional dust monitoring units (Dust Watch), that are located at different locations in order to provide sampling data from four (4) different wind directions, with the aim of indicating the predominant direction of dust loading in the area.

PM10 monitoring is conducted at:

- Seven (7) PM10 monitoring locations (E-Samplers manufactured by Met One Instruments, Inc.) that are located at strategic locations to capture ambient concentration of particulate matter on mine premises [five (5) instruments are co-located with dust monitoring points, while two (2) are independent, stand-alone sites].
- Three (3) monitoring locations with handheld instrument (SKC Deployable Particulate Sampler System with Portable Air Kit for 24-hour sampling) once a month for 24 hours.

The mine is located outside residential areas (non-residential) and should therefore comply with the following limits in terms of the National Dust Control Regulations, 2013:

Restriction Areas	Dust fall rate (D) (mg/m2/day) – averaged over 30 days.	Permitted frequency of exceeding dust fall rate
Residential area	D < 600	Two within a year, not sequential months.
Non-residential area	D < 1200	Two within a year, not sequential months.

1.h.v Ecological Monitoring

Through maintaining a terrestrial bio-monitoring programme the biodiversity of the landscape, with special mention of sensitive environments and faunal and floral assemblages, can be monitored and information can be provided to adequately manage the biological resources associated with the mining footprint and associated sphere of influence. The broad objective of the biodiversity monitoring programme should be to:

- Comply with the Khumani Safety, Health and Environment (SHE) standards, EMPr and Environmental policies;
- Assess the Present Ecological State (PES) of terrestrial ecology within the Mine footprint and associated sphere of influence;
- Monitor spatial and temporal trends in biological resource integrity in the vicinity of the Khumani Mine;

- Feed into the requirements of the current Offset area; and
- Report any emerging issues.

In order to ensure that impact mitigation takes place to an adequate level should the proposed mining expansion proceed, the Biodiversity Action Plan (BAP) must be updated with the additional activities. The BAP and the implementation of additional management measures must continue to be overseen by an environmental panel which should include representatives from the mine, and appropriately qualified specialists..

1.h.vi Closure Monitoring

The following monitoring programme is recommended upon closure:

Table 41: Post Closure Monitoring Programme

Component / Aspect	Monitoring		Performance / success criteria	Corrective action
	Methodology	Frequency / duration		
Soil Management				
Soil fertility	• Undertake a visual assessment and delineate areas where poor vegetation growth has occurred; • Submit soil samples to an accredit soil laboratory to conduct soil fertility analysis.	Yearly until soil fertility supports the final land use or for at least 5 years post-closure	• Soil analysis results comply with remediation targets at a 95 percentile level; and • Self-sustaining vegetation establishment.	• Apply amelioration where required as informed by sampling undertaken.
Erosion	• Conduct a visual assessment to determine areas of potential erosion; and • Undertake field investigations, fixed point photography to document the significance of the erosion occurring on site	Twice yearly for at least 5 years post closure.	• No evidence of significant erosion; and • Good vegetation cover and species composition.	As required: • Re-shape areas to ensure that they are free-draining; • Establish vegetation on bare patches if self-succession is unsuccesful; and • Repair and stabilisation of erosion gullies and sheet erosion.
Post-mining end land use	• Assess activities completed, as well as legal and related documentation completed and signed-off; and • Ensure rehabilitation measures are aligned to the LUP.	Once off, at mine closure.	• Area has been rehabilitated to an aesthetic quality not to compromise potential tourism; • Transfer to third party operator has taken place once the area has been proven to be safe for redevelopment; • Legal and zoning issues have been addressed; and • Vegetation re-establishment, cover and composition are sustainable.	• Refer back to end land use approach and refine measures to be implemented in achieving the desired final land use.
Topography	• Conduct a visual assessment to determine areas of potential erosion; and • Undertake regular digital surveys of rehabilitated areas to confirm that final topography is aligned with landform designs.	During rehabilitation phase	• No evidence of significant erosion. • No evidence of water pooling on rehabilitated areas. • The final profile achieved should be acceptable in terms of surface water drainage requirements and the end land use objectives.	As required: • Re-shape areas to ensure that they are free-draining; and • Refer back to end land use approach and refine measures to be implemented in achieving the desired final land use.
Vegetation establishment	○ Determine whether re-established vegetation communities are on a trajectory of achieving a stable self-sustaining community dominated by species typical of the climax-species present in the adjacent areas; ○ Inspect rehabilitated areas to assess vegetation establishment and provide for early detection of erosion in recently planted/seeded areas (monthly); ○ Undertake fixed point photography at specific points at the rehabilitated sites to obtain a long term directly comparable method of determining changes in the landscape; and ○ Conduct evaluation of rehabilitated areas by means of field inspections. During these assessments measurement	Quarterly for at least 5 years post-closure.	• Limited to no erosion; and • Self-sustaining vegetation ecosystem.	As required: • Revegetate poorly established rehabilitated areas; • Reseed bare patches; and • Apply additional fertiliser and/ or organic matter, depending on the condition of the vegetation and the initial organic material application.

