LEDET Reference Number: 12/1/9/2-GS37

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Mining Right Reference Number: LP30/5/1/2/2/182 MR

Der Brochen EMP Alignment and Amendment

Final Environmental Impact Assessment and Environmental Management Programme

Report Prepared for

Rustenburg Platinum Mines Limited

Report Number 469113/Final EIA/EMP

Report Prepared by

March 2015

Der Brochen EMP Alignment and Amendment

Final Environmental Impact Assessment and Environmental Management Programme

Rustenburg Platinum Mines Limited

55 Marshall Street
Marshalltown, Johannesburg
2001

SRK Consulting (South Africa) (Pty) Ltd
265 Oxford Rd
Illovo 2196
Johannesburg
South Africa

e-mail: johannesburg@srk.co.za
website: www.srk.co.za

Tel: +27 (0) 11 441 1111
Fax: +27 (0) 11 880 8086

SRK Project Number 469113

March 2015

Compiled by:

Charissa Tomlin
Environmental Scientist

Suzanne Venter
Senior Environmental Scientist

Email: sventer@srk.co.za

Reviewed by:

Joe de Beer
Principal Environmental Scientist

Briony Liber
Partner

Project Information Sheet

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Der Brochen EMP Alignment and Amendment

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PROJECT APPLICANT:

Rustenburg Platinum Mines Limited

Contact Person:	Mr Mike Marshall
Designation:	Senior Project Manager
Tel:	011 373 6807
Email:	mike.marshall@angloamerican.com
Postal Address:	PO Box 62179; Marshalltown, 2107

INDEPENDENT ENVIRONMENTAL CONSULTANT

SRK Consulting South Africa (Pty) Ltd (SRK)

Contact Person:	Suzanne Venter/Joe de Beer
EAP:	Briony Liber
Designation:	Environmental Consultants
Tel:	011 441 1111
Email:	sventer@srk.co.za/jdebeer@srk.co.za
Postal Address	PO Box 55291, Northlands, 2116

ANGLO AMERICAN PLATINUM LIMITED

RUSTENBURG PLATINUM MINES LIMITED

Der Brochen EMP Alignment and Amendment

Final Environmental Impact Assessment and Environmental Management Programme

MARCH 2015

SUBMITTED BY:

Mr Dean Pelser
Anglo American Platinum – Executive Head: SHE

Mr Mike Marshall
Anglo American Platinum - Senior Project Manager – Der Brochen

Dr Hermanus Prinsloo
Anglo American Platinum - Head of Environment

Mr Frank Pieterse
Anglo American Platinum - Environmental Manager

COMPILED BY:

Ms Charissa Tomlin
SRK Consulting – Environmental Scientist

Ms Suzanne Venter
SRK Consulting – Senior Environmental Scientist

REVIEWED BY:

Mr Joe de Beer
SRK Consulting – Principal Scientist

Ms Briony Liber
SRK Consulting – Partner

Executive Summary

This Final Environmental Impact Assessment and Environmental Management Programme (EIA/EMP) presents an update of the Draft EIA/EMP that was submitted during December 2014. Changes and additional information provided in the Final EIA/EMP have been highlighted in grey.

Introduction and Background

SRK Consulting (South Africa) Pty Ltd has been requested by Rustenburg Platinum Mines Limited (RPM), a wholly owned subsidiary of Anglo American Platinum Limited (AAP), to facilitate and manage the impact assessment and EMP) Alignment and Amendment for the Der Brochen Project (Der Brochen) in Limpopo Province.

Der Brochen is situated approximately 25 km south-west of the town of Steelpoort (40 km by road), and 40 km west of Mashishing (Lydenburg), in the Limpopo Province. The project is located in the Greater Tubatse Local Municipality which forms part of the Greater Sekhukhune District Municipality.

Der Brochen was the holder of an Item 7 Schedule II old order mineral right in terms of the Minerals Act (Act No. 50 of 1991) (ML 11/2003) for platinum. This right was issued by the Department of Minerals and Energy (DME). Environmental studies for the Der Brochen Project commenced in 2001 and a number of studies have been undertaken since then and are covered by several approved EMPs. The mineral right has been converted to a new order mining right in terms of the Mineral and Petroleum Resources Development Act (Act No 28 of 2002) (MPRDA) in 2010 (MP 302 MR). The Department of Mineral Resources (DMR) (previously the DME) has issued a directive for RPM to align all previously approved EMPs and consolidate them into a single document, since the commencement of the project in 2001. A list of the EMPs to be aligned is shown in Table 1.

Table 1: Summary of EMPs to be aligned for the Der Brochen Project

EMP Name	Approved activities	Status
Der Brochen Mine EMP Submitted in November 2002, approved on 16 April 2003	2 x 100 ktpm twin UG2 declines (Helena and Der Brochen) with a LOM of 65 years Concentrator plant on Helena 6 JT with a capacity of 400 ktpm Mareesburg TSF	Helena Concentrator plant (Mototolo Concentrator) constructed and operating as part of Mototolo JV. Mareesburg TSF not constructed to date. The two decline shafts do not form part of this Alignment.
EMP Amendment: Trial Mining Phase Submitted in July 2003, approved on 30 April 2004	Access to UG2 reef via 2 declines (on Helena) and via 4 adits on Richmond, LOM 9 months Ore stockpiles on Helena and Richmond farms Helena WRD (0.16ha) Richmond WRD (0.8ha)	One adit on Richmond opened and bulk sample taken. Closed and Waste Rock Dump rehabilitated. This EMP is therefore excluded from the consolidation.
EMP Amendment: Klein Dwarsrivier Wellfields Submitted in April 2004	A Wellfield to supply water to Der Brochen Project.	Wellfield currently in use as water source (referred to as Helena and Richmond Wellfields)
EMP Amendment: Helena TSF Submitted during April 2005, approved in October 2005	45ha TSF with a capacity of 200ktpm, height of 42m Two return water dams.	Helena TSF constructed and operating as part of Mototolo JV.

EMP Name	Approved activities	Status
EMP Amendment: Helena Chrome Plant Submitted in May 2006, approved in 2006	Chrome recovery spiral plant within the Concentrator area. Stockpile of chrome concentrate – 4200m^2 Final tailings returned to the Concentrator	Constructed and operating as part of Mototolo JV.
EMP Amendment for ongoing prospecting Submitted during July 2007	382 prospecting drill holes	Prospecting currently taking place
EMP Amendment: Richmond early mine Submitted in May 2010	Mining via portal 5 and adit 4 at 12.5 ktpm. LOM of 16 years Temporary ore stockpiles for future processing, 1.1ha and 2.6 ha Temporary Waste Rock Dump of 1.7ha	Not constructed. Approval still outstanding. The Richmond early mine has been removed from Der Brochen's mine plan. The Richmond early mine does not form part of the Alignment.
EMP Amendment: Raising the height of the Helena TSF Submitted in September 2014	The approved and existing Helena TSF's height will be raised	Submitted to DMR, decision pending. Operational and closure phases included in Alignment.

In addition to the alignment, RPM intends undertaking additional activities that have not been authorised in existing EMPs, which includes:

- Two Open Pits (Northern and Southern Pits) and associated Waste Rock Dumps (WRDs);
- Re-routing of a 132 kV powerline;
- A Co-Disposal Facility (tailings disposal with a rock embankment in the north pit); and
- A small expansion to the previously approved Mareesburg TSF and associated infrastructure.

These proposed activities require the following environmental authorisations:

- An EIA and EMP Alignment and Amendment in accordance with the MPRDA, to be authorised by the DMR;
- An EIA/EMP as per the National Environmental Management Act (Act No. 107 of 1998) (NEMA) and its associated Regulations 544, 545 and 546, to be authorised by the Limpopo Department of Economic Development, Environment and Tourism (LEDET); and
- A Water Use License Application (WULA) in terms of the National Water Act (Act No 36 of 1998) (NWA), authorised by the Department of Water and Sanitation (DWS).

Project Location

Table 2 presents the farms in the Der Brochen Project area.

Table 2: Properties associated with the Der Brochen Project

Farm name	RPM Mining rights	Surface rights
Richmond 370 KT	Platinum Group Metals (PGMs)	Bleskop Mining (owned by RPM)
St George 2 JT	PGM	RPM
Hermansdal 3 JT	PGM	JJ Joubert
Hebron 5 JT	PGM	Windfall 38 Prop
Helena 6 JT	PGM	RPM

Farm name	RPM Mining rights	Surface rights
Der Brochen 7 JT	PGM	RE – RPM Portion 3 - Micauwber
Mareesburg 8 JT	None	RE – RPM Portion 1 & 2 – Samancor Portion 6 - Eastplats

Project Description

Current activities

Current activities at Der Brochen are as follow (all approved by EMPs):

- Mototolo Concentrator;
- Helena TSF;
- Mine offices (old farm house) and access road;
- The Helena and Richmond wellfields (only two boreholes per well field currently in use);
- Monitoring weirs (five) with four of the weirs up and downstream of the two wellfields currently monitored;
- Prospecting activities comprising of site preparation, drilling of prospecting boreholes, site rehabilitation and monitoring;
- Trial mining area on the Richmond farm (activity is completed, and the soil stockpile and waste rock dump are well vegetated); and
- Monitoring of surface and groundwater.

The Helena concentrator and TSF form part of the Mototolo Joint Venture (JV). The Mototolo JV is an agreement between GlencoreXstrata and RPM which outlines that the underground mining of the platinum and chrome from the Borwa and Lebowa shafts on Thorncliffe farm and the transportation of the ore to the Mototolo Concentrator, are managed by GlencoreXstrata (and form part of their mining right), whilst RPM is responsible for the processing of the ore in the Concentrator and the tailings stored on the Helena TSF.

Proposed activities to be approved

RPM is considering development of two open pits (northern and southern pits) to mine the oxidised layers of the Upper Group 2 (UG 2) Reef. The Life of Mine (LOM) for the northern pit is expected to be 3.5 to 4 years, while the southern pit life of mine will be 2 years. It is expected that ore production in both pits will be 35 000 to 45 000 tonnes per month. The ore will be crushed using a mobile crusher.

To accommodate the proposed open pits, the existing 132 kV power line on the western side of the Groot-Dwars River will need to be re-routed to run along the eastern side of the Groot-Dwars River.

Waste rock from the north open pit will be used as an embankment for a proposed Co-Disposal Facility that will be constructed over the backfilled (with tailings) Northern Pit.

Lastly, RPM proposed to expand the previously approved Mareesburg TSF footprint. Pipelines will be constructed from the Mototolo Concentrator to the Mareesburg TSF for transportation of tailings and water.

Alternatives considered

The sections below provide a summary of the alternatives that were considered for the proposed new activities at Der Brochen.

Mining method alternatives

Geological exploration of the ore-body has identified a highly variable weathering depth in certain areas of the project. It will not be economically feasible to mine these areas of the ore-body by means of underground mining methods. Hence open pit mining methods, making use of blasting, will be undertaken. Open pit mining has greater environmental implications than underground mining, but for economic and stability reasons it is not possible to mine the upper 80 m by means of underground methods.

Ore processing alternatives

The platinum ore in the upper portion of the ore-body is oxidised and cannot be processed together with the current underground ore in the existing Mototolo Concentrator. The Mototolo Concentrator is running at capacity processing ore from the deeper underground mining by the Glencore/Xstrata – RPM Joint Venture. Given that the life of the open pit is only 6 years, it is not economically feasible to construct a new concentrator or to expand the capacity of the existing Mototolo Concentrator to process the oxidised ore. Therefore ore will be transported by truck to another concentrator for processing. It has not yet been confirmed where this oxidised ore will be processed, but a number of off-site alternative concentrators are being considered by RPM. These alternatives do not form part of the existing EMP Amendment.

Location of mine infrastructure

The project will have minimal mine infrastructure, the most important being the ore stockpiles and the mobile crusher. These positions have been selected based on environmental factors such as topography, vegetation cover and proximity to the Groot-Dwars River.

Water supply

The project has a proven and approved water supply in the well field on Richmond and will obtain water from this source when required. The project also has a small allocation of water from the Der Brochen dam situated south of the southern project boundary.

A further water supply alternative is a source of pit water from the northern and southern pits. This water will consist of seepage water and contaminated rainfall that will be used as make-up water for the Concentrator.

Summary of the Baseline Environment

Specialist studies have been completed and updated to reflect the current environmental and social conditions and trends and these are summarised in Table 3.

Table 3: Description of the baseline environment for the Der Brochen project

Aspect	Description
Geology	The Der Brochen Project area is located within the 66 000 km^2 eastern limb of the Bushveld Complex. It comprises an assemblage of layered ultramafic to felsic Proterozoic plutonic and volcanic rocks. Der Brochen lies approximately 40 km south-east of the Steelpoort fault in the Rustenburg Layered Suite of the complex. Approximately 9 km of Upper Group 2 (UG2) reef and 13 km of Merensky Reef (MR) horizons outcrop within the Der Brochen Project area, with a 170 m reef parting. The UG2 reef dips to the west at an average angle of 10° on Richmond farm, on the northern and central portions of Helena, as well as on Der Brochen farm.
Topography	The area is characterised by a rugged topography with the relief measuring between 940 m and over 2 000 m above sea level. The prominent north-south trending Steenkamps Mountains extend across the study area, with two deeply incised valleys lying in a north-south direction between the mountain ranges. Within these valley floors are the Groot-

Aspect	Description
	Dwars River in the east and the Klein-Dwars River in the west (both flowing northwards through the area).
Climate	Der Brochen falls within the Highveld climatic region. This climatic region is associated with warm temperature and summer rainfall. The average daily maximum temperature for the region is 27°C in January and 17°C in July, and average daily minimum for the region vary from 13ºC in January to 0ºC in July. The average annual rainfall for this climatic region is approximately 737 mm and varies from 900 mm in the east to 680 mm in the west, while the average annual evaporation is 1 731 mm. Rainfall is almost entirely derived from heavy showers and thunderstorms and occurs mostly in the summer (85%) from October to March, with a maximum in January. The prevailing wind directions on the site are north-westerly and south-easterly due to the topographical orientation of valleys and ridges in the area.
Soils, Land Capability and Land Use	Soils found in the Der Brochen Project area can be summarised as follows: • Helena farm: broadscale land types include Mispah, Arcadia, Glenrosa, Hutton and Clovelly soils, all having grazing land capabilities, with the Mispah and Hutton soils tending towards wilderness status when shallow and rocky; detailed soil surveys indicated deep and shallow Arcadia and shallow rocky Mispah soils as dominant, with arable/grazing and wilderness/grazing land capabilities respectively; • Der Brochen farm: the land types of the farm are Ib154b (Mispah soils of wilderness land capability), Dc31b (Arcadia soils of grazing/arable potential) and Ib30c (Glenrosa soils of grazing capability); specialists indicated that the rocky Mispah soils have an inherent grazing land capability and Arcadia erosion; and • Mareesburg farm: broadscale land types include Ab29 (Arcadia/Hutton – grazing); Ib31 (Mispah/Glenrosa – grazing); Dc31 (Arcadia/Hutton – grazing) and Fa327 (Glenrosa – grazing); the detailed soil survey in the vicinity of the proposed TSF found rocky Glenrosa soils to dominate (grazing land capability), followed by rocky Mispah soils (grazing land capability) and rocky Arcadia soils (also of grazing land capability).
Biodiversity	The Der Brochen Project area is located within the Sekhukhuneland Centre of Plant Endemism (SCPE). The SCPE is a micro-regional centre of plant endemism because of its exceptionally rich biodiversity and high degree of species endemism. Species are considered endemic because they are unique to a specific region. In addition to the above, the study area is also located within a South African National Biodiversity Institute (SANBI) Priority Area as well as the Sekhukhune Mountainlands Threatened Ecosystem and Critical Biodiversity Area within the Limpopo Conservation Plan (C-Plan). It is also recognised as the Highest Biodiversity Risk for Mining under the recently released (2013) Mining and Biodiversity Guidelines.
Vegetation	The Der Brochen Project area falls within two of the SCPE sub-centres, namely the Roossenekal sub-centre and the Steelpoort sub-centre. Der Brochen is located within the Savanna Biome, with the most recent national vegetation classification indicating it to be part of the Sekhukhune Mountain Bushveld vegetation type Figure 6-2 according to Mucina and Rutherford (2006). This vegetation type is restricted to only the Limpopo and Mpumalanga provinces, occurring strictly at altitudes of 900 – 1 600 mamsl and is listed to be as Least Threatened. However, Mucina & Rutherford state that there are no protected areas for this vegetation type. From the National Herbarium Pretoria Computerised Information System (PRECIS) data, 667 plant species of 109 families have been recorded for quarter degree grid's (QDG) square where the Der Brochen is located (PRECIS data accessed May 2014).
Fauna	No red data species have been recorded for birds, reptiles, mammals, amphibians, bats or spiders during the surveys undertaken for the Der Brochen Project. However, the cicada species *Pycna sylvia*, previously thought to be extinct within the region for 95 years, was encountered on the Helena farm during the survey conducted by the Transvaal Museum in 2002. *Pycna sylvia* is very habitat specific with the majority of individuals found within the eastern and south-eastern sloping areas in conjunction with

Aspect	Description
	Vitex obovata subsp *wilmsii*.
Surface water	The Der Brochen site falls within the Groot-Dwars River catchment within the B41G quaternary in Water Management Area 4. Der Brochen has an existing surface water quality monitoring programme. Water quality on the site is good (within guideline standards) and is well suited for all uses. Elevated calcium and magnesium levels are considered due to the natural geology.
Groundwater	Primary aquifers are present in locally distributed unconsolidated alluvial sediment deposits along the lower reaches of the Klein-Dwars River and Groot-Dwars River. Due to their limited size and/or probable low transmissivity and connectivity to the river baseflow, the primary aquifers are not considered suitable groundwater production targets. Absolute groundwater levels show a positive linear relationship with relief within the catchments. The hydraulic gradient is 0.0075 and closely follows the gradient of the valley. Groundwater use within the Der Brochen mining area is limited to potable water supply purposes. The Der Brochen drinking water is monitored monthly and forms part of the quarterly monitoring programme by GCS on behalf of RPM. All other potable and process water is currently obtained from the Lebalelo Water User Association via a Pipeline for the Mototolo JV. Groundwater use for domestic and livestock farming has decreased. The quality of the groundwater is slightly alkaline (pH in the range of 7.2 to 8.2) with average mineralisation (TDS between 300 to 1 000 mg/l). This is typical for groundwater in the Bushveld Complex. Numerous analysed constituents exceed the current WUL (2011) and South African Drinking water quality (2011) limits in pollution source monitoring boreholes, which are generally downstream/ adjacent of the Helena TSF and RWDs, suggesting an impact of leachate from these sources on the ambient groundwater quality. A concern is the increasing trend in sulphate concentrations.
Air Quality	The slope of the terrain accounts for the increased frequency of occurrence of northerly and north-westerly winds during the day-time and increased south-easterly winds during the night time. The differential heating and cooling of the air along a slope typically results in down-slope (katabatic) flow at night, with low-level up-slope (anabatic) airflow occurring during the day. Der Brochen has an existing dust fallout monitoring network. The measured dust fallout rates in 2013 indicate compliance with Dust Control Regulations at all monitoring sites. Simulated dust fallout rates at the closest identified sensitive receptors due to current activities at the Helena TSF only, were within the National Dust Control Regulation limit of 600 mg/m²/day and considered acceptable for non-industrial areas
Cultural Heritage	No National or Provincial Monuments of conservation importance exist within the Der Brochen Project area. There are a number of graves within the site of high significance, requiring fencing or relocation. Other sites of significance include *Eiland* dagas, tenant households, kraals, ruins and *Eiland* or *Leolo* pottery.
Socio-Economic	The project falls within the boundaries of the Greater Tubatse Local Municipality of the Sekhukhune District Municipality and borders the Thaba Chweu Local Municipality of the Ehlanzeni District Municipality. The area is characterised by high levels of poverty, low levels of education and low levels of employment. Communities within and around the Der Brochen Mining Right area include: • Ga-Mawela; • Maganae and Leshaba; • Matjomane and Mogashoa; • Pakaneng; and • Mawela. Services within and around the project area include sanitation, refuse removal, water and power supply.

Stakeholder Engagement

As part of the environmental authorisation process, a stakeholder engagement process is required to provide sufficient and accessible information regarding the proposed project to stakeholders, in an objective manner.

The following stakeholders were identified during the stakeholder identification process:

- Provincial Government;
- Municipalities;
- Tubatse Steelpoort Foundation;
- Traditional Authorities;
- Communities (within and around the project area);
- Land Claimants;
- Adjacent Landowners;
- Business and Commerce;
- Landowner Associations and Conservancies;
- Mining and Industry;
- Non-governmental organisations;
- Parastatal organisations;
- Safety and security;
- Transport; and
- Water Management Entities and Environment.

Table 4 summarises the stakeholder engagement process undertaken to date and indicates the tasks and activities undertaken for the Scoping and Impact Assessment Phases.

Table 4: Summary of the stakeholder engagement process for the Der Brochen Project

Task	Activities	Project Phase
Activities undertaken to date		
Identification of potential stakeholders	Identification of potential stakeholders through a process of discussions with the Der Brochen team and networking.	Pre-application phase
Pre-announcement consultation	Pre-announcement consultation was undertaken with key stakeholders and affected parties during February 2014 to obtain an early understanding of stakeholder issues and concerns to inform the stakeholder engagement process.	Pre-application phase
Project Announcement	The Der Brochen EMP Alignment and Amendment was announced as follows: • Distribution of a notification letter, Background Information Document (BID) and registration and comment sheet and making them available at several public places. • Two site notices (English and Sepedi) were placed at various locations in the project area. • Advertisements were placed in the Platinum Gazette (English and Sepedi) and the Seipone (Sepedi) on 5 and 7 March 2014	Scoping Phase

Task	Activities	Project Phase
	respectively. • Focus group meetings were held from 27 – 29 March 2014.	
Availability of the Draft Scoping Report (DSR)	The DSR was made available for public comment from 16 April to 2 June 2014. The availability was announced by means of personally addressed letters to stakeholders, as well as advertising the DSR's availability in the Platinum Gazette (English) and the Seipone (Sepedi) on 16 April 2014.	Scoping Phase
Stakeholder Feedback on DSR	Focus group meetings were held from 29 – 31 May and on 26 June 2014 to provide feedback regarding the scoping phase of the project and for stakeholders to verify that their comments have been considered.	Scoping Phase
Availability of the Final Scoping Report	The FSR was made available for public comment from 8 to 29 July 2014. The availability was announced by distributing a letter and comment sheet to registered stakeholders.	Scoping Phase
Acceptance of the FSR	The FSR and Plan of Study for the impact assessment were accepted on 3 September 2014 by the DMR and on 23 October 2014 by LEDET. Registered stakeholders were notified by means of a letter.	Scoping Phase
Availability of the Draft EIA/EMP	The Draft EIA/EMP was made available for public comment from 8 December 2014 to 6 February 2015. The availability of the Draft EIA/EMP was announced as follows: • Distribution of a letter and comment sheet to all registered stakeholders; • Letter and comments sheets will be made available in public places; and • Advertising in the Platinum Gazette and Limpopo Rise and Shine newspapers.	Impact Assessment Phase
Stakeholder feedback on Draft EIA/EMP	Focus group meetings were held in January 2015 to provide feedback on the impact assessment of the project and for stakeholders to verify that their comments had been considered.	Impact Assessment Phase
Availability of the Final EIA/EMP	The Final EIA/EMP, incorporating comments received by stakeholders during the comment period on the Draft EIA/EMP, will be made available for public comment from 23 March – 15 April 2015. The availability will be announced by distributing a letter and comment sheet to registered stakeholders. The availability of the Final EIA/EMP will be announced as follows:	Impact Assessment Phase

Task	Activities	Project Phase
	• Distribution of a letter and comment sheet to all registered stakeholders; • Letter and comments sheets will be made available in public places;	
Notification of authority decision	Letters notifying stakeholders of the authorities' decision will be distributed to registered stakeholders. The record of decision will also be advertised in the Platinum Gazette and Seipone.	Decision making phase

The Comment and Response Report (CRR) captures all the comments received and issues identified by stakeholders during the Scoping and Impact Assessment Phases to date. The CRR also includes responses form RPM and the project team and is updated continuously throughout the environmental authorisation process.

Key comments received from stakeholders include:

- Land claims complexity and restitution process (Different grouping claiming same portions of farms);
- Recognition of leadership and chieftainship disputes;
- Importance of cultural heritage particularly linked to ancestral graves and historical links to the areas;
- Stakeholder benefitting from mining and particularly the Der Brochen Project;
- Shareholding in Der Brochen Project;
- Inability of AAP (Der Brochen Project) to sustain relationship with communities effectively;
- Lack of services and housing in the area;
- Pressure on infrastructure;
- Change in land-use;
- Economic impacts (positive): includes job creation, skills development and opportunities for small and medium sized enterprises;
- Economic impacts (negative): includes competition for jobs, possible community unrest related to labour issues;
- Decrease in water quality;
- Increased dust, noise, traffic; and
- Impact on air quality - Potential increase in respiratory diseases.

Impact Assessment

The environmental impact assessment has been undertaken according to SRK's impact assessment methodology which follows international impact assessment principles and procedures. The impact assessment is divided into three parts:

- Issue identification;
- Impact definition; and
- Impact evaluation.

Table 5 provides a summary of the high significant impacts of the Der Brochen Project rated pre and post mitigation. The detailed impact assessment is described in Chapter 7.

Table 5: Summary of the impacts associated with the Construction Phase of the Der Brochen Project

Aspect	Impact description	Pre-mitigation	Post-mitigation
Soils, Land Capability and Land Use	Loss of soil resources at sites where Tailings Dam starter walls will be located during construction of the Mareesburg TSF	**HIGH (-)**	**MEDIUM (-)**
	Loss of land of arable/grazing potential during construction of the Mareesburg TSF	**HIGH (-)**	**MEDIUM (-)**
Biodiversity	Removal and loss of vegetation communities with a High / Medium- High Significance including wetland/ephemeral systems during construction of the Northern and Southern Open Pits	**HIGH (-)**	**HIGH (-)**
	Increase in alien invasive species impacting on natural plant community structures during construction of the Northern and Southern Open Pits	**HIGH (-)**	**MEDIUM (-)**
	Loss of natural habitat during construction of the Mareesburg TSF	**HIGH (-)**	**HIGH (-)**
	Disturbance/loss of vegetation species and communities of conservation importance, loss of biodiversity and the risk of losing unknown biodiversity due to clearing of vegetation during construction of the Mareesburg TSF	**HIGH (-)**	**HIGH (-)**
	Disturbance/loss of insect species/communities of conservation value due to loss of habitat and habitat fragmentation during construction of the Mareesburg TSF	**HIGH (-)**	**MEDIUM (-)**
	Loss of communities that have a National, Provincial and Local significance and Conservation Importance species during construction of the Mareesburg TSF	**HIGH (-)**	**MEDIUM (-)**
Wetlands	Impact on drainage line vegetation habitats during construction of the Northern and Southern Open Pits	**HIGH (-)**	**LOW (-)**
Cultural Heritage	Demolition or relocation of cultural heritage sites resulting in the disturbance of significant sites and graves during construction of the Northern and Southern Open Pits	**HIGH (-)**	**MEDIUM (-)**
	Disturbance or destruction of historical and cultural sites during the construction of Mareesburg TSF	**HIGH (-)**	**MEDIUM (-)**
	Disturbance or destruction of historical and cultural sites during the removal of the 132kV Powerline and Construction of the Powerline on the proposed new route	**HIGH (-)**	**LOW (-)**

Table 6: Summary of the impacts associated with the Operational Phase of the Der Brochen Project

Aspect	Impact description	Pre-mitigation	Post-mitigation
Geology	Impact on Geology during the operation of the Northern and Southern Open Pits	**HIGH (-)**	**MEDIUM (-)**
Soils, Land Capability and Land Use	Loss of soil resources due to erosion during the operation of the Mototolo Concentrator and Chrome Plant	**HIGH (-)**	**MEDIUM (-)**
	Loss of soil resources due to erosion during the operation of the Access Roads	**HIGH (-)**	**MEDIUM (-)**

Aspect	Impact description	Pre-mitigation	Post-mitigation
Biodiversity	Changes in community structure and population dynamics of floral species during the operation of the Northern and Southern Open Pits	**HIGH (-)**	**HIGH (-)**
	Loss of insect species / communities of conservation value due to direct impacts such as loss of habitat or habitat fragmentation and indirect impacts such as dust and noise during the operation of the Helena TSF and associated infrastructure	**HIGH (-)**	**MEDIUM (-)**
Surface Water	Deterioration in water quality in the Dwars River due to release of tailings, return water or leachate to the natural environment during the operation of the Co-Disposal Facility	**HIGH (-)**	**MEDIUM (-)**
	Deterioration in surface water quality due to increased sediment load during the operation of the Mareesburg TSF and Pipelines	**HIGH (-)**	**MEDIUM (-)**
	Contamination of surface water bodies due to diffuse pollution during the operation of the operation of the Mareesburg TSF and Pipelines	**HIGH (-)**	**MEDIUM (-)**
Groundwater	Deterioration of groundwater quality at the Tailings Dam during the operation of the Mareesburg TSF and Pipelines	**HIGH (-)**	**MEDIUM (-)**
	Contaminant plume migration (deterioration of groundwater and surface water quality) during the operation of the Mareesburg TSF and Pipelines	**HIGH (-)**	**MEDIUM (-)**
Socio-economic	Influx of employees during the Operational Phase.	**HIGH (-)**	**MEDIUM (-)**

Table 7: Summary of the impacts associated with the Decommissioning and Closure Phase of the Der Brochen Project

Aspect	Impact description	Pre-mitigation	Post-mitigation
Surface Water	Contamination of surface water resources during decommissioning and closure of the Mareesburg TSF, Helena TSF and Co-Disposal Facility	**HIGH (-)**	**MEDIUM (-)**
Groundwater	Contamination of groundwater during decommissioning and closure of the Mareesburg TSF, Helena TSF and Co-Disposal Facility	**HIGH (-)**	**MEDIUM (-)**
Socio-economic	Sustainability of livelihoods at mine closure	**HIGH (-)**	**MEDIUM (-)**
	Negative social and socio-economic impacts as a result of mine decommissioning and closure	**HIGH (-)**	**HIGH (-)**

Environmental Management Programme

The Environmental Management Programme provides information on the following:

- Objectives, management measures, management criteria and responsibilities of potential impacts (biophysical and socio-economic) during construction, operation, decommissioning and closure. Management recommendations followed the management hierarchy:
    - Avoidance;
    - Minimisation;
    - Mitigation and management; and
    - Offsets.

This EMP incorporates commitments made in the existing approved Der Brochen EMPs, as well as contains mitigation/management measures associated with the newly proposed Der Brochen activities during all mining phases.

Management measures described in italics have been copied from previous EIA/EMPs and have been marginally modified so as to only remove activities no longer covered by the current application and measures that are no longer applicable. New measures covering the proposed activities are presented in regular font in the EMP.

The EMP also includes the following:

- Environmental emergency response planning;
- Environmental Awareness planning;
- Monitoring of the EMP;
- Closure liability assessments; and
- Financial Provision.

Conclusion

This EIA/EMP has been prepared to consolidate and align all previous Der Brochen EMPs and to inform the environmental authorisation for the proposed new activities. The EIA/EMP has been structured to meet the requirements of Section 39 of the MPRDA, Regulations 50 and 51 in terms of the MPRDA and Section 31(2) and 33 of Regulation R543 of NEMA. Once approved, this aligned and amended EIA/EMP will supersede all previous Der Brochen EMPs.

No fatal flaws in the project have been identified thus far through the EIA process. However, several environmental and social impacts are envisaged from construction phase through to post-closure, which require careful mitigation and monitoring. It is the opinion of the EAP that all major impacts have been identified and have been assigned appropriate management measures, as discussed in Chapters 7 and 8. Most HIGH negative impacts, with mitigation are reduced to a MEDIUM or LOW significance, and can be managed accordingly.

It is recommended that the proposed Der Brochen Project is allowed to proceed on the assumption that the environmental and social management commitments are adhered to, the project description remains as per the description provided in this document and considering the positive social impacts associated with the project. The Der Brochen Project will ensure continued employment for those at the existing Mototolo Concentrator and Der Brochen, as well as new employment opportunities associated with the new proposed activities.

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List of Abbreviations

AAP	Anglo American Platinum
ABA	Acid Base Accounting
AMD	Acid Mine Drainage
ARD	Acid Rock Drainage
ARM	African Rainbow Minerals
ASPT	Average Score Per Taxa
BBBEE	Broad Based Black Economic Empowerment
BID	Background Information Document
BPG	Best Practice Guidelines
BV	Biodiversity Value
C	Construction
CDF	Co-Disposal Facility
CED	Community Engagement and Development
CEF	Community Engagement Forum
CI	Conservation Importance
COGTA	Department of Cooperative Government and Traditional Affairs
CPA	Communal Property Association
C-Plan	Limpopo Conservation Plan
CRR	Comments and Responses Report
D	Decommissioning and Closure
Der Brochen	Der Brochen Project
DME	Department of Minerals and Energy
DMR	Department of Mineral Resources
DSR	Draft Scoping Report
DWA	Department of Water Affairs
DWAF	Department of Water Affairs and Forestry
DWS	Department of Water and Sanitation
E	Endangered
EAP	Environmental Assessment Practitioner
EC	Electrical Conductivity
ECO	Environmental Control Officer
EDM	Ehlanzeni District Municipality
EIA	Environmental Impact Assessment
EIS	Ecological Importance and Sensitivity
EMP	Environmental Management Programme
EMS	Environmental Management System
EPRP	Emergency Preparedness and Response Plan
ESA	Early Stone Age
FDDA	Four Dimensional Data Assimilation

FG	Financial Guarantees
FHA	Fish Habitat Assessment
FOS	Factor of Safety
FRAI	Fish Response Assessment Index
FSR	Final Scoping Report
GTLM	Greater Tubatse Local Municipality
GVA	Gross Value Added
HCR	Habitat Cover Rating
HDPE	High Density Polyethylene
Helena TSF	Helena Tailings Storage Facility
HIA	Health Impact Assessment
HOH	Head of Household
I&APs	Interested and Affected Parties
IDP	Integrated Developed Plan
IEM	Integrated Environmental Management
IFC	International Finance Corporation
IHAS	Invertebrate Habitat Assessment System
IHI	Index of Habitat Integrity
IHIA	Intermediate Habitat Integrity Assessment
IWUL	Integrated Water Use Licence
IWULA	Integrated Water Use Licence Application
IWWMP	Integrated Water and Waste Management Plan
JV	Joint Venture
LED	Local Economic Development
LEDET	Limpopo Department of Economic Development, Environment and Tourism
LIBSA	Limpopo Business Support Agency
LM	Local Municipality
LOM	Life of Mine
LSA	Late Stone Age
LWUA	Lebalelo Water Users Association
mamsl	metres above mean sea level
MAP	Mean Annual Precipitation
MAR	Mean Annual Runoff
MIA	Middle Iron Age
MIRAI	Aquatic Macro-Invertebrates: Macro-invertebrate Response Assessment Index
MPRDA	Mineral and Petroleum Resources Development Act
MR	Merensky Reef
MSA	Middle Stone Age
MTPA	Mpumalanga Tourism and Parks Agency
NAAQS	National Ambient Air Quality Standards
NAFCOC	National African Federated Chamber of Commerce and Industry

NAG	Net Acid Generation
NEMA	National Environmental Management Act
NEMBA	National Environmental Management Biodiversity Act
NFEPA	National Freshwater Ecosystem Priority Areas
NPA	National Priority Area
NSS	Natural Scientific Services
NT	Near Threatened
NWA	National Water Act
O	Operational
OREWRA	Olifants River Ecological Water Requirements Assessment
PC	Post Closure
PCCT	Pakaneng Choma Community Trust
PCD	Pollution Control Dam
PCLU	Post Closure Land Use
PES	Present Ecological State
PGMs	Platinum Group Metals
PGS	Professional Grave Solutions
POSA	Plants of Southern Africa
PPE	Personal Protective Equipment
PPV	Peak Particle Velocity
PRECIS	National Herbarium Pretoria Computerised Information System
QDG	Quarter Degree Grid’s
RDL	Red Data List
REC	Recommended Ecological Category
RHP	River Health Program
RPM	Rustenburg Platinum Mines Limited
RS	Rock Sheets
RWD	Return Water Dam
SAHRA	South African Heritage Resources Agency
SANS	South African National Standards
SANAS	South African National Accreditation System
SANBI	South African National Biodiversity Institute
SAPS	South African Police Services
SAS	Scientific Aquatic Services
SASS5	South African Scoring System version 5
SCPE	Sekhukhuneland Centre of Plant Endemism
SDM	Sekhukhune District Municipality
SEAT	Socio-Economic Assessment Toolbox
SHE	Safety Health and Environment
SLP	Social and Labour Plan
SRK	SRK Consulting (South Africa) Pty Ltd

subWMA	SubWater Management Areas
TC	Traditional Council
TCLM	Thaba Chweu Local Municipality
TDS	Total Dissolved Solids
ToR	Terms of Reference
tpm	tonnes per month
TPSP	Threatened Plant Species Programme
TSF	Tailings Storage Facility
UG2	Upper Group 2
USBM	United States Bureau of Mines
VEGRAI	Riparian Vegetation Response Assessment Index
VHHC	Vhufa Hashu Heritage Consultants
WHO	World Health Organisation
WMA	Water Management Area
WRD	Waste Rock Dump
WULA	Water Use Licence Application

1 Introduction and Background

1.1 Introduction

SRK Consulting (South Africa) Pty Ltd (SRK) has been appointed by Anglo American Platinum Limited (AAP) to facilitate and manage the alignment of all approved existing Environmental Management Programmes (EMPs) for the Der Brochen Project (Der Brochen), as well as amend the EMP to include new mining activities requiring environmental authorisation.

Der Brochen is a platinum project owned by Rustenburg Platinum Mines Limited (RPM), a wholly owned subsidiary of AAP, and is located approximately 25 km south-west of the town of Steelpoort and 40 km west of Mashishing (Lydenburg), in the Limpopo Province. The project area falls within the Greater Tubatse Local Municipality, under jurisdiction of the Greater Sekhukhune District Municipality. Figure 1-1 provides the regional location of the Der Brochen Project.

1.1.1 Alignment process

Environmental and social baseline and monitoring studies for Der Brochen commenced in 2001 and a number of studies have been undertaken since then and are amongst the various EMP reports approved by the Department of Mineral Resources (DMR) (previously known as the Department of Minerals and Energy (DME)). The DMR issued a directive in May 2013 instructing RPM to align all previously submitted EMPs for Der Brochen, and consolidate them into a single document. The EMPs to be consolidated are as follows:

- Der Brochen Mine EMP, submitted in November 2002 (approved on 16 April 2003);
- EMP Amendment: Trial Mining Phase, submitted in July 2003 (approved on 30 April 2004);
- EMP Amendment: Klein Dwars River Wellfields, submitted in April 2004;
- EMP Amendment: Helena Tailings Storage Facility (TSF), submitted during April 2005 (approved in October 2005);
- EMP Amendment: Helena Chrome Plant, submitted in May 2006 (approved in 2006);
- EMP Amendment for ongoing prospecting, submitted during July 2007;
- EMP Amendment: Richmond Early Mine, submitted in May 2010 (not approved); and
- EMP Amendment: Raising the height of the Helena TSF (submitted in September 2014).

The main purpose of this aligned EMP is to consolidate existing and approved Der Brochen environmental programmes into one document. The alignment process will also assist in minimising duplication of information and promote consistency in fulfilling the project's set environmental and socio-economic objectives and goals.

1.1.2 Amendment process

In addition to the alignment process, RPM proposes undertaking new activities that have not been authorised in the existing EMPs. These activities will be included in this Final Environmental Impact Assessment (EIA)/EMP. The following newly proposed activities require authorisation:

- Two Open Pits (Northern and Southern Pits);
- Re-routing of a 132 kV powerline;
- The raising of the existing Helena TSF;
- A Co-Disposal Facility (tailings disposal with a rock embankment in the north pit); and
- An expansion to the previously approved Mareesburg TSF and associated infrastructure.

SRK will oversee the environmental assessment process and compile the relevant documentation for submission to the competent authorities in order to obtain authorisation for these activities. The following environmental authorisations are required for this EMP Alignment and Amendment:

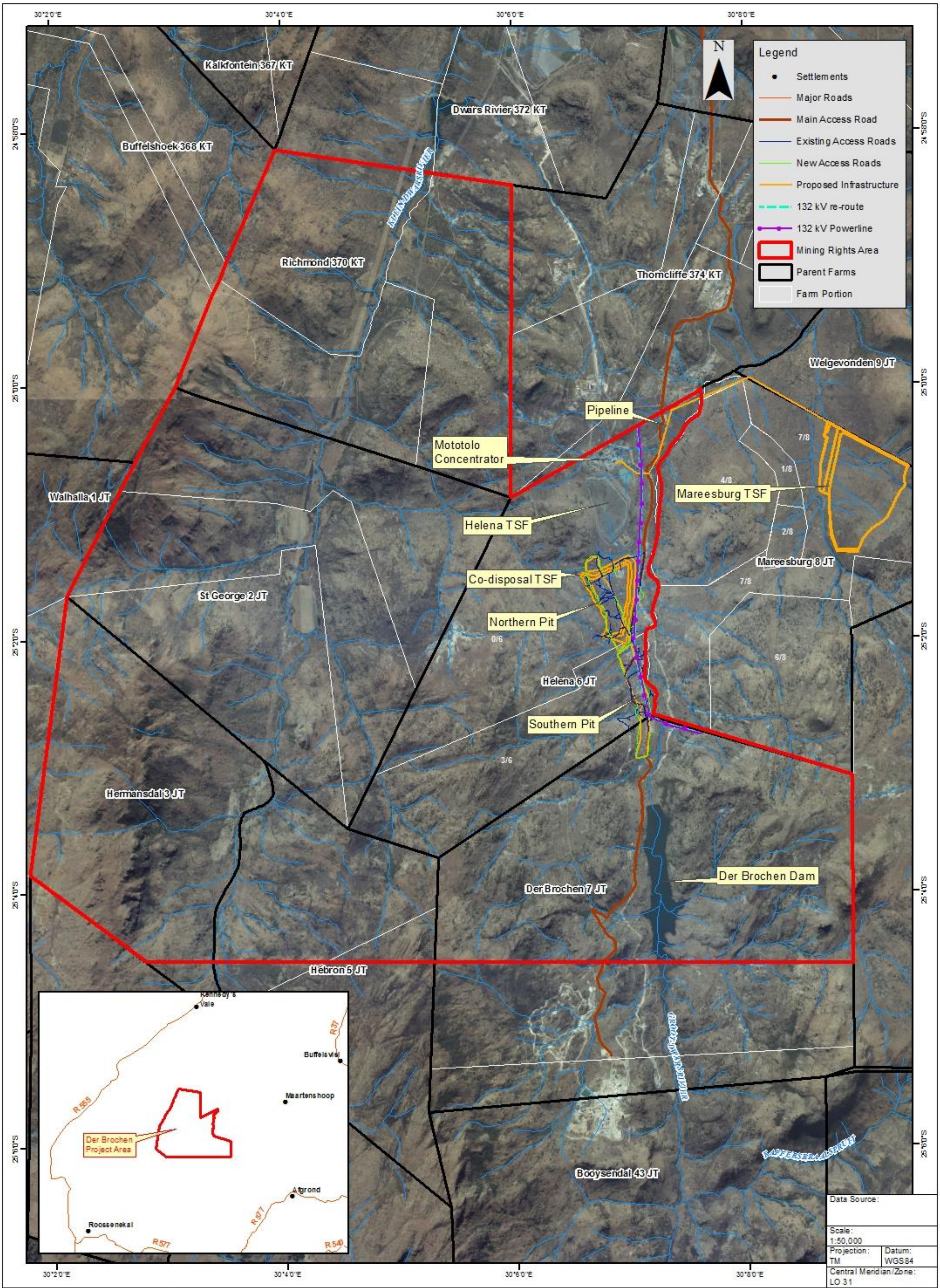
- An EMP Alignment and Amendment in accordance with the Mineral and Petroleum Resources Development Act (Act 28 of 2002) (MPRDA) and its associated Regulations 50 and 51, to be authorised by the DMR;
- An EIA/EMP as per the National Environmental Management Act (Act No. 107 of 1998) (NEMA) and its associated Regulations 544, 545 and 546, to be authorised by the Limpopo Department of Economic Development, Environment and Tourism (LEDET); and
- A Water Use Licence Application (WULA) in terms of the National Water Act (Act No 36 of 1998) (NWA), authorised by the Department of Water Affairs and Sanitation (DWS).

It was RPM's request that these additional activities be included in the proposed EMP Amendment and Alignment and be covered by a single stakeholder engagement process.

1.2 Background to Der Brochen

RPM and Glencore/Xstrata have a joint venture between them, called the Mototolo Joint Venture (JV) that involves the underground mining of platinum by Glencore/Xstrata and the processing of ore and disposal of tailings by RPM (Der Brochen). Der Brochen is currently a project and is not an operational mine as of yet and existing activities associated with Der Brochen focus on processing ore from the Mototolo JV through a Concentrator and storage of tailings from this process on the Helena Tailings Storage Facility (Helena TSF) .

Der Brochen was the holder of an Item 7 Schedule II old order mineral right (for platinum) in terms of the Minerals Act (Act No. 50 of 1991) (ML 11/2003). This right was issued by the DME. Subsequently, the mineral right has been converted to a new order mining right in terms of the MPRDA in 2010 (MP 302 MR) by the DMR. Figure 1-1 shows the location of Der Brochen's mining right area.



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DER BROCHEN

LOCALITY MAP

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1.3 Purpose of this report

In accordance with the DMR's directive issued in May 2013 and verbal discussions with DMR, the first phase of the EMP Consolidation process is the Scoping Phase, which was completed in early August 2014. Following the Scoping Phase, the EMP Alignment and Amendment is required. The objective of the EMP Alignment and Amendment is to align Der Brochen's existing and approved EMPs with the MPRDA and associated Regulations, as well as include newly proposed activities.

The primary objectives for this EMP alignment and amendment process are to:

- Adhere to the DMRs directive in submitting a consolidated EMP in compliance with Section 39, Regulations 50 and 51 of the MPRDA;
- The EIA/EMP must also comply with the requirements set out by the NEMA and NWA;
- Compile one concise, consolidated and auditable EMP from all existing approved Der Brochen EMPs;
- Provide a source document that maintains the contextual understanding of infrastructure that has been approved, constructed and still needs to be constructed;
- Update baseline information to reflect current biophysical and socio-economic trends within and around the Der Brochen Project area;
- Consolidate repeated commitments, align the commitments of the consolidated EMP and monitor the implementation of these commitments; and
- Include additional proposed activities that have not been authorised by the DMR or LEDET, in existing EMPs and identify potential impacts and mitigation measures for these new activities.

1.4 Report Structure

Information presented in this Final EIA/EMP report is set out as follows:

Chapter 1: Introduction

This chapter provides an introduction to the proposed Der Brochen EMP Alignment and Amendment project, and provides background to RPM and Der Brochen.

Chapter 2: Project Details

This Chapter presents information on the Proponent details, the Environmental Assessment Practitioner (EAP) details and the competent authorities in the process, as well as the properties potentially affected in the Der Brochen Project area.

Chapter 3: Methodology

This chapter details the objectives of the EIA/EMP Phase, as well as the legal frameworks under which the application is legislated and the details of the process followed. It also provides information regarding the process followed in the Scoping Phase for this project, the various specialist studies undertaken and the assessment methodology of impacts identified during the EIA/EMP Phase. An overview of the Stakeholder Engagement process undertaken during the scoping and impact assessment phases is also discussed in this chapter.

Chapter 4: Project Description

This chapter provides details of the project and infrastructure required for the proposed project. It also describes the Der Brochen Project location, history of the project, project activities (existing and proposed) and alternatives considered. The motivation for the project is also addressed in this chapter.

Chapter 5: Stakeholder Engagement

This chapter outlines previous and current Stakeholder Engagement processes undertaken as part of the EMP Alignment and Amendment process, including the scoping and impact assessment phases. The identification of stakeholders, compilation of stakeholder databases and issues raised are addressed in this chapter.

Chapter 6: Environmental and Social Baseline Description

This chapter provides a current description of the environmental and social baseline of the Der Brochen Project area.

Chapter 7: Environmental Impact Assessment

This chapter presents the methodology used to assess the various biophysical, socio-economic and cultural heritage impacts of the Der Brochen Project, summarises the potential impacts for each activity per mining phase (construction, operation, decommissioning/closure and post-closure) identified and the significance of these impacts.

Chapter 8: Environmental Management Programme

This chapter provides information on the environmental objectives and goals of the project and the mitigation/management measures to address the identified impacts. The EMP also includes the following:

- Management Plans;
- Monitoring Programmes;
- EMP Performance Assessment requirements;
- An Environmental Emergencies and Remediation Procedures; and
- An Environmental Awareness Plan.

Chapter 9: Closure Plan and Financial Provision

This chapter describes the closure vision, specific environmental and social objectives and goals for mine closure, a closure action plan and financial provision for closure.

Chapter 10: Knowledge Gaps

This chapter provides information of the knowledge gaps identified during the EIA process.

Chapter 11: Conclusions

This chapter provides a summary of the document and the concluding remarks of the EAP.

Chapter 12: Undertaking

The Undertaking provides the commitment of RPM/AAP to comply with the relevant legislation applicable to the proposed project.

Chapter 13: References

This section lists the references that were consulted during the drafting of this report.

Appendices

This section provides supporting documentation as referred to in the Final EIA/EMP.

1.5 Legal Structure of Report

The structure and subject headings of this Final EIA/EMP are in terms of the provisions of Section 39, Regulations 50 and 51 of the MPRDA, as well as Sections 31 (2) and 33 of Regulation R543 of the NEMA. These are listed in Table 1-1 and Table 1-2, and cross-referenced to the various sections in this report where these requirements have been addressed.

Table 1-1: Structure of the Final Environmental Impact Assessment in terms of the MPRDA Regulations and NEMA Regulations

MPRDA Regulations- Section 50		**NEMA Regulation R543 Section 31 (2)**	
(a) An assessment of the environment likely to be affected by the proposed mining operation, including cumulative environmental impacts;	Chapter 6 – Baseline Description, Chapter 7- Environmental Impact Assessment	(2) An environmental impact assessment report must contain all information that is necessary for the competent authority to consider the application and to reach a decision contemplated in regulation 35 and must include:	
(b) An assessment of the environment likely to be affected by the identified alternative land use or developments, including cumulative environmental impacts;	Chapter 6 – Baseline Description, Chapter 7- Environmental Impact Assessment	(a) Details of – (i) The EAP who prepared the report; and (ii) The expertise of the EAP to carry out scoping procedures.	Chapter 2
(c) An assessment of the nature, extent, duration, probability and significance of the identified potential environmental, social and cultural impacts of the proposed mining operation, including the cumulative environmental impacts;	Chapter 7	(b) A detailed description of the proposed activity;	Chapter 4
(d) A comparative assessment of the identified land use and development alternatives and their potential environmental, social and cultural impacts;	Chapter 7	(c) A description of the property on which the activity is to be undertaken and the location of the activity on the property, or if it is – (i) a linear activity, a description of the route of the activity; or (ii) an ocean-based activity, the coordinates where the activity is to be undertaken;	Chapter 2
(e) Determine the appropriate mitigatory measures for each significant impact of the proposed mining operations;	Chapter 8	(d) A description of the environment that may be affected by the activity and the manner in which the physical, biological, social, economic and cultural aspects of the environment may be affected by the proposed activity;	Chapter 6
(f) Details of the engagement process of interested and affected persons followed during the course of the assessment and an indication of how the issues raised by interested and affected persons have been addressed;	Chapter 5	(e) Details of the public participation process conducted in terms of subregulation (1), including – (i) Steps undertaken in accordance with the plan of study; (ii) A list of persons, organization and organs of state that were registered as interested and affected parties; (iii) A summary of comments received from, and a summary of issues raised by registered interested and affected parties, the date of receipt of these comments and the response of the EAP to those comments; and (iv) Copies of any representations and comments received from registered interested and affected parties;	Chapter 5
(g) Identify knowledge gaps and report on the adequacy of predictive methods, underlying assumptions and uncertainties encountered in compiling the required information;	Chapter 10	(f) A description of the need and desirability of the proposed activity;	Chapter 4

MPRDA Regulations- Section 50		NEMA Regulation R543 Section 31 (2)	
(h) Description of the arrangement for monitoring and management of environmental impacts and;	Chapter 8	(g) A description of identified potential alternatives to the proposed activity, including advantages and disadvantages that the proposed activity or alternatives may have on the environment and the community that may be affected by the activity;	Chapter 4 – Project Description, Chapter 7 - Environmental Impact Assessment
(i) Inclusion of technical supporting information as appendices, if any.	Chapter 13- References, Appendices A-C	(h) An indication of the methodology used in determining the significance of potential environmental impacts;	Chapter 3 – Methodology, Chapter 7 –Environmental Impact Assessment
		(i) A description and comparative assessment of all alternatives identified during the environmental impact assessment process;	Chapter 4 – Project Description, Chapter 7 - Environmental Impact Assessment
		(j) A summary of the findings and recommendations of any specialists report or report on a specialised process;	Chapter 7
		(k) A description of all environmental issues that were identified during the environmental impact assessment process, an assessment of the significance of each issue and an indication of the extent to which the issue could be addressed by the adoption of mitigation measures;	Chapter 7
		(l) An assessment of each identified potentially significant impact, including – (i) Cumulative impacts; (ii) The nature of the impact; (iii) The extent and duration of the impact; (iv) The probability of the impact occurring; (v) The degree to which the impact can be reversed; (vi) The degree to which the impact may cause irreplaceable loss of resources; and (vii) The degree to which the impact can be mitigated;	Chapter 7
		(m) A description of any assumptions, uncertainties and gaps in knowledge;	Chapter 10
		(n) A reasoned opinion as the whether the activity should or should not be authorized, and if the opinion is that it should be authorized, any conditions that should be made in respect of that authorization	Chapter 11
		(o) An environmental impact statement which contains – (i) A summary of the key findings of the environmental impact assessment; and	Chapter 11

MPRDA Regulations- Section 50	NEMA Regulation R543 Section 31 (2)	
	(ii) A comparative assessment of the positive and negative implication of the proposed activity and identified alternatives;	
	(p) A draft environmental management programme containing the aspects contemplated in regulation 33	Chapter 8
	(q) Copies of any specialist reports and reports on specialised processes complying with regulation 32;	Appendix C
	(r) Any specific information that may be required by the competent authority; and	N/A
	(s) Any other matters required in terms of section 24(4)(a) and (b) of the Act	N/A

Table 1-2: Structure of the Final Environmental Management Programmes in terms of the MPRDA Regulations and NEMA Regulations

MPRDA Regulations- Section 51		**NEMA Regulation R543 Section 33**	
(a) A description of the environmental objectives and specific goals for: (i) Mine closure (ii) The management of identified environmental impact emanating from the proposed mining operations; (iii) The socio-economic conditions as identified in the social and labour plan; and (iv) Historical and cultural aspects, if applicable;	Chapter 8	(a) Details of – (i) The person who prepared the environmental management programme; and (ii) The expertise of that person to prepare and environmental management programme	Chapter 2
(b) An outline of the implementation programme which must include – (i) A description of the appropriate technical and management options chosen for each environmental impact, socio-economic condition and historical and cultural aspects for each phase of the mining operation; (ii) Action plans to achieve the objectives and specific goals contemplated in paragraph (a) which must include a time schedule of actions to be undertaken to implement mitigatory measures for the prevention, management and remediation of each environmental impact, socio-economic condition and historical an cultural aspects for each phase of the mining operation; (iii) Procedures of environmental related emergencies and remediation; (iv) Planned monitoring and environmental management programme performance assessment; (v) Financial provision in relation to the execution of the environmental management programme which must include – a. The determining of the quantum of the financial provision contemplated in regulation 54; and b. Details of the methods providing for financial provision contemplated in regulation 53; (vi) An environmental awareness plan contemplated in section 39(3)(c) of the Act; (vii) All supporting information and specialist report that must be attached as appendices to the environmental management program (viii) An undertaking by the applicant to comply with the provision of the Act and regulation thereto.	Chapter 8	(b) Information on any proposed management or mitigation measures that will be taken to address the environmental impacts that have been identified in a report contemplate by these Regulations, including environmental impacts or objectives in respect of – (i) Planning and design; (ii) Pre-construction and construction activities; (iii) Operation or undertaking of the activity; (iv) Rehabilitation of the environment; and (v) Closure, where relevant.	Chapter 8

MPRDA Regulations- Section 51	NEMA Regulation R543 Section 33	
	(c) A detailed description of the aspects of the activity that are covered by the environmental management programme;	Chapter 4
	(d) An identification of the persons who will be responsible for the implementation of the measures contemplated in paragraph (b)	Chapter 2
	(e) Proposed mechanisms for monitoring compliances with and performance assessment against the environmental management programme and reporting thereon;	Chapter 8
	(f) As far as is reasonably practicable, measures to rehabilitate the environmental affected by the undertaking of any listed activity or specified activity to its natural or predetermined state or to a land use which conforms to the generally accepted principle of sustainable development, including where appropriate, concurrent or progressive rehabilitation measures;	Chapter 8- Environmental Management Programme, Chapter 9- Closure Plan
	(g) A description of the manner in which it intends to – (i) Modify, remedy, control or stop any action, activity or process which causes pollution or environmental degradation; (ii) Remedy the cause of pollution or degradation and migration of pollutants; (iii) Comply with any prescribed environmental management standards or practices; (iv) Comply with any applicable provision of the act regarding closure, where applicable; (v) Comply with any provision of the Act regarding financial provision for rehabilitation, where applicable;	Chapter 8- Environmental Management Programme, Chapter 9- Closure Plan
	(h) Time periods within which the measures contemplated in the environmental management programme must be implemented;	Chapter 8
	(i) The process for managing any environmental damage, pollution, pumping and treatment of extraneous water or ecological degradation as a result of undertaking a listed activity;	Chapter 8
	(j) An environmental awareness plan describing the manner in which (i) The applicant intends to inform his or her employees of any environmental risk which may result from their	Chapter 8

MPRDA Regulations- Section 51	NEMA Regulation R543 Section 33	
	work; and (ii) Risks must be dealt with in order to avoid pollution or the degradation of the environment	
	(k) Where appropriate, closure plans, including closure objectives.	Chapter 9

2 Project details

This section of the report provides the reader with an overview of who the applicant is, details of the environmental assessment practitioner who will oversee and facilitate the environmental process and details of the competent authorities. This section also provides details on the properties within Der Brochen's mining right area including surface right holders and land claims.

2.1 Proponent details

Table 2-1 presents the details of the applicant and mine owner of the Der Brochen Project.

Table 2-1: Applicant and Project Owner details

Name of Project:	Der Brochen Project
Name of Applicant:	Rustenburg Platinum Mines Limited
Contact Person:	Mr Mike Marshall
Physical Address:	55 Marshall Street, Marshalltown
Postal Address:	PO Box 62179 Marshalltown, 2107
Email:	mike.marshall@angloamerican.com
Telephone:	011 373 6807

2.2 Details of the Environmental Assessment Practitioner (EAP)

SRK was appointed by RPM as the independent environmental consultant to facilitate the environmental authorisation application process for the proposed Der Brochen Project.

SRK has more than 30 years' experience in environmental consulting and has assigned a lead EAP and associated project team to undertake the necessary environmental authorisation process. The EAP and project team's details are given in Table 2-2.

Table 2-2: SRK Project Team Details

EAP	Description	Role
Briony Liber (EAP)	Partner	Project Partner and technical reviewer
Joe de Beer	Principal Environmental Scientist	Technical reviewer
Suzanne Venter	Senior Environmental Scientist	Project manager and environmental reporting
Elna de Beer	Senior Stakeholder Engagement Specialist	Stakeholder engagement and reporting
Charissa Tomlin	Environmental Scientist	Project coordinator and environmental reporting

2.3 Competent Authorities

2.3.1 National/Provincial authorities

Environmental Authorisation for the Der Brochen EMP Alignment and Amendment Project is required from the following authorities:

- The Department of Mineral Resources, Limpopo in terms of the MPRDA;
- The Limpopo Department of Economic Development, Environment and Tourism, in terms of NEMA; and
- The Department of Water and Sanitation, in terms of the NWA.

Table 2-3 provides the details of the competent authorities.

Table 2-3: Competent Authority Details

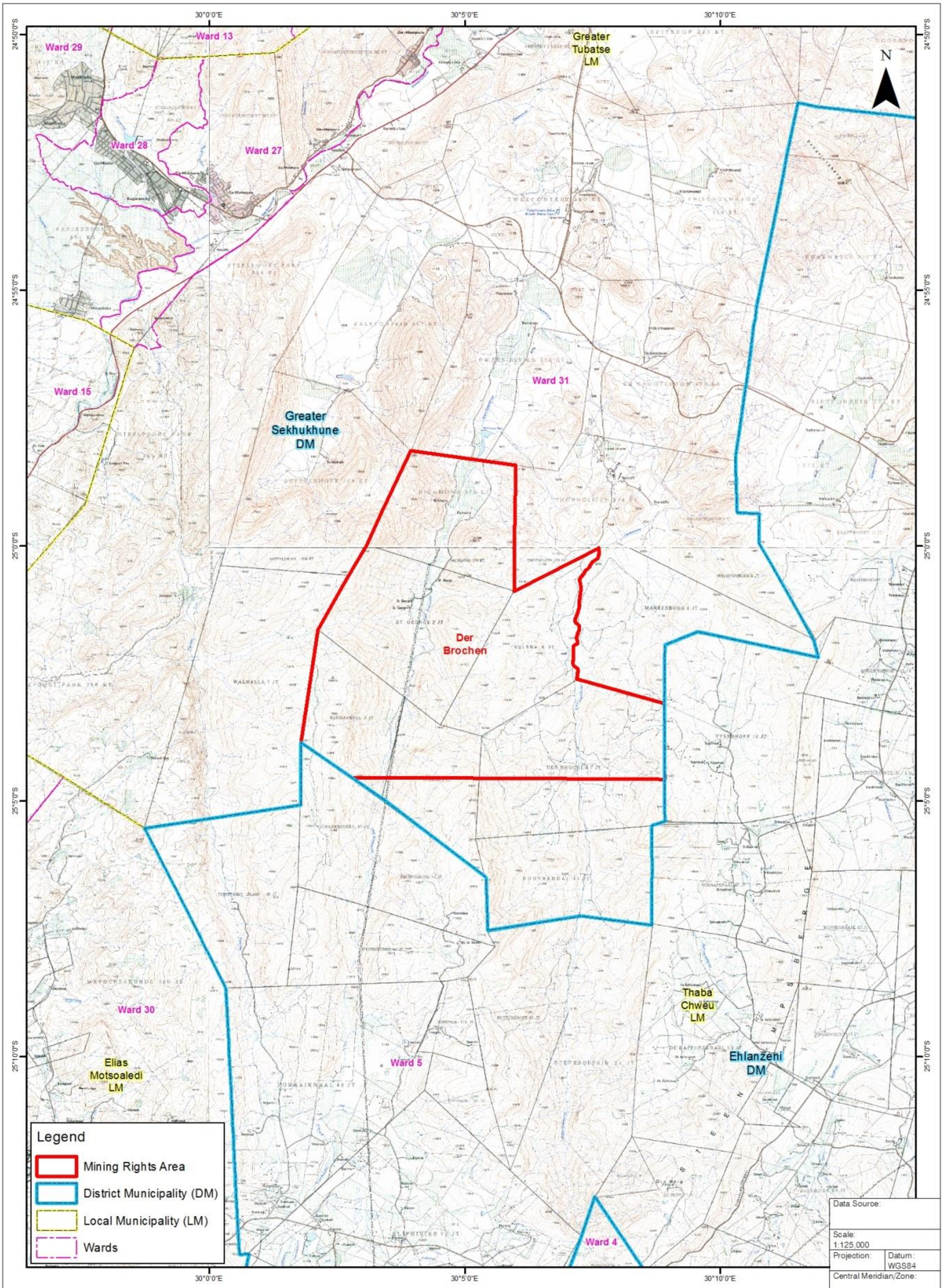
Department	Legal Process	Contact Person	Contact Details	
DMR (Polokwane office)	MPRDA	Cedric Thivhulawi	**Tel:**	015 287 4736
			Email:	Thivhulawi.Kolani@dmr.gov.za
LEDET (Polokwane office)	NEMA	Mr S.W. Mothapo	**Tel:**	015 291 7164
			Email:	mothaposw@ledet.gov.za
DWS (Lydenburg office)	NWA	Lufuno Rambau	**Tel:**	013 235 4206
			Email:	rambaul@dwa.gov.za

2.3.2 Municipality Details

The project area is located within the Greater Sekhukhune District Municipality and Greater Tubatse Local Municipality, in Ward 31. Details of the relevant municipalities are provided in Table 2-4 and municipal boundaries and wards are illustrated in Figure 2-1. Der Brochen borders the Mpumalanga Province in the southern section of the project as is indicated in Figure 2-1, and therefore borders the Ehlanzeni District and Thaba Chweu Local Municipalities.

Table 2-4: Municipality Details

Municipality	Contact Person	Contact Details	
Greater Tubatse Local Municipality	Nelson Mokgotho	**Tel:**	013 231 1000
		Email:	nmokgotho@tubatse.gov.za
Greater Sekhukhune District Municipality	Mohlabana Kgoloko	**Tel:**	079 516 6536
		Email:	kgolokomk@gmail.com



Data Source:		
Scale: 1:125,000		
Projection:	Datum: WGS84	
Central Meridian/Zone:		
Date: 08/04/2014	Compiled by: ELSA	
Project No. 469113	Fig No. 2-1	

srk consulting

DER BROCHEN

MUNICIPAL BOUNDARIES AND WARDS

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2.4 Details of the Mining Right Area

Der Brochen was the holder of an Item 7 Schedule II old order mineral right, for platinum group metals, as well as other minerals, in terms of the Minerals Act (Act No. 50 of 1991) (ML 11/2003). This right was issued by the Department of Minerals and Energy (DME), now known as the DMR. The mineral right was converted to a new order mining right in terms of the MPRDA in 2010 (DMR file nr: MP 302 MR).

Der Brochen's mining right falls on the following farms:

- Richmond 370 KT;
- St George 2 JT;
- Hermansdal 3 JT;
- Hebron 5 JT;
- Helena 6 JT; and
- Der Brochen 7 JT.

Additional proposed mining related infrastructure and activities (such as the Mareesburg TSF) are located on the farm Mareesburg 8 JT.

