PART B – ENVIRONMENTAL MANAGEMENT PROGRAMME REPORT

23 DETAILS OF THE EAP

It is hereby confirmed that the details of the EAP who undertook the EIA and prepared this EMP are provided in Part A, Section 1 of the EIA report.

24 DESCRIPTION OF THE ASPECTS OF THE ACTIVITY

It is hereby confirmed that the activities covered by this EMP are fully described in Part A, Section 4 of the EIA report.

25 COMPOSITE MAP

A map indicating all surface infrastructure superimposed on the environmental sensitive areas of the preferred site is included in Appendix G.

26 DESCRIPTION OF THE IMPACT MANAGEMENT OBJECTIVES INCLUDING MANAGEMENT STATEMENTS

26.1 DETERMINATION OF CLOSURE OBJECTIVES

The closure objectives for the proposed project were determined taking into account the exiting type of environment as described in Section 7.4.1, in order to ensure that the closure objectives strive to achieve a condition approximating its natural state as far as possible. Further information pertaining to the closure objectives identified for the proposed project, refer to Section 29.1.1.

26.2 THE PROCESS FOR MANAGING ENVIRONMENTAL DAMAGE AS A RESULT OF UNDERTAKING THE ACTIVITY

The management measures outlined in Section 28 have been identified in order to manage and reduce impacts associated with the proposed project in order to prevent unnecessary damage to the environment as a result of the proposed project. In the event that incidents occur that may result in environmental damages the emergency response procedure as outlined in Section 31.2.2 will be implemented to avoid pollution or degradation.

26.3 POTENTIAL RISK OF ACID MINE DRAINAGE

As part of the proposed project a geochemistry analysis was undertaken. The results of the analysis indicate that there is no risk of acid mine drainage. Further information is provided in Section 7.4.1.7.

26.4 STEPS TAKEN TO INVESTIGATE, ASSESS AND EVALUATE THE IMPACT OF ACID MINE DRAINAGE

This section is not applicable as acid mine drainage is not associated with the proposed project.

26.5 ENGINEERING OR MINE DESIGN SOLUTIONS TO AVOID OR REMEDY ACID MINE DRAINAGE

This section is not applicable as acid mine drainage is not associated with the proposed project.

26.6 MEASURES IN PLACE TO REMEDY RESIDUAL OR CUMULATIVE IMPACT FROM ACID MINE DRAINAGE

This section is not applicable as acid mine drainage is not associated with the proposed project.

26.7 VOLUMES AND RATE OF WATER USE FOR MINING

Return water from the TSF is dependent on season; therefore this is not included in the water balances below. The scenarios below consider the water demands if no treated sewage water is utilised (Scenario 1), if treated sewage water is utilised (Scenario 2) and if treated sewage water from the mine and housing area is utilised (Scenario 3). The housing calculations assume 1200 houses from Phase 1 and Phase 1a.

Scenario 1 – No sewerage water

Peak Water Demand	**Quantity**	**Unit**
Wet Season Peak Water Demand:	7853	m3/day
Average Season Peak Water Demand:	7487	m3/day
Dry Season Peak Water Demand:	7305	m3/day
Peak Water Demand - No TSF Return Water:	8950	m3/day
Mean Water Demand	**Quantity**	**Unit**
Wet Season Mean Water Demand:	4927	m3/day
Average Season Mean Water Demand:	4943	m3/day
Dry Season Mean Water Demand:	5743	m3/day

Scenario 2 – Mine sewerage water of 607 m3/day

Peak Water Demand	**Quantity**	**Unit**
Wet Season Peak Water Demand:	6965	m3/day
Average Season Peak Water Demand:	6599	m3/day
Dry Season Peak Water Demand:	6417	m3/day
Peak Water Demand - No TSF Return Water:	8062	m3/day
Mean Water Demand	**Quantity**	**Unit**
Wet Season Mean Water Demand:	4039	m3/day
Average Season Mean Water Demand:	4055	m3/day
Dry Season Mean Water Demand:	4855	m3/day

Scenario 3 – Mine sewerage water of 607 m3/day plus housing sewerage of 807 m3/day for 1200 houses:

Peak Water Demand	**Quantity**	**Unit**
Wet Season Peak Water Demand:	6158	m3/day
Average Season Peak Water Demand:	5792	m3/day
Dry Season Peak Water Demand:	5610	m3/day
Peak Water Demand - No TSF Return Water:	7255	m3/day

Mean Water Demand	Quantity	Unit
Wet Season Mean Water Demand:	3232	m3/day
Average Season Mean Water Demand:	3248	m3/day
Dry Season Mean Water Demand:	4048	m3/day

26.8 HAS A WATER USE LICENCE BEEN APPLIED FOR

An amendment to the water use license application is required for the proposed project. The water use license amendment application will be submitted to the DWS in mid-2016. The DWS has been notified that a water use license application will be submitted as part of the proposed project. In this regard a copy of the notice of intent letter submitted to the DWS and minutes from meetings held with the DWS are in included in Appendix E.

26.9 IMPACTS TO BE MITIGATED IN THEIR RESPECTIVE PHASES

The section below focuses on mitigation measures that are specific to listed activities based on actions outlined in Section 28.

TABLE 26.1: MEASURES TO REHABILITATE THE ENVIRONMENT AFFECTED BY THE LISTED ACTIVITIES

Activities (Listed)		Phase	Size and scale of disturbance	Mitigation measures	Compliance with standards	Time period for implementation
Number	**Description**					
GNR 983 Activity 1	The development of facilities or infrastructure for the generation of electricity from a renewable resource where - (i) the electricity output is more than 10 megawatts but less than 20 megawatts; or (ii) the output is 10 megawatts or less but the total extent of the facility covers an area in excess of 1 hectare; excluding where such development of facilities or infrastructure is for photovoltaic installations and occurs within an urban area.	All phases	Additional area to be developed will cover approximately 90.4 ha	As part of construction and operation the following should be undertaken: • Limit the clearing of vegetation and limiting infrastructure, activities and related disturbance to those absolutely necessary • Conduct pre-construction surveys of protected plants and trees of development footprints to identify locations of species of concern Obtain the required tree and plant removal permits prior to vegetation clearing Implement vegetation monitoring programme as prescribed in Table 30.1 Implement an alien and invasive species management plan • Apply the soil management principles contained in Table 28.4. • Apply appropriate management measures (e.g. destruction permits, relocation permits) for heritage sites to be impacted. • Apply chance find procedures for change heritage site finds. • As part of con-current rehabilitation during the operational and decommissioning phases, all cleared areas should be re-seeded once the topsoil has been replaced with a seed mixture reflecting the current natural vegetation. Closure objective should aim to ensure effective rehabilitation to as close to pre-mining conditions as practically possible. In addition the designs of any permanent and potentially polluting structures (TSF) will take consideration of the requirements for long-term ecosystem functionality, pollution prevention and confirmatory monitoring • During closure final rehabilitated areas will be managed through a care and maintenance programme to limit and/or enhance the long term post closure visual impacts	The mitigation action to obtain a tree removal permit from DAFF is in accordance with the National Forests Act (No. 84 of 1998) that stipulates that no person may cut, disturb, damage or destroy any protected tree or possess, collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree or any forest product derived from a protected tree, except under a license. Compliance with the National Heritage Resource Act No. 25 of 1999 in the event of any chance finds of heritage resources.	• On-going • Prior to construction • On-going • Prior to construction • As required • On-going • Closure
GNR 984 Activity 2	The development and related operation of facilities or infrastructure for the generation of electricity from a non-renewable resource where the electricity output is 20 megawatts or more.	All phases				
GNR 983 Activity 10	The development and related operation of infrastructure exceeding 1000 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 bulk transportation of sewage, effluent, process water, waste water, return water, industrial discharge or slimes inside a road reserve; or (b) where such development will occur within an urban area.	All phases				
GNR 983 Activity 28	Residential, mixed, retail, commercial, industrial or institutional developments where such land was used for agriculture or afforestation on or after 01 April 1998 and where such development: (i) will occur inside an urban area, where the total land to be developed is bigger than 5 hectares; or (ii) will occur outside an urban area, where the total land to be developed is bigger than 1 hectare; excluding where such land has already been developed for residential, mixed, retail, commercial, industrial or institutional purposes.	All phases				
GNR 983 Activity 32	The continuation of any development where the environmental authorisation has lapsed and where the continuation of the development, after the date the environmental authorisation has lapsed will meet the threshold of any activity or activities listed in this Notice, Listing Notice 2 of 2014, or Listing Notice 3 or Listing Notice 4 of 2014.	All phases				
GNR 984 Activity 15	The clearance of an area of 20 hectares or more of indigenous vegetation, excluding where such clearance of indigenous vegetation is required for- (i) the undertaking of a linear activity; or (ii) maintenance purposes undertaken in accordance with a maintenance management plan.	All phases				
GNR 984 Activity 17	Any activity including the operation of that activity which requires a mining right as contemplated in section 22 of the Mineral and Petroleum Resources Development Act, 2002 (No. 28 of 2002), including associated infrastructure, structures and earthworks, directly related to the extraction of a mineral resource, including activities for which an exemption has been issued in terms of section 106 of the Mineral and Petroleum Resources Development Act, 2002 (No. 28 of 2002).	All phases				
GNR 985 Activity 4	The development of a road wider than 4 metres with a reserve less than 13.5 metres.	All phases				
GNR 984 Activity 21	Any activity including the operation of that activity associated with the primary processing of a mineral resource including winning, reduction, extraction, classifying, concentrating, crushing, screening and washing but excluding the smelting, beneficiation, refining, calcining or gasification of the mineral resource in which case activity 6 in this Notice applies.	All phases				
GNR 985 Activity 12	The clearance of an area of 300 square metres or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a maintenance management plan.	All phases				
GNR 983 Activity 9	The development of infrastructure exceeding 1000 metres in length for the bulk transportation of water or storm water- (i) with an internal diameter of 0,36 metres or more; or (ii) with a peak throughput of 120 litres per second or more; excluding where - (a) such infrastructure is for bulk transportation of water or storm water or storm water drainage inside a road reserve; or (b) where such development will occur within an urban area.	All phases				

Activities (Listed)		Phase	Size and scale of disturbance	Mitigation measures	Compliance with standards	Time period for implementation
Number	**Description**					
GNR 983 Activity 12	The development of - (i) canals exceeding 100 square metres in size; (ii) channels exceeding 100 square metres in size; (iii) bridges exceeding 100 square metres in size; (iv) dams, where the dam, including infrastructure and water surface area, exceeds 100 square metres in size; (v) weirs, where the weir, including infrastructure and water surface area, exceeds 100 square metres in size; (vi) bulk storm water outlet structures exceeding 100 square metres in size; (vii) marinas exceeding 100 square metres in size; (viii) jetties exceeding 100 square metres in size; (ix) slipways exceeding 100 square metres in size; (x) buildings exceeding 100 square metres in size; (xi) boardwalks exceeding 100 square metres in size; or (xii) infrastructure or structures with a physical footprint of 100 square metres or more; where such development occurs - (a) within a watercourse; (b) in front of a development setback; or (c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse; - excluding - (aa) the development of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour; (bb) where such development activities are related to the development of a port or harbour, in which case activity 26 in Listing Notice 2 of 2014 applies; (cc) activities listed in activity 14 in Listing Notice 2 of 2014 or activity 14 in Listing Notice 3 of 2014, in which case that activity applies; (dd) where such development occurs within an urban area; or (ee) where such development occurs within existing roads or road reserves.	All phases	Additional area to be developed will cover approximately 90.4 ha (not all of this footprint will be near watercourses)	• In all phases mine infrastructure will be constructed, operated and maintained so as to comply with the provisions of the National Water Act (36 of 1998) and Regulation 704 (4 June 1999) of any future amendments thereto. These include: o Clean water systems are separated from dirty water systems through the storm water management plan o The water balance is refined on an on-going for water management and impact mitigation (Table 28.1). o The location of all activities and footprints are to be outside zones and/or flood lines of watercourses. If this is unavoidable the necessary exemptions/approvals will be obtained. • Ensure appropriate design, construction and management of water containment facilities. • Implementation of appropriate erosion control measures • Site rehabilitation will aim to restore surface drainage patterns as far as practically and economically feasible	National Water Act (36 of 1998) and Regulation 704 (4 June 1999) Water use licence in terms of Section 21c and i of the NWA.	• On-going • On-going • On-going • As required • On-going • On-going • Closure
GNR 983 Activity 13	The development of facilities or infrastructure for the off-stream storage of water, including dams and reservoirs, with a combined capacity of 50000 cubic metres or more, unless such storage falls within the ambit of activity 16 in Listing Notice 2 of 2014.	All phases	Return water dam 433 000m^3 (total) Reservoirs 3000m^3 (additional)			
GNR 983 Activity 19	The infilling or depositing of any material of more than 5 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 5 cubic metres from - (i) a watercourse; (ii) the seashore; or (iii) the littoral active zone , an estuary or a distance of 100 metres inland of the high water mark of the sea or an estuary, whichever distance is the greater but excluding where such infilling, depositing, dredging, excavation, removal or moving - (a) will occur behind a development setback; (b) is for maintenance purposes undertaken in accordance with a maintenance management plan; or (c) falls within the ambit of activity 21 in this Notice, in which case that activity applies.	All phases	Excavations will be done for the changes/additional infrastructure which will cover approximately 90.4 ha (not all of this footprint will be near watercourses)			
GNR 985 Activity 2	The development of reservoirs for bulk water supply with a capacity of more than 250 cubic metres.	All phases	0.3 ha, Reservoirs 3 000m^3 (additional)			
GNR 985 Activity 14	The development of - (i) canals exceeding 10 square metres in size ; (ii) channels exceeding 10 square metres in size; (iii) bridges exceeding 10 square metres in size;(iv) dams, where the dam, including infrastructure and water surface area exceeds 10 square metres in size; (v) weirs, where the weir, including infrastructure and water surface area exceeds 10 square metres in size;(vi) bulk storm water outlet structures exceeding 10 square metres in size;(vii) marinas exceeding 10 square metres in size;(viii) jetties exceeding 10 square metres in size;(ix) slipways exceeding 10 square metres in size;(x) buildings exceeding 10 square metres in size; (xi) boardwalks exceeding 10 square metres in size; or(xii) infrastructure or structures with a physical footprint of 10 square metres or more; where such development occurs - (a) within a watercourse ;(b) in front of a development setback ; or(c) if no development setback has been adopted, within 32 metres of a watercourse, measured from the edge of a watercourse; excluding the development of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour.	All phases	Additional area to be developed will cover approximately 90.4 ha (not all of this footprint will be near watercourses)			
GNR 985 Activity 23	The expansion of- (i) canals where the canal is expanded by 10 square metres or more in size; (ii) channels where the channel is expanded by 10 square metres or more in size;(iii) bridges where the bridge is expanded by 10 square metres or more in size;(iv) dams where the dam is expanded by 10 square metres or more in size;(v) weirs where the weir is expanded by 10 square metres or more in size; (vi) bulk storm water outlet structures where the structure is expanded by 10 square metres or more in size;(vii) marinas where the marina is expanded by 10 square metres or more in size; (viii) jetties where the jetty is expanded by 10 square metres or more in size;(ix) slipways where the slipway is expanded by 10 square metres or more in size;(x) buildings where the building is expanded by 10 square metres or more in size;(xi) boardwalks where the boardwalk is expanded by 10 square metres or more in size; or (xii) infrastructure or structures where the physical footprint is expanded by 10 square metres or more; where such development occurs -(a) within a watercourse ;(b) in front of a development setback adopted in the prescribed manner; or(c) if no development setback has been adopted, within 32 metres of a watercourse, measured from the edge of a watercourse ;excluding the expansion of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour.	All phases				

Activities (Listed)		Phase	Size and scale of disturbance	Mitigation measures	Compliance with standards	Time period for implementation
Number	**Description**					
GNR 983 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 , excluding - (i) where the facility, 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; or (ii) the expansion of or changes to existing facilities for the treatment of effluent, wastewater or sewage where the capacity will be increased by less than 15 000 cubic metres per day.	All phases	Additional 36 ha of the TSF to be developed (includes the return water dam footprint)	• BPM will comply with both the National Water Act (36 of 1998) and Regulation 704 (4 June 1999) • All hazardous chemicals (diesel) must be handled in a manner that surface water is not polluted. This will be implemented by means of the following: o Pollution prevention through basic infrastructure design o Pollution prevention through maintenance of equipment o Pollution prevention through education and training of workers (permanent and temporary) o Pollution prevention through appropriate management of hazardous, materials and o The required steps to enable containment and remediation of pollution incidents • Specifications for post rehabilitation audit criteria to ascertain whether the remediation has been successful and if not, to recommend and implement further measures. • Infrastructure that has the potential to pollute groundwater resources will be designed and implemented in a manner that pollution is addressed in all mine phases. In this regard design of the TSF needs to comply with Section 7 of GN. 632 of NEM:WA where relevant. • Monitoring all potential impact zones to track pollution through the groundwater monitoring programme outlined in Section 30. • In the case of a major discharge incident that may result in the pollution of water resources, the emergency response procedure in Section Section 31.2.2 will be followed.	Water use licence in terms of Section 21g of the NWA. Regulations regarding the planning and management of residue stockpiles and deposits from a prospecting, mining, exploration or production operation in terms of NEM:WA, Regulation 632	• On-going • On-going • On-going • On-going • On-going • As required
GNR 984 Activity 4	The development of facilities or infrastructure, for the storage, or storage and handling of a dangerous good, where such storage occurs in containers with a combined capacity of more than 500 cubic metres.	All phases	> 500 m3 (total)			
GNR 984 Activity 25	The development and related operation of facilities or infrastructure for the treatment of effluent, wastewater or sewage with a daily throughput capacity of 15000 cubic metres or more.	All phases	0.44 ha			
GNR 921 Category B(7)	The disposal of any quantity of hazardous waste to land.	All phases	166 ha TSF			
GNR 921 Category B(10)	The construction of a facility for a waste management activity listed in Category 8 of this Schedule (not in isolation to associated waste management activity).	All phases	Additional 36 ha of the TSF to be developed (includes the return water dam footprint)			
GNR 921 Category B(11)	The establishment or reclamation of a residue stockpile or residue deposit resulting from activities which require a mining right, exploration right or production right in terms of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002).	All phases				
GNR 921 Category C(3)	The storage of waste tyres in a storage area exceeding 500 m^2.	All phases	> 500 m3 (total)			

27 IMPACT MANAGEMENT OUTCOMES

The section below provides a description of the outcomes and objective of mitigation actions in order to manage, remedy, control or modify potential impacts. The mitigation actions identified to achieve these outcomes and objectives are described in Section 28. It should be noted that the table below includes additional impacts that did not need to be re-assessed as part of this project (refer to Appendix F) but have been incorporated in terms of their management measures as they were included in the approved 2008 EMP. These include changes to geology, groundwater levels, blasting and tourism.

TABLE 27.1: DESCRIPTION OF IMPACT MANAGEMENT OUTCOMES

Activity	Potential impact	Affected aspect	Phase	Mitigation type	Standard to be achieved (Impact management outcome/objectives)
Mining	Changes to geology	Geology	Construction Operation Decommissioning Closure	• Manage through efficient mining practices	• Optimal mining of ore reserve.
Construction of infrastructure	Impact of geology on infrastructure construction		Construction Operation Decommissioning Closure	• Manage through implementation of engineering inputs	• Minimise impact to structures
Waste rock management	Inclusion of additional mineral resources		Construction Operation Decommissioning Closure	• Manage through sale of all available aggregate waste rock	• Maximise the economic benefit of available minerals.
Site preparation Civil works Earthworks Waste rock management Mining and mining related activities Tailings management Demolition Rehabilitation Maintenance and aftercare	Hazardous excavations infrastructure and surface subsidence	Topography	Construction Operation Decommissioning Closure	• Control through access control • Control through management and monitoring • Control through rehabilitation • Remedy through emergency response procedure (Section 31.2.2) • Control and remedy through training	• To ensure the safety of people and animals in order to prevent physical harm from potentially hazardous excavations and infrastructure

Activity	Potential impact	Affected aspect	Phase	Mitigation type	Standard to be achieved (Impact management outcome/objectives)
Site preparation Earthworks Waste rock management Transport systems Housing Tailings management Demolition Rehabilitation Maintenance and aftercare	Loss of soil resources and land capability through physical disturbance	Soils and land capability	Construction Operation Decommissioning Closure	• Manage through the implementation of soil conservation management plan and waste management plan • Control through rehabilitation • Control through limiting project footprint • Control through erosion control measures	• To ensure that soil resources are handled and managed properly in order to conserve these resources for use as part of rehabilitation which will assist with the restoration of pre-mining land capability as far as possible.
Site preparation Earthworks Waste rock management Transport systems Tailings management Housing Process and storm water management Sewage sludge management Demolition Rehabilitation Maintenance and aftercare	Loss of soil resources and land capability through pollution		Construction Operation Decommissioning Closure	• Manage through the implementation of soil conservation management plan and waste management plan • Control through rehabilitation • Remedy through emergency response procedure (Section 31.2.2) • Control and remedy through training	• To ensure that soil resources are handled and managed properly in order to conserve these resources for use as part of rehabilitation which will assist with the restoration of pre-mining land capability as far as possible.
Site preparation Civil works Earthworks Tailings management Waste rock management Transport systems Housing Process and storm water management Sewage sludge management Site/contract management Demolition Rehabilitation	Physical destruction of biodiversity	Biodiversity	Construction Operation Decommissioning Closure	• Modify through placement of infrastructure • Control through species relocation and an invasive species management plan • Remedy through conservation and rehabilitation measures • Control through monitoring and inspections • Control through limiting disturbance	• To prevent loss of biodiversity due to unnecessary clearing during construction activities. • To limit and prevent the establishment of invasive and/or alien vegetation. • To promote the establishment of vegetation at any areas that have been rehabilitated. • To return the land to its pre-construction capability once mining is completed. • To avoid transformation of vegetation surrounding footprints • To manage areas for optimal biodiversity • To avoid confirmed habitat for plant species of conservation concern

Activity	Potential impact	Affected aspect	Phase	Mitigation type	Standard to be achieved (Impact management outcome/objectives)
Maintenance and aftercare					
Site preparation Civil works Earthworks Tailings management Waste rock management Transport systems Housing Process and storm water management Sewage sludge management Site/contract management Demolition Rehabilitation Maintenance and aftercare	General disturbance of biodiversity	Biodiversity	Construction Operation Decommissioning Closure	• Can be controlled through pollution management • Can be controlled through implementation of procedures, management plans and personnel training • Can be managed through an invasive species management plan	• To prevent loss of biodiversity due to unnecessary clearing during construction activities. • To limit and prevent the establishment of invasive and/or alien vegetation. • To promote the establishment of vegetation at any areas that have been rehabilitated. • To return the land to its pre-construction capability once mining is completed. • To avoid transformation of vegetation surrounding footprints • To manage areas for optimal biodiversity • To avoid confirmed habitat for plant species of conservation concern.
Site preparation Civil works Earthworks Transport systems Mining and mining related activities Waste rock management Tailings management Process and storm water management General and hazardous waste management Sewage sludge management Site support services Demolition Rehabilitation Maintenance and aftercare	Contamination of surface water resources	Surface water	Construction Operation Decommissioning Closure	• Control through storm water management and design • Remedy through emergency response procedure (Section 31.2.2)	• To ensure surface water quality remains within acceptable limits for both domestic and agricultural purposes to prevent pollution of surface water resources and related harm to surface water users.
Site preparation Civil works Earthworks	Alteration of natural drainage patterns		Construction Operation Decommissioning	• Control through appropriate design / re-alignment • Control through the separation	• Minimise the alteration of the drainage patterns in the project area. • To reduce the area of the catchment not contributing

Activity	Potential impact	Affected aspect	Phase	Mitigation type	Standard to be achieved (Impact management outcome/objectives)
Transport systems Waste rock management Tailings management Process and storm water management Demolition Rehabilitation Maintenance and aftercare			Closure	of dirty and clean water	to runoff in order to minimise the impact on the catchment yield. • To minimise water consumption from external sources and recycle as much water as possible.
Site preparation Civil works Earthworks Transport systems Mining and mining related activities Waste rock management Tailings management Process and storm water management General and hazardous waste management Sewage sludge management Site support services Demolition Rehabilitation Maintenance and aftercare	Contamination of groundwater resources	Groundwater	Construction Operation Decommissioning Closure	• Control through monitoring • Remedy through emergency response procedure (Section 31.2.2)	• To prevent pollution of groundwater.
Site preparation Civil works Earthworks Transport systems Waste rock management Tailings management Process and storm water management Demolition Rehabilitation	Changes in groundwater levels and availability		Construction Operation Decommissioning	• Control through water management measure • Control through monitoring	• To minimise impacts on the volume of ground water available for use. • To improve safety conditions. • To gather sufficient information to allow future interpretations and to guide planning for closure. • To prevent large scale mounding of groundwater.

Activity	Potential impact	Affected aspect	Phase	Mitigation type	Standard to be achieved (Impact management outcome/objectives)
Maintenance and aftercare					
Site preparation Civil works Earthworks Mining and mining related activities Waste rock management Mineral processing operations Tailings management Power Supply and Use Transport systems Housing Demolition Rehabilitation Maintenance and aftercare	Air pollution	Air	Construction Operation Decommissioning Closure	• Control through implementation of dust control measures • Monitor through the continuation of the monitoring programme	• To ensure that any pollutants emitted as a result of the proposed project remain with acceptable limits so as to prevent health related impacts.
Site preparation Earthworks Civil works Waste rock management Tailings Management Transport systems Demolition Rehabilitation Waste rock management Mineral processing operations Mining and mining related activities	Noise pollution	Noise	Construction Operation Decommissioning	• Control through noise control measures and monitoring (if required)	• To ensure that any noise generated as a result of the proposed project remains within acceptable limits to avoid the disturbance of third parties. • To limit occupational health and safety noise levels within specified regulatory parameters
Mining and mining related activities	Blasting impacts (fly rock, air blasts and ground vibrations)	Blasting	Construction Operation	• Manage through effective communication with surrounding communities • Manage through appropriate blast design • Manage through compliance with BPM' s blasting procedure	• To limit ground vibration from blasting during construction and mining activities to avoid structural damage to local buildings. • To provide the community with advanced warning of blasting and the probable experiences related thereto.
Transport systems	Road disturbance and traffic safety	Traffic	Construction Operation	• Modify through the introduction of a roundabout and converting	• To ensure the mine's use of public roads is done in a responsible manner to reduce the potential for safety

Activity	Potential impact	Affected aspect	Phase	Mitigation type	Standard to be achieved (Impact management outcome/objectives)
			Decommissioning Closure	a lane into turning lane only. • Control through appropriate design • Management through the implementation of traffic safety programme • Remedy through emergency response procedure (Section 31.2.2)	and vehicle related impacts on road users. •
Site preparation Civil works Earthworks Mining and mining related activities Waste rock management Mineral processing operations Tailings management Housing Demolition Maintenance and aftercare of final land forms and rehabilitated areas	Negative visual views	Visual	Construction Operation Decommissioning Closure	• Control through visual controls and concurrent rehabilitation	• To limit the perception of visual intrusion of the mining activities, where reasonably possible
Site preparation Earthworks Transport systems Housing Site/contract management Tailings management Demolition Rehabilitation	Loss of heritage, cultural and palaeontological resources	Heritage/ cultural and palaeontological resources	Construction Operation Decommissioning	• Control through relocation of graves • Avoid through data collection • Control through additional site assessments prior to development • Remedy through emergency response procedure (Section 31.2.2)	• To ensure the preservation of identified sites of cultural importance and graves that do not fall within the mine footprint. • To ensure that destruction or relocation of identified cultural sites that fall within the mine foot print is done in accordance with the National Heritage Resources Act (NHRA) and under the guidance of SAHRA. • To train all relevant construction staff in archaeological identification
Site preparation Civil works Earthworks Mining and mining related activities Waste rock management Mineral processing operations	Economic impact	Socio-economic	Construction Operation Decommissioning Closure	• Control through procurement programme and bursary and skills development programme	• To enhance the positive economic impacts by working together with existing structures and organisations.

Activity	Potential impact	Affected aspect	Phase	Mitigation type	Standard to be achieved (Impact management outcome/objectives)
Tailings management Power Supply and Use Water supply and use Process and storm water management Transport systems General and hazardous waste management Sewage sludge management Site support services Housing Site/contract management Demolition Rehabilitation Maintenance and aftercare					
Site preparation Civil works Earthworks Mining and mining related activities Waste rock management Mineral processing operations Tailings management Power Supply and Use Water supply and use Process and storm water management Transport systems General and hazardous waste management Sewage sludge management Site support services Housing Site/contract management Demolition	Inward migration and associated social ills		Construction Operation Decommissioning Closure	• Control through health policy, monitoring the development of informal settlements • Remedy through emergency response procedure (Section 31.2.2)	• To establish and maintain a good working relationship with surrounding communities, local authorities and land owners in order to limit the impacts associated with inward migration.