Component / Aspect	Monitoring		Performance / success criteria	Corrective action
	Methodology	**Frequency / duration**		
	of growth performance and species abundance will be carried out to determine: i. Plant basal cover and species abundance in the grassed areas. Estimates of vegetation canopy and ground cover as well as height; ii. Distribution, growth and survival of woody species; iii. Dominant plant species (woody and herbaceous); iv. Presence of exotic invasive species, and degree of encroachment; v. Browsing or grazing intensity; vi. Notes regarding erosion, such as, type, severity, degree of sediment build-up; and vii. Species composition and richness.			
Alien and Invasive floral species	• Visually inspect areas where invasive species have been previously eradicated and areas prone to invasive species (e.g. eroded/degraded areas, along drainage lines, etc.); and • Undertake surveys on relevant sites where bush encroachment has previously been identified to determine the status quo of invasive vegetation.	Yearly for at least 5 years post-closure.	• Limit and/or prevent declared Category 1, 2 and 3 invader species establishing; • Minimise extended threat to ecosystems, habitats or other species; • Increase the potential for natural systems to deliver goods and services; and • Minimise economic or environmental harm or harm to human health.	• Revisit mitigation measures; and • Continue control and management.
General site status	• Conduct a visual assessment with respect to compliance of the afore-mentioned closure measures and to ensure that the site is aesthetically neat and tidy, and that no health or safety risks exist on site.	Once-off following implementation of rehabilitation measures.	• Waste/rubble free sites.	As required: • Clear remnant rubble and dispose of in open quarry as backfill material.
Surface Water Quantity	• Visually assess the functionality of the surface water drainage systems feeding surface water runoff from rehabilitated areas. • Undertake field investigations, fixed point photography to document the significance of the erosion occurring on site.	After the first major rains of the season and after any major storm.	• No evidence of significant erosion; and • No evidence of water pooling on rehabilitated areas.	As required: • Re-shape areas to ensure that they are free-draining; and • Refer back to end land use approach and refine measures to be implemented in achieving the desired final land use.
Surface Water and Groundwater Quality	• Sample and monitor surface and groundwater quality.	Quarterly for at least 3 years post-closure.	• Water quality results within ranges of the WUL and/or DWS standards.	As required: • Increase monitoring frequency and detect point sources. • Optimise monitoring plan if needed.
Groundwater Quantity	• Sample and monitor groundwater levels in the vicinity of the mine.	Quarterly for at least 3 years post-closure.	• No evidence of dewatering and lowering of water tables within the vicinity of the mine.	As required: • Increase monitoring frequency and detect point sources. • Optimise monitoring plan if needed.

1.i Monitoring frequency and Responsible person

Please refer to Table 35 to Table 38 for the management actions required. Also refer to Section 1.h for the monitoring programme recommendations.

1.j Period for implementing actions

Please refer to Table 35 to Table 38 for the management actions required.

1.k Mechanisms for monitoring compliance

Please refer to Table 35 to Table 38 for the management actions required.

1.l Indicate the frequency of the submission of the performance assessment report.

Internal Audits

Quarterly internal audits should be undertaken to ensure that the conditions of this EMPr are implemented.