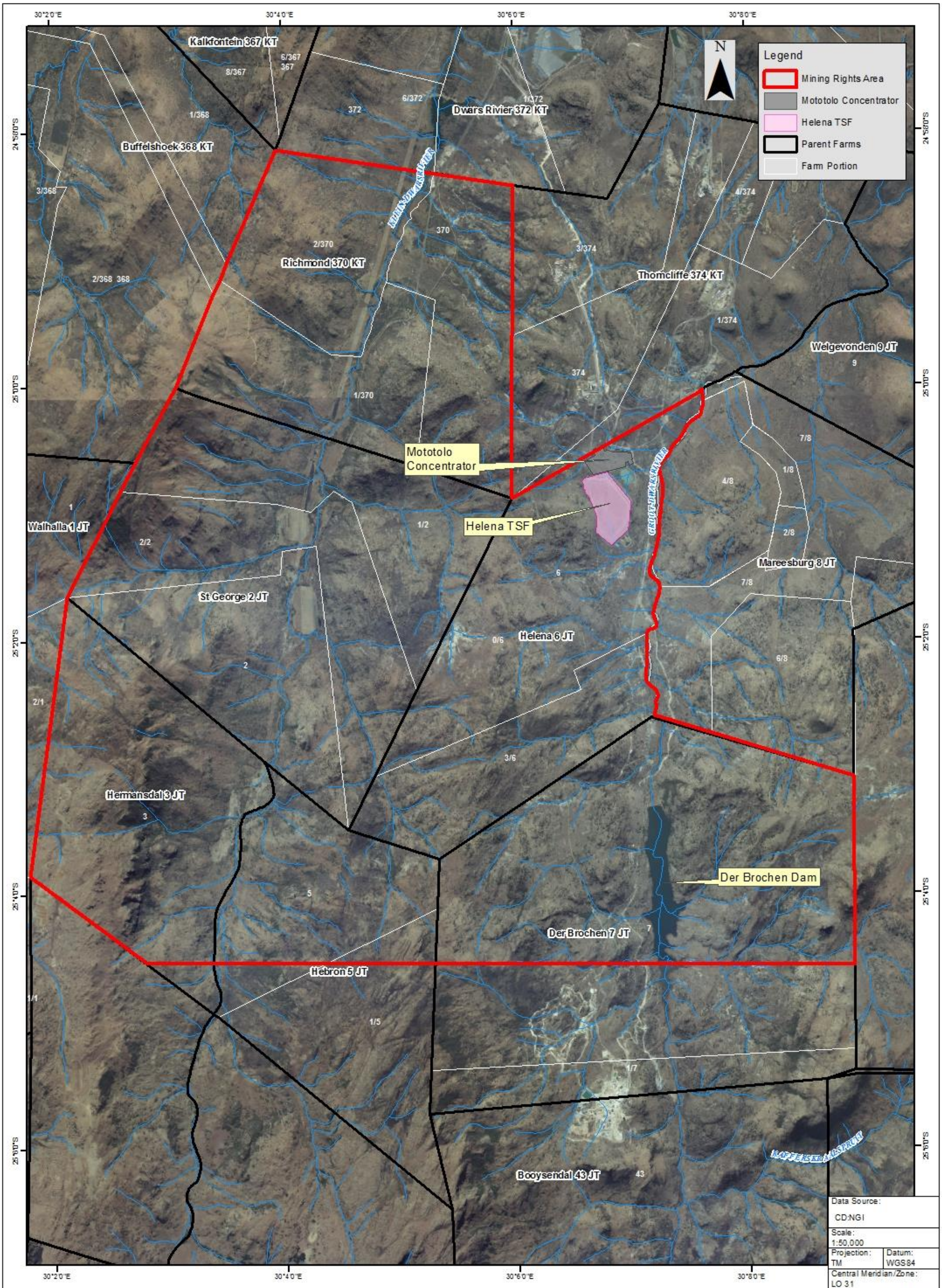
Table 2-5 provides details on the properties found within the Der Brochen mining right and properties with proposed mining related infrastructure. The red line includes all properties within the Der Brochen mining right. Figure 2-2 provides a site layout map of the mining right area and associated farms.

Table 2-5: Der Brochen Property Description

Farm Name	Portion	Mineral for mining right	Infrastructure	Landowner	Occupiers
Richmond 370 KT	Remaining extent, portions 1 and 2	All precious and base metals and mineral substances of whatever nature	**Existing:** Waste Rock Dump (well vegetated) and soil stockpile from Richmond trial mining	Bleskop Mining (wholly owned by RPM)	Johannes Matjomane Betty Mogashoa
St George 2 JT	Remaining extent Portion 1 and 2	All minerals	None	Rustenburg Platinum Mines Limited	Tiny Mankge Lazarus Mankge Piet Mankge Mmangoato Mankge Jan Mankge Manthata David Mankge Klaas Leshaba Emmanuel Mankge Putana Leshaba Miriam Leshaba Frans Leshaba Sunnyboy Mankge
Hermansdal 3 JT	Remaining extent	All rights to precious metals, including but not limited to platinum, together with all other metals or minerals found in the ores of precious metals associated with the mining of precious metal reefs and horizons	None	JJ Joubert	Robert Magane Lucas Leshaba Robert Leshaba Philemon Leshaba Allen Magane
Hebron 5 JT	Remaining extent and portion 1	Platinum, palladium, rhodium, iridium, ruthenium, osmium, gold, silver, copper and nickel	None	Windfall 38 Prop (Pty) Ltd	None
Helena 6 JT	Remaining extent	Precious and base metals and minerals excluding chrome	**Existing:** Mototolo Concentrator Helena TSF **Proposed:** North pit	Rustenburg Platinum Mines Limited	None

Farm Name	Portion	Mineral for mining right	Infrastructure	Landowner	Occupiers
			Co-Disposal Facility Pipeline		
	Portion 3		**Proposed:** South pit	Rustenburg Platinum Mines Limited	None
Der Brochen 7 JT	Remaining extent	Platinum Group Metals and associated gold, silver, copper, nickel, excluding chromite or chrome ores, except where contained in residues or tailings	**Proposed:** South pit	Rustenburg Platinum Mines Limited	None
Mareesburg 8 JT	Portion 1	No mining right	None	Samancor	None
	Portion 2	No mining right	None	Samancor	None
	Portion 4	No mining right	**Proposed:** Re-routing of powerline	Rustenburg Platinum Mines	None
	Portion 6	No mining right	None	Eastplats	None
	Portion 7	No mining right	**Proposed:** Mareesburg TSF Pipeline Re-routing of powerline	Rustenburg Platinum Mines Limited	Petrus Mankge

* Red line indicates properties that fall within the Der Brochen mining right area, as shown in Figure 2-2.



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DER BROCHEN
MINING RIGHT AREA

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3 Methodology and Legal Requirements

This Chapter provides an overview of the approach and methodology undertaken during the impact assessment process. Currently, Der Brochen is undergoing an Alignment process, involving the consolidation of all approved Der Brochen EMPs, as well as an Amendment process to include all newly proposed activities that require authorisation. The Alignment and Amendment processes are described below, in Sections 3.1 and 3.2 respectively.

The legal requirements governing the environmental authorisation process are also discussed in this Chapter, namely:

- The Minerals and Petroleum Resources Development Act (Act No. 28 of 2002) (MPRDA);
- The National Environmental Management Act (Act No. 107 of 1998) (NEMA);
- The National Water Act (Act No. 36 0f 1998) (NWA); and
- Other relevant legislation and guidelines.

3.1 Alignment process

Der Brochen was the holder of an Item 7 Schedule II old order mineral right in terms of the Minerals Act (Act No. 50 of 1991) (ML 11/2003) for platinum group metals and other minerals. This right was issued by the Department of Mineral and Energy (DME). The mineral right has since been converted to a new order mining right in terms of the MPRDA in 2010 (MP 302 MR) by the Department of Mineral Resources (DMR).

In 2001, environmental and social baseline studies commenced to inform the original 2002 EMP and since then, a number of studies have been undertaken and are covered by several approved EMPs (Table 3-1). The DMR has issued a directive requesting RPM to align all the approved EMPs for the Der Brochen Project into one concise, consolidated document. Table 3-1 provides a summary of the existing Der Brochen Project EMPs which are the subject of this consolidated EMP, and indicates the status of the activities authorised under each of these EMPs.

Der Brochen submitted an EIA/EMP for raising the Helena TSF, to the DMR in September 2014, which is a separate authorisation process underway. Once the Helena TSF EMP has been approved, it will be included in this Der Brochen EMP Alignment process.

The Aligned Der Brochen EMP will be compiled as per the MPRDA, Act 28 of 2002, described in Section 3.3.1.

3.2 Amendment process

RPM also intends on undertaking additional project activities not covered by the previous authorisations, requiring an EMP Amendment in accordance with the MPRDA (Section 3.3.1). The additional activities include the following and are further described in Chapter 4:

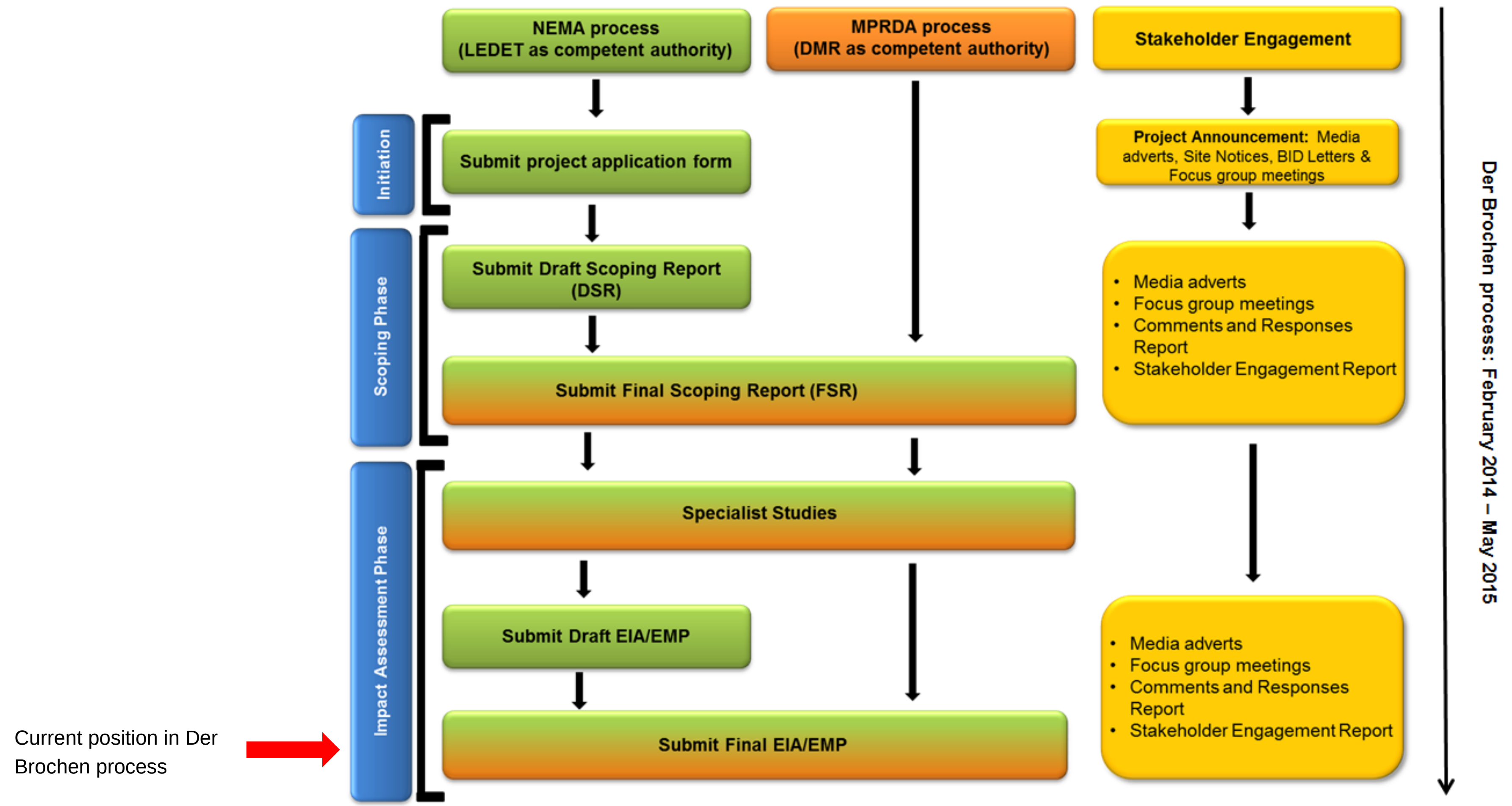
- Re-routing of a 132kV powerline;
- Two Open Pits (north and south);
- A Co-Disposal Facility (CDF)(tailings disposal with a rock embankment in the north pit); and
- An expansion to the previously approved Mareesburg TSF and associated infrastructure.

These new activities also require environmental authorisation prior to commencement in terms of NEMA, as well as an Integrated Water Use Licence (IWUL) in terms of the NWA. The EIA (both MPRDA and NEMA) and WUL application processes will be conducted simultaneously as integrated processes with a stakeholder engagement process.

Figure 3-1 illustrates the EIA process for the Der Brochen EMP Alignment and Amendment. Section 3.3 describes the legal framework.

Table 3-1: Existing EMPs for the Der Brochen Project (compiled from J9 Environmental Consultant, 2011)

EMP Name	DMR reference	Submission date	Approval date	Mining activities	Processing activities	Mine residue disposal	Infrastructure and services	Status
Der Brochen Mine EMP	DMR File Number: MP 302 MR Mining Right Reference Number: LP30/5/1/2/2/182 MR	November 2002	16 April 2003	Two 100 ktpm twin UG2 declines (Helena & Der Brochen) LOM 65 years	Concentrator plant at on Helena 6 JT 400 ktpm	Mareesburg TSF (120 ha) with return water dam	7 m wide chip and spray access roads, sewage plant at both decline shafts, overland conveyor from shafts to Concentrator.	The Concentrator plant has been constructed and is operated as part of the Mototolo JV. Known as the Mototolo Concentrator. **Included in this Alignment.** The Mareesburg TSF has not been constructed to date, but forms part of the mine plan. **Included in this Alignment.** The two decline shafts have been removed from Der Brochen's mine plan. **The two decline shafts does not form part of the alignment process**.
EMP Amendment: Trial Mining Phase	DMR File Number: MP 302 MR Mining Right Reference Number: LP30/5/1/2/2/182 MR	July 2003	30 April 2004	Access to UG2 reef via two declines (on Helena) and via four adits on Richmond. LOM 9 months	Ore stockpiles on Helena and Richmond farms	Two Waste Rock Dumps: Helena: 0.16 ha Richmond: 0.8 ha	New roads to Helena and Richmond declines and adits	One adit on Richmond opened and bulk sample taken. Closed and Waste Rock Dump rehabilitated. **This EMP is therefore excluded from the consolidation.**
EMP Amendment: Klein Dwarsrivier Wellfields	DMR File Number: MP 302 MR Mining Right Reference Number: LP30/5/1/2/2/182 MR	April 2004	Pending approval	N/A	N/A	N/A	A Wellfield to supply water to Der Brochen Project with reservoir for storage.	Wellfield currently in use as water source (referred to as Helena and Richmond Wellfields) 8 boreholes are licenced in terms of the NWA in the Helena wellfield, 2 are in use. 16 boreholes are licences in terms of the NWA in the Richmond wellfield, 2 are in use. A reservoir with a capacity of 10.5Ml and a height of 6m was included, but not built to date. **Included in this Alignment.**
EMP Amendment Helena TSF	DMR File Number: MP 302 MR Mining Right Reference Number: LP30/5/1/2/2/182 MR	April 2005	October 2005	N/A	N/A	45 ha TSF with a capacity of 200 ktpm, height of 42m Two return water dams.	Der Brochen main access road	Constructed and operating as part of Mototolo JV. **Included in this Alignment.**
EMP Amendment Helena Chrome Plant	DMR File Number: MP 302 MR Mining Right Reference Number: LP30/5/1/2/2/182 MR	May 2006	2006	N/A	Chrome recovery spiral plant within the Concentrator area. Stockpile of chrome concentrate – 4200 m^2	Final tailings returned to the Concentrator thickening plant	Chrome concentrate trucked from spiral plant to the stockpile area, and from there to GlenceoreXstrata plant on Thorncliffe.	Constructed and operating as part of Mototolo JV. **Included in this Alignment.**
EMP Amendment for ongoing prospecting	DMR File Number: MP 302 MR Mining Right Reference Number: LP30/5/1/2/2/182 MR	July 2007	Pending approval	382 prospecting drill holes, 6/7 days per drilling site	N/A	N/A	Temporary access roads	Prospecting currently taking place. **Included in this Alignment.**
EMP Amendment Richmond early mine	DMR File Number: MP 302 MR Mining Right Reference Number: LP30/5/1/2/2/182 MR	May 2010	Not approved	Mining via portal five and adit four @ 12.5 ktpm. LOM of 16 years	Temporary ore stockpiles for future processing, 1.1 ha and 2.6 ha	Temporary waste roc dump of 1.7 ha	Upgraded gravel roads, 11 kV line from Concentrator	Not constructed. Approval still outstanding. The Richmond early mine have been removed from Der Brochen's mine plan. **The Richmond early mine does not form part of the Alignment.**
EMP Amendment: Raising the height of the Helena TSF	DMR File Number: MP 302 MR Mining Right Reference Number: LP30/5/1/2/2/182 MR	September 2014	Pending approval ROD expected February 2015	N/A	N/A	The approved and existing Helena TSF's height will be raised	N/A	Submitted to DMR, decision pending. **Operational and closure phases included in Alignment.**



srk consulting	**DER BROCHEN** ENVIRONMENTAL AUTHORISATION PROCESS FOR THE DER BROCHEN EMP ALIGNMENT AND AMENDMENT	Project No. 469113

Figure 3-1: Environmental authorisation process for the Der Brochen EMP Alignment and Amendment

3.3 Legal Framework and Guidelines

The Der Brochen EMP Alignment and Amendment requires environmental authorisation by means of an EIA/EMP under the MPRDA, NEMA and NWA. The subsections below describe the legal framework underpinning the environmental authorisation process.

3.3.1 Mineral and Petroleum Resources Development Act (Act No. 28 of 2002) (MPRDA)

The DMR issued a directive in May 2013 instructing RPM to align all previously approved EMPs for Der Brochen, and consolidate them into a single document as per the MPRDA.

The MPRDA makes provision for equitable access to and sustainable development of South Africa's mineral resources. The MPRDA requires that the environmental management principles set out in NEMA shall apply to all mining operations and serves as a guideline for the interpretation, administration and implementation of the environmental requirements of NEMA.

The Der Brochen EMP Alignment and Amendment process will be undertaken in accordance with the following requirements of the MPRDA:

- An EIA which investigates, assesses and evaluates the potential impacts of the proposed operation as per Section 39(3)(a) and (b) of Act (28 of 2002) of the MPRDA, read together with Regulation 50; and
- An EMP in terms of Section 39(4)(a) of the Act, that meets the requirements of Regulation 51. The EMP must provide the description of environmental objectives and outline RPM's implementation programme, as well as include the results of the stakeholder engagement process.

This EIA/EMP has been structured as per Section 39, Regulations 50 and 51 of the MPRDA. Refer to Table 1-1 and Table 1-2, outlining the requirements and cross-references to the various sections in this report where they have been addressed.

3.3.2 National Environmental Management Act (Act No. 107 of 1998) (NEMA)

NEMA, amongst others, provides for co-operative environmental governance by establishing principles for decision-making on matters affecting the environment, institutions that will promote co-operative governance and procedures for co-ordinating environmental functions. NEMA further states that the principles of Integrated Environmental Management (IEM) should be adhered to in order to ensure sustainable development.

A vital underpinning of the IEM procedure is accountability to the various parties that may be interested in or affected by a proposed development. Stakeholder engagement is a requirement of the IEM procedure, in terms of the identification of potentially significant environmental impacts during the Scoping Phase. The IEM procedure aims to ensure that the environmental consequences of development proposals are understood and adequately considered during all stages of the project cycle, and that negative aspects are resolved or mitigated and positive aspects (benefits) are enhanced.

In 2010, new regulations (GN 543) were promulgated to revise the procedure and criteria relating to environmental authorisations for the commencement of listed activities to avoid detrimental impacts on the environment or, where it cannot be avoided, to mitigate and effectively manage these impacts and optimise positive environmental impacts. These Regulations and a revised set of Listed Activities (Listing Notices 1, 2 and 3, GN 544, 545 and 546) came into force on the 2nd of August 2010. The listed activities applicable to the proposed new activities at Der Brochen are listed in Table 3-2. These activities must be authorised by the Limpopo Department of Economic Development, Environment and Tourism (LEDET).

A NEMA application form was submitted to LEDET in Polokwane on 11 February 2014 and Reference Number 12/1/9/2-GS37 was issued.

This EIA/EMP has been structured as per Sections 31 (2) and 33 of Regulation R543 of the NEMA. Refer to Table 1-1 and Table 1-2 outlining the requirements and cross-references to the various sections in this report where they have been addressed.

Table 3-2: NEMA listed activities for the proposed new activities at the Der Brochen Project

Activity Number and Description		Actual Activity
Government Notice R544 – Basic Assessment		
9	The construction of facilities for infrastructure exceeding 1000 metres in length for the bulk transportation of water, sewage or storm water – (i) with an internal diameter of 0.36 metres or more; or (ii) with a peak throughput of 120 litres per second or more, excluding where: a) such facilities or infrastructure are for bulk transportation of water, sewage or storm water or storm water drainage inside a road reserve; or b) where such construction will occur within urban areas but further than 32 metres from a watercourse, measured from the edge of the watercourse.	Tailings delivery and return water pipelines from the existing Mototolo Concentrator to the proposed Mareesburg TSF and Co-disposal facility will be constructed Mareesburg TSF: The Mareesburg TSF will require three pipelines, two to deliver tailings material to the TSF, and another to carry return water back to the Mototolo Concentrator. Length of pipelines: 2.77km Internal diameter: • Tailings lines: 0.35m • Return water: 0.35m Peak throughput: • Tailings lines: approximately 150ℓ/s • Return water: approximately 100ℓ/s Co-disposal facility: The Co-disposal facility will require two pipelines, one to deliver tailings material to the facility, and another to carry return water back to the Mototolo Concentrator. Length of pipelines: Approximately 1.5km Internal diameter: • Tailings line: 0.3m • Return water: 0.3m Peak throughput: • Tailings line: approximately 120ℓ/s • Return water: approximately 100ℓ/s
10	The construction of facilities or infrastructure for the transmission and distribution of electricity – (i) outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kilovolts; or (ii) inside urban areas or industrial complexes with a capacity of 275 kilovolts or more.	The existing 132 kV powerline will be re-routed to accommodate the proposed open cast mining area.
11	The construction of: (i) canals; (ii) channels;	The proposed pipelines to transport tailings material from the Mototolo Concentrator to the Mareesburg TSF and return water back to the Concentrator will cross the

Activity Number and Description		Actual Activity
	(iii) bridges; (iv) dams; (v) weirs; (vi) bulk storm water outlet structures; (vii) marinas; (viii) jetties exceeding 50 square metre in size; (ix) slipways exceeding 50 square metres in size; (x) buildings exceeding 50 square metres in size, or (xi) infrastructure of structures covering 50 square metres or more where such construction occurs within a watercourse or within 32 metres of a watercourse, measured from the edge of a watercourse, excluding where such construction will occur behind the development setback line.	Groot-Dwars River and tributaries including the Mareesburg Stream. These crossings are also included in the Water Use Licence Application.
18	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 from: (i) a watercourse; (ii) the sea; (iii) the seashore; (iv) 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, dragging, excavation, removal or moving: (i) is for maintenance purposes undertaken in accordance with a management plan agreed to by the relevant environmental authority; or (ii) occurs behind the development setback line.	The proposed pipelines to transport tailings material from the Mototolo Concentrator to the Mareesburg TSF and return water back to the Concentrator will cross the Groot-Dwars River and tributaries including the Mareesburg Stream. This could results in the potential excavation of more than 5m^3 in a watercourse. These crossings are also included in the Water Use Licence Application.
22	The construction of a road, outside urban areas: (i) with a reserve wider than 13.5 metres or, (ii) where no reserve exists where the road is wider than 8 metres, or (iii) for which an environmental authorisation was obtained for the route determination in terms of activity 5 in Government Notice 387 of 2006 or activity 18 in Notice 545 of 2010.	New roads for the Der Brochen project will be developed. • Mine roads around the North and South pits (12m wide); • Service road alongside the Mareesburg TSF pipeline.
27	The decommissioning of existing facilities or infrastructure or – (i) electricity generation with a threshold of more than 10MW; (ii) electricity transmission and distribution with a threshold of more than 132KV; (iii) nuclear reactors and storage of nuclear fuel; (iv) activities, where the facility or the land on which it is located is contaminated; (v) storage, or storage and handling, of dangerous goods of more than 80 cubic metres.	Part of the existing Eskom 132 kV powerline will be demolished and re-routed to accommodate the proposed Open Pits.
Government Notice 545 – Environmental Impact Assessment		
5	The construction of facilities or infrastructure for any process or activity which requires a permit or licence in terms of national or provincial legislation governing the generation or release of emissions, pollution or effluent and which is not identified in Notice No. 544 of 2010 or included in the list of waste management activities published in terms of section 19 of the National Environmental Management:	The following infrastructure will require a Water Use Licence for the disposal of waste or water containing waste in a manner which may detrimentally impact on a water resource:

<table>
<tr><th colspan="2">Activity Number and Description</th><th>Actual Activity</th></tr>
<tr><td></td><td>Waste Act, 2008 (Act No. 59 of 2008) in which case that Act will apply.</td><td>• Pollution control dams at the Mareesburg TSF;
• Waste rock dumps at Open pits;
• Ore stockpiles at Open pits; and
• Pollution control dam at Open pits and Co-disposal area.</td></tr>
<tr><td>15</td><td>Physical alteration of undeveloped, vacant or derelict land for residential, retail commercial, recreational, industrial, or institutional use where the total area to be transformed is 20 hectares or more;
except where such physical alteration takes place for:
(i) linear development activities, or
(ii) agriculture or afforestation where activity 16 in the Schedule will apply.</td><td>The Der Brochen project will develop the following structures, and their associated footprints:
• North pit (including WRDs): 47 ha
• South pit: (including WRDs): 45 ha
• Co-disposal facility: 35ha (additional to already disturbed North pit)
• Mareesburg TSF: 150 ha
Therefor a total footprint of 277 ha of undeveloped land will be altered for industrial use as part of the Der Brochen project.</td></tr>
<tr><td colspan="3">Government Notice 546 – Basic Assessment</td></tr>
<tr><td>12</td><td>The clearance of an area of 300 square metres or more of vegetation where 75% or more of the vegetative cover constitutes indigenous vegetation.</td><td>A total footprint of 277 ha will be developed as part of the Der Brochen project.
As the Der Brochen project is situated in the SCPE and more than 300m² will be developed, this activity is triggered.</td></tr>
</table>

3.3.3 National Water Act (Act No. 36 of 1998) (NWA)

The NWA recognises that water is a scarce and unevenly distributed national resource which must be managed encompassing all aspects of water resources.

In terms of Chapter 4 of the NWA, activities and processes associated with the Der Brochen Project are required to be licensed by the Department of Water and Sanitation (DWS), formerly known as the Department of Water Affairs (DWA). An Integrated Water Use Licence Application (IWULA) will be lodged with the DWS. Furthermore, an Integrated Water and Waste Management Plan (IWWMP) will be compiled in support of the IWULA.

Section 21 of the NWA lists 11 water uses that require a Water Use Licence from the DWA. Table 3-3 provides a list of preliminary water uses identified for the Der Brochen Project that will require a Water Use Licence.

Table 3-3: NWA Section 21 water uses for Der Brochen Project

Section 21	Water Use	Proposed Der Brochen Activities
S21 (a)	Taking water from a water resource	• Abstraction of groundwater from the proposed Open Pits for re-use, de-watering boreholes
S21 (c)	Impeding or diverting the flow of water in a watercourse	• Proposed river crossings and watercourse diversions due to construction of Pits and TSFs
S21 (g)	Disposing of waste or water containing waste in a manner which may detrimentally impact on a water resource	• Pollution control dams, waste rock/overburden dumps, ore stockpiles, TSFs (Mareesburg and open-pit TSF) and associated return water dams. • Dust suppression
S21 (i)	Altering the bed, banks, course or characteristics of a watercourse	• Proposed river crossings and watercourse diversions due to construction of Pits and TSFs
S 21 (j)	Removing, discharging or disposing of water found underground if it is necessary for the efficient continuation if an activity or for the safety of people.	• Abstraction of groundwater from the proposed Pits: directly and via dewatering boreholes

3.3.4 Other applicable legislation

The Constitution of South Africa (Act No. 108 of 1996)

The Bill of Rights is the cornerstone of democracy in South Africa, ensuring the rights of all people and affirming the democratic values of human dignity, equality and freedom. Section 24 is directly relevant to environmental law and states that everyone has the right to:

"*An environment that is not harmful to their health or well-being; and have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that: Prevent pollution and ecological degradation; promote conservation; and secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development".*

The Constitution of South Africa is the overarching framework legalisation driving the NEMA principles and therefore EIA process. The right to a safe environment and the right to information are addressed in the EIA process through stakeholder engagement, where available information pertaining to the environment and proposed activities are disclosed.

The National Heritage Resources Act (Act No. 25 of 1999)

The National Heritage Resources Act aims to promote good management of cultural heritage resources and encourages the nurturing and conservation of cultural legacy so that it may be bestowed to future generations.

The Act requires all developers (including mines) to undertake cultural heritage studies for any development exceeding 0.5 ha. It also provides guidelines for impact assessment studies to be undertaken where cultural resources may be disturbed by development activities. As the Der Brochen Project developments (Mareesburg TSF, Co-Disposal Facility, Northern Pit and Southern Pit) will occupy an area of approximately 277 ha, this Act applies to the Impact Assessment process.

The South African Heritage Resources Agency (SAHRA) needs to approve the heritage assessment conducted as part of the overall Impact Assessment process. A heritage assessment was undertaken in 2012, which consolidated 12 heritage impact assessments that were compiled for the Der Brochen Project since 2002. Permits will be required for the disturbance or removal; of any heritage resources affected by the Der Brochen Project.

The National Environmental Management: Biodiversity Act (Act 10 of 2004)

The National Environmental Management: Biodiversity Act (Act No. 10 of 2004)(NEMBA) provides for the management and conservation of South Africa's biodiversity within the framework of NEMA, as well as the protection of species and ecosystems that warrant national protection and the sustainable use of indigenous biological resources.

The Der Brochen Project area falls within the Sekhukhuneland Centre of Plant Endemism (SCPE). According to the National list of Ecosystems Threatened and in need of Protection under Section 52(1) (a) of the Biodiversity Act (GG 34809, GN 1002, 9 December 2011), the Sekhukhune Mountainlands (MP 9) is listed as Endangered falling into Criterion F: These areas are known to have high irreplaceability and currently medium threat.

3.3.5 Anglo American Policies and Guidelines

Anglo American Environmental Way

The Anglo American plc Executive Committee has endorsed and committed to the implementation of an internal document known as the Anglo American Environment Way, which is governing framework for the management of environmental impacts for all Environmental projects. The Board seeks assurance of compliance with the Anglo American Environment Way standards through regular self-assessments, peer review and third party audits.

The Anglo American Safety, Health and Environmental (SHE) Policy describes Anglo's environmental vision, which is to minimise harm to the environment by designing, operating and closing all of their operations in an environmentally responsible manner.

Underpinning this vision are three core principles:

- **Zero mindset**: Anglo American shall apply the mitigation hierarchy of avoiding, minimising and mitigating environmental impacts arising from our activities, products and services;
- **No repeats**: all necessary steps will be taken to learn from environmental impacts, incidents, audit findings and other non-conformances, to prevent their recurrence; and
- **Non-negotiable standards and rules**: common, non-negotiable Environmental Performance Standards and Procedures shall be applied throughout the Group as a minimum requirement.

3.4 Scoping and Impact Assessment Methodology for this EMP Alignment and Amendment

3.4.1 Scoping Phase

The first phase of the environmental authorisation process is the Scoping Phase. The objectives for the Scoping Phase include:

- Compliance with the legal requirements of the MPRDA, NEMA and NWA;
- Identifying key environmental and social issues/concerns;
- Establishing Terms of Reference (ToR) for the preparation of the EIA; and
- Identification and engagement with project stakeholders.

The following activities were undertaken by SRK during the Scoping Phase:

- A site familiarisation visit to Der Brochen by SRK;
- Review of existing information gained mainly from the previous EMPs undertaken. Environmental baseline data was reviewed, and specialists identified to undertake additional fieldwork in order to cover the new proposed activities;
- Legal and governance review;
- Identification of potential stakeholders and development of a stakeholder database;
- Implementation of scoping stakeholder engagement;
- Review of issues and concerns raised by stakeholders;
- Ensure that views and concerns raised by stakeholders, as well as local knowledge is used to guide the impact assessment process;
- Development of specialist ToR and
- The development of ToR for the Impact Assessment Phase.

The Scoping Phase was completed in Mid-October 2014 during which a Scoping Report, aligned with the requirements of the MPRDA (Section 39, Regulation 49) and NEMA (Section 28, Regulation 543), was submitted to the DMR and LEDET, respectively. The Draft Scoping Report (DSR) was made available for public comment on the 16th April 2014 and the Final Scoping Report (FSR) was made available on the 8th July 2014.

Stakeholder Engagement during the Scoping Phase involved pre-announcement and announcement of the Der Brochen Project with identified stakeholders, as well as information sharing with regards to content and availability of the DSR and FSR. Stakeholders were identified and consulted through Der Brochen's current and ongoing stakeholder engagement processes and forums.

Comments and issues raised during this phase of the process were captured and recorded in the Comments and Responses Report (CRR) attached to the DSR and FSR and were used to inform the scope of work for the Impact Assessment Phase.

3.4.2 Impact Assessment

The objectives of the Final EIA/EMP for the Der Brochen Project are to:

- Comply with the legal requirements of the MPRDA (Section 39, Regulation 50) and NEMA (Section 31(2), Regulation R543);
- Describe the proposed project environmental and socio-economic context;
- Develop a detailed understanding of the baseline environment at the sites proposed for development;
- Determine and assess the impacts to receptors and resources as a result of project activities;
- Introduce stakeholders to the additional activities of the project and provide information about the proposed project in a transparent way;

- Identify and engage with stakeholders to ensure that feedback on the results of the study are provided and that the assessment and management of impacts is identified and concerns considered;
- Develop environmental and social management measures to mitigate negative impacts and enhance positive impacts;
- Consider and assess project alternatives in terms of environmental impacts; and
- Provide sufficient information to the authorities to inform the environmental authorisation decision.

Additional specialist studies commissioned during the impact assessment phase

Since the commencement of the Der Brochen Project in 2001, numerous environmental and social studies have been undertaken to assess the project area and define the baseline environment. These specialist studies formed part of the previous approved EMP processes.

In November 2013, SRK undertook an extensive review of existing specialist reports and all approved Der Brochen EMPs in order to determine their applicability to current Der Brochen activities, to ensure the reports reflected the current status of the environment and to identify knowledge gaps that would inform this EMP Alignment and Amendment process.

Table 3-4 lists additional specialist studies undertaken to inform the impact assessment of new proposed activities. The terms of reference for specialist studies (contained in Appendix A) was informed through the gap analysis, SRK's team experience and issues raised by stakeholders. Specialist Reports are attached in Appendix C: Specialist ReportsAppendix C.

Table 3-4: Additional Specialist Studies undertaken during the Impact Assessment Phase for the Der Brochen Project

Specialist Study	Scope of work
Geology	No additional specialist studies were done. Existing information was utilised from the November 2002 EMPR for the Der Brochen Mine, SRK Report No. 295606/4.
Climate	**Airshed** updated their Air Quality study in September 2014 (Air Quality Specialist Report for the Der Brochen EMP Alignment and Amendment, Airshed Report No. 13SRK25). This study included: • A baseline assessment which analysed meteorological data (wind speed, wind direction and temperature) obtained from MM5 data for the period of 2008 to 2010.
Topography	No additional specialist studies were done. Existing information was utilised from the November 2002 EMPR for the Der Brochen Mine, SRK Report No. 295606/4.
Visual aspects	Existing information was utilised from the November 2002 EMPR for the Der Brochen Mine, SRK Report No. 295606/4.
Soils, Land Capability and Land Use	No additional specialist studies were done. Existing information was utilised from the November 2002 EMPR for the Der Brochen Mine, SRK Report No. 295606/4.
Flora	**Natural Scientific Services (NSS)** was appointed by SRK and undertook a desktop review and site visit in 2014 to update the baseline assessment of vegetation studies and consolidate previous assessments. Fieldwork involved the following scope of work: • Identification of vegetation communities that have not yet been surveyed using the Braun-Blanquet method, as well as a record of species composition; • Listing Red Data/ Conservation Important (CI) species identified in previous surveys and within updated Threatened Species Programme (TSP)/ Plants of Southern Africa (POSA) listings; • Ground-truthing the 2012 investigated area, as well as additional

Specialist Study	Scope of work
	areas where the new proposed activities will be taking place; • Recording and mapping of any alien species, if detected; and • Recording of the GPS location of *Vitex* species where possible. The May 2014 Der Brochen Platinum Mine Floristic Assessment, Natural Scientific Services (NSS) Report 1995 was compiled using the updated information and was used to inform this EIA/EMP.
Fauna	Existing information was utilised from the November 2002 EMPR for the Der Brochen Mine, SRK Report No. 295606/4. Additional information was obtained from the Wetland Delineation study undertaken by SAS in April 2014 (Wetland and Aquatic Ecological Assessment for the proposed Anglo Platinum Der Brochen Project, Scientific Aquatic Services (SAS) Report 214035).

Wetland delineation	**Scientific Aquatic Services (SAS)** was appointed by SRK to undertake the wetland delineation of the area where new activities were proposed. This study comprised of:
	• A wetland assessment, which included:
	  o Identification of Management Units within the study area according to Hydrogeomorphic (HGM) units following the guidelines in the Classification System for Wetlands and other Aquatic Ecosystems in South Africa;
	  o Delineation of wetland resources and riparian zones as defined by DWS;
	  o Wetland functions and services;
	  o Wetland Health, Index of Habitat Integrity and Present Ecological State (PES);
	  o Ecological Importance and Sensitivity (EIS) and Recommended Ecological Category (REC) for the river feature; and
	  o Impacts on river habitat and ecological communities.
	• An aquatic assessment, which included:
	  o Defining the aquatic EIS and PES of aquatic resources by means of assessing drivers and stressors in the system, as well as response indicators; and
	  o Defining the ecology of aquatic ecosystems prior to impacts and identification of particular sensitivity.
	The April 2014 Wetland and Aquatic Ecological Assessment for the proposed Anglo Platinum Der Brochen Project, Scientific Aquatic Services (SAS) Report 214035 was compiled and used to inform this EIA/EMP.

Surface Water	All necessary hydrological information was available in the Mototolo IWWMP report (SRK, 468785). The following additional scope of work was undertaken by **SRK:** • Water balance; • Conceptual placement and sizing of the north and south Open Pits settling ponds; • Integrated water management plan; and • Mareesburg TSF clean water diversion.
Groundwater	**Delta H** was appointed by SRK and undertook a comprehensive groundwater study of the project area, which included the Mareesburg TSF in the east, the Co-Disposal Facility and the two Open Pits in the west. The study included: • A review of all previous groundwater studiers in the immediate area; • A data review and gap analysis; • A hydro census; • A geophysical survey: Use of the aerial and ground magnetic

Specialist Study	**Scope of work**
	surveys by RPM to establish major structural features at the project area for the open pit on UG2 outcrop comprising of northern and southern Pits and the new Co-Disposal Facility and site boreholes; • Drilling boreholes; • Hydraulic testing: Step Discharge Test (4 x 60 minute steps) followed by a recovery test; • Falling/rising head tests which were conducted in low yielding boreholes to determine the hydraulic conductivity of the weathered sub-surface; • Packer testing; • Hydrochemical analysis of samples taken; • Development of a Conceptual Hydrogeological Model; • Groundwater flow and transport model; • Geochemical characterisation of waste rock materials to be used in the rock berm for the Co-Disposal Facility and the tailings being deposited; and • An Impact assessment.
Air Quality	**Airshed** was appointed by SRK and updated their report in terms of the new proposed activities. The new scope of work included: • An impact assessment of particulates and gasses (sulphur dioxide, carbon monoxide and nitrogen dioxide), using ambient air quality guidelines and standards; • An emissions inventory of fugitive and point source emissions from vehicle entrainment, materials handling, crushing activities and wind erosion from tailings storage facilities; and • An impact prediction study using dispersion modelling of particulates, gaseous concentrations and dust fallout rates.
Noise	**M^2 Environmental Connections** was requested to provide a professional opinion on the impacts of the new layout. M^2 Environmental Connections considered the worst case scenario and the proposed development would have the same, or more likely a lower noise impact. As such they did not recommend any additional specialist work and their scope was limited to a professional opinion.
Blasting and Vibration	No additional specialist studies were done. Existing information was utilised from the June 2012 Assessment of Blasting Related Disturbances on the Infrastructure adjoining the Der Brochen planned Open Pits and Declines, compiled by **Cambrian CC**.
Heritage	No additional specialist studies were done. Existing information was used from the April 2012 Cultural Heritage Report, **ARM** Report. This report is a consolidation of 12 heritage assessments undertaken since 2002.
Grave relocation	Certain graves in the proposed project area require relocation. **Professional Grave Solutions (PGS)** was appointed by SRK to undertake the social consultation, followed by permitting, exhumation, re-burial and reporting. Note that the grave relocation process is a separate Anglo American Platinum process and does not form part of this Impact Assessment process, however information gathered by PGS will be used to supplement the baseline description in this report.
Socio-Economic	Updated socio-economic baseline information was obtained as part of the March 2014 Stakeholder Engagement Programme. The level of information was assessed and a decision was made on the need for additional baseline material. Furthermore, a detailed Socio-economic study was undertaken by **SRK** in August 2014. The study included: • A desktop study through secondary data collection; • Primary data collection methods to include:

Specialist Study	Scope of work
	○ Household surveys; ○ Focus group discussions; ○ Key informant interviews; and ○ Rural appraisal. • A baseline assessment of socio-economic conditions within and around the Der Brochen Project area; and • An impact assessment.
Traffic	**Aurecon** was appointed to conduct the traffic and transportation study. The traffic study determined: • The impact of a potential increase in traffic originating from the project activities; • Current road conditions; and • Sensitive receptors with respect to traffic congestion and safety aspects.
Rehabilitation and Closure Cost Assessment	**SRK** compiled an updated Rehabilitation and Closure Cost Assessment for the currently proposed project activities was undertaken to support the EIA and subsequent management plans, as well as to form the basis of the Environmental Liabilities Assessment required in terms of the MPRDA (Act 28 of 2002).

Impact identification and rating

During the Impact Assessment Phase, the potential impacts of the Der Brochen Project (pre-mitigation and post-mitigation) on the receiving environment were assessed and possible mitigation measures and monitoring programmes for each mining related activity during the construction, operational, decommissioning/closure and post-closure phases of the project were proposed. The environmental impact assessment was undertaken according to SRK's standard criteria for impact assessment. This methodology is compliant with the MPRDA and NEMA regulations and is detailed in Chapter 7 of this report.

3.4.3 Management planning methodology

The EMP (refer to Chapter 8) provides Der Brochen's management measures to conduct activities with due care and diligence, as well as avoid/ limit any adverse impacts of the mining operation. It is also compiled to help control impacts that may occur to meet acceptable standards, both as a legal and social responsibility to the environment within which the activities take place.

This EMP incorporates commitments made in the existing approved Der Brochen EMPs, as well as contains mitigation/management measures associated with the newly proposed Der Brochen activities during all mining phases.

The objectives of the EMP are to:

- Comply with the legal requirements of the MPRDA (Section 39, Regulation 51) and NEMA (Section 33, Regulation R543);
- Consolidate management commitments from all approved previous Der Brochen EMPs;
- Develop environmental and social management measures to mitigate negative impacts and enhance positive impacts from new activities;
- Specify time periods within which mitigation measures must be implemented, where appropriate;
- Provide commitments for monitoring of environmental and social aspects during all phases of the project;
- Provide an Environmental Awareness Plan describing the manner in which the applicant will inform employees of any environmental risk resulting from their work; and
- Provide a Closure and Rehabilitation Plan and Closure Cost Assessment for the project.

SRK defined and evaluated impacts, and compiled management/mitigation measures to address the identified impacts. Integrative report writing was undertaken for the compilation of various specialist reports into one, integrated assessment and management programme. Management recommendations followed the management hierarchy as follows:

- Avoidance;
- Minimisation;
- Mitigation and management; and
- Rehabilitation.

3.4.4 Stakeholder Engagement

The stakeholder engagement process undertaken for this process included the requirements of the MPRDA (Section 3.3.1), NEMA (Section 3.3.2) and the NWA (Section 3.3.3) and was designed to provide sufficient and accessible information regarding the proposed project to stakeholders in an objective manner. The process also provided opportunities to stakeholders to actively contribute to the environmental assessment. Please refer to Chapter 5 for details regarding the Stakeholder Engagement Process. Legal requirements dictate a phased approach and the objectives of stakeholder engagement were for stakeholders to:

During the Scoping Phase

- Raise issues of concern and suggestions for enhanced benefits;
- Verify that their issues have been recorded; and
- Contribute relevant local and traditional knowledge to the environmental assessment.

During the Impact Assessment Phase

- Verify that their issues have been considered in the environmental assessment; and
- Comment on the findings of the environmental assessment.

During the Decision-making Phase

- Advise stakeholders of the outcome, i.e. the authority decision, and how and by when the decision can be appealed.

This process involved:

- Identification and involvement of interested and affected parties of the proposed project, stakeholder values and concerns and the mandate/influence of institutions/stakeholders over the regulatory and public process;
- Obtaining stakeholders issues and concerns early in the process;
- Early and personal contact with directly affected Interested and Affected Parties (I&APs), taking into account cultural and language sensitivity;
- Using the languages of choice of I&APs in meetings, and providing selected documents as per the requirements of the MPRDA, NEMA and NWA;
- Utilising existing consultation forums and opportunities to minimise stakeholder fatigue with extensive consultation events where practically appropriate, and
- Clarifying I&APs' roles and responsibilities at the start of the process, sanctioned by the authorities, in terms of where and when decisions will be made and by whom.

4 Project Description

4.1 Project Motivation

4.1.1 Benefits of the project

RPM is a wholly owned subsidiary of AAP. Research shows that the platinum market will continue to grow. To this end, RPM will expand its current operations as well as develop two open pits for the mining of the UG2 platinum reef.

RPM holds the rights to platinum group metals on the farms Richmond 370 KT, St George 2 JT, Hermansdal 3 JT, Hebron 5 JT, Helena 6 JT RE, Der Brochen 7 JT RE and surface rights on Mareesburg 8 JT Portion 7 on which a TSF is to be constructed.

RPM has undertaken considerable exploratory drilling (since 2001) on the property and has investigated the economic viability, including environmental sustainability and technical feasibility of a new platinum mine, using open pit mining methods, on the above mentioned farms.

This project will ensure that RPM is able to continue with its considerable contribution to the regional and national economy. It will also become a contributor to the economies of the local and district municipalities. Der Brochen falls within the boundaries of the Greater Tubatse Local Municipality (GTLM), which is one of the five local municipalities falling under the Sekhukhune District Municipality (SDM). It borders the Thaba Chweu Local Municipality (TCLM), which is one of the five municipalities falling under the jurisdiction of the Ehlanzeni District Municipality (EDM).

4.1.2 Strategic importance of the project

As described in the GTLM Final 2013/2014 IDP, the eastern limb Bushveld Igneous Complex (mining belt) is emerging as an important structuring element of the municipality’s spatial development. As a result, retail and service businesses respond to the opening of mines and the development of housing, locating close to these areas. This will eventually alter the current fragmented spatial pattern by creating few large urban settlements.

Although there are several existing mines in the area already, resources still remain unexploited and investment in this sector is important. The expansion of the mining activities in the GTLM area presents an opportunity to improve infrastructure, increase job opportunities, address unemployment and generate many other economic spin-offs. The lack of economic growth in other sectors in the region warrants special attention and support to optimize the available opportunities in the mining sector.

GTLM has developed its Local Economic Development (LED) Strategy in June 2007 and is aligned with the Limpopo Growth and Development Strategy, Provincial Spatial Framework, National Spatial Development Perspectives and ASGISA. The strategy identifies the mining activities taking place in the area as the primary economic activity in GTLM. It also outlines key issues that have to be taped into to unlock the economic potential in GTLM. To date, the growing mining sector in the GTLM has resulted in GTLM being the 7th largest regional economy in South Africa.

The Der Brochen Project would contribute towards economic development through employment opportunities, improvement of procurement of services and increase in social development projects for the communities in the local area.

4.1.3 Product markets

The main markets for the platinum industry are the automotive, chemical and jewellery industries. Global emission policies, fuel prices and new vehicle sales are the key demand side drivers of the platinum group metals price in the automotive industry. Current cleaner gas emissions policies as being implemented worldwide continue to support Platinum prices (AAP, 2014).

Approximately 95% of refined platinum group metals (PGMs) that will be produced at the Der Brochen Mine will be sold on international markets. The main consumers of PGMs include the USA, Japan, Korea, China and Russia, where the platinum is used primarily in the motor vehicle manufacturing industry (catalytic converters) and for jewellery.

4.1.4 Estimate of expenditure on project

The capital expenditure to bring the mine into full production is approximately R199 million in year 1 increasing to R2 179 million in year 9 and decreasing to R1 118 million in year 10. This includes the total capital for mining on the mining right (ie includes a portion of the JV activities) two Open Pits, the relocation of the 132 kV Powerline, the raising of the Helena TSF and construction of the Co-CDF and the Mareesburg TSF (AAP, 2014).

4.1.5 Estimate of total annual expenditure at full production

Operating cost forecast for the mining activities (includes a portion of the JV activities) Open Pits (Excluding processing plant and labour) is between R300 – R700 million per year for the first ten years of operation (AAP, 2014).

Operating cost forecast for the Mototolo processing plant (Excluding labour) for the same 10 year period of operation is between R400 and R1 000 million per year.

Total cost of all technical skills and services required to operate the Mine is between R281 000 and R894 000 million per year over the first 10 years.

4.1.6 Estimate of labour force at full production

See summary of the anticipated workforce in Section 4.17.

4.2 Project Location

Der Brochen is located in the Limpopo Province, but borders the Mpumalanga Province on the south-eastern side of its mining right. The project falls within Ward 31 of the Greater Tubatse Local Municipality, in the Greater Sekhukhune District Municipality. The nearest main towns to Der Brochen are listed in Table 4-1.

Table 4-1: Der Brochen Project Area in relation to Adjacent Towns

Town	Approximate distance and direction in terms of the project area (line of sight)
Steelpoort	25km north
Roossenekal	28km south-west
Lydenburg	35km west south-west
Burgersfort	43km north north-east
Groblersdal	74km south-west

Der Brochen is located within the Eastern Limb of the Bushveld Complex. Access to Der Brochen is via a tarred access road from the R577 tarred road between Sekhukhuneland and Lydenburg. Railway access points are at Burgersfort, Steelpoort or Polokwane. There are two river valleys in the Der Brochen Project area, the Groot- and Klein-Dwars Rivers, in the east and west respectively. Access to Der Brochen is via a tarred access road from the R557 Provincial Road.

4.3 Surrounding Surface Infrastructure

4.3.1 Roads

R555

Provincial Road R555 is the main road that links the towns of eMalahleni (Witbank) and Middelburg in the south and Burgersfort in the north, to the town of Steelpoort. The R555 is a 2-lane single carriageway road with one lane in each direction. The R555 forms part of the regional road network linking Gauteng in the east and the Limpopo Province in the west that also serves the vast mining areas of Witbank and Ogies.

R557

Provincial Road R557 also forms part of the surrounding regional road network that links the town of Lydenburg to the east, with the R555 to the west, passing the mine access road in an east-west direction. This road is one of the main access routes for mine workers from Lydenburg as well as Steelpoort & Burgersfort.

D1261

The D1261 is a District Road that links the R557 in the south to the R555 in the north. It is a two lane, two way asphalt surfaced road with 3.7 m lanes and gravel shoulders.

Access Road

The Der Brochen Project access road is a two lane two way road with 3.5 m lanes and gravel shoulders. This road is approximately 10 km long and is fairly windy with a relatively flat vertical alignment and a speed limit of 60 km/hr.

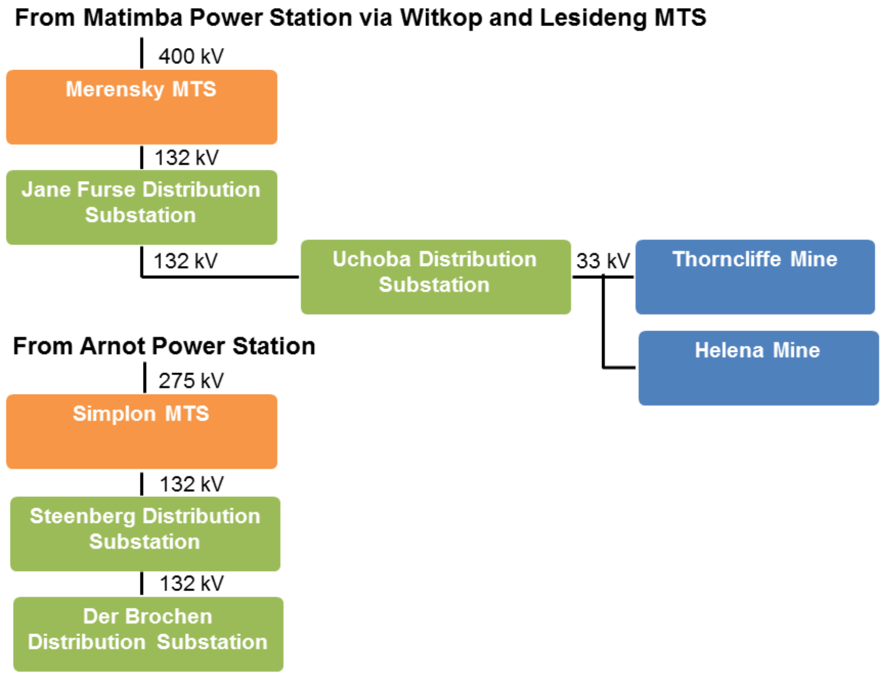
4.3.2 Railway lines

The nearest railway station to the site is at Steelpoort, approximately 43 km by road to the north east. This is the terminal of a line that extends eastwards to Burgersfort and Ohrigstad an eventually southwards to Lydenburg and Dullstroom

4.3.3 Powerlines

The nearest substation to the site is Simplon, which is situated approximately 25 km to the south-west of Der Brochen. From here, there are powerlines that follow the Klein-Dwars River valley and extends north-eastwards to Steelpoort. Simplon is fed from the Arnot power station by a 400kV powerline.

A 132kV line runs from a north south direction through Der Brochen’s mining right area on the western side of the Groot-Dwars River. Refer to Figure 4-1 for the power distribution plan.



srk consulting	**Der Brochen** Power distribution plan around Der Brochen	Project No. 469113

Figure 4-1: Power distribution plan around Der Brochen

4.3.4 Surrounding Communities

Several communities reside on Der Brochen's mining right area and immediate surrounding area. These are listed in Table 4-2 and shown in Figure 4-2.

Table 4-2 Communities surrounding Der Brochen

Families	Farm Name	Communities
Gamawela	St George 2 JT	The Gamawela and Ditsabeng Tsa Moletsi community
Magane and Leshaba,	Hermansdal 3 JT	
Matjomane and Mogashoa	Richmond 370 KT	
Mankge	Mareesburg 8 JT	
Leshaba	Welgevonden 9 JT	The Moletsi community
Pakaneng, Choma	Schaapkraal 42 JT	The Pakaneng Choma community
Pakaneng, Choma	Vygenhoek 10 JT	

4.3.5 Surrounding mines

Several mines are operating in the Groot Dwars River Valley and surrounding areas. These mines are listed in Table 4-3 and their locations shown in Figure 4-2.

Table 4-3: Surrounding mines around the Der Brochen Project area

Mine	Mine Owner	Distance and direction from Der Brochen
Tweefontein Mine	Samancor	14 km north
Dwarsrivier Mine	Assmang	10 km north

Mine	Mine Owner	Distance and direction from Der Brochen
Two Rivers Platinum Mine	Joint Venture (JV) between Impala Platinum and African Rainbow Minerals (ARM)	9 km north north west
Thorncliffe Mine	GlencoreXstrata	6 km north east
Helena Mine	GlencoreXstrata	2.5 km north east
Lebowa and Borwa Shaft (forms part of Mototolo JV, refer to Section 4.3)	GlencoreXstrata	4 km north
Booysendal Mine	Northam	9 km south

Data Source: CD:NGI	
Scale:	
Projection:	Datum: WGS84
Central Meridian/Zone:	
Date: 30/10/2014	Compiled by: ELSA
Project No: 469113	Fig No: 4-2

srk consulting

DER BROCHEN

SURFACE INFRASTRUCTURE AROUND DER BROCHEN

Revision: B Date: 01 12 2014

Path: J:\Proj\469113_DER BROCHEN EMP ALIGNMENT\8GIS\GISPROJ\MXD\Report_Dec2014\469113_A3_Fig4_2_Surface_Infrastructure_around_DerBrochen_01122014.mxd

4.4 Existing Infrastructure and Activities at Der Brochen

Although Der Brochen is not a fully operational mine currently, mining related activities are taking place as part of the Mototolo Joint Venture (JV) and approved EIA/EMPs. The Mototolo JV is a joint venture between RPM and GlencoreXstrata. The Mototolo JV utilises ore from GlencoreXstrata's underground operations (Borwa and Lebowa shafts on Thorncliffe farm) which border the northern section of the Der Brochen mining right. The ore is transported via a conveyor belt to the Mototolo Concentrator where the ore is processed. Tailings material from the Concentrator is disposed of on the Helena TSF. This process is explained in Figure 4-3.

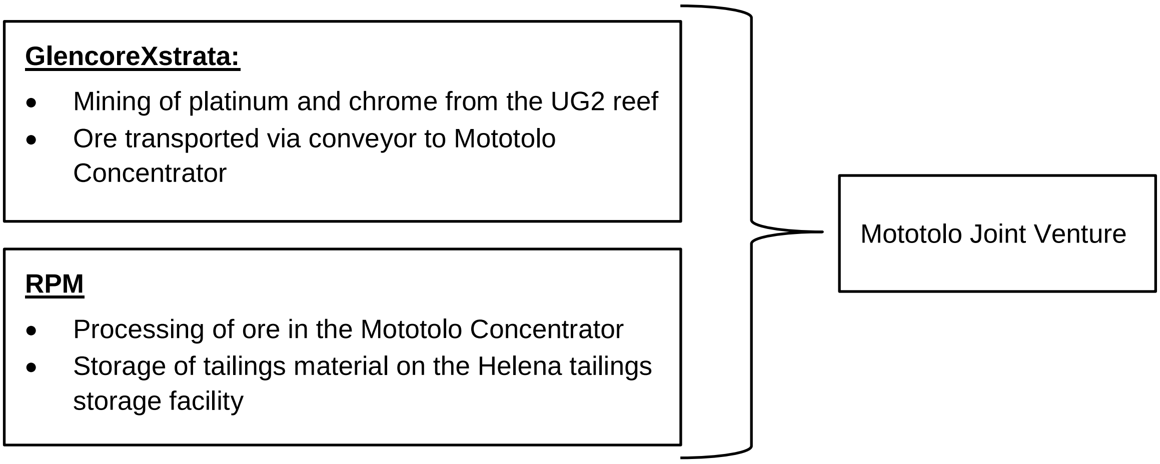


Figure 4-3: The Mototolo Joint Venture organogram

Mototolo JV Operation: UG2 ore is produced by the Mototolo JV from two decline shafts situated on the farm Thorncliffe, located north of the Der Brochen property. They provide UG2 ore to the Mototolo Concentrator at a rate of approximately 200 000 tonnes/month and 2.4 million tonnes/annum. These shafts are an existing operation and while they currently mine ore from both the Glencore/Xstrata and the Rustenburg Platinum Mines (RPM) mining right. This ore is treated in the existing Mototolo Concentrator built on approval of the 2003 EIA. The final concentrate is smelted by RPM in the smelter located in Polokwane, and refined in Rustenburg.

4.4.1 Mototolo Concentrator

Ore is transported to the Mototolo Concentrator located on the farm Helena 6 JT where it is stored in silos before being fed into the plant.

The ore is conveyed to the milling area where it undergoes milling and flotation. The flotation circuits produce a concentrate, which is pumped as slurry to the concentrate thickeners, where it is partially dewatered before being processed further. The chromite concentrate is trucked from the spiral plant to the stockpile area and from there to the Glencore/Xstrata plant on Thorncliffe along the Concentrator road.

Several reagents are used in the flotation circuit and include copper sulfate (activator), sodium isobutyl xanthate (collector), Sascol 95 (collector), KU5 and KU47 (depressants), Cresylic acid (frothing agent) and Betafroth.

There is also a Chrome recovery spiral plant within the Mototolo Concentrator footprint area.

Mototolo JV Concentrator has a 50,000t ROM stockpile in the crusher area. This ROM is from existing Mototolo Mine (Lebowa and Borwa shafts).

4.4.2 Helena TSF

Tailings from the Mototolo Concentrator is pumped at 48% solids content via a 300 mm diameter slurry delivery Pipeline to the 45.1 ha Tailings Dam on the farm Helena 6 JT at a rate of 2 600 000 m^3/annum. The TSF has cut-off walls and trenches, paddocks and solution trenches, penstocks and under-drains. Seepage water is recycled back to the Concentrator.

The 2005 EIA/EMP refers to a Tailings Dam height of 46 m, measured at the lowest point of the dam footprint. This height is expected to be reached in mid-2015. The maximum height for a 200 ktpm operation on the approved footprint is 16 m higher.

Decant water drains to two clay lined return water dams located below the Tailings Dam.

Return Water Dam (RWD) A has a storage capacity of 170 000 m^3 (retention capacity of 15 days, well above the minimum three-day design requirements to cater for well-field water in future) and Return Water Dam B has a storage capacity of 35 000 m^3 (retention capacity of three days).

Seepage from the dams is contained in two seepage sumps. Water from the sumps is pumped back to the return water dams.

Raising of the height of the Helena TSF

The approved height for the Helena TSF is 42 m (1 124 masl) which, with the current deposition rate, will be reached by September 2015. It is proposed to increase the TSF to a maximum height of 63 m (1 145 masl). This is a height increase of 21 m. The footprint will increase by 3 ha and will expand into the existing gravel road on the west side of the TSF. This road will be re-aligned. By raising the height of the Helena TSF, this will provide additional storage until June 2018.

The on-going Feasibility Study has indicated that consideration may be given to diverting tailings to the Mareesburg TSF prior to the Helena TSF reaching its planned final raised height (elevation 1 145 masl) so as to reduce the rate of rise of the Helena TSF. This will be dependent on the availability of the Mareesburg TSF to receive tailings. There will be no changes in footprint areas of the two TSFs should this option be implemented.

Figure 4-4 illustrates the position of the Helena TSF, and shows the proposed additional footprint and height increase, as well as the proposed realignment of the gravel road (4 m wide). Table 4-4 shows summaries key characteristics of the Helena TSF.

The application for the raising of the Helena TSF was dealt with in a separate EIA/EMP Amendment in accordance with the MPRDA, and was submitted to the DMR in September 2014. Details of this application are, however, repeated in this EIA/EMP Alignment.

Table 4-4: Characteristics of the Helena TSF

Characteristics	Approved (EMPR, 2002)	Current (August 2014)	Proposed Raised (at termination 2018)
Ore processing rate (ktpm)	200	200	200
TSF footprint (ha)	45	43	46
Terminal height (m)	42	38	63
Elevation (masl)	1 124	1 120	1 145
Capacity of TSF (Mt)	9.12	8.20	13.75

The design and operation for the smooth functioning of a tailings storage facility requires sophisticated design, construction, supervision and monitoring measures by a team of professionals experienced in this field. SRK's ENGEO Department was appointed to undertake the original design for the Helena TSF as well as for its raising to an elevation 1 145 masl.

Figure 4-4: Helena TSF layout

Design of the Helena TSF

For the stability assessment the slope stability software program SLIDE V 6.0 (Rocscience, 2012) was used to analyse the Factor of Safety (FOS) of the slopes of the Tailings Dam.

Table 4-5 below summarises of the factors of safety obtained through the analysis.

Table 4-5: Factors of Safety

Piezometer Section	Drains Operational (Janbu Simplified)		Drains Non-functional (Janbu Simplified)	
	Local	Global	Local	Global
F	1.26	1.58	1.16	1.37

The global FOS for normal conditions (drains operational) is above 1.5, hence it is considered acceptable for long-term stability. The FOS for local failure is below 1.5. As a local failure under normal conditions would not result in major consequences for the complete Tailings Dam, this is therefore acceptable as well.

For special loading conditions (drains non-functional), international standards advise to aim for a FOS of at least 1.1. For the analysed sections a minimum FOS of 1.37 for global failure is obtained. Even the FOS for local failure is above the minimum requirements. The results are therefore acceptable.

The report on the design of the TSF concludes that the Mototolo's Helena TSF has been designed as a safe and stable facility in accordance with the latest legislation and design principles. However, as previously, assumptions had to be made, especially with regard to the material parameters of the tailings being deposited. The current monitoring procedure (as carried out and set out in SANS 0286:1998 (inclusive of all subsequent revisions and or additions that may occur from time to time)) should therefore be extended to the new arisings of the TSF (SRK Letter Report, 474917 12 June 2014, to Mototolo JV).

Operation

The Helena TSF was commissioned in October 2006 and is currently being operated by means of cyclone deposition method. This method will continue to be used for the raising of the TSF.

It is operated in accordance with operating manuals, protocols and specifications. This includes maintenance measures to cover and manage the integrity of the Pipeline delivering tailings from the Concentrator to the TSF.

Monitoring

The following normal routine reporting procedure and frequency will continue to be implemented by teams representing the consultant, tailings contractor and the Mine:

Tailings contractor:	Daily (on-going), weekly, monthly, annual inspections and reporting to the Mine.
Mine personnel:	Weekly, monthly, quarterly and annual inspections and reporting to management.
Consultant:	Quarterly and annual reports to the Mine

Ad hoc special visits and investigations are implemented when upset conditions are suspected or observed

Parameters and characteristics of the TSF that are monitored include:

- Annual helicopter inspections;

- Piezo-cone testing (when required but typically not less than every 4 years);
- Piezometric levels to determine phreatic surface (monthly) This gives an indication of the efficiency of the underdrainage system;
- Piezometer upset testing (annual);
- Freeboard assessment (monthly monitoring and quarterly survey reporting) Freeboard design measurement is to contain a 1 in 50 year rain event as defined on site + 800 mm;
- Drain rodding (annual);
- Drain flow readings (monthly). This gives an indication of the movement of pore-water within the body of tailings;
- Rate of rise measured at the penstock intake (quarterly and annually);
- Deposition strategy to manage and prevent formation of cracks;
- Remediation of cracks and revision of deposition strategy;
- Tailings slurry density and comparison with the design slurry density (monthly);
- Tailings gradings (annually);
- Seepage data from seepage areas (monthly);
- Rainfall and evaporation data (daily);
- Visual inspection of Pipelines to detect possible failure sites and leaks (daily); and
- Beaching conditions (beaches to be kept wet to prevent formation of cracks) (daily).

Flow diversion in case of failure of the Helena TSF

SRK conducted a flow-slide analysis to assess the zone of influence, should the Helena TSF fail. The flow slide analysis was conducted using the guidelines of South African National Standards (SANS) Code of Practice, SANS 10286:1998, Clause 4.4.2. Two structures were identified within the zone of influence, namely the Helena Chrome Mine Decline Shaft Complex, and the Mine Vent Shaft complex. The Leshaba community, on the lower reaches of the right bank of the Groot Dwars River, falls outside the zone of influence. Refer to Figure 4-5 for an indication of the modelled zone of influence.