Activity	Potential impact	Affected aspect	Phase	Mitigation type	Standard to be achieved (Impact management outcome/objectives)
Rehabilitation Maintenance and aftercare					
Site preparation Civil works Earthworks Mining and mining related activities Waste rock management Mineral processing operations Tailings management Power Supply and Use Water supply and use Process and storm water management Transport systems General and hazardous waste management Sewage sludge management Site support services Housing Site/contract management Demolition Rehabilitation Maintenance and aftercare	Tourism	Socio-economic	Construction Operation Decommissioning Closure	• Control through application of socio-economic and environmental management plans	• Designing and constructing a mining complex that adheres to the provisions made in the EMP and related environmental legislation.
Construction of project components Operation of the mine Decommissioning of project components Final land forms	Loss or changes to existing land use	Land use	Construction Operation Decommissioning Closure	• Control through closure planning • Manage through implementation of mitigation measures for environmental and social impacts	• To co-exist with existing land uses and to negatively impact on land uses as little as possible in order to prevent unacceptable impacts on surrounding land uses and their economic activity. • To limit the impact of the mining operations to as small a footprint as is possible. • To manage and rehabilitate the disturbed areas in such a manner that it is possible to restore it to its pre-disturbance potential. • To minimise nuisance factors and communicate frequently with affected stakeholders to ensure they have information about activities that will generate nuisance factors.

28 IMPACT MANAGEMENT ACTIONS

The mitigation actions for all phases (construction, operation, decommissioning and closure) to achieve the objectives and outcomes set out in Section 27 are listed in tabular format below. The action plans include the timeframes for implementing the mitigation actions together with a description of how mitigation actions comply with relevant standards. Mitigation actions and recommendations identified by specialists have been summarised and are included into Table 28.1 below.

Management actions described below consider the approved EMPs (mine (2008) and housing (2014)) and additional management measures are provided where required. New measures that were not previously covered in the existing EMPs, or measures that have been updated have been underlined. Management actions for the approved Phase 1 housing are to be applied to the Phase 1a housing. The housing and mining EMPs have been provided separately. The mine EMP is contained in Table 28.1 below. The approved housing EMP is contained in Appendix T. Additional measures to be implemented following specialist assessments conducted for this EIA are contained in Table 28.2. These mine and housing EMP commitments have been separated as they have differing management measures as applicable to their respective operation and for ease of reference and auditing purposes.

TABLE 28.1: DESCRIPTION OF IMPACT MANAGEMENT ACTIONS

Activity	Potential impact	Mitigation type	Time period for implementation	Compliance with standards
Mining and mining related activities	Blasting impacts (fly rock, air blasts and ground vibrations)	• Explosive quantities during site preparation and sinking operations will be kept below quantities that could cause structures to be damaged. • The shaft and plant infrastructure was moved some 600 m further south east away from the nearest neighbour. • Blasting will be undertaken in accordance with relevant Mine Health and Safety legislation and international blasting standards. • Blasting noise will be monitored and recorded during blasting activities to ensure adherence to stipulated guidelines. • Blasting will take place within the required legal parameters. The area should be cleared of people and livestock in a radius of 500 m before blasting commences. • Ground vibrations to be kept below 10 mm/s (USBM guidelines) at the nearest structure. • Air blast levels will be kept below 135 dB. • A siren will signal the commencement of blasting in the area. • A program to inform the community on the impacts of blasting, seismics, air blast, etc. will be developed and communicated prior to the commencement of shaft sinking and surface preparation. • A schedule for all blasting work on surface and for the first 50 m of the shaft sinking should be provided to the local communities most likely to hear the noise of the blasts, especially schools and hospitals. A reminder or warning system, such as bulk SMSes, should be sent out to community representatives who can inform their neighbours. • The mine will register and address all complaints concerning possible structural damage in the complaints system and an investigation will be undertaken. • Vibration and air blast levels monitoring as per the monitoring programme.	• Prior to construction • Prior to construction • Construction • Construction • Construction • Construction • Construction • Construction • Construction • Construction • On-going • Construction	Not applicable
Mining	Changes to geology	• The ore body will be mined and processed in such a way to ensure the most effective extraction of the non-renewable resource. • Mining will take place according to industry best practice and safety measures specific to the underground conditions on the mine and will be implemented to prevent possible collapse of underground workings.	• On-going • On-going	Not applicable
Site preparation Civil works Earthworks Mining and mining related activities Waste rock management Mineral processing operations Tailings management Demolition Maintenance and aftercare of final land forms and rehabilitated areas	Negative visual impacts	• Mining infrastructure is generally designed according to functional engineering requirements. Efforts are to be made, where possible, to design structures with a more aesthetic appeal. • A noise attenuation structure and visual barrier will be constructed between the shaft bank and the receptive community areas. The structure will be designed to be as aesthetically pleasing as possible. The final design will be concluded prior to the commencement of the construction phase and will be signed off by a professional engineer. The design will include both visual and noise design criteria. • Designs are to be optimised to try to decrease visual exposure of mining infrastructure. • Lighting infrastructure should be designed to minimise the impact on neighbouring communities. • The TSF, stockpiles and waste rock dump are to be shaped to reduce their visual intrusion. • The use of bright colours or highly reflective surfaces should be avoided. • Paint structures and buildings in colours (browns and greens) that reflect and compliment the natural landscape. • The unnecessary removal of vegetation during construction should be avoided. This is extremely important on the boundaries of the mine where vegetation can assist with screening. • Exclusive use of laydown areas will be enforced and the uncontrolled dumping of waste or construction material will be prohibited. • Screening of various structures is to be achieved through landscaping and planting of vegetation. This will be undertaken where the visual impact on sensitive receptors is considered high. All vegetation that is planted as part of rehabilitation should reflect the natural vegetation of the area and be indigenous to the site. • The TSF will be screened with indigenous vegetation where the visual impact on sensitive receptors is considered high. • There must be concurrent rehabilitation on the TSF. The successful establishment of the vegetation must be demonstrated during the life of the mine so that there is little additional work to be done at closure. • Uncontrolled, open fires are prohibited on site. • Dust is to be controlled using appropriate dust suppression measures. • Implement the recommended air pollution control system to avoid plumes of dust that can reduce visibility. • The mine and plant will operate on a 24 hour basis. Lighting is thus required for safe operating conditions. As far as is possible, without compromising safety of mine personnel and operating processes, all light sources should be directed downwards and away from the public roads and surrounding communities. • Rehabilitated areas, especially on the TSF, will be maintained and monitored. • Rehabilitation is to take place according to the proposed Rehabilitation Plan contained in Section 29.1.3. • Rehabilitated areas will be maintained and monitored and managed through an aftercare and maintenance programme to limit and/or enhance the long-term post closure visual impacts.	• Prior to construction • Prior to construction • Prior to construction • Prior to construction • Prior to construction • Prior to construction • Construction • On-going • Construction • Construction • On-going • On-going • On-going • On-going • On-going • Closure • Closure • On-going	Not applicable

Site preparation
Civil works
Earthworks
Waste rock management
Mining and mining related activities
Tailings management
Demolition
Rehabilitation
Maintenance and aftercare
	Hazardous excavations infrastructure and surface subsidence	• All mineralised waste facilities and water dams will be designed, constructed, operated and closed in a manner to ensure stability and related safety risks to third parties and animals are addressed. It will furthermore be monitored according to a schedule that is deemed relevant to the type of facility by a professional engineer. As part of closure, BPM should ensure that provision is made to address long term safety risks in the decommissioning and rehabilitation planning.
		• Bakubung will survey its mining area and update its mine plan map on a routine basis to ensure that the position and extent of all potential hazardous excavations, hazardous infrastructure and subsidence is known as part of construction, operation and decommissioning. It will further more ensure that appropriate management measures are taken to address the related safety risks to third parties and animals
		• As part of construction and operation, the safety risks associated with identified hazardous excavations, subsidence and infrastructure will be addressed through one or more of the following:
		  ○ Fencing, berms, barriers and/or security personnel to prevent unauthorized access
		  ○ Warning signs in the appropriate language(s). Warning pictures can be used as an alternative
		• During decommissioning planning of any part of the mine, provision will be made to address long term safety risks in the decommissioning and rehabilitation phases.
		• At closure of any part of the mine, the hazardous infrastructure will either have been removed or decommissioned and rehabilitated in a manner that it does not present a long term safety and/or stability risk.
		• At closure the hazardous excavations and subsidence will have been dealt with as follows:
		  ○ All excavated areas will have been backfilled and rehabilitated
		  ○ Monitoring and maintenance will take place to observe whether the relevant long term safety objective have been achieved and to identify the need for additional intervention where the objectives have not been met.
			• On-going
			• On-going
			• On-going
			• Decommissioning
			• Closure
			• Closure
				Not applicable

Activity	Potential impact	Mitigation type	Time period for implementation	Compliance with standards
		• In case of injury or death due to hazardous excavations, the emergency response procedure in Section 31.2.2 will be followed.	• As required	
Site preparation Civil works Earthworks Waste rock management Mining and mining related activities Tailings management Demolition Rehabilitation Maintenance and aftercare	Alteration to topography and impact on infrastructure	• The sides of the TSF are to be designed with curves and rounded corners in order to allow the slopes to blend better into the surrounding topography. • Topographical management measures are to be included in the final TSF design document. • Any material removed from the footprint of the shaft complex, waste rock dump and TSF during bulk excavations and initial site clearing are to be temporarily stockpiled at the demarcated areas and vegetated if possible. • Upslope storm water diversion berms are to be constructed above the shaft/plant complex and TSF to prevent runoff across the cleared areas and away from stockpiles. • All storm water diversion berms will be vegetated and sloped to ensure stability and conservation of topsoil materials. • No unnecessary earthworks and clearing should be done outside of the stipulated footprint of the mining activities and TSF. • Upslope storm water diversion berms will be maintained to prevent runoff and erosion across the sites, especially around the sides of the TSF. • The development of the TSF will be in accordance with the final TSF design document and the mandatory TSF Code of Practice (COP). • Soil will be placed on the outer slopes of the TSF and vegetation will be established. Refer to Section 29.1.3 for a description of the proposed Rehabilitation Plan. • The soil and vegetation will be maintained until the vegetation is self-sustaining. • Rehabilitation and/or re-vegetation of structures selected, except the waste rock dump, that obtrude in the landscape should take place as soon as is possible and on a continuous basis. • Measures should be implemented to prevent erosion features developing on prominent structures, like the TSF. • Profiling of the landscape will take place to ensure the area is rehabilitated as close to its natural state as possible. • Additional composting material and soil will be brought in if required. • The landscape will be profiled to ensure that surface water runs off freely and does not pond anywhere. • Judicious planting of screening vegetation will be considered to ameliorate views of the taller structures from sensitive viewpoints.	• Planning and design • Planning and design • Construction • Construction • Construction • Construction • On-going • On-going • On-going • On-going • On-going • On-going • Closure • Closure • Closure • Closure	Not applicable

Construction of project components
Operation of the mine
Decommissioning of project components
Final land forms
	Loss or changes to existing land use	• Do not disturb areas unnecessarily.
		• Identify, in conjunction with tribal council, specific rights of the affected parties eligible for compensation.
		• Establish an appropriate compensation method and the measures by which it will be implemented.
		• Rehabilitate disturbed areas according to the rehabilitation plan included in Section 29.1.3 and according to recommendations from vegetation specialist included in this EMP.
		• Effective implementation of all mitigation measures as outlined in this EMP report to reduce the mine's overall impact on the environment and surrounding land-uses
		• Closure planning to incorporate measures to achieve future land use.
		• Should the impact on the surrounding land use and/or economic activity still prove unacceptable, BPM will compensate the relevant landowners accordingly.
		• Periodic communication (annual at a minimum) and feedback should be undertaken to the affected communities and stakeholders in respect of the activities that will generate nuisance factors.
		• Implement all mitigation measures as specified in the relevant specialist inputs, without compromising the safety of people, namely:
		  ○ noise impact assessment;
		  ○ air quality impact assessment;
		  ○ traffic impact assessment; and
		  ○ visual impact assessment in the EIA.
		• The existing grievance/complaints register should be maintained in which all community and IAP complaints are recorded and addressed.
		
		Construction staff, plant and equipment:
		• All construction staff will agree to a Code of Conduct (CoC) that outlines protocols and standards for working on the affected land. The CoC should address the following:
		  ○ respect for local residents;
		  ○ respect for existing livelihood activities and the environment;
		  ○ no hunting, snaring or unauthorised taking of any property belonging to someone else;
		  ○ compliance with the Traffic Management Plan and all associated regulations;
		  ○ unambiguous disciplinary measures for not adhering to the Code of Conduct.
		• Community members / affected land users will be able to lodge grievances with BPM using the existing grievance procedure. In the event that the grievance is not addressed or closed out properly, there should be an avenue through which the matter is escalated to a higher level of authority within Bakubung Platinum Mine.
		• Bakubung Platinum Mine and the *Bakubung-Ba-Ratheo* Traditional Authority will discuss appropriate mitigation measures including methods and procedures to minimise the disruption to land use patterns and livelihood activities. This will include, fencing off the construction site to ensure that community members and livestock do not get injured due to construction activities and providing access points (both during construction and during operations and maintenance) across, over or under the pipeline to ensure unhindered movement for pedestrian and livestock as well as a clear and simple claim mechanism in the event of proven damage to property by the contractor.
		• Compliance with relevant mitigation measures as outlined in the noise, air quality, and heritage assessments.
		
		Pipeline crossings:
		• Identify and confirm all affected land uses and land user groups with input from the *Bakubung-Ba-Ratheo* Traditional Authority.
		• Consider all possible measures to enable convenient and safe pedestrian and livestock crossing of the construction site and the pipeline, post construction. These may include providing overpasses and underpasses at regular intervals or in designated locations along the pipeline route.
		• Together with the *Bakubung-Ba-Ratheo* Traditional Authority and affected land user groups identify practical and cost-effective engineering solution to cross the construction site and the pipelines.
		• The pipelines should not be fenced during operations as this will completely prevent all pedestrian and livestock from crossing.
		
		If required:
		• Hold discussions with the Traditional Authority to confirm that they are in agreement that all livelihoods activities can proceed unhindered. Should they raise concerns, these should be defined and investigated, suitable mitigation should be agreed.
			• On-going
			• On-going
			• On-going
			• On-going and Closure
			• On-going
			• On-going
			• As required
			• On-going as per mitigation measure
			• On-going
			• On-going
			• On-going
			• On-going
			• On-going
			• Prior to construction
			• Prior to construction
			• Prior to construction
			• On-going
			• As required
				Re-zoning applications need to be submitted in terms of the Spatial Planning and Land Use Management Act (No. 16 of 2013), or the Cape Land Use Planning Ordinance (No. 15 of 1985) whichever is applicable at the time of the submission of the re-zoning application.

Activity	Potential impact	Mitigation type	Time period for implementation	Compliance with standards
		• Update BPM's "Grazing Compensation Assessment Procedure". Implement as and when required. • A practical and cost effective yet fair agreement should be reached between all parties. Possible mitigation measures may therefore include the construction of overpasses and underpasses at designated locations along the pipeline route or pursuing other options as detailed in the procedure. Should the pipeline prohibit livestock movement to the extent that livelihoods are compromised, BPM should enhance/ extend the *Bakubung-Ba-Ratheo* Farming Project to provide opportunities for the affected people. • Mitigation measures should be approached in accordance with the principles of the International Finance Corporation's Performance Standard 5 on Land Acquisition and Involuntary Resettlement (IFC PS5, 2012), namely to achieve fair compensation that will not leave affected parties worse off than their position pre-project intervention.	• As required • As required • As required	
Transport system	Road disturbance and traffic safety	• Designs of the intersection layouts of the access roads with the main roads must address design standards and elements such as alignment, sign distances, cross-sections and provisions for other road users including pedestrians. • Put into place a system whereby overloading of mine vehicles, as well as contractors' vehicles (weigh bridge), can be prevented and impose adherence to these standards in the strictest possible way to minimise damage to tarred road surfaces that are travelled upon and to reduce the risk of accidents. • Inspect mine vehicles weekly for clean and operational tail lights, indicators, reflective signage and reverse hooters to ensure visibility of vehicles, especially at night. • Impose safety restrictions on drivers of mine fleet vehicles and include similar stipulations in contracts signed with contractors: o Encourage drivers of mine vehicles to not stop on the side of the R556 and R565 at any time, except in emergencies, to retain the integrity of the road shoulders. o All employees and contractors must adhere to the speed limits and other road safety procedures. o Trucks that are transporting concentrate will be sealed and covered. • As far as is possible, heavy vehicle deliveries and collections will be kept to off peak traffic periods. • The needs of pedestrians should be taken into consideration in the planning and design of the access to the proposed site, as well as the design of the road infrastructure. • A single-lane access road with stop-control at the access to the shaft plant on the R565 and R556. • A right-turn lane on the R565 and R556 to access the roads to the proposed site would also be an additional safety feature. • Provide large visible road signage indicating the presence of heavy vehicle traffic at least 500 m before, on either side of the mine site access road intersections with the R565 and R556. • Road safety issues must be included as part of the overall on-site safety training and at induction. • In case of a person or animal being injured by transport activities the emergency response procedure in Section 31.2.2will be followed. • The mine will record and respond, appropriately and without delay, to any complaints about usage of roads by mine vehicles. • Bakubung needs to ensure that proper road markings, reflective road studs, road signs, overhead lighting and proper pedestrian crossings are provided and maintained at the entrance to the mine and TSF. This would need to be done in liaison with the roads department that has jurisdiction on the roads. • BPM is to share the recommendations for road infrastructure changes and upgrades provided in the 2016 traffic impact assessment report to the roads department.	• Planning and design phase • On-going • Weekly • On-going • On-going • On-going • On-going • Prior to construction • On-going • On-going • As required • On-going • On-going Prior to construction	Not applicable
Site preparation Earthworks Waste rock management Transport systems Site/contract management Tailings management Demolition Rehabilitation	Loss of heritage, cultural and palaeontological resources	• A phase two heritage investigation is to be undertaken for sites to be destroyed or relocated. • Based on the heritage investigation the preservation or the destruction of the sites will take place prior to the commencement of the construction activities. • Should destruction of the sites be necessary, destruction permits must be in place prior to construction activities commencing at or near the relevant identified sites. • The grave site (MCH017) and stone cairn (MCH021) will be fenced off to afford them greater protection. • All relevant construction staff will receive training in basic archaeological identification and the communication routes to follow in the case of a discovery. • Additional heritage resources may be unearthed during construction. Should this occur, work in that area should be halted until such time as an appropriately qualified person can make an expert decision on the mitigation measures required. The expert must notify SAHRA and carry out an emergency recovery (Emergency Response Procedure Section 31.2.2). • Where graves have been identified, if they are not to be relocated, they will be monitored and fences will be maintained during the life of mine. • Where stone cairns have been identified, if they are not to be destroyed or moved, they will be monitored and fences will be maintained during the life of mine. • For graves to be relocated the following procedure is required: o A detailed social consultation process, at least 60 days in length, comprising the attempted identification of the next-of-kin so as to obtain their consent for the relocation of the graves. o Bilingual site notices (in the most appropriate languages) indicating the intent of the relocation. o Bilingual newspaper notices indicating the intent of the relocation. o Permit applications to the legally required authorities, including (but certainly not restricted to) the South African Heritage Resources Agency. o An exhumation process that keeps the dignity of the remains and family intact. o An exhumation process that will safeguard the legal rights of the families as well as that of the development company. o The process must be done by a reputable company well versed in the mitigation of graves. **SITE SPECIFIC MEASURES:** **Iron Age sites** *For MCH003:* • Shovel pit test to determine depth and integrity of archaeological deposit of site and for sites with ceramics to positively establish group identity. • Test pit excavations will be aimed at identifying structures. • Based on the findings further assessment of the site might be required. • Before destruction of the site, a destruction permit must be applied for (for sites that require destruction permits) and received from the South African Heritage Resources Agency. • This work can only be undertaken by a suitably qualified and experienced archaeologist. • This work may only be undertaken after permits have been received from the South African Heritage Resources Agency allowing such mitigation measures to be undertaken.	• Prior to construction • Prior to construction • Prior to construction • On-going • On-going • As required • On-going • On-going • Prior to construction • Prior to construction • Prior to construction • Prior to construction • Prior to construction • During construction and prior to destruction • During construction and prior to destruction	Compliance with the National Heritage Resource Act No. 25 of 1999 in the event of any chance finds.

Activity	Potential impact	Mitigation type	Time period for implementation	Compliance with standards
		For MHC005: • If the site is impacted upon, an archaeologist must monitor the site during construction to mitigate accidental finds. • Before destruction of the site, a destruction permit must be applied for and received from the South African Heritage Resources Agency. • This work can only be undertaken by a suitably qualified and experienced archaeologist. **Early Stone Age:** • An Early Stone Age specialist must assess the study area in particular the pebble layers that contain artefacts. New dating techniques could be used here.	• As required, during construction • Prior to destruction • Prior to destruction • Prior to construction	

Site preparation
Earthworks
Civil works
Waste rock management
Transport systems
Demolition
Rehabilitation
Waste rock management
Mineral processing operations
Mining and mining related activities
	Noise Pollution	• The shaft and plant infrastructure was moved some 600 m further south east away from the nearest neighbour.
		• The prevailing wind directions is to be taken into consideration when planning the location of noise emitting installations/plant on surface
		• A noise attenuation structure and visual barrier will be constructed between the shaft bank and the receptive community areas. The structure will be designed to be as aesthetically pleasing as possible. The final design will be concluded prior to the commencement of the construction phase and will be signed off by a professional engineer. The design will include both noise and visual design criteria.
		• The designs of the shaft complex and concentrator plant should incorporate all necessary acoustic design aspects required in order to ensure that the overall generated noise level does not exceed a maximum equivalent continuous day/night rating level (LRdn) of 70 dBA inside the property boundary, as specified for industrial districts in SANS 10103. Notwithstanding this provision, the design is also to take into account the maximum allowable equivalent continuous day and night rating levels of the potentially impacted sites outside the mine property. Where the noise level at such an external site is presently lower than the maximum allowed, the maximum for that land use zoning shall not be exceeded. Where the noise level at the external site is presently at or exceeds the maximum, the existing level shall not be increased by more than indicated as acceptable in SANS 10103. Note that the induced ambient noise levels in the residential areas of Ledig Village should ideally not exceed 50dBA during the day and 40dBA at night.
		• Sound muffs will be used on the main ventilation fans.
		• Noise will be periodically (construction) and continually (operations) monitored at relevant boundary points nearest the neighbouring communities according to national standards.
		• Any complaints from any of the neighbours or other IAPs with regards to noise and vibration will be registered (A complaints system is to be established) and dealt with by the mine management.
		• Construction site yards, concrete batching plants, asphalt batching plants and other potentially noisy fixed facilities are to be located as far away as is possible from noise sensitive areas adjacent to the development site.
		• The ventilation fan outlets have been positioned facing south east, away from the village and facing slightly upwards.
		• All construction vehicles, mine fleet vehicles and equipment are to be kept in good repair and fitted with appropriate sound suppression devices.
		• Activities, particularly the noisy ones, are to be restricted as far as possible to daylight hours.
		• The noise from mechanical implements and mining activities will be maintained within the requirements of the Mine Health and Safety Act (No 29 of 1996).
		• Site generators to be equipped with suitable sound attenuation measures.
		• Blasting noise will be monitored and recorded during blasting activities to ensure adherence to stipulated guidelines.
		• A schedule for all blasting work on surface and for the first 50 m of the shaft sinking should be provided to the local communities most likely to hear the noise of the blasts, especially schools and hospitals. A reminder or warning system, such as bulk SMSes, should be sent out to community representatives who can inform their neighbours.
		• A siren will be sounded prior to a blast.
		• Personal Protection Equipment (PPE) will be worn at all times as required by the appropriate workplace health and safety legislation.
		• Demolition and rehabilitation activities are to be restricted to daylight hours.
		• Local residents are to be notified of any potentially noisy field survey works or other works during the planning and design phase and these activities are to be undertaken at reasonable times of the day. These works should not take place at night or on weekends.
		• During the pre-construction phase, consideration must be given to the noise mitigation measures required during the construction phase that should be included in the tender document specifications and the design.
		• Construction site yards, concrete batching plants, asphalt batching plants, and other noisy fixed facilities should be located well away from noise sensitive areas adjacent to the development site.
		• The temporary ventilation system for the shaft construction should incorporate all the applicable noise mitigation measures.
		• With regard to unavoidable very noisy construction activities in the vicinity of noise sensitive areas, BPM should liaise with local residents on how best to minimise impact.
		• In general operations should meet the noise standard requirements of the Occupational Health and Safety Act (Act No 85 of 1993).
		• Construction staff working in areas where the 8-hour ambient noise levels exceed 75dBA should wear ear protection equipment.
		• The latest technology incorporating maximum noise mitigation measures for the shaft complex and concentrator plant components should be designed into the system.
		• The design process is to consider, inter alia, the following aspects:
		  ○ The position and orientation of buildings on the site.
		  ○ The design of the buildings to minimise the transmission of noise from the inside to the outdoors.
		  ○ The insulation of particularly noisy plants.
		• Specifically measures need to be taken for the two types of equipment, which are responsible for the highest noise levels from the shaft complex, namely the compressor house and the mine ventilation system (upcast vent fans):
		  ○ The compressors should be fitted with effective silencers and the walls and roof of the compressor house should be constructed of a sufficiently dense material so as to achieve at least a 20dBA reduction (insertion loss) between the indoor noise and that transmitted to the outside of the building. Ventilation openings, if required, should be placed on the side of the building facing away from the noise sensitive areas.
		  ○ The mine ventilation system should preferably use centrifugal fans rather than radial fans. The upcast vent fan outlets should be oriented slightly upwards and to the south-east away from Ledig Village, and if possible the enclosure of the surface infrastructure in an insulated building should also be considered.
		  ○ Irrespective of the aforementioned mitigation measures that need to be taken at the sources of the noise, earth berms (noise attenuation barriers) should also be constructed:
		  ○ Along the eastern perimeter of Ledig Village.
			• Prior to construction
			• Prior to construction
			• Prior to construction
			
			• Prior to construction
			
			• On-going
			• On-going
			
			• On-going
			
			• Construction
			
			• Construction
			• On-going
			• On-going
			• On-going
			
			• On-going
			• Construction
			• Construction
			
			• Construction
			• On-going
			• Decommissioning and Closure
			• As required
			
			• Prior to construction
			
			• Construction
			
			• Construction
			• As required
			
			• On-going
			• Construction
			• On-going
			
			• On-going
			
			• On-going
				As described in mitigation measures

Activity	Potential impact	Mitigation type	Time period for implementation	Compliance with standards
		○ North of mine along the southern perimeter of the planned Gabonewe Estate (mine housing). • The design of the pump stations at the planned tailings dam is to incorporate all the necessary acoustic design aspects required in order that the induced ambient noise levels in the residential areas of Phatsima Village and Reagile informal settlement shall not exceed 50dBA during the day and 40dBA at night. • The National Noise Control Regulations and SANS 10103 should be used as the main guidelines for addressing the potential noise impact on this project. • The noise mitigation measures will need to be designed and/or checked by an acoustical engineer in order to optimise the design parameters and ensure that the cost/benefit of the measure is optimised. • At commissioning of the mine, the noise footprint of the new shaft complex, the concentrator plant and the tailings dam area should be established by measurement in accordance with the relevant standards, namely SANS ISO 8297:1994 and SANS 10103. The character of the noise (qualitative aspect) should also be checked to ascertain whether there is any nuisance factor associated with the operation.	• On-going • On-going • Prior to construction • Prior to operations	
Site preparation Earthworks Waste rock management Transport systems Tailings management Demolition Rehabilitation Maintenance and aftercare	Loss of soil resources and land capability through physical disturbance	• Soil stripping is to be stripped according to the soil stripping guide (Table 28.4). • Earthworks and clearing will be limited to the stipulated footprints of the infrastructural areas. • The soil conservation plan in Table 28.4 is to be followed. • Place infrastructure in already transformed areas or where transformation will occur as far as possible. • Avoid drainage lines and sensitive soils (particularly Sepane soil form). • The rehabilitation plan in Section 29.1.3 provides a guideline of the procedures for soil and vegetation to be followed for the rehabilitation of the shaft and plant complex and the remaining benches on the TSF. • Ameliorate altered physical and chemical properties of soil using appropriate methodologies and monitoring the progress thereof. • All staff and contractors handling topsoil and sub-soils are to receive the necessary training in terms of stripping guide, handling and storage procedures. • Restore affected surface areas to their pre-disturbance potential. • The surface will be contoured to potentially replicate the pre-mining conditions. • All soils compacted as a result of activities falling outside of project footprint areas should be ripped and profiled. • To prevent the erosion of topsoils, management measures to minimise erosion should include installation of berms, silt traps, hessian curtains and other appropriate engineering materials/designs at erodible areas and storm water diversion away from areas susceptible to erosion. • All areas should be monitored for erosion and incision. • Construct in the dry season	• Construction • Construction • On-going • Construction • Construction • Decommissioning • On-going • On-going • Decommissioning • Decommissioning • As required • Construction and ongoing management • On-going • Construction	Not applicable
Site preparation Earthworks Waste rock management Transport systems Tailings management Process and storm water management Sewage sludge management Demolition Rehabilitation Maintenance and aftercare	Loss of soil resources and land capability through pollution	• During the construction, operational and decommissioning phases, Bakubung will ensure that all hazardous chemicals (new and used), dirty water, mineralized wastes and non-mineralised wastes are transported, handled and stored in a manner that they do not pollute soils. This will be implemented through a procedure(s) covering the following: ○ All contaminated soils should be rehabilitated or replaced with uncontaminated soils ○ All hydrocarbons will be stored in a bunded area during all the phases of the project. ○ Pollution prevention through appropriate management of hazardous materials and waste as outlined in Table 28.3. ○ Pollution prevention through basic infrastructure design and re-alignment of the tailings pipeline ○ Pollution prevention through maintenance of equipment ○ Maintenance of equipment should be done either on impermeable surfaces or drip trays should be used. ○ Pollution prevention through education and training of workers (temporary and permanent) ○ A soil remediation plan developed by a soil chemist and hydrologist is to be implemented following a spill event. ○ The required steps to enable fast reaction to contain and remediate pollution incidents. In this regard the remediation options include containment and in situ treatment or disposal of contaminated soils as hazardous waste. In situ treatment is generally considered to be the preferred option because with successful in situ remediation the soil resource will be retained in the correct place. The in situ options include bioremediation at the point of pollution, or removal of soils for washing and/or bio remediation at a designated area after which the soils are returned. Following spillages, the pollution plume should be determined by a soil chemist, geohydrologist or hydrologist. ○ Specifications for post rehabilitation audit to ascertain whether the remediation of any polluted soils and re-establishment of soil functionality has been successful and if not, to recommend and implement further measures. • In case of major spillage incidents the emergency response procedure in Section 31.2.2 will be followed. • If spillage occurs, the spill must be contained with swales and berms, after the leakage has been repaired the spilled material should be removed and pollution plume should be determined by a soil chemist and hydrologist and geohydrologist. • Implement the soil conservation plan (Table 28.4)	• On-going • As required • As required • On-going	Spillage clean-up in accordance with the MPRDA
Site preparation Civil works Earthworks Tailings management Waste rock management Transport systems Process and storm water management Sewage sludge management Site/contract management Demolition Rehabilitation Maintenance and aftercare	Destruction to biodiversity	• The area to be disturbed during the construction of the mine and its associated infrastructure is to be kept as small as possible to limit disturbance to existing vegetation. • Specimen trees on site will be identified and efforts will be made to conserve these. • Should this not be possible, then trees and large shrubs cleared during the site clearance phase should be made available to the local community as firewood. • Site clearing shall be carried out by mechanical means. Fire will not be used for bush clearing. • Indigenous vegetation will be planted for screening and landscaping purposes, especially around the TSF. • Pollution prevention measures will be established, maintained and monitored, including spill prevention, dumping of domestic waste or building rubble outside of designated waste transfer stations. • Vehicles will be restricted to designated roads and laydown areas. • Areas of biological importance, such as the riparian zone of the Elands River, should not be disturbed by mining activities in order to preserve the existing floral and faunal habitats. • All activities are to remain within the designated infrastructure footprints • Implement the waste management procedures (Table 28.3) • No unnecessary clearing of vegetation should take place during the operational phase. • On-going rehabilitation and monitoring of previously disturbed areas will take place, especially at the TSF. • Vegetation planted for screening and landscaping purposes should be monitored and maintained. • Implement the rehabilitation plan (Section 29.1.3) • Seeds from indigenous grasses common to the area will be harvested and added to the rehabilitation seed mix. • An alien and invader species management programme is to be developed and implemented in areas where BPM has control and will include a	• Construction • Construction • Construction • Construction • Construction • Ongoing • Ongoing • Ongoing • Ongoing • Ongoing • Ongoing • Ongoing • Ongoing • Ongoing • Ongoing • Ongoing	The mitigation action to obtain a tree removal permit from DAFF is in accordance with the National Forests Act (No. 84 of 1998) that stipulates that no person may cut, disturb, damage or destroy any protected tree or possess, collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree or any forest product derived from a protected tree, except under a license.