External Performance Assessments

It is recommended that the independent external performance assessments be undertaken annually.

The external performance assessments must also include the overall mine assessment of the financial provision and EMPr commitment. The report should be submitted to the DMR within 30 days of finalisation.

Other Performance Indicator Assessments

Due to the dynamic nature in which the mine is addressing the water management on site and considering the near-future projects that are planned, the following measure to ensure that performance measures are reached are recommended:

- Ongoing water monitoring in terms of the monitoring protocol.
- Biannual meetings be scheduled with the DWS and/or CMA to discuss the action plan compliance and status.
- Annual update of the Integrated Water and Waste Management Plan (IWWMP).
- Annual update of the Water Balance.
- Annual update of the Salt Balance.

1.m Environmental Awareness Plan

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

1.m.i.1 Communication Sectors

The environmental risks for each phase of the project will be communicated to Khumani's work force i.e. management, administration, plant and mine workers. Contractors will receive the same communication.

1.m.i.2 Management Sector

A workshop will be conducted to inform all mine management of the risks associated with the mining operation and/or developments. The risks for all aspects will be explained and the appropriate management options discussed. The workshop will also elaborate on the monitoring programmes that will be implemented to identify and monitor the mines level of impact on the environment and discuss various remediation actions, should there be deterioration.

The evaluation process is integral in the assurance that the mine reduces any possible environmental risks associated with the operation.

The workshop will be conducted prior to the construction phase to ensure that all risks are discussed before there is any chance of the impacts occurring. The workshop may be repeated at certain stages during the life of the project, in the case of new employees.

1.m.i.3 Administrative Sector

The communication of the environmental risks to the administrative sector will occur through a workshop/ half day course. This workshop will seek to explain the following necessary actions:

Firstly, each aspect will be described as shown in in the following three tables (obtained from the 2016 EIA Report). The risk associated with each aspect will be discussed to ensure that there is an understanding of how each action of the project may impact on the environment.

Table 42: Environmental Awareness Plan for Construction Phase at Khumani as a whole

Parameter	Risk	Communication Strategies				Mitigation Activity
		Management	Administration	Mine Workers	Contractors	
Soil	Increase in soil erosion	Workshop	Induction	Induction	Induction	• Areas must not be stripped of vegetation before the area will be needed for construction. Use phased approach in clearance activities. • Reestablishment of vegetation will be encouraged after construction.. • Effective dust management must be employed during the construction phase.
	Contamination of soil	Workshop	Induction	Induction	Induction	• Employees and contractors will be educated by means of trainig to make them aware of the necessity to prevent spillages through the implementation n of good housekeeping practices. The management of chemicals and hydrocarbons should form part of the emergency response programme. No activities associated with hydrocarbons and or chemicals (i.e. wash bays etc.) may be undertaken outside of an effectively designed contained area.
	Soil compaction	Workshop	Induction	Induction	Induction	• Keep infrastructure localised to reduce footprint. • All areas not directly within the proposed infrastructure footprint area where the soil has been compacted will need to be ripped to break up the compacted soil surface. This will aid infiltration and decrease run-off. • All ripped areas should be monitored to ensure successful re-establishment of natural vegetation and to prevent invasion by alien species.

Parameter	Risk	Communication Strategies				Mitigation Activity
		Management	Administration	Mine Workers	Contractors	
	Removal and stockpiling of soil	Workshop	Induction	Induction	Induction	• Soil stripping and stockpiling should be undertaken as per the approved EMPr. The topsoil will be re-used during the rehabilitation phase. • Topsoil and subsoil stripping will be conducted up to a suitable depth for construction purposes, at least 20cm. Different soils must be stockpiled separately in designated areas. • Topsoil and subsoil stockpiles must be vegetated. Should it be found that self-succession does not take place within a reasonable period. • The topsoil that is collected will be stockpiled in such a way that dust and water erosion is limited. Stockpiles will be constructed in such a way to ensure stability and thereby preventing the possibility of wash down.
Fauna	Disturbance to Fauna	Workshop	Induction	Induction	Induction	• Ensure minimal footprint clearance; ensure minimal human/animal conflict potential; implement awareness programmes; control movement of personnel; limit speeds of vehicles; and avoid open waste areas that could be targeted by rodents and scavengers.
Flora	Damage to Flora	Workshop	Induction	Induction	Induction	• Vegetation clearing will be carried out in phases, only if approved and necessary, only areas requiring clearing at a specific point in time for construction activities to take place. • Natural vegetation self-succession will be encouraged. In disturbed areas the main grass species will be reintroduced after fertilisation has been added, should self-succession be unsuccesful. • Construction activities to be limited to designated areas
Surface Water	Soil erosion and sediment transportation	Workshop	Induction	Induction	Induction	• The area is located in an already classified dirty water area, they must construct the dirty water management infrastructure (PCD or storm water dams) prior to the construction of the plant expansion also all dirty water management infrastructure where possible.