SRK recommendations (SRK, 2014a) to divert the flow of tailings away from structures in the event of a failure, are as follows:

Mine Vent Shaft Complex

In terms of possible flow diversion structure options, the following three options may be considered:

- A flow diversion structure with a height of 6.5 m above the surrounding ground elevations, potentially a rockfill structure. It is proposed that the crest width be a minimum of 6 m and side slopes at 35 degrees. The length of the structure should be approximately 120 m long; and
- A gravity concrete structure. The crest width should be 0.5m, with the side slope at 45 degrees so that the structure can act as a mass concrete structure

Chrome Decline Shaft Complex

A flow diversion structure (flow slide safety berm) should be considered at the location of the Dwars River side edge of the working platform at the Helena Chrome Mine decline shaft (SRK, 2014).

Figure 4-5: Raised Helena TSF Zone of Influence

4.4.3 Trial mining on Richmond farm

This activity is completed and the soil stockpile and Waste Rock Dumps are well vegetated.

Access to the UG2 reef was to be provided via 2 decline shafts on the farm Helena 6 JT and 4 adits on the farm Richmond 370 KT, however, no site preparation in the shaft areas has as yet taken place.

Topsoil stockpiles are limited to the Richmond exploration and access road building activities (Richmond Waste Rock Dump and roads). The stockpiles have self-vegetated and the vegetation is well established.

4.4.4 Prospecting

On-going prospecting activities: An EMP submitted in 2007 included the drilling of 382 prospecting holes between 2001 and 2007. This is an on-going activity and authorisation need is covered in this EIA/EMP Amendment for future prospecting work.

Exploration activities consist of pre-drilling (site preparation), drilling of exploration boreholes, site rehabilitation and monitoring.

Other activities associated with the prospecting include construction of temporary roads, clearings and levelling at drill pads and camp sites (20 m x 20 m) near drill rigs. All these activities are rehabilitated on completion of drilling.

Waste from drill sites will be handled in accordance with AAP’s Zero waste to landfill model.

4.4.5 Monitoring of surface and groundwater

There are five monitoring weirs with the four weirs up- and downstream of the two Wellfields that are currently being monitored.

Monitoring of surface water and groundwater of the Der Brochen and Mototolo JV area is undertaken. To determine the potential impact on the groundwater quality due to seepage of contaminants from the existing Helena TSF and associated infrastructure (Pollution Control Dam (PCD), Return Water Dam (A), Return Water Dam (B)), the available Mototolo monitoring network data was assessed. Deposition on the TSF started in October 2006, while continuous monitoring data from 2007 onwards were available and were reviewed.

The Der Brochen drinking water is monitored monthly and forms part of the Quarterly Monitoring Programme undertaken by GCS on behalf of RPM.

4.4.6 Existing gravel roads

There is an extensive road network over the site of gravel surfaced roads up to 8 m wide linking the Mareesburg area with the Helena TSF, proposed open pit areas and the existing office and core yard complex. These roads are maintained when required after the wet season.

There are also a number of temporary tracks between the offices and the exploration sites.

4.4.7 Office, core yard and access road

An old farm house on Helena is being used as the project offices and there is a core yard to the north-west of the offices.

This area is serviced by an access road, which is currently managed by the neighbouring Booysendal Mine, including all Section 21(c) and (i) water uses related to river crossings, until such time that Booysendal develops a direct access road.

4.4.8 Water supply

Water is supplied to the Mototolo Concentrator by the Lebalelo Water Users Association (LWUA) via the Lebalelo Pipeline. The available and billed allocation is 5 Ml/d (the original allocation was 12 Ml/d of which 7 Ml/d has been allocated to the Booysendal Mine). On average 2.5 Ml/d of the 5 Ml/d allocation is used. The raw water is stored in the 7 700 m^3 capacity raw water dam situated at the Concentrator.

Make-up water supply for the Concentrator includes tailings return water (from the Helena TSF) and final treated sewage effluent.

Water supply to the proposed Der Brochen Mine will be from boreholes of the Helena and Richmond well-fields. Only two boreholes per Wellfield are currently in use;

Water for the current exploration activities is sourced from the existing, authorised boreholes. The well-field is covered in the 2004 Addendum to the EMPR (SRK, 2004).

4.4.9 Sanitation

The sewage treatment plant is located within the Concentrator area.

The plant consists of a package plant designed for 350 l/person and a peak flow of 7 000 l/hour. The purified effluent is directed to the pollution control dam.

The plant has four clarifiers and two settlers. Wet sludge is removed by an outside contractor via a Honey sucker.

The sewage treatment plant is designed in such a way that should it overflow, the untreated effluent will be directed into the pollution control dam to prevent discharge of sewage into the surface water course.

Sewage treatment at the project offices and the Der Brochen security gate is treated through the use of septic tanks. Wet sludge is removed by an outside contractor by means of a Honey sucker.

4.4.10 Stormwater management

Surface water runoff from the Mototolo Concentrator and Helena TSF area is treated as contact water and directed via a system of drains to a silt trap before discharging into the pollution control dam down slope of the plant.

The pollution control dam has a capacity of 11 000 m^3 and has been designed to manage a 1:50 year flood event with a freeboard of 0.5 m.

This dam is operated as dry by pumping the water back to the Concentrator process water tank from where it is used in the process.

Both the silt trap and pollution control dam are currently silted up resulting in dam overflows during the wet season.

4.4.11 Waste management

Domestic waste is disposed of at the municipal landfill site at Burgersfort. This waste disposal site is operating under an expired license.

All hazardous waste is sent to a registered hazardous waste site.

Scrap metal is sold to scrap metal dealers.

4.5 Proposed infrastructure

In addition to the Alignment, RPM intends undertaking additional activities that have not been authorised in existing EMPs, a summary of which includes:

- Two Open Pits (Northern and Southern Pits);
- A Co-Disposal Facility (tailings disposal with a rock embankment in the North Pit);
- An expansion to the previously approved Mareesburg TSF and associated infrastructure; and
- Re-routing of a 132kV powerline; and
- Contractors' laydown area.

These are discussed in more detail in the sections to follow. Refer to Figure 4-6 for the proposed project layout.

The surface areas that will be directly affected by the proposed new activities and surface infrastructure are listed in Table 4-6.

Table 4-6: Details of the properties directly affected by the new proposed activities at Der Brochen Project

Activity	Farm name and portion	Land owner
Northern Pit	Helena 6 JT RE	Rustenburg Platinum Mines Limited
	Helena 6 JT portion 3	Rustenburg Platinum Mines Limited
Southern Pit	Helena 6 JT portion 3	Rustenburg Platinum Mines Limited
	Der Brochen 7 JT RE	Rustenburg Platinum Mines Limited
Co-disposal TSF	Helena 6 JT RE	Rustenburg Platinum Mines Limited
Mareesburg TSF	Mareesburg 8 JT portion 7	Rustenburg Platinum Mines Limited
Pipelines (from Mototolo Concentrator to Mareesburg TSF	Helena 6 JT RE	Rustenburg Platinum Mines Limited
	Mareesburg 8 JT portion 7	Rustenburg Platinum Mines Limited
Re-routing of 132 kV powerline	Helena 6 JT RE	Rustenburg Platinum Mines Limited
	Mareesburg 8 JT portion 4	Rustenburg Platinum Mines Limited
	Mareesburg 8 JT portion 7	Rustenburg Platinum Mines Limited
	Der Brochen7 JT	Rustenburg Platinum Mines Limited

Figure 4-6: Der Brochen site layout map

4.6 Open Pits (Northern and Southern Pits)

RPM is considering the development of two Open Pits to mine the near-surface layer of the Upper Group 2 (UG 2) Reef. The proposed open pit operation will consists of a Northern Pit (life of mine 3.5 to 4 years) and a Southern Pit (life of mine 2 years). The ore of the near-surface layer is unsuitable for processing in the Mototolo Concentrator and will be transported off site for processing. Ore production in both Pits will be at 35 000 to 45 000 tonnes per month (tpm). The ore will be crushed in a mobile crusher. Two possible locations for the mobile crusher are being considered. The crusher will consist of a 30/42 Jaw crusher with a short Banana conveyor feeding a 30 m Stockpiling conveyor. There will be 1 container control room and 1 container office (SRK, 2014b).

Waste rock from the open pit will be used to construct an embankment for a proposed co-disposal storage facility that will be constructed over the backfilled (with tailings) Northern pit. This is discussed in more detail below.

Alternatively, should the Co-Disposal Facility be considered not feasible, the Northern Pit will be closed in a manner similar to the Southern Pit. Closure will entail the backfilling of the Pits with overburden stripped ahead of mining. Temporary Waste Rock Dumps (WRDs) to create an initial void will be provided on the edges of the pit highwall side and the waste rock will be dozed into the pit to fill the final void. The majority of the pit will be backfilled during operations, with this roll over mining method being practiced. Two WRD options, A and B, are considered for the northern section of the North Pit. WRD C is proposed in the southern section. Two WRD options, E and F, are considered for the southern section of the South Pit, and WRD D is proposed for northern section.

Table 4-7 summarises the specification of the proposed temporary WRDs.

Table 4-7: Temporary Waste Rock Dump summary

Waste rock dump	Size		Volume	Approximate square size
	m^2	ha	m^3	
North Pit A or B	79 524	8	1 518 923	282 m x 282 m
North Pit C	79 524	8	1 518 923	282 m x 282 m
South Pit D	93 025	9	1 8282 365	305 x 305
South pit E or F	93 025	9	1 8282 365	305 x 305

Should the Co-disposal Facility (CDF) not be constructed, topsoil from the Open Pits will be stockpiled in a proposed stockpile (6.9 ha in extent) to be situated adjacent to the existing topsoil stockpile (0.5 ha) south of the Helena TSF. The positions of the existing and proposed stockpiles are shown on Figure 4-7. This area falls within the area that would have been occupied by the starter wall of the CDF where it would have been constructed.

Ore from the proposed Open Pits will be trucked on the existing Booysendal/Thorncliffe tarred haul road to a yet to be identified third party processing facility. Available information indicates that night-time transport of ore will take place. Trucks, with carrying capacities of 30 tonnes will be used and will then generate 106 to 136 trucks per day two-way, assuming that the transport operations only occur during the week and for 12 hours a day (ie. 22 days per month). This calculates to a maximum of 11 vehicles two-way in an hour (Aurecon, 2014).

The high wall of the open pit is approximately 70-80 m.

ABGM (Mr Anton von Wielligh) was commissioned by AAP to prepare a report on the mine planning aspects of the project. This report is entitled “Der Brochen Open Pit Study Summary Report” Draft 1 dated 10th September 2013 (SRK, 2014b).

Information contained in this report has been used to develop an understanding of the sequence of mining and in particular the materials that will be excavated from the open pit and that will become available as wall building material for the CDF. The integration of the excavation of the open pit and the construction of the CDF is vital and important factor of this project, this include material selection, placing and compaction to specifications.

The ABGM report covers an “unconstrained” and a “constrained” open pit development. The unconstrained pit covers the area designated by the combined north and south Pits while the constrained pit covers the north pit only subject to the geographic constraints related to the rivers and streams (east, north and south), the road and power lines on the site. For the unconstrained pit the UG2 ore and waste rock amounts to 3.3Mt and 42.1Mt respectively. For the constrained pit the tonnages are approximately 1.64Mt and 21.46Mt respectively.

The ABGM report furthermore considers two waste rock and rehabilitation options. The first is the backfilling of the pit with the waste rock at the end of the pit life and using the previously stripped topsoil for closure purposes. The second option is to construct a Co-Disposal Facility consisting of waste rock and tailings which is a second option dealt with in this EIA/EMP Amendment.

An early design by AAP considers the available data on the jointing of the rock mass and the weathering profile and concludes that the slope angles and bench widths should be as follows:

- Soils and free dig battered back to 40° with a 15m catch berm;
- Weathered zone slope angle of 55°; and
- Fresh rock 59° stack slope angle consisting of 15m high benches and 12m berms.

The conceptual design seeks to define the maximum possible footprint subject to the geographical (river, road and powerline) and engineering (stability) constraints, by balancing the cut and fill quantities. Alternative design criteria will be investigated during the feasibility and detailed design phases as necessary.

The plan area of the proposed North and South Pits cover and area of approximately 31 and 27 ha respectively. The Co-Disposal Facility, including the North pit, covers an area of approximately 60 ha.

Refer to Figure 4-7 for an indication of the general layout of the North and South Pits and Co-Disposal Facility.

The bench sizes and widths are important for the subsequent construction of the Co-Disposal Facility since the tailings benches will be required to integrate with the rock benches within the area of the pit. SRK has therefore accepted these slope angles as the basis for the design of the Co-Disposal Facility. However, a review of the face angles will be required once the detailed design of the tailings deposition strategy for the lined and unlined conditions to be used, are finalised. Issues include the safety and accessibility to the rock benches for the installation and maintenance of tailings delivery and return water pipes, the securing of HDPE (or other) liners to the highwall, the preparation of the highwall to accept the HDPE liner and dealing with the drainage of the natural groundwater percolating from the highwall face. These issues are dealt with later in this EIA/EMP Amendment.

Figure 4-7: North and South pit layouts

4.6.1 Blasting and ground vibrations

Cambrian CC undertook an assessment of the blasting-related disturbances on the infrastructure adjoining the Der Brochen Open Pits in June 2012. This involved the modelling of design blasts to determine the possible ground vibration and airblast levels at various distances around the Pits. The open pit blast design parameters were based on the standard designs used in open pit environments. The infrastructure around the Pits that could be potentially affected by blasting included the, Mototolo Concentrator, the Helena TSF, the mine offices and coresheds and the Der Brochen Dam at the southern side of the Der Brochen lease area (Cambrian CC, June 2012).

Blasting in the Northern pit will have the greatest impact on the Mototolo Concentrator and the Helena TSF. The disturbance levels at the Concentrator will be noticed but should be within acceptable limits.

While Cambrian CC expressed concern about the possibility of a potential liquefaction failure of the TSF, it can be controlled by a blast design limiting the peak particle velocity (PPV).

Blasting will have a severe impact on the mine offices and core shed area, however, as ground vibration here will exceed the recommended limits. The offices will be affected by blasting on the southern side of the northern pit and the northern side of the southern pit. In addition, the offices fall within the 500 m safety blasting radius and as such all inhabitants will need to be evacuated when blasting takes place in the proximity.

Cambrian CC considers that blasting at the southern pit will have minimal effect on the Der Brochen Dam wall. However, given that the Dam wall shows signs of settlement, Cambria CC considers it to be prudent to keep the vibration levels as low as possible. Blasts will be required to be monitored at the Dam wall to ensure that the levels experienced are acceptable. Inspection of the spillway showed significant cracks in the concrete of the spillway areas. Cambrian CC advises with the available information, the dam should be treated with caution and vibration levels should be kept as low as possible. With careful blast design the vibration levels should easily be kept below 2 mm/sec. which levels are well within the acceptable limits for the Dam structure.

Based on the above concerns of potential blasting impacts on the Helena TSF and the Der Brochen Dam, RPM will require the mining contractor to undertake a blast design for submission to and approval by RPM prior to commencement of any blasting at the Pits.

4.6.2 Blasting requirements in the Northern pit

Integration between the mine plan and the construction of the embankment wall will be essential as will choice/selection and placement of material. For this purpose, it is envisaged that the material available from the blasting operations according to a prescribed blasting/fragmentation design, will be available directly for embankment wall construction within the required parameters and criteria (SRK, 2014b). From a construction perspective, it will be important to avoid double handling of materials. Therefore during the final design phase, considerable effort will need to be placed on blasting/fragmentation design, material gradings, open pit geometrical mine planning and pre-preparation of the mining faces to receive the future tailings (particularly for the lined option).

4.6.3 Power supply

Power supply for the project will be sourced from the 132kV overhead power line supply negotiated separately by Anglo American Platinum and which presently feeds the Der Brochen Distribution Sub-Station from the Steenberg Distribution Sub-Station. At the Der Brochen Distribution Sub-Station provision has been made for a 33 kV off-take, which could temporarily be used to feed the Helena Open Pit mining operation (AAP, 2014)

4.6.4 Water demand

The water demand for the project is based on a consumption of 0.73 kl per tonne of ROM ore. There is currently 5Ml per day supply from LWUA southern extension Pipeline, 1Ml per day supply from well fields, and 0.3Ml per day allocation from Der Brochen dam (AAP, 2014).

4.6.5 Access and haul roads

Twelve metre wide roads will be constructed around the proposed pit areas.

4.6.6 Groundwater, dewatering and Pipelines

Groundwater inflows into the northern and southern pit will necessitate continuous dewatering of the Pits during life of mine with associated decline of groundwater levels in the vicinity and a reduction of groundwater baseflow towards the Groot-Dwars River. (Delta-H, Der Brochen, Groundwater investigation and modelling report, 2014)

The predictive model scenarios and resulting data are presented in a chronological order based on the applied transient model stress components. Based on the predictive modelling the average long term inflow rates into the northern and southern open cast equate to 2.3 and 6.2 l/s. The proposed Pits (and more specifically the southern pit) are likely to reduce groundwater baseflow towards the Groot-Dwars River. The expected mine inflows resulting from the northern pit (based on the assumption that the southern pit will not be developed) only relates to 3.6 l/s.

If the CDF is to be constructed, an underdrain system at the highwall/footwall using drainage pipes connected to the second compartment of the sump at the southern corner of the Northern pit will be installed. The tailings water reporting to the sump will be pumped to the main sump and from there to the Helena RWD for recycling to the Mototolo Concentrator.

If the CDF is not to be constructed the seepage water, considered to be polluted, will be pumped to the surface containment dam situated to the north of the Northern pit and from there transferred to the Mototolo Concentrator, after settling, for reuse as process water in the Concentrator.

The Pipelines will have diameters of around 300 mm.

Decommissioning and post-closure of the Open Pits will lead to recovery of groundwater levels. This will lead to the re-establishment of groundwater levels, flow directions and flow gradients to near pre-mining levels. This will re-establish the base flow rates within the zone of influence (Delta-H, Der Brochen, Groundwater investigation and modelling report, 2014)

4.7 Co-Disposal Facility (CDF)

An additional tailings disposal option being considered by RPM is the construction of a Co-disposal Facility (CDF) which will have a starter wall constructed of waste rock obtained from the Northern Pit, following which tailings will be deposited within the pit and the surrounding starter wall. The selection of this option will be dependent on cost considerations and the timing of the availability of the completed structure to receive tailings from the Mototolo Concentrator. These aspects will be taken into consideration during the Feasibility Study.

A Concept Design Study has been undertaken by SRK for RPM for the design and construction of the CDF (SRK, 2014b). This report considers both an unlined as well as a lined option for the TSF as described below. Much of the description below is from this report.

It is essential that the integration of mining and civil wall construction takes the highest priority in this project. This will include blasting/fragmentation patterns, high wall design, in-pit materials selection, materials scheduling (loading hauling and placing), wall construction sequencing, wall interface development, liner installation (for the lined option) and tailings deposition strategy as the final step.

The selection and placing of material will be paramount to the success of the project. While open-pit mining techniques will be operational within the mining area, cognisance must be taken of the more civil engineering requirements of placing and compacting the material to form a competent wall structure that is able to meet stability and seepage requirements. This will require the availability of an experienced earthworks foreman and engineer, who have the requisite experience to guide and control the process, including the adaptation of the blasting /fragmentation patterns in consultation with the open-pit mining operators.

The further phases of the design process will be required and will involve the pre-feasibility, feasibility and detailed design phases of the facility to be carried out, with particular reference to the seepage and impact on the environment. Refer to Figure 4-8 for the layout of the proposed CDF.

Figure 4-8: Layout of the Co-Disposal Facility

4.7.1 Unlined option

The tailings disposal concept for the Der Brochen CDF incorporates in-pit disposal and once the tailings reaches the top rim of the pit, the tailings will be contained by a ring embankment constructed around the rim. The embankment will be constructed mainly using waste rock from the pit.

From the volumes of the various materials assessed, it is anticipated that sufficient volumes will be available for the zones required for the embankment construction.

The tailings and the rockfill produced by the mining have different grain size distribution with tailings being much finer than the rockfill, thus interface layers should be designed to prevent water and fines migration into the rockfill which could pose a high risk of internal erosion of the embankment.

The interface layers should be designed in such way that particle sizes of the receiving surface are compatible with the tailings and subsequently ensure that the interface layer is compatible with the receiving rockfill surface. The interface layers have been designed using the methodology recommended in the National Resources Conservation Service of the United States. Given the large difference between grading of the tailings and rockfill, two layers have been obtained namely Sand Filter and Selected Rockfill.

The specified materials for the interface need to be placed in certain thickness and in a sequence to meet the required objectives. A model has been prepared to forecast the location of the phreatic surface within the embankment to validate the assumed layering and define the position of a seepage collection sump at the base of the embankment.

At a conceptual level, the upstream face layers have been placed in a sequence as follows (from Innermost to outermost):

- Selected rockfill mixed with tailings (50% mixture by volume);
- Sand filter;
- Selected rockfill; and
- Random rockfill.

From the model, it is concluded that the phreatic surface will likely develop within the embankment in the vicinity of the upstream toe. The Sand filter layer acts effectively as a seepage collection element and draws down the water table at shallow depths. Following that criterion, a sump filled with gravel has been placed beneath the Sand and Selected Rockfill layers with the aim of collecting and conveying the infiltrated water from the tailings in pipes installed at 50 m centres. These pipes will report to the solution trench and main sump and from there the water will be pumped to the Helena Return Water Dam.

The conceptual construction sequence is as follows:

- It is understood from the mine planning information that the open pit will be developed progressively from south to north in a partially splayed fashion where the active face will be developed with a strike direction approximately NE/SW. This plan will leave the highwall complete in the south area initially and as mining progresses, the highwall will progressively be exposed in a northward direction.
- It is envisaged that wall construction will begin at the central eastern area and proceed north and south. Therefore two faces will be available for construction at any time.
- Construction of the wall will necessitate the selection of material applicable to the zonal designation according to the required grading curves. The principle used here is to carefully select the material for the inner zone materials (which have a filter grading that ensures that movement of fines (that is, piping or internal erosion) cannot occur). For this purpose, there are two main layers, namely the selected rockfill and the sand layer forming the inner layers;

- Construction of the wall within the pit area on the south side can be started while the excavation of the open pit is being finalised in the north. Once the open pit has been completed in the north, the north wall construction can begin, once the wall is complete, then tailings deposition into the open pit can be commenced.

Construction timing

Construction of the main part of the wall will commence simultaneously with the excavation of the open pit and will be on-going during the open pit life time. This is for a period of 4 years according to the mining planning (Northern pit only). Construction of the southern wall could commence prior to completion of the open pit and is therefore considered to be a simultaneous exercise within the open pit life time. The north wall, however, can only be constructed once the open pit mining is complete. It is estimated that the decommissioning of the crusher plant and the construction of the northern wall will take approximately 6 months to complete, including the installation for the tailings spigot lines to the open pit deposition sites on the south wall. Tailings deposition is therefore likely to commence approximately 4.5 years after commencement of the open pit operation.

4.7.2 Lined option

The upstream embankment face for the lined case will be covered with a 2 mm Single textured HDPE liner (texture downward onto A8 Geotextile). In order to prevent puncturing of the geomembrane from rockfill clasts protruding from the surface, a cushion layer composed of fine rockfill and tailings sand has been selected. This layer will have a minimum horizontal width of 15 m to cater for construction equipment access.

The liner would prevent infiltration in the short term, but as there is permeability associated to the liner material (very low, in the order of 1 x 10-10 m/s), there will be infiltration in the steady state (long term) but at a reduced rate.

A scenario has been run with a liner as foundation, and modelling the receiving basin similar to the unlined case, as the upper overburden/weathered rock (Delta H, 2014). The maximum horizontal flow obtained through the foundation at steady state conditions with a liner is 7.0 x 10-7 m3/s.

The conceptual construction sequence is as follows:

- The open pit will be developed progressively from south to north;
- The conditioning of the highwall to receive the future HDPE liner. For this purpose it is proposed that the highwall faces are smooth blasted at a face angle not exceeding 80°, so as to ensure that the liner has a positive gravity surface on which to found;
- Preparation of the highwall to receive the lining consists of the installation of a mesh gunite/shotcrete surface layer, held in place by grouted rock-pins on the face and underlain by continuous cuspated drains at nominally 5 m centres vertically down the face. It is anticipated that the work required to prepare the highwall face will take place contemporaneously with the development of the highwall faces, but at some distance (probably 200 m) away from the active faces. Access to the highwall will be required for this purpose via the benches, therefore it will be important to design the benches height to accommodate access for the gunite/shotcrete and rock-bolting process. For this purpose it may be more practical to limit the bench heights to 10 m;
- It is envisaged that wall construction will begin at the central eastern area and proceed north and south. Therefore two faces will be available for construction at any time;
- Construction of the wall will necessitate the minimal selection of material applicable to the zonal designation according to the required grading curves. The principle used here is to carefully select the material for the inner zone materials to act as a cushion layer for the liner. For this purpose, there is one main layer, namely the selected fine rockfill;
- The outer layer consists of oversized rockfill (layer B2) where nominal compaction will be necessary;
- Construction of the wall within the pit area on the south side can be started while the excavation of the open pit is being finalised in the north;

- Once the open pit has been completed in the north, the north wall construction can begin;
- Installation of the liner system will commence on the footwall of the open pit, the highwall and on
- the wall benches to the 1 090m level;
- The underdrain system at the highwall/footwall using drainage pipes connected to the second compartment of the sump at the southern corner of the open pit and cover with a coarse tailings drainage layer prior to tailings deposition. The tailings water reporting to the sump will be pumped to the main sump and hence to the Helena RWD; and
- This system will allow deposition of the tailings into the open pit area for the first 12 months. Thereafter liner will be installed on successive 5 m benches over the entire perimeter ahead of tailings deposition. Re-preparation of the surface of the cushion layer will likely be necessary on each bench to ensure that there are no deleterious materials, clasts or erosion channels at the time of placement. On the highwall, the liner will be installed over a full bench height.

Construction timing

Construction of the main part of the wall will commence simultaneously with the excavation of the open pit and will be on-going during the open bit life time. This is for a period of 4 years according to the mining planning. Construction of the southern wall could commence prior to completion of the open pit and is therefore considered to be a contemporaneous exercise within the open pit life time. The north wall, however, can only be constructed once the open pit mining is complete. It is estimated that the decommissioning of the crusher plant and the construction of the northern wall will take approximately 6 months to complete, including the installation for the tailings spigot lines to the open pit deposition sites on the south wall. This will be followed by the installation of the liner system to the 1090m level and the drainage system at the highwall/footwall which is estimated to take approximately 3 months to complete.

Tailings deposition is therefore likely to commence approximately 4.75 years after commencement of the open pit operation. The installation of the liner system will take place on a bench by bench basis ahead of the tailings deposition level. Consequently, liner construction will be on-going almost for the duration of the deposition (deposition of tailings approximately 7 years).

4.7.3 Discussion on the lining of the CDF

The groundwater study by Delta-H considered two scenarios for the CDF, the Unlined Scenario and the Lined Scenario. The discussion below is largely from that report. The predictive simulations consider an unlined and lined CDF scenario with assumed seepage rates as well as the de-commissioning of the Helena TSF, which will result in a decline of its source concentration and seepage rates. The Helena RWD will, however, still be in use by the CDF and it is assumed that the pollution control dam, will also continue to function as part of the Mototolo Concentrator. The source terms for the latter two facilities therefore remain constant for the predictive simulation period.

The simulated leachate (cumulative) plumes emanating from an unlined CDF and the decommissioned Helena TSF will in all likelihood reach the Groot-Dwars River, although with relatively low concentrations. The installation of a lining system would limit the seepage rate and subsequently the spreading of potential contaminants (both laterally and vertically) emanating from the CDF reducing the expected contaminant load to the underlying groundwater considerably.

Upon closure of the TSFs the cessation of tailings deposition will lead to a decline of the source concentration and seepage rates. However, it takes around 20 to 40 years after closure of the TSF before the regional background recharge rate is re-established; the reduction in seepage concentration post-closure is also a slow process. Compared to the operation scenarios the seepage plumes from the CDF (and Mareesburg) TSF reduces significantly over the simulation time (post-closure). However, it is evident from the predictive simulations that the lateral extent still encroaches the Groot-Dwars River, albeit at lower concentrations (90 to 250 mg/l SO_4 and 3 to 23 mg/l NO_3 as N).

The groundwater study concludes that the lining of the Der Brochen Co-Disposal TSF with a Composite Liner to minimise impacts on the ambient water quality is recommended. Further, suitable engineering designs such as perimeter drainage trenches (toe drains) should be implemented to intercept potential shallow seepage. Should such a system need to be implemented, it is proposed that the number, locations and optimal pumping rates should be further modelled and designed to ensure sufficient spatial drawdown and associated capture zones to actually arrest the entire plume.

4.7.4 Embankment slope stability

The slope stability of the embankment was assessed, with analysis including both end of construction stage, considered representative at the end of the Waste Rock Dump placement, as well as the final CDF configuration prior to closure.

Circular failure surfaces have been considered to be representative of the probable failure mechanism and Simplified Bishop's method has been adopted to obtain the minimum FoS for the analyses.

Results of the stability analysis of the embankment are summarised in Table 4-8. For all cases, the FOS obtained meet or exceed the design criteria requirements.

Table 4-8: Results of static stability assessment on the intermediate state rock embankment

Case	FoS
Upstream End of Construction	2.1
Downstream End of LOM	1.8

4.7.5 Geochemistry of the waste rock

A study on the geochemistry of the waste rock to be generated by the open pit mining indicated that the vast majority (75%) of waste rock samples were classified as non-acid generating based on their limited sulfur content respectively acid potential, this is, however, generally compensated by the low, though sufficient neutralisation potential of the tested samples. Two waste rock samples (17%, norite and chromitite) were classified as uncertain or potentially acid generating in the case of preferential exposure or reactivity of sulphides. The single dolerite waste rock sample (HEO43/2) was classified as short term acid generating. The results are in agreement with earlier assessments of waste rocks and tailings material from the Der Brochen Project and other nearby platinum mines in the eastern limb of the Bushveld Complex, which all indicate non-acid generation and a likely neutral to alkaline leachate quality from the tested mine residues (Delta H, 2014).

4.7.6 Tailings deposition strategy

The Der Brochen CDF has two distinct compartments that would need to have separate disposal plans. These are the pit void and the above-surface void (contained by the waste rock embankment).

The main driver for the tailings disposal strategy would be to place the supernatant water pond close to the pit high wall and where possible, away from the embankments to minimise infiltration.

The first deposition phase would consist in filling up the pit void. In order to position the supernatant pond close to the high wall and locate it at the northern side of the pit, a set of spigots has been placed at the south eastern rim of the pit.

The second phase should commission additional delivery pipes laid out on the crest of the embankment at the south eastern flank. The criteria would be similar to the first phase, i.e. to keep the pond at the northern end of the facility, close to the return water piping system. The required freeboard was set as 3 m, therefore the maximum beach head is designed at elevation 1 116 m.

The total tonnages stored in the facility is the combination of phase 1 (2 510 270 t) and phase 2 (16 014 2750 t), making a total of 18.5Mt, or 7.7 years of tailings deposition.

4.7.7 Summary of pertinent information of the CDF

A summary of pertinent information on the tailings facility is as follows:

- Area covered by open pit: 30 ha;
- Area covered by Tailings Dam: 60 ha;
- Crest level: 1 119 mamsl;
- Freeboard allowance: 3m;
- Tailings level when full: 1 116 mamsl;
- Level of open pit rim east side: 1 095 mamsl;
- Surface area of tailings at level 1 116 m is 41.32 ha; and
- Waste rock available from pit: 10.77 Mm^3 (bulked).

Unlined option

- Volume of tailing storage (unlined option) 10.212 Mm^3
- Tonnage of tailings: (unlined option) 18 382 Mt
- Life of Tailings Dam: 7.66 years
- Dam wall volume (waste rock required) 9.425 Mm3
- Volume at closure (domed option) 11.521 Mm^3
- Tonnage at closure (domed option) 20.738 Mm^3

Lined option

- Volume of tailing storage (unlined option) 9.564 Mm^3
- Tonnage of tailings: (unlined option) 17 216 Mt
- Life of Tailings Dam: 7.17 years
- Dam wall volume (waste rock required) 10 064 Mm^3
- Volume at closure (domed option) 10 884 Mm^3
- Tonnage at closure (domed option) 19 592 Mm

4.7.8 Power supply

Piping (both tailings supply and return water to the Concentrator) will be routed from the northern sector of the CDF via the west of the Helena TSF to the Concentrator. Return water from the Helena RWD will use the currently available facilities.

Electrical supply will be required for the barge pumping system, booster pumps (at the NW corner of the CDF), at the main sump (NE corner) and at the in-pit sump(s) (S corner of the open pit). The 11 kV Powerline that was constructed from the Der Brochen distribution substation will be used for this purpose.

4.7.9 Flow diversion in case of failure of the CDF

SRK conducted a flow-slide analysis to assess the zone of influence, should the Co-Disposal Facility fail. The flow slide analysis was conducted using the guidelines of South African National Standards (SANS) Code of Practice, SANS 10286:1998, Clause 4.4.2.

The Leshaba community, on the lower reaches of the right bank of the Groot Dwars River, falls outside the zone of influence of this facility and no particular precautions are considered necessary. Refer to Figure 4-9 for an indication of the modelled zone of influence.

4.7.10 Access road

A 5m wide service road will be located around the dam. The western road will include the stormwater controls as part of the construction. The conceptual layout of the road and stormwater cut off details and the access to the temporary crusher area in the basin are shown on Figure 4-8.

4.7.11 Rehabilitation

The approach to rehabilitation will be to minimize the volume of rainfall retained on the top surface by shaping the facility to be free draining where possible with water draining in an easterly direction towards the highwall of the pit, located against the existing slope of the hill on which the pit and CDF are constructed. Water will be drained from the top surface via an engineered decant. This will be supported by draining the decant into the existing surface water drains on the northern side to drain run-off away from the mountain slopes between the existing Helena TSF and the proposed Der Brochen CDF. The drainage around the toe will be undertaken to minimise the risks of water flowing along the toe of the CDF, potentially eroding the rock wall (SRK, Der Brochen, Rehabilitation and Closure Plan, October 2014).

Although some of the strata will be removed as ore, it is likely that with the bulking of the overburden as it is mined, the “bulked” volume available for backfill will exceed the volume of the mining void. However, all overburden will be replaced into the void and the final surface reshaped to simulate the surrounding topography while ensuring that the surface is free draining.

Once backfilling is complete a growth medium cover will be placed and vegetation will be established. There may be a requirement to include sacrificial erosion protection measures on the surface while vegetation is being established. The need for this will be assessed ahead of closure once mining plans and tailings management strategies have been finalised. (SRK, Der Brochen, Rehabilitation and Closure Plan, October 2014)

Post closure, drainage from the CDF is expected to consist of direct rainfall as the operational runoff diversion structures will remain on the site after relinquishment criteria have been achieved, with the only closure activities expected on these structures being to repair any erosion that may have occurred during the operational period.

Refer to Chapter 9 and Appendix C11 for the Closure and Rehabilitation Plan.

4.7.12 Operation and monitoring

The operation and monitoring of the CDF will be undertaken as the Helena TSF as described in Section 4.4.2.

Figure 4-9: Co-disposal Zone of Influence

4.8 Mareesburg tailings storage facility

The Mareesburg TSF has the characteristics as described below. The layout of the TSF is shown on Figure 4-10.

- It is a hillside tailings storage facility;
- Maximum footprint area - 133 ha (excluding return water dam complexes).
- Maximum operational deposition area - 76 ha;
- Starter wall height - approximately 14 metres;
- Maximum height at closure - 115 metres (elevation 1190.0 mamsl);
- Target dry density - 1.86 tonnes per cubic metre;
- Maximum storage capacity - 64.6 million cubic metres or 120.1 million tonnes;
- Maximum operational life of TSF based on 250 Kt/month - 40 to 41 years (July 2017 – June 2057); and
- There is a 5 m wide service road running between the TSF and the Concentrator which will follow the route of the powerline to the TSF.

As stated earlier, consideration may be given to diverting tailings to the Mareesburg TSF prior to the Helena TSF reaching its planned final raised height (elevation 1 145 masl) so as to reduce the rate of rise of the Helena TSF. This will be dependent on the availability of the Mareesburg TSF to receive tailings. There will be no changes in footprint areas of the two TSFs should this option be implemented.

Figure 4-10: Layout of the Mareesburg TSF

The TSF features

The following features have been incorporated into the design.

Starter walls

The starter walls will demarcate the downstream limit of the TSF and will provide a wall for placement of the tailings delivery column and be constructed to a maximum height of 15 m. The downstream outer slope will be 1V:3H while the inside face/slope will be built at a slope of 1V:2H.

Slurry deposition and Pipelines

Slurry will be delivered to the dam using dual 300 - 350 mm ND steel lined or HDPE tailings delivery pipes. The Pipelines will then extend along the northern, western and southern flanks of the perimeter of the dam with offtakes at approximately 50 m centres. The dual pipelines will be placed next to each other on a concrete plinth. Scour valves will be placed at intervals along the delivery pipelines to allow for clearing of blocked sections. The return water Pipeline will also be 300 mm diameter.

Cyclones will initially be used to cover the inner toe drain behind the starter wall. When the top of the starter wall is reached, cyclone wall building will be employed.

Wall building above the starter wall

As discussed above the outer walls above the starter wall will be constructed with cycloned tailings. This will be carried out using the upstream method at the same overall angles and with the same step in intervals and widths as for the starter wall. The overall outer slope will be 1V:3H, albeit that physical slope will be constructed at approximately 1V:2H with 6 metre wide step-ins provided/installed every 7 m vertical intervals.

Lining

The TSF basin will be appropriately lined to meet the legal requirements.

Underdrainage

A blanket drain will be constructed along the upstream toe of the starter and toe walls to collect seepage water from the TSF during its development. The drain will consist of 160 mm slotted pipes bedded in graded stone and filter sand and the collected water will be transported under the starter wall in 160 mm unslotted drainage pipes to a collection system comprising manholes connected by 220 mm sewer pipes. The sewer pipes will report to a concrete collector sump from where water will be pumped back to the TSF. As the TSF will be a hillside development these drains will be extended up the hillside along the northern and south flanks.

The underdrains will draw down the phreatic surface to the toe of the Tailings Dam in the longer term thus increasing the stability of the outer slope.

Stormwater drainage

The stormwater drainage has been designed to cater for a 1:50 year storm event. The TSF will be isolated from significant stormwater by constructing dry stone walling on the up contour side of the TSF. Stormwater will be diverted to suitable discharge points that will have a dump rock dissipater to reduce erosion during high discharge periods.

Decant system

The supernatant and stormwater will be removed from the dam via penstock intakes leading to westerly sloping penstock Pipelines under the Tailings Dam that will discharge to a Return Water Dam (RWD). The system has been designed to drain a 100 year storm event within four days, through three operation penstocks connected to a 750NB penstock outfall Pipeline.

A primary (permanent) and secondary (temporary) penstock Pipeline will be constructed. The primary Pipeline will consist of 14 intermediate outlets that will be covered by the rising tailings, with a final triple outlets and/or three intake towers that will function to the end of mining. The secondary Pipeline will lie roughly central with three intermediate outlets, will ultimately be covered by the rising tailings and will be sealed in the second year of operation.

Return Water Dam

The RWD has been sized to accommodate the operating volume plus the 1:50 year storm event, which requires a capacity of approximately 260 000 m^3 before spillage. The RWD will be located downslope and west of the TSF and will consist of four compartments. These will cascade down to the Primary Dam where a suction line for the return water pump station will be located. Each of the compartments will be interconnected with low level linking pipes and a valve chamber. Supernatant stormwater will be pumped from an above ground pump station back to the Concentrator along a similar route as the slurry delivery system.

Catwalk

A timber catwalk structure will be installed to provide access from the starter wall to the intermediate and final decant towers.

Topsoil handling at Mareesburg

For the storage of the topsoil at the Mareesburg TSF the following option will be considered (refer to Figure 4-10):

- Option 1: The areas marked up on the Figure 4-10 as dashed lines and labelled Topsoil Stockpile Area (1), (2) and (3) , as well as the return water dam paddocks 3 and 4. Since the dam will be constructed in phases, there is the likelihood that RWD paddocks 3 and 4 will be available as potential topsoil stockpile areas.
  - Topsoil Stockpile Areas (2) is an extension of the Borrow Area and/or Topsoil Stockpile Area (1).
  - Topsoil Stockpile Areas (3) lies adjacent to the RWD paddocks 3 and 4.

Should additional space be required, additional stockpile areas will be temporarily provided within the basin of the TSF.

4.8.1 Access road and perimeter fence

An access road will be built around the north-west and southern perimeters of the TSF. A cattle fence will be erected around the TSF with appropriate signage.

4.8.2 Power supply

An 11 kV power supply will required for the operation of the TSF with an off-take from the 132 kV line. The powerline will be erected in a services corridor between the TSF and the Concentrator.

4.8.3 River crossings

Details of the existing access road crossings are presented in the Surface Water specialist report (Appendix C3). Some erosion protection measures have already been constructed at the existing crossings. Limited impedance of flow is anticipated at these crossings but silting of the culverts is a concern due to the erodibility of soil in the area.

Erosion has also occurred at some of the existing crossings. Localised areas where under-scouring of culverts has occurred needs to be reinforced with weaved mesh gabion and rock mattress structures. Regular maintenance of crossings will need to occur to reduce the risk of flooding and subsequent damage of infrastructure.

A new tailings delivery and return water Pipeline and access road will be constructed from the Concentrator to the Mareesburg TSF and will entail nine river crossings (See Surface water report, Map ID's MP34 to MP42 in the Figure in Appendix C3). An existing farm track will be upgraded to act as a service road for the Pipeline and access road to the Mareesburg TSF. These crossings need to be designed to handle the 1:50 year flood event and have sufficient erosion and scour protection measures in place to minimise impacts on the riparian zone and/or damage to infrastructure. The proposed option for the crossings is multiple barrel culverts comprising pipes or portals depending on crossing size. The lengths of the culverts will be dependent on the exact crossing location and the width of the culverts will be such that they accommodate vehicle access and the Pipelines with side bunding for spillage containment. Further design criteria will be considered based on the recommendations from the Biodiversity and other specialist studies as appropriate.

4.8.4 Flow diversion in case of failure of the Mareesburg TSF

As with the Helena TSF, SRK conducted a flow-slide analysis to assess the zone of influence, should the Mareesburg TSF fail. The flow slide analysis was conducted using the guidelines of South African National Standards (SANS) Code of Practice, SANS 10286:1998, Clause 4.4.2.

The Leshaba community, on the lower reaches of the right bank of the Groot-Dwars River, falls marginally outside the zone of influence. Refer to Figure 4-11 for an indication of the modelled zone of influence.

The Mankge family, situated south-west of the Mareesburg TSF, falls outside the zone of influence.

However, to divert any potential flow of tailings away from the existing and any potential future dwellings, in the event of a failure, SRK recommends, that a flow diversion berm be constructed on the eastern side of the settlement as shown on Figure 4-11 or the dwellings should be at least 100m from the river.

4.8.5 Operation and monitoring

The operation and monitoring of the Mareesburg TSF will be undertaken as the Helena TSF as described in Section 4.4.2.

Figure 4-11: Mareesburg TSF Zone of Influence

4.9 Clean water diversions

In terms of Regulation 704 the clean water runoff arising within Catchments 1 to 5 is required to be diverted around the proposed mining infrastructure and returned to the natural watercourse. The clean water diversion channels required to divert run-off up to the 1:50 year 24-hour stormwater runoff volume are presented in Table 4-9. The channel number aligns with the catchment number i.e. Channel 1 diverts runoff from Catchment 1 around the Mareesburg TSF. In addition a 1 m high flood protection berm is needed along the south eastern section of the Southern Pit to prevent the 1:100 year flood from flooding the South Pit. Details of the berm are included in Table 4-9. In terms of Regulation 704 the clean water runoff arising within Catchments 1 to 5 is required to be diverted around the proposed mining infrastructure and returned to the natural watercourse.

Table 4-9: Summary of design criteria for the clean water diversion structures

Section	Canal/ Berm Length (m)	Slope (m/m)	Froude Number	Water Velocity (m/s)	Side Slope (m/m)	Peak Flow (m^3/s)	Depth/ height (m)	Bottom Width (m)	Top Width (m)
Channel 1	480	0.063	4.54	8.84	1:3	19.80	0.5	4	7.0
Channel 2	1 230	0.024	2.93	4.56	1:3	19.95	0.8	4	8.8
Channel 3	1 540	0.020	2.70	6.45	1:3	29.75	0.8	4	8.8
Channel 4	1 445	0.028	3.08	7.01	1:3	23.37	0.8	2	6.8
Channel 5	450	0.111	5.00	9.97	1:3	4.73	0.5	1	4.0
Flood protection berm	880	0.011	NA	NA	1:3	NA	1	7	1

NA: Not applicable

4.9.1 Open Pits (Channel 2 to 4 and flood protection berm)

Clean water will be diverted away from the western side of the Open Pits using diversion trenches sized to accommodate the 1:50 year storm event. The diversions around the Northern and Southern pit areas will meet at the gap between the two Pits at the lower portion of the diversion before it flows into the Groot Dwars River. The diversion dimensions are presented in Table 4-9 and the schematic layout of the diversions is presented in Figure 4-12.

A flood protection berm along the south eastern section of Southern Pit within the 1:50 and 1:100 year floodline and100 m distance from the watercourse edge will protect the pit from flooding. The berm will be sized to protect against the 1:50 year storm event and is included in Figure 4-12.

4.9.2 Proposed co-disposal TSF (Channel 2 and 3)

Clean water will be diverted away from the Co-Disposal Facility using the existing diversion trenches of the Northern pit as described above.

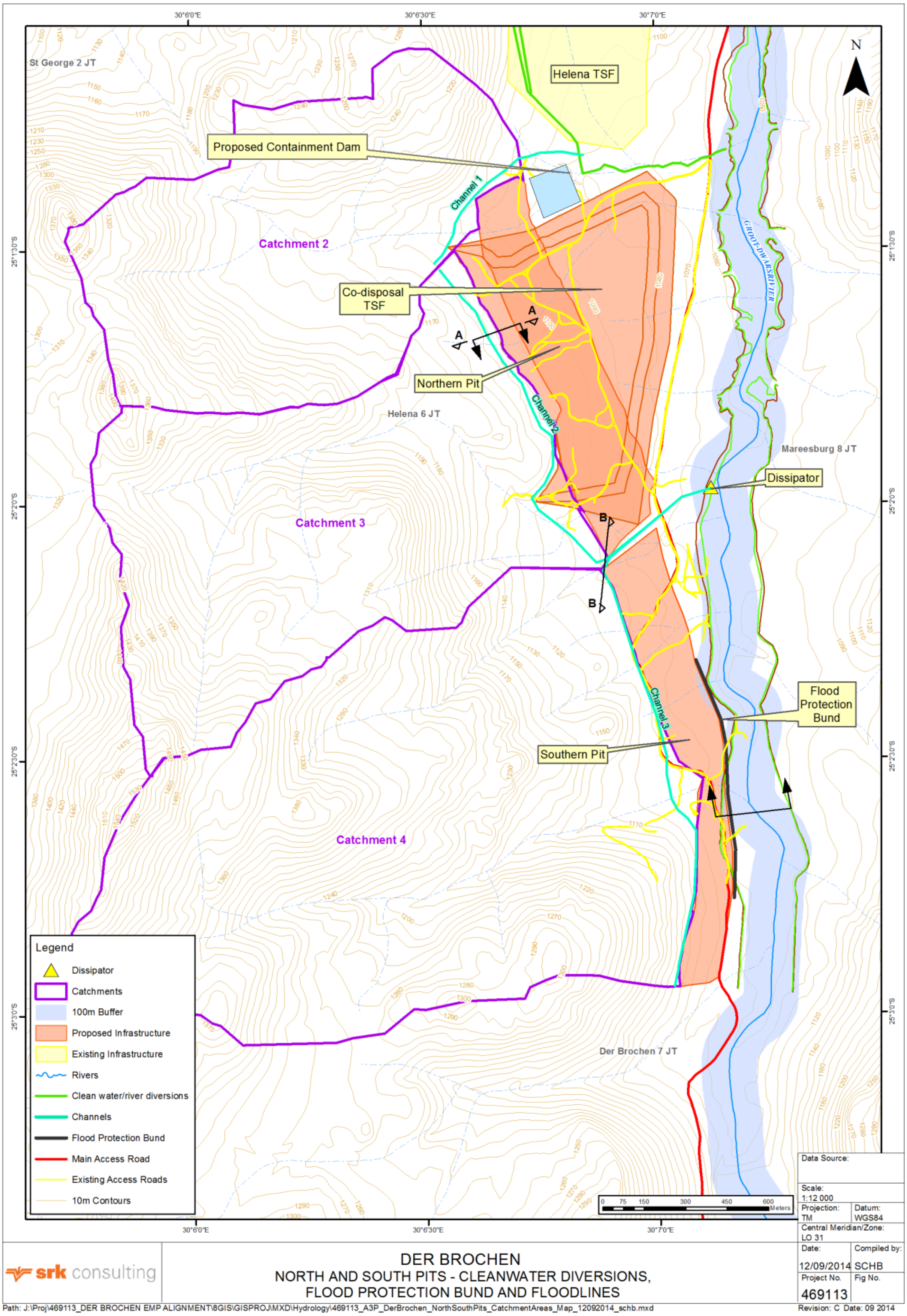
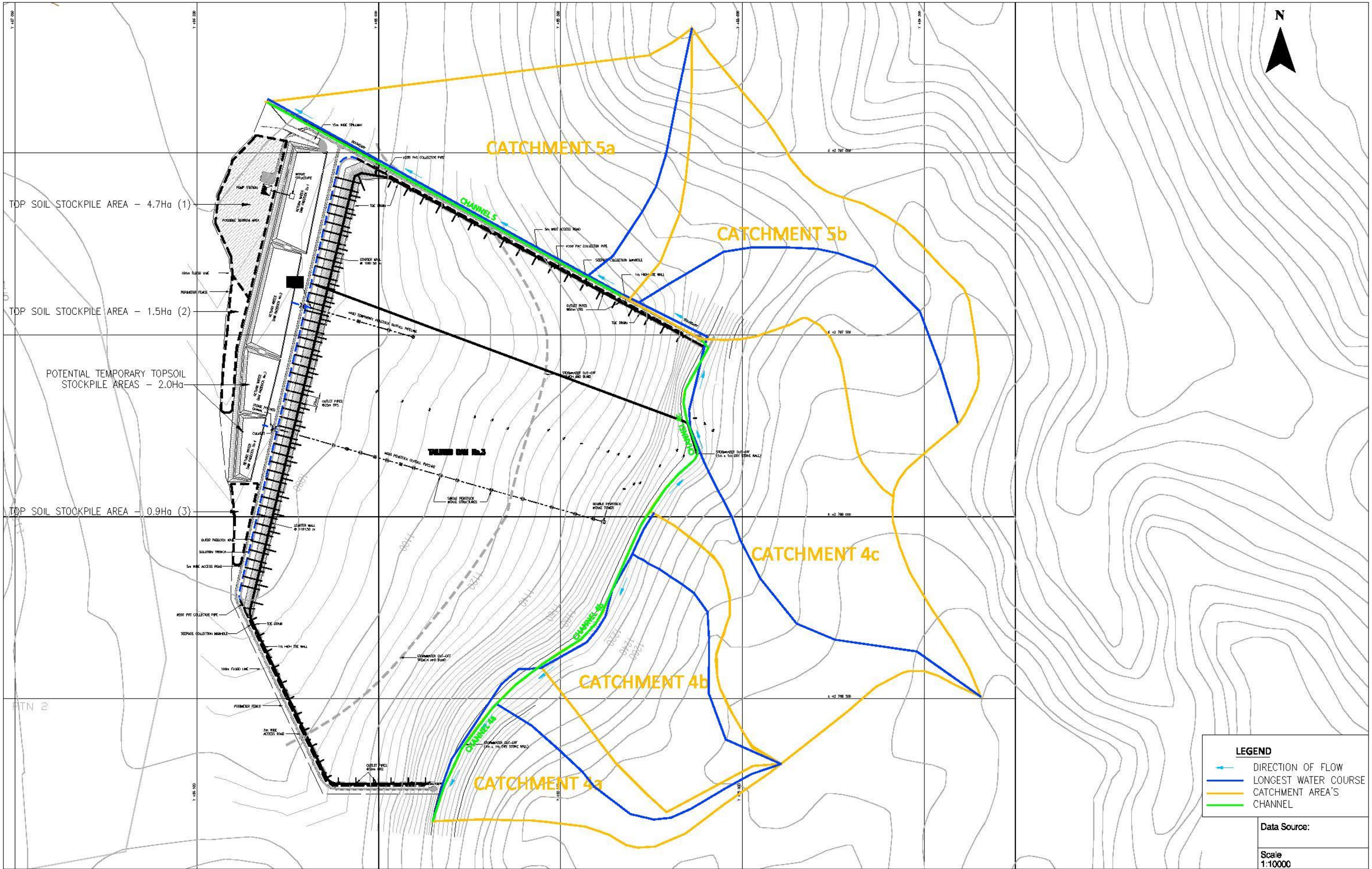


Figure 4-12: North and South Pits clean water diversions

4.9.3 Mareesburg TSF (Channel 1 and 5)

Clean water will be diverted away from the TSF using diversion trenches sized to accommodate the 1:50 year storm event to the east of the TSF area. The diverted water will flow into the Mareesburg Stream. The diversion dimensions are presented in Table 4-9 and the schematic layout of the diversions is presented in Figure 4-13.



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srk consulting

DER BROCHEN EMP ALIGNMENT

SENARIO 1 CLEAN WATER DIVERSION CATCHMENTS

Revision: A Date: 31 07 2014

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4.10 Dirty water containment

In terms of Regulation 704 all dirty water must be captured in holding facilities with a capacity to contain up to the 1:50 year flood event. The dirty water containment requirements have been informed by the site hydrology in accordance with Regulation 704 to minimise the impact of any contaminants as a result of explosives residue, spillages and mine residue on the Groot Dwars River. Design criteria including liner requirements will need to consider the recommendations from the geotechnical and groundwater specialist studies over and above the detailed TSF and open pit design as appropriate. Approximate sizing of the dirty water containment facilities are presented in Table 4-10. The storage capacity required for the Co-disposal TSF return water dam can be accommodated in the Helena RWD A, which has a capacity of 170 000 m^3 at full supply level or 158 000 m^3 to spillway (SRK, 2014c).

Table 4-10: Approximate sizing of the dirty water containment facilities (m^3)

Area	1:50 year volume	Operating volume	Total dam size
Open pit pollution control dam	38 200	5 000	43 200
Open pit/co-disposal TSF settling dam	56 700	170150	226 850
Co-disposal TSF using Helena RWD A	74 000	20 000	94 000
Mareesburg TSF RWD	130 000	50 000	180 000

4.10.1 Open Pits

Additional dirty stormwater (as rainfall) will be produced at a rate of approximately 70 000 m^3/annum per pit due to the increase in dirty area attributed to the respective operational open pit areas. It is recommended that dirty water runoff captured in the Pits is pumped to pit settling dams and transferred to the Mototolo Concentrator, after settling for reuse as process water in the Concentrator. The locations of the containment facilities including the settling dams are included in Proposed Co-disposal TSF.

Additional dirty stormwater (as rainfall) will be produced at a rate of approximately 384 000 m^3/annum due to the increase in dirty area attributed to the proposed co-disposal TSF area. It is recommended that dirty water runoff captured on the surface of the TSF is contained and returned to the Helena RWD B and then RWD A for reuse as process water in the Mototolo Concentrator. Runoff from the side slopes should be contained in a paddock system.

4.10.2 Mareesburg TSF

Additional dirty stormwater (as rainfall) will be produced at a rate of approximately 672 000 m^3/annum due to the increase in dirty area attributed to the proposed Mareesburg TSF area. Dirty water runoff will be contained in a return water dam with sufficient capacity to contain a 1:50 year storm event with freeboard of more than 0.8 m. Dirty water will be available for reuse as process water in the Mototolo Concentrator.

4.11 Re-routing of a 132 kV powerline

An existing 132 kV power line runs along the western side of the Groot-Dwars River on the project site. To accommodate the proposed southern open pit, this powerline will be re-routed to run along the eastern side of the river Groot Dwars River. This activity will be undertaken by Eskom.

4.12 Contractors' offices and laydown area.

The main office at the open pit will cover an area of 110 m2 and will be a pre-fabricated structure on a concrete base. It will contain 3 toilets and a kitchen.

The workshop office will be 44 m2 and will be a pre-fabricated structure on a concrete base. It will contain 1 toilet and a kitchen.

The workshop will be a steel structure on an 18 m x 18 m concrete base. Attached will be a 6 m x 8 m concrete wash bay with sumps and a bunded area for fuel tanks.

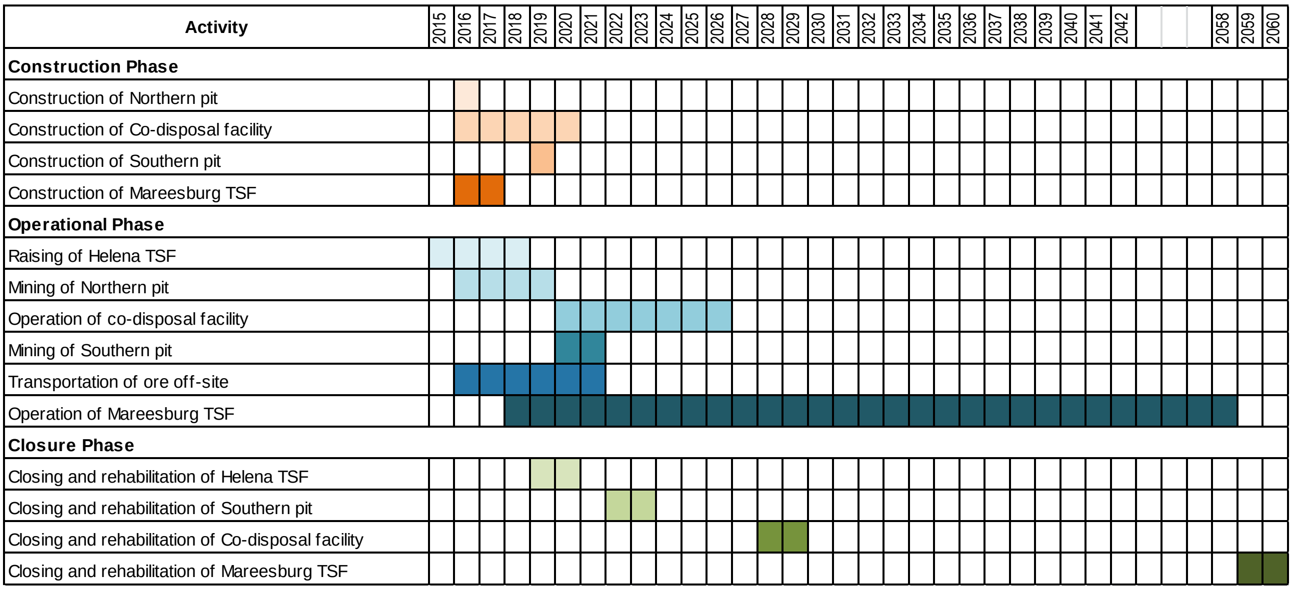
A laydown area of 50 m x 50 m will be provided for the contractor.

A salvage yard (50 m x 50 m) will be provided for the temporary storage of hydrocarbon-contaminated soils, which will have a concreted surface and berms to capture contaminated runoff.

4.13 Project Schedule

The Der Brochen Project schedule can be divided into three phases, namely construction, operation and closure.

Figure 4-14 provides a breakdown of the various phases, the activities that will take place during each phase, and the approximate kick-off date and timeframes for each activity during that phase. Note that some activities in various phases may overlap.



* Orange – Construction Phase, Blue – Operational Phase, Green – Closure and Rehabilitation phase

Figure 4-14: Der Brochen schedule for the project various phases

4.14 Construction Phase key activities

The following key activities will be undertaken during the Construction Phase:

- Stripping of vegetation over areas to be developed. In the area of the relocated powerline all tall growing vegetation will also be removed beneath the lines;
- Stripping and stockpiling of topsoil;
- Preparation of the areas for offices/workshop complexes near pit areas;
- Dismantling of the section of powerline to be relocated, removal of pylons and rehabilitation of the disturbed areas;
- Erection of new pylons over the section of relocated powerline;
- Preparation of the contractors' laydown area;

- Preparing borrow Pits for road construction materials;
- Construction of the haul roads: stripping of vegetation, stripping and stockpiling topsoil, hauling construction materials to where roads will be constructed; and
- Construction of stormwater management systems including channels to divert stormwater from and around the pit areas and the TSFs.

4.15 Operational Phase key activities

The following key activities will be undertaken during the Operational Phase:

- Stripping of vegetation and topsoil and stockpiling topsoil at mining areas as mining progresses;
- Extracting materials from the Open Pits (ore and waste rock);
- Hauling ore along the access road to as yet to be identified processing plant;
- Hauling and preparing waste rock to the rock embankment for the CDF;
- Transporting materials and the workforce to the mining areas and the TSFs;
- Dust suppression on the haul roads through the use of water carts;
- Operation of the Concentrator; and
- Delivering tailings from the Concentrator by means of the tailings delivery Pipeline to the TSFs and pumping return water back to the RWDs.

4.16 Closure Phase

The following key activities will be undertaken during the closure phase.

Please refer to the Closure Plan in Chapter 9 and Appendix C11.

4.17 Workforce

Employees will be housed in existing accommodation in the vicinity of the site. No accommodation will be provided on site.

The anticipated workforce during the various phases of the project is provided on Table 4-11. RPM will prescribe methods that contractors must follow to recruit the workforce.

The operational workforce will work within the following departments: Mining, Engineering, Mineral Resource Management and Safety Management (AAP, 2014).

Table 4-11: Der Brochen Construction and Operation phases: workforce estimates

<table>
<tr><th>Phase</th><th>Helena Raising</th><th>Helena Open pit Mining and Co-Disposal Facility</th><th>Mareesburg TSF</th></tr>
<tr><td>Construction</td><td>Clearing vegetation
(1 month, earthworks contractor)</td><td>Clearing vegetation, topsoil stripping and stockpiling (3 months)(earthworks contractor)</td><td>Clearing vegetation, topsoil stripping and stockpiling, building starter wall
(12 months--June 2016 to June 2017) (earthworks and civil contractors)</td></tr>
<tr><td>Number of workers/contractors expected</td><td>10</td><td>10</td><td>100 - 150</td></tr>
<tr><td rowspan="3">Operation</td><td rowspan="3">Tailings disposal</td><td>Mining Pits (6.5 years)(Mid 2015 to 2022)
Truck drivers and support</td><td rowspan="3">Tailings disposal
10 No Specialist contractor, will move over from Helena

Life of 25 years</td></tr>
<tr><td>Construction of complete rock embankment (6.25 years concurrent with mining) (Mid-2015 to mid-2022)</td></tr>
<tr><td>Tailings disposal (Disposal can only</td></tr>
</table>

Phase	Helena Raising	Helena Open pit Mining and Co-Disposal Facility	Mareesburg TSF
		commence mid-2022)	
Number of workers/contractors expected	10 until July 2018	Mining: 80 Truck drivers and support: 20 Construction of rock embankment: 100 Tailings disposal: 10	10
Closure	10	10	10

Financial provision to manage downscaling and retrenchment will be based on the following model and the severance packages will be calculated using the formula as detailed below:

- 2 weeks per one year service with Anglo American Platinum;
- 1 month notice pay; and
- Leave provision equivalent to 30 days.

The above provision will be consistent with Anglo American Platinum Retrenchment Policy and may be altered in terms of applicable legislation and or collective agreements with stakeholders (AAP, 2014).

4.18 Project Alternatives Considered

The following project alternatives were considered during the pre-feasibility phase of the project:

- Mining methods;
- Ore processing alternatives;
- Tailings storage facilities;
- Location of mine infrastructure; and
- Water supply.

4.18.1 Mining method alternatives

Geological exploration of the ore-body has identified a highly variable weathering depth in certain areas of the project. It will not be economically feasible to mine these areas of the ore-body by means of underground mining methods. Hence open pit mining methods, making use of blasting, will be undertaken.

Open pit mining has greater environmental implications than underground mining, but for economic and stability reasons it is not possible to mine the upper 80 m by means of underground methods, hence open pit mining will be undertaken.

Mobile in-pit crushers will be used to crush the ore to a size suitable for transport by truck to a nearby Concentrator.

The Co-Disposal Facility will be constructed in such a manner to allow future underground mining by means of future shafts as yet to be located.

Waste rock from the open pit will be used to construct an embankment for a proposed co-disposal storage facility that will be constructed over the backfilled (with tailings) Northern Pit. This is discussed in more detail below.

Should the Co-Disposal Facility not considered to be viable, there will need to be a modification to the mine plan in that the excavated waste rock will be returned to the Northern Pit. In this case tailings will be deposited on the Mareesburg TSF after the raised Helena TSF has reached its capacity.

4.18.2 Ore processing alternatives

The platinum ore in the upper portion of the ore-body is oxidised and cannot be processed together with the current underground ore in the existing Mototolo Concentrator. The Mototolo Concentrator is running at capacity processing ore from the deeper underground mining by the Glencore/Xstrata – RPM Joint Venture.

As the life of the open pit section is only 6 years and only a relatively small volume of ore will be processed, it is not economically feasible to construct a new Concentrator for the processing of the oxidised ore. Hence the ore will be transported by truck to another Concentrator able to process ore with these characteristics. It has not yet been confirmed where this oxidised ore will be processed, but a number of off-site alternative Concentrators are being considered by RPM. This information was not yet available at the time of preparation of this EIA.

In view of the small quantity of oxidised ore it is also not economically feasible to expand the capacity of the existing Mototolo Concentrator to process the oxidised ore.

4.18.3 Location of mine infrastructure

The project will have minimal mine infrastructure, the most important being the ore stockpiles the temporary Waste Rock Dumps and the mobile crusher. These positions have been selected based on environmental factors (topography, vegetation cover and proximity to the Groot Dwars River).

4.18.4 Water supply

The project has a proven and approved water supply in the well field on Richmond and Helena and will obtain water from this source when required.

The project also has a small allocation of water from the Der Brochen dam situated south of the southern project boundary.

A further water supply alternative is a source of pit water from the northern and southern Pits. This water will consist of seepage water and contaminated rainfall that will be used as make-up water for the Concentrator.

4.18.5 No-go alternative

Should the Der Brochen Project, as envisaged in this document, not proceed, RPM would need to revert to its previously authorised project activities which include a number of decline shafts. The additional exploration undertaken since obtaining authorisation for the previous layout has indicated that the shaft positions originally proposed are not in an optimal position in terms of the updated geological knowledge of the area. Proceeding with the previous options in their currently approved positions (2002, EMPR) would not make economic sense.

With limited tailings disposal capacity, the Mototolo Concentrator would be unable to function and the Mototolo JV with GlencoreXstrata would be in jeopardy.

The majority of the negative impacts associated with the project can be managed at reasonable cost and with prudent long term planning and monitoring. Adequate funds and expertise are available for the rehabilitation of the mine following closure. The positive benefits for the region and the country are considerable and should be realised.

The ‘no project’ option will therefore result in the non-realisation of an important economic development opportunity for RPM, AAP, the region and South Africa. Accordingly this is not an option for RPM, and has not been considered.