Activity	Potential impact	Mitigation type	Time period for implementation	Compliance with standards
		monitoring phase to evaluate successes achieved. This will be managed throughout the project life and for an additional three-year period after rehabilitation. • The annual vegetation survey will be continued to ascertain the progress and success of rehabilitation. This will include the TSF. • Additional surveys to be performed if expansion of infrastructure is planned in the future. • Conduct additional, brief floristic surveys, focused on searching for *Drimia sanguinea, Stentonstelma umbelluliferum*, *Boophone disticha* and *Hypoxis hemerocallidea* within the final development footprints prior to construction. Surveys should be conducted in late October to early November and in January. • The mine will ensure that all staff members and contractors are familiar with the conservation policy of the company through training and induction. • No snaring, trapping, hunting, poisoning or disturbance of fauna will be allowed by any employee or contractor or their employees. • Perimeter fences are to be inspected monthly to determine if breached by poachers. • Speed restrictions will be enforced on all access roads. • Prevent any pollution of water, soil or vegetation which can cause harm to animal life. • Apply sound veld management principles to ensure maximum biodiversity. This would include sound fire management and grazing techniques to ensure optimal vegetation condition and biodiversity levels in areas of Marikana Thornveld and spatially restricted untransformed vegetation units not destroyed by the project. • No uncontrolled or camp fires are permitted on site • Develop and implement a water course rehabilitation plan near the end of the construction phase to address remnant impacts. • All reseeding activities must be undertaken at the end of the dry season to ensure optimal conditions for germination and rapid vegetation establishment. • Any damage to the drainage lines necessary to complete the work must be limited in extent. • Avoid placement of any infrastructure footprints within the buffer zones for the biological corridors recommended in the vegetation impact assessment. • Botanical research and conservation institutions (e.g. SANBI and universities), should also be afforded an opportunity to search the footprint for species that are of research or horticultural interest, prior to commencement of development. • Buffer zones need to be maintained during the operational phase of the project in order to be effective. This includes the maintenance of a well vegetated grass cover that is free of aliens and erosion features. Any aliens and/or erosion features observed within the buffer zone need to be addressed in order to ensure buffer functioning. • Construction teams to be housed off-site to reduce human presence on site. • Delineated watercourses and buffers should be treated as sensitive no-go areas as far as possible. No unauthorized access is allowed in these features. • Dewatering that may be required during excavation activities should not be released directly into watercourses. • Ensure that geotechnical and geohydrological mitigation measures are in place around the proposed tailings storage facility to prevent seepage into nearby watercourses. • Water storage, waste and stockpile facilities are to constructed and operated according to specifications to reduce the likelihood of structure failure • Fence off surrounding untransformed vegetation (applicable to all footprints except the pipeline); • Illegal medicinal plant harvesting should be discouraged through control of access to untransformed habitats and vegetation within the study area. • Implement and maintain sediment control structures upslope of watercourses, in between stockpiles and construction activities that may act as sources of sediment. • The damaging or destruction of any plant species protected in terms of the National Forest Act or the Biodiversity Act should be avoided wherever possible, and the relevant permits for the destruction, removal or translocation of any such protected plant must be obtained prior to development from the provincial Directorate of Biodiversity Management • In the event of any 'Declining' plant species being recorded within approved development footprints in future, permission for their removal or destruction should be obtained from the provincial Directorate of Biodiversity Management. Where feasible, viable populations of such species should be translocated to degraded or untransformed areas within the study area which provide potentially suitable habitats, but such translocations will have to be carried out in a way that ensures no ecological degradation of the host habitat occurs, and will have to be evaluated by a botanist for each species and each potential translocation area. • In the event of any threatened (i.e. Critically Endangered, Endangered and Vulnerable) or Near Threatened plant species being recorded within the study area or proposed development footprints in future, appropriate in situ and/or ex situ conservation measures should be developed in consultation with the North-West Province Directorate of Biodiversity Management. • It must be ensured that all hazardous storage containers and storage areas comply with the relevant SABS standards to prevent leakage. • Limit damage and access to riparian vegetation during bridge construction. • Limit transformation only to development footprints. • Maintain the pipeline in a good working order with regular checks and inspections to help reduce the risk of spillage events. • Maintain untransformed vegetation in a natural state. • Maintain sediment control structures in a functional manner during the entire throughout the construction and operational phases. • Modify infrastructure footprints so as to avoid overlap of watercourses, as well as the 32m and 100m buffers as far as possible. This pertains specifically to a portion of the tailings/return water pipelines. • Reporting of faunal species of conservation-concern and implementing a monitoring programme • Modify infrastructure footprints so as to reduce the area of spatially restricted vegetation units and Marikana Thornveld within the footprints wherever possible. Realigned footprints should be placed within the 'Secondary vegetation' unit in as far as possible. • Modify TSF footprint so as to maximise the surface area comprising Secondary vegetation and minimise the extent of Marikana Thornveld within the footprint. • Realign the Frischgewaagd section of the tailings and return water pipeline alignment along the recently constructed access road and reduce the width of the construction servitude in untransformed habitats. • Bridge designs need to be modified to prevent further habitat loss due to expected anthropogenic erosion damage. • Proposed bridge crossings should contain culverts across the length of the crossing and armouring on the downstream channel banks and bed to avoid further channel incision and channel bank scour during high flow events. Pipes are not recommended as they can become easily blocked with alluvial material, which can lead to further scour damage in the watercourse. • Tie-in points at riverbanks (i.e. where infrastructure is placed into the ground) must be suitably safeguarded with gabion cut-off walls to prevent erosion. • All final footprints should be searched for protected plant species prior to the commencement of construction. The surveys should focus on searching for Drimia sanguinea, Stentonstelma umbelluliferum, Boophone disticha and Hypoxis hemerocallidea within the final development footprints prior to construction, and should be conducted in late October to early November and in January. • A restricted servitude width for pipeline river crossings should be used, and no construction activities should occur within the instream and riparian	• Ongoing • As required • End of construction • On-going • On-going • On-going as per management measure • On-going • On-going • On-going • On-going • On-going • Post construction • On-going • Construction • Construction • Prior to construction • On-going • Construction • On-going • Construction • On-going • On-going • On-going • On-going • On-going • Prior to construction • Prior to construction • On-going • On-going • Prior to construction • On-going • On-going • On-going • On-going • On-going • Prior to construction • Prior to construction • Prior to construction • Prior to construction • Prior to construction • Construction • Construction • Prior to construction • Construction	

Activity	Potential impact	Mitigation type	Time period for implementation	Compliance with standards
		habitats. • The pipeline should be spanned across the watercourse with plinths, plinths can be located within the 32m buffer, but not within delineated riparian habitat. • No new access roads may be created through watercourses along the pipeline alignment. All new tracks and roads that intersect delineated watercourses and the 32m buffer will have to receive environmental approval before they can be constructed. • No refueling of any vehicles, stockpiling of material or the positioning of portable toilets should be allowed within any of the watercourses or their associated buffer zones. • Permit only essential construction personnel within 32m of the riparian habitat, if absolutely necessary that they enter the buffer zone; • Regular monitoring of the tailings pipeline is recommended during the operational phase to prevent potential spills/leakages. • Rehabilitate all drainage line and riparian habitat areas if required, in order to ensure that the ecology of these areas is re-instated during all phases. Edge effects of activities including erosion and alien/weed control need to be strictly managed in these areas. • Repair erosion damage within watercourse through the use of either soft or hard rehabilitation interventions. Hard interventions, such as gabion drop inlets and other features, will require design by an engineer with rehabilitation experience. Soft rehabilitation interventions include rehabilitation interventions that do not consists of rock and concrete, examples include earth berms, revegetation with indigenous species and biojute fabrics. Note also that rehabilitation works in watercourses require a WUL. • Sheet runoff from access roads should be slowed down by the strategic placement of berms; • Stockpiles should be protected from erosion during the wet season to prevent sedimentation in watercourses. • Discharged storm water must be released in a controlled manner in a diffuse flow pattern across a buffered vegetation strip and be accompanied by energy dissipating interventions to prevent erosion damage. • Limit the amount of impervious material near watercourses as far as possible, and demarcate setbacks from watercourses in the form of a buffer zone with a natural vegetation cover. • Structural control measures such as treatment techniques or naturally vegetated detention basins could be used to improve storm water quality. • Other structural control measures include grass swales, infiltration trenches and basins, wet ponds, and constructed wetlands to intercept and partially treat storm water before it is released. A combination of source controls and structural controls can result in an integrated solution, which is likely to provide the best benefits. • Since the downstream sites in both the Sandspruit and unnamed tributary of the Elands River displayed higher SASS scores this spatial trend should not show a deterioration in the future once the proposed development takes place and this trend should be considered a Key Performance Indicator for the project throughout the life of the infrastructure. • Environmental control officers should ensure that signage to identify watercourses and their buffers are kept in place and remain well visible during the construction process and that no unauthorised access occurs. Toolbox talks should address the importance and sensitivity of wetlands and other watercourses. • If herbaceous protected plant species that are readily transplantable are found (e.g. many geophytes), viable populations of such species can also be translocated to transformed (including rehabilitation areas) or untransformed areas within the study area which provide potentially suitable habitats, but such translocations will have to be carried out in a manner that ensures that no ecological degradation of the host habitat occurs, and will have to be evaluated by a botanist for each species and each potential translocation area. • Develop and implement a rehabilitation plan for the tailings pipeline construction servitude. The principal objectives of the plan should be the optimal reintroduction of stripped topsoil and the establishment of indigenous seral plant communities through the natural process of secondary succession. • Modify the solar plant footprint so as reduce the extent of vegetation units with High biodiversity conservation value and sensitivity as far as possible and covering a greater extent of secondary vegetation.	• Construction • Construction • On-going • Construction • On-going • As required • On-going • On-going • On-going • On-going • On-going • On-going • On-going • On-going • During construction • Construction • On-going • On-going • Design phase	

Site preparation
Civil works
Earthworks
Tailings management
Waste rock management
Transport systems
Process and storm water management
Sewage sludge management
Site/contract management
Demolition
Rehabilitation
Maintenance and aftercare
	General disturbance to biodiversity	• The use of light will be kept to a minimum, and where it is required, yellow lighting will be used where possible
		• Workers (permanent and temporary) will be trained on the value of biodiversity and the need to conserve the species and ecosystems, as well as fire control and prevention. This will be included in induction training as well as relevant follow-up training.
		• There will be zero tolerance with respect to the killing or collecting of any biodiversity by anybody working for or on behalf of Bakubung Platinum Mine within or adjacent to the mine area
		• Strict speed control measures will be implemented on access roads and vehicles will be restricted to travel on designated roads
		• Alien plant species proliferation, which may affect floral and faunal diversity, will be controlled in accordance with legislation and in a manner that no additional loss of indigenous plant species occurs
		• Effective implementation of the following management plans (as described in the EMP):
		  ○ Surface and groundwater management plans
		  ○ Soil management plan
		  ○ Dust management plan
		  ○ Waste management plan
		  ○ Noise management plan
		  ○ Blast management plan
		• Concurrent and final rehabilitation of the TSF.
		• Concurrent rehabilitation of areas no longer required for mining activities with a particular focus on establishing indigenous vegetation cover
		• As part of closure planning, the designs of any permanent and potentially polluting structures (TSF) will take consideration of the requirements for long-term ecosystem functionality, pollution prevention and confirmatory monitoring
			• On-going
			• On-going
			• On-going
			• On-going
			• On-going
			• On-going
			• On-going
			• On-going
			• Closure
				The mitigation actions regarding veld fires are in accordance with the National Veld and Forest Fire Act No. 101 of 1998. The purpose of this Act is to prevent and combat veld, fires and places the responsibility on landowners to develop and maintain firebreaks as well as be sufficiently prepared to combat veld fires in terms of equipment as well as suitably trained personnel.

Site preparation Civil works Earthworks Transport systems Waste rock management Tailings management Process and storm water management Demolition Rehabilitation	Alteration to natural drainage patterns and changes to water quantity	• Surface water, particularly storm water for all phases of the proposed mining operation, is to be managed in accordance with legislative requirements of the NWA and Regulation 704 (4 June 1999). • Temporary storm water diversion berms will be constructed around all construction sites to divert clean water around and away from the sites. • Water consumption will be managed by setting key performance indicators to achieve water reduction based on the current water balance and the implementation of annual water audits. • All surface water management measures to be implemented in accordance with the Integrated Water and IWWMP and IWUL. • As the TSF develops, surface water control structures (contours and down drains) will be installed to prevent erosion and guide water into the return water dam. • An approved storm water management plan is to be implemented on site where clean and dirty water will be separated and clean water will be diverted around dirty areas and allowed to return to its normal flow path. • Site rehabilitation will aim to restore surface drainage patterns as far as practically and economically feasible. • Infrastructure is to be re-aligned in accordance with the recommendations provided by the wetland specialist; this includes modifying infrastructure	• On-going • Construction • On-going • On-going • On-going • Construction • Closure • Prior to construction	As outlined in mitigation type.

Activity	Potential impact	Mitigation type	Time period for implementation	Compliance with standards
Maintenance and aftercare		footprints so as to avoid overlap of watercourses, as well as the 32m and 100m buffers as far as possible including the tailings and return water pipelines. • A well designed and implemented storm water management system is required to attenuate flood peak events and consider buffer zones in order to prevent erosion impacts and the creation of channelised flows at discharge points. • Interventions and mechanisms in the storm water management system can include measures to facilitate a higher percentage of infiltration and reduce runoff volumes and velocities, without concentrating their outflows as far as practically possible.	• Prior to construction and on-going • Prior to construction and on-going	
Site preparation Civil works Earthworks Transport systems Mining and mining related activities Waste rock management Tailings management Process and storm water management General and hazardous waste management Sewage sludge management Site support services Demolition Rehabilitation Maintenance and aftercare	Contamination of surface water resources	• Surface water, particularly storm water for all phases of the proposed mining operation, is to be managed in accordance with legislative requirements of the NWA and Regulation 704 (4 June 1999). • The entire mine area (plant and TSF) subscribes to a zero-discharge policy for all dirty water. • All applicable water uses are to be licensed. • Temporary storm water diversion berms will be constructed around all construction sites to divert clean water around and away from the sites. • Pollution control dams will be constructed downslope of the shaft and plant site to capture all dirty water run-off. • The pollution control dams will be sized to accommodate all the dirty water from the area and not spill once in 50 years due to a storm event. The dams will have a minimum of 0.8m free board as required in Regulation GN R704. • The pollution control dams, TSF and return water dam are to include appropriate barrier systems in accordance with legislative requirements with designs approved by the DWS. • Silt traps will be constructed upslope of the pollution control dams and return water dam. • Ensure that all contractors and employees that are employed on site are aware of their responsibilities with regard to the prevention of pollution of water according to the requirements of the NWA. • The pollution control facilities (pollution control dams, silt traps and return water dam) will be placed on planned maintenance, routine inspections will be implemented and they will be de-silted periodically to ensure effective performance. • Water in the pollution control dams will be used for dust suppression, industrial water, for construction, during underground mining activities, as make up water for the mine service water system and, should the quality be suitable, it will be used in the plant. as required • The contractors' laydown areas are to be surfaced and are to drain to a sump with silt traps and hydrocarbon collectors. • Portable chemical toilets will be provided during the construction phase. They are to be routinely cleaned and sewage disposed of at a licensed sewage treatment plant with the safe disposal certificate to be provided. • All chemicals, bulk fuels, oils and grease and any other hazardous substance, will be stored and handled as per all applicable legislation and national standards. • Temporary hazardous waste disposal facilities will be licensed prior to construction. Temporary waste disposal facilities are to be provided for the collection of waste, which will be removed regularly by a reputable contractor to the permitted waste disposal site. • All vehicle transfer of hazardous materials must be done within bunded areas to minimise potential effects of spills. • DWS are to be given details of the design of pollution control facilities before these are constructed. • All surface water management measures to be implemented in accordance with the Integrated Water and IWWMP and IWUL. • A sewage plant will be provided and the treated effluent water will contained in the pollution control dams and will be recycled. • Water on the surface of the TSF will migrate toward the penstock, from where it will be channeled to the return water dam. • Seepage water captured by drains beneath the TSF will be channeled to the return water dam and into the pollution control dams for re-use in the plant. • A site wide water balance will be kept and updated annually. • Waste management procedures will be implemented including hazardous waste handling, storage and disposal of all waste types. • Hazardous materials handling and storage procedure will be implemented, including the availability of Material Safety Data Sheets (MSDS). • Hazardous materials spill procedures and an emergency response plan will be implemented. • Soil will be placed on the TSF as soon as deposition activities have moved high enough (one bench) to allow rehabilitation to begin. These re-soiled areas will be vegetated in the following growing season. • Tailings, chemical and hydrocarbon spillages from trucks, conveyors and pipelines will be cleaned up timeously in order to prevent contamination. • The return water dam and all pollution control dams will remain until such time that monitoring proves that surface water qualities are adequate thus allowing surface water to be released directly into the watercourses. • Rehabilitation will be done according the provisional rehabilitation plan in Section 29.1.3 in order to encourage clean surface flow off the rehabilitated surfaces. • Surface water quality needs to be monitored until any impacts attributable to mining have been eliminated and are acceptable to the receiving water environment. • Results from the water monitoring program must be presented to DWS on an annual basis until acceptable limits are achieved.	• On-going • On-going • Prior to construction • Construction • Construction • Prior to construction • Construction • Construction • On-going • On-going • On-going • Construction • Construction • On-going • On-going • On-going • Prior to construction • On-going • On-going • On-going • On-going • On-going as per requirement • On-going • On-going • On-going • On-going • On-going • On-going • Closure • Closure • Closure	
Site preparation Civil works Earthworks Transport systems Waste rock management Tailings management Process and storm water management Demolition Rehabilitation Maintenance and aftercare	Changes of groundwater levels and availability	• The shafts will be sealed during the construction phase to prevent the ingress of groundwater. • The shafts will be concrete lined and any water bearing fissures encountered during shaft sinking will be plugged to prevent further ingress of water. • Water pumped from underground during construction should be treated as dirty water and will be pumped to the settling ponds or pollution control dams. • The impact of shaft sinking on the surrounding aquifers will be monitored and reported on. Should there be a reduction as a direct result of the cone of dewatering from the shaft then an alternative source of water will be identified for the particular borehole user(s). • Groundwater inflow into the mine workings will be minimised by using appropriate measures. • Water encountered underground will be collected and re-circulated to surface. • All unwanted water accumulating in the excavations will be used or discharged into pollution control dams or settling ponds • Monitoring of groundwater levels should continue post closure. If a groundwater abstraction scheme is required around the TSF, this process must be scoped and discussed with all the authorities. The abstraction and disposal of polluted water must be licensed. • Groundwater levels should be continuously monitored for any type of impact;	• Construction • Construction • Construction • Construction • On-going • On-going • Construction • On-going and post closure • On-going as per monitoring programme	Not applicable
Site preparation Civil works Earthworks Transport systems Mining and mining	Contamination of ground water resources	• The TSF and return water dam will be constructed in accordance with the proposed TSF design document. • Suitable clay soils found on site at the TSF, waste rock dump and pollution control dams will be compacted to form an impermeable layer that will minimise the flow of leachate into the groundwater regime. • The return water dam will be lined with an appropriate barrier system approved by the DWS to prevent seepage. • All plant and surface infrastructure (including TSF, waste rock dump and pollution control dams) to be designed in accordance with national standards	• Prior to construction • rigor to construction • Prior to construction • Prior to construction	As outlined in mitigation type.

Activity	Potential impact	Mitigation type	Time period for implementation	Compliance with standards
related activities Waste rock management Tailings management Process and storm water management General and hazardous waste management Sewage sludge management Site support services Demolition Rehabilitation Maintenance and aftercare		and applicable legislative requirements, to prevent ingress of surface water into the groundwater regime. • The in situ subsoil layer containing clay will be compacted beneath the waste rock dump, TSF and pollution control dams to act as an impermeable layer. • All plant and surface infrastructure (including TSF, waste rock dump and pollution control dams) to be constructed in accordance with national standards and applicable legislative requirements, to prevent ingress of surface water into the groundwater regime. • All chemicals, bulk fuels, oils, grease and any other hazardous substance, will be stored and handled as per all applicable legislation and national standards. • All dirty face water will be captured and stored in underground settling ponds. • All groundwater management measures to be implemented in accordance with the Integrated Water and IWWMP and IWUL. • Waste management procedures to be implemented including hazardous waste handling, storage and disposal of all waste types. • Hazardous materials handling and storage procedure to be implemented, including the availability of Material Safety Data Sheets (MSDS). • Hazardous materials spill procedures and emergency response plan to be implemented. • All chemicals, bulk fuels, oils, grease and any other hazardous substance, will be stored and handled as per all applicable legislation and national standards. • Clean and dirty water will be separated. • All tailings spills require immediate clean up to prevent contamination of water resources. • Groundwater quality and level monitoring will be conducted on a monthly basis as per the water management plan. Internal quarterly reporting will be undertaken and an annual report will be submitted to DWS. • Seepage from under drains of TSF plus that from the penstock will be circulated back to the return water dam and the pollution control dams for use in the plant or for other mining purposes. • All hydrocarbon spills should be cleaned up as soon as possible to prevent ingress of pollutants into the ground water regime. • Surface water quality needs to be monitored until any impacts attributable to mining have been eliminated and are acceptable to the receiving water environment. • Results from the water monitoring program must be presented to DWS on an annual basis until acceptable limits are achieved. • The TSF should be rehabilitated correctly to prevent the ingress of surface water after closure, thus reducing the potential for the generation of leachates. • Excess water that accumulates during the construction phase will be dealt with as part of the construction phase water balance; • Clean runoff will be diverted around the total TSF complex. • All excess water must be managed as part of operational phase water balance. Return water from the TSF must be used as much as possible; • All water coming to the TSF must be treated as polluted. Where water is not returned to the plant area, disposal must take place in the correct polluted water facility; • Groundwater quality should be continuously monitored for any type of impact; • If required, a groundwater abstraction scheme should be implemented around the TSF to capture polluted ground water, and to prevent the migration of polluted water away from the site. • Monitoring of groundwater qualities should continue post closure. If a groundwater abstraction scheme is required around the TSF, this process must be scoped and discussed with all the authorities. The abstraction and disposal of polluted water must be licensed. • Groundwater monitoring has to continue during all phases of the TSF operation to identify the impact on the groundwater resources over time, so effective measures can be taken at an early stage before serious damage to the environment occurs. • In total nine monitoring points are recommended for the proposed groundwater monitoring program four shallow (to monitor the water level and quality in the weathered aquifer), four deep (to monitor groundwater conditions in the fractured aquifer) and one by the Elands River).	• Construction • Construction • On-going • On-going • On-going • On-going • On-going • On-going • On-going • On-going • On-going • On-going as per measure • On-going • As required • On-going as per monitoring programme • On-going as per monitoring programme • On-going • Construction • On-going • On-going • On-going • On-going as per monitoring programme • As required • On-going as per monitoring programme • On-going as per monitoring programme • On-going as per monitoring programme	
Site preparation Civil works Earthworks Mining and mining related activities Waste rock management Mineral processing operations Tailings management Power Supply and Use Water supply and use Process and storm water management Transport systems General and hazardous waste management Sewage sludge management Site support services Site/contract management Demolition Rehabilitation Maintenance and aftercare	Economic impact	• A policy regarding labour recruitment and employment will be compiled for use during the onset of the construction phase and early life of mine. The policy is to be reviewed at least once every two years. • Recruitment may not take place at any other point other than at the designated offices. • To compile a policy regarding labour training programs to guide contractor contracts as well as BPM. • Create a database of employable community members. This database will include identification documents, certificates of highest qualifications and proof of residence confirmed by the leader of the community. • A suitably qualified recruiting company will assist with the employment of individuals, both contractors and permanent, during both the construction and operational phases. This assistance will be in the form of interviews and a register held by the recruiting company. • Development of a policy regarding procurement/contracting of local SMMEs and BEE and creation of business opportunities to be developed. • Local products and services will be used where possible. • A policy regarding the preferred use of local SMME's as service providers will be compiled for use throughout the life of mine. • Provide contractors with the policy regarding labour recruitment and employment for their implementation. • Ensure that this policy is clearly communicated to all employees and to the communities. • Fair and equitable recruitment opportunities will be afforded to all with equivalent qualifications. • Recruitment practices must be transparent and auditable. • Stipulate the preferential use of local labour in all contracts, from Phatsima and Ledig, from communities within 50 km of the mine site, and then those areas from further afield, but without disregarding a person's constitutional rights. • Any job vacancy that is advertised must clearly indicate the required and appropriate skills for that position. • BPM will comply with the requirements of the mining charter with respect to employment equity, women in mining and employment of disabled persons. Policies with respect to this have been drafted. • BPM will identify candidates from the local communities for apprenticeships and on the job training programs • Employees Training and skills development: • BPM has developed a policy and program for the training, development, mentorship, skilling and career progression of its permanent employees as per the requirements of the SLP. Any BPM contractor will also be expected to meet the requirements of the SLP. All training will be carried out in accordance with the requisite SETA and NQA. • Communicate recruitment and appointment policy in transparent manner at local level. • Where retrenchments are unavoidable, they should be managed according to legislative requirements. • Provide contractors with the policy regarding the preferred use of local SMME's. • Preference should be given to local SMMEs as sub-contractors wherever possible. • Larger contractors will also be required, where possible, to sub-contract and mentor local SMMEs. • Make use of locally available raw materials, goods, and services as far as possible, and where appropriate, during construction and operation.	• Planning and design • Planning and design • Planning and design • Planning and design • Planning and design • Planning and design • Planning and design • Planning and design • On-going • On-going • On-going • On-going • On-going • On-going • On-going • On-going • On-going • On-going • On-going • Decommissioning • On-going • On-going • On-going • On-going	