Parameter	Risk	Communication Strategies				Mitigation Activity
		Management	Administration	Mine Workers	Contractors	
	Contamination of surface water	Workshop	Induction	Induction	Induction	• Employees and contractors will be educated to necessity to prevent spillages through the implementation of good housekeeping practices. • The management of chemicals and hydrocarbons must form part of the Emergency Preparedness and Response Programme. • A dedicated area for the placement of waste skips must be determined prior to construction activities, and the area will to be cemented. Allowance for keeping clean water run-off away from the skip area through the correct bunding design. • Measures should be in place to contain any spills and allow safe collection and disposal of waste. Khumani has an approved Waste disposal site and a Temporary Hazardous storage facility. Waste generated on site will be stored in Skips until it can be collected and transported to the licensed area.
Groundwater	Groundwater Contamination	Workshop	Induction	Induction	Induction	• The management of chemicals and hydrocarbons should form part of the Emergency Preparedness and Response Programme. • A dedicated area for the placement of waste skips must be determined prior to construction activities. Waste will be temporarily stored in the dedicated area until it is collected and disposed of at the approved Khumani waste disposal area.
Air Quality	Generation of Dust	Workshop	Induction	Induction	Induction	• Recover exposed land promptly, where possible. • Dust suppression techniques will be implemented.

Table 43: Environmental Awareness Plan for the Operational Phase at Khumani as a whole

Parameter	Risk	Communication Strategy				Mitigation Activity
		Management	Administration	Mine Workers	Contractors	
Soil	Increase in soil erosion	Workshop	Induction	Induction & Monthly Meeting	Induction & Monthly Meeting	• Workshops must be constructed within the dirty water area of the mine. Clean and dirty water separation structures to be constructed around the workshop and wash bay areas.

Parameter	Risk	Communication Strategy				Mitigation Activity
		Management	Administration	Mine Workers	Contractors	
	Contamination of soil	Workshop	Induction	Induction & Monthly Meeting	Induction & Monthly Meeting	• Workshops must be constructed within the dirty water area of the mine. Clean and dirty water separation structures to be constructed around the workshop and wash bay areas. • All heavy vehicles within the mining rights area will make use of drip trays when parked.
Fauna	Damage to Fauna	Workshop	Induction	Induction & Monthly Meeting	Induction & Monthly Meeting	• Develop dedicated waste handling areas; prevent the spread of waste. • Develop dedicated waste handling areas; prevent access to rodents and opportunistic species; prevent the spread of waste.
Flora	Damage to Flora	Workshop	Induction	Induction & Monthly Meeting	Induction & Monthly Meeting	• Develop dedicated waste handling areas; prevent the spread of waste. • Develop dedicated waste handling areas and prevent the spread of waste. Prevent access to rodents and opportunistic species;
Surface Water	Water Quality	Workshop	Induction	Induction & Monthly Meeting	Induction & Monthly Meeting	• Workshops must be constructed within the dirty water area of the mine. Clean and dirty water separation structures to be constructed around the workshop and wash bay areas. • All heavy vehicles within the mining rights area will make use of drip trays when parked. • Suitable oil traps must be provided to trap and store hydrocarbons for safe disposal off-site. Water associated with stockpiles will be dirty water and therefore has to be channelled and contained in a dirty water dam. Dirty water areas must be kept as small as possible. • All contaminated surface water run contained within a downstream lined pollution control dam. These structures should be located well away from surface water resources and drainage lines. • A dedicated area for the placement of waste skips must be determined prior to construction activities, and the area will to be cemented. Allowance for keeping clean water run-off away from the skip area through the correct bunding design.