5 Stakeholder Engagement

An integrated and comprehensive stakeholder engagement process was undertaken for the environmental authorisation process of the Der Brochen Project. This chapter provides background information taken into consideration in the engagement approach and outlines the process undertaken during the environmental authorisation process and the results thereof.

The stakeholder engagement process is designed to provide sufficient and accessible information to I&APs in an objective manner to assist them to:

During the Scoping Phase

- Raise issues of concern and suggestions for enhanced benefits;
- Verify that their issues have been recorded; and
- Contribute relevant local and traditional knowledge to the environmental assessment.

During the Impact Assessment Phase

- Verify that their issues have been considered in the environmental assessment; and
- Comment on the findings of the environmental assessment.

During the Decision-making Phase

- Advise I&APs of the outcome, i.e. the authority decision, and how and by when the decision can be appealed.

The key steps in the stakeholder engagement process for this environmental authorisation process is presented in the sections below and summarised in Figure 5-1. The process is focused on:

- Obtaining issues and including those from stakeholders early on in the process, with the latter half of the process designed to provide environmental and technical evaluation of these issues;
- Early and personal contact with directly affected Interested and Affected Parties (I&APs), taking into account cultural and language sensitivity;
- Using the languages of choice of I&APs in meetings, and providing selected documents as per the requirements of the MPRDA, NEMA and NWA;
- Raising a diversity of perspectives and opinions rather than forcing consensus among I&APs. This approach also minimises project risks by building trust with I&APs;
- Building capacity of I&APs to participate;
- Utilising existing consultation forums and opportunities to minimise stakeholder fatigue with extensive consultation events where practically appropriate, and
- Clarifying I&APs' roles and responsibilities at the start of the process, sanctioned by the authorities, in terms of where and when decisions will be made and by whom.

All related stakeholder engagement documentation is available in Appendix BAppendix B Stakeholder Engagement: Supporting Documentation.

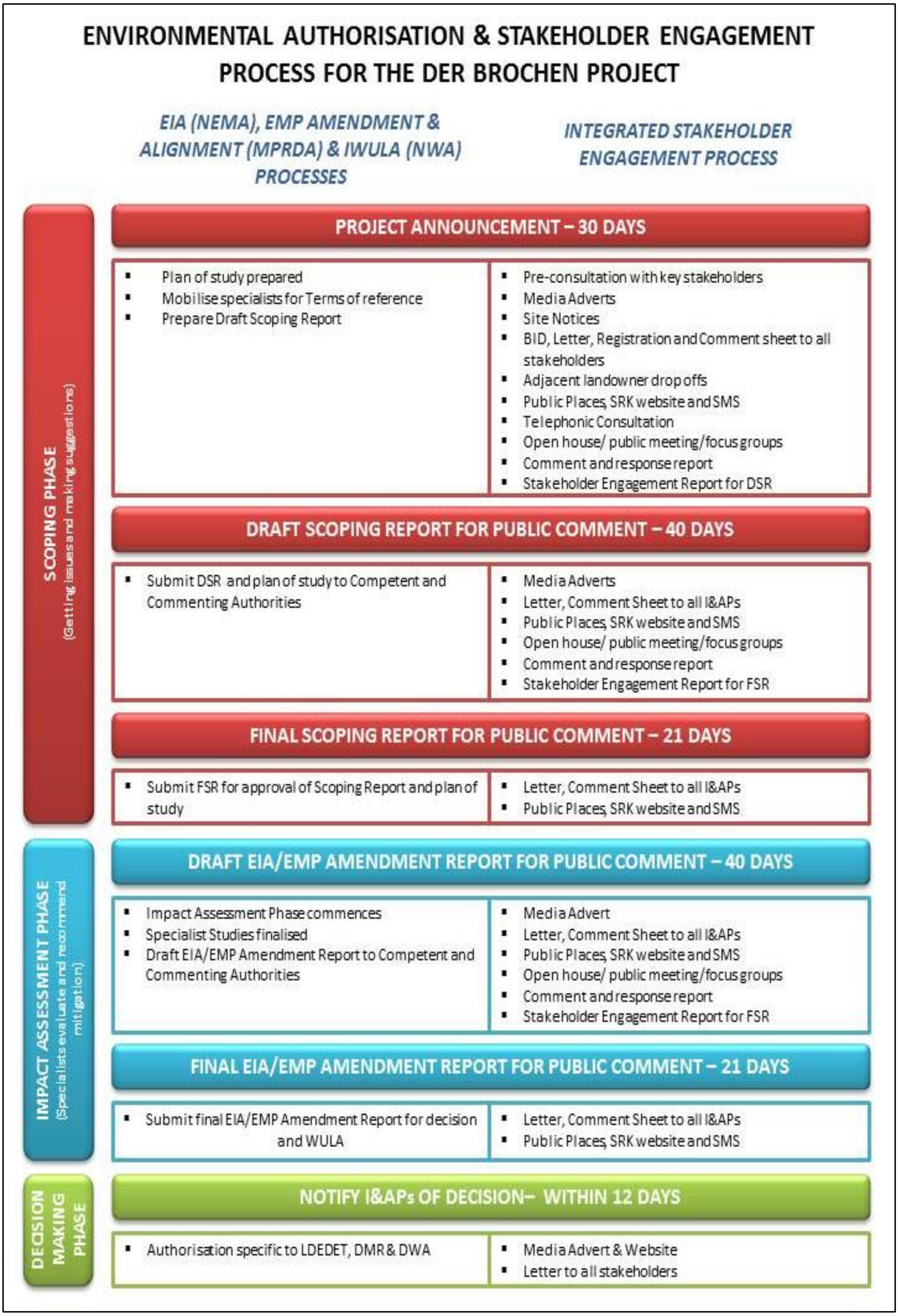


Figure 5-1 Environmental authorisation and associated stakeholder engagement process

5.1 Legal Framework and Guidelines

Stakeholder engagement has been guided by the requirements outlined in the NEMA Chapter 1 subsections (2), (3), (4)(f), (g), (h), (k), (q) and (r) and the amended EIA Regulations promulgated in June 2010 in GN R543, Chapter 6, section 54-57 and the Public Participation Guidelines in terms of section 24J of NEMA published in October 2012. With regards to the MPRDA the requirements of Section 39 (3) (b) (ii) and (iii) read with Regulation 50 (c) (d) and (f) of the Act and the DMR *Guidelines for Consultation with Communities and Interested and Affected Parties* published in 2011guided the engagement process.

In support of the above legal requirements, SRK's professional experience, the nature and scale of the project, and Anglo American platinum's policies were applied to SRK's approach to stakeholder engagement and include the following key principles:

- Meet the legislative and internal requirements;
- Provide fair opportunity for stakeholders to engage in the process and influence decisions that could affect their lives; and
- Ensure stakeholder engagement approaches for the EIA dovetail with existing stakeholders engagement platforms.

5.2 Current stakeholder environment

This section provides a broad overview of the existing stakeholder environment and is based on previous stakeholder engagement processes undertaken as part of required environmental authorisation processes, as well as stakeholder identification, mapping and profiling exercises undertaken by AAP in November 2011. SRK Consulting used this information to inform the stakeholder engagement process and included additional information to ensure contextual understanding of the existing stakeholder environment of the Der Brochen Project.

5.2.1 Previous stakeholder engagement undertaken

Environmental studies for the Der Brochen Project commenced in 2001 and seven EMP/EMP Amendment processes have been undertaken to date (Refer to Section 1.1 of this report for details).

A summary of the previous stakeholder engagement processes undertaken is shown in Table 5-1, and the details of this stakeholder engagement, indicating the stakeholders identified, methods used to consult with stakeholders and their issues and concerns, are included in Appendix B1.

Table 5-1 Summary of previous EMPs and stakeholder engagement undertaken

EMPs undertaken since 2001	Date	Stakeholder Engagement undertaken
Environmental Management Programme Report for the Der Brochen Mine Volume 1 of 3 (SRK Consulting Report No. 295606/4/ November 2002)	November 2002	Scoping meetings, Feedback meetings (November 2001 – September 2002)
Amendment to the Environmental Management Programme Report for the Der Brochen Mine – Trial Mining Phase (SRK Consulting Report No. 315588/TMP, July 2003)	July 2003	Trial mining meetings (June 2003)
Addendum to the Environmental Management Programme for the Der Brochen Mine to include a well-field in the Klein-Dwars River Valley on the Farms Richmond 370 KT and St George 2 JT (Report No. 335470/1, April 2004)	April 2004	Engagement was undertaken as part of EMPR base case 2002/3

EMPs undertaken since 2001	Date	Stakeholder Engagement undertaken
Addendum to the approved Environmental Management Programme for the Der Brochen Mine as part of the Feasibility Studies for possible mining on adjacent properties – Final EIA Report and EMP Report, SRK Project No. 343158, April 2005)	April 2005	Scoping meetings (November 2004) Feedback meetings (February – March 2005
Final EIAR and EMP – Chrome Plant – Helena 6 JT, May 2006, ERM)	May 2006	EIA/EMPR stakeholder engagement meetings (March – May 2006)
Environmental Management Programme Report: Amendment to the approved Environmental Management Programme Report (EMPR) for ongoing prospecting in support of current mining operations, July 2007	July 2007	Personal /telephonic consultations regarding the impact of drilling in proximity of their properties
Amendment to the Environmental Management Programme (EMPR) for Der Brochen: Richmond Early Mine (Revised – May 2010)	May 2010	Post EIA/EIR Phase Public Open Day (27 May 2008), 'Focus Group meeting with Gamawela Community, 28 June 2008
Raising of the Helena tailings storage facility	2014	Project announcement May 2014 Focus group meetings with I&APs of the Der Brochen Project – May – June 2014 to comment on Scoping Report Comprehensive MPRDA stakeholder engagement process undertaken

5.2.2 Understanding stakeholder issues prior to project announcement

During 2011 as part of ongoing stakeholder engagement associated with Der Brochen, AAP undertook comprehensive stakeholder identification and mapping exercises through one-on-one meetings and community meetings with all the relevant stakeholders in Der Brochen's potential sphere of influence with the purpose to establish baseline data for Der Brochen, focusing on:

- Identification of relevant stakeholders;
- Building relationships with key stakeholders and potential host communities; and
- Identifying baseline issues and concerns expressed by stakeholders in order to inform future engagement processes.

SRK Consulting used the above baseline information (as documented in Der Brochen Project Report: Stakeholder identification, mapping and profiling, November 2011), to inform the development of the stakeholder database for the Der Brochen Project in 2014, and gain insight into the existing stakeholder environment and potential issues and concerns that could influence the current environmental authorisation process.

In February 2014, prior to the public announcement of this environmental authorisation process, SRK Consulting met with key stakeholders as part of a social scanning exercise in order to establish contact with communities in close proximity of the proposed project, land claimant groups, the traditional authorities and Greater Tubatse Local Municipality Ward 31 Councillor (the Der Brochen Project falls within Ward 31) in order to do a preliminary assessment of baseline issues.

The issues and concerns as identified by stakeholders during the February 2014 social scanning exercise, AAP's process in 2011 and the stakeholder engagement undertaken during the previous EMP processes are summarised in Table 5-2 and provide context to the existing stakeholder environment and the potential issues that stakeholders had during this environmental authorisation processes.

Table 5-2: **Summary of baseline stakeholder issues and concerns raised prior to the announcement of the project**

Category	Stakeholder issues and concerns
Land restitution	• Land claims complexity and restitution process (Different grouping claiming same portions of land) • Unresolved land claims
Leadership	• Recognition of leadership and chieftainship disputes
Cultural heritage	• Importance of cultural heritage particularly linked to ancestral graves and historical links to the areas • Previous cases of grave desecration due to development activities
Company conduct and policy (Shareholding and benefits)	• Stakeholder should benefit from mining and particularly the Der Brochen Project • Shareholding in Der Brochen Project • Confirmation of mining and surface rights • Mining operations – performance assessments
Socio-economic	• Economic impacts (positive): includes job creation, skills development and opportunities for small and medium sized enterprises • Economic impacts (negative): includes competition for jobs, possible community unrest related to labour issues
Services and infrastructure	• Lack of services and housing in the area • Pressure on infrastructure
Environmental impact	• Decrease in water quality • Increased noise, and traffic • Deterioration of air quality (Dust generation) - Potential increase in respiratory diseases • Visual – loss of scenic value in the area • Conservation, vegetation, wildlife and tourism – loss of ecosystems • Mitigation and rehabilitation measures – mine closure

5.3 Identification of Interested and Affected Parties (I&APs)

The MPRDA and NEMA Regulations require identification of and consultation with communities and I&APs. The term I&AP is interchangeably used in this report with the term stakeholder, which generically refers to persons or groups who are directly or indirectly affected by a project, as well as those who may have interests in a project and/or the ability to influence its outcome, either positively or negatively.

SRK Consulting started the stakeholder identification process by utilising stakeholder databases from previous environmental authorisation processes and the stakeholder identification and mapping exercise undertaken by AAP in November 2011. Existing stakeholder details were verified and incorporated into the stakeholder database developed for the proposed Der Brochen Project.

I&APs were identified through a process of discussions with the Der Brochen Project team, meetings with stakeholders, networking and previous relationships developed with key stakeholders. The NEMA Regulations (GN R543) distinguish between I&APs and registered I&APs. I&APs, as contemplated in Section 24(4)(d) of the NEMA include:

(a) any person, group of persons or organisation interested in or affected by an activity; and

(b) any organ of state that may have jurisdiction over any aspect of the activity.

In terms of the Regulations **'***registered interested and affected parties'* means an interested and affected party whose name is recorded in the register opened for that application.

For that purpose, an EAP managing an application must open and maintain a register which contains the names, contact details and addresses of:

- All persons who; have submitted written comments or attended meetings with the applicant or EAP;
- All persons who; have requested the applicant or EAP managing the application, in writing, for their names to be placed on the register; and
- All organs of state which have jurisdiction in respect of the activity to which the application relates.

SRK's approach recognised that stakeholders are diverse in character and in their project interest and the following criteria were used to identify the stakeholders:

- *Zone of influence*: physical location relative to the project site and potential impacts. Generally the closer stakeholders live to a project site the higher their interest and the potential impacts of the project;
- *Stakeholder values*: the value stakeholders attach to the area that might be affected by the project. This includes aspects such as livelihoods, land use, ownership, heritage and sense of place; and
- *Jurisdiction*: the mandate/influence of institutions over regulatory and public opinion.

The following spatial features were used as a guideline in the identification of interested and affected parties in terms of the NEMA Regulations (GN R 543) and the MPRDA requirements.

- District and local municipal boundaries;
- Communities residing within the mining rights area of the Der Brochen Project;
- Ngwaabe, a group of 10 traditional authorities communities to the north-west of the Der Brochen Project with potential heritage links to the farms constituting the Der Brochen Project; and
- Schaapkraal and Vygenhoek farms (Pakaneng Choma Community, Mawela and Malepa A Makanyane Community) in Thaba Chweu Local Municipality as communities with potential land claims on the Der Brochen mining rights area.

The stakeholder groups identified for the Der Brochen Project shown in Table 5-3 represent a broad spectrum of sectors of society and has been categorised as such. The current stakeholder database, including the Register of I&APs is attached as Appendix B2.

Table 5-3: **Stakeholder identification and categorisation**

Stakeholder identification and categorisation	
Stakeholder Category	**Stakeholders/groups represented**
Various sector grouping represented by the stakeholders in the project area. The stakeholder groupings and categories may change depending on the nature and extent of stakeholder involvement during the process.	
Provincial Government *Relevant government department providing services in the project area*	• Department of Economic Development, Environmental and Tourism (LEDET) • Department of Labour • Department of Water and Sanitation (DWS) • Department of Mineral Resources (DMR) • Department of Public Works • Department of Roads and Transport • Department of Cooperative Government and Traditional Affairs

Stakeholder identification and categorisation	
Stakeholder Category	**Stakeholders/groups represented**
	(COGTA) • Regional Land Claims Commission • Department of Rural Development and Land Reform (DRDLR) • Department of Agriculture • Department of Education • Department of Health & Social Development
Sekhukhune District Municipality (SDM) *within the Limpopo Province*	• Executive Mayor • Municipal Manager • Development Planning (Spatial Development Planning and Integrated Development Planning) • Environmental Manager • Technical Director
Greater Tubatse Local Municipality (GTLM) *within Sekhukhune District Municipality*	• Executive Mayor • Municipal Manger • LED Manager • IDP Manager • Environmental Manager • Councillors: Wards 2, 6, 27, 28, 29, 31
Traditional authorities in Ngwaabe, Steelpoort and Kalkfontein areas	• Ga-Malekane (Kgoshi NM Malekane) • Bangwenyama MaSwati (Kgoshi T Nkosi) • Ga Mampuru (Kgoshi M H Mampuru) • Ga Phasha (Kgoshi Dick Pasha) • Ga Rantho (Kgoshi NJ Rantho) • Ga Masha(Kgoshigadi Mante Gauta Masha) • Ga Maphopha (Kgoshigadi ME Maphopha) • Ga Maphopha (Kgoshi Masha Ntake) • Ga Magolego (Maseven) (Kgoshi M Magolego) • Ga Maepa (Kgoshi SP Maepa) • Ga Makua (Kgoshi N Makua) • Ga Ratau (Kgoshi R Letuana) • Kalkfontein(Kgoshi Makopole) • Dithamaga (Kgoshi TMW Magolego)
Traditional Authorities and communities within Ward 2 (GTLM)	• Residents of Tulakgomo (870 households • Residents of Mapodile (Eertegeluk) (600 households) • Residents of Matimatsatsi (68 households) • Residents of Legaveng (108 households)
Traditional Authorities and communities within Ward 6 (GTLM	• Babina Ba Mapuru Traditional Council (TC) of Ga Mampura (870 households) • Baroka Pasha TC, of Ga Pasha (566 households)
Traditional Authorities and communities within Ward 27 (GTLM)	• Bahlakwana BA Malekana TC of GA Malekana (237 households) and portion of Tsakane (203 households) • Babina Ba Mapuru TC of Ga Mampura (Same name in Ward 6, same Kgoshi)
Traditional Authorities and communities within Ward 28 (GTLM)	• Bahlakwana Ba Rantho TC of Ga Rantho (1500 households) • Masha Phathane TC of Ga Masha Nkotane (1900 households) • Kgoshigadi Mante Masha communities of GA Masha Nkotane (Same as Masha Phathane TC 1900 households)
Traditional Authorities and	• Bahlakwana BA Maphopha TC of GA Maphopa (405

Stakeholder identification and categorisation	
Stakeholder Category	**Stakeholders/groups represented**
communities within Ward 29 (GTLM)	households) • Tswako Maepa TC, of GA Maepa (800 households) • Magolego Community of Ga Magolego (Maseven) (900 households) • Makua Community of Ga Makua (500 households) • Ratau Community of Ga Ratau (400 households) • Masha Ntake Community of Ga Maphopha (350 households)
Traditional Authorities and communities within Ward 31 (GTLM)	• Residents of Moletsi Community (5 households) • Residents of Ga Mawela (16 Households) • Residents of Mahlakwena (680 households) • Residents of Kalkfontein (600 households) • Dithamaga Communal Association (45 Households) • Residents of Koppie (600 Households) • Residents of Buffelshoek (Mashagoshebo) (100 Households) • Residents of Makgemeng (>50km away) (650 households) • Residents of Dresden (>50km away) (739 Households)
Ehlanzeni *District Municipality* *within the Mpumalanga Province*	• Executive Mayor • Municipal Manager • Development Planning (Spatial Development Planning and Integrated Development Planning) • Environmental Manager • Technical Director
Thaba Chweu Local Municipality (TCLM) *within Ehlanzeni District Municipality*	• Executive Mayor • Municipal Manger • LED Manager • IDP Manager • Environmental Manager • Public participation manager • Councillor: Ward 5
Key communities with land claims (confirmed or in process) on mining rights area	• Ba Phetla Community • DItsabeng Tsa Moletsi Community • Gamawela Mankge Communal Property Association • Mawela Community & Malepa A Makanyane Community • Masha Community • Pakaneng Choma Community
Adjacent landowners (Including mines) *Landowners or occupiers immediately adjacent to the project site identified by land portions*	• Welgevonden Farm (R Frylinck) – adjacent to Mareesburg TSF • Thorncliff Mine • Northam Booysensdal Mine • Mototolo Concentrator • Helena TSF • Samancor
Business and Commerce	• Greater Tubatse Business Forum • National African Federated Chamber of Commerce and Industry (NAFCOC) • Limpopo Business Support Agency (LIBSA)
Landowner Associations and Conservancies	• De Berg Conservancy

Stakeholder identification and categorisation	
Stakeholder Category	**Stakeholders/groups represented**
Local Media	• Seipone Newspaper • Platinum Gazette
Mining and Industry	• Steelpoort Producers' Forum • Association of Mine Managers of SA • Sekhukhune District Mayor and Mine Managers' Forum • Chamber of Mines
Non-governmental organisation *Organisations representing specific issues*	• Endangered Wildlife Trust • Sekhukhune Centre of Plant Endemism • Escarpment Environment Protection Group
Parastatal organisation *State-owned enterprises representing specific interests*	• Benchmark Foundation • ESKOM • National Development Agency • Limpopo Tourism & Parks Board • Limpopo Heritage Resources Agency • Mpumalanga Parks Board • AFGRI SA • TRANSNET – Sekhukhune District • Roads Agency Limpopo • Independent Development Trust (Limpopo and Mpumalanga) • Sekhukhune Economic Development Agency
Safety & Security *Institutions focusing on safety and security in emergency planning and response*	• SA Policing Services • Emergency Services (internal Proto team, mine security)
Transport *Institutions focusing on traffic and transport in general as well as in emergency planning and response*	• District and Local Municipality Department includes • Sekhukhune and Burgersfort Taxi Associations • Traffic Department
Water Management Entities and Environment *Institutions focusing on water use and environmental management in general and represent water users in the area.*	• Olifants River Joint Water Forum • Dwars River Environment Forum • Lebalelo Water User's Association • Groot Dwars River Irrigation Board

5.3.1 Communities within and surrounding Der Brochen

Der Brochen falls within the boundaries of the Greater Tubatse Local Municipality, which falls under the Sekhukhune District Municipality. It borders the Thaba Chweu Local Municipality, which is one of the five municipalities falling under the jurisdiction of the Ehlanzeni District Municipality in Mpumalanga.

The farm portions that are included in Der Brochen's mining rights area are: St George 2 JT, Hermansdal 3 JT, Richmond 370 KT, Helena 6 JT, Der Brochen7 JT, and Hebron 5 JT. For the purposes of the stakeholder engagement process, the immediately affected communities were identified as those families and communities living on and directly adjacent to Der Brochen's mining right area. The farms that the families live on are St George 2 JT, Hermansdal 3 JT, Richmond, Welgevonden 9 JT, Vygenhoek 10 JT, Mareesburg 8 JT, Schaapkraal 42 JT.

Table 5-4 Communities surrounding Der Brochen

Families	Farm Name	Communities
Gamawela	St George 2 JT	The Gamawela and Ditsabeng Tsa Moletsi community
Magane and Leshaba,	Hermansdal 3 JT	
Matjomane and Mogashoa	Richmond 370 KT	
Mankge	Mareesburg 8 JT	
Leshaba	Welgevonden 9 JT	The Moletsi community
Pakaneng, Choma	Schaapkraal 42 JT	The Pakaneng Choma community
Pakaneng, Choma	Vygenhoek 10 JT	

In terms of the potential zones of influence, immediate focus areas (defined as regional for the purposes of the impact assessment) identified for Der Brochen were Steelpoort and Burgersfort in the Greater Tubatse Local Municipality, and Mashishing (formerly Lydenburg) in the Thaba Chweu Local Municipality (Der Brochen Social and Labour Plan, 2010). The locality of these towns allows for access to benefit from opportunities at Der Brochen. Der Brochen will focus on providing villages within this radius access to opportunities, starting with those in their immediate vicinity. A socio-economic baseline is provided in Chapter 6 and Appendix C10 and indicates the geographical location of the identified communities.

5.3.2 Land claims

During the stakeholder identification and the pre-announcement consultation process, the existence of land claims from various communities on the above land portions and areas included in AAP's mining rights area, were identified. As the land restitution process in terms of the Restitution of Land Rights Act, Act 22 of 1994 is recognised; the Limpopo Regional Land Claims Commissioner has been informed of the proposed development and official feedback on the status of the land claims on these properties will be confirmed, as far as the information is available, during the impact assessment phase. The stakeholder engagement process for the Der Brochen Project will include all land claimants however Anglo American Platinum recognises the legal process underway in accordance with the Act 22 of 1994.

5.4 Stakeholder Engagement during Scoping Phase

5.4.1 Pre-announcement consultation

Pre-announcement consultation was undertaken with key stakeholders and affected parties during February 2014 to obtain an early understanding of stakeholder issues and concerns to inform the stakeholder engagement process. The details of these meetings are shown in Table 5-5. Attendance lists of all the meetings are included in Appendix B3. The issues identified and comments received during the above meetings are included in the CRR (Appendix B4).

Table 5-5: **Details of pre-announcement consultation meetings**

Date of Meeting	Meeting details	Stakeholders attending
6 February 2014	Gamawela Communal Property Association (CPA) – St George **Venue:** Development Bank of SA, Midrand	Mathibela Mankge: *Vice-Chairperson of the Gamawela CPA* Tiny Mankge *Secretary of the Gamawela CPA*

Date of Meeting	Meeting details	Stakeholders attending
10 February 2014	Tubatse Steelpoort Foundation (TSF) (an assembly of 15 Traditional Authorities) **Venue**: Tubatse Chrome Club, Steelpoort	Kgoshi P.D. Pasha *Chairperson of TSF and Kgoshi of Roka Pasha Phokwane Traditional Council* Kgoshi N.M. Malekane *Secretary of TSF and Kgoshi of Malekane Traditional Council)* Kgoshi M Nkosi *Bengwenyama Traditional Council*
11 February 2014	Gamawela CPA – St George **Venue:** Community Centre St George Farm	Lazarus Mankge *Chairperson of the Gamawela CPA* Allen Magane *Ward 31 Committee Member – Hermansdal* Elias Mogashwa and Cecilia Mankge *Recruitment Committee (District link to all mining companies recruitment process)* Jacobus Magane *Elder in Ga-Mawela representing the farmers*
11 February 2014	Moletsi Community **Venue:** Welgevonden Farm	Case Leshaba Tebogo Leshaba Sarah Leshaba
12 February 2014	Greater Tubatse Local Municipality **Venue:** Maxi's Restaurant, Burgersfort	Lazarus Mabilo *Ward 31 Councillor*
12 February 2014	Mawela Community, including Pakaneng Choma Community Trust (PCCT) **Venue:** Pakaneng Choma Community Trust Offices Schaapkraal Portion 11	Sedikane Mawela *Leader of the Mawela Community* Sam Choma *Leader of Pakaneng Community* Z.T. Maphanga *Secretary of PCCT* M.J. Tau M.A. Moenyane Salome Rakgalokane Steve Mmako

5.4.2 Project announcement

The opportunity to participate in the proposed Der Brochen Project and to register as an I&AP was announced on 5 March 2014 as follows:

Background Information Document, letter of invitation to register as an I&AP

Postal and electronic distribution

- Distribution of a personally addressed letter, Background Information Document (BID), and registration and comment sheet (in English and Sepedi) inviting stakeholders to participate in the process and to register as an I&AP. Copies of the BID, letter, and registration and comment sheet are included in Appendix B5a and B5b; and
- Posting the documentation on the SRK website http://www.srk.co.za/en/za-der-brochen.

Public Places

- Placing 5 copies of the invitation letter, BID, registration and comment sheet in English and Sepedi together with an A3 notification poster, at each of the public places in the project area. (Table 5-6);
- Issue receipts of documents delivered to the public places are included in Appendix B6; and
- Figure 5-2 shows the location and GPS coordinates of public places where stakeholders could collect the documents.

Table 5-6 Public places where stakeholders could access announcement documentation

Public Place	Locality	Telephone number
Mapodile/Eerstegeluk Public Library	735 Kgahlanong Street, Mapodile	013 237 0039
Thaba Chweu Local Municipality	Cnr Viljoen & Sentral Street, Lydenburg	013 235 7300
Burgersfort Public Library	Cnr Kort & Eddie Sedibe Str, Burgersfort	013 231 7815
Sekhukhune District Municipality	No 3 Wes Street, Groblersdal	013 262 7308
Greater Tubatse Local Municipality (Reception	Eddy Sediba Street, Burgersfort	013 231 1000
Ga-Malekane Traditional Council	Ga-Malekane Tribal Office, Ngwaabe	No landline
Pakaneng Community Trust Office	Schaapkraal Farm	No landline
Gamawela Community Centre	St George Farm	No Landline

Site notices

- Two site notices in English and Sepedi (see Appendix B7) were placed at various locations in the project area - refer to map in Figure 5-2, showing GPS coordinates and photographs of the site notice locations.

Advertisements

- Advertisements in English and Sepedi were published in the main body of two newspapers, see details in Table 5-7; and
- Copies of the advertisements as published in newspapers are included in Appendix B8.

Table 5-7: **Newspaper advertisements for project announcement**

Newspaper	Language	Date published
Platinum Gazette	English and Sepedi	5 March 2014
Seipone	Sepedi	7 March 2014

Personal deliveries to key stakeholders and adjacent communities

- BIDs, announcement letters and I&AP registration forms were delivered to the following key stakeholders: Pakaneng Choma and Mawela Communities, 10 Traditional Authorities); Gamawela and Moletsi Communities. Details of personal deliveries to stakeholders are included in Appendix B9.

Distribution of announcement documentation

- The quantities of project announcement documentation and the method of distribution are reflected in Table 5-8.

Table 5-8: **Distribution of announcement documentation**

Method of distribution	Announcement documentation
Emailed and/or posted to stakeholders on the database (English)	**152**
BIDs, and letters placed in public places (all languages)	**90**
Personal drop offs to adjacent landowners and key stakeholders in the project area (English and Sepedi where relevant)	**418**
Total number of project announcement documentation distributed	**660**

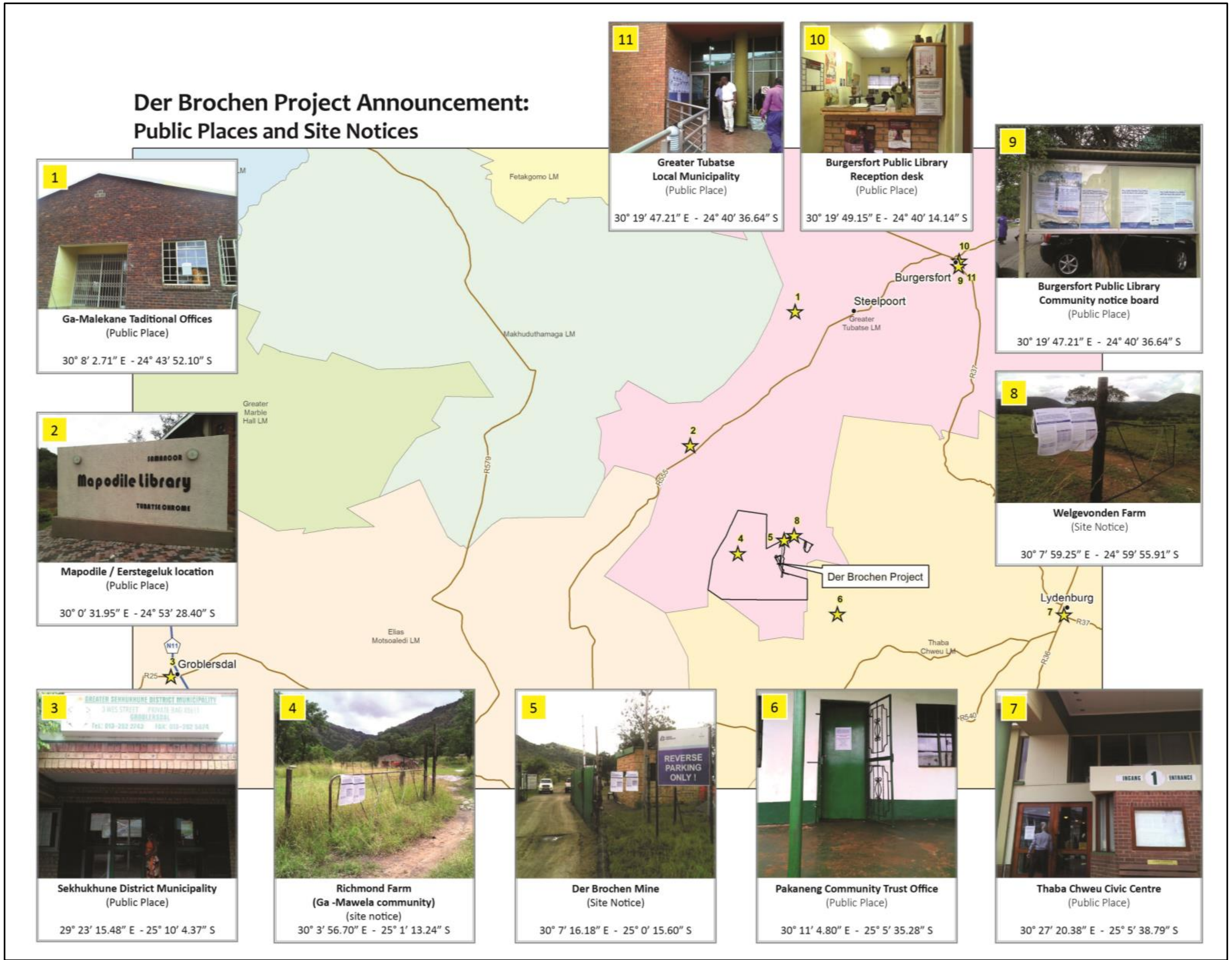


Figure 5-2: **Map showing the public places and site notices announcing the environmental authorisation process**

5.4.3 Obtaining stakeholder comments during announcement period

Stakeholders were invited to comment on the proposed project and the environmental authorisation process by completing and returning the comment sheets or by attending focus group meetings that were held from 27 - 29 March 2014. The purpose of these meetings was to share information regarding the proposed project and details of these meetings are shown in Table 5-9.

The content of the BID was summarised in presentation format and presented in English and Sepedi during the meetings; 150 copies of the presentations (in English and Sepedi) were distributed in hard copy during the meetings and an additional 100 BIDs (English and Sepedi) were made available to attendees. Stakeholders had the opportunity to discuss the proposed project with representatives from AAP and the SRK project team. The presentation and attendance lists from all the meetings are included in Appendix B10a and B10b.

Comments and issues raised during all meetings and via the other opportunities were captured in the CRR, refer to Appendix B4.

Table 5-9: **List of key stakeholder meetings during project announcement period**

Details of meeting	Key stakeholder groups	Photographs
27 March 2014 Time: 9h30-11h30 Venue: Pakaneng Choma Community Trust Office, Schaapkraal	Mawela Community Pakaneng Choma Community Malepa A Makanyane Community	 **Figure 5-3 Meeting: Pakaneng, Mawela and Malepa A Makanyane Communities 27 March 2014**
27 March 2014 Time:15h00-16h30 Venue: Tubatse Chrome Club	Adjacent mines: • Samancor Chrome • Northam Booysendal • Glencore Eastern Chrome Lebalelo Water User's Association	 **Figure 5-4 Meeting: Adjacent mines 27 March 2014**
28 March 2014 Time: 9h00-11h00 Venue: Tubatse Chrome Club	Competent and commenting authorities including ward councillors and Limpopo Heritage Resources Agency	 **Figure 5-5 Meeting: Authorities 28 March 2014**

Details of meeting	Key stakeholder groups	Photographs
28 March 2014 Time:12h00-15h00 Venue: Tubatse Chrome Club	Tubatse Steelpoort Foundation (an assembly of 15 Traditional Authorities in the Steelpoort and Ngwaabe Area)	 **Figure 5-6 Meeting: Tubatse Steelpoort Foundation 28 March 2014**
29 March 2014 Time: 10h00-14h00 Venue: Gamawela Community Centre, St George Farm	Gamawela Community Moletsi Community	 **Figure 5-7 Meeting: Gamawela and Moletsi Communities 29 March 2014**

5.4.4 Availability of the Draft Scoping Report for public comment

A period of 40 days was allowed for public review of the Draft Scoping Report (DSR) - from Wednesday, 16 April to Monday, 2 June 2014. The availability of the DSR was announced as follows:

- Distribution of a personally addressed letter dated 11 April 2014 and registration and comment sheet (in English and Sepedi) inviting stakeholders to comment on the DSR and to register as an I&AP. Copies of the letter, registration and comment sheet are included in Appendix B11;
- Posting the DSR, letter and comment sheet on the SRK website http://www.srk.co.za/en/za-der-brochen;
- Advertisements in English and Sepedi were published in the main body of two newspapers, see details in Table 5-10; and
- Copies of the advertisements as published in newspapers are included in Appendix B12.

Table 5-10: **Newspaper advertisements: Availability of DSR for public comment**

Newspaper	Language	Date published
Platinum Gazette	English	16 April 2014
Seipone	Sepedi	16 April 2014

The DSR, letters and comment sheets were made accessible for public viewing and comment, in the same public places as for project announcement. Document issue receipts for public places can be seen in Appendix B13.

5.4.5 Obtaining stakeholder comment on Draft Scoping Report

Stakeholders were invited to comment on the DSR and the environmental authorisation process by completing and returning the comment sheets or by attending focus group meetings that were held from 29-31 May 2014. The purpose of these meetings was to provide feedback regarding the scoping phase of the project and for stakeholders to verify that their comments have been considered. The details of these meetings are shown in Table 5-11.

The content of the DSR was summarised in presentation format and presented in English and Sepedi during the meetings; 300 presentations (in English and Sepedi) were distributed in hard copy during the meetings to attendees. Stakeholders had the opportunity to discuss the proposed project with representatives from AAP and the SRK project team. The presentation and attendance lists from all the meetings are included in Appendix B14a and B14b.

Comments and issues raised during all meetings and via the other opportunities were captured in the CRR, refer to Appendix B4.

Table 5-11: List of key stakeholder meetings to present and discuss the DSR

Details of meeting	Key stakeholder groups	Photographs
29 May 2014 Time: 9h30-12h00 Venue: Pakaneng Choma Community Trust Office, Schaapkraal	Pakaneng Choma Community	 **Figure 5-8 Meeting: Pakaneng Community 29 May 2014**
29 May 2014 Time:14h30-15h30 Venue: Tubatse Chrome Club	Adjacent mines • Samancor Chrome Limited • Glencore Eastern Chrome Mines Lebalelo Water User's Association Business sector: • SBBF Onpoint • Steelpoort Business Forum • Mojaladi Trading Enterprise	 **Figure 5-9 Meeting: Adjacent mines and business sector 29 May 2014**
30 May 2014 Time:9h00-11h00 Venue: Tubatse Chrome Club	Traditional Authorities in the Steelpoort and Ngwaabe Area *Note: at the meeting it was confirmed that the Tubatse Steelpoort Foundation is no longer functional and that traditional authorities need to be invited to the meetings individually.*	 **Figure 5-10 Meeting: Traditional Authorities 30 May 2014**
30 May 2014 Time: 13h00-15h00 Venue: Tubatse Chrome Club	Authorities meeting Sekhukhune District Municipality and the Ward 31 Councillor of Tubatse Local Municipality	 **Figure 5-11 Meeting: Authorities 30 May**

Details of meeting	Key stakeholder groups	Photographs
		2014
31 May 2014 Time: 10h00-14h00 Venue: Gamawela Community Centre, St George Farm	Gamawela Community Moletsi Community	 **Figure 5-12 Meeting: Gamawela and Moletsi communities 31 May 2014**
26 June 2014 Time: 10h00-14h00 Venue: Jane Furse	Mawela Community	 **Figure 5-13: Meeting: Mawela Community 26 June 2014**

5.4.6 Availability of the Final Scoping Report for public comment

The Final Scoping Report (FSR) was prepared at the end of the DSR public comment period, and was updated with additional comments and suggestions raised by I&APs.

Legislation requires that the updated FSR must be made available to stakeholders for comment again for a period of 21 days. The public comment period was from 8 to 29 July 2014. The FSR was submitted simultaneously to the competent and commenting authorities. The availability of the FSR was announced as follows:

- Distribution of a letter and comment sheet dated 7 July 2014 informing stakeholders of the availability of the FSR for public comment, and the options of submitting comments directly to the competent authorities or to SRK. Copies of the letter and comment sheet are included in Appendix B15;
- The FSR, letter and comment sheet was made accessible for public viewing and comment in the same public places as throughout the scoping phase – refer Table 5-6; and
- Posting the FSR, letter and comment sheet on the SRK website http://www.srk.co.za/en/za-der-brochen

5.4.7 Acceptance of the Final Scoping Report by Authorities

The FSR and Plan of Study for the impact assessment were accepted on 3 September 2014 by the DMR and on 23 October 2014 by LEDET. AAP proceeded with the impact assessment phase of the EIA in accordance with the tasks contemplated in the Plan of Study for the impact assessment. A letter dated 31 October 2014 was distributed to all stakeholders on the database notifying them of the acceptance of the FSR, as well as the proposed increase in the Mareesburg TSF footprint. Copies of the letter are included in Appendix B16.

5.5 Stakeholder engagement during Impact Assessment phase

A period of 40 days was provided for public review of the Draft EIA/EMP. The public comment period was from 8 December 2014 – 6 February 2015**.** The availability of the Draft EIA/EMP was announced as follows:

- Distribution of a personally addressed letter dated 8 December 2014 and comment sheet (in English and Sepedi) inviting stakeholders to comment on the Draft EIA/EMP. Copies of the letter and comment sheet are included in Appendix B17;
- The Draft EIA/EMP, letter and comment sheet were made accessible for public viewing and comment in the same public places as throughout the scoping phase (Refer to Table 5-6);
- Advertisements in English and Sepedi were published in the main body of two newspapers, see details in Table 5-12; and
- Copies of the advertisements as published in newspapers are included in Appendix B18.

Table 5-12: Newspaper advertisements: Availability of Draft EIA/EMP for public comment

Newspaper	Language	Date published
Platinum Gazette	English	5 December 2014
Limpopo Rise and Shine	Sepedi	4 December 2014

- The Draft EIA/EMP, letter and comment sheet were posted on the SRK website http://www.srk.co.za/en/za-der-brochen

5.5.1 Obtaining stakeholder comment on the Draft EIA/EMP Amendment Report

Stakeholders were invited to comment on the Draft EIA/EMP and the environmental authorisation process by completing and returning the comment sheets or by attending focus group meetings that were held from 28-31 January 2015. The purpose of these meetings was to provide feedback regarding the impact assessment phase of the project and for stakeholders to verify that their comments have been considered. The details of these meetings are shown in Table 5-13.

The content of the Draft EIA/EMP was summarised in presentation format and presented in English and Sepedi during the meetings; 300 presentations (in English and Sepedi) were distributed in hard copy during the meetings to attendees. Stakeholders had the opportunity to discuss the proposed project with representatives from RPM and the SRK project team. The presentation and attendance lists from all the meetings are included in Appendix B19a and B19b.

Comments and issues raised during all meetings and via the other opportunities were captured in the CRR, refer to Appendix B4.

Table 5-13: List of key stakeholder meetings to present and discuss the Draft EIA/EMP

Details of meeting	Key stakeholder groups	Photographs
28 January 2015 Time: 9h30-12h00 Venue: Pakaneng Choma Community Trust Office, Schaapkraal	Pakaneng Choma Community	 **Figure 5-14 Meeting: Pakaneng Community 28 January 2015**

Details of meeting	Key stakeholder groups	Photographs
28 January 2015 Time:14h30-15h30 Venue: Tubatse Chrome Club	Adjacent mines • Samancor Chrome Limited • Glencore Eastern Chrome Mines Business sector: • SBBF Onpoint • Steelpoort Business Forum • Mojaladi Trading Enterprise Authorities and community forums • Ward 31 Councillor • Ngwaabe Forum	 **Figure 5-15 Meeting: Adjacent mines and business sector 28 January 2015**
29 January 2015 Time:9h00-11h00 Venue: Makhudutamaga Local Municipality	Mawela Community	 **Figure 5-16 Meeting: Mawela Community 29 January 2015**
30 January 2015 Time: 9h00-12h00 Venue: Tubatse Chrome Club	Traditional Authorities: 15 Traditional Authorities in the area	 **Figure 5-17 Meeting: Traditional Authorities 30 January 2015**
31 January 2015 Time: 10h00-13h00 Venue: Gamawela Community Centre, St George Farm	Gamawela Community Moletsi Community	 **Figure 5-18 Meeting: Gamawela and Moletsi communities 31 January 2015**

5.5.2 Availability of the Final EIA/EMP Report for public comment

The Final EIA/EMP (this report) was prepared at the end of the Draft EIA/EMP public comment period and was updated with additional comments and suggestions raised by I&APs. Legislation requires that the Final EIA/EMP must be made available to stakeholders for comment again for a period of 21 days.

The public comment period is from 23 March 2015 to 15 April 2015. The Final EIA/EMP is also submitted to the competent and commenting authorities. The availability of the Final EIA/EMP is announced as follows:

- Distribution of a letter and comment sheet informing stakeholders of the availability of the Final EIA/EMP for public comment, and the options of submitting comments directly to the competent authorities or to SRK Consulting. Copies of the letter and comment sheet are included in Appendix B20;
- The Final EIA/EMP, letter and comment sheet was made accessible for public viewing and comment in the same public places as throughout the scoping phase (refer Table 5-6);
- The Draft EIA/EMP, letter and comment sheet were posted on the SRK website http://www.srk.co.za/en/za-der-brochen

5.6 Comment and Response Report

The Comment and Response Report (CRR) captures all the comments received and issues identified by stakeholders during the Scoping and Impact Assessment Phases to date and are included in Appendix B4. The CRR also includes responses form AAP and the project team and is updated continuously throughout the environmental authorisation process. The key comments are summarised in Table 5-14 and referenced to the corresponding key sections in the Final EIA/EMP.

Table 5-14: Summary of stakeholder comments received

Category	Summary of comment	Commentators	Reference in the Final EIA/EMP
Environmental Issues	• Air quality - Generation of dust in an area already impacted by mining and the potential thereof for contributing to an increase in respiratory disease • Biodiversity – The impact of the project on vegetation in the area, particularly traditional medicinal plants as used by local communities • Traffic – The impact of trucks transporting ore on traffic volumes via public roads and the responsibility for maintenance of the roads • Groundwater – The cumulative impact of mining (this project in particular) on groundwater in the area	• Local communities • LEDET • Welgevonden farm landowner	Appendix C7 Appendix C2 Appendix C9 Appendix C4
Cultural heritage	• Insistence on commitment from AAP to preserve ancestral and cultural heritage by providing access and opportunities to sites of significance • Need for a Heritage Impact Assessment updating the status of heritage resources done in 2009 • Restitution of desecration of ancestral graves due to previous construction	• Local communities • LEDET	Appendix C8
Socio-economic	• Resettlement – The potential for resettlement of communities due the impact of the project was of concern • Job creation and benefits - AAP's contribution and obligation to provide employment, skills development, local procurement and contractor management through the Social Labour Plan • Access to procurement opportunities within AAP - Procurement opportunities within small scale companies, dealing with corruption and transparency in evaluation and awarding tenders • Community involvement in providing correct information in social demographical data	• Local Communities • Traditional Authorities • District and Local Municipalities • Local business • Community Property Associations	Appendix C10
Land restitution	• Importance of the land restitution process has been emphasised by the multiple land claimant groups and resolution of this process by the Regional Land Claims Commissioner will be acknowledged	• Local Communities • Traditional Authorities • District and	Section 5.2.3

Category	Summary of comment	Commentators	Reference in the Final EIA/EMP
	• Recognition of leadership and chieftainship characterises in the area and the manner in which local communities and groups must be approached in the EIA process	Local Municipalities • Land claimant groups • Regional Land Claims Commissioner	
Company conduct and policy	• Focusing on AAP's previous and existing relationship with local communities • Benefit sharing with communities in the form of shareholder, local procurement and training and skills development • Insistence from local communities for AAP to address outstanding issues ranging from grave desecration due to construction to resolving commitment made to local communities • AAP's restructuring process. Could Der Brochen Project be sold?	• Local Communities • Traditional Authorities • District and Local Municipalities • Local business • Local business • Community Property Associations	Comment and Responses Report, Appendix B4
EIA process	• Investigation and assessment of project alternatives should not be limited to implementation of activities but also include the no-go option • Consultation with Samancor regarding prospecting rights on Mareesburg 8JT • Terms of Reference for the specialist studies needed to be confirmed and include involvement of local communities	• Adjacent landowner (Welgevonden) • Adjacent mines • LEDET • Local communities	Chapter 3 and 4 Chapter 5 Chapter 3 and Appendix A
Stakeholder engagement	• Nature and extent of the stakeholder engagement process with a concern that the legitimate land claimants remain involved • Request to ensure that all I&APs remain involved • Collaborative effort is needed to bring effective development to the communities. • Suggestion to establish a community forum to continue communication with AAP even after EIA process.	• Local Communities • Traditional Authorities • District and Local Municipalities • Land claimant groups •	Chapter 5
Project specific issues	• General questions regarding the technical specification of the project such as life span of project • The relationship between the raising of Helena TSF and the Der Brochen	• Adjacent landowner • Adjacent mines • District and Local	Chapter 4 Chapter 4

Category	Summary of comment	Commentators	Reference in the Final EIA/EMP
	Project and the risk of increasing the Helena TSF height to 1145 masl • The Mareesburg TSF and engagement with stakeholders during 2002 did not include the adjacent landowner • The continuation of underground mining after open pit mining	Municipality • Traditional Authorities • Local communities	Chapter 4 and 5 Chapter 4

Stakeholder engagement is an on-going process throughout the EIA process and as more comments are received during the final impact assessment phase, the CRR will be updated accordingly.

5.7 Notification of Authority decision

Stakeholders will be advised in writing (mail, email, fax and sms) and by advertisements in the media placed in the same newspapers as during the process of the authority decision on the Final EIA/EMP and IWUL Amendment, and conditions of each authorisation. Stakeholders will be advised that the environmental authorisation decision may be appealed within 30 days after the date of decision. The notification to stakeholders will summarise the authorities' decision and will advise stakeholders how an appeal may be lodged should they wish to do so.

6 Description of the Baseline Environment

Der Brochen is situated in a steep sided, north-south trending valley within which the Groot-Dwars River flows in a northerly direction. There are mining developments north and south of Der Brochen but little other developments. Several small communities are situated around the Der Brochen area.

Der Brochen is located within the Sekhukhuneland Centre of Plant Endemism (SCPE), which is characterised by a large number of endemic plant species and sub-species.

6.1 Geology

The Der Brochen project area is located within the 66 000 km^2 eastern limb of the Bushveld Complex. It comprises an assemblage of layered ultramafic to felsic Proterozoic plutonic and volcanic rocks. Der Brochen lies approximately 40 km south-east of the Steelpoort fault in the Rustenburg Layered Suite of the complex.

Approximately 9 km of Upper Group 2 (UG2) reef and 13 km of Merensky Reef (MR) horizons outcrop within the Der Brochen project area, with a 170 m reef parting. The UG2 reef dips to the west at an average angle of 10° on Richmond farm, on the northern and central portions of Helena, as well as on Der Brochen farm.

The MR dips at an overall average of 10.3°over the project area. Eighty percent of the total area of the six farms covered by the Der Brochen new order mining right is underlain by both reef horizons.

The MR is located at the top of a thick pyroxenite (~ 5 m) sequence and is fairly consistent with a thin chromitite stringer located ~ 30 cm from the top of the Merensky pyroxenite/norite contact. The most prominent Platinum Group Metal (PGM) mineralisation usually occurs within the upper two metres of the pyroxenite. A second Merensky facies has been identified and is termed the “Sunk Facies”. This facies is known to occur fairly extensively on the Helena farm and is characterised by mineralisation occurring at a lower stratigraphic position within the pyroxenite. The UG2 reef is usually characterised by a single thick chromitite layer overlain by a pyroxene hanging wall. A series of chromitite bands/stringers classified as the Triplets occurs above the pyroxenite.

Exploitation of the reefs in the area is complicated by various features such as the rugged topography limiting easy access via declines, as well as geological features present in the region, in particular the St George fault and the Helena depression (jointing, faulting, dykes, potholes, shear zones and slump features). The St George Fault displacement is approximately 35-41 m. Various dyke swarms have been delineated across the project area, being predominantly dolerite and diabase in composition and trending either north-northeast or north-south. The overall geological losses (including internal waste) are 19.6% MR and 21.5% UG2.

6.2 Geochemistry

Information regarding the geochemistry in the Der Brochen area was obtained from the Delta H report: *Geochemical Study – Der Brochen Project, May 2014*. (Project Number: Delh.2013.027-2). Refer to Appendix C1 for the full report.

Delta H assessed the Acid Rock Drainage (ARD) potential and potential leachate quality of samples taken from the existing Helena TSF, the ore stockpile at the Mototolo Concentrator and drill core (waste rock) samples. As the proposed Mareesburg TSF will store the same tailings material (processed ore by the Mototolo Concentrator originating from the same ore body), the samples are considered appropriate and representative for the Der Brochen project. Similarly, the potential leachate quality emanating from the waste rock and tailings samples are considered representative for the potential future co-disposal option of the two material types over the Northern open pit, with the waste rocks being also used for construction of the potential future starter wall of the co-disposal facility.

The geochemical test work was carried out by Waterlab (Pty) Ltd, a SANAS (South African National Accreditation System) accredited laboratory, in February 2014 and included the following:

- Acid-Base Accounting (ABA), Net Acid Generation (NAG), Sulfur (S)-speciation and total inorganic carbon content; and
- Distilled water and sulfuric acid leach tests.

All tailings, the ore and the vast majority (75%) of waste rock samples were classified as non-acid generating based on their limited sulfur content respectively acid potential, which is generally compensated by the low, though sufficient neutralisation potential of the tested samples. Two waste rock samples (17%, norite and chromitite) were classified as uncertain or potentially acid generating in the case of preferential exposure or reactivity of sulfides. The single dolerite waste rock sample was classified as short term acid generating. The results are in agreement with earlier assessments of waste rock and tailings material from the Der Brochen project and other nearby platinum mines in the eastern limb of the Bushveld Complex, which all indicate non-acid generation and a likely neutral to alkaline leachate quality from the tested mine residues. However, Delta H suggested that classifications based on single samples for a lithology only need to be corroborated in future ARD assessments (Delta H, 2014).

Leach test results suggest limited impacts of seepage from waste rock dumps and ore stockpiles on the ambient groundwater quality, with selected trace elements exceeding WUL, drinking water and/or effluent limits which trigger requirements of appropriate design and leachate management strategies for the facilities. Based on leach test and liquor analysis results, seepage from the tailings dams (Helena, Co-disposal and Mareesburg) is on the other hand likely to have significant impacts on the quality of groundwater underlying the TSF footprint or surrounding surface water courses if not contained. Major elements (chloride, sulfate nitrate, calcium, magnesium, sodium and potassium) as well as for several trace elements (ammonia, aluminium, arsenic, chromium and iron) clearly exceed applicable WUL, drinking water and/or effluent limits in the tested samples. An earlier geochemical assessment for a nearby mine by SRK (2002) adds arsenic, manganese, nickel, antimony and selenium to the list of constituents of concern for the tailings liquor.

The concentrations of these elements are likely to exceed, especially during life of mine (as assessed by the tailings liquor quality) but also post closure (as assessed by the leach tests), the applicable WUL, discharge and/or drinking water limits used for precautionary screening. Delta H therefore recommends that appropriate engineering designs and leachate management strategies should be implemented for the tailings dams.

6.3 Topography

The area is characterised by a rugged topography with the relief measuring between 940 m and over 2 000 m above mean sea level (mamsl). The prominent north-south trending Steenkamps Mountains extend across the study area, with two deeply incised valleys lying in a north-south direction between the mountain ranges. Within these valley floors are the Groot-Dwars River in the east and the Klein-Dwars River in the west (both flowing northwards through the area).

The area varies in elevation from 1 054 mamsl in the Groot-Dwars River valley in the north (border between Mareesburg and Helena farms) to 1 654 mamsl on Der Brochen farm. In only a few valley bottoms, where the topography is fairly flat, has any significant depth soil accumulated (SRK, 2002).

6.4 Climate

Information regarding the climate in the Der Brochen area was obtained from the SRK report: *Environmental Management Programme Report for the Der Brochen Mine Volume 1 of 3, November 2002*.

6.4.1 Regional climate

Der Brochen falls within the Highveld climatic region. This climatic region is associated with warm temperature and summer rainfall. The average daily maximum temperature for the region is 27°C in January and 17°C in July, and average daily minimum for the region vary from 13ºC in January to 0ºC in July (SRK, 2002).

The average annual rainfall for this climatic region varies from 900 mm in the east to 680 mm in the west, while the average annual evaporation is 1 731 mm. The average annual rainfall for the Der Brochen area is approximately 737 mm. Rainfall is almost entirely derived from heavy showers and thunderstorms and occurs mostly in the summer (85%) from October to March, with a maximum in January. These storms tend to be severe but shortlived, with lightning, gusts of south-westerly winds and some hail (SRK, 2002).

The prevailing wind directions on the site are north-westerly and south-easterly due to the topographical orientation of valleys and ridges in the area. Calm wind conditions occur on average 28% of the time, with no seasonal pattern observed. However, there is a distinct diurnal pattern, with over 50% of calm winds recorded during the night hours. The average surface wind speed is 2.5 m/s, with a maximum observed wind speed of 7.9 m/s (SRK, 2002).

6.4.2 Mean monthly maximum and minimum temperatures

Ambient air temperature is important, both for determining the effect of plume buoyancy (the larger the temperature difference between the plume and the ambient air, the higher the plume is able to rise), and determining the development of the mixing depth and inversion layers. The average daily maximum temperature at Der Brochen (based on Mashishing information) is 22.9°C and the minimum 9.5°C. Temperature extremes of 34.5°C have occurred in summer and 5.9°C in winter. Table 6-1 shows the average monthly minimum and maximum temperatures for Mashishing (SRK, 2002).

Table 6-1: Long term average monthly temperatures for Lydenburg

SAWB, 2001	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Minimum (°C)	2.7	4.8	8.1	10.8	12.7	14.1	14.7	14.2	12.9	10.0	6.0	2.8
Maximum (°C)	18.8	20.9	23.6	24.0	24.2	25.2	25.9	25.5	24.8	22.6	20.8	18.3

6.4.3 Mean monthly and annual precipitation

Data were gathered from the closest first-order South African weather station, Lydenburg (Mashishing) (W0554816) during 2002, which is approximately 35 km south-east of Der Brochen. Information from a rainfall station at Maartenshoop (Gauge W0593419), situated about 10 km east of Der Brochen, is also included, as it probably reflects the site rainfall better that the gauge at Mashishing. The long-term (1961 – 1990) Mean Annual Precipitation (MAP) for Mashishing is 737 mm. The MAP for Maartenshoop for the period October 1915 – September 2000 is 680 mm (SRK, 2002). Table 6-2 shows the average monthly rainfall and is illustrated in Figure 6-1 (SRK, 2002).

Table 6-2: Mean Monthly Precipitation (mm)

Weather Station	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Lydenburg	73	136	123	132	85	73	52	17	7	5	9	25
Maartenshoop	61	116	122	115	91	83	45	15	6	6	7	21

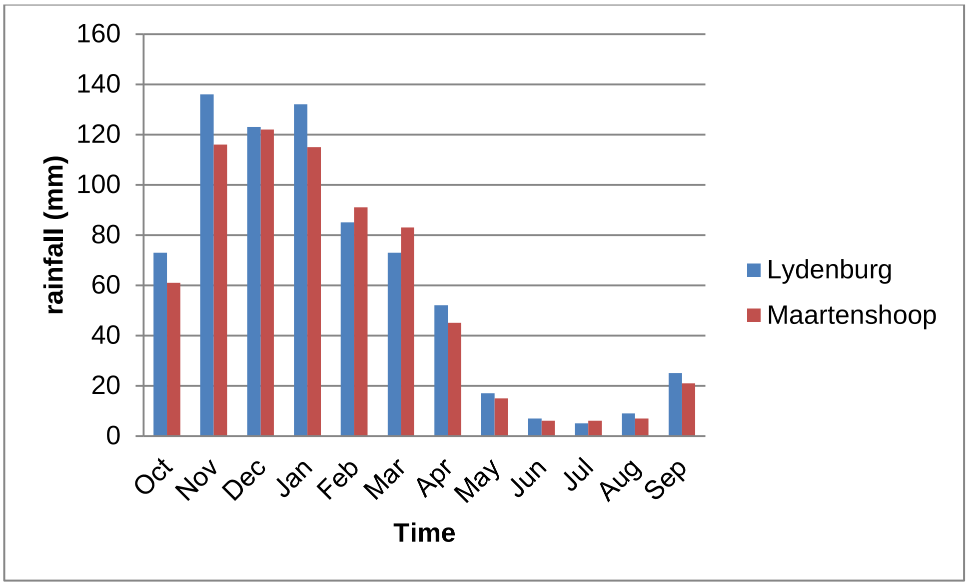


Figure 6-1: Mean Monthly Precipitation

6.5 Soils and Land Capability

Various soils and land capability surveys have been conducted in the project area since 2002, namely:

- February 2002: Soils survey for the Der Brochen Mine – ISCW;
- May 2003: Soil survey for Helena and Richmond infrastructure – ISCW;
- December 2003: An ecological study of the Anglo Platinum Der Brochen lands (including soils and land types) – Ecolife and the Centre for Wildlife Management, University of Pretoria; and
- September 2008: Soils, land use and land capability survey: proposed Richmond early mining area – JH van der Waals.

The results can be summarised as follows:

- Helena farm: broadscale land types include Mispah, Arcadia, Glenrosa, Hutton and Clovelly soils, all having grazing land capabilities, with the Mispah and Hutton soils tending towards wilderness status when shallow and rocky; detailed soil surveys indicated deep and shallow Arcadia and shallow rocky Mispah soils as dominant, with arable/grazing and wilderness/grazing land capabilities respectively;
- Der Brochen farm: the land types of the farm are Ib154b (Mispah soils of wilderness land capability), Dc31b (Arcadia soils of grazing/arable potential) and Ib30c (Glenrosa soils of grazing capability); specialists indicated that the rocky Mispah soils have an inherent grazing land capability and Arcadia erosion;
- Mareesburg farm: broadscale land types include Ab29 (Arcadia/Hutton – grazing); Ib31 (Mispah/Glenrosa – grazing); Dc31 (Arcadia/Hutton – grazing) and Fa327 (Glenrosa – grazing); the detailed soil survey in the vicinity of the proposed TSF found rocky Glenrosa soils to dominate (grazing land capability), followed by rocky Mispah soils (grazing land capability) and rocky Arcadia soils (also of grazing land capability); and

- Richmond farm: broadscale land types Ib154 (Mispah soils with wilderness/grazing land capability); Ib30 (Glenrosa soils with grazing land capability); Ib31 (Bonheim and Swartland soils with grazing land capability) and Dc31 (Arcadia soils with mixed arable/grazing land capability); the specialist identified shallow rocky soils (Glenrosa/Mispah/Mayo/ Steendal/Milkwood/Dundee) of grazing/wilderness land capability; structured non-swelling soils of the Valsrivier form having grazing potential; structured swelling soils namely Arcadia/ Bonheim/ Steendal/ Mayo /Inhoek/ Oakleaf being of grazing potential; transported and/or eroded Dundee/ Mispah/Augrabies soil forms of either wetland or wilderness land capability; young alluvial Hutton/Clovelly/Oakleaf/ Augrabies/Addo/Etosha/Molopo and Kimberley forms having inherent wilderness potential and lastly, young alluvial Dundee soils being of wetland land capability.

The surveys all depicted widespread erosion in the area.

Prior to transfer of the surface rights to RPM, all the properties in the study area were privately owned. The land uses included sheep farming, cattle ranching and game farming. Game farming is still being undertaken on Der Brochen and Mareesburg farms. Land uses on the broader surrounding properties also include crop and trout farming, eco-tourism, chicken farming, mining and forestry (J9 Environmental CC, 2011).

6.6 Land Use

The Der Brochen project area is situated in a remote rural area, which up until recently saw very little human activity. This is the result of:

- The steep Dwars-River valley combined with the rocky soils and low rainfall, which is not suitable for crop agriculture in the area;
- The steep gradients in the area and rocky soils leading to stock farming being marginal in the area; and
- The Dwars-River valley that is bordered by tall mountains to the east, west and south making accessibility and thoroughfare difficult, therefore limiting human activity in the area (SAS, 2011).

Based on the above observations historical land use in the area consisted of large areas of open wilderness with some game farming and cattle grazing activities occurring. In more recent times mining development has become established in the area and now forms the most dominant land use feature in the area (SAS, 2011).

6.7 Biodiversity

The Der Brochen project area is located within the Sekhukhuneland Centre of Plant Endemism (SCPE). The SCPE is a micro-regional centre of plant endemism because of its exceptionally rich biodiversity and high degree of species endemism. Species are considered endemic because they are unique to a specific region (NSS, 2014).

In addition to the above, the study area is also located within a South African National Biodiversity Institute (SANBI) Priority Area as well as the Sekhukhune Mountainlands Threatened Ecosystem and Critical Biodiversity Area within the Limpopo Conservation Plan (C-Plan). It is also recognised as the Highest Biodiversity Risk for Mining under the recently released (2013) Mining and Biodiversity Guidelines (NSS, 2014).

6.8 Vegetation

Information regarding the vegetation of the Der Brochen area was obtained from Natural Scientific Services' (NSS) report *Der Brochen Platinum Mine Floristic Assessment, May 2014.* Reference No. 1995. Refer to Appendix C2 for the full report.

6.8.1 Regional vegetation

As mentioned, the study area lies within the SCPE. The endemic plants are primarily edaphic (soil) specialists that have adapted to the unique geology and associated 'heavy metal toxic' mafic and ultramafic soils of the area, as well as the irregular topography and diverse micro-climates.

The SPCE is divided into three sub-centres, and the farms on which the proposed infrastructure for Der Brochen will be established is located within two of the sub-centres of the SCPE.

Roossenekal sub-centre in the east of the study area has a total of 67 SCPE endemics/near-endemics and nine newly assessed Red List taxa (Siebert, 1998). Six taxa are exclusively endemic to this sub-centre.

Steelpoort sub-centre to the west is a uniquely *Kirkia wilmsii* (Mountain Seringa) dominated mountain bushveld with 90 SCPE endemics/near-endemics and 16 newly assessed Red List taxa (Siebert, 1998). Twenty taxa are strictly endemic to this sub-centre.

The area is furthermore located within the Savanna Biome, with the most recent national vegetation classification indicating it to be part of the Sekhukhune Mountain Bushveld vegetation type (Figure 6-2) according to Mucina and Rutherford (2006). This vegetation type is restricted to only the Limpopo and Mpumalanga provinces, occurring strictly at altitudes of 900 – 1 600 mamsl and is listed in as Least Threatened. However, Mucina & Rutherford (2006) state that there are no protected areas for this vegetation type. It is furthermore restricted to the Leolo mountains, Dwars River mountains and some smaller hills and isolated mountains along the Steelpoort and Klip Rivers.

Due largely to the uniqueness and endemic richness of these areas, the larger Sekhukhune Mountainlands has recently been described by the NEM:BA's National List of Threatened Ecosystems as an Endangered System within Criterion F. These are Priority areas for meeting explicit biodiversity targets as defined within systematic biodiversity plans for the province. Further to this, the area is recognised as a Priority Zone (North Eastern Escarpment) under SANBI for conservation initiatives.