Activity	Potential impact	Mitigation type	Time period for implementation	Compliance with standards
		• Through the correct implementation of the SLP the mine are to put in place alternative forms of employment and generation of income prior to its closure, to hopefully ensure the sustainability of the neighbouring communities. • A grievance/ complaints register should be maintained in which all community and Interested and Affected Parties (IAP) complaints are recorded and addressed. • Periodic communication (annual at a minimum) and feedback should be undertaken to the community and IAPs in respect of the progress of the Project and the implementation of the EIA management plans • Review all commitments outlined in the SLP and EMP, update to ensure that there is an increased benefit directed towards Phatsima. This should include meaningful interventions that promote long-term investment and expenditure in the community. • All directly affected communities will be considered for corporate social investment initiatives. Bakubung Platinum Mine is to clearly define beneficiaries (notably Ledig and Phatsima). Specific initiative should be defined for these communities. • BPM will continue to support the *Bakubung-Ba-Ratheo* Non-Mining Economic Development Trust and the *Bakubung-Ba-Ratheo* Economic Development Unit (EDU) sustainable development initiatives and monitor their effectiveness. • All IAPs should be informed of the commencement of the decommissioning phase and the date of mine closure on a regular basis. • BPM must ensure that rehabilitation has taken place correctly, as stated in Section 13.17 of the SLP and according to legislation and the final end land users' requirements.	• Prior to closure • On-going • On-going as per mitigation stipulation • Annually • On-going • On-going • Prior to decommissioning • On-going and Closure	
Site preparation Civil works Earthworks Mining and mining related activities Waste rock management Mineral processing operations Tailings management Power Supply and Use Water supply and use Process and storm water management Transport systems General and hazardous waste management Sewage sludge management Site support services Site/contract management Demolition Rehabilitation Maintenance and aftercare	Inward migration and associated social ills	• Worker accommodation (construction and operation phases) must comply with the standards of international best practice; i.e. Workers Accommodation Processes and Standards: A Guidance Note by IFC and EBRD (2009). • Focus on employing local labour and the appointment of contractors. • Link with relevant forums/organisations on issues of community safety and provision of emergency response services. • Plan a medical facility for employee needs. • Through the CSI department, identify opportunities to improve the health of the community. • Communicate the fact that BPM will operate through contractors, and that recruitment is to be done at specified centres that will be regularly advertised to the local communities. • Ensure the inclusion of stipulations in the contractors' agreements which prohibit them from employing people from the street or on-site. • Negotiate the establishment of a recruitment facility at the Traditional Council's offices/ information centre in Ledig and at an equivalent facility in Phatsima. • Actively downplay (through clear, simple, and persistent communication) inflated expectations of unlimited employment opportunities. • Liaise regularly with the Community Policing Forums. • A zero tolerance policy will be adopted for with respect to drugs and alcohols on site. • Access to councilors will be made available to employees attend to conflict resolution, HIV/AIDS issues, and any other relevant social issues. • Join established forums in conjunction with BDM and the MKLM that deal collectively with emergency incidents, such as the Western Limb Local Producer's Forum or other relevant forums/organisations. Discover where effective contributions to these services can be made. • Through this establish linkages with the respective municipalities' Disaster Management Plans to determine if any contribution can be made to these plans. • Through the *Bakubung-Ba-Ratheo* Non-Mining Economic Development Trust and the *Bakubung-Ba-Ratheo* Economic Development Unit and BPM's corporate social investment program investigate opportunities to improve local health care. • Communicate with other mining houses and the local municipalities with regards to the support and implementation of emergency services as well as essential general services. • BPM will work closely with the *Bakubung-Ba-Ratheo* tribal authority on the management of informal settlements that entails that no newcomers to the area will be permitted to construct any form of informal housing structure on land held in trust for the Bakubung. • BPM will ensure that contractor accommodation is provided for contractors, of a particular standard, and is managed in an environmentally and socially acceptable manner. All necessary authorisations for the construction of the contractors' camp will be obtained prior to the commencement of construction. • The adherence to the EMP specifications for the construction and operational phases will be made a conditional precedent of the contract. • Actively support the endeavours of the *Bakubung-Ba-Ratheo* Traditional Council and the Moses Kotane and Rustenburg Local Municipalities to prevent squatting and to formalise settlement of newcomers in demarcated stands. • BPM will, in accordance with other mining practice, provide a housing allowance for their employees. However, this allowance will be paid in cash only to those employees who can prove that they own their own local residences. • Those who do not own houses will be given the opportunity to purchase houses through a housing scheme that will be backed by a major financial institution in cooperation with BPM. • Those who neither currently own a local house and who do not wish to purchase locally will be provided with accommodation that will be paid for directly by the mine in order to discourage workers from taking up residence in informal settlements. • Compile a policy on HIV/AIDS. • Ensure that all applicable health legislation is strictly adhered to by both BPM and its contractors. • Actively inform employees and contractor employees about the HIV/AIDS pandemic and how they can help reduce the spread of the disease HIV/AIDS amongst their families, relatives and communities in which they live. • Educate employees and contractor employees about promoting good health practices, and inform them about other communicable diseases, and the prevention of the spread thereof. • Provide access to voluntary testing and counselling. • Provide free condoms at the workplace. • Facilitate appropriate information sessions with regard to HIV/AIDS for employees on all levels. • The facilitation of health training sessions.	• On-going as per mitigation stipulation • Planning and design • Planning and design • Planning and design • Planning and design • On-going • On-going • As required • On-going • On-going • On-going • On-going • On-going • On-going • On-going • On-going • On-going • Planning and design • On-going • On-going • On-going • On-going • On-going • On-going • On-going • On-going	Not Applicable

Site preparation
Civil works
Earthworks
Mining and mining related activities
Waste rock management
Mineral processing
	Tourism	• Implement all mitigation measures as specified in the relevant specialist inputs, without compromising the safety of people. Namely:
		  ○ noise impact assessment;
		  ○ air quality impact assessment;
		  ○ traffic impact assessment; and
		  ○ visual impact assessment in the EIA.
		• A grievance/complaints register should be compiled and implemented in which all community and IAP complaints are recorded and addressed.
		• BPM is to undertake to act in all its activities in a sustainable and environmentally and socially acceptable manner.
		• BPM seeks to engage with established forums to discuss matters of mutual environmental concern.
			• On-going
			• On-going
			• On-going as per mitigation stipulation
			• On-going	

Activity	Potential impact	Mitigation type	Time period for implementation	Compliance with standards
operations Tailings management Power Supply and Use Water supply and use Process and storm water management Transport systems General and hazardous waste management Sewage sludge management Site support services Site/contract management Demolition Rehabilitation Maintenance and aftercare		• Ensure that construction of the mining complex adheres to the provisions made in the EMP and environmental legislation. • Ensure that open communication is set-up between BPM, contractors, Pilanesberg National Park, Sun City and other tourism operators in the area, in order to pro-actively and "in-house" manage matters of mutual environmental concern. • Minimise light pollution as far as is practically possible. • Establish ties between BPM, the EDU, the Ipopeng Farmers' Association, and applicable local environmental NGOs, to consider appropriate sustainable use development programs, driven through ventures creation in Ledig and Phatsima. • Establish a forum between BPM, BDM, MKLM and RLM, the Pilanesberg National Park, Sun City, the Traditional Council and other tourism operators in the area to meet a minimum of annually to discuss matters of mutual environmental concern. • Ensure the correct implementation of the Rehabilitation Plan so the land will be returned to a grazing land use after decommissioning and the wilderness feel to the area will be promoted	• On-going • Construction • On-going • On-going • On-going • On-going	
Site preparation Civil works Earthworks Mining and mining related activities Waste rock management Mineral processing operations Tailings management Power Supply and Use Transport systems Demolition Rehabilitation Maintenance and aftercare	Air Pollution	• Maintain the weather station on site to provide required weather data. • Maintain the mine and plant designs that have been developed to reduce dust emissions on surface. • Ensure the position of the TSF, waste rock dump and mine have been positioned to reduce as far as is possible the impact on the neighbouring communities. • All vehicles and machines should be equipped such that gaseous emissions from engine exhausts are kept to a minimum. • A refrigeration plant (marine chiller) is to be installed to meet current legal practice and be a closed system with zero emissions (non-ozone depleting substance technology). • Ventilation fans are to be placed in a manner to ensure directional ventilation along with prevailing winds and away from communities. • Paste technology, cyclone underflow, waste rock impoundment and spigotting are to be actively investigated from an environmental, technological and economic perspective to determine the viability of these and/or other technologies. • The TSF design is to include erosion control design measures such as energy dissipaters and optimal slope angles and lengths. • A dust monitoring program will be implemented prior to the commencement of construction, and will be on-going as part of the overall environmental monitoring program for the mining area. The dust monitoring program will continue through the decommissioning phase in order to assess dust levels generated by closure activities. • Alternative dust suppression methods, other than water, will be investigated, in order to reduce the consumption of water by the mine, particularly during the windier, winter months when water is scarce. • Roads on the mine and plant area will be surfaced or managed by water sprays or dust suppressants resulting in 75% control efficiency. • Vehicles will be maintained and inspected regularly to reduce emissions. • Disturbed sites will be re-vegetated as soon as possible. Regular inspection of vegetation cover will be undertaken to ensure dust does not emanate from soil surface. • Blasting will be undertaken in accordance with relevant Mine Health and Safety legislation and international blasting standards. • Vehicle speeds and routes on un-surfaced roads will be controlled to reduce dust entrainment by vehicles. • BPM are to operate within the law at all times and will undertake to assist in finding ways in which to reduce existing local emissions • A dust suppression sprinkler system will be implemented over the crest of the TSF wall and extending over the accessible dry portions of the beach. • All uncontrolled fires will be prohibited on site. • Mine vehicle fleets (diesel driven vehicles) will be serviced regularly and tested for compliance with exhaust emission regulations. • Personal Protection Equipment (PPE) will be worn at all times as required by the appropriate workplace health and safety legislation. • Firefighting equipment will be placed around the site to enable rapid control of fires. • Unpaved surfaces and exposed areas to be regularly sprayed with water or periodically treated with chemical dust suppressants. • All conveyor tipping or transfer points will have dust suppression systems on them. • Application of relevant and applicable best practice vegetation establishment and erosion control as determined for the particular TSF design, according to the rehabilitation plan. • Earthen berms may also be placed between the prevailing winds and the TSF. • The installation and maintenance of permanent hydro-sprays are recommended on the traditionally, drier outer annulus of the TSF. • The side walls of the TSF will be progressively re-vegetated as the facility increases in height. • The TSF slope is to be designed to reduce the dusting effects of laminar wind flow over the slopes. • The TSF will be rehabilitated and closed properly to prevent the ingress of water. • Topsoils should be wetted as moist topsoil will reduce the potential for dust generation when tipped onto stockpiles. • Trees will be planted around the TSF to partially break laminar wind flow. • Upstream development of the TSF allowing simultaneous rehabilitation as close behind the active working area as possible. • Vegetation to be planted on exposed side slopes of the TSF as and where applicable. • Water sprays should be used for underground roads, material handling points and drilling points resulting in 75%, 50% and 70% Control Efficiency (CE) respectively. • $PM_{2.5}$ and PM_{10} ambient samplers must have no exceedances of the selected criteria. • SO_2 and NO_2 ambient samplers must have no exceedances of the selected criteria. • Ensure travel distance between clearing area and topsoil piles to be at a minimum. • For crushing and screening, a minimum mitigation measure of enclosure with fabric filters resulting in 83% CE is to be implemented.	• On-going • Planning and design • Planning and design • On-going • On-going • Planning and design • Planning and design • Planning and design • On-going • On-going • On-going • On-going • On-going • On-going • On-going • On-going • On-going • On-going • On-going • On-going • On-going • On-going • On-going • On-going • On-going • On-going • On-going • On-going • On-going • On-going • On-going • On-going • On-going • On-going • On-going • On-going • On-going	National Atmospheric Emission Reporting Regulations in terms of the NEMAQA requires that holders of mining rights register on the National Atmospheric Emissions Inventory System (NAEIS) and to ensure that annual monitoring reports are uploaded onto the NAEIS. South African National Ambient Air Quality Standards as set out by the NEMAQA National Dust Control Regulations

Activity	Potential impact	Mitigation type	Time period for implementation	Compliance with standards
		• Freshly graded areas to be kept to a minimum. • Haul routes should be shortened where possible • Keep active TSF and WRD surfaces to a minimum to decrease wind erosion. • During the life of the project monthly dustfall rates should not exceed 600 mg/m²/day at residential dustfall bucket locations and 1 200 mg/m²/day at non-residential dustfall bucket locations. • During demolition ensure the site is restored to pre-mining conditions. • Demolition of infrastructure to have water sprays where a lot of vehicle activity is required. • Site inspections and progress reporting be undertaken at regular intervals (at least quarterly) during operations, with annual environmental audits being conducted. • Results from site inspections and off-site monitoring efforts should be combined to determine progress against source- and receptor-based performance indicators. Progress should be reported to all interested and affected parties, including authorities and persons affected by pollution. • Corrective action or the implementation of contingency measures must be proposed to the stakeholder forum in the event that progress towards targets is indicated by the quarterly/annual reviews to be unsatisfactory. • Stakeholder forums at specific intervals should be held for information dissemination and consultation. • The final design of the ventilation shafts will include measures to ensure $PM_{2.5}$ levels are within acceptable limits at third party residential receptors. These considerations can include position, height and orientation, or alternative appropriate means.	• On-going • Construction • On-going • On-going as per monitoring programme • Decommissioning • Decommissioning • On-going as per requirement • On-going in line with annual monitoring programme • As required • Regularly as per mitigation requirement • Design phase prior to construction	

TABLE 28.2:DESCRIPTION OF IMPACT MANAGEMENT ACTIONS FOR THE HOUSING (ADDITIONAL MEASURES)

Activity	Potential Impact	Mitigation Types	Time Period for Implementation	Compliance with Standards
Housing	Biodiversity	Modify infrastructure footprints to avoid overlap between watercourses, as well as the 32m and 100m buffers as far as possible.	• Prior to construction	Not applicable
Housing	Traffic	• Public transport facilities must be provided to accommodate the movement of residents and mine workers to and from the proposed township. • Pedestrians must have ease of access and safe mobility on internal roads and along the R556. • Traffic calming measures within the development should be considered to contribute to pedestrian safety.	• On-going • On-going • On-going	Not applicable
Housing	Heritage	**Iron Age sites** *For MHC018, MCH020:* • Shovel pit test to determine depth and integrity of archaeological deposit of site and for sites with ceramics also to collect more diagnostic ceramics to positively establish group identity. • Test pit excavations will be aimed at identifying structures. • Based on the findings further assessment of the site might be required. • Before destruction of the site, a destruction permit must be applied for (for sites that require destruction permits) and received from the South African Heritage Resources Agency. • This work can only be undertaken by a suitably qualified and experienced archaeologist. • This work may only be undertaken after permits have been received from the South African Heritage Resources Agency allowing such mitigation measures to be undertaken. *MHC019:* • An archaeologist must monitor the site during construction to mitigate accidental finds. • This work can only be undertaken by a suitably qualified and experienced archaeologist. **Stone Cairn** *MHC021* • The stone cairn (MCH021) will be fenced off to afford them greater protection. **General** • Additional heritage resources may be unearthed during construction. Should this occur, work in that area should be halted until such time as an appropriately qualified person can make an expert decision on the mitigation measures required. The expert must notify SAHRA and carry out an emergency recovery (Emergency Response Procedure Section 31.2.2).	• Prior to construction • Prior to construction • Prior to construction • Prior to construction • Prior to construction • Prior to construction • During construction • During construction • On-going • As required	Compliance with the National Heritage Resource Act No. 25 of 1999 in the event of any chance finds.

The waste management and soil conservation procedures applicable to the proposed project are included in Table 28.3 and Table 28.4 below.

TABLE 28.3: WASTE MANAGEMENT PROCEDURES FOR GENERAL AND HAZARDOUS WASTE

Items to be considered		**Intentions**
General	**Specific**	
Classification and record keeping	General	The waste management procedure for the mine will cover the storage, handling and transportation of waste to and from the mine. The mine will ensure that the contractor's responsible are made aware of these procedures.
	Waste opportunity analysis	In line with DWS/DEA's strategy to eliminate waste streams in the longer term, Bakubung Platinum Mine will assess each waste type to see whether there are alternative uses for the material. This will be done as a priority before the disposal option.
	Classification	Wastes (except those listed in Annexure 1 of the new Waste Regulations) will be classified in accordance with SANS 10234 within one hundred and eighty (180) days of generation. Waste will be re-classified every five (5) years, or within 30 days of modification to the process or activity that generated the waste, changes in raw materials or other inputs, or any other variation of relevant factors.
	Safety data sheets	The mine will maintain, where required in terms of the Regulations, the safety data sheets for hazardous waste (prepared in accordance with SANS 10234).
	Inventory of wastes produced	The mine will keep an accurate and up to date record of the management of the waste they generate, which records must reflect: The classification of the wastes The quantity of each waste generated, expressed in tons or cubic metres per month The quantities of each waste that has either been re-used, recycled, recovered, treated or disposed of By whom the waste was managed.
	Labelling and inventory of waste produced	Any container or storage impoundment holding waste must be labelled, or where labelling is not possible, records must be kept, reflecting: The date on which waste was first placed in the container The date on which waste was placed in the container for the last time when the container was filled, closed, sealed or covered The dates when, and quantities of, waste added and waste removed from containers or storage impoundments, if relevant The specific category or categories of waste in the container or storage impoundment as identified in terms of the National Waste Information Regulations, 2012 The classification of the waste in terms of Regulation 4 once it has been completed (if required).
	Disposal record	Written evidence of safe disposal of waste will be kept.
	Record keeping	Records will be retained for a period of at least 5 years and will be made available to the Department on request.
Waste management	Collection points	Designated waste collection points will be established on site. Care will be taken to ensure that there will be sufficient collection points with adequate capacity and that these are serviced frequently.
	Laydown/ salvage areas	During decommissioning and closure, lay down areas for re-usable non-hazardous materials will be established.
	General waste	Will be stored in designated skips and removed by an approved contractor for disposal at a licensed facility.
	Scrap metal and building rubble	Care will be taken to ensure that scrap metal and building rubble does not become polluted or mixed with any other waste. The scrap metal will be collected in a designated area for scrap metal. It will be sold to scrap dealers.
	Hazardous wastes	Medical waste will be temporarily stored in sealed containers in a bunded store before removal by an approved waste contractor and disposal in a licenced facility.

Items to be considered		Intentions
General	**Specific**	
	Oil and grease	Oil and grease will be collected in suitable containers at designated collection points. The collection points will be bunded and underlain by impervious materials to ensure that any spills are contained. Notices will be erected at each waste oil point giving instructions on the procedure for waste oil discharge and collection. An approved subcontractor will remove oil from site.
	Diesel tanks	Bunds should be established around the diesel tanks
	Any soil polluted by a spill	If remediation of the soil in situ is not possible, the soils will be classified as a waste in terms of the Waste Regulations and will be disposed of at an appropriate permitted waste facility.
	Mixing of wastes	Waste will not be mixed or treated where this would reduce the potential for re-use, recycling or recovery; or result in treatment that is not controlled and not permanent.
Disposal	Off-site waste disposal facilities	Waste will be disposed of at appropriate permitted waste disposal facilities.
		Unless collected by the municipality, the mine must ensure that their waste is assessed in accordance with the Norms and Standards for Assessment of Waste for Landfill Disposal set in terms of section 7(1) of the Waste Act prior to the disposal of the waste to landfill.
		Unless collected by the municipality, the mine must ensure that the disposal of their waste to landfill is done in accordance with the Norms and Standards for Disposal of Waste to Landfill set in terms of section 7(1) of the Waste Act.
Waste transport	Contractor	A qualified waste management subcontractor will undertake the waste transport. The contractor will provide an inventory of each load collected and of proof of disposal at a licensed facility.
Banned practices	Long-term stockpiling of waste	Stockpiling of waste is a temporary measure. Waste stockpiling sites must have an impervious floor, be bunded and have a drainage system for collection and containment of water on the site.
	Burying of waste	No wastes will be buried on site.
	Burning of waste	Waste may only be burned in legally approved incinerators.

TABLE 28.4: SOIL MANAGEMENT PRINCIPLES

Steps	Factors to consider	Detail
Delineation of areas to be stripped		Stripping will only occur where soils are to be disturbed by activities that are described in the EIA and EMP report, and where a clearly defined end rehabilitation use for the stripped soil has been identified. Plan and construct infrastructure in such a manner that minimises soil disturbance.
Reference to biodiversity action plan		All requirements for moving and preserving fauna and flora according to the biodiversity management plan as per the EMP will be adhered to.
Stripping	Soil horizons are to be stripped and stockpiled separately and replaced in the correct order: C-horizon material to be backfilled first followed by B- and A-horizon material and a map of where the different soil types are placed will be kept. Topsoil should, if possible, be stripped during the dry winter months to protect the structural integrity of the soils. Stripped soil is to be back-filled as soon as possible.	
	Topsoil	Soils will be stripped to the competent rock. Where this is not possible, topsoil will be stripped to at least 300 mm where available and stockpiled for later use as a cover material. The stripped soils from the TSF area will be used for the ongoing rehabilitation of the TSF and for rehabilitation of disturbed areas on closure.
	Subsoil	**Shaft & plant complex and housing:** Subsoil will be stripped to at least 200 mm where available and stockpiled for later use as a cover material.
		TSF: The entire site is covered by either black sandy/silty clay colluvium (Soil Zone A) or reddish brown/red colluvium (Soil Zone B). *Zone A:* The stiff black colluvium will be used for the foundations of the starter walls. The foundations will be ripped to 300 mm below surface compacted to at least 98% of Proctor density to ensure the soil horizon has a low permeability. The stiff clayey soil has a very high potential for expansiveness therefore, moisture fluctuation should be monitored or controlled.

Steps	Factors to consider	Detail
		Residual Norite will be used for construction of the starter wall and other embankments. The soft to very soft rock norite is considered suitable for foundations of heavy structures. *Zone B*: Reddish brown/red colluvium will be excavated to a depth of 500 mm and ripped an additional 300 mm. The base of the excavation will then be compacted to 98% Proctor maximum dry density. The reddish brown/red colluvium may be used as the inner core of the zoned embankment for the TSF. The black and reddish brown/red colluvium soils may be reused for the inner core of the zoned embankment walls. This material has very low permeability k-values.
Delineation of stockpiling areas	Location	Stockpiling areas are located close to the shaft and concentrator complexes which are in close proximity to the source of the soil to limit handling and to promote reuse of soils in the correct areas. Topsoil from the TSF will be located near the TSF. All stockpiled material must be easily accessible without any environmental damage to adjacent undisturbed areas.
	Designation of the areas	Soil stockpiles will be clearly marked to identify the soil type.
Stockpile management	Vegetation establishment and erosion control	Rapid growth of vegetation on the topsoil stockpiles will be promoted (e.g. by means of watering or fertilisation). The purpose of this exercise will be to encourage vegetation growth on soil stockpiles and to combat erosion by water and wind. Monitor vegetation on soil stockpiles to prevent erosion and loss of topsoil. Disturbed or excavated areas should be backfilled with the soil material that was removed from it, shaped to free draining slopes and planted with sustainable grass species. Erosion control measures using sustainable methods and natural vegetation must be in place and must be monitored and maintained to minimise the loss of material from erosion.
	Storm water controls	Stockpiles will be established with storm water diversion berms to prevent run off erosion. Stockpiles are to be monitored for erosion.
	Height	Utilisable topsoil will be stockpiled in berms. Soils to be stored for longer than three years should preferably not be stockpiled in piles greater than 1.5 m in height. Slopes of the berm/stockpiles should be constructed to minimise the chances of erosion of the soils.
	Waste	No waste material will be placed on the soil stockpiles.
	Vehicles	Equipment movement on top of the soil stockpiles will be limited to avoid topsoil compaction and subsequent damage to the soils and seedbank. The handling of soil will also be limited.
Rehabilitation of disturbed land: restoration of land capability	Placement of soil	A minimum layer of 300 mm of topsoil will be replaced. Soil horizons are to be replaced in the correct order: C-horizon material to be backfilled first followed by B- and A-horizon material.
	Fertilisation	A soil specialist will be consulted to sample the stockpiled soils at relevant depths in the topsoil stockpile berms to determine the nutrient status of the soil. As a minimum the following elements will be tested for: cation exchange capacity, pH and phosphate. These elements provide the basis for determining the fertility of soil. Based on the analysis, the soils specialist will advise if fertilisers must be applied.
	Vegetation	Refer to the rehabilitation plan which provides a guideline of the procedures for soil and vegetation to be followed for rehabilitation. Topsoil stockpiles should be vegetated as soon as possible and monitored to prevent loss of the resource by wind and water erosion and to retain its micro-biological functions.
	Erosion control	Erosion control measures will be implemented to ensure that the topsoil is not washed away and that erosion gulleys do not develop prior to vegetation establishment. If soil erosion has occurred, an erosion control plan entailing hard (i.e. gabion construction) and/or soft (i.e. breaking surface water flow velocities) should be designed by a competent person.

Steps	Factors to consider	Detail
Pollution of soils	In situ remediation	If soil (whether stockpiled or in its undisturbed natural state) is polluted, the first management priority is to treat the pollution by means of in situ bio-remediation alternatively by the removal and handling as per waste management plan. If the spill covers an extensive area the soil must be removed and rehabilitated elsewhere, then replaced.
	Off-site disposal	If in situ treatment is not possible or acceptable then the polluted soil must be classified according to the Minimum Requirements for the Handling, Classification and Disposal of Hazardous Waste (DWAF 1998) and disposed at an appropriate, permitted, off-site waste facility.

29 FINANCIAL PROVISION

29.1 DETERMINATION OF THE AMOUNT OF THE FINANCIAL PROVISION

29.1.1 DESCRIPTION OF THE CLOSURE OBJECTIVES AND THE ALIGNMENT WITH THE BASELINE ENVIRONMENT

The closure objective for the proposed project including how with the objective will align with the current baseline environment includes the following:

- Meet all regulatory conditions;
- Maintain Bakubung Mine's Reputation;
- No lost time injuries during closure and post-closure activities;
- Removal of surface infrastructure except for the TSF (remains on site and revegetated) and housing and the training/community centre (to be retained for community use);
- Minimise post-closure health and safety hazards;
- Mitigate micro-and macrotopographic impacts created during the operational phase through landscaping the area to as close as possible its original state. Ensure that free drainage of surface water is initiated;
- Provide viable soils for post closure land uses through use of stockpiled topsoil for rehabilitation and amelioration where required;
- Minimise adverse air quality, especially dust, impacts through re-vegetating remaining exposed surfaces;
- Maintain noise levels within the requirements of the Mine Health and Safety Act (Act No 29 of 1996) during and post closure;
- Reduce visual impacts on the landscape post closure through contouring and use of vegetation to screen areas of low visual worth;
- Ensure rehabilitated land is stable in the long term, both from the point of view of soil erosion and self-sustaining vegetation cover;
- Minimises long term maintenance on rehabilitated areas;
- Annual inspection and monitoring of rehabilitated areas post closure for a period of three to five years;
- Ensure the successful reestablishment of a range of indigenous species;
- Minimise impacts on downstream surface water and groundwater uses by complying with water quality objectives with the regulator;
- Any waste produced during closure will be disposed of to minimise environmental risks and community impacts;
- Workforce is enabled to plan for closure;
- Empower the workforce to develop skills that will equip them to obtain employment in other sectors of the economy after mine closure;

- Contribute to the development of a self-reliant (not dependent on the mine) community surrounding the area of operation;
- Open, accurate, accessible and transparent communication on closure with stakeholders; and
- Mine closure is achieved efficiently and cost effectively.

The above measures are to be carried out to return the area to its pre-mining potential of grazing. Housing and the training/community centre are to be retained for community use and the TSF will remain on site and be re-vegetated.

29.1.2 CONFIRMATION THAT THE CLOSURE OBJECTIVES HAVE BEEN CONSULTED WITH LANDOWNERS AND IAPS

The high level closure objective of returning the land to pre-mining potential has been sourced from the approved EIA and EMP and was outlined in the scoping report which was made available to IAPs, including landowners for review and comment (Section 7.2.5). Further to this, IAPs including landowners will be given a further opportunity to review the closure objectives described in Section 29.1.1, associated with the proposed project as part of the review of the EIA and EMP report (Section 7.2.9).

As the mine gets closer to closure the stakeholder engagement will increase with the relevant affected stakeholders.

To date no comments regarding the closure objectives associated with the proposed project have been received from IAPs including landowners.

29.1.3 REHABILITATION PLAN

The rehabilitation plan as provided in the approved mining EIA and EMP has been incorporated here.

Proposed Rehabilitation Plan as per approved mine EIA (TWP, 2008):
The main objective of a rehabilitation plan for a mine is to restore the land pre-mining land capabilities and to create a self-sustaining land surface, in this instance to grazing and wilderness. Other key aims of the plan are to:

- Ensure the successful re-establishment of a range of indigenous species.
- Manage the natural and rehabilitated vegetation so as to avoid the loss of species diversity and habitats within the stipulated mine infrastructural areas.
- Ensure that rehabilitated land is stable in the long term, both from the point of view of soil erosion and self-sustaining vegetation cover.

Much of the area on which the mine is to be developed has been impacted by anthropogenic disturbances. The level of impact ranges from low, in areas such as the hillslope to the west of the farm Mimosa, to high, in areas such as the central and southern areas of the farm Frischgewaagd.