Parameter	Risk	Communication Strategy				Mitigation Activity
		Management	Administration	Mine Workers	Contractors	
	Contaminated runoff	Workshop	Induction	Induction & Monthly Meeting	Induction & Monthly Meeting	• Clean and dirty water separation system to be constructed upstream from the stockpile area and divert clean water around the stockpile area as to prevent it from entering the area.
Groundwater	Groundwater Contamination	Workshop	Induction	Induction & Monthly Meeting	Induction & Monthly Meeting	• Workshops must be constructed within the dirty water area of the mine. Clean and dirty water separation structures to be constructed around the workshop areas. • All heavy vehicles within the mining rights area will make use of drip trays when parked
Air Quality	Generation of Dust	Workshop	Induction	Induction & Monthly Meeting	Induction & Monthly Meeting	• Dust suppression methods must be implemented around the stockpiling areas and transfer stations and it is recommended that a dust monitoring network be established to monitor levels of dust dispersion. Should it be found that the stockpiles create excessive dust; measures must be implemented to reduce this impact. • A dust monitoring network must be set up prior to the construction phase so that any air quality or dust issues can be addressed accordingly.

Table 44: Environmental Awareness Plan for the Decommissioning Phase at Khumani

Environmental Parameter	Risk	Communication Strategy				Mitigation Activity
		Management	Administration	Mine Workers	Contractors	
Soil	Incorrect rehabilitation	Workshop	Workshop	Induction	Induction	• The correct placement of soil layers will be implemented.
	Lack of soil fertility	Workshop	Workshop	Induction	Induction	• Fertilisation programmes will be introduced where required.
Flora	Alien Invader Species	Workshop	Workshop	Induction	Induction	• Indigenous vegetation establishment will be encouraged; and • A Alien and Invasive Eradication Planwill be implemented.
Surface Water	Water Quality	Workshop	Workshop	Induction	Induction	• Detailed surface water monitoring programme to be implemented.
Groundwater	Groundwater Contamination	Workshop	Workshop	Induction	Induction	• Detailed ground water monitoring programme to be implemented
Air Quality	Generation of Dust	Workshop	Workshop	Induction	Induction	• Dust suppression methods will be implemented.

The mitigation of the environmental risk will be elaborated on. It is important that each person understand these management strategies as it ensures that the impact on the environment is kept to a minimum. Data collection regarding each aspect will also be explained to ensure that each aspect is monitored according to those protocols specified by the mine and the DMR. Along with data collection the reporting of findings will be discussed.

This workshop will take place before the construction phase begins, thus ensuring a full understanding of the project and its associated environmental risks before any construction activity is undertaken. The course will be repeated at the beginning of the operational phase and the material will be integrated in the induction for new personnel.

The following communication channels and media will/ can be used to communicate environmental issues within the operation:

- Head of Department (HOD) Meetings: The Mine Manager communicates information to senior management on environmental issues and the information is minuted.
- Safety, Health, Environment and Qaulity (SHEQ) Meetings: 'Environmental issues' should be an agenda item on plant and section monthly safety, health & environmental meeting agendas.
- Publications: Leaflets, posters etc. are produced by the relevant department or other designated persons, for use on notice boards, and distribution. A quarterly newsletter can also be made available. Email notifications and or relevant articles are also distributed.
- Environmental Management System (EMS) Database (if established): Feedback from line management on objectives, targets and actions.
- Daily Weekly Safety Meeting: All meetings are scheduled to commence with a discussion on safety, health & environmental topics.