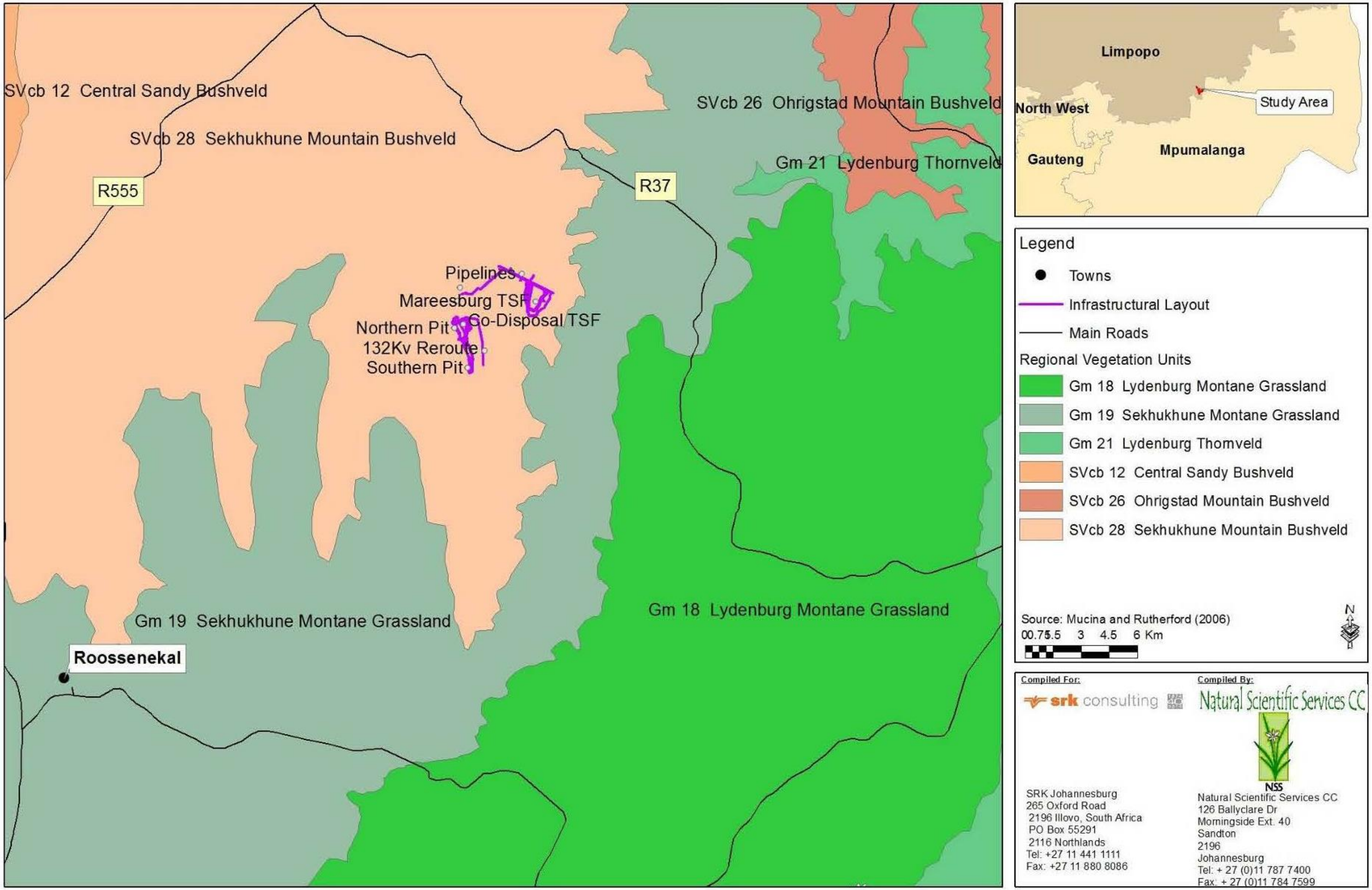


Figure 6-2: Regional vegetation units in the greater area around Der Brochen (NSS, 2014)

6.8.2 Local vegetation

From the National Herbarium Pretoria Computerised Information System (PRECIS) data supplied by SANBI (2430CC; 2530AA), 667 plant species of 109 families have been recorded for quarter degree grid's (QDG) square where the site is located (PRECIS data accessed May 2014). The dominant families are listed:

- Asteraceae (herbs) (32% of species expected);
- Poaceae (shrubs and small trees) (9% of species expected); and
- Fabaceae (geophyte).

The following communities or habitats were identified within the Der Brochen project footprint:

- Hillslope and Rock Communities:
  - Doleritic Community;
  - Quartzite Rubble Plains;
  - Sheetrock Mat Formation (including Rock Sheets – RS; Hoare, 2008);
  - Wooded Hillslopes;
  - Rocky Hillslopes;
  - Rocky Wooded Hillslopes;
  - Rocky Gorge Woodland; and
  - Ridge Grasslands (Hoare,2008).
- Watercourses and Wetland Systems:
  - Drainage Line Communities (including Thornveld Drainage, Hoare, 2008); and
  - Turfsoil Thornveld.
- Shrublands:
  - Low Shrublands; and
  - Shrubby Grassland.
- Woodland:
  - Mixed Sparse and Grassland Closed Woodland;
  - Open Woodland (Including Plains Thornveld: Hoare, 2008); and
  - Open Plain Woodland.
- Transformed:
  - Cultivated; and
  - Disturbed Areas/Borrow Pits.

Within these habits, a further 34 sub-communities were identified in the project footprint areas. These are described in Table 6-3 and shown Figure 6-3.

Table 6-3: Vegetation communities and sub-communities within the Der Brochen area (NSS, 2014)

Community	Sub-community	Community Description	Code
Hillslope and Rock Communities			
Rocky Hillslopes	*Lydenburgia cassinoides – Kirkia wilmsii*	South-facing slopes	H4
Woodland Rocky Gorge	*Lydenburgia cassinoides*	Contains large boulders and dominated by large trees, Smaller systems with similar traits	M9
Doleritic Community	*Combretum molle – Aloe longibracteata*	A conspicuous dolerite dyke habitat supports a distinctive plant community	H9
Quartzite Rubble Plains	*Euclea affinity linearis - Gnidia*	This community occupies plains	M3

Community	Sub-community	Community Description	Code
	capitata - Loudetia sp.	lying between the hills and the river, covered in quartzite rocks and stones	
Sheetrock Mat Formation	*Xerophyta schlechteri- X villosa - Myrothamnus flabellifolius*	Smooth, exfoliating rock surfaces are exposed on the lower slopes of the hills, containing some form of seeps	H3; HW2
Rocky Wooded Hillslopes	*Combretum zeyheri - Acacia caffra - Acacia gerrardii - Aloe marlothii*	Norite covered hills	M5
Wooded Hillslopes	*Peltophorum africanum - Heteropogon contortus*	Dense Vegetation Community	DBW4; HH4
	Themeda triandra - Acacia caffra	Wooded Community - occupies the slopes on both sides of the river system.	DB4
Rocky Wooded Hillslopes	*Protea – Tristachya - Loudetia*	Open Wooded Community - occupies the slopes on the eastern side of the river system.	P1
Watercourse & Wetland Systems			
Drainage Line Communities	*Euclea crispa - Nuxia gracilis*	Drainage lines leading to the Groot-Dwars River can be fairly wide (up to 8 m) and some contain running water, even in early summer.	DB2
	Acacia caffra - Combretum zeyheri	These drainage lines are located on the eastern side of the Groot-Dwars River.	M2
	Adiantum capillis veneris - Crotalaria monteiroi	Uniform vegetation within drainage lines to the Groot-Dwars River.	H2
	Combretum erythrophyllum - Euclea crispa	Wooded Drainage Community.	DBW1
	Phragmites mauritianus - Combretum erythrophyllum*	Banks of the Groot-Dwars River on Helena Farm and strong flowing tributaries.	H1 ; M1
	Searsia keetii - Cyperus sexangularis	This vegetation community is a typical drainage line community, with selected patches supporting rock pools.	HH1 ; HW1
Turfsoil Thornveld - Wetlands	*Acacia karroo - Imperata cylindrica*	The north-west corner of Helena Farm supports an Acacia community on dark turf soils. This was also located within certain patches in the northern and southern pit areas.	H6
Shrublands			
Shrubby Grassland	*Loudetia sp. - Euclea affinity linearis.*	Shrubs and small trees constitute the woody vegetation layer in this community.	DBW3
	Acacia caffra - Euclea aff. linearis	This heavily grazed community occupies magnesite covered turf soils.	H7
Shrubland	*Themeda triandra - Euclea aff. linearis*	Sparsely tree'd community occupying level ground between	DB3

Community	Sub-community	Community Description	Code
		the Groot-Dwars River and the hills to the west.	
Woodland			
Woodland Mixed Sparse & Grassland Closed	*Acacia caffra - Acacia karroo (similar to H7)*	Lower slopes within the proposed opencast area.	HH2
Open Woodland	*Acacia caffra - Aristida sp.*	Lower hill slopes	M6
	Faurea saligna - Tristachya leucothrix - Loudetia simplex	These areas support relatively sparse woody vegetation.	HH3/T3
Woodland Open Plain	*Acacia caffra - Combretum zeyheri - Acacia gerrardii*	Positioned on rocky quartzite plains with some norite nearer the hills. These wooded plains are bounded by drainage lines on either side, making an abrupt transition with M3.	M4
	Faurea saligna - Themeda triandra	Relatively flat area decending to the drainage lines and Groot-Dwars River (deeper soils than the rocky hillslopes).	H5 : HW6
Transformed			
Disturbed Areas/Borrow Pits	*Melinis repens - Aristida sp.*	A number of disturbed areas located between the existing dirt road and the Groot-Dwars River. Further disturbed areas within the proposed opencast area.	DBW2

* NSS identified *P australis* in these systems

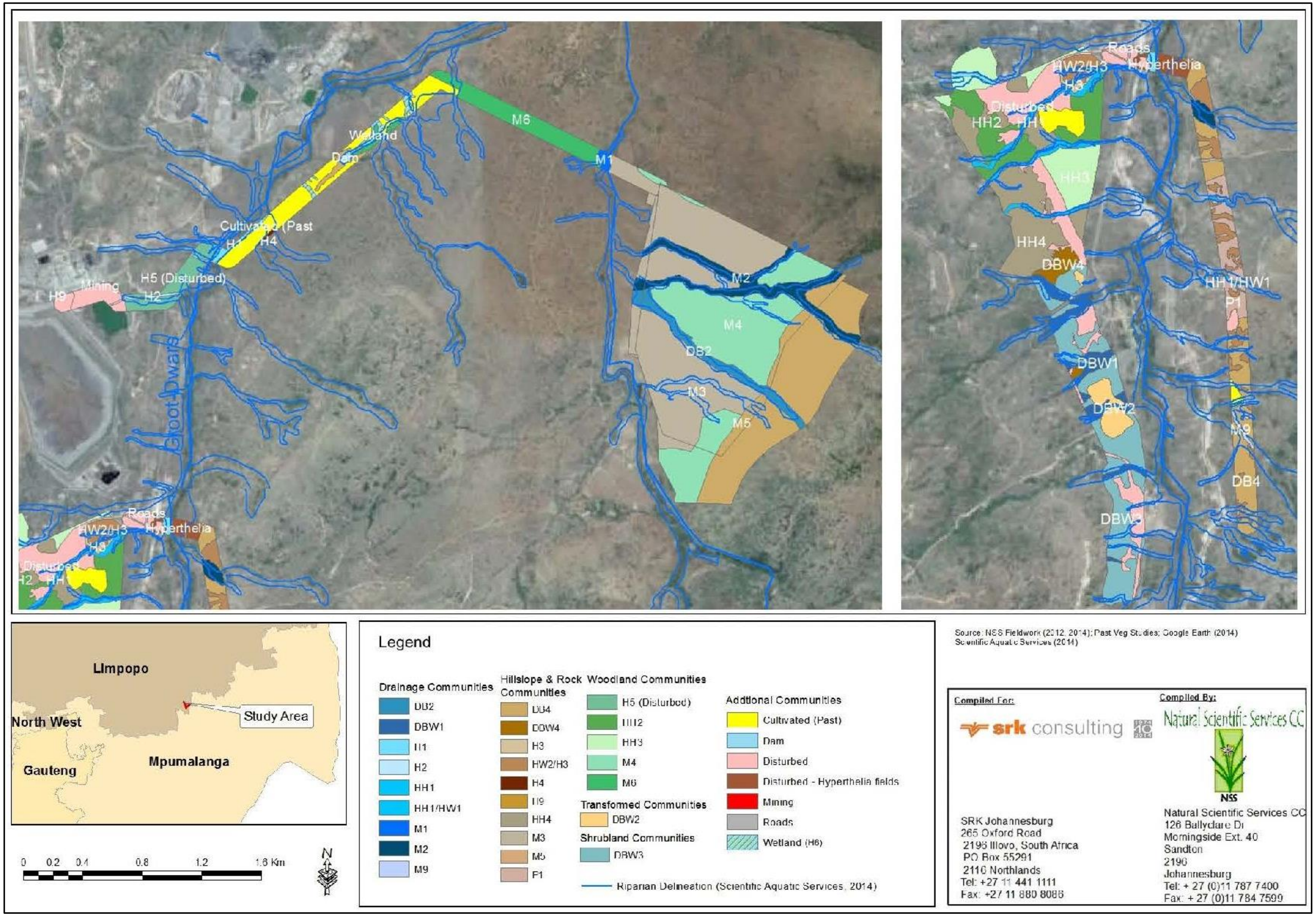


Figure 6-3: Vegetation communities and sub-communities within the Der Brochen area (NSS, 2014)

6.8.3 Conservation Important Species

The Threatened Plant Species Programme (TSP) has revised all threatened plant species assessments made by Hilton –Taylor (1996), using IUCN Red Listing Criteria modified from Davies et al (1986). The IUCN is the best known Red Listing Criteria and it is intended to an easily understood system. The Red List of South African Plants indicates that there are almost 80 species in Limpopo that are Endangered, Vulnerable or Near Threatened.

According to the Plants of Southern Africa (POSA) website (data extracted June 2012 and updated May 2014), the TSP interim Red Data list of South African plant taxa shows that within the Der Brochen project area there are potentially two Endangered species, seven Near Threatened and Ten Vulnerable species. Three of these listed species have been recorded in the study area by past vegetation studies, or the most recent one undertaken in April by NSS. These species are listed in Table 6-4.

Table 6-4: National Floral Species Status Listings (NSS, 2014)

Species	Common name	Plant type	Status	Habitat
Jamesbrittenia macrantha (Codd) Hilliard	Sutera macrantha Codd	Forb	NT	Grassy slopes with other scattered shrubs, restricted to norite.
Lydenburgia cassinoides N.Robson	Sekhukhuni Bushman's Tea	Tree	NT	Exposed norite bedrock and dolomite.(dolomite not found on Der Brochen)
Searsia sekhukhuniensis (Moffett) Moffett	Rhus sekhukhuniensis Moffett	Tree	Rare	Rocky hillsides in bushveld, on pyroxenitic substrates of the eastern rim of Bushveld Complex.

As the Der Brochen area was positioned in Mpumalanga before the change to Limpopo Province, the Mpumalanga Tourism and Parks Agency (MTPA) did have a fair amount of data for the farms that the study area falls within. MTPA furthermore assigned a provincial status to these species. Two species have been identified as shown in Table 6-5.

Table 6-5: Conservation species recorded by MTPA for the Der Brochen farm areas

Scientific Name	Farms	RSA	MTPA
Jamesbrittenia macrantha	Thorncliffe 374 KT	NT	NT
Searsia sekhukhuniensis	Thorncliffe 374 KT; Der Brochen 7JT	Rare	Rare

NT – Near Threatened

6.8.4 Medicinal/Culturally significant plant species

Almost 30% of the species that could be identified within the Der Brochen project area contained a more common form of medicinal or cultural use. These species are listed below in Table 6-6. It is important to note, that traditional plant use in the “pharmacopoeia” of rural areas and its economic value, although difficult to estimate, is significant and entirely dependent on natural biodiversity. Many plants used in traditional medicine are slow-growing and, once lost, are unlikely to return to an area. Their presence depends on sustainable harvesting as well as on the maintenance of vegetation condition. A majority of the medicinal plants are indigenous and found within the relatively “pristine” areas.

Table 6-6: Medicinal plants within the Der Brochen project area

Family	Scientific Name	Common Name
Acanthaceae	*Justicia flava (Vahl) Vahl*	Yellow Justicia
Amaranthaceae	*Amaranthus hybridus L.***	Pigweed
Amaranthaceae	*Achyranthes aspera L. ***	Burrweed
Amaryllidaceae	*Scadoxus af. puniceus (L.) Friis & Nordal*	Blood Lily
Amaryllidaceae	*Crinum af. bulbispermum*	Orange River Lily
Anacardiaceae	*Searsia sekhukhuniensis (Moffett) Moffett*	Mountain Karee
Anacardiaceae	*Searsia pyroides (Burch.) Moffett var. pyroides*	Common Wild Currant
Anacardiaceae	*Searsia lancea (L.f.) F.A.Barkley*	Karee
Anacardiaceae	*Sclerocarya birrea (A.Rich.) Hochst. subsp. Caffra (Sond.) Kokwaro*	Marula
Apocynaceae	*Sarcostemma viminale*	Caustic Vine
Araceae	*Stylochiton natalensis*	Bushveld Arum
Asphodelaceae	*Aloe marlothii A.Berger subsp. marlothii*	Mountain Aloe
Asteraceae	*Helichrysum nudifolium (L.) Less. var. nudifolium*	Hottentot's Tea
Asteraceae	*Aster af.lydenburgensis W.Lippert*	
Asteraceae	*Senecio tamoides DC.*	Canary Creeper
Asteraceae	*Tagetes minuta L. ***	Khaki Weed
Asteraceae	*Hilliardiella oligocephala*	Bicoloured-leaved Vernonia
Asteraceae	*Gerbera piloselloides (L.) Cass.*	Small Yellow Gerbera
Asteraceae	*Bidens pilosa L.***	Black Jack
Asteraceae	*Dicoma schinzii O.Hoffm.*	Stomach Bush
Boraginaceae	*Ehretia rigida (Thunb.) Druce*	Ehretia rigida (Thunb.) Druce
Celastraceae	*Catha edulis (Vahl) Forssk. ex Endl.*	Bushman's Tea
Combretaceae	*Combretum zeyheri Sond.*	Large – fruit Bushwillow
Combretaceae	*Combretum hereroense Schinz*	Russett Bushwillow
Combretaceae	*Combretum apiculatum Sond. subsp. apiculatum*	Hairy Red Bushwillow
Combretaceae	*Combretum molle R.Br. ex G.Don*	Velvet Bushwillow
Combretaceae	*Combretum erythrophyllum (Burch.) Sond*	River Bushwillow
Commelinaceae	*Commelina africana L. var. africana*	Yellow Commelina
Dipsacaceae	*Scabiosa columbaria L.*	Wild Scabiosa
Ebenaceae	*Euclea crispa (Thunb.) Gürke Form A*	Blue Guarri
Ebenaceae	*Diospyros whyteana (Hiern) F.White*	Bladder Nut
Ebenaceae	*Diospyros lycioides Desf. subsp. guerkei (Kuntze) De Winter*	Transvaal Bluebush
Euphorbiaceae	*Croton gratissimus Burch. var. gratissimus*	Lavender Fever Berry
Fabaceae	*Schotia brachypetala Sond.*	Weeping Boer – bean
Fabaceae	*Erythrina lysistemon Hutch.*	Common Coral Tree
Fabaceae	*Acacia caffra (Thunb.) Willd*	Common Hookthorn
Fabaceae	*Elephantorrhiza elephantina (Burch.) Skeels*	Elephant's Root
Fabaceae	*Elephantorrhiza burkei Benth.*	Sumach Bean
Fabaceae	*Mundulea sericea (Willd.) A.Chev. subsp. sericea*	Cork Bush

Family	Scientific Name	Common Name
Fabaceae	*Acacia gerrardii Benth. Subsp. gerrardii var. gerrardii*	Red Thorn
Fabaceae	*Dichrostachys cinerea*	Sickle Bush
Fabaceae	*Peltophorum africanum Sond.*	African Wattle
Fabaceae	*Acacia karroo Hayne*	Sweet – thorn
Fabaceae	*Acacia nigrescens Oliv.*	Knob Thorn
Fabaceae	*Bolusanthus speciosus (Bolus) Harms*	Tree Wisteria
Gentianaceae	*Thunbergia atriplicifolia E.Mey. ex Nees*	Large – flowered Sebaea
Hypoxidaceae	*Hypoxis rigidula Baker var. rigidula*	Silver-leaved Starflower
Kirkiaceae	*Kirkia wilmsii Engl*	Mountain Syringa
Lamiaceae	*Leonotis leonurus (L.) R. Br.*	Wild Dagga
Lamiaceae	*Rotheca louwalbertsii (P.P.J.Herman) P.P.J.Herman and Retief*	Grassland Clerodendrum
Leguminosae	*Sphenostylis angustifolia Sond.*	Wild Sweetpea
Meliaceae	*Melia azedarach L.***	Syringa
Olacaceae	*Ximenia americana L. var. americana*	Small Sourplum
Oleaceae	*Olea europaea L. subsp. africana (Mill.) P.S.*	Green African Olive
Orchidaceae	*Gladiolus dalenii Van Geel subsp. dalenii*	African Gladiolus
Oxalidaceae	*Oxalis corniculata L. ***	Jimson Weed
Papaveraceae	*Argemone mexicana L. ***	Yellow Mexican Poppy
Pedaliaceae	*Ceratotheca triloba (Bernh.) Hook.f.*	Wild Foxglove
Polygonaceae	*Polygala hottentotta C.Presl*	Small Purple Broom
Proteaceae	*Protea caffra Meisn. subsp. caffra*	Common Sugarbush
Ranunculaceae	*Clematis brachiata Thunb.*	Traveller's Joy
Rhamnaceae	*Ziziphus mucronata Willd. subsp. mucronata*	Buffalo Thorn
Rhamnaceae	*Berchemia zeyheri (Sond.) Grubov*	Red Ivory
Rubiaceae	*Vangueria infausta Burch. subsp. infausta*	Wild Medlar
Rubiaceae	*Kohautia caespitosa Schnizl. subsp. Brachyloba (Sond.) D.Mantell*	Tremble Tops
Rutaceae	*Zanthoxylum capense*	Small Knobwood
Sapindaceae	*Pappea capensis Eckl. & Zeyh*	Jacket Plum
Sinopteridaceae	*Pellaea calomelanos (Sw.) Link var. calomelanos*	Hard Fern
Solanaceae	*Solanum panduriforme E.Mey*	Poison Apple
Sterculiaceae	*Dombeya rotundifolia (Hochst.) Planch. var. rotundifolia*	Wild Pear

Family	Scientific Name	Common Name
Tiliaceae	*Grewia flava DC.*	Velvet Raisin Bush
Velloziaceae	*Xerophyta retinervis Baker*	Black Stick Lily
Verbenaceae	*Lantana rugosa Thunb*	Birds' Brandy
Vitaceae	*Rhoicissus tridentata (L.f.) Wild & R.B.Drumm. subsp. cuneifolia (Eckl. & Zeyh.) Urton*	Bushman's Grape

**Alien Species

6.8.5 Floral species supporting Conservation Important faunal species

In terms of Faunal species, there are a number of habitats that support Conservation Importance (CI) species within the Der Brochen region, including the *Vitex* species. This species is the host plant for the CI Cicada species – *Pycnia sylvia*. *Vitex* is most prolific on the slopes and open areas and is a positive indicator of *Pycnia sylvia* as they are found in places where the plant is plentiful (clumpings) but separated by several metres (possibly convinient flying distances).

In terms of the pipeline area and the TSF on Mareesberg, limited *Vitex* species were recorded and therefore this region does not provide a good habitat for the species, however, the relocated powerline route, the Northern and Southern Pits and the Co-Disposal Facility all contain good habitat for this species.

6.8.6 Alien and invasive plant species

Few alien species are present within the Der Brochen project area. Alien species are emerging along the main road routes and the pipeline that traverses the study area, as well as within the borrow pit areas in the proposed southern and northern open cast pits. Species include Category 1 (1b) *Datura, Ricinus* and *Xanthium* species. There is also a limited number of alien species in past disturbed areas such as the old kraals, past livestock feeding areas (dominated by *Cynodon dactylon*) and borrow pits.

Category 1 (1b) species require an alien control programme as per the draft Listing 3 NEM:BA 9 April 2009 Government Gazette. The Category 1 (1b) alien species found in the Der Brochen area can be seen in Table 6-7.

Table 6-7: Category 1 (1b) alien invasive species within Der Brochen project area

Family	Scientific Name	Common Name
Amaranthaceae	*Achyranthes aspera L.*	Burrweed
Asphodelaceae	*Opuntia ficus-indica (L.) Mill.*	Prickly Pear
Asteraceae	*Xanthium strumarium*	Large Cocklebur
Euphorbiaceae	*Ricinus communis L. var. communis*	Castor-oil plant
Fabaceae	*Pueraria lobata (Willd.) Ohwi var. lobata*	Kudu Vine
Papaveraceae	*Argemone ochroleuca L.*	Mexican Poppy
Phytolaccaceae	*Phytolacca octandra L.*	Inkberry
Solanaceae	*Datura ferox L.*	Large Thorn Apple
Solanaceae	*Solanum mauritianum Scop.*	Bugweed

6.8.7 Areas of conservation significance

No international sites of conservation importance (World Heritage or Ramsar sites) were identified in the Der Brochen project area, however, a few Nationally Protected Areas were confirmed. This includes a number of seep areas, wetlands, ephermal drainage lines and riparian habitats of the Groot-Dwars River System. It was identified that the proposed Der Brochen infrastructure will affect all these systems.

National Priority Areas and recognised threatened systems

According to the South African National Biodiversity Institute (SANBI), Der Brochen falls within the National Priority Area (NPA), the North Eastern Escarpment. Nine spatial priority areas for terrestrial biodiversity were identified and these priority areas represent areas with high concentrations of biodiversity features and/or areas where there are few options for meeting biodiversity targets.

Der Brochen also falls directly within the Sekhukhune Mountainlands (MP 9) threatened area and has an ecosystem threat status of Endangered (E). This system is listed under criterion: F: Priority areas for meeting explicit biodiversity targets as defined in a systematic biodiversity plan - Very high irreplaceability and medium threat.

Mining and biodiversity

According to the national Mining and Biodiversity Guideline, Der Brochen project area falls within the Highest Biodiversity Importance and Risk for Mining category. These areas are viewed as necessary to ensure protection of biodiversity, environmental sustainability, and human well-being.

Provincial level

In accordance with the C-Plan 3 data, the majority of the Der Brochen site also falls within Highly Significant Areas on a Mpumalanga Provincial Scale. Highly significant areas are those where biodiversity has been heavily compromised and very few options remain to meet biodiversity targets. Natural vegetation cover in these areas should be maintained or restored. Any significant habitat loss may cause these areas to become irreplaceable.

Local level

Rocky Ridges, Riparian Areas and the Bushveld and Plains were recorded as having a very high Biodiversity Value (BV) due the complexity of species and ecological processes found in these habitats. Areas containing a high rating include Drainage, Riparian and Wetland/Seep areas, which are designated Nationally and Provincially as sensitive and require preservation due to a number of endemic species. The following are also of high significance:

- *Lydenburgia cassinoides - Cussonia transvaalensis* Boulder Thicket Community (HW5);
- *Lydenburgia cassinoides* Woodland Rocky Gorge (M9); and
- *Xerophyta schlechteri - Myrothamnus flabellifolius* Sheetrock Mat Formation (H3;HW2).

6.9 Fauna

The Transvaal Museum undertook a specialist survey of the vertebrate and invertebrate animal life of the Der Brochen area during two surveys in October/November 2001 and February 2002. The specialist study reported on the distribution of reptiles, amphibians, birds and mammals, as well as the diversity of vertebrates and invertebrates, including insects, spiders and scorpions.

No red data species were recorded for birds, reptiles, mammals, amphibians, bats or spiders during the surveys (J9 Environmental Consultant, 2011).

6.9.1 Mammals

The Der Brochen project area is currently managed as a game reserve and as such a variety of mammal species occur. Large mammals that currently occur include Kudu (*Tragelaphus strepsiceros*), Impala (*Aepyceros melampus*), Baboon (*Papio cynocephalus ursinus*) and Leopard (*Panthera pardus*). The study by the Transvaal Museum determined that a variety of mammals can potentially inhabit the study area as a result of the undisturbed conditions that predominate. During the survey, no Red data listed (RDL) species were encountered, although RDL species have a high probability of occurring on the study area. This confirms the importance of the study area in terms of biodiversity and conservation (SAS, 2011).

6.9.2 Birds

Due to the diversity of habitat types present on the study area, a wide variety of avian species occur in the study area, as determined by the Transvaal Museum. Bird species that were identified are, among others, Carmine Bee-eater (*Merops nubicoides*), Grey-headed Bush-Shrike (*Malaconotus blanchoti*) and Speckled Mousebird (*Colius striatus*). No RDL avian species were encountered, but various RDL and sensitive bird species are known to occur in the region, and have a high probability of occurring in the study area. This confirms the importance of the study area in terms of biodiversity and conservation (SAS, 2011).

6.9.3 Reptiles

The study area provides a variety of habitats which are suitable for reptile species. In the study performed by the Transvaal Museum, a wide variety of reptile species were identified such as the Sekhukhune Flat Lizard (*Platysaurus orientalis orientalis*), White Throated Monitor (*Varanus albigularis*) and Flap Neck Chameleon (*Chamaeleo dilepsis*). No RDL reptile species were encountered, but various RDL and sensitive reptile species are known to occur in the region, and have a high probability of occurring on the study area. This confirms the importance of the study area in terms of biodiversity and conservation (SAS, 2011).

6.9.4 Amphibians

The Groot-Dwars River and its tributaries provide perfect habitat for a variety of amphibian species. In the study performed by the Transvaal Museum, a wide variety of amphibian species were identified such as the Common River Frog (*Afrana angolensis*), Bubbling Kassina (*Kassina senegalensis*) and Tremolo Sand Frog (*Tomopterna cryptotis*). No RDL amphibian species were encountered, but due to the undisturbed habitat present on the study area, RDL and sensitive amphibian species have a high probability of occurring on the study area. This confirms the importance of the study area in terms of biodiversity and conservation (SAS, 2011).

6.9.5 Invertebrates

The study area presents a high diversity of habitats which are utilised by invertebrate species. During the survey performed by the Transvaal Museum, an extremely high diversity and abundance of invertebrate species was encountered. The most important of these is the cicada, *Pycna sylvia*, which was recently rediscovered in the Groot-Dwars River Valley. This species was previously thought to be extinct, and further research was undertaken to determine the exact habits, breeding and feeding requirements and distribution of *Pycna sylvia*. This increases the importance of the study area in terms of invertebrate conservation, and increases its biodiversity value (SAS, 2011).

Red Data List invertebrate species

The cicada species *Pycna Sylvia*, previously thought to be extinct within the region for 95 years, was encountered on the Helena farm during the survey conducted by the Transvaal Museum. The documented floral food and shelter source *Vitex obovata* subsp *wilmsii* (Hairy Fingerleaf), was encountered within the assessment site. Observations by Stephen and Stephen (2007) indicated that this species also utilises *Combretum erythrophyllum*, *Faurea saligna*, *Protea caffra* and *Peltophorum africanum* for food and shelter. Stephen and Stephen (2007) also concluded that *Pycna sylvia* is very habitat specific with the majority of individuals found within the eastern and southeastern sloping areas in conjunction with *Vitex obovata* subsp *wilmsii*. Furthermore, water appears to be a determining factor in the distribution of P. sylvia and this is due to the *Vitex obovata* subsp *wilmsii* preference to riverbanks, as well as soil type playing a role in underground larval stages. The study area provides riparian habitat in combination with *Vitex obovata* subsp *wilmsii* in relatively close proximity to sloping areas and therefore the study area provides sustainable habitat for this cicada species. Following the discovery of the cicada, follow-up surveys between 2003 - 2011 were undertaken:

- January 2002: Cicada specialist study *Pycna sylvia* Distant – Transvaal Museum;
- 2003: Monitoring of the cicada *Pycna sylvia* in the Groot-Dwars River valley - Transvaal Museum;
- January 2007: Distribution and conservation recommendations of the endemic cicada *Pycna sylvia* in the Der Brochen Valley - RD Stephen and VC Stephen;
- 10 December 2007: Measurement and analysis of mining noise and analysis of pre-recorded *Pycna sylvia* mating calls – B v Zyl;
- 14 December 2007: Biological assessment of likely effects of mining noise on the behaviour of *Pycna sylvia* at Mototolo Borwa shaft – MH Villet;
- November 2008: Further investigation into and monitoring of the endemic cicada *Pycna sylvia* in the Groot-Dwars River valley - RD Stephen with AP Marias;
- December 2009: Investigation into the abundance of the endemic cicada *Pycna sylvia* in areas designated for mining on the properties Richmond, Helena and Der Brochen - RD Stephen with AP Marias; and
- December 2009: Extralimital search for *Pycna sylvia* in the surrounding Lydenburg area in the Watervals River valley – J v As and M v As (University of the FS).

The cicada's sensitivity to light, noise and pollution was also investigated in these studies. A summary of the findings is as follows:

- *Pycna sylvia* is restricted to the Steelpoort River valley, Groot- and Klein-Dwars river valleys, with no individuals identified in the adjacent Watervals River valley directly east and parallel to the Groot-Dwars River valley;
- *Pycna sylvia* mostly occurs on east- and south-east-facing slopes along riverbeds (within 120 m of riverbanks) and confined to areas where their host plant *Vitex obovata* subsp. *wilmsii* occurs (no Vitex specimens were observed in the Watervals River valley);
- *Pycna sylvia* is not attracted to any light sources, though other cicada species are attracted to light;
- The sound frequency pattern of *Pycna sylvia* differs greatly from that of mining noise; and
- The adult cicadas only emerge and are active for a few weeks from the beginning of November.

A new tiger beetle species *Dromica honesta* was also discovered on Helena farm during the 2001/2002 surveys. The probability that these species occur within the Der Brochen project area and to a lesser extent the Mototolo project area is deemed high (Van Staden and Van der Westhuizen, 2011).

6.10 Surface Water

Information regarding the surface water aspects of the Der Brochen area was obtained from SRK's report *Der Brochen Project Environmental Impact Assessment/Environmental Management Programme Amendment and Alignment: Surface Water Specialist Report, October 2014.* 469113/SW. Refer to Appendix C3 for the full report.

The Der Brochen project area is situated in quaternary catchment B41G approximately 30 km south-southwest of Steelpoort and 35 km west of Mashishing, in the Greater Tubatse Municipality and Greater Sekhukhune District Municipality of the Limpopo Province. The Der Brochen mining area is characterised by rugged topography with prominent north-south trending mountain ranges (the Steenkampsberge) extending across the mining area.

The highest elevation of 2 300 mamsl is located to the extreme south of the project area, and the lowest elevation of 1 035 mamsl is located to the northern drainage path of the Groot-Dwars River.

6.10.1 Water management area

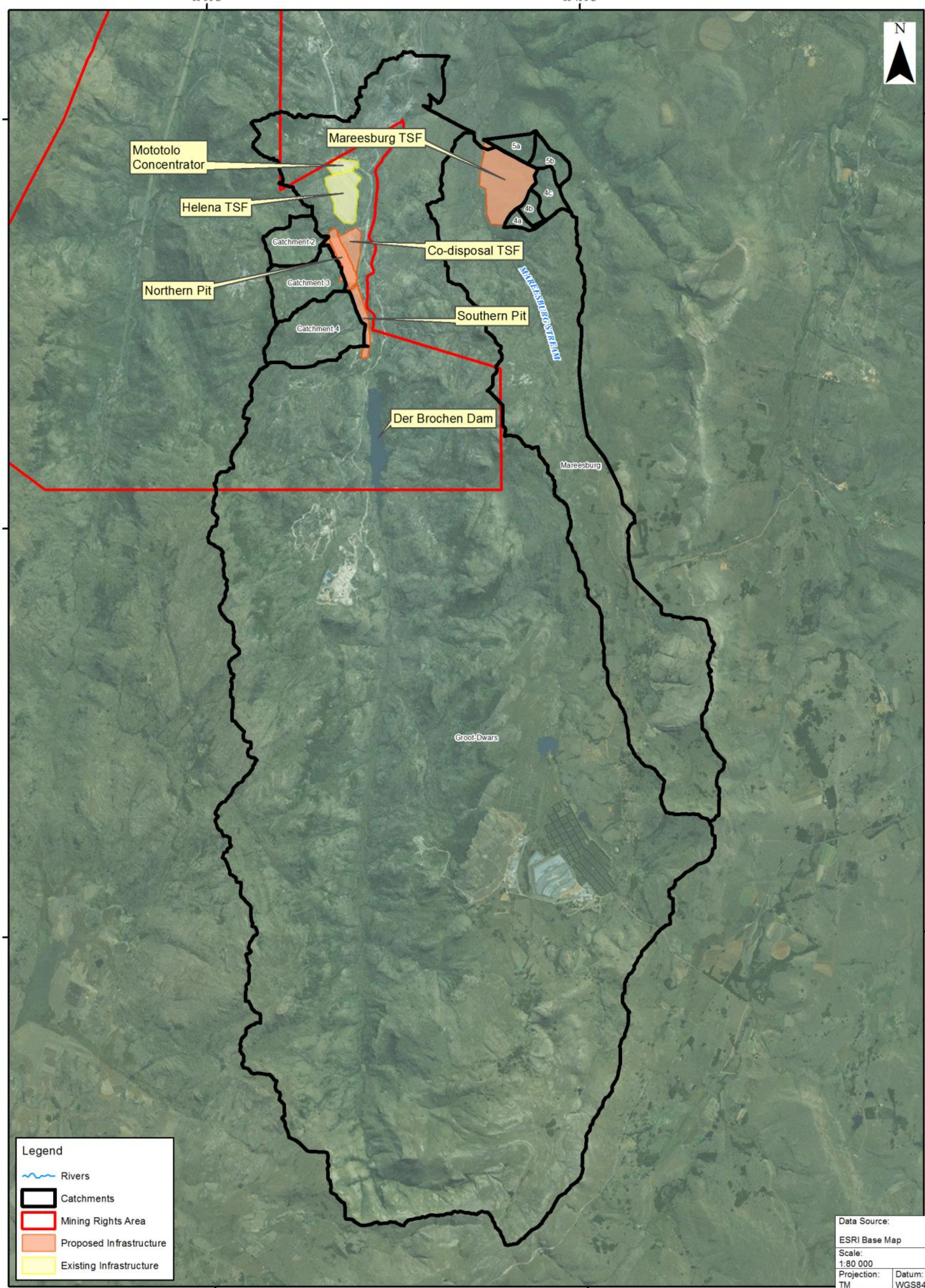
The Der Brochen site falls within the Groot-Dwars River catchment within the B41G quaternary in Water Management Area 4.

Catchment description

The Der Brochen project area is characterised by rugged topography with prominent north-south trending mountain ranges (the Steenkampsberge) extending across the project area. Two deep valleys extend in a north-south direction between the Steenkampsberge mountain ranges and the Groot-Dwars River (in the east) and the Klein-Dwars River (in the west) are contained within these valley floors.

Surface water from the Der Brochen project area flows via a number of unnamed ephemeral tributaries and drainage lines into the perennial Groot-Dwars River. The Der Brochen dam is situated on the Groot-Dwars River upstream of the Der Brochen project area. The main tributary of the Groot-Dwars River in the project area is the ephemeral Mareesburg Stream, which is adjacent to the proposed Mareesburg TSF. The Groot-Dwars River together with the Klein-Dwars River joins the Dwars River on the farm Dwarsrivier 372 KT approximately 10 km north-northwest of Der Brochen. The Dwars River then joins the Tubatse River (formerly Steelpoort River), which in turn feeds into the Olifants River.

The Dwars River catchment in the Der Brochen project area has been divided into five sub-catchments based on the tributaries associated with the open pits and TSFs. The sub-catchments are presented in Figure 6-4 and are discussed in detail in Table 6-8.



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Date: 30/04/2014	Compiled by: ELSA
Project No. 469113	Fig No. 6-4

srk consulting

DER BROCHEN
GROOT DWARS RIVER CATCHMENTS

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6.10.2 Surface water hydrology

The characteristics of the five sub-catchments delineated in the Dwars River catchment in the Der Brochen project area are presented in Table 6-8.

Table 6-8: Catchment characteristics

No.	Catchment description	Area (km2)	Longest watercourse (km)	10-85 slopes (m/m)	Time of concentration (hrs)
-	Groot-Dwars River Catchment	176.5	27.9	0.017	4.1
-	Mareesburg sub-catchment	31.9	17.57	0.04	1.9
1	East of Mareesburg TSF : Catchment 5a	1.48	3.73	0.1002	0.44
	Catchment 5b	1.02	2.58	0.0178	0.37
2	North-west of Northern pit and co-disposal TSF	1.69	2.72	0.08	0.34
3	South-west of Northern pit and co-disposal TSF	2.69	3.08	0.08	0.38
4	West of Southern pit	1.73	2.20	0.10	0.26
5	North of Mareesburg TSF : Catchment 1c	0.56	2.03	0.1843	0.27
	Catchment 1b	0.264	1.39	0.1540	0.18
	Catchment 1a	0.45	1.94	0.1103	0.26

The definitions of the terms described above are listed below:

- 10-85 slopes denote the slope of the catchment from a point, 10% from the end point and 85% of the distance to the furthest point.
- Time of concentration denotes the length of time it takes for a raindrop to travel from the furthest point of the catchment to the outlet point.
- Longest watercourse denotes the longest length of the watercourse from the furthest point of the catchment to the outlet.

Flood peaks and volumes

The flood peaks for the Der Brochen project area and applicable tributaries were determined using the Rational Method or the Alternative Rational Method. The flood peaks for the Groot-Dwars River and delineated sub-catchments for the open pits and proposed TSFs are presented in Table 6-9.

Table 6-9: **Flood peaks for various return periods (m^3/s)**

Catchment name	Return period (years)						
	2	5	10	20	50	100	200
Groot-Dwars River catchment	175	260	333	460	649	909	1189
Mareesburg sub-catchment	40	53	67	84	118	156	204
Proposed Mareesburg TSF							
Catchment 1	6.74	8.94	11.24	14.02	19.80	26.11	34.23
Catchment 5	1.61	2.14	2.69	3.35	4.73	6.24	8.18
Proposed North pit and co-disposal TSF							
Catchment 2	6.79	9.01	11.33	14.12	19.95	26.31	34.49
Catchment 3	10.12	13.43	16.89	21.06	29.75	39.24	51.43
Proposed South pit							
Catchment 4	7.95	10.55	13.27	16.55	23.37	30.83	40.40

Actual monthly flow is measured at two weirs in the Groot-Dwars River situated up-stream of the open pits (HW1) and up-stream of the proposed clean water diversion outlet (HW2). The flow monitoring weirs have been installed to assess impact on flow due to wellfield development for the Der Brochen Project.

Floodlines

The 1:50 and 1:100 year natural floodlines were previously determined for the Groot and Klein Dwars rivers but not for the Mareesburg Stream, the main tributary of the Groot-Dwars River in the Der Brochen project area.

The floodlines are presented in Figure 6-5 and indicate the following:

- The proposed Mareesburg TSF will be located outside of the 1:50 and 1:100 year floodline. There are, however, minor drainage lines within the TSF area that drain to the Mareesburg Stream but these will be diverted around the TSF to the Mareesburg Stream;
- The south eastern section of Southern Pit falls within the 1:50 and 1:100 year floodline and 100 m distance from the watercourse edge and should not be developed in this area without taking precautions to prevent flooding of the pit, such as flood protection berms. The greater of the 1:100 year floodline and 100 m boundary constitutes the riparian zone;
- The Northern Pit and co-disposal TSF fall outside the floodlines; and
- There are minor drainage lines within the open pit and co-disposal TSF areas that drain to the Groot-Dwars River, however, these will be diverted around the infrastructure to the Groot-Dwars River.

Following detailed design of potential crossings (pipeline and roads) the floodlines for the post-development situation should be updated. This has particular relevance to the Southern pit area, which currently falls within the natural (pre-development) floodlines.

Figure 6-5: Floodlines and monitoring points for the affected river sections in the Der Brochen project area

Mean Annual Runoff (MAR)

Catchment areas and the mean annual runoff (MAR) for the Dwars River and catchments 1-5 are presented in Table 6-10. The proposed open pit mining and TSF options will result in changes to the MAR. The stormwater flowing into the pit and off the TSF will be contained in pollution control dams rather than allowed to flow downstream thus decreasing MAR. Water from upstream of the TSF and open pits will be diverted around the infrastructure to ensure it remains clean and continues to contribute to the catchment.

The reduction in MAR included in Table 6-10 was estimated based on the runoff calculations form the water balance.

Table 6-10: Natural mean annual runoff (MAR) (from WR90, Midgley, Pitman and Middleton, 1994) and loss of MAR due to dirty water containment

Catchment	Area (km^2)	MAR (mill m^3)	Infrastructure area (km^2)	Loss of MAR (%)
Groot-Dwars River catchment: existing infrastructure	176.5	11.6	0.80	0.45
Mareesburg catchment	31.9	2.1	0.65	2.0
Groot-Dwars River catchment including Mareesburg tributary: proposed infrastructure	176.5	11.6	0.81*	0.46
Groot-Dwars River catchment: cumulative loss of MAR	176.5	11.6	1.61	0.91

*Area considers the larger Mareesburg TSF and not the alternative co-disposal TSF so loss of MAR is the maximum anticipated.

Loss of MAR to the Groot-Dwars River catchment due to containment of dirty water at the existing concentrator and Helena TSF is considered insignificant at 0.45%. The proposed infrastructure will result in a loss of an additional 0.46% of MAR resulting in a cumulative loss of MAR of 0.91%, which is still considered insignificant at less than 1% of the Groot-Dwars River catchment MAR.

6.10.3 Surface water quality

Monthly surface water quality monitoring is undertaken in the Der Brochen project area. The monitoring point locations are presented in Figure 6-5 and Table 6-10 and quality monitoring data based on the annual mean for 2012 and 2013[1] are presented in Table 6-12. The current upstream monitoring point (Groot-Dwars 2) is also upstream of the open pits at the upstream flow monitoring weir HW1.

The general water quality profile in the site area is good with the water suited for all uses if compared against the guidelines of the Department of Water Affairs and Forestry (1996). The mean values for the monitoring points in Table 6-11 indicate that the Groot-Dwars River water quality in the vicinity of the Der Brochen project area is generally well within the Water Use License (WUL) water quality limits and the South African National Standard for drinking water (SANS241:2011) with a few exceptions to the WUL limits noted in in Table 6-12. Elevated calcium and magnesium are considered due to the natural geology.

Total Dissolved Solids (TDS), as a general indicator of overall water quality, has been assessed over the long term (May 2009 – January 2014) for the existing operations. The long term trend is decreasing both up- and downstream of the existing Mototolo Concentrator and Helena TSF with the decrease more pronounced upstream of the operations. The TDS trend is presented in Figure 6-6.

[1] Annual data for the Groot-Dwars and M1 monitoring points is up to October for 2013.

Table 6-11: Surface water monitoring points (natural watercourse)

Site Name	X co-ord	Y co-ord	Site description
Dwars upstream	30.11963	-25.02360	Surface water
Dwars downstream	30.12122	-25.01064	Surface water
G_Drs2	30.12057	-25.04964	Groot-Dwars upstream at weir HW1 and below the Der Brochen Dam
G_Drs3	30.13244	-24.99895	Downstream of Helena and Mareesburg before the confluence of the Groot-Dwars River and the Mareesburg stream
G_Drs4	30.13767	-24.96257	Groot-Dwars downstream of confluence with the Mareesburg stream
G_Drs5	30.12488	-25.00608	Groot-Dwars upstream of G-Drs3
M1	30.14362	-24.99450	Mareesburg Stream before the confluence with the Groot-Dwars River
K_Drs1	30.07225	-25.01235	Upstream of the mining activities on the farm Richmond (border of the farm Richmond and St George)
K_Drs2	30.08122	-24.98573	Downstream of the farm Richmond (border with the farm Dwars River - upstream of the Inyoni Dam (T1))
Dwars upstream	30.11963	-25.02360	Upstream of Mototolo Concentrator
Dwars downstream	30.12122	-25.01064	Downstream of Mototolo Concentrator

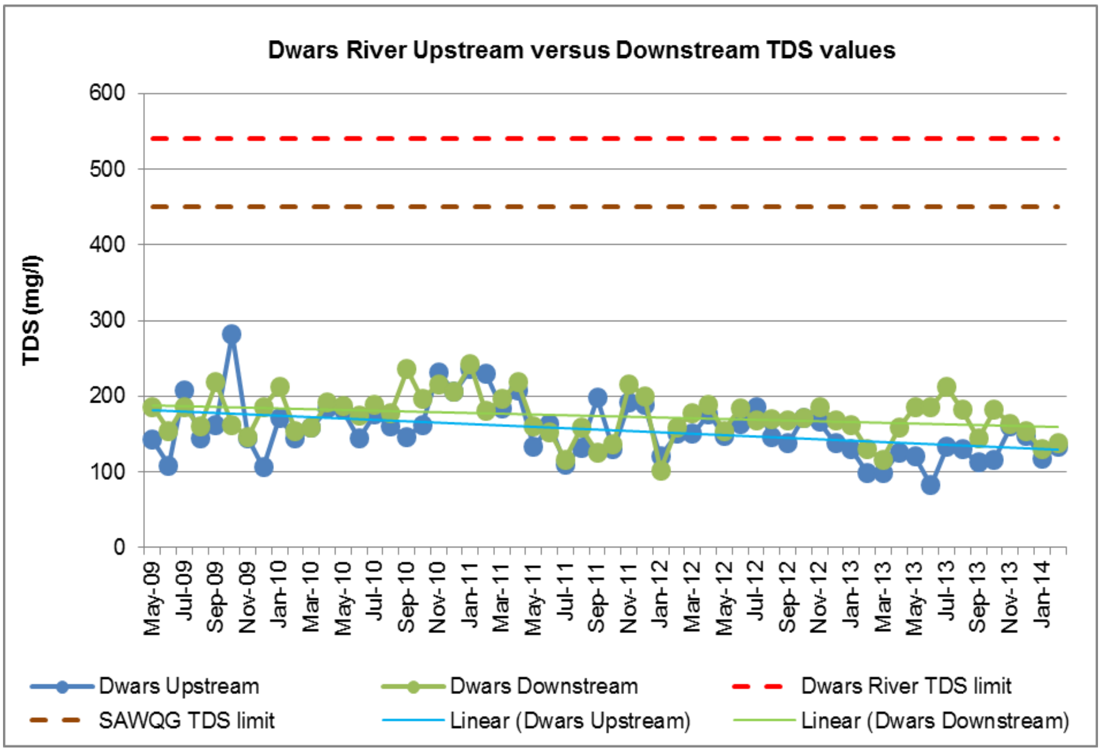

Figure 6-6: Long term trend for TDS up and downstream of current activities (Mototolo Concentrator)

Table 6-12: Surface water quality for the Der Brochen project area: annual mean

Variable (mg/l unless specified)	WUL Limit	SANS 241: 2011	Groot-Dwars River 2 (upstream)		Groot-Dwars River 3 (before Mareesburg confluence)		Groot-Dwars River 4 (downstream of site)		Groot-Dwars River 5 (upstream of 3)		Mareesburg tributary of Great Dwars River M1		Groot-Dwars upstream Mototolo concentrator		Groot-Dwars downstream Mototolo concentrator	
			2012	**2013**	**2012**	**2013**	**2012**	**2013**	**2012**	**2013**	**2012**	**2013**	**2012**	**2013**	**2012**	**2013**
pH Value @ 20°C	5-9.5	5.0-9.7	8	7.9	8.1	8	8.1	8	8.1	8.2	8.2	8.3	8.0	8.1	8.1	8.1
Conductivity mS/m @ 25°C		170	19.7	19.6	29.8	29.9	30.6	31.7	28.1	26.6	32.7	40.9	22.8	21.5	25.6	25.5
Total Dissolved Solids	520	1 200	129	121	200	199	198	207	188	180	221	254	155	121	166	165
Calcium, Ca	25		19	17.8	26.1	27.0	26.3	27.2	26.5	24.9	24.9	29.5	22.6	19.7	25.7	23.6
Magnesium, Mg	25		11.8	11.2	16.2	16	19.2	18.6	16.4	13.6	25.7	33.3	14.1	12.6	15.2	14
Sodium, Na	9	200	5.3	5.5	8.2	7.8	8.7	7.9	8.8	7.3	7.5	8.2	7.7	6.3	8.1	7.1
Potassium, K	46		0.54	0.65	1.9	0.69	0.82	0.7	1	0.51	0.51	0.50	0.90	0.70	1.1	0.69
Total Alkalinity as $CaCO_3$			96.3	89.7	125	109	138	125	123	103	171	206	117	98.8	124	105
Chloride, Cl	62	300	2.5	2.5	6.2	6.4	6.2	6.3	6.3	6.5	4.6	5.5	4.1	3.3	5.6	5.5
Sulfate, SO_4	70	500	6.4	3.6	17	15.9	14	15.8	17.3	16.3	10.4	8.9	10.9	5.5	15.9	13.5
Nitrate, NO_3			2.4	1.6	8.6	17.4	6.0	12	3.7	3.9	2.6	1.6	2.0	1.7	3.1	2.0
Nitrate as N	6	11	0.53	0.37	1.9	4.0	1.3	2.7	0.81	0.9	1.2	0.4	0.5	0.4	0.75	0.45
Fluoride, F		1.5	0.12	0.22	0.13	0.3	0.13	0.20	0.13	0.2	0.15	0.3	0.11	0.20	0.10	0.24
Chemical Oxygen Demand			12.9	11.6	15.8	12.0	15.4	13.9	78.1	18.3	61.5	14.9				
Dissolved Oxygen, O_2			7.3	7.1	7.0	7.0	7.1	6.9	7.0	7.2	7.1	7.1				
Free and Saline Ammonia as NH_4		1.5 (as N) 1.9 (as NH_4)	0.10	0.43	0.65	1.8	0.68	1.2	0.30	0.19	0.10	0.70		0.05		0.05
Suspended Solids			12.4	14.0	25.1	13.3	19.1	32.8	16.1	18.0	8.8	7.0				

Shaded: exceeds WUL Bold: exceeds SANS241:2011 Bdl: Below detection limit

6.10.4 Surface water uses

Surface water in the Der Brochen project area supports a wide diversity of sensitive aquatic species and is currently only utilised for game and limited cattle farming. Communities on the neighbouring farms utilise surface water for domestic purposes, but borehole water is also used for potable domestic use. Downstream of the proposed Der Brochen activities, the Leshaba family utilises the Groot-Dwars River for domestic purposes.

It is currently not foreseen that surface water resources will be exploited for proposed mining activities on Der Brochen.

6.11 Groundwater

Information regarding the groundwater regime around the existing Helena TSF was obtained from the SRK report: *Der Brochen/Mototolo Joint Venture Integrated Water and Waste Management Plan, August 2012*, as well as the new groundwater study undertaken for the Der Brochen EMP Alignment and Amendment project by Delta H during January – June 2014 (*Der Brochen Project – Groundwater Investigation and Model Report*, Project No. Delh.2013.027-01). The Delta H report is available in Appendix C4

6.11.1 Local groundwater overview

Primary aquifers are present in locally distributed unconsolidated alluvial sediment deposits along the lower reaches of the Klein-Dwars River, Groot-Dwars River and Mareesburg stream. Alluvial sediment development in the Groot-Dwars valley consists of mixed boulders, cobbles, gravel and sand. In general, the thickness is less than 6 m due to recent active channel incision and erosion, although remnant pockets of sediment may exceed this. Lateral distribution of the alluvial sediment in the Groot-Dwars River is restricted to the immediate banks of the current active channel (SRK, 2012).

These aquifers provide groundwater storage and recharge to the underlying secondary weathered bedrock aquifers with which they are in hydraulic continuity, as well as interacting and contributing to the baseflow of the main rivers. Due to their limited size and/or probable low transmissivity and connectivity to the river baseflow, the primary aquifers are not considered suitable groundwater production targets (SRK, 2012).

Due to their generally limited distribution in the Groot-Dwars River valley these aquifers have limited extraction potential. They do interact with, and provide a baseflow contribution to the main rivers of the catchment. They are classified as Minor Aquifer Systems (SRK, 2012).

In general, the absolute groundwater levels (metres above sea level - masl) show a positive linear relationship with relief elevation within the catchments. A transverse hydraulic gradient is present across the sides of the main valleys and a longitudinal hydraulic gradient down the centre of each valley. The hydraulic gradient is 0.0075 and closely follows the gradient of the valley. Locally, this relationship between the depth to groundwater and relief may be less clear due to abrupt changes in relief, particularly in the middle and upper sections of the valleys (SRK, 2012).

6.11.2 Hydrocencus

A total of 34 boreholes were visited during the hydrocensus on the 17 and 18 March 2014, focusing mainly on the boreholes within close proximity of the proposed mine infrastructure (Delta H, 2014). Refer to Figure 6-7.

Groundwater use within the Der Brochen mining right area limited to potable water supply purposes to the offices, manager's houses and the top RPM guest house. The Der Brochen drinking water is monitored monthly and forms part of the Quarterly Monitoring programme by GCS on behalf of RPM. All other potable and process water is currently obtained from the Lebalelo Water User Association via a pipeline for the Mototolo JV (Delta H, 2014).

Due to the expansion of the mining industry in the catchment, it can be assumed that groundwater use for domestic and livestock farming has decreased and is limited to the few remaining local inhabitants, guesthouses and lodges (i.e. Didingwe River Lodge). Furthermore, numerous boreholes are un-equipped and were drilled solely to determine aquifer hydraulics as part of EIA investigations and/or monitoring programmes, i.e. not intended for water use (Delta H, 2014).

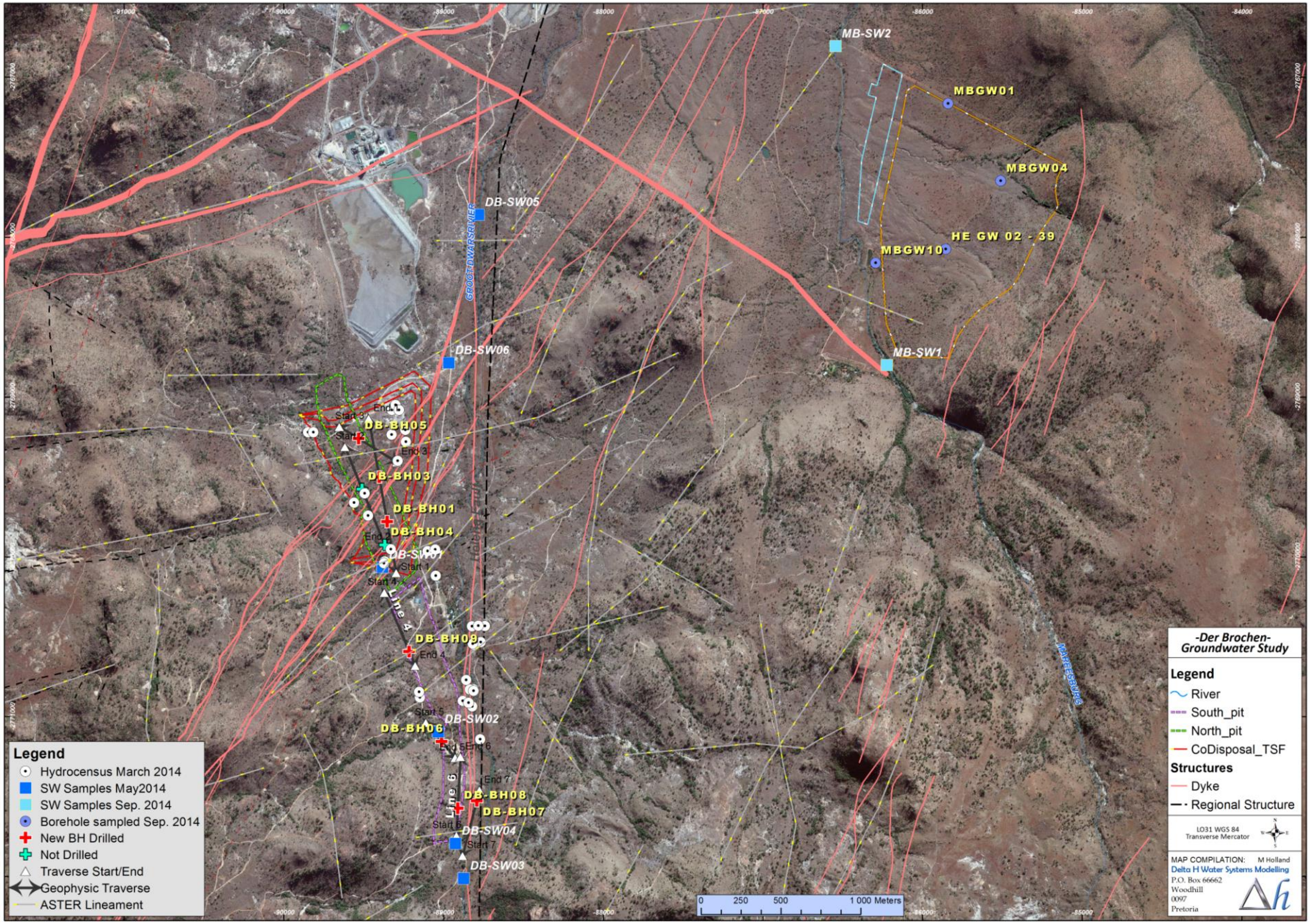

Figure 6-7: Borehole information for the Der Brochen project (Delta H, 2014)

6.11.3 Groundwater quality

For the purposes of the assessment the following standards were considered and the exceedances of the highest threshold for each element highlighted in the result tables:

- International Finance Corporation (IFC) Guidelines for Mining Effluents (IFC, 2007);
- World Health Organisation (WHO) Guidelines for drinking-water quality (WHO, 2011);
- SANS 241-1 Standards for drinking water quality (SANS, 2011); and
- Water Use Licence (WUL) for Rustenburg Platinum Mines Limited: Mototolo Joint Venture, issued on 11 April 2011 (Licence no. 24072959).

Note that the comparison to drinking water standards and guidelines does not suggest that drainage from the mine site will be used for drinking purposes. While the drinking water standards are for obvious reasons very stringent, the less stringent IFC effluent guidelines are applicable for any site run-off and treated effluents to surface waters and should be achieved, without dilution, at least 95 % of the time that the plant or unit is operating as well as post closure. Site-specific discharge levels may be established based on the availability and conditions of publicly operated treatment systems or on the receiving water use classification (Delta H, 2014).

Der Brochen samples

A gradual increase in the mineralisation of the Groot-Dwars River surface water samples along its flow path in the project area is evident in Table 6-13. The total dissolved solids content increases from 100 mg/l for sample DB SW03 (upstream of the Der Brochen area and Mototolo operations) to 130 mg/l downstream of the project area (sample DB SW05). Major contributors to the increase is the (generally) higher mineralised groundwater baseflow towards the river as well as seepages from the Helena TSF into surface drainages (sample DB-SW06), which ultimately report to the Groot-Dwars River. While the surface TSF seepage sample is highly mineralised, (TDS of 1156 mg/l), the low seepage rate results in a low mass flux and hence limited impact on the Groot-Dwars River. Except for the highly mineralised DB-SW06 seepage sample, which shows an impacted Calcium-Magnesium-Sulphate watertype exceeding the WUL limits for several elements, all other surface water samples are classified as fresh Calcium-Magnesium-Bicarbonate watertypes, well within the WUL and other limits.

Similarly, as expected for shallower groundwater samples in the Bushveld Complex, most groundwater samples show generally a Calcium-Magnesium-Bicarbonate watertype. Exceptions are:

- Sample DB-BH06, which is classified as a Chloride-Sulphate type, and
- Sample DB-BH9 and Hex100, a Sodium-Chloride Bicarbonate type and a Sodium-Bicarbonate type, respectively.

It is obvious from Table 6-13 that numerous analysed constituents exceed the current, although very low Water Use Licence (WUL 2011) limits. The highly elevated selenium concentration observed in sample DB BH09 (0.094 mg/l) and the aluminium concentration of sample HE27 (1.21 mg/l) are of concern due to potential health implications and should be investigated further if confirmed in future sampling exercises (and not simple outliers due to analytical or sample preparation errors).

The exceedances of the WUL limits for major elements like calcium and chloride and minor or trace elements like nitrate, iron and manganese are on the other hand not considered a human health risk as evident in the higher South African Drinking Water limits. They are in fact mostly within the range of natural concentrations observed within the eastern limb of the BC and/or often a result of weathering reactions in the soil or shallow groundwater zone. A review of the WUL limits is therefore suggested. Similarly, the elevated turbidity of the groundwater samples in simply indicative of the absence of a gravel filter pack in the monitoring boreholes (as commonly used for potable water supply boreholes) and the analysis of unfiltered samples. They are therefore of no further concern for the groundwater samples.

Beyond the exceedances discussed above, the hydrocensus established a rather pristine groundwater quality baseline for the open pit and Co-disposal facility, against which potential future impacts will have to be evaluated.