Most of the impacts as a result of the BPM (approved operations and proposed project changes) that will be brought about during the construction and operational phases will be reduced and eventually cease to occur through the decommissioning and closure phases

The following actions need to be implemented in order to rehabilitate disturbed areas and achieve the above mentioned objectives and aims. Some of the following actions are also relevant to the rehabilitation of the TSF during the operational phase:

- Rehabilitation goals (the state to which the land will be rehabilitated) must be ascertained in consultation with the authorities and local IAPs. This will be done during the operational phase of the mine so that ongoing rehabilitation can be directed towards the agreed upon end land use.
- Consultation with the community will result in a decision as to which structures will remain for use by the community. All infrastructure that will not remain will be demolished and sold as scrap or spares, where feasible. Building foundations will be removed to a depth of 0.4 m below surface.
- Rubble will be disposed of according to instruction of the local authority and/or DMR. The site will be selected in consultation with the relevant authorities.
- Any topsoils or subsoils that have been compacted must be scarified.
- All land exposed by the demolition of infrastructure and other land disturbed by the mining activities will be rehabilitated by replacing the stored and ameliorated topsoil, which was stripped during the construction phase.
- Topsoil will be placed on the slope of the TSF once a step-in has been created and the development of the next slope is in process.
- Disturbed areas will be profiled to be free draining through landscaping, topsoil replacement and the establishment of natural vegetation, as far as possible. Where practical, rehabilitation will take place during the life of the mine.
- All access road surfaces will be ripped and rehabilitated.
- The soils will be profiled and the depths will be sampled.
- Soil will be sampled, composted and fertilised prior to re-vegetation, if necessary.
- The correct order of replacement of the soils and the preparation of an adequate planting medium will facilitate the re-vegetation program and will help to limit the potential for erosion;
- The rehabilitated sites will be seeded. Table 29.1 provides a list of species to be sustained or propagated on site.

TABLE 29.1:SPECIES TO BE SUSTAINED OR PROPAGATED ON SITE

Trees and Shrubs	Grasses
Acacia tortilis	*Cenchrus ciliaris*
Acacia karroo	*Digitaria eriantha*
Rhus leptodictya	*Eragrostis rigidior*
Rhus pyroides	*Cynodon dactylon*
Ehretia rigida	*Enneapogon cenchroides*
Grewia flavescens	

Seeds from local indigenous grasses commonly occurring in the area will also be added to the seed mix. The seed mix proposed for the TSF is indicated in below.

TABLE 29.2: SPECIES TO BE SUSTAINED OR PROPAGATED ON THE TSF

Common Name	Latin Name	Volume
Buffalo grass	*Cenchrus ciliaris*	5 kg/ha
Rhodes grass	*Chloris gayana*	1 kg/ha
Guinea grass	*Panicum maximum*	3 kg/ha
Couch grass	*Cynodon dactylon*	5 kg/ha
Finger grass	*Digitaria eriantha*	1 kg/ha
Weeping love grass	*Eragrostis curvula*	2 kg/ha
Tef	*Eragrostis tef*	1 kg/ha

- Additional hand plants should be incorporated into the seed mix for the TSF. Suggested hand plants include Blue thatching grass (*Hyparrhenia tamba*), River bed Grass (*Pennisetum macrourum*), Common thatching grass (*Hyparrhenia hirta*), Pinhole grass (*Bothriochloa insculpta*), Couch grass (*Cynodon dactylon*) and Vetiver grass (*Vetiver zizanoides*).
- In addition to the grassing and hand plants, trees of various types (listed above in Table 29.2) would also be planted on the TSF.
- The primary purpose of the vegetation is to prevent erosion, improve soil structure and assist in micro-organism re-establishment. Therefore the sward will not be removed during the first season until the grass has begun to take root. Measures will be taken to prevent veldt fires.
- Where possible the planted seeds should be covered with a mulch.
- Appropriate watering and fertilisation regimes will be developed to facilitate rapid re-vegetation of disturbed areas.
- Soil properties and vegetation cover will be monitored annually and remediation measures be implemented, should it be necessary.
- Pollution control dams, cut-off trenches and other surface water management infrastructure will be maintained until closure, and possibly permanently if they can be used as part of the planned end use for the land.

- Just prior to closure, all water management structures will be cleaned, concrete broken and removed, backfilled and re-vegetated as outlined above. Alternatively they will be left open and managed if the end use so requires.
- The proposed rehabilitation plan will be incorporated into the first closure plan and will be elaborated upon for implementation. The updated/elaborated rehabilitation plan is to take into consideration recommendations provided by specialists in the EMP and future surveys to ensure effective implementation. This rehabilitation plan will form part of the closure plan, which will be updated as required.

In order to effectively rehabilitate and manage the project area, the mitigation measures as provided in the EMP in Section 28 which is based on specialist inputs also needs to be adhered to.

29.1.4 COMPATIBILITY OF THE REHABILITATION PLAN WITH THE CLOSURE OBJECTIVES

It can be confirmed that the rehabilitation plan is compatible with the closure objectives given that the closure objectives were taken into account during the determination of the financial provision.

29.1.5 CALCULATE AND STATE THE QUANTUM OF THE FINANCIAL PROVISION

The information in this section was sourced from the closure cost calculation study completed by Worley Parsons and is included in Appendix S. The closure cost assessment was undertaken in accordance to the DMR Guideline Document for the Evaluation of the Quantum of Closure-Related Financial Provision Provided by a Mine based on the 2010 DMR master rates escalated at 6.5% per annum.

The financial closure liability associated with the proposed Bakubung Platinum Mine (as at life of mine), is R1 247 970 412 (including VAT). The annual forecasted financial provision for the first 10 years (2019 – 2028) and life of mine (2044) of the proposed project is provided in Table 29.3 below. Further details regarding the closure cost calculation is included in the closure cost assessment (Worley Parsons, 2016).

TABLE 29.3: FINANCIAL PROVISION (WORLEY PARSONS, 2016)

Year	Financial provision (R, including vat)
1	R 258 378 967
2	R 275 173 600
3	R 293 059 884
4	R 312 108 777
5	R 332 395 847
6	R 354 001 577
7	R 377 011 680
8	R 401 517 439
9	R 427 616 073

Year	Financial provision (R, including vat)
10	R 455 411 117
Life of mine	**R 1 247 970 412**

30 MECHANISMS FOR MONITORING COMPLIANCE AND PERFORMANCE AGAINST THE EMP

Environmental impacts requiring monitoring are listed in Table 30.1 below. Existing monitoring points for air quality, surface water and groundwater are shown in Figure 7-23 and Figure 7-19. Additional groundwater monitoring points are provided in the table below.

TABLE 30.1: MONITORING OF COMPLIANCE AND PERFORMANCE IN TERMS OF EMPR

Activity	Impacts requiring monitoring	Functional requirements for monitoring	Roles and responsibilities	Monitoring and reporting frequency and time period for management actions
Site preparation Civil works Earthworks Waste rock management Mining and mining related activities Tailings management Demolition Rehabilitation Maintenance and aftercare	Hazardous infrastructure	• All mineralised waste facilities and water dams will be monitored to ensure stability, safety and prevention of environmental impacts. The findings will be documented for record-keeping and auditing purposes and addressed where relevant to achieve the stated objectives.	Qualified engineer	• The frequency of the monitoring and the qualification of the monitoring personnel will be determined on an infrastructure specific basis. • Monitoring will be undertaken for the duration of the mine.
Site preparation Earthworks Waste rock management Transport systems Tailings management Housing Process and storm water management Sewage sludge management Demolition Rehabilitation Maintenance and aftercare	Physical disturbance and contamination of soil resources	<u>Soil compaction:</u> • Inspection of compacted areas using a penetrometer or similar instrument. • A soil scientist should recommend whether or not ripping of the soils should be done after a year of monitoring. This decision must be based on the monitoring data • Visual inspections of stockpiles, TSF and disturbed areas to ensure adherence to the soil conservation plan and rehabilitation plan <u>Soil erosion:</u> • Visual inspection of the impacted area. <u>Chemical composition</u> • Chemical composition of stockpiles are to be monitored to ensure they maintain fertility.	Environmental Department	• Soil compaction must be inspected every three months during construction and upon completion of construction. • Quarterly • Soil erosion inspection must be done every month in the rainy season and every three months in the dry season. • Annually
Site preparation	Aquatic	• On-going aquatic ecological monitoring must take	Environmental	• Every 6 months during construction and operation

Activity	Impacts requiring monitoring	Functional requirements for monitoring	Roles and responsibilities	Monitoring and reporting frequency and time period for management actions
Civil works Earthworks Tailings management Waste rock management Transport systems Housing Process and storm water management Sewage sludge management Site/contract management Demolition Rehabilitation Maintenance and aftercare	Ecology	place by an SA RHP Accredited assessor; • Post closure aquatic ecological monitoring is recommended to ensure that no impact on the aquatic resources in the area takes place after decommissioning and closure has taken place;	Department	• Post closure
Site preparation Civil works Earthworks Tailings management Waste rock management Transport systems Housing Process and storm water management Sewage sludge management Site/contract management Demolition Rehabilitation Maintenance and aftercare	Flora	• Monitoring that activities are restricted to infrastructure footprints and that impacts such as setting of fires, cutting of trees and collection of firewood are not occurring. • Implementation of a simple vegetation monitoring programme that focuses on the use of repeatable fixed point photography and should include: o Monitoring remaining Marikana Thornveld and other untransformed vegetation within the study area (including sampling where necessary), emphasis is on the untransformed vegetation situated in close proximity to infrastructure (particularly areas around the TSF and tailings / return water pipelines). o A brief evaluation of the success of any future rehabilitation activities should also be included in monitoring. o Monitoring of the medicinal plant Hypoxis henorocallidea and all subpopulations of plant 'species of conservation concern' recorded within the study area in future. Emphasis must be placed on monitoring any threatened or Near Threatened species that may be recorded in future. Monitoring should	Environmental Department	• Continuous during construction • Baseline monitoring should be conducted prior to the construction phase and monitoring should be conducted annually thereafter.

Activity	Impacts requiring monitoring	Functional requirements for monitoring	Roles and responsibilities	Monitoring and reporting frequency and time period for management actions
		include counts or estimates of the number of plants present and the age structure.		
Site preparation Civil works Earthworks Tailings management Waste rock management Transport systems Housing Process and storm water management Sewage sludge management Site/contract management Demolition Rehabilitation Maintenance and aftercare	Wetland	• Monitor that activities are restricted to infrastructure footprints. Temporary structures, such as stockpiles and lay down areas should be excluded from delineated watercourse footprints. • Ensure that signage to identify watercourses and their buffers are kept in place and remain well visible during the construction process and that no unauthorised access occurs. • Fix point photography of wetlands and other watercourses should be undertaken. • Sediment control and storm water control measures should be monitored and maintained to ensure they remain functioning • Regular monitoring and maintenance by a suitably qualified specialist to ensure that the pipeline remains in a good working order and that weak points are repaired once observed. • Monitoring the proliferation of alien and invasive species to evaluate successes achieved from the alien and invasive species management plan.	Environmental Department	• Continuous during construction • Continuous during construction • Prior to the start of construction and during construction • Continuous, especially during the wet season. • Continuous • Quarterly
Site preparation Civil works Earthworks Tailings management Waste rock management Transport systems Housing Process and storm water management Sewage sludge management Site/contract management Demolition Rehabilitation Maintenance and aftercare	Fauna	• Inspections of all untransformed areas to assess whether habitat is being disturbed or damaged through illegal operations; • Inspections of fence lines to assess breaches / deterioration of the perimeter. • Monitoring and reporting species of conservation concern through a monitoring programme	Environmental Department	• Monthly • Monthly • Quarterly
Site preparation	Surface water	• Continuation of monitoring plans on site. • Regular surface water quality and quantity	Environmental	• On-going

Activity	Impacts requiring monitoring	Functional requirements for monitoring	Roles and responsibilities	Monitoring and reporting frequency and time period for management actions
Civil works Earthworks Transport systems Waste rock management Tailings management Process and storm water management Demolition Rehabilitation Maintenance and aftercare		monitoring programs as per the IWUL. • The surface water monitoring parameters will be sampled according to determinants and frequencies as stated in the IWUL. • The surface water monitoring program will be assessed, optimised and updated.	Department	• Monthly, quarterly and annual reporting. • Monthly and quarterly monitoring. <u>Monthly</u>: pH, electrical conductivity, total dissolved solids, temperature and total suspended solids <u>Quarterly</u>: pH, electrical conductivity, total dissolved solids, temperature, total suspended solid, total alkalinity, bicarbonate as HCO3, Carbonate as CO3,Cl, SO4, F, N, Ag, Al, As, B, Ba, Bi, Ca, Cd, Co, Cr, Cu, Fe, K, Li, Mg, Mn, Mo, Na, Ni, P, Pb, S, Sb, Se, Si, Sn, Sr, Ti, V, W, Zn, Zr, ammonia and E.coli. • Annually
Site preparation Civil works Earthworks Transport systems Waste rock management Tailings management Process and storm water management Demolition Rehabilitation Maintenance and aftercare	Groundwater	• Groundwater Level • Ground water quality	Environmental Department	• Monthly • Monthly and quarterly monitoring. <u>Monthly</u>: pH, electrical conductivity, total dissolved solids (TDS) and temperature <u>Quarterly</u>: pH, EC, TDS, total alkalinity, bicarbonate as HCO3, Carbonate as CO3,Cl, SO4, F, N, Ag, Al, As, B, Ba, Bi, Ca, Cd, Co, Cr, Cu, Fe, K, Li, Mg, Mn, Mo, Na, Ni, P, Pb, S, Sb, Se, Si, Sn, Sr, Ti, V, W, Zn, Zr, ammonia and E.coli. Proposed borehole locations for monitoring (D = deep, 30 – 60 mbgl, S= shallow, 15 mbgl):

<table>
<tr><th>Activity</th><th>Impacts requiring monitoring</th><th>Functional requirements for monitoring</th><th>Roles and responsibilities</th><th>Monitoring and reporting frequency and time period for management actions</th></tr>
<tr><td></td><td></td><td></td><td></td><td>
<table>
<tr><th>BHID</th><th>X-Coordinate</th><th>Y-Coordinate</th><th>Purpose</th></tr>
<tr><td>MBH01D* and S</td><td>3184</td><td>-2810436</td><td>West of TSF</td></tr>
<tr><td>MBH04 D* and S</td><td>3104</td><td>-2809560</td><td>North western corner of TSF</td></tr>
<tr><td>MBH05 D* and S</td><td>4951</td><td>-2809492</td><td>North eastern corner of TSF</td></tr>
<tr><td>MBH07 D and S</td><td>4449</td><td>-2810839</td><td>South of TSF</td></tr>
<tr><td>MBH06</td><td>5106</td><td>-2810980</td><td>Elands River</td></tr>
</table>
*These boreholes already exist and will serve as deep monitoring boreholes.
</td></tr>
<tr><td>Site preparation
Civil works
Earthworks
Mining and mining related activities
Waste rock management
Mineral processing operations
Tailings management
Power Supply and Use
Transport systems
Housing
Demolition
Rehabilitation
Maintenance and aftercare</td><td>SO2, NO2, PM2.5 and PM10</td><td>• Monthly dustfall monitoring as well as ambient SO2, NO2 and PM10 monitoring.
• It is recommended that PM2.5 sampling be conducted to determine if there are significant PM2.5 concentrations. The recommended location for the PM2.5 sampling would be close to the current PM10 sampling site.
• It is recommended that the on-site meteorological monitoring remain where it is located and be kept in good working order. The meteorological station must be calibrated and data validation carried out to ensure the data reported are correct.
• Site inspections and progress reporting to be undertaken at regular intervals during operations
• Environmental audits to be conducted forming part of the overall environmental management systems at the mine.</td><td>Environmental Department</td><td>• Data collection ongoing, collected bi-weekly. Monthly, quarterly and annual reporting
• Data collection ongoing, collected bi-weekly. Monthly, quarterly and annual reporting
• Ongoing, calibration at least once a year with regular span checks
• Quarterly
• Annually</td></tr>
<tr><td>Site preparation
Earthworks
Civil works
Waste rock management</td><td>Noise pollution</td><td>• Ambient noise surveys will be conducted.</td><td>Environmental Department</td><td>• Every six months</td></tr>
</table>

Activity	Impacts requiring monitoring	Functional requirements for monitoring	Roles and responsibilities	Monitoring and reporting frequency and time period for management actions
Transport systems Demolition Rehabilitation Waste rock management Mineral processing operations Mining and mining related activities				
Mining and mining related activities	Blasting impacts (fly rock, air blasts and ground vibrations)	• Vibration and air blast levels will be monitored and recorded during blasting activities in the early construction phase. • Vibration monitoring equipment will be installed in certain structures to provide information regarding ground vibrations specifically related to blasting associated with mining. • Blasting noise will be monitored and recorded during blasting activities to ensure adherence to stipulated guidelines.	Qualified blasting specialist	• Blast monitoring will take place for the duration of blasting activities.
Transport systems	Road disturbance and traffic safety	• Routine vehicle inspections. • Incident and accident reports. • Road maintenance and signage inspections. •	Environmental Department	• On-going • Monthly • Monthly
Site preparation Civil works Earthworks Mining and mining related activities Waste rock management Mineral processing operations Tailings management Housing Demolition Maintenance and aftercare of final land forms and rehabilitated areas	Visual impacts	• Regular housekeeping inspections will be implemented. • Vegetation monitoring. • Complaints and incident register.	Environmental Department	• Monthly • Annual • On-going
Site preparation	Physical disturbance of	• Periodic observations of all excavation or ground breaking activities (particularly at MHC005 and	Environmental	• Monthly during construction

Activity	Impacts requiring monitoring	Functional requirements for monitoring	Roles and responsibilities	Monitoring and reporting frequency and time period for management actions
Earthworks Waste rock management Transport systems Housing Site/contract management Tailings management Demolition Rehabilitation	heritage resources	MHC019) during the construction. • Annual survey to identify the status of existing heritage sites during the operational phase. • Feedback reports to be produced for the mine and SAHRA should more discoveries be made.	Department	• Annual • As required
Construction of project components Operation of the mine Decommissioning of project components Final land forms	Land Use	• Monitoring of land use will take place on the TSF and disturbed areas and monitoring of flora, fauna and soils as given in this table.	Environmental Department	• Annually

30.1 FREQUENCY OF PERFORMANCE ASSESSMENT REPORT

The environmental department manager will conduct internal management audits against the commitments in the EMP. These audits will be conducted on an on-going basis until final closure. The audit findings will be documented for both record keeping purposes and for informing continual improvement. In addition, and in accordance with mining regulation R527 and as set out in NEMA GNR982, an independent professional will conduct an EMP performance assessment every 2 years or in accordance with the timeframes as specified in the Environmental Authorisation (if provided). The site's compliance with the provisions of the EMP and the adequacy of the EMP report relative to the on-site activities will be assessed in the performance assessment and will be submitted to the competent authority at intervals as indicated in the environmental authorisation.

31 ENVIRONMENTAL AWARENESS PLAN

31.1 MANNER IN WHICH APPLICANT INTENDS TO INFORM EMPLOYEES OF THE ENVIRONMENTAL RISKS

This section includes an environmental awareness plan for the proposed mine. The plan describes how employees will be informed of environmental risks which may result from their work, the manner in which the risk must be dealt with in order to avoid pollution or degradation of the environment and the training required for general environmental awareness and the dealing of emergency situations and remediation measures for such emergencies.

All contractors that conduct work on behalf of BPM are bound by the content of the EMPr and a contractual condition to this effect will be included in all such contracts entered into by the mine. If contractors are used, the responsibility for ensuring compliance with the EMPr will remain with BPM.

The purpose of the environmental awareness plan is to ensure that all personnel and management understand the general environmental requirements of the site. In addition, greater environmental awareness must be communicated to personnel involved in specific activities which can have a significant impact on the environment and ensure that they are competent to carry out their tasks on the basis of appropriate education, training and/or experience. The environmental awareness plan should enable BPM to achieve the objectives of the environmental policy.

31.1.1 ENVIRONMENTAL POLICY

BPM will display the environmental policy. To achieve world class environmental performance in a sustainable manner BPM is currently committed to:

- Integrating environmental management into all aspects of our business, including the entire product life cycle;
- Complying with all applicable legislation and other requirement to which BPM subscribes;
- Practising responsible stewardship by adopting world class standards;
- Proactively identifying and managing significant environmental aspects in order to:
    - Minimise emissions to atmosphere
    - Minimise the release of effluent
    - Optimise resource consumption
    - Mitigate our impacts on climate change
    - Minimise waste
    - Rehabilitate disturbed land and protect environmental biodiversity
    - Protect cultural heritage resources.

- Ensuring environmental awareness and appropriate competency among employees and promoting environmental awareness in the community
- Engaging with all IAPs towards the shared goal of improving the environment;
- Setting objectives and, where possible, quantitative targets, to determine continual improvement in environmental performance and the prevention of pollution

31.1.2 STEPS TO ACHIEVE THE ENVIRONMENTAL POLICY OBJECTIVES

BPM's environmental policy will be realised by setting specific and measurable objectives. It is proposed that new objectives are set throughout the life of mine, but initial objectives are as follows:

- Management of environmental responsibilities:
  - BPM will establish and appoint Managers at senior mine management level at each site, who will be provided with all necessary resources to carry out the management of all environmental aspects of the site irrespective of other responsibilities, for example:
    - Compliance with environmental legislation and EMP commitments
    - Implementing and maintaining an environmental management system
    - Developing environmental emergency response procedures and coordinating personnel during incidents
    - Manage routine environmental monitoring and data interpretation
    - Environmental trouble shooting and implementation of remediation strategies
    - Closure planning.
- Communication of environmental issues and information:
  - Meetings, consultations and progress reviews will be carried out, and specifically BPM will:
    - Set the discussion of environmental issues and feedback on environmental projects as an agenda item at all company board meetings
    - Provide progress reports on the achievement of policy objectives and level of compliance with the approved EMP to the DMR
    - Ensure environmental issues are raised at monthly mine management executive committee meetings and all relevant mine wide meetings at all levels
    - Ensure environmental issues are discussed at all general liaison meetings with local communities and other interested and affected parties.
- Environmental awareness training:
  - BPM will provide environmental awareness training to individuals at a level of detail specific to the requirements of their job, but will generally comprise:
    - Basic awareness training for all prior to granting access to site (e.g. short video presentation requiring registration once completed). Employees and contractors who have not attended the training will not be allowed on site.

  - General environmental awareness training will be given to all employees and contractors as part of the Safety, Health and Environment induction programme. All non-BPM personnel who will be on site for more than three days must undergo the SHE induction training.
  - Specific environmental awareness training will be provided to personnel whose work activities can have a significant impact on the environment (e.g. workshops, waste handling and disposal, sanitation, etc.).
- Review and update the environmental topics already identified in the EMP which currently includes the following purpose
  - Geology (additional minerals and impact of geology on infastructure);
  - Topography (hazardous excavations and surface subsidence);
  - Soil management (loss of soil resource);
  - Land capability (loss of land with agricultural and conservation potential);
  - Surrounding land use (traffic management, reduction in land available to livestock grazing);
  - Management of biodiversity (impacts on land and water related habitats and species);
  - Surface water management (alteration of surface drainage and pollution of surface water);
  - Groundwater management (changes in groundwater levels/availability and groundwater contamination);
  - Management of air quality (dust generation);
  - Noise (specifically management of disturbing noise);
  - Visual aspects (reduction of negative visual impacts);
  - Heritage resources (management of archaeological, cultural and historical sites);
  - Socio-economic impacts (management of positive and negative impacts); and
  - Interested and affected parties
- All mine projects will be designed to minimise impact on the environment and to accomplish closure/rehabilitation objectives.
- BPM will maintain records of all environmental training, monitoring, incidents, corrective actions and reports.
- Contractors and employees will be contractually bound to participate in the achievement of environmental policy objectives and compliance with the EMP.

31.1.3 TRAINING OBJECTIVES OF THE ENVIRONMENTAL AWARENESS PLAN

The environmental awareness plan ensures that training needs are identified and that appropriate training is provided. The environmental awareness plan should communicate:

- The importance of conformance with the environmental policy, procedures and other requirements of good environmental management
- The significant environmental impacts and risks of individuals work activities and explain the environmental benefits of improved performance

- Individuals roles and responsibilities in achieving the aims and objectives of the environmental policy
- The potential consequences of not complying with environmental procedures.

31.1.3.1 General Contents of the Environmental Awareness Plan

To achieve the objectives of the environmental awareness plan the general contents of the training plans are as follows:

- Module 1 – Basic training plan applicable to all personnel entering the site:
  - Short (15 min) presentation to indicate the site layout and activities at specific business units together with their environmental aspects and potential impacts.
  - Individuals to sign off with site security on completion in order to gain access to the site.
- Module 2 – General training plan applicable to all personnel at the site for longer than three days:
  - General understanding of the environmental setting of the mine (e.g. local communities and industries and proximity to natural resources such as rivers);
  - Understanding the environmental impact of individuals activities on site (e.g. excessive production of waste, poor housekeeping, energy consumption, water use, noise, etc.);
  - Indicate potential site specific environmental aspects and their impacts;
  - BPM's environmental management strategy;
  - Identifying poor environmental management and stopping work which presents significant risks;
  - Reporting incidents;
  - Examples of poor environmental management and environmental incidents; and
  - Procedures for emergency response and cleaning up minor leaks and spills.
- Module 3 – Specific training plan:
  - Environmental setting of the workplace (e.g. proximity of watercourses, vulnerability of groundwater, proximity of local communities and industries, etc.);
  - Specific environmental aspects such as:
    - Spillage of hydrocarbons at workshops
    - Spillage of explosive liquids
    - Poor waste management such as mixing hazardous and general wastes, inappropriate storage and stockpiling large amounts of waste
    - Poor housekeeping practices
    - Poor working practices (e.g. not carrying out oil changes in designated bunded areas)
    - Excessive noise generation and unnecessary use of hooters
    - Protection of heritage resources.
  - Impact of environmental aspects, for example:
    - Hydrocarbon contamination resulting in loss of resource (soil, water) to downstream users;
    - Groundwater contamination also resulting in loss of resource due to potential adverse aesthetic, taste and health effects; and
    - Dust impacts on local communities (nuisance and health implications).

- BPM's duty of care (specifically with respect to waste management); and
- Purpose and function of BPM's environmental management system.

Individuals required to complete Module 3 (Specific training module) will need to complete Modules 1 and 2 first. On completion of the Module 3, individuals will be subject to a short test (written or verbal) to ensure the level of competence has been achieved. Individuals who fail the test will be allowed to re-sit the test after further training by the training department.

The actual contents of the training modules will be developed based on a training needs analysis.

Key personnel will be required to undergo formal, external environmental management training (e.g. how to operate the environmental management system, waste management and legal compliance).
In addition to the above BPM will:

- Conduct refresher training/presentations on environmental issues for mine employees (permanent and contractors) at regular intervals.
- Promote environmental awareness using relevant environmental topic posters displayed at strategic locations on the mine. These topics will be changed monthly, and will be reviewed annually by the Environmental Manager to ensure relevance.
- Participate and organise events which promote environmental awareness, some of which will be tied to national initiatives e.g. National Arbour Week, World Environment Day and National Water Week.

31.2 MANNER IN WHICH RISKS WILL BE DEALT WITH TO AVOID POLLUTION OR DEGRADATION

31.2.1 ON-GOING MONITORING AND MANAGEMENT MEASURES

The monitoring programme as described in Section 30 will be undertaken to provide early warning systems necessary to avoid environmental emergencies.

31.2.2 PROCEDURES IN CASE OF ENVIRONMENTAL EMERGENCIES

Emergency procedures apply to incidents that are unexpected and that may be sudden, and which lead to serious danger to the public and/or potentially serious pollution of, or detriment to the environment (immediate and delayed). Procedures to be followed in case of environmental emergencies are described in the table below (Table 31.1).

31.2.2.1 General emergency procedure

The general procedure that should be followed in the event of all emergency situations is as follows:

- Applicable incident controller defined in emergency plans must be notified of an incident upon discovery
- Area to be cordoned off to prevent unauthorised access and tampering with evidence
- Undertake actions defined in emergency plant to limit/contain the impact of the emergency
- If residue facilities/dams, storm water diversions, etc., are partially or totally failing and this cannot be prevented, the emergency siren is to be sounded (nearest one available). After hours the Operations Engineer on shift must be notified
- Take photographs and samples as necessary to assist in investigation
- Report the incident immediately to the environmental department for emergencies involving environmental impacts or to the safely department in the case of injury
- The Environment department must comply with Section 30 of the National Environmental Management Act (107 of 1998) such that:
    - The Environment department must immediately notify the Director-General (DWS and DEA, DMR and Inspectorate of Mines as appropriate), the South African Police Services, the relevant fire prevention service, the provincial head of READ, the head of the local municipality, the head of the regional DWS office and any persons whose health may be affected of:
        - The nature of the incident
        - Any risks posed to public health, safety and property
        - The toxicity of the substances or by-products released by the incident
        - Any steps taken to avoid or minimise the effects of the incident on public health and the environment.
- The Environment department must as soon as is practical after the incident:
        - Take all reasonable measures to contain and minimise the effects of the incident including its effects on the environment and any risks posed by the incident to the health, safety and property of persons;
        - Undertake clean up procedures;
        - Remedy the effects of the incident; and
        - Assess the immediate and long term effects of the incident (environment and public health);
    - Within 14 days the Environment department must report to the Director-General DWS and DEA, the provincial head of DMR, the regional manager of the DMR, the head of the local and district municipality, the head of the regional DWS office such information as is available to enable an initial evaluation of the incident, including:
        - The nature of the incident
        - The substances involved and an estimation of the quantity released
        - The possible acute effects of the substances on the persons and the environment (including the data needed to assess these effects)
        - Initial measures taken to minimise the impacts

- Causes of the incident, whether direct or indirect, including equipment, technology, system or management failure
- Measures taken to avoid a recurrence of the incident.

31.2.2.2 Identification of Emergency Situations

The site wide emergency situations that have been identified together with specific emergency response procedures are outlined in Table 31.1.