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

The following protocols must be developed by the mine, in parallel to the actions recommended in Table 35 to Table 39:

- Task/ Issue Based Risk Assessments must be undertaken with all workers involved in the specific task in order to establish an understanding of the risks associated with a specific task and the required mitigation and management measures.
- 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. Thin plant should be placed around the mine where it will be easily viewed. The plan should contain a list of procedures, evacuation routes and a list of emergency contact numbers. It is advisable that the mine tests the emergency response plan in order to identify any areas for improvement.
- If the emergency has the potential to affect surrounding communities, they should be alerted via alarm signals or contacted in person. The surrounding community will be informed, prior to mining taking place, of the potential dangers and emergencies that exist, and the actions to be taken in such emergencies.
- Communication is vital in an emergency and thus communication devices, such as mobile phones, two-way radios, pagers or telephones, must be placed around the mine.
- Protocols to be developed or which should be regularly updated should include:
    - Chance Heritage finds procedure;
    - No Go zone requirements;
    - Waste Management procedure;
    - Emergency Preparedness' Procedure;
    - Hydrocarbon Spill Management Procedure;
    - Monitoring Protocol; and
    - Alien Invasive Management and Monitoring Procedure.

1.n Specific information required by the Competent Authority

Khumani Mine is required to make financial provision for final rehabilitation activities on the site. The Regulations for Financial Provision states in Regulation 8 the following:

8. (1) an applicant or holder of a right or permit must make financial provision by one or a combination of a—

(a) Financial guarantee from a bank registered in terms of the Banks Act, 1990 (Act No. 94 of 1990) or from a financial institution registered by the Financial Services Board as an insurer or underwriter;

(b) Deposit into an account administered by the Minister responsible for mineral resources; or

(c) Contribution to a trust fund established in terms of applicable legislation, on condition that—

(i) this may not be used for the financial provision required in terms of regulations 6(a) or (b) or regulation 11(1)(a) or (b); and

(ii) This may not be used by an applicant for, or holder of, a mining permit in terms of the Mineral and Petroleum Resources Development Act, 2002.

Khumani Mine, will provide for the closure liability either through a Bank Guarantee or as part of the Rehabilitation Fund as allowed by NEMA.

2 UNDERTAKING REGARDING CORRECTNESS OF INFORMATION

The EAP herewith confirms:

2.a The correctness of the Information provided in the Reports

2.b The inclusion of Comments and Inputs from Stakeholders and I&APs

2.c The inclusion of Inputs and Recommendations from the Specialist Reports where relevant

2.d That the Information provided by the EAP to I&APs and any Responses by the EAP to Comments and Inputs made by I&AP are correctly reflected herein

Signature of the Environmental Assessment Practitioner

EnviroGistics (Pty) Ltd

Name of company

Date

3 UNDERTAKING REGARDING LEVEL OF AGREEMENT (*TO BE SIGNED UPON THE FINAL REPORT*)

Undertaking by the client:

Herewith I, the person whose name and identity number is stated below, confirm that I am the person authorised to act as representative of the applicant, and confirm that the above report comprises EIA and EMPr compiled in accordance with the guideline on the Departments official website and the directive in terms of sections 29 and 39 (5) in that regard, and the applicant undertakes to execute the Environmental management plan as proposed.

Full Names and Surname

Identity Number

Designation

Signature

Date

Annexures

Annexure 1: DMR Acknowledgment of Receipt

Annexure 2: EAP Curriculum Vitae

Annexure 3: Environmental Authorisations

Annexure 4: Stakeholder Consultation Report

- Stakeholder Database
- Background Information Document
- Advertisement
- Notifications
- Comments received
- Minutes of meetings

Annexure 5: Proof of submission to commenting authorities

- Scoping Report
- EMPr

Annexure 6: Specialist Reports

- Heritage and Palaeontological Study
- Water Study
- Groundwater Study

Annexure 7: Financial Provision Study (2018 Submission)

Annexure 8: Waste Classification

Annexure 1: DMR Acknowledgement of Receipt

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Background Information Document

Advertisement

Stakeholder Database

Comments received

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Minutes of meetings

Annexure 5: Proof of submission to commenting authorities

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Heritage and Palaeontological Study

Hydrological Investigation (2018)

Groundwater Study

Annexure 7: Financial Provision Study (2018 submission)

Annexure 8: Waste Classification (2016)