Table 6-13: Groundwater quality results in the Der Brochen area (Delta H, 2014)

Parameter	SANS 241-1 (2011)	WUL (2011)	IFC (2007)	WHO (2011)	HE GW 56	HE GW 02-25	HE GW 02-28	HE GW 71	HE 7B	HEX 100	HE 27	HE GW 02-21	DB SW 01	DB SW 02	DB SW 03	DB SW 04	DB SW 05	DB SW 06	DB BH1	DB BH2	DB BH5	DB BH6	DB BH7	DB BH8	DB BH9
Lab ID					1397	1398	1399	1400	1401	1402	1403	1404	5997	5998	5999	6000	6001	6002	7422	7423	7424	7425	7426	7427	7428
% Balancing					99.6	95.4	96.1	93.5	96	97.4	96.1	98.7	98.5	99.8	95.7	97.6	99.2	98	98.8	98.2	98.4	96.3	98.6	99.7	94.5
pH Value at 25° C	5 - 9.7	6.5 - 9.5	6 - 9		7.8	7.9	7.9	7.9	8	8.1	7.9	7.9	8.3	8.2	8.3	8.1	8.2	8	7.5	7.4	7.4	8.4	7.7	7.6	8
EC mS/m @ 25°C	170	59.2			56.4	26.7	67.4	59.5	49.5	31.5	66.3	53.8	53.9	56.5	14.3	42.9	19.4	151	77.7	74.4	75.2	38.3	48.3	54	32.2
Total Dissolved Solids	1200	780			354	180	400	384	330	174	446	336	342	392	100	262	130	1156	538	498	498	250	300	364	208
Turbidity in N.T.U	5			5	85	6.9	401	1.9	0.6	372	405	763	0.3	0.4	1.6	0.6	2.5	2.2	0.3	0.4	0.1	1	0.5	1	16
Calcium, Ca		68			67	29	57	49	53	25	76	57	41	63	13	41	20	178	95	90	98	24	42	66	22
Magnesium, Mg		45			26	12	37	35	29	9	35	32	39	40	8	27	12	82	36	39	36	4	33	28	5
Sodium, Na	200	59		50	22	3	29	26	11	20	18	16	17	18	4	10	5	37	28	21	20	40	12	15	37
Potassium, K		4			<1.0	2.5	<1.0	<1.0	<1.0	2.4	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.5
Total Alk. as $CaCO_3$					300	104	360	340	280	144	364	304	268	324	68	224	92	252	388	384	380	48	252	276	148
Chloride, Cl	300	25			20	11	29	6	5	20	11	8	9	8	<5	5	5	124	16	16	15	81	7	9	9
Sulfate, SO_4	250/500	90			13	24	<5	22	12	6	36	12	27	26	<5	15	8	438	44	35	42	13	12	20	15
Nitrate as N	11	1		11.29	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.2	<0.2	0.3	3.8	0.3	1	1.7	<0.2	<0.2	0.4	<0.2
Ammonia as NH_4	1.5				<0.2	1.8	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Aluminium, Al	0.3			0.9*	0.120	0.206	0.112	0.13	0.213	0.680	1.21	0.111	<0.100	0.103	0.124	<0.100	0.143	0.183	0.135	0.140	0.131	<0.100	<0.100	0.109	0.278
Chromium, Cr	0.05		0.1 (VI)	0.05	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	0.031	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Copper, Cu	2		0.3	2	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Fluoride, F	1.5	1.25		1.5	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Iron, Fe	0.3 / 2	2.6	2		12	0.098	6.88	1.51	0.130	13	7.13	15	<0.025	<0.025	0.101	<0.025	0.151	0.062	0.055	<0.025	<0.025	<0.025	0.047	0.126	0.152
Manganese, Mn	0.5	0.07		0.4*	0.15	0.397	0.092	<0.025	<0.025	0.501	0.112	0.071	<0.025	<0.025	0.041	<0.025	<0.025	0.030	0.312	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Phosphorus as P					0.03	0.339	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Selenium, Se	0.01			0.04	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.094
Silica, Si					22	12.6	18.9	30	23	7.4	35	28	24	33	10.6	17.4	12.0	30	30	30	30	17.1	22	29	16.1
Strontium, Sr					0.190	0.097	0.209	0.22	0.204	0.101	0.280	0.206	0.180	0.230	0.050	0.105	0.076	0.784	0.331	0.323	0.376	0.062	0.163	0.264	0.139
Vanadium, V	0.2				<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	0.028	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Zinc, Zn	5		0.5		<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	0.025	0.031	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025

Mareesburg samples

Based on the results the surface water samples taken from the Mareesburg Stream are relatively low mineralised with electrical conductivities of around 40 mS/m and are slightly alkaline (pH in the range of 8). Both samples are within the recommended water quality standards for the selected inorganic chemical parameters.

Compared to the Der Brochen samples (of 2014), the groundwater samples shows a stronger magnesium dominance resulting in a Magnesium- Calcium-Bicarbonate watertype. The bicarbonate anion dominance of the samples indicates relatively young or fresh groundwater.

However, sample MBGW-10 shows a trend towards a sodium-chloride type. This particular borehole also showed highly elevated iron concentrations that, at 88 mg/l, exceed all the recommended water quality standards. Elevated iron concentrations were also observed for samples MBGW-01 and MBGW-04. The brown coloration of the water sampled during pumping suggests iron oxidation and probably related to the dissolution of ferrous borehole components (i.e. casing). These samples also showed aluminium concentrations above the recommended water quality standards. The elevated magnesium concentrations can be directly linked to the underlying geology with magnesium and calcium rich pyroxenites, norites and anorthosites.

Beyond the exceedances discussed above, the hydrocensus established a rather pristine groundwater quality baseline for the Mareesburg TSF, against which potential future impacts will have to be evaluated.

Table 6-14: Groundwater quality results in the Mareesburg area (Delta H, 2014)

Parameter	SANS 241-1 (2011)	WUL (2011)	IFC (2007)	WHO (2011)	MB-SW01	MB-SW02	MBGW-01	MBGW-04	MBGW-10	GW-02-39
Lab ID					16040	16041	16042	16043	16044	16045
pH Value at 25^o C	5 - 9.7	6.5 - 9.5	6 - 9		8.3	8.4	7.3	7.5	7.4	7.5
EC mS/m @ 25°C	170	59.2			28.7	47.9	90.5	82.7	86.8	93.1
Total Dissolved Solids	1200	780			198	308	594	532	526	596
Turbidity in N.T.U	5			5	1.9	2.4	55	629	1 354	11
Calcium, Ca		68			23.9	30.5	62.7	44.4	48.3	54.1
Magnesium, Mg		45			14.8	33	55	62	40	70
Sodium, Na	200	59		50	5.2	6.8	18.2	13.4	31.2	13.4
Potassium, K		4			0.15	0.20	0.49	0.26	1.19	0.23
Total Alk. as $CaCO_3$					168	280	520	488	300	548
Chloride, Cl	300	25			5	8	10	8	78	9
Sulfate, SO_4	250/500	90			5	11	44	30	81	37
Nitrate as N	11	1		11.29	<0.2	<0.2	0.2	<0.2	<0.2	0.2
Ammonia as NH_4	1.5				<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Aluminium, Al	0.3			0.9*	0.018	0.017	0.885	1.261	0.337	0.218
Chromium, Cr	0.05		0.1 (VI)	0.05	<0.025	<0.025	<0.025	<0.025	0.030	<0.025
Copper, Cu	2		0.3	2	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Fluoride, F	1.5	1.25		1.5	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Iron, Fe	0.3 / 2	2.6	2		0.162	0.250	7.740	29.401	88.934	0.615
Manganese, Mn	0.5	0.07		0.4*	<0.025	<0.025	0.027	<0.025	0.128	<0.025
Phosphorus as P					<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Selenium, Se	0.01			0.04	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Silica, Si					3.340	4.534	7.335	8.321	6.941	7.298
Strontium, Sr					0.032	0.039	0.085	0.064	0.067	0.069
Vanadium, V	0.2				<0.025	<0.025	<0.025	0.048	0.151	<0.025
Zinc, Zn	5		0.5		<0.025	<0.025	<0.025	<0.025	<0.025	<0.025

Helena TSF samples

Based on the results in Table 6-15 , the local groundwater quality is generally classified as a slightly alkaline (pH in the range of 7.2 to 8.2) Magnesium-Calcium-Bicarbonate water type with average mineralisation (calculated TDS content between 300 to 1000 mg/l). Such water type is typical for groundwater found in the Bushveld Complex and its semi-arid environment. Numerous analysed constituents exceed the current WUL (2011) and South African Drinking water quality (2011) limits in these pollution source monitoring boreholes, which are generally downstream/adjacent of the Helena TSF and RWDs, suggesting an impact on the ambient groundwater quality from these sources when compared to the recent Der Brochen hydrocensus samples (refer to Table 6-13). A concern is the increasing trend in sulfate concentrations observed in MBH3 (adjacent the RWD B) (although the levels remain below the SANS 241-1 drinking water quality limits), while an initially observed increasing trend in MBH1 and MBH2 (adjacent RWD A) appears to have stabilised early in 2012.

Table 6-15: Groundwater quality results in the Helena TSF area

Parameter	**SANS 241-1 (2011)**	**WULA 2011**	**IFC 2007**	**WHO 2011**	**MBH1**	**MBH2**	**MBH3**	**MBH4**	**MBH5**	**MBH6**	**MBH7**	**MBH7 (R)**	**MBH8**	**MBH9**	**MBH10**	**MBH11**
Samples Dates					**May-07 to Jan-2014 (~29 samples, 17 trace)**			**Apr-2011 to Jan-2014 (~12 samples)**		**Jul-2011 to Jan-2014 (~10 samples)**		**Mototolo monitoring expansion May 2014 (1 sample)**				
pH Value @ 20°C	5-9.7	6.5-9.5	6-9		8	8.1	8.2	7.55	7.85	7.5	7.8	7.43	7.72	7.87	7.23	7.79
EC mS/m @ 25°C	170	59.2			146	103	153	150	95.85	146	158.1	89.7	157	152	43.9	112
Total Dissolved Solids	1200	780			944	676	988	1030	627	1104	1114	659	1170	1151	300	772
Calcium, Ca		68			125	101	78	151.5	88	142	126.5	118	129	206	56.1	143
Magnesium, Mg		45			65	34	75	68.5	43	74	65	45.3	46.6	79.8	18.4	61.1
Total Hard. as $CaCO_3$					580	339.5	488	695	305			480	513	843	216	608
Sodium, Na	200	59		50	89	78	138	87.5	41	65	71	22.2	176	36.3	10.7	29.5
Potassium, K		4			1.55	3	2.5	0.54	1.1	0.66	2.15	1.13	6.65	3.63	1.55	2.7
Total Alk. as $CaCO_3$					500	446	503	410	202.5	261	383.5	466	391	471	224	506
Bicarbonate, HCO_3					610	536	605	500	246	318	467.5					
Carbonate, CO_3					7	5	7.5	0	0	0	0					
Chloride, Cl	300	25			121	79	95	111	109.5	99	99	23.7	124	98.2	9.64	49.3
Sulfate, SO_4	500	90			113	17.1	121	228	121	285	250.5	65.5	397	374	16.3	116
Nitrate as N	11	1		11.29	0.15	0.1	0.1	1.05	0.05	10.6	1.2	4.11	0.333	0.518	1.24	1.44
Fluoride, F	1.5	1.25		1.5	0.2	0.2	0.4	0.2	0.15	0.2	0.3	0.201	0.162	0.178	0.186	0.194
Ammonia as NH_4					0.05	0.05	0.05					0.04	2.24	0.236	0.055	0.051
Suspended Solids			50		14	6.5	16									
Iron, Fe	2	2.6	2		0.025	0.025	0.025	0.12	0.16	0.02	0.025	*	*	*	*	*
Manganese, Mn		0.07		0.4	0.485	0.475	0.415	0.05	0.18	0.17	0.097	*	1.12	0.093	*	*
Zinc, Zn	5		0.5		0.0025	0.0025	0.0025					*	*	*	*	*
Lead, Pb	0.01		0.2	0.01	0.005	0.005	0.005					*	*	*	*	*
Cobalt, Co	0.5				0.0005	0.001	0.005					*	*	*	*	*
Copper, Cu	2	0.3			0.003	0.002	0.002					*	*	*	*	*
Chromium, Cr				0.05	0.0015	0.0015	0.0015									
Hexavalent Chromium, Cr	0.1				0.005	0.005	0.005	0.005	0.005	0.005	0.005					
Phosphorus as PO_4					0.07	0.06	0.06					*	0.039	0.055	0.008	0.017

6.11.4 Potential pollution plume emanating from the existing Helena TSF

The calibrated transient groundwater model was used as the basis for the Helena TSF transport model. The Helena TSF (including RWDs) were incorporated into the regional model as recharge boundaries with specified source concentrations starting at the appropriate points in time (deposition started in October 2006).

According to the simulation conducted, the sulfate seepage plumes from the Helena TSF and associated infrastructure extend around 300 m towards the Groot-Dwars River (Figure 6-8). The simulated plume migration is relatively slow due to the prevailing gradients, low aquifer conductivities and dilution (dispersion) of constituents of concern along the flow path below the visualised concentration limits. Based on the predictive model simulations and confirmed by the water quality observed in the Groot-Dwars River no significant loads of constituents of concern emanating from the Helena TSF have reached the Groot-Dwars River yet after almost 8 years of operation (Delta H, 2014).

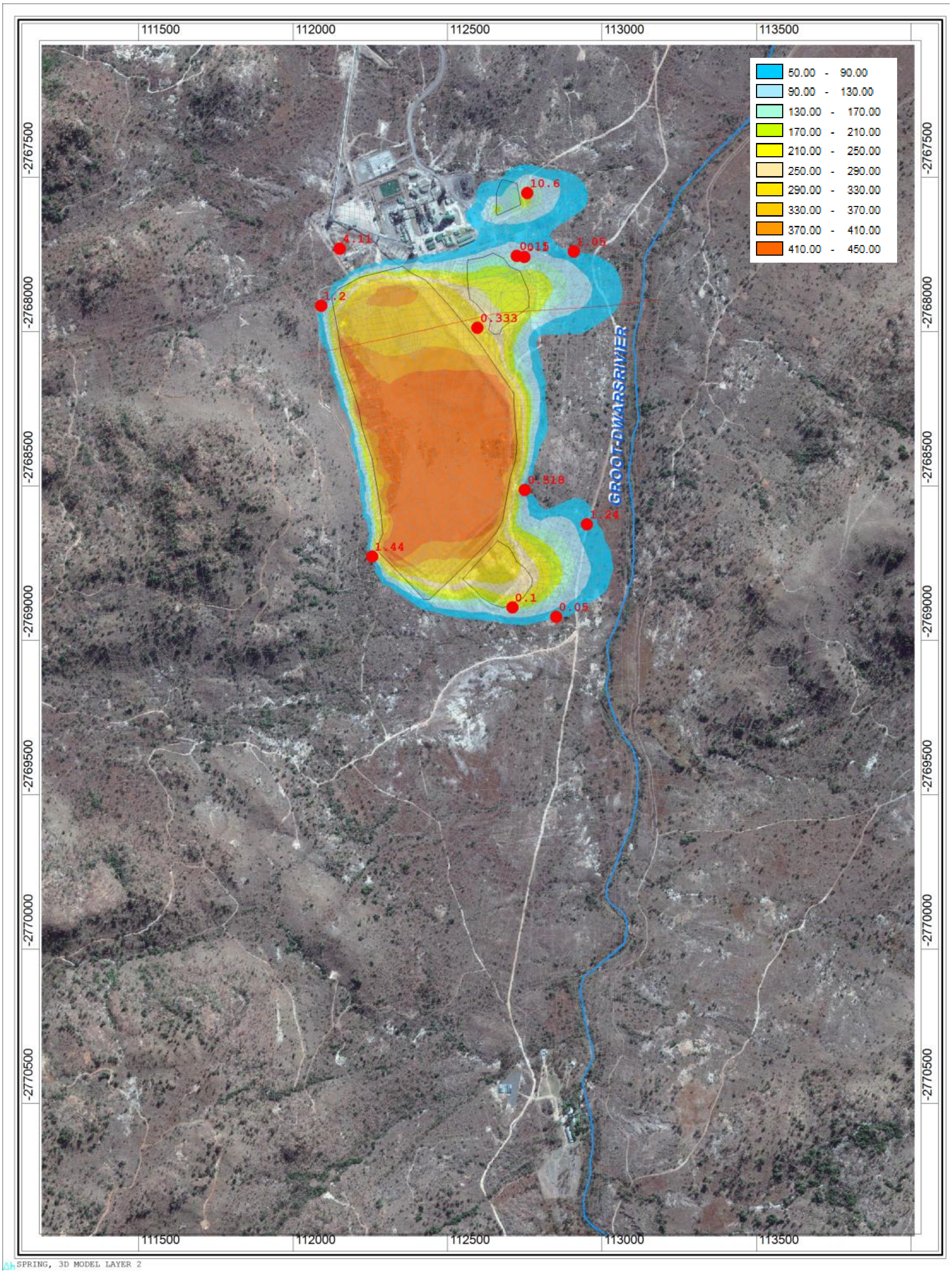

Figure 6-8: Simulated sulfate plume for the Helena TSF 2014 relative to actual median concentrations (mg/l) (median monitoring concentrations indicated in red (Delta H, 2014)

6.12 Wetlands

Information regarding the wetland assessment for the Der Brochen project was obtained from Scientific Aquatic Services' report: *Wetland and Aquatic Ecological assessment for the proposed Anglo Platinum Der Brochen project, Limpopo Province*, *September 2014*. Report No SAS 214035. Refer to Appendix C5 for the full report

6.12.1 Wetland assessment method

The following assessments were undertaken to delineated wetlands and establish the current conditions of these wetlands within the Der Brochen project area.

Classification system for wetlands and other aquatic ecosystems in South Africa: All wetland or riparian features encountered within the study area were assessed using the Classification System for Wetlands and other Aquatic Ecosystems in South Africa. User Manual: Inland Systems, hereafter referred to as the "classification system" (Ollis *et al*, 2009). This assessment classifies wetland and riparian features according to four levels of classification, namely:

- Systems;
- Regional setting;
- Landscape unit; and
- Hydrogeomorphic unit.

Riparian Vegetation Response Assessment Index (VEGRAI): This index is designed for qualitative assessment of the response of riparian vegetation to impacts in such a way that qualitative ratings translate into quantitative and defensible results. Results are defensible because their generation can be traced through an outlined process (a suite of rules that convert assessor estimates into ratings and convert multiple ratings into an Ecological Category.

Index of Habitat Integrity (IHI): The IHI for South African floodplain and channelled valley bottom wetland types were used to assess the Present Ecological State (PES) of the riparian features.

Wetland function assessment: The assessment of the ecosystem services supplied by the identified wetlands was conducted according to the guidelines as described by Kotze *et al* (2009).

Ecological Importance and Sensitivity (EIS): The method used for the EIS determination was adapted from the method as provided by DWA (1999) for floodplains. The method takes into consideration PES scores obtained for WET-Health as well as function and service provision to enable the assessor to determine the most representative EIS category for the wetland feature or group being assessed.

Recommended Ecological Category: The REC was determined based on the results obtained from the PES, reference conditions and EIS of the resource. A wetland may receive the same class for the PES as the REC if the wetland is deemed in good condition, and therefore must stay in good condition.

Wetland and riparian resource delineation: The wetland and riparian zone delineation took place according to the method presented in the final draft of "A practical field procedure for identification and delineation of wetlands and riparian areas" published by the Department of Water Affairs (DWA) in February 2005. The foundation of the method is based on the fact that wetlands and riparian zones have several distinguishing factors including the following:

- The presence of water at or near the ground surface;
- Distinctive hydromorphic soils;
- Vegetation adapted to saturated soils and
- The presence of alluvial soils in stream systems.

By observing the evidence of these features in the form of indicators, wetlands and riparian zones can be delineated and identified.

6.12.2 Wetland system characterisation

Several drainage lines as well as artificial farm dams were identified during the site assessment, in addition to the Groot-Dwars River and Mareesburg stream and their associated tributaries. Although hillslope seepage and bench wetlands were identified within the greater study are, none were identified directly within the areas identified for development of the proposed mining infrastructure, or within 500 m of the proposed activities.

The systems identified were grouped according to their classification, their location in relation to the proposed development and their perceived levels of importance in terms of ecological and socio-economic service provision. These were classified according to the Classification System for Wetlands and other Aquatic Ecosystems in South Africa (Ollis *et al*, 2013). These groupings are shown in Table 6-16.

Two main feature types are present within the study area: drainage lines, some of which are perennial although the majority are seasonal or ephemeral, and riparian features. These features were then assessed to determine importance in terms of function and service provision as well as PES, and EIS of the systems.

Table 6-16: Characterisation of the wetlands and riparian systems within the Der Brochen area

Group	Level 1: System	Levels 2: Regional Setting	Level 3: Landscape unit	Level 4: Hydrogeomorphic Unit
Group 1: Southern drainage lines associated with the main access road (excludes Der Brochen Dam)	**Inland:** An ecosystem that has no existing connection to the ocean but which is inundated or saturated with water, either permanently or periodically.	**Ecoregion:** The study area falls within the Eastern Bankenveld Ecoregion **NFEPA WetVeg Group:** Central Bushveld Group 1	**Slope**: an included stretch of ground that is not part of a valley floor, which is typically located on the side of a mountain, hill or valley.	**River:** a linear landform with clearly discernible bed and banks, which permanently or periodically carries a concentrated flow of water.
Group 2: Central drainage lines associated with the open pit mining infrastructure	**Inland:** An ecosystem that has no existing connection to the ocean but which is inundated or saturated with water, either permanently or periodically.	**Ecoregion:** The study area falls within the Eastern Bankenveld Ecoregion **NFEPA WetVeg Group:** Central Bushveld Group 1	**Slope:** an included stretch of ground that is not part of a valley floor, which is typically located on the side of a mountain, hill or valley.	**River:** a linear landform with clearly discernible bed and banks, which permanently or periodically carries a concentrated flow of water.
Group 3: Drainage lines associated with the Mareesburg TSF	**Inland:** An ecosystem that has no existing connection to the ocean but which is inundated or saturated with water, either permanently or periodically.	**Ecoregion:** The study area falls within the Eastern Bankenveld Ecoregion **NFEPA WetVeg Group:** Central Bushveld Group 1	**Slope:** an included stretch of ground that is not part of a valley floor, which is typically located on the side of a mountain, hill or valley.	**River:** a linear landform with clearly discernible bed and banks, which permanently or periodically carries a concentrated flow of water.
Group 4: Artificial dam located on Mareesburg farm portions, south west of the proposed TSF	**Inland:** An ecosystem that has no existing connection to the ocean but which is inundated or saturated with water, either permanently or periodically.	**Ecoregion:** The study area falls within the Eastern Bankenveld Ecoregion **NFEPA WetVeg Group:** Central Bushveld Group 1	**Slope:** an included stretch of ground that is not part of a valley floor, which is typically located on the side of a mountain, hill or valley.	**Channelled valley-bottom wetland:** a valley-bottom wetland with a river channel running through it.
Group 5: Groot-Dwars River, Mareesburg Stream and their associated tributaries	**Inland:** An ecosystem that has no existing connection to the ocean but which is inundated or saturated with water, either permanently or periodically.	**Ecoregion:** The study area falls within the Eastern Bankenveld Ecoregion **NFEPA WetVeg Group:** Central Bushveld Group 1	**Slope:** an included stretch of ground that is not part of a valley floor, which is typically located on the side of a mountain, hill or valley.	**River:** a linear landform with clearly discernible bed and banks, which permanently or periodically carries a concentrated flow of water.
Group 6: Northern drainage lines associated with the main access road	**Inland:** An ecosystem that has no existing connection to the ocean but which is inundated or saturated with water, either permanently or periodically.	**Ecoregion:** The study area falls within the Eastern Bankenveld Ecoregion **NFEPA WetVeg Group:** Central Bushveld Group 1	**Slope:** an included stretch of ground that is not part of a valley floor, which is typically located on the side of a mountain, hill or valley.	**River:** a linear landform with clearly discernible bed and banks, which permanently or periodically carries a concentrated flow of water.

Riparian Vegetation Response Index (VEGRAI)

The Riparian Vegetation Response Index (VEGRAI) was applied to assess the response of riparian vegetation to impacts within the Groot-Dwars River and Mareesburg Stream. The Groot-Dwars River received a score placing it in a Category C (moderately modified) whilst the Mareesburg Stream was placed in a Category B (largely natural).

Index of Habitat Integrity

The average score calculated for the Dwars River using the Wetland IHI indicates that the feature can be considered to fall within a PES Category C (moderately modified; loss and change of natural habitat and biota have occurred, but the basic ecosystem functions are still predominantly unchanged).

The score calculated for the Mareesburg Stream indicates that this feature falls within a PES Category B. The system has undergone some modifications; basic ecosystem functions remain predominantly intact.

The drainage line feature located in the southern portions of the study area is currently considered to be in a predominantly natural condition; the predominant effect being increased sediment inputs originating from the main access road. The results of the Wetland IHI assessment placed these features in a Category B/C.

Drainage lines situated in the central areas of the study area are still considered to be in a relatively natural state, although they have undergone some modifications as a result of activities related to exploratory drilling. These features calculated a score placing them in a PES Category C in the Wetland IHI assessment.

The drainage line features located on the Mareesburg Farm portions remain in a largely natural, unmodified condition, and according to the score received in the Wetland IHI assessment, can be deemed to be in a PES Category B/C.

The artificial farm dam on the Mareesburg Farm portions, which is in close proximity to the proposed Mareesburg TSF, provides important ecological services, even though it is not a naturally occurring feature. The results of the Wetland IHI place the dam in a PES Category C.

Figure 6-9 shows the PES classification for wetlands found within the Der Brochen project area.

Figure 6-9: Wetland Present Ecological State for the Der Brochen area

Wetland function assessment

The results obtained for the wetland function and service provision assessments conducted on the drainage line and riparian features indicate that all features fall into the Intermediate category, meaning that they are deemed to have moderate importance in terms of ecological and socio-cultural service provision. Overall, the most important ecological services provided by the features are flood attenuation, sediment trapping, erosion control, nutrient and toxicant assimilation, biodiversity maintenance and education and research. The Groot-Dwars River and Mareesburg Stream are also considered to be important in terms of water supply and harvestable resources, particularly within the catchment.

Ecological Importance and Sensitivity Assessment

Results of the EIS assessment conducted on the drainage lines and riparian features indicate that the riverine systems are considered to be very important ecologically, and are extremely sensitive to flow modifications, and received a score placing them in an EIS Category A. The drainage line features, with the exception of those associated with the northern section of the main access road, achieved scores which indicate that they are considered to be ecologically important and sensitive.

The Groot-Dwars River and Mareesburg Stream calculated a score which placed them in an EIS Category A. The drainage lines situated along the northern portion of the main access road are deemed to be an EIS C. Based on these results, it can be deduced that the drainage lines and artificial dam are considered to be moderately sensitive to modifications, and are marginally less ecologically important than the two riparian resources, which are considered ecologically important, and very sensitive to modifications.

Figure 6-10 shows the EIA classification for wetlands found within the Der Brochen project area.

Figure 6-10: Wetland Ecological Importance and Sensitivity for the Der Brochen area

6.13 Aquatic Ecology

Information regarding the aquatic assessment for the Der Brochen project was obtained from Scientific Aquatic Services' report: *Wetland and Aquatic Ecological assessment for the proposed Anglo Platinum Der Brochen project, Limpopo Province*, *September 2014*. Report No SAS 214035. Refer to Appendix C5 for the full report.

The Der Brochen project falls within the Eastern Bankenveld Aquatic Ecoregion and the B41G quaternary catchment. According to the ecological importance classification for the B41G quaternary catchment, the system can be classified as a Sensitive system. The most significant riverine resource within the Der Brochen project area, and within the B41G quaternary catchment, is the Groot-Dwars River. The Mareesburg Stream, a tributary of the Groot-Dwars River, is also considered to be an important riverine resource within the study area.

The National Freshwater Ecosystem Priority Areas (NFEPA) (2011) databases were consulted to define the ecology of the river systems within the Der Brochen project area that may be of ecological importance. Aspects applicable to the Der Brochen project area and surroundings are as follows:

- The Der Brochen project falls within the Olifants Water Management Area (WMA). Each Water Management Area is divided into several SubWater Management Areas (subWMA), where catchment or watershed is defined as a topographically represented area, which is drained by a stream, or river network. The subWMA indicated for the study area is the Steelpoort River;
- The NFEPA database does not map the entire extent of the wetland system found in the study area. Those that are mapped by NFEPA are considered to be artificial. The site assessment revealed numerous non-perennial drainage lines which drain into the Groot-Dwars River, Mareesburg Stream, and mountainous areas within the study area. Several artificial dams were also identified on the Mareesburg farm portions;
- The NFEPA database indicates that there are no RAMSAR wetlands within the study area;
- The NFEPA database indicates that the wetland system within the study area is not within 500m of an IUCN threatened frog point locality, or within 500m of a threatened waterbird point locality; and
- According to the NFEPA database, the aquatic resources within the study area are not considered important on a macro scale for fish migration or breeding habitat; however based on observations made during the biomonitoring programme, the Groot-Dwars River and Mareesburg Stream are important migratory corridors and breeding grounds for a variety of fish species, with specific mention of the confluence of the Groot-Dwars River and Mareesburg Stream.

6.13.1 Aquatic assessment

Six monitoring sites were selected in order to assess the levels of aquatic ecological integrity In the Der Brochen project area. The following criteria were used in identifying suitable sites:

- The site location in relation to the existing infrastructure and activities in the area;
- Consideration was given to the position of the proposed development site in order to assist in defining the PES and any impacts in this area;
- Accessibility with a vehicle in order to allow for the transport of equipment; and
- The site was also selected where there were good habitat conditions with a good level of diversity, suitable for supporting a diverse aquatic community.

The monitoring sites are described in Table 6-17 and shown in Figure 6-5.

Table 6-17: Der Brochen Biomonitoring site description

Site number	Coordinates	Site Description
GD2	25° 05' 12.5''S 30° 07' 29.9''E	Located on the Groot-Dwars River downstream of the Booysendal boundary fence
GD3	25º 02' 26.6'' S 30º 07' 12.8'' E	Located approximately 100 meters downstream of the existing low water crossing of the Groot-Dwars River, which is upstream of the Helena/Der Brochen boundary fence.
GD4	25º 00' 21.6'' S 30º 07' 28.3'' E	Groot-Dwars River downstream of the Mototolo Concentrator but upstream of the Helena mine. Located at a point where the road along the east bank of the river is near to the river downstream of a small waterfall
GD5	24º 59' 26.3'' S 30º 08' 42.5'' E	Located within the Xstrata game farm grounds. The point is approximately 150 meters downstream of the confluence of the unnamed tributary, in which catchment the tailings dam will be placed, with the Groot-Dwars River
T0	25° 1' 19.70''S 30° 8' 44.41''E	Located upstream of the proposed Mareesburg TSF, on the Mareesburg Stream. Located adjacent to a housing facility for the Der Brochen mine management.
T1	24º 59" 35.3 S 30º 08" 37.7 E	Located on the Mareesburg Stream which confluences with the Dwars River just above the GD5 site

Water resources are generally classified according to the degree of modification or level of impairment. The classes used by the South African River Health Program (RHP) are presented in the Table 6-18 and will be used as the basis of classification of the systems in the study area.

Table 6-18: Classification of river health assessment classes in line with the RHP

Class	Description
A	Unmodified, natural.
B	Largely natural, with few modifications.
C	Moderately modified.
D	Largely modified.
E	Seriously modified.
F	Critically modified.

The following assessments were undertaken to establish the current conditions of the river system within the Der Brochen project area.

Visual assessment: A visual assessments of each site was undertaken in to identify visible impacts on the site, with specific reference to impacts from surrounding activities and any effects of activities occurring upstream in the catchment. Natural constraints and function and anthropogenic alterations to the system, were identified.

Physico chemical water quality data: On site testing of biota specific water quality variables took place. Parameters measured include pH, electrical conductivity, dissolved oxygen concentration and temperature.

General habitat integrity: The general habitat integrity of each site was discussed based on the application of the Intermediate Habitat Integrity Assessment (IHIA) for use in rapid and intermediate habitat assessments.

Habitat for aquatic macro-invertebrates: The Invertebrate Habitat Assessment System (IHAS) was applied according to the protocol of McMillan. This index was used to determine specific habitat suitability for aquatic macro-invertebrates, as well as to aid in the interpretation of the results of the South African Scoring System version 5 (SASS5) scores.

Aquatic macro-invertebrates: Aquatic macro-invertebrates were sampled using the qualitative kick sampling method called SASS5 (South African Scoring System version 5). The SASS5 method was designed to incorporate all available biotypes (stones, vegetation, sand-gravel-mud) at a given site and to provide an indication of the integrity of the of the aquatic macro-invertebrate community through recording the presence of various macro-invertebrate families at each site, as well as consideration of abundance of various populations, community diversity and community sensitivity. Each taxon is allocated a score according to its level of tolerance to river health degradation

Aquatic macro-invertebrates: Macro-invertebrate Response Assessment Index (MIRAI): The four major components of a stream system that determine productivity, with particular reference to aquatic organisms, are flow regime, physical habitat structure, water quality and energy inputs. An interplay between these factors (particularly habitat and availability of food sources) result in the discontinuous, patchy distribution pattern of aquatic macro-invertebrate populations. As such, aquatic invertebrates shall respond to habitat changes (i.e. changes in driver conditions).

Fish biota: Habitat Cover Rating (HCR) and Fish Habitat Assessment (FHA): This approach was developed to assess habitats according to different attributes that are surmised to satisfy the habitat requirements of various fish species.

Fish biota: Fish Response Assessment Index (FRAI): The FRAI is based on the premise that “drivers” (environmental conditions) may cause fish stress which shall then manifest as changes in fish species assemblage.

6.13.2 Results of the aquatic assessment

Water quality

The water quality on the Groot-Dwars River at Site GD2 has generally been good throughout the biomonitoring programme, displaying EC levels of below 20mS/m. The water quality at Sites GD3, GD4 and GD5 on the Groot-Dwars River may be considered to be fair, with slightly elevated EC levels in relation to the spatial reference site GD2. This may be as a result of mining activities downstream, however, the geology of the area also leads to elevated amounts of dissolved salts in the system under natural conditions. The TDS values at all sites during all surveys however, fall within the target levels as stipulated in the Olifants River Ecological Water Requirements Assessment (2001) (OREWRA).

Spatially, an increasing trend in EC level is generally observed in a downstream direction on the Groot-Dwars during all of the surveys undertaken since November 2001, serving as an indication that salt concentrations in the system are increasing over time. This may be due to natural geology to an extent; however, the increased mining activity in the area is also likely to be a major contributing factor to the observed salinisation of the Groot-Dwars River system.

The water quality at Sites T0 and T1 on the Mareesburg Stream in March 2014 may be considered to be fair, with slightly elevated EC levels, however, the TDS values at both sites still fall within the target levels of as stipulated in the OREWRA.

Spatially, an increase in EC level is observed in a downstream direction, indicating that there is currently some addition of salts occurring between the sites, which may result in some osmotic stress on the aquatic community likely to be occurring between these points.

The pH value at both sites currently fall within the OREWRA target range in the current assessment and is therefore unlikely to limit the aquatic community at both points at the present time.

The DO level along this section of the Groot-Dwars River and the Mareesburg Stream is adequate and is unlikely to affect the diversity and sensitivity of the aquatic community over time.

General habitat integrity

The general habitat integrity at all sites on the Groot-Dwars River can be regarded as being in an “Unmodified, natural” (Class A) state, although the integrity began decreasing slightly at all sites which is possibly due to flow and water quality modifications and the impacts of upstream and adjacent mining activities.

According to the application of the IHIA index, the general habitat integrity can be regarded as being in an “Unmodified, natural” (Class A) state at Site T0 and in a “Largely natural, with few modifications” (Class B) state at Site T1. The decline in habitat integrity at Site T1 may be related to flow and water quality modifications as well as bank erosion and indigenous vegetation removal.

Habitat for aquatic invertebrates

According to the application of the IHAS index, the habitat structure and diversity at all sites on the Groot-Dwars River were adequate in supporting a diverse and sensitive aquatic macro-invertebrate community during all surveys with the exception of the April 2011 survey during which the habitat integrity at all sites were inadequate, and during the September 2011 survey during which the habitat at Sites GD2 and GD3 were deemed inadequate. This is likely due to impacts as a result of water quality modifications at the sites.

Habitat suitability shows limited variation between the assessment Sites GD2 and GD3 during the majority of the surveys. However, an increasing trend is evident from Sites GD3 to GD4, and a decreasing trend is evident from Site GD4 to Site GD5 generally indicating better habitat suitability at Site GD4 in relation to Sites GD3 and GD5.

The habitat at Site T0 on the Mareesburg Stream is highly suited to supporting a diverse and sensitive aquatic macro-invertebrate community, whereas the habitat structure and diversity at Site T1 is adequate in supporting a diverse and sensitive community. There is therefore a significant variation in habitat suitability for aquatic macro-invertebrates between the two sites under the present conditions and is likely to have a significant influence on the aquatic community composition of the two sites at the present time with a more diverse and sensitive community expected at the upstream Site T0.

Aquatic macro-invertebrates

According to the SASS5 index in November 2012, Site GD2 may be considered to be in a slightly impaired (Class B) state, Sites GD3, GD4 in a largely impaired (Class D) state and Site GD5 in a severely impaired (Class E) state, indicating a decline in the macro-invertebrate community integrity in a downstream direction. The average score per taxa (ASPT) scores at all sites, however, indicate that the sensitivity of the macro-invertebrate communities have generally remained reasonably intact over time and the system may therefore still be considered as being sensitive irrespective of the surrounding impacts. It is therefore deemed essential that every effort be made to maintain the high levels of ecological integrity, community diversity and sensitivity evident in this section of the Groot-Dwars River.

The aquatic macro-invertebrate community may presently be classified as being in a moderately impaired (Class C) state at Sites T0 and T1.

Spatially, the SASS5 and ASPT scores have decreased between Sites T0 and T1 in a downstream direction. These results indicate that there may be a negative impact occurring on the diversity and sensitivity of the macro-invertebrate community at the downstream Site T1, which may be related to the variation in EC level between these points. In addition, some impacts on the habitat of this site may be occurring as a result of erosion and sedimentation in the system.

Macro-invertebrate Response Assessment Index (MIRAI)

According to the MIRAI index, the EC values follow the same trends as that obtained using the SASS EC values, indicating that the SASS5 scores are a true representation of the condition of the system during November 2012. The key drivers of change in the system include water quality and flow, which have an increasing impact in a downstream direction. This is most prominent at the sites downstream of the Der Brochen dam, which may have an effect on the system by altering surface flow cycles and water chemistry.

According to the MIRAI index, Site T0 is in a B state, and Site T1 in a C state, which follow the same trend as that obtained using the SASS5 class classifications. The general decline of macro-invertebrate community integrity in a downstream direction is evident. The key drivers of change include water quality and habitat at Site T0, and water quality, habitat and flow at Site T1.

Habitat cover rating (for fish)

From the results of the Habitat Cover Rating scores for fish, it is evident that slow-shallow conditions are prevalent at Site GD2 followed by fast-shallow and slow-deep conditions. In contrast, fast-shallow conditions dominate at Sites GD3 and GD5 followed by slow-shallow conditions. Fast-shallow and slow shallow conditions are equally evident at Site GD4. The fish expected in the area, with the exception of Site GD2, will therefore be limited to fish with high intolerance values for very slow-flowing water and species with a high intolerance value for deep habitats.

Habitat Cover Rating scores for fish indicate that slow-shallow conditions predominate at Sites T0 and T1 on the Mareesburg Stream, followed by fast-shallow conditions at Site T0 and slow-deep conditions at Site T1. Slow-deep conditions are also present at Site T0, but to a limited extent. The fish expected in the area at the current time will therefore be limited to fish with high intolerance values for very fast-flowing water and species with a high intolerance value for very deep habitats. Limited cover is available at both sites, due to bank erosion.

Fish Response Assessment Index (FRAI)

Results indicate that the fish community integrity at Sites GD2, GD3 and GD4 in November 2012 in a seriously modified state (Class E), and the integrity at Site GD5 is in a seriously to critically modified state (Class E/F).

It is unlikely that the fish community at Site GD2 has been affected by altered water quality at this point. However, some impacts from a loss of stream continuity, due to the downstream migration barriers such as the Der Brochen Dam, as well as the introduction of alien species such as *Micropterus salmoides* (Largemouth Bass), may be occurring. Deteriorations in the water quality at Sites GD3, GD4 and GD5 in terms of salt loading in a downstream direction as well as the effects of the Der Brochen dam upstream are likely to be limiting the diversities and abundances of the fish observed at these points.

Results indicate that the fish community integrity at Sites T0 and T1 is currently in a largely modified state (Class D). The lower fish community diversity at Site T1 may be due to natural variation in distribution patterns, as well as seasonal variation due to fish movement in the system. The lack of fast-flowing water, as well as the limited availability of overhanging vegetation at Site T1 is likely to impact on the diversity of fish at this site.

6.14 Air Quality

Information regarding air quality in the Der Brochen project area was obtained from Airshed's report: *Air Quality Specialist Report for the Der Brochen EMP Alignment and Amendment project, Report No. 13SRK25*, September 2014. Refer to Appendix C6 for the full report.

6.14.1 Surface wind field

The baseline study encompassed the analysis of meteorological data. Local meteorological data (including wind speed, wind direction and temperature) was obtained from MM5[2] data for the period 2008 to 2010.

Calculated MM5 data for the study area for the period 2008-2010 is presented in Figure 6-11. The flow field is dominated by south-easterly winds with a >15% frequency of occurrence. Thermo-topographical induced flow is anticipated to represent an important component in the airflow over the study area with significant differences evident between day-time and night-time wind field characteristics. The slope of the terrain accounts for the increased frequency of occurrence of northerly and north-westerly wind during the day-time and increased south-easterly winds during the nighttime. The differential heating and cooling of the air along a slope typically results in down-slope (katabatic) flow at night, with low-level up-slope (anabatic) airflow occurring during the day (Airshed, 2014).

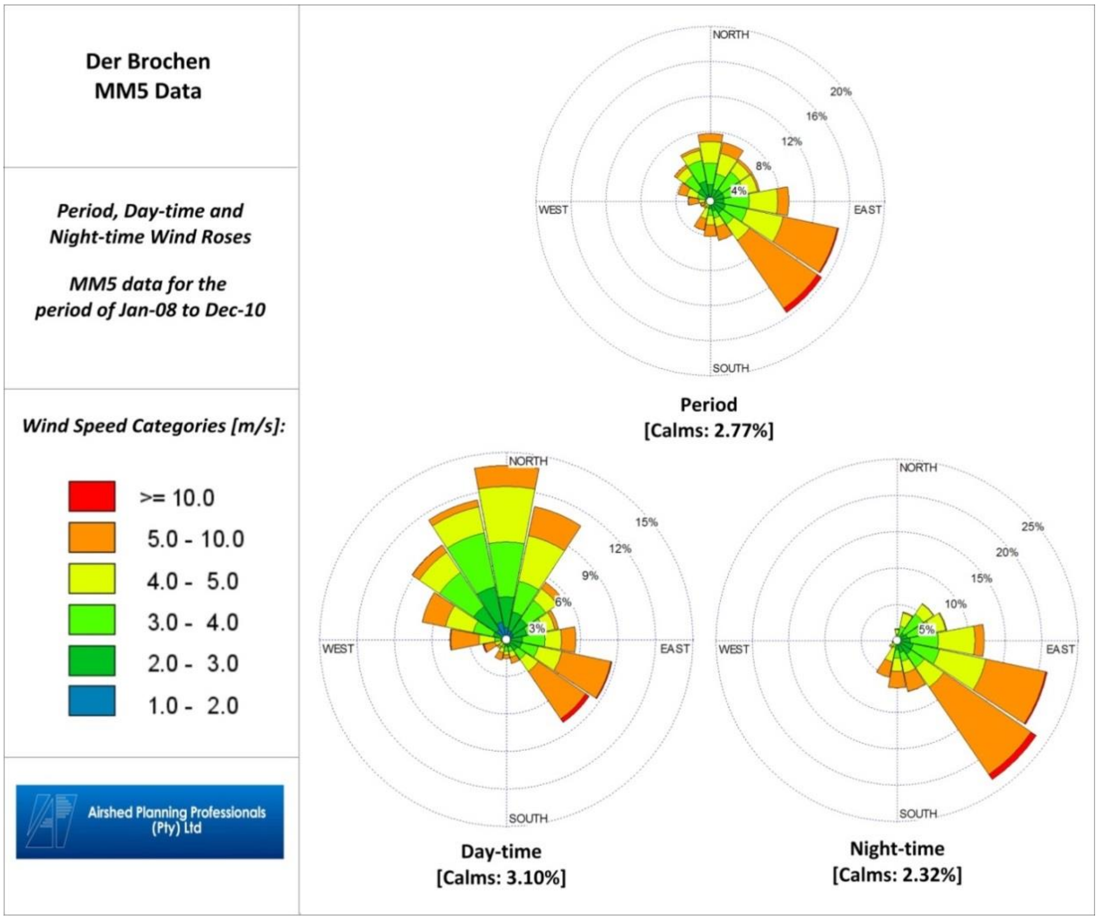

Figure 6-11: Period day and night time wind roses for the Der Brochen area (MM5 data) for the period 2008 - 2010

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[2] MM5 is a widely-used three-dimensional numerical meteorological model which contains non-hydrostatic dynamics, a variety of physics options for parameterizing cumulus clouds, microphysics, the planetary boundary layer and atmospheric radiation. MM5 has the capability to perform Four Dimensional Data Assimilation (FDDA), and are able to simulate a variety of meteorological phenomena such as tropical cyclones, severe convective storms, sea-land breezes, and terrain forced flows such as mountain valley wind systems.

6.14.2 Current ambient air quality

The sources of SO_2 and NO_x that occur in the region include industrial emissions, blasting operations at mines, veld burning, vehicle exhaust emissions and household fuel burning.

Various local and far-a-field sources are expected to contribute to the suspended fine particulate concentrations (which would include PM_{10} and $PM_{2.5}$) in the region. Local sources include wind erosion from exposed areas, fugitive dust from agricultural and mining operations, vehicle entrainment from roadways and veld burning. Long-range transport of particulates, emitted from remote tall stacks and from large-scale biomass burning in countries to the north of South Africa, has been found to contribute significantly to background fine particulate concentrations over the interior (Airshed, 2014)

6.14.3 Dust fallout monitoring

Der Brochen has a dust fallout monitoring network (conducted by GCS (Pty) Ltd) that consists of eight single dust buckets and two directional dust buckets. The location of the dust buckets are provided in Table 6-19 and shown in Figure 6-13. The measured dust fallout rates from single buckets can be compared to Dust Control Regulations that specify rates not to exceed 1 200 mg/m²/day for industrial areas and 600 mg/m²/day for non-residential areas. Dust fallout sites S1, S2, S3, S4, S5 and S6 would be classified as industrial sites and S7 and S8 and non-industrial sites. The measured dust fallout rates for 2013 indicate compliance with the Dust Control Regulations at all sampling sites. Refer to Figure 6-12).

Table 6-19: Dust Bucket Location at Der Brochen

Dust bucket no.	Latitude	Longitude	Classification
S1	S25.03136	E30.11570	Industrial
S2	S25.02517	E30.11024	Industrial
S3	S25.04228	E30.11503	Industrial
S4	S25.02823	E30.11790	Industrial
S5	S25.00789	E30.15049	Industrial
S6	S25.03117	E30.12504	Industrial
S7	S24.98050	E30.08749	Non-industrial
S8	S24.99958	E30.07391	Non-industrial

S – single dust fallout bucket

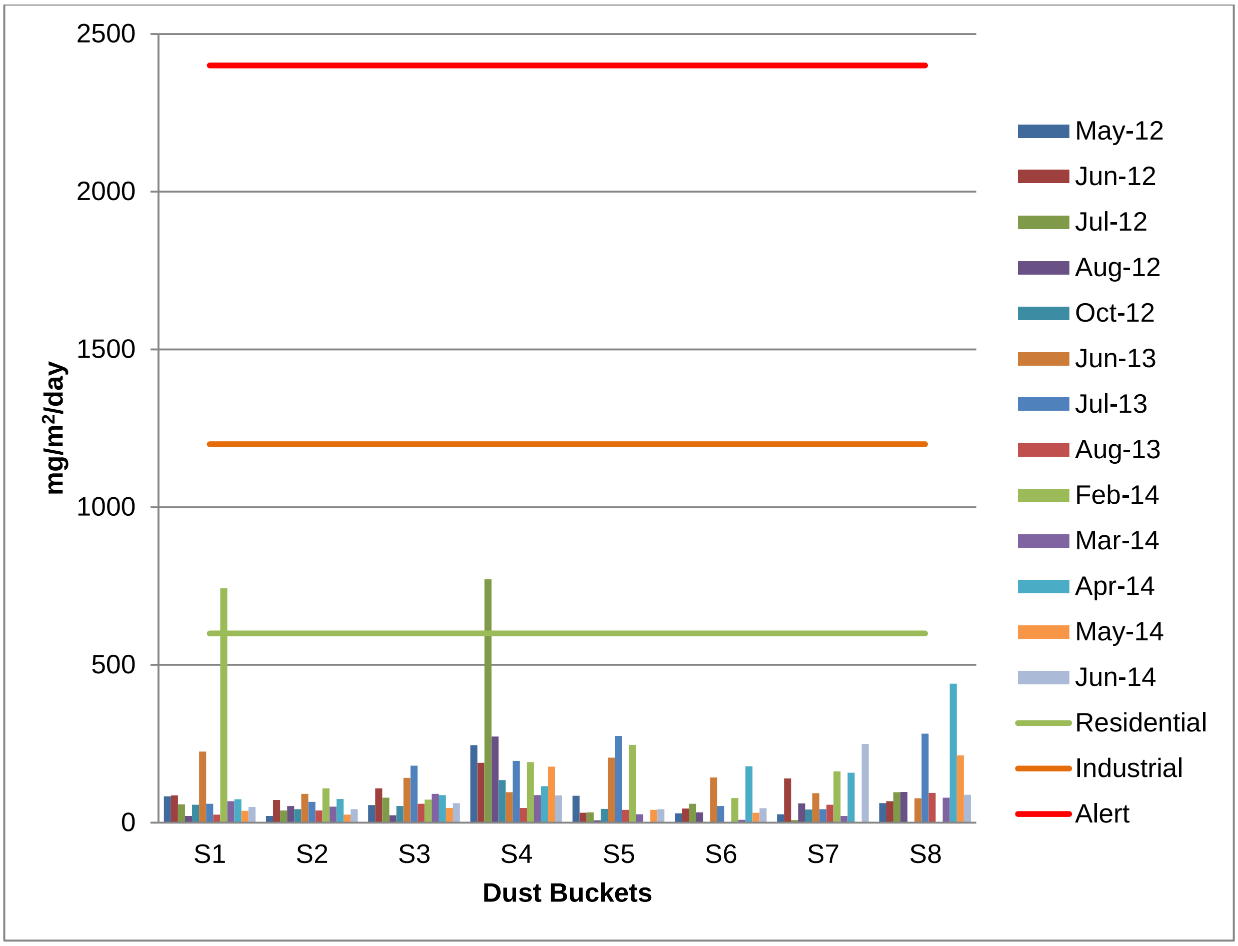


Figure 6-12: Measured dust fallout rates at Der Brochen from June 2012 – June 2014

Figure 6-13: Dust Fallout Monitoring Points at Der Brochen

6.14.4 Simulated ambient air pollutant concentrations

The simulated impacts due to existing Mototolo concentrator and TSF operations, as obtained from the previous air quality assessment (Von Gruenewaldt, 2012), are discussed in the following section.

Dispersion simulation results

The plots provided for the relevant pollutants of concern are given in Table 6-20. Only plots where impacts were in non-compliance with National Ambient Air Quality Standards (NAAQS) were included. Deposition impacts were also included in the current section. The simulated impacts are due to operations at the existing Mototolo JV only (Airshed, 2014).

Table 6-20: Isopleth plots presented in the current section

Pollutant	Averaging Period	Figure
PM_{10}	Area of non-compliance of the daily NAAQS*	Figure 6-14
$PM_{2.5}$	Area of non-compliance of the daily NAAQS [(a)]	Figure 6-15
Dustfall	Maximum daily	Figure 6-16

* The NAAQS take into account the applicable limit and tolerance values of relevance as well as the allowable frequency of exceedences

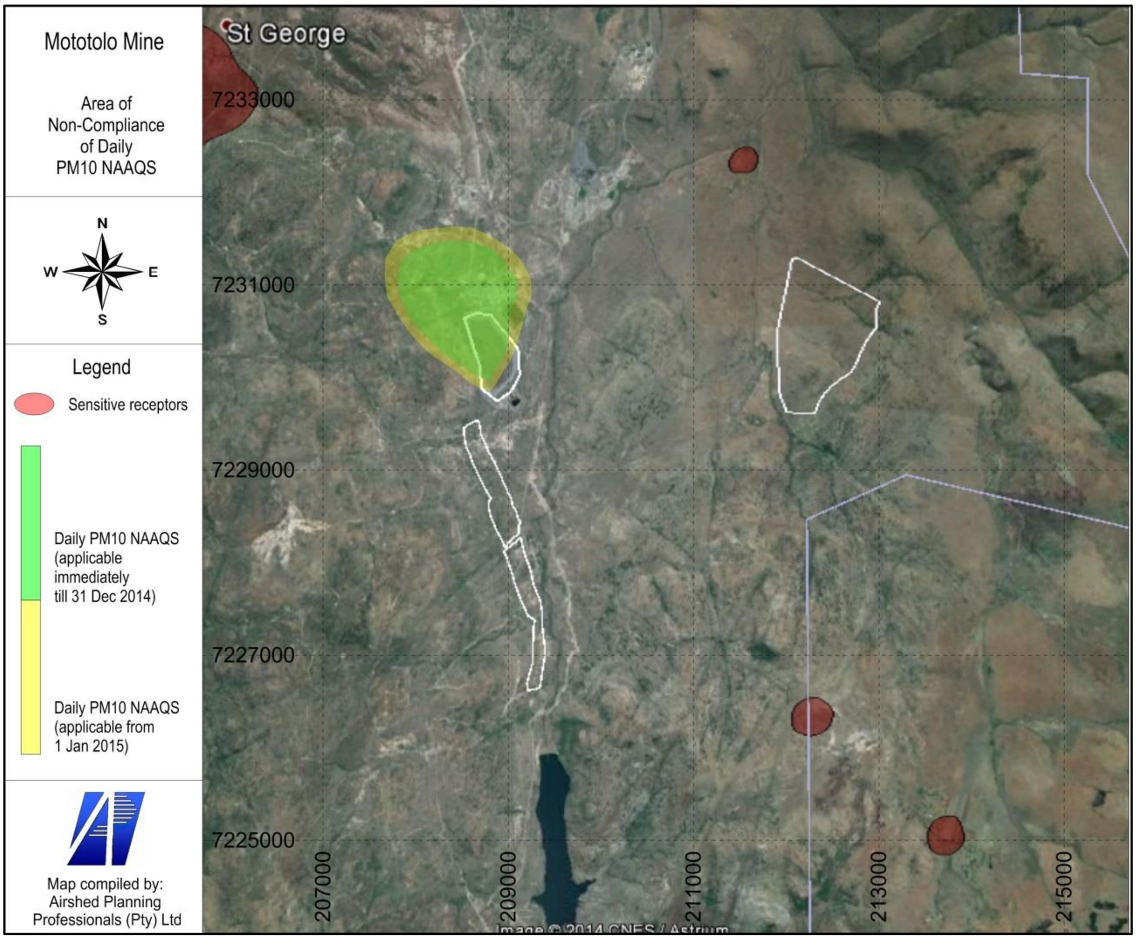


Figure 6-14: Area of non-compliance of daily PM_{10} NAAQS due to current operations at the Motololo JV (Airshed, 2014)

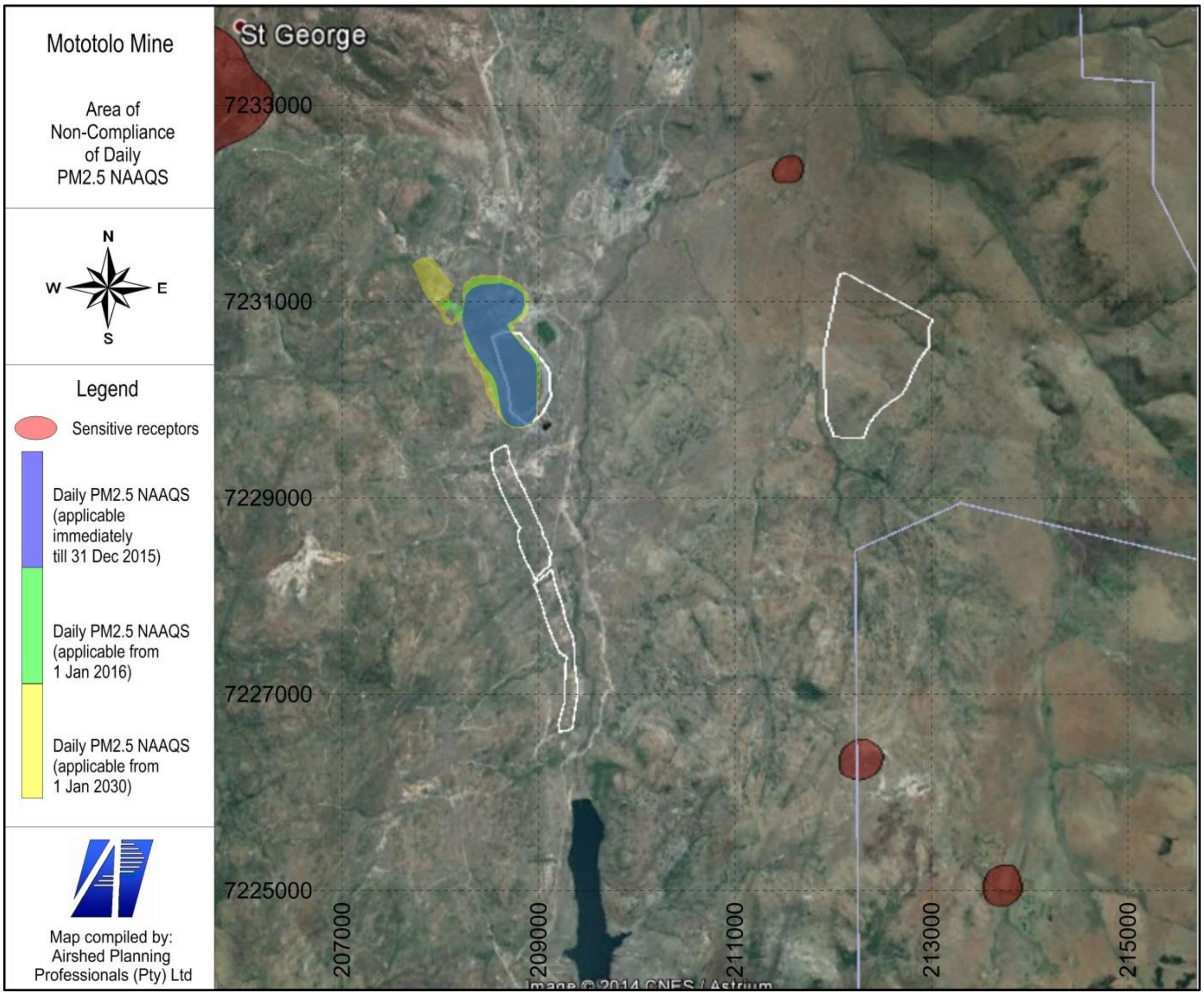


Figure 6-15: Area of non-compliance of daily $PM_{2.5}$ NAAQS due to current operations at the Mototolo JV (Airshed, 2014)

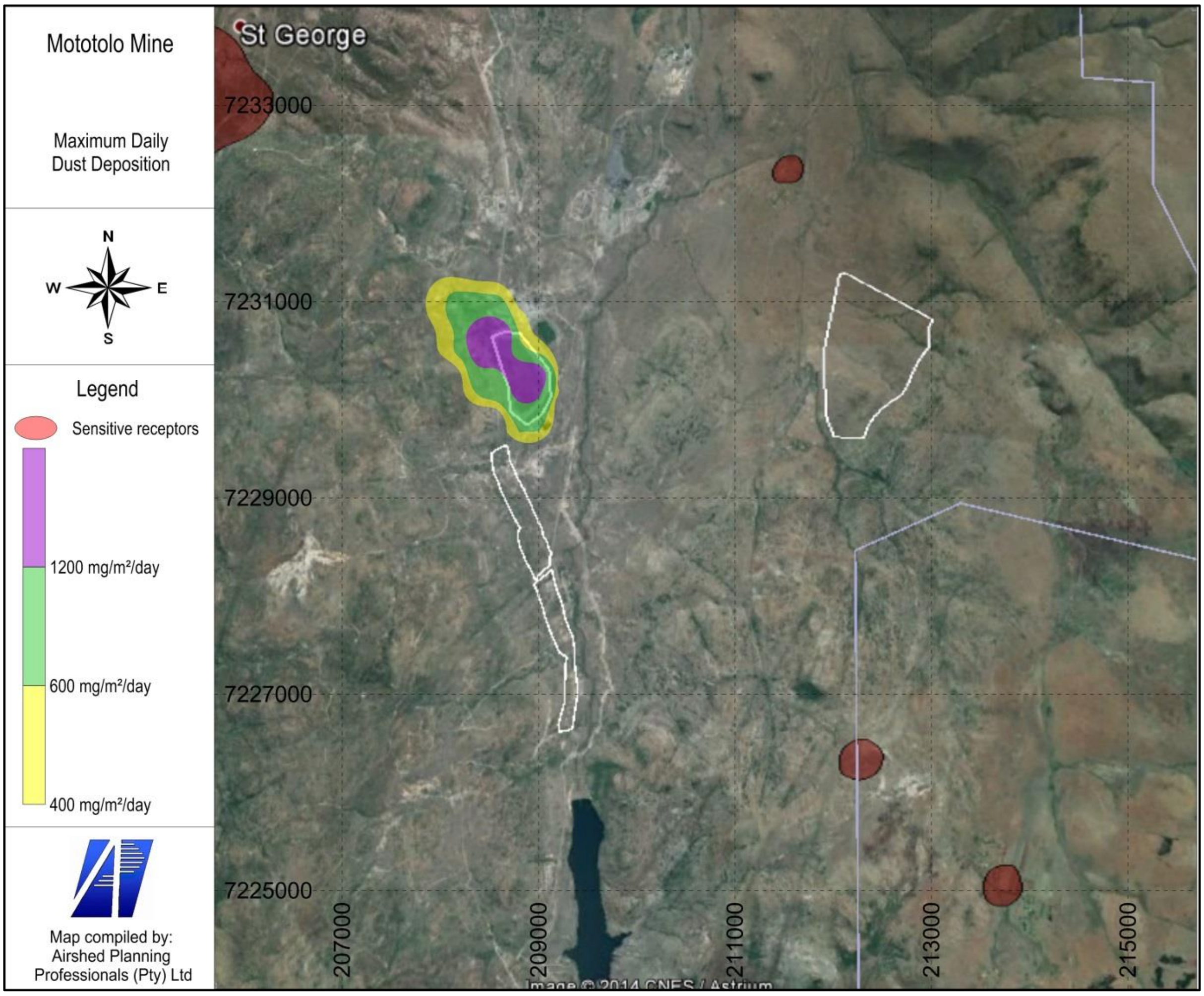


Figure 6-16: Maximum daily dust deposition due to current operations at the Mototolo JV (Airshed, 2014)

Analysis of impact on human health from existing operations

Inhalable Particulate Matter of less than 10 µm (PM_{10})

Simulated PM_{10} ground level concentrations at the closest identified sensitive receptor included in the study area are presented in Table 6-21 and illustrated in Figure 6-14. The simulated PM_{10} impacts at the closest identified sensitive receptors (due to current Mototolo JV activities only) were within the NAAQS (Airshed, 2014).

Table 6-21: Simulated PM_{10} ground level concentrations at the nearest identified sensitive receptor due to the current operations at the Mototolo JV only

Frequency of Exceedence of daily PM_{10} NAAQ limit applicable immediately till 31 December 2014	Frequency of Exceedence of daily PM_{10} NAAQ limit applicable 1 January 2015	Annual Average Concentration (µg/m³)	Within PM_{10} NAAQS applicable immediately till 31 December 2014	Within PM_{10} NAAQS applicable from 1 January 2015
0	0	1.5	Yes	Yes

Inhalable Particulate Matter of less than 2.5 µm ($PM_{2.5}$)

Simulated $PM_{2.5}$ ground level concentrations at the closest identified sensitive receptor included in the study area are presented in Table 6-22 and illustrated in Figure 6-15. The simulated PM2.5

impacts at the closest identified sensitive receptors (due to current Mototolo processing and residue disposal activities only) are within the NAAQS.

Table 6-22: Simulated PM2.5 ground level concentrations at the nearest identified sensitive receptor due to the current operations at the Mototolo JV only

Frequency of Exceedence of daily $PM_{2.5}$ NAAQ limit applicable immediately till 31 December 2015	Frequency of Exceedence of daily PM_{10} NAAQ limit applicable 1 January 2016	Frequency of Exceedence of daily PM_{10} NAAQ limit applicable 1 January 2030	Annual Average Concentration (µg/m³)	Within PM_{10} NAAQS applicable immediately till 31 December 2014	Within PM_{10} NAAQS applicable from 1 January 2016	Within PM_{10} NAAQS applicable from 1 January 2030
0	0	0	0.7	Yes	Yes	Yes

Analysis of Impact on the Environment (Dustfall) from existing operations

Simulated dustfall rates at the closest identified sensitive receptors due to current Mototolo processing and Helena TSF only were 85 mg/m²/day, well within the National Dust Control Regulation limit of 600 mg/m²/day considered acceptable for non-industrial areas (Airshed, 2014).

6.15 Noise

Information regarding the noise aspects for the Der Brochen project was obtained from M2 Environmental Connections' report: *Noise Impact Study for Environmental Impact Assessment – Development of the Der Brochen Project & the existing Mototolo Concentrator and TSF near Steelpoort, Limpopo Province 2012*. Refer to Appendix C7.

The Der Brochen Project area has a rural character in terms of the background ambient sound levels. There are existing noise sources in the proposed project area that will influence ambient sound levels in the area, which include:

- The Mototolo, Concentrator and Helena TSF located just north of the proposed mining development; and
- The Booysendal Mine to the south of the proposed Der Brochen project.

Both of these mines influence the day and night-time ambient environment.

The Mototolo JV's shafts (Lebowa and Borwa shafts) were also considered as existing background noise levels, with potential noise estimated and considered during the operational phase. Traffic servicing the Booysendal Mine also uses the access road through the proposed Der Brochen mining site, and currently influences the ambient sound character along the main route.

6.15.1 Ambient noise levels

The 2002 noise levels measured on the Helena and Der Brochen farms in 2002 were very low {35 dBA during the daytime (06:00-22:00) and 26.6 dBA during the night time (22:00-06:00)} and mostly determined by natural sounds. These levels were lower than the typical ambient noise levels for a rural residential area as described in the then SABS standards, of 45 dBA and 35 dBA for the day and night respectively. The implication of these low ambient noise levels is that any heavily mechanised activity, such as mining, will cause a significant increase in ambient noise levels.

The specialist study furthermore stated that the topography and vegetation would provide acoustic screening, limiting the noise levels mainly to within the valley. The noise modelling undertaken along the Groot-Dwars River valley in 2002, predicted that there would be a high noise impact during both construction and operation, especially during the night when ambient noise levels are extremely low and meteorological conditions favour the propagation of noise. Very high increases in ambient noise levels (> 10 dB) and high increases (> 5) will be restricted close to infrastructure and no residential developments fell inside the predicted 3 dB noise increase contour, where humans would detect the noise increase and react.

The 2012 study by M^2 Environmental Connections measured ambient (background) noise levels during day and night time (during the day and night of 16 February 2012) in accordance with the South African National Standard SANS 10103:2003.

The various points measured were considered sufficient to determine the ambient (background) sound levels in the area. The results are presented in Table 6-23.

Table 6-23: Results of ambient sound level measurements (Datum: WGS84)(D=Day, N=Night)

Point name	Latitude, Longitude	$L_{Aeq,T}$ (dBA)	L_{A90} (dBA)	$L_{A,\ max}$ (dBA)	$L_{A,\ min}$ (dBA)	Ave wind speed (m/s)	Max wind speed (m/s)
DBBN01(**D**)	-25.070501° 30.114244°	31.7	26	45.6	23.7	0.7	2.1
DBBN01(**N**)		45.3	30.5	62.6	28.6	0.6	2.0
DBBN02(**D**)	-25.043582° 30.117927°	32	26.1	46.7	23.1	1.4	3.0
DBBN02(**N**)		43	32.2	52	28.5	0.0	0.0
DBBN03(**D**)	-25.032095° 30.115345°	47.1	40.9	56.2	34.5	1.7	3.6
DBBN03(**N**)		41.1	27.9	49.2	25.9	0.8	1.6
DBBN04(**N**)[3]	-25.035380° 30.117920°	36.6	34.4	41.7	31.9	0.2	0.7
DBBN05(**N**)	-25.019747° 30.118951°	49.3	49	50.7	46	0.1	0.5
DBBN06(**N**)	-25.003689° 30.122287°	59.9	58.1	63.1	56.4	0.2	0.5

- $L_{Aeq,T}$- Equivalent A-weighted noise level, similar to an average noise level
- L_{A90} - Noise level that is exceeded 90% or more of the time
- $L_{A,max}$ - Maximum noise level measured at the point
- $L_{A,\ min}$ - Minimum noise level measured at the point

Increased noise levels are directly linked with the various activities associated with the construction of the proposed mine and related infrastructure, as well as the operational phase of the activity as described below:

- Construction phase: Various activities including traffic;
- Operational phase; and
- Mining activities associated with the opencast mining activity at the northern and southern pits.