31.2.3 TECHNICAL, MANAGEMENT AND FINANCIAL OPTIONS

Technical, management and financial options that will be put into place to deal with the remediation of impacts in cases of environmental emergencies are described below.

- The applicant will appoint a competent management team with the appropriate skills to develop and manage a mine of this scale and nature.
- To prevent the occurrence of emergency situations, the mine will implement as a minimum the mine plan and mitigation measures as included in this EIA and EMP report.
- The mine has an environmental management system in place where all operation identify, report, investigate, address and close out environmental incidents.
- As part of its annual budget, the mine will allow a contingency for handling of any risks identified and/or emergency situations.
- Where required, the mine will seek input from appropriately qualified people.

TABLE 31.1: EMERGENCY RESPONSE PROCEDURES

Item	Emergency Situation	Response in Addition to General Procedures
1	Spillage of chemicals, engineering substances and waste	Where there is a risk that contamination will contaminate the land (leading to a loss of resource), surface water and/or groundwater, Bakubung Platinum Mine will: 1. Notify residents/users downstream of the pollution incident. 2. Identify and provide alternative resources should contamination impact adversely on the existing environment. 3. Cut off the source if the spill is originating from a pump, pipeline or valve (e.g. TSF delivery pipeline, refuelling tanker) and the infrastructure 'made safe'. 4. Contain the spill (e.g. construct temporary earth bund around source such as road tanker). 5. Pump excess hazardous liquids on the surface to temporary containers (e.g. drums, mobile tanker, etc.) for appropriate disposal. 6. Remove hazardous substances from damaged infrastructure to an appropriate storage area before it is removed/repaired.
2	Discharge of dirty water to the environment	1. Apply the principals listed for Item 1 above. 2. To stop spillage from the dirty water system the mine will: a. Redirect excess water to other dirty water facilities where possible; b. Pump dirty water to available containment in the clean water system, where there is no capacity in the dirty water system; and c. Carry out an emergency discharge of clean water and redirect the spillage to the emptied facility. 3. Apply for emergency discharge as a last resort.
3	Pollution of surface water	1. Personnel discovering the incident must inform the SHEQ department of the location and contaminant source. 2. Apply the principals listed for Item 1 above. 3. Absorbent booms will be used to absorb surface plumes of hydrocarbon contaminants. 4. Contamination entering the surface water drainage system should be redirected into the dirty water system. 5. The SHEQ department will collect in-stream water samples downstream of the incident to assess the immediate risk posed by contamination.
4	Groundwater contamination	1. Use the groundwater monitoring boreholes as scavenger wells to pump out the polluted groundwater for re-use in the process water circuit (hence containing the contamination and preventing further migration). 2. Investigate the source of contamination and implement control/mitigation measures.
5	Burst water pipes (loss of resource and erosion)	1. Notify authority responsible for the pipeline (if not mine responsibility). 2. Shut off the water flowing through the damaged area and repair the damage (if Bakubung Platinum Mine pipeline). 3. Apply the principals listed for Item 1 above if spill is from the dirty/process water circuit.
6	Flooding from failure of surface water control infrastructure	1. Evacuate the area downstream of the failure (e.g.PCDs, return water dam). 2. Using the emergency response team, rescue/recover and medically treat any injured personnel. 3. Temporarily reinstate/repair storm water diversions during the storm event (e.g. emergency supply of sandbags). 4. Close the roads affected by localised flooding or where a storm water surge has destroyed crossings/bridges.
7	Risk of drowning from falling into water dams	1. Attempt rescue of individuals from land by throwing lifeline/life saving ring. 2. Get assistance of emergency response team whilst attempting rescue or to carry out rescue of animals. 3. Ensure medical assistance is available to recovered individual.
8	Veldt fire	1. Evacuate mine employees from areas at risk.

Item	Emergency Situation	Response in Addition to General Procedures
		2. Notify down wind residents and industries of the danger. 3. Assist those in imminent danger/less able individuals to evacuate until danger has passed. 4. Provide emergency firefighting assistance with available trained mine personnel and equipment.
9	Overtopping or failure of the tailings dam	1. Sound the alarm to evacuate danger area. 2. Pump water from top of dam and follow redirection of water as indicated in Item 2 above. 3. Stop pumping tailings to the TSF. 4. Recover casualties resulting from dam failure using the emergency response team. 5. Make the remaining structure safe. 6. Apply the principles of Item 1 above.
10	Falling into hazardous excavations	1. Personnel discovering the fallen individual or animal must mobilise the emergency response team to the location of the incident and provide a general appraisal of the situation (e.g. human or animal, conscious or unconscious, etc.). 2. The injured party should be recovered by trained professionals such as the mine emergency response team. 3. A doctor (or appropriate medical practitioner)/ambulance should be present at the scene to provide first aid and transport individual to hospital.
11	Road traffic accidents (on site)	1. The individual discovering the accident (be it bystander or able casualty) must raise the alarm giving the location of the incident. Able personnel at the scene should shut down vehicles where it is safe to do so. 2. Access to the area should be restricted and access roads cleared for the emergency response team. 3. Vehicles must be made safe first by trained professionals (e.g. crushed or overturned vehicles). 4. Casualties will be moved to safety by trained professionals and provided with medical assistance. 5. Medical centres in the vicinity with appropriate medical capabilities will be notified if multiple seriously injured casualties are expected.
12	Development of informal settlements	The mine will inform the local authorities (municipality and police) that people are illegally occupying the land and ensure that action is taken within 24hrs.
13	Uncovering of graves and sites	Personnel discovering the grave or site must inform the SHEQ department immediately. Prior to damaging or destroying any of the identified graves, permission for the exhumation and relocation of graves must be obtained from the relevant descendants (if known), the National Department of Health, the Provincial Department of Health, the Premier of the Province and the local Police. The exhumation process must comply with the requirements of the relevant Ordinance on Exhumations, and the Human Tissues Act, 65 of 1983.

32 SPECIFIC INFORMATION REQUIRED BY THE COMPETENT AUTHORITY

The following documents will be submitted to the DMR from the start of construction until mine closure:

- In accordance to Section 34 of GNR. 982 of NEMA, the holder of a mining right needs to submit an environmental audit report, prepared by an independent person, to the DMR at intervals indicated in the environmental authorisation. The purpose of the environmental audit report is to ensure compliance with the conditions of the environmental authorisation and the EMP.
- The financial provision will be updated on an annual basis and submitted to the DMR

33 UNDERTAKING

I, Chiara D'Egidio Kotze, the Environmental Assessment Practitioner responsible for compiling this EMPR hereby confirm:

- The correctness of the information provided in the report;
- The inclusion of comments and inputs from stakeholders and IAPs;
- The inclusion of inputs and recommendations from the specialist reports where relevant; and
- The acceptability of the project in relation to the finding of the assessment and the level of mitigation proposed.

Ckotze

Signature of the EAP

Date: 01/04/2016.

34 REFERENCES

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APPENDIX A: PROOF OF EAP QUALIFICATIONS

APPENDIX B: CURRICULUM VITAE OF EAP

APPENDIX C: LOCAL AND REGIONAL SETTING

APPENDIX D: SITE LAYOUT

APPENDIX E: STAKEHOLDER ENGAGEMENT DOCUMENTS

- NEMA/NEMWA application form and DMR acceptance letter of application
- Section 102 EMP amendment application form
- Database
- Background information document in English and Setswana
- Notices
  - Site notices in English and Setswana and photos of the site notices
  - Advertisements placed in the Sowetan, Rustenburg Herald and the Ledig Sun.
- Notifications to public and authorities
  - Formal invitations sent to IAPs to notify them of the open day
  - Formal invitations sent to Regulatory authorities to notify them of the authorities meeting
- Minutes of the regulatory authorities meeting including the attendance register
- Copies of the posters, attendance registers and photos of the public open day
- Correspondence to land owner
- Summary document of the scoping report submitted to IAPs and regulatory authorities in English, Setswana and Zulu
- Proof of distribution of the draft scoping report and summaries to IAPs and regulatory authorities for review and comment
- Comments received during the review of the draft scoping report by IAPs and regulatory authorities
- Proof of distribution of the final scoping report and summaries to IAPs and regulatory authorities for review and comment
- Comments received during the review of the final scoping report by IAPs and regulatory authorities
- Acknowledgment from DWS of notice of intent to apply for WULA

APPENDIX F: IMPACT RATING FOR EACH POTENTIAL IMPACT

Potential environmental and socio-economic impacts were identified by SLR and other stakeholders. The impacts are discussed under issue headings in this section. All identified impacts are considered in a cumulative manner such that the current baseline conditions on site and in the surrounding area are discussed and assessed together. In addition, the assessment considers the approved operations including the housing and provides an updated assessment of the approved operations together with the proposed project changes. The criteria used to rate each impact is outlined in Section 7.6. The potential impacts are rated with the assumption that no mitigation measures are applied and then again with mitigation. An indication of the phases in which the impact will occur including the activity associated with each impact is provided below. A summary of the impact assessment is summarised in Section 9 of the main report.

It should be noted that in the approved mine EIA and EMP, impacts during the decommissioning and closure phases were assessed in relation to the construction and operational phases of the mine and therefore were often assessed as positive impacts. In this assessment, impacts have been considered collectively across the life of mine and are assessed in relation to the pre-mining baseline conditions.

In the impact assessment below, the approved EIA and EMP has been referred to as the mine EIA and the approved BAR and EMP has been referred to as the housing BAR.

Environmental impacts that will be assessed/discussed in this section include the following:

- Addition of a mineral resource
- Hazardous excavations, infrastructure and surface subsidence
- Loss of soil resources and land capability through contamination
- Loss of soil resources and land capability through physical disturbance
- Physical destruction of biodiversity
- General disturbance of biodiversity
- Contamination of surface water resources
- Alteration of natural drainage patterns
- Changes in groundwater levels
- Contamination of groundwater resources
- Air pollution
- Noise pollution
- Blasting
- Disturbance to roads and traffic
- Visual impacts
- Loss of heritage, cultural and palaeontological resources
- Economic impact
- Inward migration
- Tourism
- Land use impact

GEOLOGY

ISSUE: INCLUSION OF ADDITIONAL MINERAL RESOURCE

Information in this section was sourced from the project team.

Introduction

The information for this section was sourced from approved mine EIA and housing BAR.

Introduction

The placement of infrastructure and activities on or in close proximity to mineral resources preventing access to potential mining areas as well as disposal of mineral resources onto mineralised waste facilities can result in the sterilisation or loss of these resources. This would have negative economic impacts as the economic potential of the minerals are not realised.

Bakubung Minerals (Pty) Ltd hold the mineral rights for the areas where the plant and housing are located and a section of Mimosa where the TSF is located. However, a portion of the TSF area and the tailings and return water pipelines fall on areas that are not included in this mineral right. The mineral rights of these areas belong to Maseve, a neighbouring mine, owned by Platinum Group Metals (RSA) (Pty) Ltd and Wesizwe. BPM has however indicated that there will not be sterilisation of minerals as a result of this project.

Bakubung Platinum Mine does not plan to reprocess the TSF material. This has not changed from the previous EIA and thus has not been included in the assessment for this project.

As part of this project, Bakubung Minerals (Pty) Ltd are applying for the inclusion of aggregate in their existing mineral right. The inclusion of additional minerals has positive economic value as economic benefit of a mineral is maximised.

The approved mine EIA assessed the changes to geology as a result of the development of the mine. The approved housing BAR considered two aspects jointly; the impact that the geology will have on the development of the infrastructure and the impact that the housing will have on the underlying rock formations.

With regard to geology, the concern of the impact to geology relates to how a resource will be affected by the activities of a project. The assessment below considers how the project could impact the geology in terms of its use as a resource, in this case as a result of the inclusion of additional minerals in the mining right. The economic impacts are discussed in Socio-Economic impact section.

The impacts on the natural geology as a result of mining and related activities as assessed in the approved EIA, BAR and EMPs have not been re-assessed in this report as there are no changes to the underground mining. However, the approved mitigation measures linked to these have been included in the EMP report, Section 28 for completeness.

Project phase and link to activities/infrastructure

Construction	Operational	Decommissioning	Closure
Waste Rock Management	Waste Rock Management	Waste Rock Management	Waste Rock Management

Rating of impact

Severity / nature

Waste rock is currently being produced from the shaft sinking occurring on site. Waste rock will continue to be produced during construction and mining and will either be used to develop the bank areas (this includes roads, terraces and housing foundations) or will be stockpiled on the approved waste rock dump.

BPM is proposing to crush waste rock from the waste rock dump, and sell it as aggregate. The mining and sale of this additional mineral has a positive economic benefit and thus a positive geological impact. However, the benefit will depend on the quantity of waste rock sold; if waste rock is not sold and kept on site this benefit will not be realised. Any waste rock remaining on site at the end of the life of mine not sold will be backfilled down the shaft and there will not be a residual waste rock dump on surface.

Prior to mitigation (retaining waste rock on site and having minimal sale of waste rock) the severity is low negative, with mitigation (selling all remaining waste rock) the severity is high positive.

Duration

The duration for the mitigated and unmitigated scenario will last the life of the project.

Spatial scale / extent

In the unmitigated and mitigated scenario the spatial scale is widespread as the economic effect can be felt on a regional or even national scale.

Consequence

Without mitigation, the consequence is medium, with mitigation it is high positive.

Probability

The probability of the impact occurring in both the unmitigated and mitigated scenarios is possible.

Significance

Without mitigation, the significance of not selling all the available aggregate waste rock on site will have a medium negative impact as the aggregates economic potential will not be realised. With the sale of all the available aggregate waste rock (the mitigated scenario) there will be a high positive significance as the economic potential of the aggregate mineral will be realised.

Tabulated summary of the assessed impact

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
All phases						
Unmitigated	L	M	H	M	M	M
Mitigated	H+	M	H	H+	M	H+

TOPOGRAPHY

ISSUE: HAZARDOUS EXCAVATIONS AND INFRASTRUCTURE

The information for this section was sourced from approved EIA, BAR and EMPs.

Introduction

The approved mine EIA assessed the impact to the change in topography due to construction activities and mining operations. The approved housing BAR assessed the impact that changed topography can have on stormwater dispersal (discussed further in the surface water impact section below). This assessment considers how topography is altered by construction and mining activities and links this alteration to safety risks associated with the development of hazardous excavations and infrastructure.

Hazardous excavations and infrastructure include all excavations, structures or land forms into or off which third parties (non-mine personnel) and animals can fall and be harmed. Included in this category are facilities that can fail such as the TSF. Hazardous excavations and infrastructure occur in all project phases from construction through operation to decommissioning and closure. In the construction and decommissioning phases these hazardous excavations and infrastructure are temporary in nature, usually existing for a few weeks to a few months. The operational phase will present more long term hazardous excavations and infrastructure and the closure phase will present final land forms that are considered hazardous (TSF).

Project phase and link to activities/infrastructure

Construction	Operational	Decommissioning	Closure
Site preparation Civil works Earthworks Waste rock management	Mining and mining related activities Waste rock management Mineral processing operations Tailings management	Demolition Rehabilitation	Maintenance and aftercare

Rating of impact

Severity / nature

In the approved mine EIA the severity of the impact that construction and operations would have on the topography was rated as moderate to severe for the construction and operational phases. Most of the approved infrastructure has not yet been constructed (concentrator plant, TSF) and some of the already present infrastructure has not yet reached its maximum height and footprint (the waste rock dump).

For this project, while the TSF is not increasing in height it is increasing in footprint. There will also be additional topsoil stockpiles and establishment of additional infrastructure which will present a potential

risk of injury and/or death to both people and animals. This results in a high severity in the unmitigated scenario and decreases to medium with mitigation.

When considering this impact cumulatively with the approved operations, the severity rating for the overall mine is high in the unmitigated scenario and decreases to medium with mitigation.

Duration

In the context of this assessment, death or permanent injury is considered a long term, permanent impact.

Spatial scale / extent

For the most part, the direct impacts will be located within the site boundary, but the indirect impacts will extend to the communities to which the people / animals belong.

Consequence

The consequence relating to death and/or injury is high in both the unmitigated and mitigated scenario.

Probability

Changes to mining operations and infrastructure are taking place within the existing mine boundaries. Mitigation measures and emergency procedures with a focus on infrastructure safety and limiting access to third parties and animals and implementing effective stormwater management can decrease the probability of incidences. In the absence of these measures, the probability is high. With mitigation, the probability reduces to low for the plant area and somewhere between medium and low for the TSF area.

Significance

In the approved mine EIA the significance to changed topography was rated as high without mitigation. During decommissioning the surface infrastructure related to the mine will be removed and the areas will be levelled as best as possible. The TSF will remain after closure but with final shaping, capping, rehabilitation and re-vegetation of the TSF the impact would reduce. With mitigation the significance was predicted to decrease to moderate (plant areas) to moderate to high (TSF area).

When considering the project's impact cumulatively with the approved operation, the significance rating for the overall mine is high in the unmitigated scenario and medium (plant area) and medium to high (TSF area) in the mitigated scenario.

Tabulated summary of the assessed impact

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
All phases						

Unmitigated	H	H	M	H	H	H
Mitigated	M	H	M	H	L (plant area) M-L (TSF area)	M (plant area) M-H (TSF area)

SOIL AND LAND CAPABILITY

ISSUE: LOSS OF SOIL RESOURCES AND LAND CAPABILITY THROUGH PHYSICAL DISTURBANCE

The information is based on the soils specialist studies (De Castro and Brits, 2016 and Rehab Green, 2007).

Introduction

Soil is a valuable resource that supports a variety of ecological systems and is key to re-establishing post closure land capabilities. The project has the potential to damage soil resources and associated land capability through physical disturbance and/or contamination. These physical and contamination aspects have been considered separately. The approved mine EIA assessed soil impacts, and land capability impacts separately, and the housing BAR only assessed soil impacts whereas this assessment considers these two aspects together as an impact to the soil resource is linked to the impact on the land capability.

In the construction and decommissioning phases these activities are temporary in nature, usually existing from a few weeks to a few months. The operational phase will present more long-term activities and the closure phase will present final landforms that may be susceptible to erosion.

Project phase and link to activities/infrastructure

Construction	Operational	Decommissioning	Closure
Site preparation Earthworks Waste rock management Transport systems	Tailings management Waste rock management Transport systems Housing	Tailings management Waste rock management Transport systems Housing Demolition Rehabilitation	Maintenance and aftercare

Rating of impacts

Severity / nature

The approved mine EIA found the physical impact to the soil resource and land capability to be between moderate and severe depending on the mine phase. The severity post-mitigation was not indicated. The housing BAR didn't specify severity.

Approved infrastructure will cover approximately 407 ha. This project will have an additional footprint of approximately 90.4 ha. Of this 79 ha is within areas already approved for mining and 11.4 ha is of new land impacted by the tailings and return water pipeline. The approved development would disturb a wide range of soil types with varying land capabilities; the infrastructure of this project will disturb similar soil

types and land capabilities. Some of these soils are considered to be sensitive. Where possible the more sensitive soils have been avoided. In the unmitigated scenario, the physical disturbance can result in the loss of soil functionality. In terms of compaction it negatively impacts on plant root growth and development, and in terms of erosion it results in loss of soils in the area of disturbance which impacts negatively on land capability and the biodiversity of the natural area. At the TSF, the clay present on site will be stripped and re-compacted for the liner of the TSF. The in-situ clay soil will be used to act (in conjunction with other liner materials) as a natural liner for pollution control. Soils may also be reused for the inner core of the zoned embankment walls. For all other areas, topsoil will be stripped for use in rehabilitation and closure. This amounts to a high severity for both the mitigated and unmitigated scenario for the project.

When considering the project's impact cumulatively with the approved operations, the severity rating for the overall mine is high for both the unmitigated and mitigated scenarios.

Duration

In the unmitigated scenario the loss of soil and the related land capability is long term and will continue after the life of the project. In the mitigated scenario, measures provide for soils that are to be stripped to be appropriately stockpiled, conserved and replaced in areas that require rehabilitation; this reduces the duration of the impact to the life of the project. Some soils will however be lost forever due to the need to retain an in-situ layer of clay below the TSF.

Spatial scale / extent

The extent of the physical impact can vary, with compaction being localised and erosion possibly extending beyond the site boundary, particularly near drainage complexes. In the unmitigated scenario for all project phases, this is a medium spatial scale. With mitigation measures the impact will be limited to the within the site boundary.

Consequence

In the unmitigated scenario the consequence is high. In the mitigated scenario the consequence is medium-high as some soils will be lost as part of the TSF liner.

Probability

Without mitigation measures the probability of losing soil resources and the associated land capability is definite. With the implementation of mitigation measures this can be reduced to medium. Although emphasis is placed on soil conservation and re-establishment as far as possible, soils below mineralised waste facilities will be lost permanently.

Significance

In the approved mine EIA the significance was indicated to range between moderate to high depending on the mine phase and specific activity of the project. The housing BAR found impact significance to be low to medium with mitigation implemented.

When considering the project's impact cumulatively with the approved project, the significance for the unmitigated scenario is high. The mitigated scenario is medium-high due to the need to retain an in-situ layer of clay below the TSF which covers approximately 41% of the total project area. Retaining the layer of clay soil below the TSF is unavoidable. The significance can be decreased if alternative sources of soil material are considered during the decommissioning phase to replace the soil that has been lost.

Tabulated summary of the assessed impact

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
All phases						
Unmitigated	H	H	M	H	H	H
Mitigated	H	M-H	L	M-H	M	M-H

ISSUE: LOSS OF SOIL RESOURCES AND LAND CAPABILITIES THROUGH POLLUTION

The information is based on the soils specialist studies (De Castro and Brits, 2016d and Rehab Green, 2007).

Introduction

Soil is a valuable resource that supports a variety of ecological functions. There are a number of activities/infrastructure in all phases that have the potential to damage soil resources through contamination from runoff, spillages and seepage. Contamination of soils also has the potential to impact both surface and groundwater resources (see the surface water and groundwater impact sections below for water related impacts). The loss of soil resources has a direct impact on the potential loss of the natural capability of the land. This section focuses directly on the potential for contamination of the soil resources and the effect this has on land capability.

In the construction and decommissioning phases these activities are temporary in nature, usually existing from a few weeks to a few months. The operational phase will present more long-term activities and the closure phase will present final landforms that may be susceptible to erosion.

Project phase and link to activities/infrastructure

Construction	Operational	Decommissioning	Closure
Site preparation Earthworks Waste rock management Transport systems	Tailings management Waste rock management Transport systems Housing Process and storm water management Sewage sludge management	Tailings management Waste rock management Transport systems Housing Process and storm water management Sewage sludge management Demolition Rehabilitation	Maintenance and aftercare

Rating of impact

Severity / nature

The approved mine EIA found the pollution impact to the soil resource and land capability to be between moderate and severe depending on the phase of the mine. The severity post-mitigation was not indicated. Pollution impacts to soil were not assessed in the housing BAR.

The approved mine EIA identified a number of pollution sources. The project components present similar sources of contamination in similar locations as for the approved operations. These include the addition of a tailings pipeline, a return water pipeline, a larger TSF, which can have an impact on the soil resource through contamination from seepage from the TSF and/or spillage from the pipelines, spillage from sewage pipelines linking to the sewage treatment plant, dripping vehicles, chemical spills e.g. lubricants,

oils or improper environmental practices e.g. disposal of waste materials onto soil resources, at the housing developments.

Potential seepage and/or dirty runoff from the TSF, dripping vehicles, spilled sewage or improper disposal could alter the soil composition, negatively impacting on the chemistry of the soils such that current growth conditions are impaired. The soils in the study area do have the capacity to buffer chemical change. The soils are high in 2:1 swelling-shrinking clays which have the capacity to sorb high levels of cationic heavy metals, especially under near neutral to slightly alkaline pH values and oxidising conditions. However, the capacity of the soils to sequester heavy metals can reach a saturation point and thus this cannot be seen as a mitigation measure should there be spillages.

In the unmitigated scenario, the chemical disturbance can result in the loss of soil functionality and thus also land capability. This amounts to a high severity for the unmitigated scenario for the project should there be dam failure, liner failure, spillage from pipelines or improper disposal to soil resources. With mitigation the severity can be reduced to medium to low depending on the reaction time of clean-up teams and the maintenance of pollution control facilities. The specialist assessment conducted for the pipeline provided a high severity for both unmitigated and mitigated scenarios and indicated that while mitigation measures implemented when spillages occurs will limit the extent of the impact, they do not impact the severity.

For this project's components the severity is considered to be medium to low, except the pipeline which is high.

When considering the project's impact cumulatively with the approved operations, the severity rating for the overall mine is high for the unmitigated and mitigated scenario.

Duration

In the unmitigated scenario most of the pollution impacts and the associated loss of land capability will remain after mine closure. In the mitigated scenario, these potential impacts should either be avoided or remedied immediately; this can reduce the impact to the life or less than the project life. This can be achieved through effective management of the facilities, regular inspections for early detection and effective reaction time of the clean-up team.

Spatial scale / extent

In the unmitigated scenario, the extent of the pollution impact can extend far beyond the site boundary by contaminated runoff or seepage from the project sites. In the mitigated scenario for all the project phases, the impacts will be restricted to be within the site boundary.

Consequence

In the unmitigated scenario the consequence is high. In the mitigated scenario the consequence is medium.

Probability

Without mitigation measures the probability of losing soil resources and the associated land capability is definite. With the implementation of mitigation measures this can be reduced to low because emphasis is placed on preventing pollution events and on quick and effective remediation if pollution events do occur. The soil assessment for the pipeline indicates that the probability stays high for the pipeline, though it was also indicated by the specialist that the impact can be avoided and is preventable through maintenance of the pipeline. When considering these aspects jointly, the probability is more likely to be medium to high than high for the pipeline. The probability for the mitigated scenario is therefore rated as low except for the pipeline which is medium to high.

Significance

In the approved mine EIA the significance was indicated to range between moderate to high depending on the phase and activity of the project. When considering the project's impact cumulatively with the approved project, the significance for the unmitigated scenario is high and the mitigated scenario is low and medium to high for the pipeline.

Tabulated summary of the assessed impact

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
All phases						
Unmitigated	H	H	H	H	H	H
Mitigated	H	M	L	M	L M-H (pipeline)	L M-H (pipeline)

BIODIVERSITY

ISSUE: PHYSICAL DESTRUCTION OF BIODIVERSITY

Information from this section is sourced from the approved mine EIA and housing BAR and the following studies:

- Aquatic ecological assessment: Scientific Aquatic Services (2015)
- Vegetation assessment: De Castro and Brits (2016a)
- Watercourse assessment: De Castro and Brits (2016b)
- Faunal assessment: De Castro and Brits (2016c)

Introduction

There are activities/infrastructure in all phases that have the potential to destroy biodiversity in the broadest sense. In this regard, the discussion relates to the physical destruction of specific biodiversity areas, of linkages between biodiversity areas and related species which are considered to be significant because of their status, and/or the role that they play in the ecosystem. The approved mine EIA and the housing BAR assessed all impacts on fauna jointly and all impacts on flora jointly but in separate sections. This assessment assesses destruction and general disturbance of biodiversity separately but assesses fauna, flora, wetlands and aquatic ecosystems together as they each play an integral part in the overall biodiversity of an area. This section focuses on the destruction to biodiversity.

Project phase and link to activities/infrastructure

Construction	Operational	Decommissioning	Closure
Site preparation Civil works Earthworks Waste rock management Transport systems Housing Site/contract management	Tailings management Waste rock management Transport systems Housing Process and storm water management Sewage sludge management Site/contract management	Tailings management Waste rock management Transport systems Housing Process and storm water management Sewage sludge management Site/contract management Demolition Rehabilitation	Maintenance and aftercare

Rating of impact

Severity / nature

High biodiversity areas are functioning biodiversity areas with species diversity and associated intrinsic value. In addition, some of these high biodiversity areas host several red data and protected species. The linking areas have value because of the role they play in allowing the migration or movement of flora and fauna between the areas of high biodiversity, which is a key function for the broader ecosystem. The transformation of land for any purpose, including mining and associated activities, increases the

destruction of site-specific biodiversity, reduces its intrinsic functionality and reduces the linkage role that undeveloped land fulfils between different areas of biodiversity importance.

In the approved mine EIA, the severity for fauna and flora impacts were rated as moderate for the construction and operational phases.

The following is relevant with regard to biodiversity within the project area and specifically within the footprint areas of the project components:

- In terms of national guidelines, the project area is located within a high biodiversity area in terms of the Mining and Biodiversity guidelines.
- The project area falls entirely within a terrestrial Critical Biodiversity Area, CBA2, which has a management objective to maintain it in a natural or near natural state that maximises the retention of biodiversity pattern and ecological process. Important in this area are the natural corridor linkages and natural protected area buffer of the Pilanesberg National Park. It is important to note that these national guidelines and assessments were published after the mine was approved in 2008.
- Approximately 57% of the proposed project footprints (including approved but not yet built infrastructure) fall within transformed habitats or secondary vegetation.
- Approximately 41% of the proposed project footprints fall within the Vulnerable Marikana Thornveld.
- There are two protected tree species in terms of the NFA that have been identified on site; these include *Boscia albitrunca* and *Sclerocarya birrea subsp. Africana*.
- Several wetlands and watercourses were identified. These could be impacted to varying degrees by project components. The present ecological state of these features ranges from Category B (largely unmodified) in the case of ephemeral channels 3, 9, and 10, and ephemeral drainage lines 7, 8, 13, to Category D (largely modified) in the case of the unchannelled valley bottom wetland which has been impacted by mining infrastructure.
- The ecological importance and sensitivity of the watercourses is moderate to very high, with the ephemeral channel 2 (PES C) being very high.
- The Sandspruit and Elands River tributary show conditions that are deteriorated from what could be expected. However, these systems are deemed important in terms of the provision of services to the terrestrial fauna of the area as well as from a socio-cultural point of view.
- While only two red data species (1 floral and 1 mammal) were identified on site, there is the likelihood of other red data species/ species of conservation concern being present. This includes 1 arthropod (low likelihood), 5 floral species (3 having a moderate likelihood and 2 having a low likelihood), 21 mammals (18 having a moderate likelihood and 2 having a low likelihood), 23 birds (6 having a moderate likelihood and 17 having a low likelihood) and 1 amphibian (low likelihood).

Taking the above points into account, the severity of potential impacts of the project is rated as high in the unmitigated scenario. In the mitigated scenario, the severity reduces to medium for all impacts except for the permanent loss of Vulnerable Marikana Thornveld which remains high.

When considering this impact cumulatively with the approved operations, the severity rating for the overall mine is high in the unmitigated scenario and medium to medium-high in the mitigated scenario, due to the permanent loss of Vulnerable Marikana Thornveld.

Duration

In the unmitigated scenario, the impacts will extend beyond the life of the project as there could be permanent loss and/ or disturbance to habitats, decrease in diversity and species of conservation concern. In the mitigated scenario, this reduces to medium for all terrestrial impacts except for the loss of the Marikana Thornveld which remains high. For aquatic habitats, the permanent loss of a small section of wetland habitat will extend beyond the life of the project.

Spatial scale / extent

In the unmitigated scenario the impact can extend beyond the project boundary, whereas with mitigation this can be limited to the project boundary.

Consequence

For the unmitigated scenario, the consequence is high. For the mitigated scenario the consequence decreases to medium, except for the loss of Marikana Thornveld, which would be moderate-high.

Probability

The probability of impacts occurring in the unmitigated scenario is high. With mitigation the probability decreases to medium for all terrestrial impacts, except for the loss of Marikana Thornveld which remains high. For aquatic habitats, the permanent loss of a small section of wetland habitat is definite. However, during decommissioning the re-instatement of the drainage channels will decrease it to the life of the project.

Significance

In the approved mine EIA the significance of impacts on fauna and flora was rated as moderate and decreased to low with mitigation. For the approved housing BAR the significance of fauna and flora-related impacts was rated low post-mitigation.

When considering the project's cumulative impact with the approved operations, the significance rating is high without mitigation. The higher significance is attributed to the permanent loss of additional Marikana Thornveld which is now categorised as Vulnerable, as well as the location of the project area within a

CBA2 area (these two aspects were not applicable at the time of the previous EIA approval). With mitigation this can be decreased to moderate for all impacts except for the impact to the Marikana Thornveld vegetation type which is medium-high. The floral specialist has indicated that in his professional opinion the significance rating is medium-high as the proposed mitigation measures will lead to a significant and meaningful reduction in the destruction of Marikana Thornveld.

Tabulated summary of the assessed impact

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
All phases						
Unmitigated	H	H	M	H	H	H
Mitigated	M - H (vegetation type) M	H (vegetation type) M	L	M-H (vegetation type) M	H (habitat / vegetation type) M	M- H (habitat / vegetation type) M

ISSUE: GENERAL DISTURBANCE OF BIODIVERSITY

Information from this section is sourced from the approved mine EIA and housing BAR and the following studies:

- Aquatic ecological assessment: Scientific Aquatic Services (2015)
- Vegetation assessment: De Castro and Brits (2016a)
- Watercourse assessment: De Castro and Brits (2016b)
- Faunal assessment: De Castro and Brits (2016c)

Introduction

There are a number of activities/infrastructure that have the potential to disturb vegetation and fauna in all project phases, particularly in the unmitigated scenario. In the construction and decommissioning phases these activities are temporary in nature, usually existing for a few weeks to a few months. The operational phase will present more long term occurrences and the closure phase will present final land forms (rehabilitated areas). The approved mine EIA and housing BAR assessed all impacts on fauna jointly and all impacts on flora jointly but in separate sections. This assessment assesses destruction and general disturbance of biodiversity separately but assesses fauna, flora, wetlands and aquatic ecosystems together as they each play an integral part of overall biodiversity of an area. This section focuses on the general disturbance to biodiversity.

Project phase and link to activities/infrastructure

Construction	Operational	Decommissioning	Closure
Site preparation Civil works Earthworks	Tailings management Waste rock management Transport systems	Tailings management Waste rock management Transport systems	Maintenance and aftercare

Construction	Operational	Decommissioning	Closure
Waste rock management Transport systems Housing Site/contract management	Housing Process and storm water management Sewage sludge management Site/contract management	Housing Process and storm water management Sewage sludge management Site/contract management Demolition Rehabilitation	

Rating of impact

Severity / nature

In the approved mine EIA, the severity for fauna and flora impacts were rated as moderate for the construction and operational phases. In the approved housing BAR severity was not indicated.

In the unmitigated scenario, biodiversity will be disturbed by the project components in the following ways:

- Where additional lighting is required, lighting can attract large numbers of invertebrates which become easy prey for predators. This can upset the invertebrate population balances.
- Contamination of water and soil and general litter as well as dust may directly impact on the survival of individual plants, vertebrates and invertebrates and downstream ecosystems.
- Noise and equipment vibration from project activities may scare off vertebrates and invertebrates. In some instances the animals may be deterred from passing close to noisy activities which can effectively block some of their migration paths. In other instances, vertebrates and invertebrates that rely on vibration and noise senses to locate for, and hunt, prey may be forced to leave the vicinity of noisy, vibrating activities.
- The tailings and return water pipelines can block migration pathways for animals.
- Harvesting and killing of plant and animal species in adjacent areas for medicinal use, food, fire wood, for sport, and persecution of predators can decrease species populations and diversity. Increased wood harvesting could cause a loss of cover for faunal species and tree nesting habitat for birds.
- Following area clearance during construction, alien invasive species can proliferate altering the biodiversity of the terrestrial and aquatic systems.
- Sedimentation in watercourses as a result of runoff from poorly vegetated areas and/or stockpiles areas can impact the ecological integrity of watercourses.

The disturbance of biodiversity has been rated as having a high severity during all project phases. This can however be reduced to low with the implementation of management and mitigation measures.

When considering this impact cumulatively with the approved operations, the severity rating for the overall mine is high in the unmitigated scenario and medium in the mitigated scenario.

Duration

In the unmitigated scenario, the impacts will continue for the life of the project. In the mitigated scenario, this reduces to medium.

Spatial scale / extent

The disturbance of biodiversity could affect the ecosystem beyond the site boundary because of the linkages between biodiversity components and areas. This is particularly true for animals which may migrate on a periodic basis in search of food, water or breeding areas and aquatic ecosystems. This spatial scale cannot be significantly reduced with mitigation.

Consequence

In the unmitigated scenario, the consequence of this potential impact is high. In the mitigated scenario, this reduces to medium because the severity and duration of the impact is reduced.

Probability

Without any mitigation the probability of negatively impacting on biodiversity through multiple disturbance events as a result of the project components is high. With mitigation, the probability will be reduced to medium because most of the disturbances can be controlled through implementation and enforcement of practices, policies and procedures.

Significance

In the approved mine EIA the significance of impacts to fauna and flora was rated as moderate and decreased to low with mitigation. For the approved housing BAR the significance for fauna and flora was rated low post-mitigation.

When considering the project's impact cumulatively with the approved operations, the significance rating for the overall mine is high in the unmitigated scenario and medium in the mitigated scenario.

Tabulated summary of the assessed impact

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
All phases						
Unmitigated	H	H	M	H	H	H
Mitigated	M	M	M	M	M	M

SURFACE WATER

ISSUES: ALTERATION OF NATURAL DRAINAGE PATTERNS

The information for this section was sourced from the approved mine EIA and housing BAR and the watercourse assessment report (De Castro and Brits, 2016d).

Introduction

There is a stormwater management system at the mine (as required by legislation) and therefore pre-mining drainage patterns have been altered to a certain extent. There has also been the construction of berms contributing to the alteration of drainage patterns. Surface drainage patterns can be further altered through changes to this stormwater management system to accommodate the project components, which may reduce the volume of runoff entering a watercourse and lead to a reduction in flows. Development within the floodlines may impede conveyance within the channel altering flood levels upstream of the development. This will last during the construction, operational and decommissioning phases. During the closure phase rehabilitation will allow for the restoration of drainage patterns to an extent.

This assessment focuses on the changes to the drainage patterns which links to the surface water quantity aspect assessed in the approved mine EIA and the flooding impact assessed in the housing BAR. Impacts on surface and groundwater quality are assessed separately.

Project phase and link to activities/infrastructure

Construction	Operational	Decommissioning	Closure
Site preparation Civil works Earthworks Transport systems	Waste rock management Tailings management Process and storm water management	Tailings management Demolition Rehabilitation	Maintenance and aftercare

Rating of impact

Severity / nature

The approved mine EIA indicated that the approved operations would reduce runoff volumes, as runoff from the surface area of the entire mining site and TSF area would be removed from the catchment area. Since the loss was considered to be low (less than 1.2% of the quaternary catchment), the unmitigated severity was rated as moderate for the construction and operation phase. There was no indication of the severity for the mitigated scenario. The approved housing BAR considered the possibility of flooding as a result of intense rainfall events, and the impact of topography on storm water dispersal. Stormwater dispersal as a result of topography would have been a concern as personnel living in the housing area on low gradients could be affected, however no severity was indicated. Significantly, in the approved mine EIA, no surface infrastructure would be located within floodlines.

In terms of runoff, the approved mine EIA assessed the entire mining site including the TSF and considered a total area of 365 ha. The housing will not retain any water received and will all be diverted off site. The components of this project will occupy an additional 90.4 ha. This will have an additional reduction of runoff yield of 14.36 Ml/annum which equates to 0.29% of the quaternary catchment in the unmitigated scenario. This calculation assumes that each hectare has an equal contribution and also considers the worst case scenario of removing all the water from site from the catchment area. Even unmitigated the additional reduction has a low severity.

There are a number of water courses draining the mine and project site. Most of these are ephemeral in nature. The more significant water course is the Elands River. In the unmitigated scenario, project components can alter drainage patterns in the following ways (this also takes into consideration changed approved facilities):

- The return water dam will overlap with an ephemeral drainage line on the farm Mimosa;
- The Gabonewe Estate Mine housing area will overlap with ephemeral channels;
- The tailings and return water pipelines will cross over ephemeral drainage lines, an ephemeral drainage channel and the Sandspruit;
- A bridge will be constructed between the mine housing;
- An existing bridge needs to be refurbished north of the mine housing;
- There will be a road crossing over an ephemeral channel and drainage lines;
- The Magalies Water Board pipeline will cross over the unnamed tributary of the Elands River; and
- Erosion control measures will be implemented along the unnamed tributary of the Elands River.

In the unmitigated scenario, the severity is considered high. With mitigation that focuses on re-aligning infrastructure where possible to avoid drainage lines/channels and caters for appropriate design of water course crossings, the severity reduces to medium.

When considering the above cumulatively with the approved operations, the severity is high in the unmitigated scenario and medium in the mitigated scenario.

Duration

The alteration of drainage patterns will be long-term and extend beyond the life of the project due to the TSF remaining on site. The duration cannot be significantly reduced with mitigation.

Spatial scale / extent

In the unmitigated scenario, the alteration of drainage patterns could extend beyond the project boundaries to downstream users. With mitigation this can be contained to the project site.

Consequence

The consequence is high for the unmitigated scenario and medium for the mitigated scenario.

Probability

The probability is high and reduces to moderate in the mitigated scenario.

Significance

The approved mine EIA indicated that the significance for the unmitigated scenario is high and with mitigation it is low for the construction and operation phases. In the approved housing BAR, the significance of the impact of topography on stormwater dispersal was rated as low to medium in the mitigated scenario. Significance pre-mitigation is not specified.

When considering the approved project and this project cumulatively, the unmitigated significance is high and reduces to medium with mitigation measures implemented.

Tabulated summary of the assessed impact

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
All phases						
Unmitigated	H	H	M	H	H	H
Mitigated	M	H	L	M	M	M

ISSUE: CONTAMINATION OF SURFACE WATER RESOURCES

The information for this section was sourced from the approved mine EIA and housing BAR, the annual surface water monitoring report (SLR, 2015a), the September 2015 and December 2015 quarterly reports (SLR, 2015b and 2016c).

Introduction

On site and off site (downstream of project-related infrastructure and activities) surface water resources could be polluted if there are discharges of contaminated substances into these resources. Pollution of water resources can have negative health impacts on both people and animals, and it can negatively impact on the water course related biodiversity. Biodiversity and soil related impacts are discussed above.

In the construction and decommissioning phases these potential pollution sources are temporary in nature, usually existing for a few weeks to a few months. Although these sources may be temporary, the potential pollution may be long term. The operational phase will present more long term potential sources

and the closure phase will present final land forms that may have the potential to contaminate surface water through long term seepage and/or run-off.

The approved housing BAR assessed impacts on water quality of ground and surface water collectively. This assessment considers the impacts on surface and ground water quality separately. The focus in this section is on the contamination of surface water resources.

Project phase and link to activities/infrastructure

Construction	Operational	Decommissioning	Closure
Site preparation Civil works Earthworks Waste rock management Tailings management Transport systems	Mining and mining related activities Waste rock management Tailings management Process and storm water management General and hazardous waste management Sewage sludge management Site support services	Tailings management Demolition Rehabilitation	Maintenance and aftercare

Rating of impact

Severity / nature

In the approved mine EIA, the severity rating for impacts to surface water quality were severe for the construction and operational phases prior to mitigation. The severity with mitigation was not indicated. In the approved housing BAR severity was not indicated.

For the project components, in the unmitigated scenario, during the construction phase, pollution sources include sedimentation from erosion, and spillage of construction solvents, paint, fuel, oil, and cement. During operation and decommissioning phases pollution sources include the TSF, the tailings and return water pipelines spills of fuel and oil, the sewage treatment plant, sewage pipelines, workshops, dangerous goods, dripping vehicles, the salvage yard and sedimentation from erosion contaminated discharges from the dirty water systems including: the PCDs, the return water dam. This amounts to a high severity in the unmitigated scenario and reduces to medium in the mitigated scenario.

When considering this impact cumulatively with the approved operations, the severity rating for the overall mine is high in the unmitigated scenario and reduces to medium in the mitigated scenario.

Duration

The pollution of surface water resources could have long-term effects on both people and animals during all project phases. The implementation of mitigation measures could reduce the duration.

Spatial scale / extent

In both the unmitigated and mitigated scenarios for all phases of the project, there is potential for contamination to extend beyond the site boundary (worst case).

Consequence

In the unmitigated scenario, the consequence is high. In the mitigated scenario the consequence is medium as the severity and duration of the impact is reduced.

Probability

The probability of the impact occurring relies on a causal chain that comprises three main elements:

- Does contamination reach surface water resources?
- Will people and livestock utilise this contaminated water?
- Is the contamination level harmful?

The first element is that contamination reaches the surface water resources within the proposed project area. Due to the proximity of the project to ephemeral drainage lines and channels, the Elands River and the Sandspruit, contaminants could reach surface water resources. However, these watercourses are ephemeral in nature and thus are dry for most of the dry months.

The second element is that third parties and/or livestock use this contaminated water for drinking purposes. This is a possibility as the surrounding communities use the water for fishing and for livestock watering when water is available.

The third element is that it is likely that only some contaminants will be at a level which is harmful to humans and livestock. This is influenced both by the quality of any discharged water and by the diluting effect of any rainwater particularly in the rainy season. However, conservatively it is assumed there could be contaminants that could reach levels that are harmful to humans and livestock if unmitigated, particularly if they add to existing baseline exceedances further deteriorating the water quality.

Based on the above, the probability is high for the unmitigated scenario and low for the mitigated scenario.

Significance

In the approved EIA and EMP, the significance of contamination of surface water resources without mitigation was rated as moderate for the shaft and plant area for construction and operation and low and high for the TSF for construction and operation respectively. With mitigation this decreased to low and very low.

In the approved BAR and EMP, the significance of contamination of surface water resources occurring was considered to be low with mitigation measures implemented.

When considering the project's impact cumulatively with the approved operations, the significance rating for the overall mine is high in the unmitigated scenario and reduces to low in the mitigated scenario.

Tabulated summary of the assessed impact

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
All phases						
Unmitigated	H	H	M	H	H	H
Mitigated	M	M	M	M	L	L

GROUNDWATER

ISSUE: CHANGES IN GROUNDWATER LEVELS AND AVAILABILITY

Discussion

A reduction in ground water levels could impact on the flow of streams as well as groundwater resources used by third parties. Local communities use streams and groundwater in the area for domestic and agricultural (livestock watering and irrigation) purposes. The main activities influencing ground water levels are dewatering to ensure safe operations. This has not changed from the approved operations and thus dewatering has not been re-assessed. However, the mitigation measures as provided in the approved mine EMP have been included in the EMP in Section 28 for completeness.

ISSUE: CONTAMINATION OF GROUNDWATER RESOURCES

The information for this section was sourced from the approved mine EIA and housing BAR, and the groundwater modelling report (DTM, 2016).

Introduction

There are activities associated with the changes in infrastructure and operations at the mine that have the potential to pollute groundwater. These activities include the larger TSF, the existing waste rock dump and diffuse sources such as adhoc spills of hydrocarbons, chemicals and untreated sewage effluent. Although pollution sources are temporary in nature with the exception of the TSF and waste rock dumps, the potential for pollution may be long term. The operational phase will present more long-term potential sources.

The approved housing BAR assessed impacts on water quality of ground and surface water collectively. This assessment considers surface and ground water quality impacts separately. The focus in this section is on the contamination of groundwater resources.

Project phase and link to activities/infrastructure

Construction	Operational	Decommissioning	Closure
Site preparation Civil works Earthworks Waste rock management Transport systems	Mining and mining related activities Waste rock management Tailings management Process and storm water management General and hazardous waste management Sewage sludge management Site support services General and hazardous	Tailings management Demolition Rehabilitation	Maintenance and aftercare

Construction	Operational	Decommissioning	Closure
	waste management		

Rating of impact

Severity / nature

In the approved mine EIA, the severity for impacts to groundwater quality were rated as slight for the construction phase for the plant and shaft area and moderate for the operational phase for the plant and shaft area and the TSF. The severity for the mitigated scenario was not indicated. For the approved housing BAR the severity was not indicated.

As part of this project, the contamination plume for the TSF area was remodelled with the updated layout. The contamination plume for the waste rock dump area at the plant was not remodelled and the assumption is that the previous modelling is still applicable as the waste rock dump is not increasing in size. At the plant area, the waste rock dump pollution plume was modelled for 50 years and the plume was predicted to move in a southerly direction reaching the southern edge of the proposed solar plant area.

As discussed in the geology baseline section (Section 7.4.1.2), the tailings and waste rock are considered to be non-acid forming and were indicated to have negligible potential to mobilise metals. Although acid production and metals mobilisation may not occur, the sulphide content may be sufficient to produce some soluble sulphates under oxidising conditions. This may increase the sulphate concentration in water that comes into contact with the tailings if there is not sufficient buffering capacity. Mobilisation of other, non-pH dependent contaminants such as salts, is also possible. These manifest as increased electrical conductivity from increased salt loads. In the unmitigated scenario, artificial recharge is predicted to occur under the TSF thus, any potential contaminant emanating from the TSF will potentially migrate downstream.

A mass transport simulation was carried out to predict the direction and receptor area of any potential plume. A transport simulation run for 100 years was assumed. A recharge source term was used at 100 % of the contaminant concentration. Up to 45 % of the initial source concentration is predicted to reach the weathered aquifer underneath the TSF footprint. Based on groundwater modelling, the pollution plume is predicted to travel south-south east from the TSF towards the Elands River. It is predicted that a pollution plume with a concentration of 500 mg/l of sulphate (drinking water guideline limit in terms of SANS: 241 (2015)) will extend approximately 112 m south-south east from the TSF. The Elands River is not predicted to be impacted by potential contamination from the TSF.

The plant area has a higher rate of hydraulic conductivity than the TSF area. Potential contaminants to the groundwater can therefore migrate faster in these areas. Potential contaminants that could arise from

the plant area can include untreated sewage, spilled tailings along the pipeline route, spilled hydrocarbons and chemicals and polluted water.

For this project, the severity for the unmitigated scenario is considered to be high with mitigation this decreases to medium.

When considering this impact cumulatively with the approved operations, the severity rating for the overall mine is high in the unmitigated scenario and reduces to medium in the mitigated scenario

Duration

In the unmitigated and mitigated scenarios, the potential pollution and in turn the potential for health impacts on third party water users could extend beyond the life of the project.

Spatial scale / extent

Unmitigated groundwater pollution impacts are likely to extend beyond the project boundaries. This is a medium spatial scale. With mitigation, groundwater pollution impacts will be minimised or prevented through appropriate design of facilities such as the TSF and undertaking good housekeeping in the operations on site. The spatial scale in the mitigated scenario therefore reduces to low.

Consequence

For the unmitigated scenario the consequence is high. With mitigation this decreases to medium.

Probability

The probability of the impact occurring relies on a causal chain that comprises three main elements:

- Does contamination reach groundwater resources?
- Will people and animals utilise this contaminated water?
- Is the contamination level harmful?

The first element is that contamination reaches the groundwater resources underneath or adjacent to the proposed project area. Due to the proximity of the sources to shallow aquifer systems and the possibility that there could be artificial recharge under the TSF (unmitigated) (thus increasing water levels), contaminants could reach groundwater resources.

The second element is that third parties and/or livestock use this contaminated water for drinking purposes. There are boreholes on Frischgewaagd and Mimosa used for monitoring. Domestic, agriculture and irrigation boreholes are present in Ledig and Phatsima. During the hydrocensus conducted for the updated modelling, boreholes identified on site were indicated to only be for monitoring. No third party boreholes are known to be located within the potential contamination plume zone.

The third element is whether contamination is at concentrations which are harmful to users. The monitoring taking place on site indicates that there are several contaminants that have been identified in the groundwater likely attributed to the populated areas. The baseline groundwater quality in the area was generally good with most of the water samples fit for human consumption. Therefore, should there be contamination; there will be a deterioration of water that is mostly fit for human consumption. The conservative approach is to assume that contaminants could be harmful to users.

Based on the above, the probability of the impact occurring for the unmitigated scenario is high. With mitigation measures implemented, that intercede pollution plumes, the probability decreases to low.

Significance

In the approved mine EIA, the significance of the impact was rated as low and moderate for the plant area during construction and operations respectively. With mitigation this decreased the rating to very low and low. For the TSF the significance was rated as high. Following mitigation this decreased to moderate. It should be noted in the approved mine EIA, a liner under the TSF was not required and was not part of mitigating the impact.

In the approved housing BAR the significance of groundwater pollution was considered to be low with mitigation measures implemented.

When considering the project's impact cumulatively with the approved operations, and that the TSF will now be constructed with an appropriate barrier system, the significance for the unmitigated scenario is high and with mitigation it decreases to low.

Tabulated summary of the assessed impact

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
All phases						
Unmitigated	H	H	M	H	H	H
Mitigated	M	H	L	M	L	L

AIR QUALITY

ISSUES: AIR POLLUTION

Information in this section was sourced from the air quality assessment report conducted by Airshed (2016).

Introduction

There are activities/infrastructure in all phases that have the potential to generate dust and gaseous emissions. The more significant pollutants associated with mining related operations are TSP and inhalable particulate matter less than 10/2.5 microns in size (PM10 and PM2.5). In both the construction and decommissioning phases, these activities will be temporary in nature, usually lasting from a few weeks to a few months. The operation phase will present more long term sources of dust as well as gaseous emissions from vehicles and the ventilation shafts. As the concentration of gasses released by vehicle tailpipe emissions are expected by the specialist to be negligible, these are not discussed further below. The 2016 air quality study assessed the cumulative impact of the full operations of the site (approved and proposed). Therefore, the impact assessment information from the approved mine EIA and housing BAR has not been considered in the impact assessment below.

Air pollution related impacts on biodiversity have been discussed in the biodiversity impact assessment above and therefore this section focuses on the potential for human health impacts.

Project phase and link to activities/infrastructure

Construction	Operational	Decommissioning	Closure
Site preparation Civil works Earthworks Mining and mining related activities Waste rock management Transport systems	Mining and mining related activities Waste rock management Mineral processing operations Tailings management Power Supply and Use Transport systems Housing	Mining and mining related activities Waste rock management Mineral processing operations Tailings management Power Supply and Use Transport systems Housing Demolition Rehabilitation	Maintenance and aftercare

Rating of impact

Severity / nature

The most significant source of $PM_{2.5}$ and PM_{10} emissions are the ventilation shafts (activities include: drilling and blasting, waste removal and handling, ore removal and handling, vehicle entrained dust and exhaust emissions from vehicle travelling on unpaved roads) and the most significant sources of TSP emissions are crushing and screening. The second most significant source of $PM_{2.5}$ and PM_{10} emissions

is crushing and screening and the second most significant source of TSP emissions are the ventilation shafts. The least significant source of $PM_{2.5}$, PM_{10} and TSP emissions is surface vehicle exhausts. For underground and plant vehicle exhaust emissions, the simulated diesel particulate matter (DPM), CO, SO_2 and Volatile organic compound(s) (VOC) concentrations are not expected to exceed the NAAQ limits. The hourly NO_2 concentrations could exceed the NAAQ limit, but for an annual average it is unlikely to exceed the NAAQ limit.

It is predicted under simulated scenarios that the limit for $PM_{2.5}$ and PM_{10} of the TSF will not exceed the annual concentration threshold or the allowable annual exceedances. The TSF is not considered to be the main source of emissions on site and thus its proximity to Ledig and Phatsima is not considered by the specialist as a high impact in terms of air quality.

In the construction and closure phase for the unmitigated scenario, the activities (approved and proposed) are expected to have a moderate deterioration for $PM_{2.5}$ and PM_{10} as the recommended daily NAAQ limit will occasionally be exceeded. For dustfall the deterioration is expected to be low. The specialist indicated that the recommended residential limit is unlikely to be violated. The unmitigated operational phase is expected to have substantial deterioration for air quality for $PM_{2.5}$ and PM_{10}. For dustfall, SO_2, NO_2, CO, DPM and VOCs the expected deterioration is low. With mitigation measures implemented the severity for construction will decrease to low for PM_{10} and dustfall. With mitigation in the operational phase, the severity will decrease to low for PM_{10} and dustfall but remains high for $PM_{2.5}$.

In terms of simulated health impacts, the construction phase will be less significant than the overall operational activities as construction related activities are temporary in nature. For the unmitigated operational phase, the $PM_{2.5}$ daily average concentration exceeds the NAAQ limits of 40 µg/m³ for more than 4 days per year at the south eastern section of Ledig, the Gabonewe Housing Estate and off-site (i.e. just off the property boundary). Over an annual average there are no expected exceedances. For the mitigated scenario, there is still an exceedance for daily $PM_{2.5}$ concentration at the Gabonewe Housing Estate and slightly off-site.

Overall the severity for the unmitigated scenario is high and with mitigation it decreases to low except for $PM_{2.5}$ which stays high.

Duration

While the sources of the impacts will last for the project life, in both the unmitigated and mitigated scenario, if human health impacts occur these are potentially medium to long term in nature.

Spatial scale / extent

The spatial scale of the potential impact is directly related to the spatial scale of the dispersion of any air pollution that has the potential to cause human health impacts. In the unmitigated scenario, the potential impacts extend beyond the site boundary. With mitigation, impacts remain mainly within the site boundary except for $PM_{2.5}$ that extends to parts of Gabonewe Housing Estate and slightly off-site.

Consequence

For the unmitigated scenario the consequence is high and with mitigation it is medium to low, except for $PM_{2.5}$ which is medium to high.

Probability

Whether the predicted air pollution will result in human health impacts depends on the extent of the pollution plume, the concentration of the different pollution components, and the exposure of receptors to exceedances of the relevant evaluation criteria.

The probability of the exceedances of the selected criteria off-site and at sensitive receptors without mitigation is possible. With mitigation, the probability for $PM_{2.5}$ is possible to unlikely as the ventilation shaft emissions which are the contributor to exceedances off-site and at the Gabonewe Housing Estate are not likely to be the same as the total PM emissions as has been assumed in the model. If suitable mitigation can be implemented during the design phase to decrease $PM_{2.5}$ levels (e.g. shaft vent position, orientation, height or other suitable measures), the probability of exceedances could decrease to low. For PM_{10} and dustfall the exceedance is possible.

Significance

When considering the approved and proposed project cumulatively, for the unmitigated scenario the significance is high. For the mitigated scenario, it is medium for dustfall and PM_{10} and low to medium for $PM_{2.5}$ (provided adequate mitigation measures are implemented to decrease $PM_{2.5}$ during the design phase). The range in significance for $PM_{2.5}$ is due to the conservative assumptions used for the modelled predictions. In this regard the ventilation shaft emissions which are the contributor to $PM_{2.5}$ exceedances off-site and at the Gabonewe Housing Estate are not likely to be the same as the total PM emissions as has been assumed in the model.