The projected noise impact would also be the highest at night-time, due to the lower required 35 dBA rating level. As the ambient sound levels are frequently lower at night, increased noise coupled with more stable atmospheric conditions creates situations where noise created at night can be heard over long distances. The projected total noise levels are, however, limited to the activities and

[3] No daytime sound levels measurements were collected at points 4, 5 and 6 because the complex character of ambient sound levels at these points during the day, with noise from the adjacent mining activities, traffic on the gravel road as well as natural sounds (wind through vegetation, birds and other unidentifiable sounds) impacting on the quality (repeatability) of a daytime measurement

directly adjacent surrounding area, likely due to the topography in the valley that prevents the significant propagation of sound.

The surrounding terrain would significantly assist in the attenuation of ambient sound levels, with the higher hills effectively acting as sound barriers between the operation and potential noise-sensitive developments (M^2 Environmental Connections, 2012).

6.16 Heritage

Information regarding the heritage resources for the Der Brochen project was obtained from Archaeological Resources Management's (ARM) report: *Der Brochen Project and Mototolo Complex – An integrated Report prepared for Anglo American Platinum Limited*, April 2012. Refer to Appendix C8 for the full report.

6.16.1 Heritage sites recorded

Since 2002, various heritage surveys conducted since 2002 have recorded some 240 sites, ranging from the Middle Stone Age to the recent households of farm labourers in the Der Brochen project area. Their distributions on the landscape show different land use patterns. Many agriculturally-orientated societies (making *Eiland, Leolo* and *Marateng pottery*) built their villages in the valleys near cultivatable alluvium. Others (probably Ndebele) built terraced-settlements on basal slopes of the valley edge, while farm labourers usually lived in the valleys as well. During the 19th Century, farmers lived around the edge of high meadows as a measure of protection. A few Middle Iron Age *Eiland* sites were also sited in this plateau environment (ARM, 2012).

Heritage Assessment Reports compiled to date are:

- April 2012: Der Brochen Project and Mototolo Complex – An integrated Report prepared for Anglo American Platinum Limited – Professor TN Huffman & Jaco van der Walt.
- November 2009: Phase I Heritage Impact Assessment (HIA) Study for Xstrata's proposed Kuka Aerial ropeway project between Steelpoort and Lydenburg in the Limpopo and Mpumalanga Provinces of South Africa – Julius CC Pistorius
- October 2008: Phase 1 Heritage Resources Scoping Report – Der Brochen Mine: Road Options – Frans Roodt: Vhufa Hashu Heritage Consultants (VHHC);
- July 2008: Phase 1 Heritage Resources Scoping Report – Der Brochen Mine: Richmond 370 KT – VHHC;
- 18 November 2005: Helena Tailings Dam – A Final Assessment – R&R;
- 20 January 2005: Helena Tailings Dam – Overview and Assessment – R&R;
- 26 April 2004: Preliminary List of Archaeological sites recorded at Richmond and St George: Der Brochen Mine – R&R;
- June 2003: Phase 1 Heritage Impact Assessment – Richmond Complex: Trial Mining Phase – R&R;
- May 2003: Phase 1 Heritage Impact Assessment – Helena Complex: Trial Mining Phase – R&R;
- January 2003: Phase 1 Heritage Impact Assessment – Der Brochen Tailings Dams: Helena and St George - R&R; and
- February 2002: Phase 1 Archaeological Assessment of the Der Brochen Project - WITS Archaeological Resources Management.

Stone Age

About 1.4 million years ago hominids started producing recognizable stone artefacts such as handaxes, cleavers and core tools, however, there are no Acheulian tools/ Early Stone Age (ESA) recorded within the Der Brochen project area.

There are a few Middle Stone Age (MSA) (250 000 years ago) localities on record on the Richmond and Mareesburg farms, but the lack of raw material for flaking has affected the archaeological record for this time period.

There are a few Late Stone Age (LSA) (25 000 years ago) Bored stones on Richmond and Helena which are the only evidence for Late Stone Age (LSA) occupation in the project area. The shelters on Booysendal, however, may contain LSA deposits (ARM, 2012).

Iron Age

Artefacts from the Iron Age is divided into three periods, namely the Early (EIA: AD 400-1000), Middle (MIA: AD 1000-1300) and Late (LIA: AD 1300-1840). In the Der Brochen project area, *Mzonjani* occurs on Helena and possibly St George. A single *Mzonjani* period shard, an isolated mid-Moloko pot and two Late Iron Age (LIA) stonewalled kgotla were recorded, and ARM considered that this small hill could have had ritual significance. Several sites on Richmond, Mareesburg, Thorncliffe, Booysendal and Helena yielded *Eiland* pottery dating to this time. As elsewhere, these Middle Iron Age (MIA) settlements followed the common ‘valley pattern’ in that villagers lived next to cultivatable alluvium. Some of the *Eiland* sites on Helena contain burnt daga features that may well have climatic implications.

The Late Iron Age begins with the first appearance of pottery associated with Sotho-Tswana (the Moloko Branch) and with Nguni (the Blackburn branch). Some archaeologists have identified early Moloko pottery on Thorncliffe, Richmond and Helena as the first phase known as *Icon* (ARM, 2012).

Historic period

European occupation began in 1845 when trekkers established Ohrigstad and then Lydenburg a few years later. Originally, the trekkers were interested in ivory, but they also needed land and labour for agriculture. Tensions with African communities over these needs rose to such a point that the Trekkers attacked the Pedi capital in 1852. They failed, however, to destroy Pedi authority. Somewhat later, they negotiated a peace with Sekwati and traded cattle for land. Boers then started to establish farms in the region. GS Maree, for example, settled on Mareesburg in 1871. Tensions over land and labour increased again until the ZAR attacked the Pedi capital in 1876: this battle also failed to break Pedi resistance.

This brief historical outline helps to date some other sites in the greater Der Brochen area. In particular, a number of settlements located around high meadows probably date from 1860 to 1880, when tensions were high but before the European occupation of local farms. Certainly, rectangular walls date the settlements to after 1850. One large cluster on Helena includes a kgotla, communal grinding area and various homesteads. Two modern graves in this cluster may be the remains of herdsmen who looked after the later landowner’s cattle. Some high sites on Der Brochen contain burnt structures.

It was also customary in the past to mark passes between settlements with the grave of a person put there for that purpose. On Helena near the meadow cluster is one such *seotlwane*. Many more graves are associated with tenant housing. Three tenant households on Mareesburg are particularly well-preserved.

While living on European farms, local people were concerned that their children could not attend formal circumcision schools, and so they held their own. These schools were always located in secluded areas, conducted in winter, and normally lasted two to three months. After the schools were finished, participants erected stone cairns, known as *phiri,* to celebrate the birth of a new age set of men (ARM, 2012).

In terms of European occupation, the original Helena farmhouse was associated with a European grave. Nearby stand the remains of what is said to be a hotel that burned down before it could be opened for business.

The distribution of these sites represents different land use patterns. The first valley pattern was common to pre-colonial agricultural communities throughout southern Africa. In this common pattern villagers built their settlements in the open at the base of hills near agricultural land. Ndebele terraced sites are a variation; here settlements were located on the basal contours. Tenant homesteads form a third valley variation; most compounds lacked cattle kraals although small stock kraals were common. Furthermore, adults were buried outside the homesteads in dispersed cemeteries (children were buried in the household). In earlier times, the village was the cemetery for everyone. Finally, settlements built around high meadows form the plateau pattern. Somewhat surprisingly, some *Eiland* sites on Helena are located on the plateau.

6.16.2 Heritage sites within the Der Brochen project area

The South African Heritage Resources Agency (SAHRA) recognises National and Provincial Monuments for conservation purposes. None of these exist in the Der Brochen project area. For the rest, ARM bases site importance on five interrelated criteria:

- Primary versus secondary context;
- Amount of deposit;
- Number and variety of features;
- Uniqueness; and
- Potential to answer present research questions.

Sites with no importance do not require mitigation; low to medium sites may require limited mitigation; while those with high importance require extensive mitigation. Outstanding sites should not be disturbed at all. Recognizable graves have high social value regardless of their archaeological importance (ARM, 2012).

Table 6-24 shows the heritage sites identified in the Der Brochen project area, and are shown in Figure 6-17, Figure 6-18 and

Figure 6-19.

Table 6-24: Cultural heritage sites within the Der Brochen project area

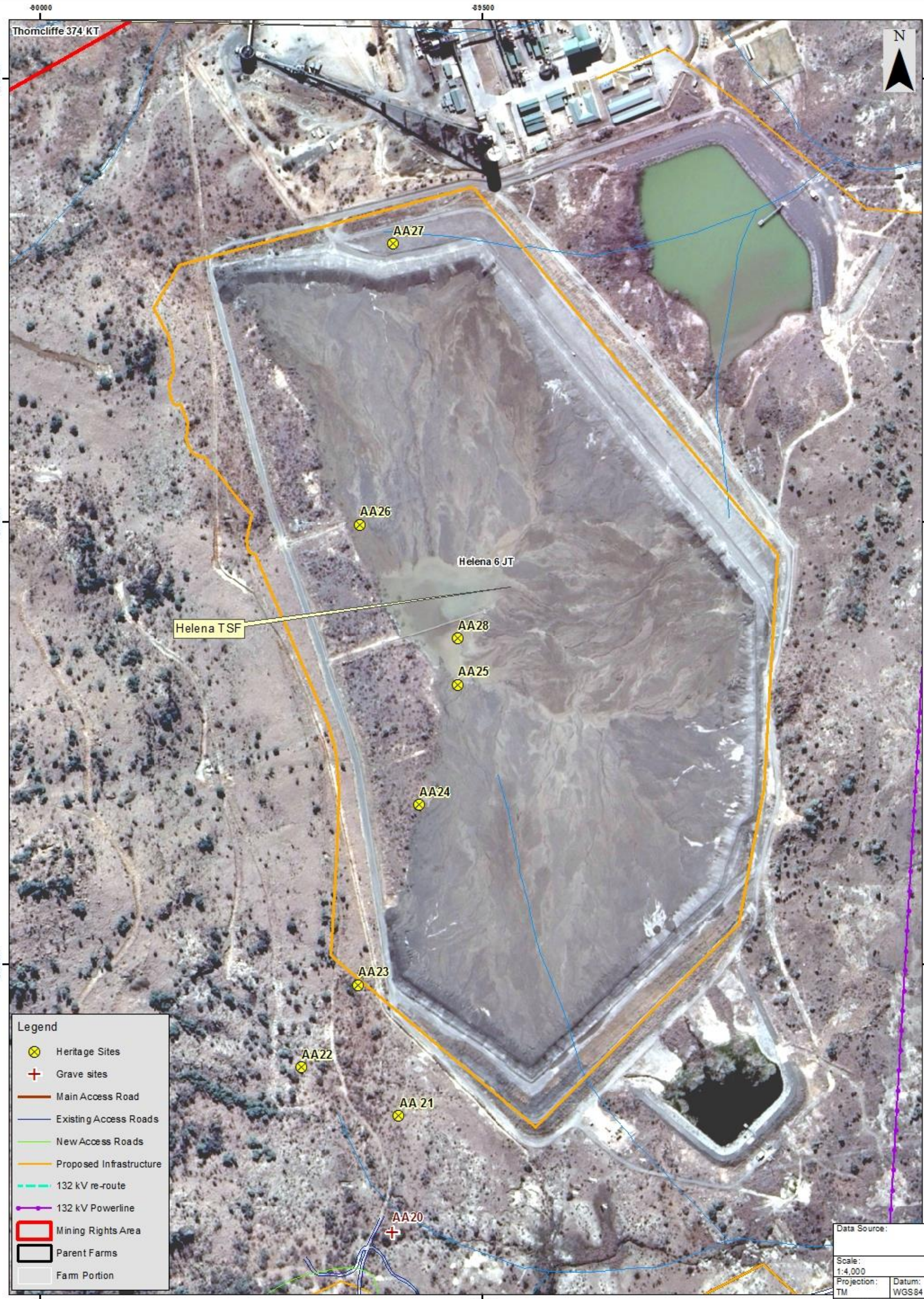
Site No.	Farm Name	Co-ordinates	Artefact description	Significance	Location
Helena TSF					
AA21	Helena 6 JT	25° 01'' 15.5''S 30° 06' 44.5''E	Tenants	No importance	Outside footprint
AA22	Helena 6 JT	25° 01' 13.7''S 30° 06' 40.6''E	Household of African tenants	No importance	Outside footprint
AA23	Helena 6 JT	25° 01' 10.7''S 30° 06' 42.9''E	Oval stone kraal	Low importance	Within 100m of footprint
AA24	Helena 6 JT	25° 01' 04.1''S 30° 06' 45.4''E	Tenants	No importance Already destroyed for construction of Helena TSF.	N/A
AA25	Helena 6 JT	25° 00' 59.7''S 30° 06' 47''E	Tenants	No importance Already destroyed for construction of Helena TSF.	N/A
AA26	Helena 6 JT	25° 00' 53.8''S 30° 06' 43.1''E	Tenants	No importance Already destroyed for construction of Helena TSF.	N/A
AA27	Helena 6 JT	25° 00' 43.5''S 30° 06' 44.5''E	Tenants	No importance Already destroyed for construction of Helena TSF.	N/A
AA28	Helena 6 JT	25° 00' 58-56''S 30° 06' 47''E	Tenants, daga	Low importance Already destroyed for construction of Helena TSF.	N/A
Northern Pit/Co-disposal					
AA20	Helena 6 JT	25° 01' 19.8''S 30° 06' 44.2''E	5 graves, P.M. Mankge (died 1975), P.M. Mankge (died 1974) and S. Koba	High social importance	Approximately 500m from footprint
AA41	Helena 6 JT	25° 02' 23.5''S 30° 05' 19.6''E	Isolated *Leolo* pot, two rectangular kgotla on exposed rock, isolated *Mzonjani* shard and some	Medium importance	Within footprint

Site No.	Farm Name	Co-ordinates	Artefact description	Significance	Location
			MSA clustered around small kopje. Damaged by road and drilling		
AA42	Helena 6 JT	25° 01’ 28.05’’S 30° 06’ 34.5’’E	Pottery scatter	No importance	Outside footprint, possibly within footprint of proposed WRD
AA43	Helena 6 JT	25° 01’ 33.6’’S 30° 06’ 31.6’’E	Terraces	No importance	Outside footprint
AA44a	Helena 6 JT	25° 01’ 35.5’’S 30° 06’ 38.9’’E	Original European farmstead	Low importance	Within footprint
AA44b	Helena 6 JT	25° 01’ 34.2’’S 30° 06’ 39.3’’E	Grave of child and F.I. du Preez (died 1937)	High social importance	Within footprint
AA110a	Helena 6 JT	25° 01’ 37.2’’S 30° 06’ 39.2’’E	Water tank for hotel (ruins)	Medium importance	Within footprint
AA110b	Helena 6 JT	25° 01’ 38.3’’S 30° 06’ 40.4’’E	Main hotel complex. This complex includes many plastered walls (some with painted designs), stone walls and stone steps (ruins)		
AA110c	Helena 6 JT	25° 01’ 38.5’S 30° 06’ 41.6’E	More rooms of main hotel complex (ruins)		
AA111	Helena 6 JT	25° 01’ 56.8’’S 30° 06’ 49.5’’E	Clearing with pottery and stone lines	No importance	Within footprint
AA124	Helena 6 JT	25° 02’ 03.9’’S 30° 06’ 52.2’’E	Cemetery with two graves (H.L. Tshela and M. Leshaba died 1975)	High social importance	Within footprint
AA127	Helena 6 JT	25° 01’ 46.1’’S 30° 06’29.9’’E	*Eiland* daga	Medium importance	Outside footprint
Southern Pit					
AA33	Helena 6 JT	25° 02’ 13.2 - 11.8’’S 30° 06 54 – 53.2’’E	Tenants	Not rated	Outside footprint , possibly within footprint of proposed WRD
AA34	Helena 6 JT	25° 02’ 29.3’’S 30° 06’ 59.7’’E	Household of African tenants	No importance	Outside footprint
AA34a	Helena 6 JT	25° 02’ 33’’S 30° 06’ 56.8’’E	pottery, mud and stone walls and headstones placed against tree. Headstones removed by	No importance	Outside footprint

Site No.	Farm Name	Co-ordinates	Artefact description	Significance	Location
			2012		
AA35	Helena 6 JT	25° 03' 01.5''S 30° 07' 07.1''E	Tenants – already destroyed	Not rated	Outside footprint
AA113	Der Brochen 7 JT	25° 02' 39.9''S 30° 07' 06.9''E	Tenant household destroyed to make storage area. Steep and stony and therefore no sites on hillside	No importance	Within footprint
AA117	Helena 6 JT	25° 02' 30.7''S 30° 06' 28.7''E	Daga	Low importance	Outside footprint
Powerline					
AA96	Mareesburg 8 JT	25° 01' 44.9''S 30° 07' 42.2''E	Several stone lines marking household of African tenants	No importance	Outside footprint
AA97	Mareesburg 8 JT	25° 01' 51.6''S 30° 07' 44.9''E	Tenant household in good state of preservation with extant mud walls and front lapa wall	High importance	Outside footprint
AA98	Mareesburg 8 JT	25° 02' 04.9''S 30° 07' 26.5''E	Poor stone tool industry in quartz	No importance	Within in 100m of proposed powerline
AA99	Mareesburg 8 JT	25° 01' 41.5''S 30° 07' 27.8''E	Tenants	Low importance	Outside footprint
AA100	Mareesburg 8 JT	25° 01' 38.3''S 30° 07' 35''E	Tenants	Low importance	Outside footprint
AA101	Mareesburg 8 JT	25° 01' 43''S 30° 07' 36.9''E	Tenants, lower grinding stone, pots	Low importance	Outside footprint
AA102	Mareesburg 8 JT	25° 02' 18.3''S 30° 07' 25.1''E	Walls and grindstones marking household of African tenants	Low importance	Within in 100m of proposed powerline
AA103	Mareesburg 8 JT	25° 02' 20.3''S 30° 07' 25.1''E	Stone kraal and mud houses marking household of African tenants	Medium importance	Within in 100m of proposed powerline
AA104	Mareesburg 8 JT	25° 02' 24.9''S 30° 07' 27''E	Twelve graves associated with Petrus Mankge	High social importance	Within in 100m of proposed powerline
AA105	Mareesburg 8 JT	25° 02' 11.9''S 30° 07' 19.9''E	Graves	High social importance	Outside footprint
Mareesburg TSF					

Site No.	Farm Name	Co-ordinates	Artefact description	Significance	Location
AA16	Mareesburg 8 JT	25° 00' 46''S 30° 08' 57.8''E	Stone lines, maize grindstones and pottery marking household of African tenants	No importance	Within footprint
AA17	Mareesburg 8 JT	25° 00' 23.9''S 30° 08' 49.9''E	*Eiland* or *Leolo* pottery and slag as well as *Marateng* pottery	Low importance	Within footprint
AA18	Mareesburg 8 JT	25° 01' 02''S 30° 09' 00.4''E	Cemetery with three graves (-died 1979), one (E.M. Mankge-died 1967) with new headstone	High social importance	Within footprint
AA19	Mareesburg 8 JT	25° 01' 00.2''S 30° 08' 48.2''E	Cleared area with stone lines marking household of African tenants	No importance	Within footprint
AA88a	Mareesburg 8 JT	25° 00' 21.5''S 30° 08' 28.8''E	Stone terraces, upper maize grindstone and sundried brick marking household of African tenants	Low importance	Outside footprint
AA88b	Mareesburg 8 JT	25° 00' 22.5''S 30° 08' 27.8''E			Outside footprint
AA89	Mareesburg 8 JT	25° 00' 29.8''S 30° 08' 24.2''E	Cemetery with 5 graves, three with headstones (Mosehla-died 1980; J. Mosehl-died 1975; Methaka-died 1970)	High social importance	Outside footprint
AA90	Mareesburg 8 JT	25° 00' 13.2''S 30° 08' 31.4''E	Single terrace line, lower maize grindstone, upper grindstones on boundary road marking household of African tenants	Low importance	Within footprint of pipeline
AA91	Mareesburg 8 JT	25° 01' 00.2''S 30° 08' 34.9''E	Rectangular house foundations, lower maize grindstone and midden marking household of African tenants.	Low importance	Outside footprint
AA92	Mareesburg 8 JT	25° 01' 06.7''S 30° 08' 53.7''E	Well-preserved household of African tenants with terrace lines, house remains, grindstones and midden. *Leolo pottery* underneath.	High social importance	Within footprint
AA93	Mareesburg 8 JT	25° 00' 38.4''S 30° 08' 38.6''E	MSA artefacts including triangular point, blade and scraper, all made from a black dolerite-like stone.	Not *in situ* and therefore of no importance	Within 100m of footprint
AA94a	Mareesburg 8 JT	25° 00' 20 - 21''S 30° 08' 46 - 47''	Stonewalled kraal, rectangular house foundation and lower grindstone marking household of African tenants. *Leolo pottery* eroding out of the road.	Low importance	Within footprint
AA95	Mareesburg 8 JT	25° 00' 22.6''S 30° 08' 51.6''E	Scatter of small slag pieces in road upslope of Site AA94.	Medium importance	Within footprint

Site No.	Farm Name	Co-ordinates	Artefact description	Significance	Location
AA108	Mareesburg 8 JT	25° 01’ 15.9’’S 30° 08’ 36’’E	*Leolo* pottery in old ploughed field next to Mareesburg house	Low importance	Outside footprint



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Project No. 469113	Fig No. 6-17	

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DER BROCHEN
HERITAGE SITES - HELENA TSF

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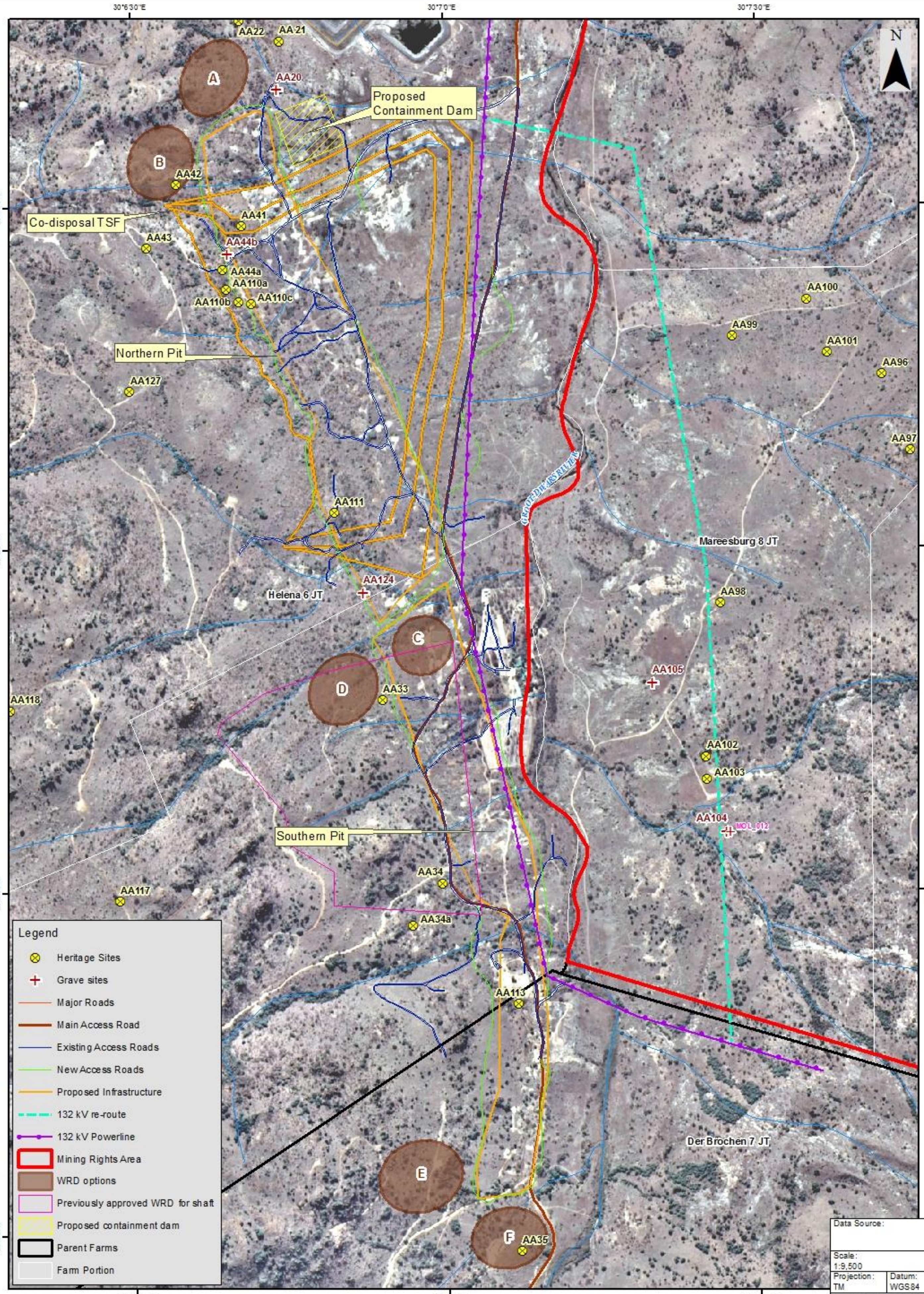

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Project No. 469113	Fig No. 6-18

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HERITAGE SITES - NORTH AND SOUTH PITS, CO-DISPOSAL FACILITY

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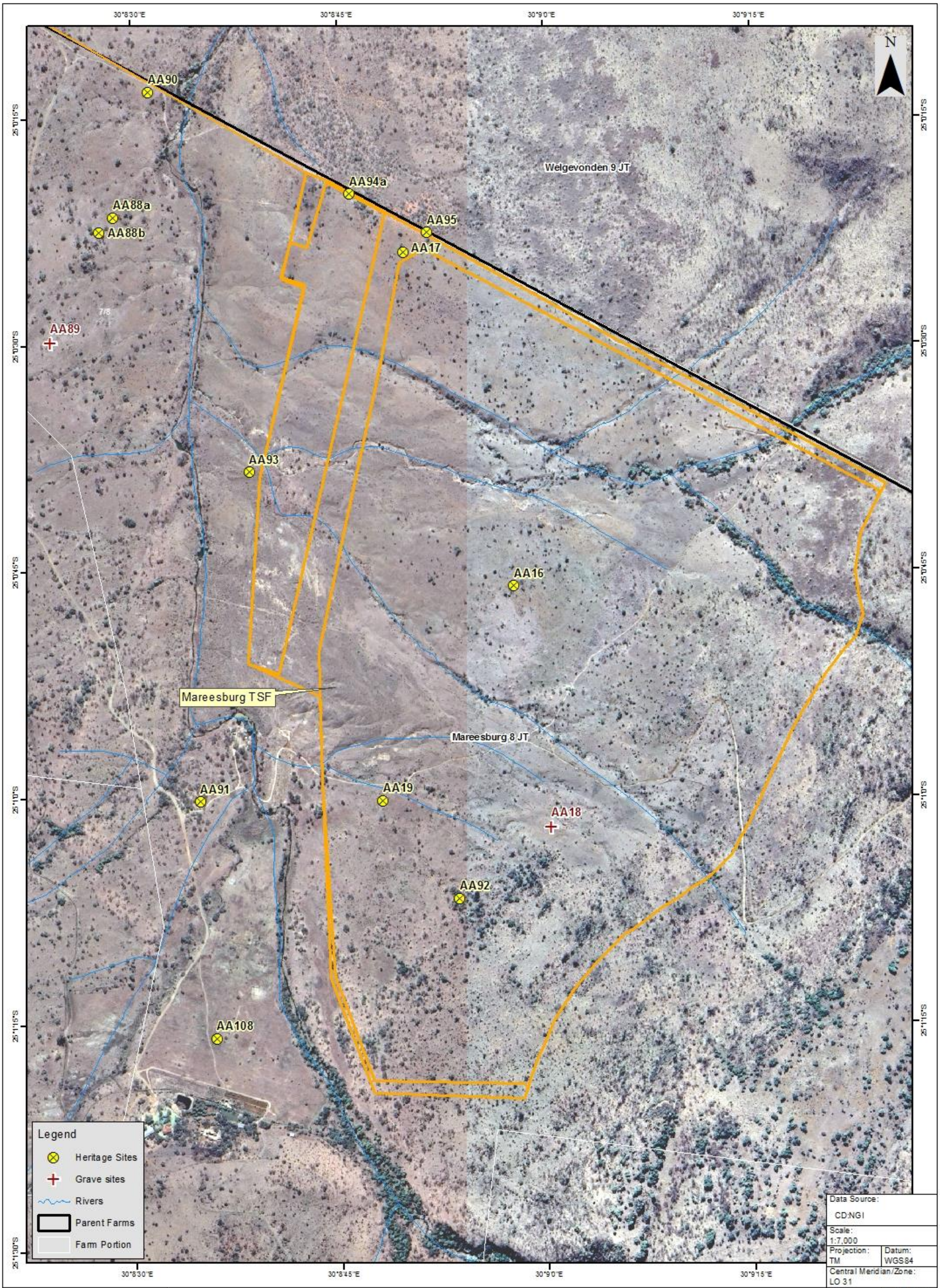

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Project No. 469113	Fig No. 6-19

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HERITAGE SITES - MAREESBURG TSF

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Revision: A Date: 26 11 2014

6.17 Traffic

Information for this section was obtained from the Aurecon report: *The proposed EMP Alignment and Amendment of the Der Brochen project to include open cast mining, tailings storage facilities and associated infrastructure*. Report No. 9522, October 2014. Refer to Appendix C9 for the full report.

The current road network around the Der Brochen project consists of the mine access road, R557, D1261, and R555. The sections below describe the existing road network and traffic conditions. Figure 6-20 shows the road networks around the Der Brochen project.

srk consulting	**DER BROCHEN** Road networks around Der Brochen	Project No. 469113

Figure 6-20: Road networks around the Der Brochen project

6.17.1 Provincial Road R555

Provincial Road R555 is the main road that links the towns of eMalahleni (Witbank) and Middelburg in the south and Burgersfort in the north, to the town of Steelpoort. The R555 is a 2-lane single carriageway road with one lane in each direction. Each lane is approximately 3.7 m wide. The R555 forms part of the regional road network linking Gauteng in the east and the Limpopo Province in the west that also serves the vast mining areas of Witbank and Ogies.

The R555 is an asphalt surfaced road with unpaved shoulders and with a 60km/hr speed restriction in the vicinity of the Tubatse Chrome Plant, thereafter it is 80km/hr. The horizontal alignment of the R555 within the study area is fairly straight while the vertical alignment is predominantly flat.

The pavement condition of this road ranges from fair to poor with potholes, rutting, ravelling, cracking and patching is evident in certain sections. There are no formal sidewalks along the R555. Pedestrians were observed walking on the unpaved shoulders and verges. There are no formal public transport facilities along the R555 in the vicinity of the Der Brochen project, however mini bus taxis were observed stopping randomly at numerous locations along this section of road.

From the results of the abovementioned traffic counts, northeast of the D1261 intersection, R555 carries a maximum of 895 veh/hr. The capacity of this section of road is estimated at around 1 800 veh/hr indicating that there is plenty of spare two-way capacity along this section of road. Of this around 20% is heavy vehicles, which is high for this type of regional road but reflects the mine activity in the area (Aurecon, 2014).

6.17.2 Provincial Road R557

Provincial Road R557 also forms part of the surrounding regional road network that links the town of Mashishing to the east, with the R555 to the west, passing the mine access road in an east-west direction. It is a two way two lane road with 3.7m wide lanes, and local widening at the major intersecting roads, allowing right turning vehicles to turn in the protection of a right-turn lane. This road is one of the main access routes for mine workers from Mashishing as well as Steelpoort and Burgersfort. The alignment of the R557 in the vicinity of the access road to the Der Brochen project is fairly straight and the vertical alignment is predominantly flat. The pavement condition of this road also ranges from fair to poor with potholes, rutting, ravelling, cracking and patching visible in certain sections. There are no formal sidewalks, public transport facilities, or street lighting. Pedestrians were observed at the mine access road intersection, waiting for public transport or hitch hiking, with minibus taxis and random cars pulling off onto the roadside to pick up passengers.

Based on the results of the abovementioned traffic counts, west of the access road to the De Brochen project (which also serves other mining activity), the R557 carries a maximum of 522 veh/hr. The capacity of this section of road is estimated at around 1 800 veh/hr indicating that there is plenty of spare two-way capacity along this section of road. Of this around 10% is heavy vehicles, which is typical for this type of regional road (Aurecon, 2014).

6.17.3 District Road D1261

D1261 is a District Road that links the R557 in the south to the R555 in the north. It is a two lane, two way asphalt surfaced road with 3.7m lanes, gravel shoulders, and a speed limit of 80km/hr, reducing to 60km/hr near the several mine access intersections. The D1261 road also has local widening at each mine access road, allowing through vehicles to safely pass vehicles waiting to turn into the mines.

Just south of the R555, the D1261 carries a maximum of 649 veh/hr.

The capacity of this section of road is estimated at around 1 650 veh/hr indicating that there is plenty of spare two-way capacity along this section of road. Of this around 20% is heavy vehicles, which is high for this type of regional road but reflects the mine activity in the area (Aurecon, 2014).

6.17.4 Access road to the Der Brochen project

The access road to the Der Brochen project from the R557, serves the Booysendal Mine as well as a further 5 mining activity nodes along its length. The road is a two lane two way road with 3.5m lanes and gravel shoulders. This road is approximately 10km long and is fairly windy with a relatively flat vertical alignment and a speed limit of 60km/hr. There are high volumes of heavy vehicles waiting to load at each mine, sometimes to the point where they block the access road for a few minutes with their activity. The road condition is good to fair with the occasional pothole and edge breaks. There are no pedestrian facilities or public transport facilities along the road nor is there street lighting.

Based on the results of eth abovementioned traffic counts, just south of the R557 intersection, the Mine Access Road carries a maximum of 577 veh/hr. The capacity of this section of road is estimated at around 1 550 veh/hr indicating that there is plenty of spare two-way capacity along this section of road. Of this around 7% are heavy vehicles, which is currently low for this type of access regional road. This volume of traffic decreases along the access road until the Der Brochen and separate Booysendal Mine access gates where just Der Brochen project and Booysendal Mashishing Mine generated traffic passes through (Aurecon, 2014).

6.17.5 Intersection of R557 and the Access Road

This intersection of R557 and the Access Road that serves the Der Brochen project and several other mines along its length, is used extensively by heavy vehicles carrying goods, equipment and materials, as well as private vehicles and public transport vehicles. The R557 has a right-turn refuge lane and a left-turn deceleration lane, and the mine access road is a single lane approach. The intersection is stop controlled with the R557 being free flow, and the mine access road operating under stop conditions at the intersection. Bell mouths are wide allowing heavy vehicles to easily turn into and out of the mine access road. Shoulder sight distances and stopping sight distances along the R557 are adequate.

A 12 hour traffic count, classified by vehicle type, was carried out at this intersection to determine the existing operating conditions. The AM and PM peak hours at this intersection were found to be from 06:00 to 07:00 and 15:45 to 16:45. Results have shown that this intersection is operating very well with minimal delays and queues at each approach and for all movements for both the AM & PM peaks. All movements at the intersection are currently operating at a Level of Service B or better (Aurecon, 2014).

6.17.6 Intersection of R555 and D1261

This intersection lies north of the R557 and Mine Access Road intersection. This intersection has recently been upgraded and has good shoulder sight distances and stopping sight distances. It is a four way stop controlled intersection with sidewalks all around in the immediate vicinity of the intersection, and public transport facilities, as well as street lighting. All turning movements have been designed to accommodate heavy vehicles and operate well. The R555 has a left-turn lane, straight lane and right-turn lane at both approaches and both side roads at this intersection have a shared left-turn and straight lane and a right-turn lane.

A classified 12 hour count was carried out at this intersection and the AM and PM peak hours were found to be from 06:00 to 07:00 and 15:00 to 16:00. Results have shown that this intersection is also operating very well with minimal delays and queues at each approach and for all movements for both the AM and PM peak hours. All movements at the intersection are currently operating at a Level of Service B or better (Aurecon, 2014).

6.17.7 Der Brochen project access gate

As stated earlier, the Der Brochen project access gate is shared with the neighbouring Booysendal Mine, with each organisation having a separate, dedicated security control point where visitors and staff enter and exit. From the dedicated security control point however, both streams of traffic merge onto one road and proceed further south until the Der Brochen project access road splits onto a gravel road. The access road before the split is an asphalt surfaced two lane, two way road with a speed limit of 40km/hr. Only Der Brochen project and Booysendal Mine generated traffic use this section of the Mine Access Road (Aurecon, 2014).

6.17.8 Existing pedestrian and bicycle activity

A few pedestrians and no cyclists were observed on the road network in the immediate vicinity of the Der Brochen project area. A concentration of pedestrian activity was observed to the north, along the R555, in the vicinity of the commercial and residential areas around Steelpoort and Burgersfort. The pedestrians use the wide unpaved shoulders and wide verges of the R555. Pedestrians do not impede the flow of traffic on any of the roads within the study area.

No pedestrians were observed along the R557 except in the immediate vicinity of the mine access road intersection. Public transport vehicles as well as private vehicles were parked along the roadside and also pulled over to pick up passengers.

The public transport services pick up and drop off mine workers at the mine gate and therefore there is very little pedestrian activity along the mine access road. There is pedestrian activity at the mine access gates, however there are no pedestrian or public transport facilities at the mine gates (Aurecon, 2014).

6.17.9 Existing road safety conditions

Based on observation of Aurecon during their site visit, the road safety conditions along the R555 and R557 are generally acceptable during the day when visibility is good and smaller vehicles are able to overtake the heavy vehicles fairly safely. At night, however, when visibility is reduced, passenger vehicles still overtake heavy vehicles even though visibility is limited, resulting in collisions which at times have been fatal. The large number of heavy vehicles, however, frustrates passenger vehicle drivers both during the day and night forcing them to overtake even though it may not be safe to do so, further increasing the chances for a collision.

The vehicle speeds and driver behaviour within the study area are generally good based on observation during the site visit, with the occasional vehicle exceeding the speed limit. There is signage displaying the maximum permissible speed on the R555 and R557 and advanced warning signs for the presence of slower moving heavy vehicles on these sections of road.

From observation, pedestrian activity did not pose a road safety threat on any of the roads surrounding the project area (Aurecon, 2014).

6.18 Visual aspects

Visual impact assessments, including viewshed simulations, lines of sight modeling, spatial and 3D analysis, revealed that the dense vegetation, high trees and rugged topography in the area will prevent extensive views of the infrastructure from ground level. The increased exploration and mining activities surrounding Der Brochen have furthermore reduced the natural scenic integrity and value of the area. This is mainly due to cleared gravel roads and access tracks being visible over extensive areas, specifically where these cross higher up on steep hills. The various mining activities, including Der Brochen will be visible from portions along the Steenkampsberg Pass (J9 Environmental Consultant, 2011).

6.19 Socio-Economic Profile

Information regarding the socio-economic structure around the Der Brochen area was obtained from the SRK report: *Social Baseline and Impact Assessment for the Der Brochen EMP Alignment and Amendment*. Report No. 469113/SIA. Refer to Appendix C10 for the full report.

Der Brochen falls within the boundaries of the Greater Tubatse Local Municipality (GTLM), which is one of the five local municipalities falling under the Sekhukhune District Municipality (SDM). It borders the Thaba Chweu Local Municipality (TCLM), which is one of the five municipalities falling under the jurisdiction of the Ehlanzeni District Municipality (EDM). Geographically, the GTLM and the TCLM cover areas of 4 602 km² and 5 680 km² respectively (Statistics South Africa (StatsSA), 2011).

6.19.1 Macro-economic context

Local municipalities

The Greater Tubatse Local Municipality (LM) has a weak economic base, accompanied by high poverty levels. The economy is concentrated and not diversified since it is based largely on mining and related activities in the region, platinum mining especially (GTLM IDP, 2012).

Some of the largest platinum producers in South Africa are currently operating in the Greater Tubatse LM, including AAP, Impala Platinum and GlencoreXstrata. Of note is that the platinum boom associated with the South African Platinum belt has seen the commodity account for 80% of the world's platinum group metal reserves and the commodity is one of the country's largest exports (Mining weekly, 2014).

Mining accounts for 55% of the Gross Value Added (GVA) for the municipality. It follows that the largest majority of employment opportunities in the Greater Tubatse LM (approximately 50%) are from the mine and mine-related industries (including ferro-chrome smelting) in the region (StatsSA, 2011).

Opportunities for development have been identified in the Local Economic Development Plan (LED) of 2007, but the current status of plans to develop and expand on these opportunities could not be determined.

The western half of the Thaba Chweu LM, which Der Brochen boarders (Mashishing district), is dominated by agricultural and farming activities. Other economic activities in the Western region of Thaba Chweu LM include mining and quarrying, manufacturing, real estate and business services. In contrast to the Greater Tubaste LM, mining contributes 24% to the Thaba Chweu LM GVA (StatsSA, 2011).

However, mining has been identified as a fast growing industry in the region. The locality of Thaba Chweu LM within the eastern limb of the Bushveld Complex suggests that mining should be the future focus of the Thaba Chweu LM's economy. This is reflected in the growth of towns such as Mashishing and informal settlements around the area (GTLM IDP, 2012/2013).

Tourism contributes significantly to the economy of the Greater Tubatse LM, however, its full potential is yet to be realised. Proximity to wildlife, nature and heritage sites and the Kruger National Park, as well as multiple luxury lodges, contributes to job creation and economic growth. Most of these activities are, however, concentrated around the eastern section of the Greater Tubatse LM (GTLM IDP, 2012/2013).

6.19.2 Survey of households within the study area

As determined through consultation with local leaders in 2014, the estimated number of households in the study area is 264 in 2014. The number of households that participated in the social survey was 146, and 669 household members were recorded, indicating an estimated household size of 3.6 on average. Households from the following communities were surveyed:

- Gamawela community (St George 2 JT, Hermansdal 3 JT, Richmond 370 KT, Mareesburg 8 JT);
- PakanengChoma and Mawela (Vygenhoek 10 JT and Schaapkraal 42 JT), collectively referred to as the PakanengChoma community;
- Welgevonden 9 JT, collectively referred to as the Moletsi community; and
- Farm workers at Vygenhoek 10 JT and Schaapkraal 42 JT (SRK, 2014).

Refer to Figure 6-21 which indicates the locality of these communities.

Figure 6-21: Communities around Der Brochen

6.19.3 Education

The percentage of people aged 20 years and older within the study area who do not have any formal education is 14.9%. This figure is far higher than those reported for the Greater Tubatse LM (1.6%) and Thaba Chweu LM (2.8%). This high percentage indicates both poor access to education and early entry into household work and employment. As indicated in Figure 6-22, 4.2% of the surveyed population have attained a higher education and 10.2% have completed primary school education (SRK, 2014).

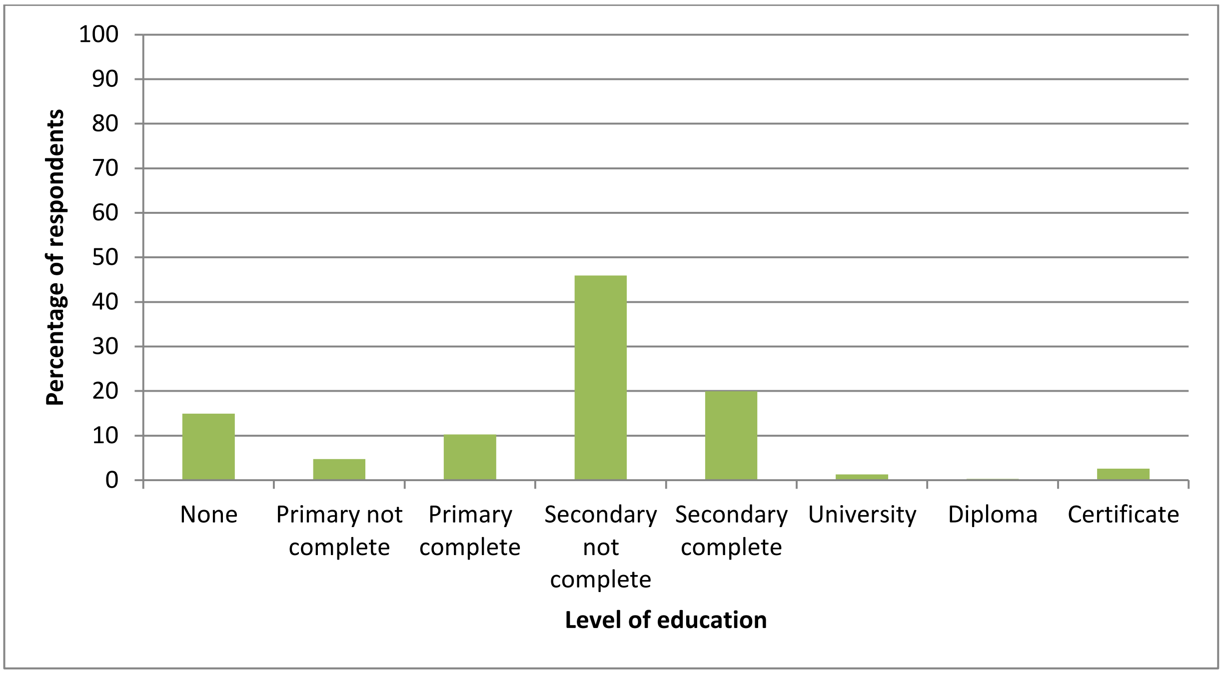


Figure 6-22: Study area education level of people over 20 years of age (SRK, 2014)

6.19.4 Household income

Analysis of the incomes for households within the study area indicates poor financial status. The household income is also an indicator of poor skills and education levels in the area, fuelled by poverty. It was found that 46.6% of the surveyed population earns less than or equal to R799.00 a month (SRK, 2014).

6.19.5 Employment

The household survey results showed that, of those employed in the area (15 years and older), 11.6% are currently working for a mine. Additionally, 40.4% of those who have been unemployed since the start of 2014 fall between the ages of 25 and 30, again highlighting the high level of unemployment and dependency on a single income amongst households. This also indicates that few job opportunities are available in the area within the unskilled and semi-skilled markets. Notably, there are a high number of young parents in the study area, with 21.9% of the surveyed population between the ages of 15 and 24 receiving monthly child grants (SRK, 2014).

6.19.6 Housing

Traditional and informal housing are the main dwelling types within the study area. The prevalent form of housing construction is that of mud bricks, with corrugated iron housing located at Schaapkraal 42 JT and Vygenhoek 10 JT (SRK, 2014).

6.19.7 Water

In the study area, the vast majority of households (89.4%) rely on water from dams and rivers. Of the households interviewed, 97.3% reported to not pay for water, and 63.0% felt that they did not have enough water. This is an indication of high poverty and poor service delivery in the area. Some 19.4% of households felt that water was contaminated, while 59.7% suggested borehole water would be a better option to their current situations (SRK, 2014).

6.19.8 Sanitation

The majority of households in the study area (40.8%) use pit latrines without ventilation. It is often the case (26.1% of households) that the pit latrines are communal with several families sharing one latrine (SRK, 2014).

6.19.9 Energy

For lighting, 82.4% of households are reliant on candles, while 9.9% of households have access to solar energy from the Greater Tubatse LM, for which they pay R20 per month. The dominant resource used for heating is wood (92.2%). At 93.7%, wood is also the dominant resource used for cooking, followed by paraffin at 5.6%. The results indicate that 95.7% of people believe the area should be electrified (SRK, 2014).

6.19.10 Roads and transport

The quality of roads in the area is very poor and upgrades are required (Figure 6-23). Rainfall causes severe problems as roads flood, and a lack of bridges prevents people from travelling to work or school. Walking was reported to be the most common mode of transport. In many instances, people walk long distances to get to the main roads, where they take lifts to get to shops, clinics, schools, etc. (SRK, 2014).

Figure 6-23: A bridge at the entrance to Richmond 370 KT, and access roads to Gamawela and Pakaneng Choma communities (SRK, 2014)

6.19.11 Access to education and healthcare

Learners in the study area travel long distances to the Mahlagare, Kiwi and Bosfontein Primary Schools. Transport is either on foot, or by a bus provided by the Department of Education. Secondary schools are approximately 12 km and 30 km away, and transport is not provided. The Lydenburg Education Circuit Manager highlighted transportation, lack of school teachers, high drop-out rates and low levels of parental involvement as some of the key challenges in local schools.

Most people living in the study area make use of the local medical facilities. However, many people expressed that the medical facilities are too far away, as they are located in Jane Furse, Mashishing and Burgersfort. In the event of an emergency, an ambulance has to be called from Mashishing. However, due to the poor road conditions, the ambulance is unable to access the villages, and as such, people need to walk or take alternative transport to the main road, where the ambulance waits.

Prevalent illnesses experienced by household members include flu, coughing, diarrhoea and stomach pain (SRK, 2014).

6.19.12 Food security

Food security is an important component in local households, with many reliant on subsistence farming for livelihoods and sustenance. Common forms of subsistence farming include cattle, goats, pigs and sheep, as well as crops and peach orchards (SRK, 2014).

6.19.13 Cultural areas

A common trend in the area is that of each family having the graves of their relatives located in their own property as there is no local cemetery, or community members do not have access to it. The only recreational facility in the study area is a soccer pitch situated in Pakaneng (SRK, 2014).

6.19.14 Community safety

The Maartenshoop Police Station at Shaga is the nearest police station to the study area. Information received from the Station Commander (SRK key informant interview, 2014) was that while the number of reported crimes in the area seemed to be decreasing, copper cable theft, stock theft and drug dealings were still rife. Some of the initiatives mentioned to control crime in the area were police patrols, stop-and-searches and community awareness campaigns. A lack of human resources and difficulties in reaching crime scenes due to poor roads are some of the challenges experiences by the South African Police Service (SAPS) in the area (SRK, 2014).

7 Environmental Impact Assessment

The environmental impact assessment has been undertaken according to SRK's impact assessment methodology which follows international impact assessment principles. This methodology is compliant with the NEMA and MPRDA regulations. This methodology is used as a common, systematic and defensible method of assessing impact significance that will enable comparisons to be made between impacts across different disciplines. It will also enable all relevant parties to understand the process and rationale upon which impacts have been assessed.

The following section explains the principles and approach to SRK's impact assessment methodology.

7.1 Impact Assessment Methodology

7.1.1 Introduction

Generally, an impact assessment is divided into three parts:

- Issue identification – each specialist will be asked to evaluate the 'aspects' arising from the project description and ensure that all issues in their area of expertise have been identified;
- Impact definition – positive and negative impacts associated with these issues (and any others not included) then need to be defined – the definition statement should include the activity (source of impact), aspect and receptor as well as whether the impact is direct, indirect or cumulative. Fatal flaws should also be identified at this stage.
- Impact evaluation – this is not a purely objective and quantitative exercise. It has a subjective element, often using judgement and values as much as science-based criteria and standards. The need therefore exists to clearly explain how impacts have been interpreted so that others can see the weight attached to different factors and can understand the rationale of the assessment.

In order to understand the impact evaluation, the sensitivity of the receiving environment, the effect on the receiving environment and the significance of the impacts needs to be clearly described. These characteristics are summarised in Table 7-1 below.

Table 7-1: Characteristics to be used in impact description

<table>
<tr><th>Characteristics used to describe consequence</th><th>Sub-components</th><th>Terms used to describe the characteristic</th></tr>
<tr><td colspan="2">Type</td><td>Biophysical, social or economic</td></tr>
<tr><td colspan="2">Nature</td><td>Direct or indirect, cumulative etc.</td></tr>
<tr><td colspan="2">Status</td><td>Positive (a benefit), negative (a cost) or neutral</td></tr>
<tr><td colspan="2">Phase of project</td><td>During pre-construction (if applicable e.g. resettlement), construction, operation, decommissioning/post closure</td></tr>
<tr><td colspan="2">Timing</td><td>Immediate, delayed</td></tr>
<tr><td rowspan="3">Magnitude</td><td>Sensitivity of the receiving environment/ receptors</td><td>High, medium or low sensitivity
Low capacity to accommodate the change (impact)/ tolerant of the proposed change</td></tr>
<tr><td>Severity/ intensity (degree of change measured against thresholds and/or professional judgment)</td><td>Gravity/ seriousness of the impact
Intensity/ influence/ power/ strength</td></tr>
<tr><td>Level of stakeholder concern</td><td>High, medium or low levels of concern
All or some stakeholders are concerned about the change</td></tr>
<tr><td colspan="2">Spatial extent or population affected
The area/population affected by the impact
The boundaries at local and regional extents will be different for biophysical and social impacts.</td><td>Area/ volume covered, distribution, population
Site/Local (social impacts should distinguish between site and local), regional, national or international</td></tr>
<tr><td colspan="2">Duration (and reversibility)
Length of time over which an impact occurs and potential for recovery of the endpoint from the impact</td><td>Short term, long term
Intermittent, continuous
Reversible/ irreversibility
Temporary, permanent</td></tr>
</table>

7.1.2 Management recommendations

Practicable management measures will be recommended in as much detail as possible, using the mitigation hierarchy, namely avoid, minimise, mitigate and finally offset. These management measures will be recommended to reduce or avoid the potential impact identified.

7.1.3 Impact significance rating

The impact significance rating process serves two purposes: firstly, it helps to highlight the critical impacts requiring consideration in the management and approval process; secondly, it serves to show the primary impact characteristics, as defined above, used to evaluate impact significance.

The impact significance rating system is presented in Table 7-2 and involves three parts:

- Part A: Define impact consequence using the three primary impact characteristics of magnitude, spatial scale/population and duration;
- Part B: Use the matrix to determine a rating for impact consequence based on the definitions identified in Part A; and
- Part C: Use the matrix to determine the impact significance rating, which is a function of the impact consequence rating (from Part B) and the probability of occurrence.

Table 7-2: Method for rating the significance of impacts

PART A: DEFINING CONSEQUENCE IN TERMS OF MAGNITUDE, DURATION AND SPATIAL SCALE *Use these definitions to define the consequence in Part B*		
Impact characteristics	**Definition**	**Criteria**
MAGNITUDE	Major	Substantial deterioration or harm to receptors; receiving environment has an inherent value to stakeholders; receptors of impact are of conservation importance; or identified threshold often exceeded
	Moderate	Moderate/measurable deterioration or harm to receptors; receiving environment moderately sensitive; or identified threshold occasionally exceeded
	Minor	Minor deterioration (nuisance or minor deterioration) or harm to receptors; change to receiving environment not measurable; or identified threshold never exceeded
	Minor+	Minor improvement; change not measurable; or threshold never exceeded
	Moderate+	Moderate improvement; within or better than the threshold; or no observed reaction
	Major+	Substantial improvement; within or better than the threshold; or favourable publicity
SPATIAL SCALE OR POPULATION	Site or local	Site specific or confined to the immediate project area
	Regional	May be defined in various ways, e.g. cadastral, catchment, topographic
	National/ International	Nationally or beyond
DURATION	Short term	Up to 18 months.
	Medium term	18 months to 5 years
	Long term	Longer than 5 years

PART B: DETERMINING CONSEQUENCE RATING *Rate consequence based on definition of magnitude, spatial extent and duration*					
			SPATIAL SCALE/ POPULATION		
			Site or Local	**Regional**	**National/ international**
MAGNITUDE					
Minor	**DURATION**	**Long term**	Medium	Medium	High
		Medium term	Low	Low	Medium
		Short term	Low	Low	Medium
Moderate	**DURATION**	**Long term**	Medium	High	High
		Medium term	Medium	Medium	High
		Short term	Low	Medium	Medium
Major	**DURATION**	**Long term**	High	High	High

		Medium term	Medium	Medium	High
		Short term	Medium	Medium	High
PART C: DETERMINING SIGNIFICANCE RATING ***Rate significance based on consequence and probability***					
			CONSEQUENCE		
			Low	**Medium**	**High**
PROBABILITY (of exposure to impacts)		**Definite**	Medium	Medium	High
		Possible	Low	Medium	High
		Unlikely	Low	Low	Medium

Using the matrix, the significance of each described impact is initially rated. This rating assumes the management measures inherent in the Project design, are in place.

The impacts have been identified per project phase, namely Construction, Operation and Decommissioning and Closure.

7.2 Construction Phase

The activities envisaged during the Construction Phase can be seen in Table 7-3.

Table 7-3: Construction activities at Der Brochen

Activity	Activity Description	Reference Table
Construction of the Northern and Southern Open Pits	• The Northern Pit will occupy 47 ha of land (including WRDs with a combined area of 16 ha) and the Southern pit will occupy 45 ha (including WRDs with a combined capacity of 18 ha). A total of 92 ha will be cleared for the proposed Open Pits and associated WRDs. • During the Construction Phase, the contractors lay down area will be established. • Vegetation will be stripped and topsoil will be stockpiled.	Table 7-4
Construction of the Co-Disposal Facility	• The Co-Disposal Facility will be constructed over the backfilled (with tailings) Northern Pit. • Waste rock from the Northern open pit will be used as an embankment for the proposed Co-Disposal Facility and will be constructed in the Operational Phase of the Northern open pit. • Should the Co-Disposal Facility be deemed not feasible, waste rock from the Northern pit will be backfilled into the pit.	Table 7-5
Construction of the Mareesburg TSF	• The TSF will be developed to the east of the processing plant on the farm Mareesburg. • The footprint of the TSF will be 150 hectares, which will be cleared (including the RWD). • During construction, starter walls will be constructed to an approximate height of 15 m. • A blanket drain will be constructed to collect seepage water during development. • A RWD will also be constructed downslope and west of the TSF.	Table 7-6
Construction of the Mareesburg Pipeline	• Two Pipelines will be constructed. One Pipeline will transport tailings material from Mototolo Concentrator and the other Pipeline will transport return water from Mareesburg to the Concentrator. • There will be several river crossings across various tributaries and rivers. • A maintenance road will be constructed alongside the Pipeline route.	Table 7-7
Removal of the existing 132kV Powerline Route and construction of the Powerline on the proposed new route	• The existing powerline runs along the western side of the Groot-Dwars River. It will be removed and re-routed to accommodate the proposed Southern Pit. • The existing 132kV powerline will be re-routed to run along the eastern side of the Groot-Dwars River. • This activity will be undertaken by ESKOM.	Table 7-8

7.2.1 Construction of the Northern and Southern Open Pits

Table 7-4 describes and rates the potential impacts with the construction of the Open Pits.

Table 7-4: Impacts associated with the Construction of the Open Pits (North and South Pits)

Construction of the Northern and Southern Open Pits					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
	Geology				
	No impacts are envisaged during the Construction Phase.				
	Topography				
	No impacts are envisaged during the Construction Phase.				
	Soils, land capability and land use				
C1	**Loss of soil resources due to clearing activities** Due to the preparation for open pit mining, soils resources will be lost during vegetation clearing and stockpiling of topsoil. An area of 58 ha is expected to be cleared and topsoil stockpiled. The Project area is characterised by Mispah, Arcadia, Glenrosa, Hutton and Clovelly soils, all which have grazing land capabilities. However no grazing or agricultural practices are currently taking place in the area and therefore if managed, will be	• Magnitude: Moderate • Duration: Long term • Scale: Site specific • Consequence: Medium • Probability: Definite Significance: **MEDIUM (-)**	• Soils should be stripped and stockpiled for use during rehabilitation.	• Magnitude: Moderate • Duration: Long term • Scale: Site specific • Consequence: Medium • Probability: Unlikely Significance: **LOW (-)**	New impact.

Construction of the Northern and Southern Open Pits					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
	a low impact.				
C2	**Contamination of soil resource due to hydrocarbon spills during construction** The potential contamination of soils as a result of hydrocarbon spills from construction vehicles.	• Magnitude: Moderate • Duration: Long term • Scale: Site specific • Consequence: Medium • Probability: Possible Significance: **MEDIUM (-)**	• Conduct daily site inspections to detect leaks on equipment which may lead to hydrocarbon spills. • Regular maintenance of vehicles. • Placement of drip trays under vehicles when parked and during fuel transfer. • Undertake on-site bioremediation or remove contaminated soils and dispose of at a licensed hazardous waste storage facility.	• Magnitude: Minor • Duration: Short term • Scale: Site specific • Consequence: Low • Probability: Unlikely Significance: **LOW (-)**	New impact.
	Biodiversity				
C3	**Removal and loss of vegetation communities with a High / Medium- High Significance including wetland/ephemeral systems** Removal /loss of vegetation communities as well as a change to community structure within and surrounding the	• Magnitude: Moderate • Duration: Long term • Scale: Regional • Consequence: High • Probability: Definite Significance: **HIGH (-)**	• The Open Pit footprint areas should be clearly marked to contain activities within the designated area. • Prior to construction, fences should be erected surrounding each footprint area to prevent further destruction of the surrounding	• Magnitude: Moderate • Duration: Long term • Scale: Regional • Consequence: High • Probability: Definite Significance: **HIGH (-)**	Der Brochen Platinum Mine Floristic Assessment (Natural Scientific Services (NSS) Report 1995, May 2014)

Construction of the Northern and Southern Open Pits					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
	activity. Removal/destruction of CI species such as numerous SCE endemics and Protected species including species such as the Not Threatened (NT) species *Jamesbrittenia macrantha* and DDT species *Myrothamnus flabellifolius Welw,* as well as endemic/near endemic species. Possibly *Resnova af. pillosa* within the drainage lines. This will result in a regional impact due to the fact that the Der Brochen Project lies within the SCPE, which is considered a conservational area of importance.		vegetation communities, specifically near the riparian areas (i.e. off road driving affects vegetation community structure as well as faunal habitat). • Consideration will be given to the harvesting of vegetation (trees and medicinal plants) by stakeholders prior to final stripping of vegetation. Such a programme will be developed in consultation with stakeholders and access to the mine area will be controlled by RPM. • Raise biodiversity awareness with construction crew and Environmental Control Officer (ECO) on site through induction and training. • All CI species identified within the footprint of the Open Pits that can grow successfully *ex situ* must be translocated and the necessary permits must be applied for.		

Construction of the Northern and Southern Open Pits					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
C4	**Increase in alien invasive species impacting on natural plant community structures** An increase in alien invasive species, impacting on plant community structure as a result of the removal of vegetation and storage of topsoil stockpiles.	• Magnitude: Moderate • Duration: Long term • Scale: Regional • Consequence: High • Probability: Possible Significance: **HIGH (-)**	• Ensure excavation equipment entering the site are cleaned and free of any seed propagules (this includes soil imports into the area-certificates required from source). • An Alien Invasive Management Plan is required for all current and future operations. • Educate the Construction crew on the identification and eradication of the top 10 alien species found within the area. Create an induction programme at commencement of the project.	• Magnitude: Minor • Duration: Long term • Scale: Local • Consequence: Medium • Probability: Possible Significance: **MEDIUM (-)**	Der Brochen Platinum Mine Floristic Assessment (Natural Scientific Services (NSS) Report 1995, May 2014)
	Wetlands				
C5	**Increase in erosion and sediment loads** Site clearing and grubbing of the footprint area associated with the Open Pits may result in an increased potential for erosion, leading to increased sediments	• Magnitude: Moderate • Duration: Short term • Scale: Local • Consequence: Low • Probability: Definite	• Clearly demarcate areas to be cleared and ensure that vegetation clearing only occurs within the demarcated areas. • Ensure that erosion management and sediment	• Magnitude: Moderate • Duration: Short term • Scale: Local • Consequence: Low • Probability: Possible	Wetland and Aquatic Ecological Assessment for the Proposed Anglo Platinum Der Brochen Project, Limpopo Province (Scientific Aquatic Services (SAS), SAS Report No.