Tabulated summary of the assessed impact

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
All phases						
Unmitigated	H	H	M	H	M	H
Mitigated	L (PM_{10} & Dustfall) H ($PM_{2.5}$)	H - M	M	M - L (PM_{10} & Dustfall) H- M ($PM_{2.5}$)	M (PM_{10} & Dustfall) L ($PM_{2.5}$)	M (PM_{10} & Dustfall) M -L ($PM_{2.5}$)

NOISE

ISSUES: NOISE POLLUTION

The information for this section was sourced from the approved mine EIA and housing BAR and the updated noise impact assessment conducted for the project by JKA (2016).

Introduction

Based on noise monitoring surveys, noise emissions from the activities in the surrounding areas and at the mine do contribute to the general ambient noise in the area (Section 7.4.1.9). The project components present the possibility of generating additional noise disturbances and noise nuisances in all project phases as outlined in the table below. The cumulative impact of the approved and proposed project is assessed below.

The Noise Impact Assessment conducted for this project considered the cumulative impact of this project and the approved project, as it was indicated to not be meaningful to calculate incremental noise impact in isolation. This is due to the fact that cumulative impact of noise is calculated on a logarithmic scale, not a linear scale. The specialist did provide information on the incremental impact to discuss the additional noise that will be generated by the project. Based on this, only the current assessment is considered below as it has considered the cumulative impact already.

The noise impact assessment conducted for the approved mine EIA (TWP, 2008) indicated the anticipated daily traffic generated by the site during operations will be insignificant compared to anticipated daily traffic on the external main road system. The 2016 noise impact assessment also indicated that additional traffic volumes for this project are not expected to add significantly to noise pollution of the project. Therefore, the noise pollution from traffic is not specifically assessed below.

Project phase and link to activities/infrastructure

Construction	Operational	Decommissioning	Closure
Site preparation Earthworks Civil works Waste rock management Transport systems	Transport systems Waste rock management Mineral processing operations Tailings management Mining and mining related activities Tailings management	Transport systems Tailings management Demolition Rehabilitation	Maintenance and aftercare activities - negligible

Rating of impact

Severity / nature

The severity of the noise impacts related to the construction phase of this project will mainly be a nuisance in nature and at times there may be loud short-term noises. The construction of the additional infrastructure will not increase the total construction noise footprint significantly. The cumulative severity is rated as medium. The construction operations are unlikely to exceed 70 dBA at the closest noise receptors. There could be some nuisance effects from intermittent loud noises on people living on the eastern periphery of the urban area. No major noise impacts are anticipated in Phatsima Village. Reagile informal settlement may be slightly affected by the construction activities of the tailings and return water pipelines to the TSF.

For the operational phase, the additional elements will have a low noise severity and will not have a perceptible increase above the approved operations. In the unmitigated scenario, the predicted increase in noise levels is by 0.6 dBA at the Shaft Complex, a 1.7 dBA at the Concentrator Plant, and the additional traffic is not anticipated to have a significant increase in noise. The severity of the impact is also dependent on the distance of the receptor from the activity; the closer the receptor the higher the severity. The Gabonewe Estate mine housing and the south eastern edge of the Ledig Village are the closest receptors and fall within the 50 dBA noise contour.

The noise from the pumps at the TSF is not expected to be problematic at noise sensitive sites more than 300 m from a pump station. Residents in Phatsima Village Reagile informal settlement are unlikely to be negatively affected by the noise. It is unlikely that there will be a noise disturbance for the residents on the farms to the south of the Elands River as well as the livestock and game (where relevant) on these farms. However the character of the noise climate will alter in some parts of these southern areas that lie close to the TSF.

Looking at the cumulative impact, the severity for the unmitigated scenario and mitigated scenario is medium.

It is important to note that the severity of the noise impact will decrease with increasing distance from the source of the noise.

Duration

The duration of the noise pollution impact will last for the life of the project for the mitigated and unmitigated scenario.

Spatial scale / extent

In both the unmitigated and mitigated scenarios, the noise impacts extend beyond the site boundaries to the nearest noise sensitive receptors. This is a medium spatial scale.

Consequence

For the unmitigated and mitigated scenario the consequence medium.

Probability

In the unmitigated scenario, the probability of noise related impacts is definite (though this is dependent on the distance of receptors from noise generating activities). For the mitigated scenario the probability decreases to medium.

Significance

Cumulatively, the significance of the approved operations and proposed project is medium without mitigation and with mitigation it stays medium. While the significance may be unchanged from the unmitigated scenario, the mitigation will decrease the likelihood of the impact occurring. The significance with mitigation is unchanged from the approved project.

Tabulated summary of the assessed impact

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
All phases						
Unmitigated	M	M	M	M	H	M
Mitigated	M	M	M	M	M	M

BLASTING

ISSUE: BLASTING IMPACTS

Discussion

This project does not deal with underground mining activities, which formed part of the approved project. No additional areas will be mined and there are no changes to approved underground mining activities. Therefore no additional blasting and vibration impacts were identified. The information contained in the approved mine EIA is still applicable to the approved operations. Blasting was considered in the emissions inventory of the Air Quality Impact Assessment due to the addition of ventilation shafts; refer to the Air Quality Impact Assessment above. The management measures and monitoring requirements for blasting and vibrations as provided in the approved mine EIA have been included in the EMP section of this EIA and EMP report, refer to Section 28, for completeness.

TRAFFIC

ISSUE: ROAD AND TRAFFIC DISTURBANCE

The information for this section was sourced from the TIA conducted by WSP, 2016.

Introduction

Traffic will be generated in all phases of the project when trucks, buses, and private vehicles make use of the public and internal transport network in and adjacent to the mine. The key potential traffic related impacts are on road capacity. These are assessed below.

Public safety has not been specifically assessed as the traffic specialist indicated that these are expected to be limited as the majority of mine generated pedestrians is expected to be generated by the Gabonewe Estate and will therefore travel along the internal road network and not along highly trafficked public roads. Recommendations regarding pedestrian safety however were provided and are included in the EMP in Section 28. All safety mitigation measures from approved mine EMP have also been incorporated in the EMP in Section 28.

Traffic impacts are expected from construction through to the end of the decommissioning phases when trucks, buses, and private vehicles make use of the private and public transport network in and adjacent to the proposed project area. The closure phase will have minimal traffic impacts and will mainly involve travel for maintenance and aftercare. Since the approved mine EIA there have been changes that have had an influence on traffic. This includes changes to mine access from two access points to one and plans for new mine housing. With these changes and since it is difficult to quantify the changes in traffic that are specific only to this project, the 2016 traffic study assessed the cumulative impact of the full operations of the site (approved and proposed). Therefore, the impact assessment information from the approved mine EIA and housing BAR has not been considered in the impact assessment below.

Project phase and link to activities/infrastructure

Construction	Operational	Decommissioning	Closure
Transport systems	Transport systems	Transport systems	Transport systems

Rating of impact

Severity / nature

The full mine and project-related traffic will include transport on internal mine roads and transport on external public roads. The transport on external roads will include transport of staff during construction and operation, mine and plant equipment during construction, wet concentrate slurry which will be transported to a nearby platinum smelter for further processing and deliveries and collections from site including waste collection. There will also be minimal travel to the TSF site.

During the AM peak hour the impact of the additional mine traffic (approved project and this project) at the intersection of the R565 and the R556 will be moderate, whereas during the PM peak hour the impact will be low. The recommended operating level will be violated on a number of movements during AM and PM peak hours. For the PM peak hour, these movements are operating at critical levels of service under existing traffic conditions and the additional impact is not considered to be significant. The impact is therefore medium without mitigation. With the implementation of mitigation of changing the intersection, the severity becomes high positive as the mitigation improves the current situation.

It should be noted that the LOS of the roads will be LOS F even without the mine, though the mine will contribute to the lowered LOS.

Duration

The impact of the additional mine traffic (approved project and this project) will continue as long as the mine is operational. During the decommissioning and closure phases it can be expected that the traffic impact of the mine will reduce and eventually discontinue. The duration of the impact is therefore medium term for both the mitigated and unmitigated scenarios.

Spatial scale / extent

The impact of the additional mine traffic (approved project and this project) will be fairly widespread and be beyond the project area. The spatial scale is medium in the unmitigated and mitigated scenarios.

Consequence

The consequence will be medium for the unmitigated scenario though it will be high positive for the mitigated scenario as the mitigation measures will improve the current and projected traffic conditions.

Probability

In the unmitigated scenario, the probability of the mine negatively impacting the surrounding road network is high. The mine will be the source of a large number of employment opportunities and a large number of daily commuters are expected. With mitigation that caters for improvements in road capacity, the probability of the mine positively impacting the surrounding road network is high positive.

Significance

The significance of the impact of the additional mine traffic is medium negative in the unmitigated scenario. The mitigation measures of introducing a roundabout and adding another approach lane to the north-eastern approach, separating the through and right turning movements, in the opinion of the specialist, will fully mitigate the negative impact of the mine traffic and will improve the service levels to above the existing levels. With mitigation this is a high positive significance.

Tabulated summary of the assessed impact

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
All phases						
Unmitigated	M	M	M	M	H	M
Mitigated	H+	H	M	H+	H+	H+

VISUAL

ISSUE: NEGATIVE VISUAL IMPACT

For the approved mine EIA a specialist study was conducted by MetroGIS (Pty) Ltd (2007). This information has been updated by SLR for the purposes of this study.

Introduction

Visual impacts will be caused by activities and infrastructure in all project phases. These activities will be visible, to varying degrees from varying distances around the mine site. The construction period will involve the construction of the rest of the approved infrastructure as well as the additional/changed infrastructure as part of this project. Impacts are expected during the operational phase as the development of the TSF advances. In addition, there will be the remaining TSF at mine closure.

Project phase and link to activities/infrastructure

Construction	Operational	Decommissioning	Closure
Site preparation Civil works Earthworks Mining and mining related activities Waste rock management	Mining and mining related activities Waste rock management Mineral processing operations Tailings management Housing	Demolition	Maintenance and aftercare of final land forms and rehabilitated areas

Rating of impact

Severity / nature

The severity of visual impacts is determined by assessing the change to the visual landscape as a result of mine and project related infrastructure and activities. In the approved mine EIA report the severity of the visual impact was rated as severe for the construction and operational phases. The approved housing BAR did not assess the visual impact.

When considering the potential change to the visual landscape as a result of the project components the key issues are visual exposure, visual intrusion, and sensitivity of receptors. Each of these is discussed further below, taking into consideration how this project adds to the approved project as if all the approved facilities already existed. Consideration of the tailings and return water pipelines was included in the assessment of the previous visual study, however since it did not form part of the approved mine EIA it is considered below.

In the unmitigated scenario for the infrastructure as part of this project:

- None of the new/changed infrastructure is expected to be higher than approved infrastructure with the approved mine shaft head gear being the most prominent feature at approximately 82 m in height. The new TSF height will be 4 m less than the approved height, though the additional footprint adds to the visual intrusion and thus is as significant as the vertical dimension. The visual intrusion of the additional/changed infrastructure will be low because the infrastructure will be absorbed by approved mining activities, will not change the already assessed landscape character of the area and will result in only minor changes to a few key views (when considering all the approved infrastructure already built).
- Visual exposure is the extent to which project infrastructure and activities will be visible. It follows that the closer the infrastructure and activities, the greater the visual exposure. The main new/ changed project components that will influence the visibility of the mine are the larger TSF (footprint increasing by 36 ha but height decreasing by 4 m), the tailings and return water pipeline, the relocated crusher above ground, the solar plant (height assumed to be equal or less than average building height), the Phase 1 (not assessed previously) and Phase 1a housing, and larger stockpiles. A turf stockpile berm has already been constructed between the plant area and the south eastern edge of Ledig (Lekwadi) and a noise berm has been constructed between the plant and Phase 1 mine housing aiding in decreasing the visual impact. The approved operations will mostly shield the remaining project components. Views from local roads, communal grazing areas and local residences will present the greatest visual exposure. Overall the infrastructure will form part of the mine structures and contribute to the overall visibility of the mine. The visibility is therefore regarded as moderate
- Sensitivity of receptors relates to the way in which people will view the visual intrusion. In this regard it is anticipated that receptors west of the TSF, and west, north and south east of the plant will be highly sensitive due to increased change in views and these areas having been the identified sensitive receptors in the approved EIA and EMP. The receptors include Sun City, tourists travelling on the R565 and R556 (very high sensitivity) as well as residents in Ledig, Phatsima and Chaneng (high sensitivity).

The project components will have a low severity visual impact because this infrastructure will be absorbed into the overall mine infrastructure.

When considering this impact cumulatively with the approved operations, the severity rating for the overall mine in the unmitigated scenario is high. With mitigation, that focuses on designing and implementing measures where the TSF side slopes can be rehabilitated during the operational phase (concurrent rehabilitation) and tree lines are planted between the TSF and closest receptors, the severity rating for the overall mine is high to medium depending on the effectiveness of rehabilitation measures.

<u>Duration</u>

The duration of this impact is expected to be long-term for all project phases in the unmitigated scenario because the impacts will extend beyond the life of the project. In the mitigated scenario, the duration will be reduced to the life of the project, and only the rehabilitated TSF will remain after closure, which, if correctly rehabilitated, will not be associated with negative visual impacts.

Spatial scale / extent

In all phases, visual impacts are likely to extend beyond the site boundary. This is a medium spatial scale in both the unmitigated and mitigated scenarios.

Consequence

The unmitigated consequence is high and reduces to high - medium in the mitigated scenario.

Probability

The unmitigated probability is high in all the phases. With mitigation, the probability is low with effective rehabilitation measures.

Significance

In the approved mine EIA, the significance of the visual impact was rated as high for the plant area and moderate for the TSF during construction. For the operational phase the TSF rating increased to very high as it increases in size. In this project, the waste rock dump will not remain on site as waste rock will either be sold as aggregate or if any waste rock remains it will be backfilled into the shaft.

When considering the project's impact cumulatively with the approved operation, the significance rating for the overall mine is high in the unmitigated scenario and reduces to medium with mitigation.

Tabulated summary of the assessed impact

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
All phases						
Unmitigated	H	H	M	H	H	H
Mitigated	H-M	M	M	H-M	L	M

HERITAGE/CULTURAL AND PALAEONTOLOGICAL RESOURCES

ISSUE: LOSS OF HERITAGE/CULTURAL AND PALAEONTOLOGICAL RESOURCES

The information is based on the heritage study conducted by PGS (2016).

Introduction

The project has the potential to damage heritage resources and result in the loss of the resource for future generations. Heritage resources include sites of archaeological, cultural or historical importance. The more significant of these are expected to occur during the construction and operational phases when most of the project infrastructure will be established on site. No impacts are expected to occur during the decommissioning and closure phases however the potential for uncovering new heritage resources during the operational and decommissioning phases does exist.

As discussed in the heritage baseline section, 7.4.1.11, the project area has no significant/zero palaeontological significance.

Project phase and link to activities/infrastructure

Construction	Operational	Decommissioning	Closure
			N/A
Site preparation Earthworks Transport systems Housing Site/contract management	Tailings management Transport systems Housing Site/contract management	Tailings management Transport systems Housing Site/contract management Demolition Rehabilitation	

Rating of impact

Severity / nature

In the approved mine EIA the significance was indicated to range between severe and very severe depending on the mine phase and specific activity of the project. There is no distinction made between a mitigated and unmitigated scenario. The housing BAR did not identify any additional heritage resources and thus did not assess heritage resources.

Heritage resources that will be impacted by the positioning of project-related infrastructure include graves and cemeteries which are considered to have high significance. While there are sites that were identified to have low and medium significance, cumulatively the severity of destruction to the sites on site without mitigation is high. With mitigation measures implemented the severity can decrease to medium and low depending on the resource.

Duration

Should there be an impact to the resources identified, the impact would be permanent and is thus classified as high. With mitigation involving relocation or preservation of resources, the social significances of a site can be retained and some value can be re-instated, though the impression of the value might not stay the same. With mitigation, the duration is medium to high, depending on the resource.

Spatial scale / extent

The actual loss of the resource will occur within the site boundary, though with some of the identified heritage sites, the impact can occur beyond the site boundary with and without mitigation as there is the loss to the history of the area and the loss can be felt by outside the site boundary.

Consequence

For the unmitigated scenario the consequence is high. With mitigation measures implemented this can decrease to low to high.

Probability

In the unmitigated scenario, the loss of heritage resources will be definite. With mitigation, the probability can decrease to low where graves will be relocated and the information within heritage sites preserved through further investigation, sample collection and record keeping. For the sites identified in the buffer of the magazine area these will only be impacted if there is an accidental explosion, which is unlikely.

Significance

In the approved mine EIA the significance was indicated to range between moderate and very high to moderate positive depending on the mine phase and specific activity of the project.

When considering the project's cumulative impact, in the unmitigated scenario the significance of the impact is considered high. With the implementation of mitigation measures, the significance decreases to low to medium depending on the heritage resource impacted.

Tabulated summary of the assessed impact

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
All phases						
Unmitigated	H	H	M	H	H	H
Mitigated	L-M	M-H	M	L-H	L	L-M

SOCIO-ECONOMIC

ISSUE: INWARD MIGRATION AND ASSOCIATED ILLS

Information in this section was sources from the Social Impact Assessment that was conducted by Kerryn Desai (2016) and the approved mine EIA and housing BAR.

Introduction

Mining projects tend to bring with them an expectation of employment in all project phases prior to closure. This expectation can lead to the influx of job seekers to an area which in turn increases pressure on existing communities, housing, basic service delivery and raises concerns around safety and security. The approved EIA and EMP assessed influx, development of informal settlements, and health risks separately. The approved BAR discussed skills development. The assessment below considers these aspects together, focusing on the potential for the inward migration and associated social issues.

Project phase and link to activities/infrastructure

Construction	Operational	Decommissioning	Closure
			N/A
Construction of project components	Operation of the mine	Decommissioning of project components	

Rating of impact

Severity / nature

In the approved mine EIA the severity linked to influx ranged from severe (all related aspects for construction and operation) to very severe (decommissioning phase and the related establishment of informal settlements impact).

For the project components, there will be some short term employment opportunities during construction but no additional employment during operation. The project components will be undertaken as an extension of the approved mining operations. Contractors will also be used where required. The potential exists for inward migration of people seeking employment and the associated social issues and pressures. According to the social specialist (Desai, 2016), as a worst-case scenario, these changes can increase levels of crime/ theft, drug and alcohol abuse, increase the incidence of sex work, spread of sexually transmitted diseases (STDs), domestic violence, and general unrest due to increased competition. The relative size of the project compared to the already approved mine will not increase the level of social ills linked to the influx of workers and job-seekers already assessed in the approved EIA and EMP. The severity for the proposed project will therefore be low in the unmitigated and mitigated scenario.

In terms of pressure on housing and basic service delivery, the approved housing BAR and this project makes provision for housing facilities. The approved housing BAR indicated that this provision relates to

one of the demands made by miners during the 5 month protracted strike in 2014, for adequate social facilities (including housing) to be provided. As this contributes to alleviating pressure on housing, the related severity is considered to be positive in both the unmitigated and mitigated scenarios.

When considering this impact cumulatively with the approved operations, the severity rating for the overall mine will be high, mainly due to the size of the workforce required for the approved mine. With mitigation, it can be reduced to medium.

Duration

In the normal course, social impacts associated with each phase of the project will occur for the life of the project, but negative social issues associated with inward migration can continue beyond the closure of the mine, particularly in the unmitigated scenario.

Spatial scale / extent

In both the unmitigated and mitigated scenarios, the impacts of inward migration and associated social ills could extend beyond the project areas into surrounding communities.

Consequence

In the unmitigated and mitigated scenario the consequence associated with inward migration and associated social ills is high.

Probability

The probability of influx and related impacts is possible. With mitigation, impacts associated with inward migration are considered to be less likely, but they are unlikely to be eliminated.

Significance

In the approved mine EIA the influx and development of informal settlements was considered to be high. For the increased health risks the impact was considered to be moderate to high prior to mitigation and moderate with mitigation. For this project's components, a significant change to the influx of workers and the associated social ills is not expected. The approved housing BAR did not discuss impacts relating to influx and associated social issues.

When considering the approved mine EIA and housing BAR and this project's components cumulatively, the significance is considered high without mitigation and with mitigation it reduces to medium.

Tabulated summary of the assessed impact

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
All phases						

Unmitigated	H	H	H	H	M	H
Mitigated	M	H	H	H	L	M

ISSUE: CHANGES TO TOURISM

Discussion

The approved mine EIA assessed the impact that the project will have on tourism and indicated that the significance would be low for the unmitigated scenario and very low for the mitigated scenario. The approved mine EIA and 2016 SIA (Desai, 2016) indicated that tourism has been increasing in the area and tourism is likely to continue as it has done despite the increases in mining.

The components of this project are not expected to contribute significantly to changes in tourism as changes are mainly within project footprints and are related to the already approved operations. The approved mine impact assessment for tourism is thus considered to still be applicable.

The mitigation measures that link to the above impacts from the approved mine EIA have been incorporated into the EMP in Section 28 for completeness.

ISSUE: ECONOMIC IMPACT

Information in this section was sources from the Social Impact Assessment that was conducted by Kerryn Desai (2016) and the approved mine EIA and housing BAR.

Introduction

Mining projects in general have the potential to impact on the economy both positively through potential growth in the mining sector and job and income creation and negatively through the potential loss of existing economic activities. The approved mine EIA assessed direct and indirect employment impacts separately and the approved housing BAR assessed direct employment.

For the loss of pre-mining economic activities, in terms of the approved mine footprint, it is assumed that as part of the land purchase/lease agreements fair market price was/is being paid for the land and therefore any potential negative economic impacts associated with the loss of land are compensated for and are not considered further in this assessment. Land along the pipeline route is considered a communal resource (Desai, 2016) and therefore the loss of this land for community grazing is assessed in the land use impact assessment section and does not form part of the economic assessment below.

Project phase and link to activities/infrastructure

Construction	Operational	Decommissioning	Closure
			N/A

Construction	Operational	Decommissioning	Closure
			N/A
Construction of project components	Operation of the mine	Decommissioning of project components	

Rating of impact

Severity / nature

In the approved mine EIA, the severity of positive socio-economic impacts associated with the approved operations was rated to be beneficial. There was no distinction made between the unmitigated and mitigated scenarios. The approved housing BAR did not specify severity in relation to socio-economic impacts.

As part of the approved operations, the mine is expected to generate employment for 3130 personnel (at full production) and the construction of the Phase 1 mine housing will create 200 jobs, though only 25 would remain as permanent jobs. The approved operations will also contribute towards local economic growth through revenue on sale of platinum which contributes to broadening tax bases, and local and regional spending on services and infrastructure/equipment.

This project comprises a number of changes to the approved mine operations which will result in the inclusion of additional minerals (aggregate), increased mineral processing capacity, additional housing and increased Life of Mine of an additional two years. As a result the project components could have the following negative and/or positive impacts:

- employment for local communities – although this will be limited to approximately 570 additional construction phase jobs and no additional operational phase jobs. While there will be no additional operational phase jobs, some of these will be sourced from existing Bakubung workers thereby ensuring continuation of employment;
- provision of additional housing for mine employees;
- additional benefit to the local and regional economy through additional spending and income from sale of another mineral (waste rock as aggregate) and increased capacity of the concentrator plant by 15%;
- additional impact on land value of properties surrounding the project – additional mine development could be perceived to be a negative impact; and
- impacts on livelihoods of community who make use of immediately surrounding land.

Although the mine housing is removing land with agricultural potential it is contributing to housing provision in the area. The approved BAR indicated that this provision relates to one of the demands made by miners during the 5 month protracted strike in 2014, for adequate social facilities (including housing) to be provided. The housing was seen as a benefit as there would be employment generated,

affordable housing needs would be partially addressed, and the tax base of the local municipality would be broadened.

The development of the project components which increases the economic benefits of the mine and does not require additional land to be purchased and/or leased will therefore have a moderate positive severity until closure. This positive impact may be enhanced with the implementation of management and mitigation measures. After closure, the positive economic impact from mining will cease but with rehabilitation, the respective pre-mining activities can resume in appropriate areas.

When considering the approved and proposed project aspects cumulatively, the severity rating for the overall mine is medium high positive in the unmitigated and high positive in the mitigated scenario

Duration

The positive economic impacts described above will be limited to the life of project. After closure there may still be some positive impacts through maintenance and aftercare activities.

Spatial scale / extent

The positive economic impacts will be far-reaching in both the unmitigated and mitigated scenarios for all project phases until closure.

Consequence

The consequences for the mitigated and unmitigated scenarios are high positive.

Probability

The probability is considered to be high in both the unmitigated and mitigated scenarios for all project phases until closure.

Significance

The approved mine EIA rated the significance as being high to moderate high before mitigation and high after mitigation.

The approved housing BAR rated the significance of employment (and skills development) as medium to high (it is assumed to be positive based on the impact description).

When considering the cumulative significance of the approved projects and this project, the significance is high positive.

Tabulated summary of the assessed impact

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
All phases						
Unmitigated	M–H+	M	H	H+	H+	H+
Mitigated	H+	M	H	H+	H+	H+

LAND USE

ISSUE: LOSS OR CHANGES TO EXISTING LAND USE

The information for this section was sourced from approved EIA and EMP as well as specialist studies including the social impact assessment (Desai, 2016) and the heritage impact assessment (PGS, 2016).

Introduction

There are project related activities and infrastructure that may have an impact on other land uses in all project phases. This section focuses on potential impacts affecting land use on and surrounding the project sites.

When considering impacts on land use, consideration needs to be given to the range of environmental impacts that could occur as a result of the project. These include: groundwater, noise, visual, air, traffic, heritage, soils, and socio-economic. With this in mind, the main activity that could have an impact on existing land uses is the development of the project components together with the operation of the approved mine as a whole. These activities will continue for the planned life of the mine. At closure, final land forms (TSF) will remain on site in perpetuity. This section focuses on the potential loss and/or change of the land uses.

Project phase and link to activities/infrastructure

Construction	Operational	Decommissioning	Closure
Construction of project components	Operation of the mine	Decommissioning of project components	Final land forms

Rating of impact

Severity / nature

The approved mine EIA rated the severity of changes in land use to be severe for the construction and operational phases, with land returning to wilderness or grazing status post closure. A rating for the mitigated scenario was not indicated.

The project area is located in an area where mining is a dominant land use inter-mixed with agriculture, tourism and residential land use type activities. Apart from the tailings and return water pipeline footprint, the placement of infrastructure is within areas already approved for mining. The area where the TSF is located is owned by Wesizwe which was purchased from the RLM. BPM is allowing grazing to continue on the property until the TSF is constructed. Locating or allocating alternative grazing land falls within the RLM's responsibility. The area where the tailings and return water pipelines are to be constructed is communal grazing land, this land use can continue with the development of the pipelines, though there will be a reduction of available area from the servitude development.

When considering surrounding land uses, these land uses may be affected by one or more of the following potential environmental and social impacts: hazardous excavations and structures, disturbance of biodiversity, surface and groundwater quality and quantity, dust generation, increase in traffic, noise pollution, visual and negative socio-economic impacts. These impacts would primarily be experienced by the residents of the nearest villages, any nearby grazing areas as well as travellers on the surrounding roads. In this regard, the severity of the project's unmitigated potential impacts on the surrounding non-mining land uses is medium. With mitigation that is focused on prevention and/or controls for each environmental and social impact type, the severity reduces to low.

When considering the project's impact cumulatively with the approved operations, the significance rating for the overall mine is high in the unmitigated scenario reducing medium - low in the mitigated scenario.

Duration

In the unmitigated scenario, and using a conservative approach, land use impacts could be experienced after the life of mine. With mitigation, these impacts can be avoided and/or remedied within the life of the project.

Spatial scale / extent

The spatial scale extends beyond the mining footprint, in both the unmitigated and mitigated scenarios.

Consequence

The unmitigated consequence is high in all project phases. The mitigated consequence is medium to low in all the project phases.

Probability

In the unmitigated scenario, where environmental and social impacts are uncontrolled, the probability that land uses on and surrounding the project sites will be impacted by mining is definite. With mitigation, the probability reduces to medium prior to closure and low post closure.

Significance

When considering the project's impact cumulatively with the operations, the significance rating for the overall mine is high in the unmitigated scenario. With mitigation that is focussed on prevention and/or controls for each environmental and social impact type, the severity reduces to between medium and low for all phases except closure which will be low.

Tabulated summary of the assessed impact

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
All phases						
Unmitigated	H	H	M	H	H	H
Mitigated	M-L	M-L	M	M-L	M L (at closure)	M-L L (at closure)

APPENDIX G: COMPOSITE MAP

APPENDIX H: GROUNDWATER IMPACT ASSESSMENT REPORT

APPENDIX I: WATERCOURSE IMPACT ASSESSMENT REPORT

APPENDIX J: SOILS AND LAND CAPABILITY IMPACT ASSESSMENT REPORT

APPENDIX K: VEGETATION IMPACT ASSESSMENT REPORT

APPENDIX L: FAUNAL IMPACT ASSESSMENT REPORT

APPENDIX M: AQUATIC ECOLOGY IMPACT ASSESSMENT REPORT

APPENDIX N: NOISE IMPACT ASSESSMENT REPORT

APPENDIX O: TRAFFIC IMPACT ASSESSMENT REPORT

APPENDIX P: SOCIO-ECONOMIC IMPACT ASSESSMENT

APPENDIX Q: HERITAGE/CULTURAL AND PALEONTOLOGICAL IMPACT ASSESSMENT REPORT

APPENDIX R: AIR QUALITY IMPACT ASSESSMENT

APPENDIX S: CLOSURE COST ASSESSMENT

APPENDIX T: 2014 HOUSING EMP

APPENDIX U: TSF DESIGN REPORT

RECORD OF REPORT DISTRIBUTION

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