Construction of the Northern and Southern Open Pits					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
	loads entering the drainage line and riparian habitats. This may result in the loss of wetland habitat and ecoservices, impacting on hydrology and sediment balance.	Significance: **MEDIUM (-)**	controls are strictly implemented from the beginning of site clearing activities.	Significance: **LOW (-)**	214035, April 2014.
C6	**Impact on riparian zones** Vegetation removal and increased surface area of impermeable surfaces leading to increased risk of erosion, as well as disturbance to soil as a result of movement of motor vehicles within or near drainage lines/ riparian zone.	• Magnitude: Moderate • Duration: Short term • Scale: Local • Consequence: Low • Probability: Definite Significance: **MEDIUM (-)**	• Ensure that contractor laydown areas are included in the initial areas demarcated for clearing, to minimise vegetation loss. • Contractor laydown areas should not encroach into drainage line / riparian areas or their respective buffer zones. • Vehicles must remain on demarcated roads and not encroach into drainage line / riparian areas or their respective buffer zones.	• Magnitude: Minor • Duration: Short term • Scale: Local • Consequence: Low • Probability: Possible Significance: **LOW (-)**	Wetland and Aquatic Ecological Assessment for the Proposed Anglo Platinum Der Brochen Project, Limpopo Province (Scientific Aquatic Services (SAS), SAS Report No. 214035, April 2014.
C7	**Impact on drainage line vegetation habitats** The drainage lines will be impacted upon due to removal of drainage line habitat during	• Magnitude: Moderate • Duration: Long term • Scale: Regional • Consequence: High	• Where possible, infrastructure should be placed outside of drainage line areas to reduce loss of habitats. • Topsoil stockpiles must not	• Magnitude: Moderate • Duration: Short term • Scale: Local • Consequence: Low	Wetland and Aquatic Ecological Assessment for the Proposed Anglo Platinum Der Brochen Project, Limpopo Province (Scientific

Construction of the Northern and Southern Open Pits					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
	construction-related earthworks. This will lead to an increased risk of erosion due to substantial disturbances to soils as a result of earthworks and movement of construction vehicles. The stockpiling of topsoil may increase the risk of sediment deposition into adjacent drainage lines / riparian areas.	• Probability: Definite Significance: **HIGH (-)**	be placed directly adjacent to drainage line or riparian features and measures such as berms and hessian curtains must be implemented to prevent erosion and sedimentation. • Clear separation of clean and Dirty water must take place and diversion of clean water around operational areas must ensure minimisation of the loss of catchment yield.	• Probability: Possible Significance: **LOW (-)**	Aquatic Services (SAS), SAS Report No. 214035, April 2014.
	Surface water				
C8	**Increase in erosion from areas of exposed soils during site clearing and grubbing** An increase in erosion from cleared areas, topsoil stockpiles or any other area where there are exposed soils can occur during storm events (direct impact). Increased erosion can result in an increase in turbidity, suspended solids and sedimentation in the Groot-Dwars River and tributaries (indirect and cumulative impact).	• Magnitude: Moderate • Duration: Short term • Scale: Regional • Consequence: Medium • Probability: Possible Significance: **MEDIUM (-)**	• Flood protection berms should be constructed at the area where the Southern pit footprint falls within the 1:100 year floodline. • Erosion control measures in the form of temporary erosion prevention berms should be implemented during construction. • Clean water diversion bunds should be constructed upstream of the construction	• Magnitude: Minor • Duration: Short term • Scale: Local • Consequence: Low • Probability: Possible Significance: **LOW (-)**	Der Brochen Project Environmental Impact Assessment/ Environmental Management Plan Amendment and Alignment: Surface Water Specialist Report (SRK Report No. 469113/SW, October 2014)

Construction of the Northern and Southern Open Pits					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
			site prior to clearing areas for new infrastructure. • Paddocks should be constructed downstream of the working activities to minimise uncontrolled runoff from the site. • Areas disturbed by construction activities should be rehabilitated immediately on completion of construction of each area.		
C9	**Increased potential for damming and flooding and subsequent damage to property and infrastructure due to increased hard-standing areas** Provision of hardstanding areas will reduce infiltration and increase the volume and velocity of stormwater runoff with subsequent potential for damming of water and flooding. Increased runoff velocity and volume could increase the potential for erosion.	• Magnitude: Moderate • Duration: Short term • Scale: Local • Consequence: Low • Probability: Possible Significance: **LOW (-)**	• Stormwater measures should be appropriately designed to allow for free flow of water. • Areas should be appropriately graded to prevent ponding.	• Magnitude: Minor • Duration: Short term • Scale: Local • Consequence: Low • Probability: Possible Significance: **LOW (-)**	Der Brochen Project Environmental Impact Assessment/ Environmental Management Plan Amendment and Alignment: Surface Water Specialist Report (SRK Report No. 469113/SW, October 2014)

Construction of the Northern and Southern Open Pits					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
C10	**Deterioration in surface water quality due to spillages and accidental discharges** Spillages and accidental discharges could result in the contamination of surface water resources. Localised accidental spillages of hydrocarbons (diesel, oils etc.) from earthmoving and construction equipment, hazardous substances (ammonia nitrates for blasting) and other potentially polluting materials including human waste, could result in contaminated runoff. This could result in indirect contamination of the surface water resources down gradient of the contractor laydown area.	• Magnitude: Moderate • Duration: Short term • Scale: Local • Consequence: Low • Probability: Possible Significance: **LOW (-)**	• Clean water diversions should be constructed prior to clearing areas for new infrastructure. • Hazardous substances and potentially polluting materials (hydrocarbons) should be stored in appropriately bunded areas located outside of the riparian zone. Bunds should be designed for a capacity of 110% of the stored material. • Servicing and maintenance of vehicles and equipment should be done outside the riparian zone in appropriate facilities designed for this purpose. • Contractors should be adequately trained in handling of hazardous substances and potentially polluting materials especially during transport in the vicinity of the riparian zone, e.g. over river crossings.	• Magnitude: Minor • Duration: Short term • Scale: Local • Consequence: Low • Probability: Possible Significance: **LOW (-)**	Der Brochen Project Environmental Impact Assessment/ Environmental Management Plan Amendment and Alignment: Surface Water Specialist Report (SRK Report No. 469113/SW, October 2014)

Construction of the Northern and Southern Open Pits					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
			• Contractors should be made aware of the WUL conditions that apply during construction and made liable for environmental damages caused by spillages. • Emergency action plans should be drawn up to deal with spillages. • Contaminated runoff should be contained and reused as necessary e.g. for dust suppression. • Chemical toilets should be provided at construction sites.		
C11	**Alteration of catchment hydrology causing change in watercourse functionality and increased risk of flooding and scouring** Due to placement of infrastructure within drainage lines and containment of dirty runoff in the box cut., changes to surface water hydrology may occur. Surface drainage paths exist	• Magnitude: Moderate • Duration: Long term • Scale: Regional • Consequence: Medium • Probability: Definite Significance: **MEDIUM (-)**	• Runoff from the catchment should be diverted away from the open pit areas by cut-off channels and diversion berms designed to handle the 1:50 year storm event. • Energy dissipaters should be constructed in areas of concentrated flows. • Routine inspections and maintenance should be	• Magnitude: Moderate • Duration: Long term • Scale: Local • Consequence: Medium • Probability: Definite Significance: **MEDIUM (-)**	Der Brochen Project Environmental Impact Assessment/ Environmental Management Plan Amendment and Alignment: Surface Water Specialist Report (SRK Report No. 469113/SW, October 2014)

Construction of the Northern and Southern Open Pits					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
	within the footprint area of the open pit and Co-Disposal Facility which capture water during rainfall events.		conducted to keep the diversions free of debris (silt build up, vegetation etc.) and areas suitably graded.		
	Groundwater				
	No impacts are envisaged during the Construction Phase.				
	Air Quality				
C12	**Increase in nuisance dust potentially impacting sensitive receptors** Dust will be generated by construction activities. Exposed surfaces from the removal of vegetation are susceptible to erosional forces including wind. Construction vehicles and machinery moving along roads will generate dust. The Leshaba household lies approximately 5 kms from the proposed Pits area and were identified as the nearest sensitive receptors. It is expected that there will be a low impact due to the distance from the Pits and dominant wind direction.	• Magnitude: Minor • Duration: Short term • Scale: Local • Consequence: Low • Probability: Possible • Significance: **LOW (-)**	• Dust suppression where feasible on stockpiles and materials handling activities. • Dust suppression or chemical stabilization of unpaved roads. • Haul trucks to be restricted to specified haul roads. • Speed limit on unpaved roads not to exceed 40 km/hr. • Stabilisation of unpaved roads (chemical, rock cladding or vegetative).	• Magnitude: Minor • Duration: Short term • Scale: Local • Consequence: Low • Probability: Unlikely Significance: **LOW (-)**	Air Quality Specialist Report for the Der Brochen EMP Alignment and Amendment (Airshed Report No. 13SRK25, September 2014)

Construction of the Northern and Southern Open Pits					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
	Noise				
C13	**Increase in ambient noise levels potentially affecting community well-being** During construction, there is an expected increase in ambient noise levels as a result of clearing, activities and vehicles. However, this impact is likely to be low due to the distance of the closest sensitive receptor (Leshaba household, 5 kms).	• Magnitude: Minor • Duration: Short term • Scale: Local • Consequence: Low • Probability: Possible Significance: **LOW (-)**	• Construction activities will be confined to daylight hours. • Construction vehicles will be serviced at regular intervals to minimise noise generation.	• Magnitude: Minor • Duration: Short term • Scale: Local • Consequence: Low • Probability: Unlikely Significance: **LOW (-)**	Noise Impact Study for Environmental Impact Assessment (M^2 Environmental Connections cc, February 2012)
	Cultural heritage				
C14	**Demolition or relocation of cultural heritage sites resulting in the disturbance of significant sites and graves** Several heritage sites with medium to high significance have been identified within the proposed Open Pits footprint areas. These include cemeteries, pot shards and ruins (hotel complex) (Refer to Table 6-24 in Chapter 6). The clearing and construction	• Magnitude: Major • Duration: Long term • Scale: Local • Consequence: High • Probability: Definite Significance: **HIGH (-)**	• Graves within cemeteries in the footprint area are to be removed and relocated, and must be removed and reburied following the mandated procedure by a qualified Archaeologist. • Heritage sites within the footprint area rated low to high significance, require a permit from SAHRA for the demolishment thereof. • The necessary permits for grave relocation must be	• Magnitude: Moderate • Duration: Long term • Scale: Local • Consequence: Medium • Probability: Definite Significance: **MEDIUM (-)**	Der Brochen Project and Mototolo Complex- An Integrated Report prepared for Anglo American Platinum Limited (Archaeological Resources Management, April 2012)

Construction of the Northern and Southern Open Pits					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
	activities will impact on the identified significant sites, as they will have to be demolished or relocated.		obtained from the South African Heritage Resources Agency (SAHRA). • Refer to Table 6-24 in Chapter 6 of this report for identified heritage sites and associated significance ratings. • The identified ruins (hotel complex (AA110)) should be mapped by a qualified Archaeologist and permits should be obtained prior to demolishment. • Undertake a Phase 2 Heritage Impact Assessment to further assess heritage sites found within the development footprint.		
	Visual				
C15	**Decrease in visual aesthetics of the area** The Open Pits cover an area of 58 ha, from which vegetation will be removed and topsoil stockpiled. This is likely to have an impact on the natural	• Magnitude: Moderate • Duration: Long term • Scale: Local • Consequence: Medium • Probability: Definite	• Minimise vegetation clearing to the demarcated footprint area of the Open Pits.	• Magnitude: Moderate • Duration: Long term • Scale: Local • Consequence: Medium • Probability: Definite	New impact.

Construction of the Northern and Southern Open Pits					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
	aesthetics of the environment.	Significance: **MEDIUM (-)**		Significance: **MEDIUM (-)**	
	Traffic and transportation				
C16	**Increased generation of traffic on existing road networks potentially resulting in an increase in road traffic** Construction activities will generate additional traffic along the Mine Access Road, the R557, D1261 and the R555 as well as some other roads within the study area. Although there will be an increase in traffic flows along these roads, the increase is rated low and the road network capacity can accommodate the expected increase due to the relatively low existing traffic flows on these roads compared to their capacity.	• Magnitude: Minor • Duration: Short term • Scale: Regional • Consequence: Low • Probability: Possible Significance: **LOW (-)**	• Traffic conditions to be monitored annually, should traffic congestion increase, appropriate mitigation measures will need to be explored and implemented.	• Magnitude: Minor • Duration: Short term • Scale: Regional • Consequence: Low • Probability: Unlikely Significance: **LOW (-)**	Specialist Traffic and Transportation Study for the Proposed EMP Alignment and Amendment of the Der Brochen Project to include open cast mining, tailings storage facilities and associated infrastructure (Aurecon, Report No. 9522, October 2014)
C17	**Impact on pedestrians and cyclists** The increase in light and heavy vehicles generated by Construction activities will have minimal impact on the existing	• Magnitude: Minor • Duration: Short term • Scale: Regional • Consequence: Low	• None required	• Magnitude: Minor • Duration: Short term • Scale: Regional • Consequence: Low	Specialist Traffic and Transportation Study for the Proposed EMP Alignment and Amendment of the Der Brochen Project to

Construction of the Northern and Southern Open Pits					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
	road space available for pedestrians and cyclists. There is minimal pedestrian activity and no cycle activity in the immediate vicinity of the Der Brochen Project.	• Probability: Possible Significance: **LOW (-)**		• Probability: Unlikely Significance: **LOW (-)**	include open cast mining, tailings storage facilities and associated infrastructure (Aurecon, Report No. 9522, October 2014)
C18	**Impact on road safety conditions resulting in a potential increase in road accidents** The increase in traffic generated is expected to have an increase in heavy vehicle traffic flows on the surrounding road network. Heavy vehicles have been identified as one of the major causes of accidents and incidents including fatalities on this road network.	• Magnitude: Minor • Duration: Short term • Scale: Regional • Consequence: Low • Probability: Possible Significance: **LOW (-)**	• Drivers of heavy construction vehicles should attend a road safety and driving course to sensitise them to the impact they have on driving conditions for other drivers on the road.	• Magnitude: Minor • Duration: Short term • Scale: Regional • Consequence: Low • Probability: Unlikely Significance: **LOW (-)**	Specialist Traffic and Transportation Study for the Proposed EMP Alignment and Amendment of the Der Brochen Project to include open cast mining, tailings storage facilities and associated infrastructure (Aurecon, Report No. 9522, October 2014)
C19	**Decreased condition of the road network** The increase in heavy vehicles will accelerate the deterioration of the R555 and R557 roads as the result of heavy vehicles using this road network during	• Magnitude: Minor • Duration: Short term • Scale: Regional • Consequence: Low • Probability: Possible	• A standard operating procedure is developed for all mine drivers to identify and report potholes and edge breaks to the operations manager who in turn will report it to the relevant	• Magnitude: Minor • Duration: Short term • Scale: Regional • Consequence: Low • Probability: Possible	Specialist Traffic and Transportation Study for the Proposed EMP Alignment and Amendment of the Der Brochen Project to include open cast mining, tailings storage

Construction of the Northern and Southern Open Pits					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
	construction.	Significance: **LOW (-)**	authorities.	Significance: **LOW (-)**	facilities and associated infrastructure (Aurecon, Report No. 9522, October 2014)

7.2.2 Construction of the Co-Disposal Facility

Table 7-5 describes and rates the potential impacts with the construction of the Co-Disposal Facility.

Table 7-5: Impacts associated with the Construction of the Co-Disposal Facility

Construction of the Co-Disposal Facility					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
	Geology				
	No impacts are envisaged during the Construction Phase.				
	Topography				
	No impacts are envisaged during the Construction Phase.				
	Soils, land capability and land use				
C20	Refer to Table 7-4, Impact Reference C1 and C2 for impacts associated with the Construction Phase. An additional area of 35 ha will be cleared for the Construction of the Co-Disposal Facility. The total footprint of the Co-Disposal Facility will be 60 ha.				
C21					
	Biodiversity				
C22	Refer to Table 7-4, Impact Reference C3 and C4 for impacts associated with the Construction Phase. An area of 30 ha will be cleared for the Construction of the Co-Disposal Facility.				
C23					
	Wetlands				
C24	Refer to Table 7-4, Impact Reference C5 and C6 for impacts associated with the Construction Phase.				
C25					
C26	**Loss of habitat and increased erosion during construction of the starter wall**	• Magnitude: Moderate • Duration: Long term	• Wherever possible, infrastructure should be placed outside of drainage line areas to reduce loss of	• Magnitude: Moderate • Duration: Long term	Wetland and Aquatic Ecological Assessment for the Proposed Anglo Platinum Der Brochen

Construction of the Co-Disposal Facility					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
	Earthworks within and in the vicinity of drainage line / riparian features, leading to loss of habitat, increased erosion and sedimentation of adjacent features. Disturbances of soils due to earthworks and movement of construction vehicles leading to increased risk of erosion and sedimentation	• Scale: Local • Consequence: Medium • Probability: Definite Significance: **MEDIUM (-)**	habitats. • Topsoil stockpiles must not be placed directly adjacent to drainage line or riparian features and measures such as berms and hessian curtains must be implemented to prevent erosion and sedimentation.	• Scale: Local • Consequence: Medium • Probability: Definite Significance: **MEDIUM (-)**	Project, Limpopo Province (Scientific Aquatic Services (SAS), SAS Report No. 214035, April 2014.
	Surface water				
C27	Refer to Table 7-4, Impact Reference C8, C9 and C10 for impacts associated with the Construction Phase.				
C28					
C29					
C30	**Alteration of catchment hydrology causing change in watercourse functionality and increased risk of flooding and scouring** Changes to surface water hydrology could result due to placement of infrastructure within drainage lines and containment of dirty runoff in the	• Magnitude: Moderate • Duration: Long term • Scale: Regional • Consequence: Medium • Probability: Definite Significance: **MEDIUM (-)**	• Runoff from the catchment should be diverted away from the open pit areas by cut-off channels and diversion berms designed to handle the 1:50 year storm event. • Energy dissipaters should be constructed in areas of concentrated flows. • Routine inspections and	• Magnitude: Moderate • Duration: Long term • Scale: Local • Consequence: Medium • Probability: Definite Significance: **MEDIUM (-)**	Der Brochen Project Environmental Impact Assessment/ Environmental Management Plan Amendment and Alignment: Surface Water Specialist Report (SRK Report No. 469113/SW, October

Construction of the Co-Disposal Facility					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
	Co-Disposal area. Surface drainage paths exist within the footprint area of the Co-Disposal Facility which capture water during rainfall events.		maintenance should be conducted to keep the diversions free of debris (silt build up, vegetation etc.) and areas suitably graded.		2014)
C31	**Deterioration of surface water quality due to use of waste rock in construction** It is expected that there may be a potential impact arising from the generation of contaminated runoff from the use of waste rock in construction. Although leachate from the waste rock is generally considered to be non-acid generating, trace elements aluminium and iron were found to exceed the SANS241: 2011 drinking water limits in several standards, and manganese was found to exceed the stringent WUL limit of 0.07 mg/l but complied with the SANS241: 2011 limit.	• Magnitude: Minor • Duration: Long term • Scale: Local • Consequence: Medium • Probability: Possible Significance: **MEDIUM (-)**	• Dirty water that is generated should be contained on site for reuse. • Provide chemical toilets at construction sites.	• Magnitude: Moderate • Duration: Long term • Scale: Local • Consequence: Medium • Probability: Unlikely Significance: **LOW (-)**	Der Brochen Project Environmental Impact Assessment/ Environmental Management Plan Amendment and Alignment: Surface Water Specialist Report (SRK Report No. 469113/SW, October 2014)
	Groundwater				
	No impacts are envisaged during the Construction Phase.				

Construction of the Co-Disposal Facility					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
	Air Quality				
C32	Refer to Table 7-4, Impact Reference C12, for air quality impacts associated with the Construction Phase.				
	Noise				
C33	Refer to Table 7-4, Impact Reference C13, for air quality impacts associated with the Construction Phase.				
	Cultural heritage				
C34	Refer to Table 7-4, Impact Reference C14, for air quality impacts associated with the Construction Phase.				
	Visual				
C35	**Decrease in visual aesthetics of the area** The Co-Disposal Facility will cover an area of an additional 35 ha from which vegetation will be removed and topsoil stockpiled. This is likely to have an impact on the natural aesthetics of the environment.	• Magnitude: Moderate • Duration: Long term • Scale: Local • Consequence: Medium • Probability: Definite Significance: **MEDIUM (-)**	• Minimise vegetation clearing to the demarcated footprint area of the Co-Disposal Facility.	• Magnitude: Moderate • Duration: Long term • Scale: Local • Consequence: Medium • Probability: Definite Significance: **MEDIUM (-)**	New impact.
	Traffic and transportation				
C36	Refer to Table 7-4, Impact Reference C16, C17, C18 and C19 for impacts associated with the Construction Phase.				
C37					
C38					
C39					

7.2.3 Construction of the Mareesburg TSF

The potential impacts associated with the construction of the Mareesburg TSF and Return Water Pipeline can be seen in Table 7-6. Environmental and social impacts have been identified from the original 2002 Der Brochen EMP (SRK Consulting Report No. 295606/4/ November 2002) and have been updated to reflect the impact of the Mareesburg TSF on the current baseline environment.

Impacts and associated management measures from the previous Der Brochen EMPs will be italicised in the impact tables below. All new impacts and new/ updated management measures, as well as impacts identified by specialists will remain in normal font.

Table 7-6: Impacts associated with the Construction of the Mareesburg TSF and associated Return Water Pipeline

Construction of the Mareesburg TSF					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
	Geology				
	No impacts are envisaged for the Construction Phase.				
	Topography				
	No impacts are envisaged for the Construction Phase.				
	Soils, land capability and land use				
C40	***Loss of soil resources at sites where Tailings Dam starter walls will be located*** *General clearing of vegetation and stripping of soil will lead to loss/disturbance of usable soil (existing grazing and arable land). A total area of 150 ha will be cleared for the Tailings Dam complex, resulting in a significant loss of soil resource.* *The dominant soils found on site*	• *Magnitude: Moderate* • *Duration: Long term* • *Scale: Site specific* • *Consequence: High* • *Probability: Definite* *Significance: **HIGH (-)***	• *Rehabilitation of soils.* • *Soil will only be cleared from those areas to be affected immediately by construction.* • Soil for the purpose of rehabilitation will be stripped from cleared areas that can be rehabilitated soon after construction activities have been completed. This soil will be stockpiled and stored.	• *Magnitude: Moderate* • *Duration: Long term* • *Scale: Site specific* • *Consequence: Medium* • *Probability: Possible* *Significance: **MEDIUM (-)***	*Environmental Management Programme Report for the Der Brochen Mine Volume 1 of 3 (SRK Consulting Report No. 295606/4/ November 2002)*

Construction of the Mareesburg TSF					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
	include Mispah (with high percentage of rock outcrops), Glenrosa and Arcadia. All these soils have a high inherent fertility and moderate erodibility.		• Construction of water management infrastructure will commence prior to the Tailings Storage Facility to prevent soil erosion.		
C41	***Loss of land of arable/grazing potential*** *Clearing of the TSF site will lead to loss of land of arable potential and grazing potential and an associated general loss of agricultural production potential.* *74% of the 120 ha of the Tailings Dam site has grazing potential (88.4 ha), as well as 3.9% of arable land (4.7 ha). The remainder of the Mareesburg site consists of erosion and streambeds.*	• *Magnitude: Moderate* • *Duration: Long term* • *Scale: Site specific* • *Consequence: High* • *Probability: Definite* *Significance:* ***HIGH (-)***	• The footprint extent of the project has been designed to where possible, only impact on the Tailings Storage Facility and associated infrastructure. • Minimise the area that can be potentially impacted on (eroded, compacted, sterilised or de-nutrified).	• *Magnitude: Moderate* • *Duration: Long term* • *Scale: Site specific* • *Consequence: Medium* • *Probability: Possible* *Significance:* ***MEDIUM (-)***	*Environmental Management Programme Report for the Der Brochen Mine Volume 1 of 3 (SRK Consulting Report No. 295606/4/ November 2002)*
	Biodiversity				
C42	***Loss of natural habitat*** *General clearing of the area for the construction of the Mareesburg TSF resulting in noise and dust will lead to the disturbance and loss of surrounding habitats, as well as*	• *Magnitude: Major* • *Duration: Long term* • *Scale: Regional* • *Consequence: High* • *Probability: Definite*	• *The area of land disturbed and isolated for the purpose of construction, mining and processing activities will be limited, as far as is practical, to the minimum required for safe and efficient operation*	• *Magnitude: Moderate* • *Duration: Long term* • *Scale: Regional* • *Consequence: High* • *Probability: Possible*	*Environmental Management Programme Report for the Der Brochen Mine Volume 1 of 3 (SRK Consulting Report No. 295606/4/ November*

Construction of the Mareesburg TSF					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
	inhibit movement of animals within these habitats. *As the Der Brochen Project area falls within the Sekhukuneland Centre of Endemism (SCE), habitats have a high sensitivity and conservation status. Due to the various individual mining developments in the area, cumulatively this may lead to habitat loss or species and endangerment.*	*Significance: **HIGH (-)***	• *No unnecessary destruction of vegetation will be allowed and, in particular, construction workers will not be allowed to harvest any trees for use as firewood or any other purpose.* • The required biodiversity specialists has surveyed the marked out surface infrastructure in detail prior to clearing to identify plants (number and location) ahead of clearing for purposes of the permit applications. • The necessary permits will be obtained before any clearing of the site takes place. • Plants that are to be translocated for conservation purposes will be removed under the guidance of a recognized taxonomist/ecologist and planted in a conservation area of similar habitat. • Plants that are to be removed for rehabilitation purposes will	*Significance: **HIGH (-)***	*2002)*

Construction of the Mareesburg TSF					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
			be removed and replanted in a nursery under the guidance of a recognized landscaper. The mine should be responsible for the operation of the nursery until such time as rehabilitation has been completed.		
C43	***Disturbance/loss of vegetation species and communities of conservation importance, loss of biodiversity and the risk of losing unknown biodiversity due to clearing of vegetation*** *Clearing of the area for construction of the Mareesburg TSF will lead to destruction of vegetation, as well as possible loss of plant diversity and important plant communities within the immediate TSF footprint.*	• *Magnitude: Moderate* • *Duration: Long term* • *Scale: Regional* • *Consequence: High* • *Probability: Definite* *Significance: **HIGH (-)***	• *Any decisions regarding the fate of populations of these priority species will only be made after consultation with the vegetation specialists.* • *Vegetation specialists will be employed to identify individual specimens or populations for possible relocation. Specialists will be involved in establishing a relocation procedure that will include timing and selecting new locations for the plants.* • The necessary permits for removal of CI plants sould be obtained before any clearing of the site takes place. • Plants that are to be	• *Magnitude: Moderate* • *Duration: Long term* • *Scale: Regional* • *Consequence: High* • *Probability: Possible* *Significance: **HIGH (-)***	*Environmental Management Programme Report for the Der Brochen Mine Volume 1 of 3 (SRK Consulting Report No. 295606/4/ November 2002)*

Construction of the Mareesburg TSF					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
			translocated for conservation purposes will be removed under the guidance of a recognized taxonomist/ecologist and planted in a conservation area of similar habitat. • Plants that are to be removed for rehabilitation purposes will be removed and replanted in a nursery under the guidance of a recognized landscaper. The mine should be responsible for the operation of the nursery until such time as rehabilitation has been completed.		
C44	***Displacement or disturbance of animal life (and their migration paths) as a result of construction activities*** *Site clearance will lead to a disturbance of the fauna on site. Herpetofauna, birds, small mammals and insects will be displaced locally due to an increase in dust, noise and illumination during construction*	• *Magnitude: Moderate* • *Duration: Long term* • *Scale: Site specific* • *Consequence: Medium* • *Probability: Definite* *Significance: **MEDIUM (-)***	• *The area of habitat disturbed and isolated for the purpose of mining and processing activities will be limited, as far as is practical, to the minimum required for safe and efficient operation.* • The Mareesburg TSF footprint area should be clearly demarcated to contain construction activities within	• *Magnitude: Minor* • *Duration: Long term* • *Scale: Site specific* • *Consequence: Medium* • *Probability: Possible* *Significance: **MEDIUM (-)***	*Environmental Management Programme Report for the Der Brochen Mine Volume 1 of 3 (SRK Consulting Report No. 295606/4/ November 2002)*

Construction of the Mareesburg TSF					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
	of the Mareesburg TSF.		the designated area. • Create biodiversity awareness with construction crew and ECO on site.		
C45	***Disturbance/loss of insect species/communities of conservation value due to loss of habitat and habitat fragmentation*** *Increased dust, fuel emissions and loss of habitat during construction may lead to the disturbance and possible loss of cicadas, Pycna sylvia species.*	• *Magnitude: Major* • *Duration: Long term* • *Scale: Site specific* • *Consequence: High* • *Probability: Definite* *Significance: **HIGH (-)***	• *Following construction, all disturbed areas will be rehabilitated.* • *The cicada population will be monitored during the mining phases. The mine is participating in ongoing studies of the invertebrate fauna.* • If possible, Vitex species identified within the footprint of the Mareesburg TSF should be translocated.	• *Magnitude: Moderate* • *Duration: Long term* • *Scale: Site specific* • *Consequence: Medium* • *Probability: Definite* *Significance: **MEDIUM (-)***	*Environmental Management Programme Report for the Der Brochen Mine Volume 1 of 3 (SRK Consulting Report No. 295606/4/ November 2002)*
C46	**Loss of communities that have a National, Provincial and Local significance and Conservation Importance species** The clearing of vegetation will result in the loss of vegetation communities that cannot be successfully rehabilitated and	• Magnitude: Major • Duration: Long term • Scale: National • Consequence: High • Probability: Definite Significance: **HIGH (-)**	• Consider offsets which will require a detailed investigation to find similar habitat to conserve. • Appoint a biodiversity specialist to identify CI species that can grow successfully *ex situ.* These species must be translocated	• Magnitude: Minor • Duration: Long term • Scale: Regional • Consequence: Medium • Probability: Definite Significance: **MEDIUM (-)**	Der Brochen Platinum Mine Floristic Assessment (Natural Scientific Services (NSS) Report 1995, May 2014)

Construction of the Mareesburg TSF					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
	will result in the loss of important upstream wetland/riparian habitat. This will have an impact on the catchment and the Groot-Dwars River as a Freshwater Ecosystem Priority Area (FEPA). The clearing of vegetation will also result in the loss of CI species, including numerous SCE endemics and the relatively unknown *Cyphostemma wilmsii* & undescribed *Resnova af. pillosa* (R *megaphylla*) thereby reducing their overall population numbers.		and the necessary permits from DWS must be applied for. • Obtain the necessary regulatory authorisation for crossing any of the streams / drainage lines or wetlands. • Where the road/Pipeline traverses a wetland, measures are required to ensure that the road has minimal effect on the flow of water through the wetland, e.g. by using box culverts rather than pipes.		
C47	**Increase in Alien invasive species** An increase in alien invasive species. Refer to Table 7-4, Impact Reference C4.				
	Wetlands				
C48	**Increase in erosion and sediment loads resulting in the loss of wetland habitats and ecoservices** Site clearing and grubbing of the footprint area associated with the Mareesburg TSF may result in an increased potential for	• Magnitude: Moderate • Duration: Short term • Scale: Local • Consequence: Low • Probability: Definite	• Clearly demarcate areas to be cleared and ensure that vegetation clearing only occurs within the demarcated areas. • Ensure that erosion management and sediment controls are strictly	• Magnitude: Moderate • Duration: Short term • Scale: Local • Consequence: Low • Probability: Possible	Wetland and Aquatic Ecological Assessment for the Proposed Anglo Platinum Der Brochen Project, Limpopo Province (Scientific Aquatic Services (SAS), SAS Report No.

Construction of the Mareesburg TSF					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
	erosion, leading to increased sediments loads entering the drainage line and riparian habitats. This may result in the loss of wetland habitat and ecoservices, impacting on hydrology and sediment balance.	Significance: **MEDIUM (-)**	implemented from the beginning of site clearing activities. • Minimise the footprint and control edge effects.	Significance: **LOW (-)**	214035, April 2014)
C49	**Impact on riparian zone** Refer to Table 7-4, Impact Reference C6.				
C50	**Impact on drainage line habitat** Refer to Table 7-4, Impact Reference C7.				
	Surface water				
C51	***Deterioration of surface water quality due to increased sediment loads as a result of erosion*** *Clearing of vegetation and earthworks at the Tailings Dam site will leave soils bare and exposed to erosion agents, as well as potentially increase the volume and flow rate of surface runoff entering surface water bodies. This will in turn result in*	• *Magnitude: Major* • *Duration: Short term* • *Scale: Site specific* • *Consequence: Medium* • *Probability: Definite* *Significance: **MEDIUM (-)***	• *A stormwater management plan, including watercourse diversion, will be implemented at the onset of construction.* • Construction of water management infrastructure will commence prior to the TSF.	• *Magnitude: Moderate* • *Duration: Short term* • *Scale: Site specific* • *Consequence: Low* • *Probability: Possible* *Significance: **LOW (-)***	*Environmental Management Programme Report for the Der Brochen Mine Volume 1 of 3 (SRK Consulting Report No. 295606/4/ November 2002)*

Construction of the Mareesburg TSF					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
	an increase in sediment loads in these water bodies. *Should there be no settlement facilities or stormwater diversion works established prior to the major construction activities commencing, it can be expected that surface water bodies in the area will receive high silt loads (particularly downstream of the Tailings Dam).*				
C52	***Deterioration of surface water quality due to contamination of runoff by oil and fuel spills and leaks, and other construction activities*** *Impact on surface water during construction from potential construction vehicles spillage.* *Increased fuels, oils, cements and other waste from construction activities and vehicles may contaminate surface water bodies.*	• *Magnitude: Major* • *Duration: Short term* • *Scale: Site specific* • *Consequence: Medium* • *Probability: Definite* *Significance: **MEDIUM (-)***	• *Construction areas and construction campsites will be provided with earth berms which will divert clean stormwater runoff and prevent this water from entering such working areas.* • *Re-vegetation of all denuded area.* • A leak/spill detection plan will be devised and implemented for all possible areas of leak/spillage within the construction site.	• *Magnitude: Moderate* • *Duration: Short term* • *Scale: Site specific* • *Consequence: Low* • *Probability: Possible* *Significance: **LOW (-)***	*Environmental Management Programme Report for the Der Brochen Mine Volume 1 of 3 (SRK Consulting Report No. 295606/4/ November 2002)*
C53	**Deterioration of surface water quality due to erosion,**	• Magnitude: Moderate	• *Clean stormwater cut-off drains with diversion berms*	• Magnitude: Moderate	*Environmental Management*

Construction of the Mareesburg TSF					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
	spillages and accidental discharges at the Pipeline crossings Changes to the hydrology within the Mareesburg Stream catchment combined will impacts on the Groot-Dwars River from the open pit activities will result in cumulative impacts on the hydrology of the Groot-Dwars River. Direct contamination of the Groot- Dwars River or its tributaries at the Pipeline crossings can occur due to spillages and accidental discharges or due to erosion of disturbed areas during construction in the riparian zone. Contamination of surface resources could also impact on downstream users, such as the Leshaba family.	• Duration: Long term • Scale: Local • Consequence: Medium • Probability: Possible Significance: **MEDIUM (-)**	*will be positioned to divert stormwater from the sites. The drains will be designed to accommodate a 1:50 year storm and diversion berms will assist to divert a 1:100 year storm. Stormwater diverted by these drains and berms will be redirected towards the natural watercourses in the area.* • Construction should take place in the low flow period (dry season). • Stormwater culverts at watercourse crossings should be designed and constructed to accommodate the 1:50 year storm event. • Areas disturbed by linear construction activities should be rehabilitated immediately on completion of construction of each area. • Erosion protection and energy dissipaters should be constructed at the crossings as applicable	• Duration: Long term • Scale: Local • Consequence: Medium • Probability: Unlikely Significance: **LOW (-)**	*Programme Report for the Der Brochen Mine Volume 1 of 3 (SRK Consulting Report No. 295606/4/ November 2002).* Der Brochen Project Environmental Impact Assessment/ Environmental Management Plan Amendment and Alignment: Surface Water Specialist Report (SRK Report No. 469113/SW, October 2014)

Construction of the Mareesburg TSF					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
			• Contractors should be made aware of the WUL conditions that apply during construction and made liable for environmental damages caused by spillages. • Emergency action plans should be drawn up to deal with spillages. • Chemical toilets should be provided at construction sites.		
C54	Refer to Table 7-4, Impact Reference C8, C9 and C10, for impacts associated with the Construction Phase.				
C55					
C56					
	Groundwater				
	There are no impacts envisaged during the Construction Phase.				
	Air Quality				
C57	***Increased dust levels during construction of infrastructure and roads*** *Construction equipment will generate dust from cleared, exposed surfaces such as the Tailings Dam site. Excessive*	• *Magnitude: Moderate* • *Duration: Short term* • *Scale: Site specific* • *Consequence: Low* • *Probability: Definite*	• *The contractors and the mine will control dust on the site and access roads to acceptable levels, with water, chemical soil stabilisers or temporary surfacing.* • *The mine will undertake*	• *Magnitude: Moderate* • *Duration: Short term* • *Scale: Site specific* • *Consequence: Low* • *Probability: Possible*	*Environmental Management Programme Report for the Der Brochen Mine Volume 1 of 3 (SRK Consulting Report No. 295606/4/ November*

Construction of the Mareesburg TSF					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
	dust will impact on surrounding vegetation and indirectly on animals feeding on vegetation.	*Significance:* ***MEDIUM (-)***	*monthly dust monitoring at various locations along the main access road and shaft access roads until these are tarred.* • A dust monitoring programme will be implemented to monitor the impacts from dust. • Dust suppression will be undertaken of the service roads and Tailings Facility where required. • Only the immediate footprint of the area will be cleared. • Movement of vehicles on site will be restricted.	*Significance:* ***LOW (-)***	*2002)*
C58	Refer to Table 7-4, Impact Reference C12, for impacts associated with the Construction Phase.				
	Noise				
C59	***Increase in ambient noise levels to surrounding communities* (Leshaba family) *as a result of construction activities*** *Construction activities such as movement of trucks and*	• *Magnitude: Minor* • *Duration: Short term* • *Scale: Site specific* • *Consequence: Low*	• *Machinery and vehicle silencer units will be maintained in good working order. Non-compliant machinery and/or vehicles will be removed from service until repaired.*	• *Magnitude: Minor* • *Duration: Short term* • *Scale: Site specific* • *Consequence: Low*	*Environmental Management Programme Report for the Der Brochen Mine Volume 1 of 3 (SRK Consulting Report No. 295606/4/ November*

Construction of the Mareesburg TSF					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
	earthmoving equipment and machinery will cause an increase in ambient noise levels.	• *Probability: Possible* *Significance:* ***LOW (-)***	• *Should community complaints be received with regard to noise generation, mine management will, at the discretion of the ECO, investigate this, model the noise against the baseline information obtained during the specialist survey and implement appropriate measures. Possible best practice management measures regarding noise mitigation include:* • Construction activities will be confined to daylight hours. • A noise monitoring programme will be implemented prior to construction. • Construction vehicles will be serviced at regular intervals to minimise noise generation.	• *Probability: Unlikely* *Significance:* ***LOW (-)***	*2002)*
	Cultural heritage				
C60	***Disturbance or destruction of historical and cultural sites*** *Disturbance to graveyards in*	• Magnitude: Major • Duration: Long term	• *The South African Heritage Resources Agency (SAHRA) has recommended a holistic*	• Magnitude: Moderate • Duration: Long term	*Environmental Management Programme Report for*

Construction of the Mareesburg TSF					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
	close proximity (outside project boundary) to the Mareesburg TSF site. Several heritage sites with medium to high significance have been identified within the proposed Mareesburg TSF footprint area. These include grindstones, *Eiland, Leolo* and *Marateng* pottery, cemeteries with graves, terraces, foundation and kraals. The clearing and construction activities are likely to impact on the identified significant sites.	• Scale: Local • Consequence: High • Probability: Definite Significance: **HIGH (-)**	*conservation strategy including the conservation of cultural heritage resources. The following geologically and archaeologically important sites should be included in the holistic conservation management plan.* • Graveyards need to be fenced to ensure their protection. • Heritage sites within the footprint area rated low to high significance, require a permit from SAHRA for the demolishment thereof. • Graves identified within the footprint area need to be removed and relocated, following the mandated procedure by a qualified Archaeologist. • The necessary permits for grave relocation must be obtained from the South African Heritage Resources Agency (SAHRA).	• Scale: Local • Consequence: Medium • Probability: Definite Significance: **MEDIUM (-)**	*the Der Brochen Mine Volume 1 of 3 (SRK Consulting Report No. 295606/4/ November 2002)*

Construction of the Mareesburg TSF					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
			• Undertake a Phase 2 Heritage Impact Assessment to further assess heritage sites found within the development footprint. • Refer to Table 6-24 in Chapter 6 of this report.		
	Visual				
C61	**Decrease in visual aesthetics of the area** The Mareesburg TSF will cover an area of approximately 150 ha, from which vegetation will be removed and topsoil stockpiled. This is likely to have an impact on the natural aesthetics of the environment, particularly for the Leshaba household located 1 km away from the proposed TSF.	• Magnitude: Moderate • Duration: Long term • Scale: Local • Consequence: Medium • Probability: Definite Significance: **MEDIUM (-)**	• Minimise vegetation clearing to the demarcated footprint area of the Mareesburg TSF.	• Magnitude: Moderate • Duration: Long term • Scale: Local • Consequence: Medium • Probability: Definite Significance: **MEDIUM (-)**	New impact.
	Traffic and transportation				
C62	Refer to Table 7-4, Impact Reference C16, C17, C18 and C19, for impacts associated with the Construction Phase.				
C63					
C64					

Construction of the Mareesburg TSF					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
C65					

7.2.4 Construction of the Mareesburg TSF Pipeline

Table 7-7 describes and rates the potential impacts with the construction of the Mareesburg Pipeline.

Table 7-7: Impacts associated with the Construction of the Mareesburg Pipeline

Construction of the Mareesburg TSF Pipeline					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
	Geology				
	There are no impacts envisaged during the Construction Phase.				
	Topography				
	There are no impacts envisaged during the Construction Phase.				
	Soils, land capability and land use				
C66	**Loss of soil resources as a result of sterilisation from Pipeline and road** The loss of soil resources due to sterilisation where the Pipeline and maintenance road will be constructed. The Project area is characterised by Mispah, Arcadia, Glenrosa, Hutton and Clovelly soils, all which have grazing land capabilities. However no grazing or agricultural practices are currently taking place in the area and therefore if managed, will be	• Magnitude: Moderate • Duration: Long term • Scale: Local • Consequence: Medium • Probability: Definite Significance: **MEDIUM (-)**	• Place Pipeline on plinths to avoid compaction of soils.	• Magnitude: Minor • Duration: Long term • Scale: Local • Consequence: Medium • Probability: Unlikely Significance: **LOW (-)**	New impact.

Construction of the Mareesburg TSF Pipeline

Impact Reference No.	Impact	Significance rating pre-mitigation	Recommended management measures	Significance rating post-mitigation	Source document
	a low impact.				
C67	Refer to Table 7-4, Impact Reference C2, for impacts associated with the Construction Phase.				
	Biodiversity				
C68	Refer to Table 7-4 Impact Reference C4, for impacts associated with the Construction Phase.				
C69					
	Wetlands				
C70	**Impact on drainage line features and riparian areas on the Pipeline route** Construction of Pipeline route will traverse several drainage lines, the Mareesburg stream and the Groot-Dwars River. This is expected to impact upon the various riparian habitats along the Pipeline route due to potential erosion and sedimentation of drainage lines.	• Magnitude: Moderate • Duration: Long term • Scale: Local • Consequence: Medium • Probability: Definite Significance: **MEDIUM (-)**	• Support structures for the Pipelines should, if possible, be placed outside of drainage line or riparian habitat. • The crossing designs of any bridges must ensure that the creation of turbulent flow in the system is minimised in order to prevent downstream erosion. • No support pillars should be constructed within the active channels. • The Pipeline should be constructed as close as possible to existing or planned roads in order to minimise the need for maintenance personnel to	• Magnitude: Moderate • Duration: Long term • Scale: Local • Consequence: Medium • Probability: Possible Significance: **MEDIUM (-)**	New impact.

Construction of the Mareesburg TSF Pipeline					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
			access the Pipeline.		
	Surface water				
C71	**Deterioration of surface water quality due to erosion, spillages and accidental discharges at the Pipeline crossings** Changes to the hydrology within the Mareesburg Stream catchment combined will impacts on the Groot-Dwars River from the open pit activities will result in cumulative impacts on the hydrology of the Groot-Dwars River. Direct contamination of the Groot- Dwars River or its tributaries at the Pipeline crossings can occur due to spillages and accidental discharges or due to erosion of disturbed areas during construction in the riparian zone.	• Magnitude: Moderate • Duration: Long term • Scale: Local • Consequence: Medium • Probability: Possible Significance: **MEDIUM (-)**	• Stormwater culverts at watercourse crossings should be designed and constructed to accommodate the 1:50 year storm event. • Areas disturbed by linear construction activities should be rehabilitated immediately on completion of construction of each area. • Erosion protection and energy dissipaters should be constructed at the crossings as applicable • Contractors should be made aware of the WUL conditions that apply during construction and made liable for environmental damages caused by spillages. • Emergency action plans should be drawn up to deal with spillages. • Chemical toilets should be	• Magnitude: Moderate • Duration: Long term • Scale: Local • Consequence: Medium • Probability: Unlikely Significance: **LOW (-)**	Der Brochen Project Environmental Impact Assessment/ Environmental Management Plan Amendment and Alignment: Surface Water Specialist Report (SRK Report No. 469113/SW, October 2014)

Construction of the Mareesburg TSF Pipeline					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
			provided at construction sites.		
	Groundwater				
	There are no impacts envisaged during the Construction Phase.				
	Air Quality				
C72	Refer to Table 7-4, Impact Reference C12, for impacts associated with the Construction Phase.				
	Noise				
C73	Refer to Table 7-4, Impact Reference C13, for impacts associated with the Construction Phase.				
	Cultural heritage				
C74	Refer to Table 7-6, Impact Reference C60, for impacts associated with the Construction of the Pipeline.				
	Visual				
	There are no significant impacts envisaged during the Construction Phase.				
	Traffic and transportation				
C75	Refer to Table 7-4, Impact Reference C16, C17, C18 and C19, for impacts associated with the Construction Phase.				
C76					
C77					
C78					

7.2.5 Removal of the existing 132kV Powerline Route and Construction of the Powerline on the proposed new route

Table 7-8 describes and rates the potential impacts with the removal of the existing 132kV Powerline Route and Construction of the Powerline on the proposed new route.

Table 7-8: Impacts associated with the removal of the existing 132kV Powerline Route

Removal of the 132kV Powerline and Construction of the Powerline on the proposed new route					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
	Geology				
	There are no impacts envisaged during the Construction Phase.				
	Topography				
	There are no impacts envisaged during the Construction Phase.				
	Soils, land capability and land use				
C79	**Impact on soil resources** The removal of the Powerline poles will expose soils and could result in erosion of soil resources. The development of the new Powerline route will also involve the placement of poles on undisturbed areas. Excavated soils will be deposited next to the foundation holes prior to backfilling and surplus soil is usually spread evenly around the construction site. No grazing or agricultural	• Magnitude: Minor • Duration: Short term • Scale: Local • Consequence: Low • Probability: Definite Significance: **MEDIUM (-)**	• Topsoil must be stockpiled separately and spread around the foundation last to facilitate natural revegetation processes. • Backfilled material should be compacted to limit the possibility of erosion.	• Magnitude: Minor • Duration: Short term • Scale: Local • Consequence: Low • Probability: Unlikely Significance: **LOW (-)**	New impact.

Removal of the 132kV Powerline and Construction of the Powerline on the proposed new route					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
	practices are currently taking place in the area and therefore if managed, will be a low impact.				
	Biodiversity				
C80	**Loss of vegetation along the re-routed Powerline route** Minimal loss of vegetation communities due to the limited footprint of each Powerline pole. However, the Powerline servitude (8 m wide) would need to be cleared of shrubs and trees and only grass species will remain. The servitude where the existing Powerline will be removed, will be left to naturally rehabilitate. No sensitive receptors are within the powerline footprint.	• Magnitude: Moderate • Duration: Medium term • Scale: Local • Consequence: Medium • Probability: Definite Significance: **MEDIUM(-)**	• Ensure pole construction remains out of any wetland/ riparian areas. • Limit access to pole positions through existing road networks. • Remove and replant any CI species within the direct footprint of the pole.	• Magnitude: Minor • Duration: Medium term • Scale: Local • Consequence: Low • Probability: Possible Significance: **LOW (-)**	Der Brochen Platinum Mine Floristic Assessment (Natural Scientific Services (NSS) Report 1995, May 2014)
C81	Refer to Table 7-4, Impact Reference C4, for impacts associated with the Construction Phase.				
	Wetlands				
C82	**Impact on riparian habitats due to demolition and construction activities** The demolition of the existing Powerline may result in the	• Magnitude: Moderate • Duration: Short term • Scale: Local	• All waste resulting from the demolition of the existing Powerline must be removed from site and disposed of at a Licensed Waste Disposal	• Magnitude: Minor • Duration: Short term • Scale: Local	Wetland and Aquatic Ecological Assessment for the Proposed Anglo Platinum Der Brochen Project, Limpopo

Removal of the 132kV Powerline and Construction of the Powerline on the proposed new route					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
	disposal of waste into drainage lines/ riparian habitats, as well disturbances to vegetation and soils due to the movement of demolition vehicles within the vicinity. Placement of infrastructure related to the new re-routed Powerline within or in the vicinity of drainage lines/ riparian habitats leading to loss of habitat, altered flow patterns and increased erosion due to vegetation removal.	• Consequence: Low • Probability: Definite Significance: **MEDIUM(-)**	Facility. • Inspect all adjacent drainage lines/ riparian habitats on both the former and new routes for sedimentation on a weekly basis. • Ensure that support structures for the new Powerline poles are not placed within drainage line areas and their associated buffers. • Re-profile topsoil and revegetate disturbed areas once demolition is complete.	• Consequence: Low • Probability: Possible Significance: **LOW (-)**	Province (Scientific Aquatic Services (SAS), SAS Report No. 214035, April 2014.
	Surface water				
C83	**Increase in erosion from areas of exposed soils exacerbated by increased runoff volume and velocity from soil compacted areas** Soil compaction during demolition and construction may cause an increase in runoff velocity and volume during rainstorm events. An increase in runoff velocity	• Magnitude: Minor • Duration: Short term • Scale: Local • Consequence: Low • Probability: Possible Significance: **LOW (-)**	• Areas disturbed by demolition and construction activities should be rehabilitated immediately on completion in each area. • Areas disturbed by linear infrastructure should be rehabilitated progressively as construction progresses.	• Magnitude: Minor • Duration: Short term • Scale: Local • Consequence: Low • Probability: Possible Significance: **LOW (-)**	Der Brochen Project Environmental Impact Assessment/ Environmental Management Plan Amendment and Alignment: Surface Water Specialist Report (SRK Report No. 469113/SW, October 2014)

Removal of the 132kV Powerline and Construction of the Powerline on the proposed new route					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
	and volume may result in an increased potential for erosion in disturbed areas with subsequent increase in turbidity, suspended solids and sedimentation in the Groot-Dwars River and tributaries				
	Groundwater				
	There are no impacts envisaged during the Construction Phase.				
	Air Quality				
C84	Refer to Table 7-4, Impact Reference C12, for impacts associated with the Construction Phase.				
	Noise				
C85	Refer to Table 7-4, Impact Reference C13, for impacts associated with the Construction Phase.				
	Cultural heritage				
C86	**Disturbance or destruction of historical and cultural sites** Several heritage sites with medium to high significance have been identified around the proposed new Powerline route. These include Stone lines marking African tenants, Tenant household in good state of preservation with mud walls and front lapa walls, as well as	• Magnitude: Major • Duration: Long term • Scale: Local • Consequence: High • Probability: Definite Significance**: HIGH (-)**	• Graveyards need to be fenced to ensure their protection. • Consider realigning powerline to avoid cemeteries and graves, and other heritage sites identified. If unavoidable, graves within cemeteries will be removed and relocated by a qualified Archaeologist in accordance	• Magnitude: Minor • Duration: Long term • Scale: Local • Consequence: Medium • Probability: Unlikely Significance**: LOW (-)**	New impact.

Removal of the 132kV Powerline and Construction of the Powerline on the proposed new route					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
	cemeteries. The clearing and construction activities associated with the new re-routed Powerline are likely to impact on the identified significant sites.		with the mandated procedure • The necessary permits for grave relocation must be obtained from the South African Heritage Resources Agency (SAHRA). • Heritage sites that were rated low to medium require a permit from SAHRA for the demolishment thereof, if required. • Undertake a Phase 2 Heritage Impact Assessment to further assess heritage sites found within the development footprint.		
	Visual				
C87	**Impact on the visual aesthetics of the area** The new Powerline route will be constructed in an undisturbed area and the clearing of the servitude will make the Powerline more visible to road users, vehicles using the access road en-route to Booysendal Mine.	• Magnitude: Minor • Duration: Long term • Scale: Local • Consequence: Medium • Probability: Possible **Significance: LOW (-)**	• Ensure that the servitude area is maintained and kept neat by clearing the area on a regular basis.	• Magnitude: Minor • Duration: Long term • Scale: Local • Consequence: Medium • Probability: Possible **Significance: LOW (-)**	New impact.

Removal of the 132kV Powerline and Construction of the Powerline on the proposed new route					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
	Traffic and transportation				
	No additional impacts other than those that have been mentioned in Table 7-4 above are expected.				

7.2.6 Socio-economic impacts associated with the Construction Phase

Table 7-9 describes and rates the potential socio-economic impacts associated with the Construction Phase of the Der Brochen Project.

Table 7-9: Socio-economic impacts associated with the Construction Phase

Socio-economic impacts during Construction					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
	Socio-economic				
C88	***Contribution to the local and regional economy*** *The Der Brochen Project will make a positive contribution at both the macro- and micro-economic level. This contribution to the national, regional and local economy includes a boost to the Gross Geographical and Domestic* *Product through the creation of jobs during construction and the associated improvement in the annual per capita and household income of these workers and their families.* *In addition, the project will provide new business opportunities, improved physical infrastructure and social services.*	• *Magnitude: Minor* • *Duration: Short term* • *Scale: Regional* • *Consequence: Low* • *Probability: Possible* *Significance: **LOW (+)***	• The mine has developed a SLP which will guide the operation on social issues. This is updated every five years. • Der Brochen will inject investment into the local and regional economy through the employment of labour, use of local support services and the use of local infrastructure. Der Brochen will ensure that as much of this as possible is directed to the local economy. Since it is unlikely that suppliers from within the study area (local level) will be suitable, goods should be preferentially procured in the immediate focus area and, if unsuccessful, only then in the broader focus area. • AAP will inform businesses	• *Magnitude: Moderate* • *Duration: Short term* • *Scale: Regional* • *Consequence: Medium* • *Probability: Possible* *Significance: **MEDIUM (+)***	*Environmental Management Programme Report for the Der Brochen Mine Volume 1 of 3 (SRK Consulting Report No. 295606/4/ November 2002)* Social Baseline and Impact Assessment for the Der Brochen EMP Alignment (SRK Report No. 469113/SIA, September 2014)

Socio-economic impacts during Construction					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
			when appropriate through business fora about available opportunities and how business may access these. For example the Steelpoort Business Forum will be used to engage with businesses in the local and regional areas. • The revised SLP should reflect the targets for procuring goods locally and regionally, and to develop local suppliers. Contractors will be required to submit annual reports on how they are attaining these targets as part of AAP's SLP reporting to Government. • Develop a social strategy, once mining has commenced, in line with the life of mine plan to assist in leaving a positive legacy. This strategy will be reviewed and monitored for implementation.		
C89	**Contribution to national economic growth**	• Magnitude: Moderate • Duration: Medium term	• Der Brochen will inject investment into the local and regional economy through the	• Magnitude: Moderate • Duration: Medium term	Social Baseline and Impact Assessment for the Der Brochen EMP

Socio-economic impacts during Construction					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
	Some goods and services will be procured from national suppliers. Further, Der Brochen will contribute income taxes and royalties during the LOM. Timeous payment of taxes will contribute towards the ability of government to pursue national development objectives.	• Scale: National • Consequence: Medium • Probability: Unlikely Significance: **LOW (+)**	employment of labour, use of local support services and the use of local infrastructure. Der Brochen will ensure that as much of this as possible is directed to the local economy. Since it is unlikely that suppliers from within the study area (local level) will be suitable, goods should be preferentially procured in the immediate focus area and, if unsuccessful, only then in the broader focus area. • AAP will inform businesses when applicable through appropriate business fora about available opportunities and how business may access these. For example, the Steelpoort Business Forum can be used to engage with businesses in the local and regional areas. • The revised SLP should reflect the targets for procuring goods locally and regionally, and to develop local suppliers. Contractors	• Scale: National • Consequence: Medium • Probability: Possible Significance: **MEDIUM (+)**	Alignment (SRK Report No. 469113/SIA, September 2014)

Socio-economic impacts during Construction					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
			will be required to submit annual reports on how they are attaining these targets as part of AAP's SLP reporting to Government. • Develop a social strategy, once mining has commenced, in line with the life of mine plan to assist in leaving a positive legacy. This strategy will be reviewed and monitored for implementation.		
C90	***Social disruption*** *Temporary social disruption is to be expected during the Construction Phase, due to the presence of a non-local workforce, an influx of job seekers (including family visits), increased traffic and temporary disturbance of access roads.* *General physical disruption could be further aggravated by a perceived threat by the local community to existing safety and security levels.*	• *Magnitude: Moderate* • *Duration: Short term* • *Scale: Site specific* • *Consequence: Low* • *Probability: Definite* *Significance: **MEDIUM (-)***	• *Contractors will be required to find their own accommodation. Der Brochen will provide appropriate policies and procedures with regards to employee accommodation and related transport assistance. Construction contractors will not be housed on the Der Brochen Property* • *Complaints from neighbours and the public with regard to interference from contractors' or mine staff will be promptly addressed, and due process*	• *Magnitude: Minor* • *Duration: Short term* • *Scale: Site specific* • *Consequence: Low* • *Probability: Possible* *Significance: **LOW (-)***	*Environmental Management Programme Report for the Der Brochen Mine Volume 1 of 3 (SRK Consulting Report No. 295606/4/ November 2002)*

Socio-economic impacts during Construction					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
			followed. • Der Brochen should implement management commitments with respect to noise, dust, safety, blasting and vibrations and other activities in line with recommendations made by the specialists. • Der Brochen should consult with CPAs and tribal authorities to discuss possibilities of the influx of people into the area. • Implementation of an HIV/AIDS awareness campaign targeting construction workers, employees and surrounding communities.		
C91	***Disturbance of the local community, social infrastructure and services*** *It is expected that there will be an increased pressure on local and sub-regional services and facilities such as temporary*	• *Magnitude: Moderate* • *Duration: Short term* • *Scale: Regional* • *Consequence: Medium* • *Probability: Definite*	• Employ as many people from the local area as possible to avoid increased pressure on local and sub-regional services and facilities.	• *Magnitude: Minor* • *Duration: Short term* • *Scale: Regional* • *Consequence: Low* • *Probability: Possible*	*Environmental Management Programme Report for the Der Brochen Mine Volume 1 of 3 (SRK Consulting Report No. 295606/4/ November*

Socio-economic impacts during Construction					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
	housing, recruitment and employment procedures), as well as public transport, electricity and roads.	Significance: **MEDIUM (-)**		Significance: **LOW (-)**	*2002)*
C92	**Generation of jobs** Temporary jobs will be created during construction. It is expected that there will be a moderate number of jobs created (magnitude), in the short term and regionally.	• Magnitude: Moderate • Duration: Medium term • Scale: Regional • Consequence: Medium • Probability: Definite Significance: **MEDIUM (+)**	• Employ as many locals as possible so that mining in the area maximises benefits to immediate affected communities. • If possible identify temporary employees for further training and recommendation for incorporation in the longer term staff complement.	• Magnitude: Moderate • Duration: Medium term • Scale: Regional • Consequence: Medium • Probability: Definite Significance: **MEDIUM (+)**	Social Baseline and Impact Assessment for the Der Brochen EMP Alignment (SRK Report No. 469113/SIA, September 2014)
C93	**Procurement of goods and services** Procurement of goods and services during construction will result in maintaining and possibly creation of jobs since those companies providing goods and services will have contracts.	• Magnitude: Minor • Duration: Medium term • Scale: National • Consequence: Medium • Probability: Definite Significance: **MEDIUM (+)**	• Procure as many goods and services as possible from local communities and the local municipal area so that the project benefits immediate affected communities. • Identify potential service providers for longer term procurement. Advise and support these companies so that they can be incorporated as long term suppliers.	• Magnitude: Minor • Duration: Medium term • Scale: National • Consequence: Medium • Probability: Definite Significance: **MEDIUM (+)**	Social Baseline and Impact Assessment for the Der Brochen EMP Alignment (SRK Report No. 469113/SIA, September 2014)

Socio-economic impacts during Construction					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
C94	**Influx of job seekers** The arrival of non-locals in the area can result in negative health consequences and the increase in risky behaviour.	• Magnitude: Moderate • Duration: Medium term • Scale: Local • Consequence: Medium • Probability: Possible Significance: **MEDIUM (-)**	• Enhance employment of people and procurement of service providers in the study area and the region. • Accommodation should preferably be provided in towns in close proximity to the project area and workers bussed in. • Should accommodation be required in close proximity to Der Brochen: ○ RPM should require the contractors to promote HIV/AIDS prevention amongst employees. ○ RPM and the contractors should work with the health authorities to provide HIV/AIDS prevention and treatment interventions in a culturally appropriate manner. AAP will confirm if this is possible. ○ Sub-contractors should adhere to the contract	• Magnitude: Moderate • Duration: Medium term • Scale: Local • Consequence: Medium • Probability: Possible Significance: **MEDIUM (-)**	Social Baseline and Impact Assessment for the Der Brochen EMP Alignment (SRK Report No. 469113/SIA, September 2014)

Socio-economic impacts during Construction					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
			with the contractor. ○ A strategy and protocol for camp management should be developed and implemented, should an existing worker accommodation facility be used.		
C95	**Impacts on medicinal plants during land clearing activities during the Construction Phase** Clearing the land during construction will destroy a proportion of valuable community resources, medicinal plants. Gamawela Mankge CPA highlighted the variety of medicinal plants in the valley that needed to be preserved. Der Brochen infrastructure, however, will occupy a small proportion of the land under the mining right.	• Magnitude: Moderate • Duration: Long term • Scale: Site • Consequence: Medium • Probability: Possible Significance: **MEDIUM (-)**	• A land access protocol for visiting graves is currently in place and AAP Land Use Management will explore the possibility of extending this protocol for enabling the collection of medicinal plants on the property.	• Magnitude: Minor • Duration: Short term • Scale: Site • Consequence: Low • Probability: Possible Significance: **LOW (-)**	Social Baseline and Impact Assessment for the Der Brochen EMP Alignment (SRK Report No. 469113/SIA, September 2014)

7.3 Operational Phase

The activities envisaged during the Operational Phase can be seen in Table 7-10.

Table 7-10: Operation activities at Der Brochen

Activity	Activity Description	Reference Table
Operation of the Northern and Southern Open Pits	• The Northern Pit is expected to have a life of approximately four years and the Southern Pit a life of mine of two years. • Ore production in both Pits will be at 35 000 to 45 000 tonnes per month. • Ore is unsuitable for processing in the Mototolo Concentrator concurrently with underground ore and will be transported off site for processing. • The high wall of the Open Pit will be approximately 70-80 m.	Table 7-11
Operation of the Co-Disposal Facility	• The first deposition phase will consist of filling up the Northern Pit void. • The second phase will involve the filling of the area behind the embankment wall with tailings, up to the height of 70 m.	Table 7-12
Operation of the Mareesburg TSF and Pipeline	• The Mareesburg TSF will have an operation life based on 250 Kt per month, lasting 40-41 years from July 2017 to June 2057. • The TSF will have a final height of approximately 110 m during operations. It is expected that the maximum operational deposition area will be 150 ha. • Slurry will be deposited on the dam using a tailings delivery Pipelines extended along the northern, western and southern sides of the dam. • The Return Water Dam will accommodate an operating volume, as well as a 1:50 year storm event, requiring a capacity of 260 000m^3.	Table 7-13
Operation of the re-routed Powerline	• There are no additional activities once the 132kV Powerline has been re-routed. However, regular maintenance (cutting of the grass) of the servitude will be required. Therefore, no impact table has been compiled for this activity.	Table 7-14
Operation of the Helena TSF	• The existing Helena TSF occupies 43 ha of land, and the RWDs cover an area of 6.4ha. The raising of the height of the Helena TSF will increase this footprint area by 3 ha due to tailings infilling between the two rockfill walls to be constructed. • Currently tailings material from the Concentrator is pumped by Pipeline to the TSF at a rate of 200 to 220 ktpm (dry). • The approved height of the Helena TSF is 42 metres, elevation 1124 masl Continued disposal on the TSF will continue until a level of 1145 masl has been reached (63 metres height, that is, a 21 m rise).	Table 7-15
Operation of the Mototolo Concentrator and Chrome Plant	• Ore is currently transported via a conveyor belt and processed in the Mototolo Concentrator. • Ore undergoes milling and flotation and eventually becomes chromite concentrate. • The chromite concentrate is trucked from the spiral plant to the stockpile area and from there to the Glencore/Xstrata plant on Thorncliffe along the Concentrator road.	Table 7-16
Operation of the Access	• There are gravel roads around the open pit that will	Table 7-17

Activity	Activity Description	Reference Table
Roads	be maintained and dust supressed. • The access road to Mareesburg is a gravel road and will also be maintained and dust supressed.	
Operation of the Wellfield and ongoing prospecting boreholes	• The Helena and Richmond wellfields currently have only two boreholes per wellfield currently in use • The operation of the Wellfield will not involve the use of process water.	Table 7-18

7.3.1 Operation of the Northern and Southern Open Pits

Table 7-11 describes and rates the potential impacts associated with the Operation of the Northern and Southern Open Pits.

Table 7-11: Impacts associated with the Operation of the Open Pits (North and South Pits)

Operation of the Northern and Southern Open Pits					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
	Geology				
O1	**Impact on Geology** Opencast mining methods will permanently alter the geological strata in the proposed Northern and Southern Pit areas. This includes the removal of waste rock and platinum ore.	• Magnitude: Major • Duration: Long term • Scale: Local • Consequence: High • Probability: Definite Significance: **HIGH (-)**	• Waste rock from the Northern Pit will be used to construct the embankment for the proposed Co-Disposal Facility. • Should the Co-Disposal Facility be deemed not feasible, waste rock will be backfilled to the Northern pit concurrently to mining. • Ongoing rehabilitation of the Southern Pit area will take concurrently as the operation phase progresses. • The Southern Pit will be backfilled with waste rock material.	• Magnitude: Moderate • Duration: Long term • Scale: Local • Consequence: Medium • Probability: Definite Significance: **MEDIUM (-)**	New impact.
	Topography				
O2	**Change in local topography** During Operation, the Northern Pit will be excavated and waste	• Magnitude: Moderate • Duration: Long term	• Upon Closure, the Co-Disposal Facility and backfilled Southern Pit should	• Magnitude: Moderate • Duration: Long term	New impact.

Operation of the Northern and Southern Open Pits					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
	rock used to construct the embankment wall for the Co-Disposal Facility. The Northern Pit will be filled with tailings and the Co-Disposal Facility will be constructed on top of the filled Northern Pit. This will have an impact on the natural topography of the site. The Southern Pit will be backfilled concurrently with waste rock during the Operational Phase, therefore little impact on the topography is expected.	• Scale: Local • Consequence: Medium • Probability: Definite Significance: **MEDIUM (-)**	be shaped to be free-draining. • Should the Co-Disposal Facility be deemed not feasible, waste rock will be backfilled to the Northern pit concurrently to mining. The backfilled pit should be shaped to be free-draining, covered with topsoil and revegetated. • Stockpiled topsoils should be used to cover the closed Co-Disposal Facility and backfilled Southern Pit and should be revegetated.	• Scale: Local • Consequence: Medium • Probability: Definite Significance: **MEDIUM (-)**	
	Soils, land capability and land use				
O3	No additional impacts are envisaged during the Operational Phase, however management measures for topsoil stockpiling are included.	Not applicable.	• Soil for the purpose of rehabilitation that has been stripped from cleared areas during the Construction Phase will be stockpiled. The following conservation principles will apply: ○ Stripped soil should be stored with as little compaction as possible; ○ Stockpile areas should	Not applicable.	Not applicable.

Operation of the Northern and Southern Open Pits					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
			have their soil stripped to conserve the seed bank; ○ Single handing should be practiced where possible; ○ Stockpiles that are likely to remain undisturbed for 12 months or more should be revegetated; and ○ Usable soil will be respread with as little compaction as possible. ○ Land to which soil has been applied will be revegetated		
	Biodiversity				
O4	No additional impact expected after the Construction Phase (clearing of vegetation), however the surrounding natural area should not be further impacted upon.	Not applicable.	• Continuous education of staff – both permanent, and contractors is required on the importance of biodiversity in the region and why it should be conserved. • Regular wetting of the roads are required. • No off road driving permitted. • No harvesting of species from	Not applicable.	Not applicable.

Operation of the Northern and Southern Open Pits					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
			any natural areas. • Long term monitoring of the Groot- Dwars River is required both in terms of habitat/community structural changes as well as bio-monitoring of the system. • Ensure the Alien and Invasive Management Plan and Biodiversity Action Plan is continuously updated.		
	Wetlands				
O5	No additional impact expected after the Construction Phase (clearing of vegetation), however the surrounding natural area should not be further impacted upon.	Not applicable.	• Clear separation of clean and dirty water must take place and diversion of clean water around the operational areas must ensure minimisation of the loss of catchment yield.	Not applicable.	Not applicable.
	Surface water				
O6	**Reduced availability of water to surrounding water users due to physical obstruction from the Open Pits resulting in loss of Mean Annual Runoff (MAR)** The rainfall water within the designated dirty water area of	• Magnitude: Moderate • Duration: Long term • Scale: Local • Consequence: Medium • Probability: Definite	• Appropriately placed clean water diversions, designed to handle the 1:50 year storm event, should be constructed to divert water away from the Pits and return it to the natural environment.	• Magnitude: Moderate • Duration: Long term • Scale: Local • Consequence: Medium • Probability: Possible	Der Brochen Project Environmental Impact Assessment/ Environmental Management Plan Amendment and Alignment: Surface Water Specialist Report

Operation of the Northern and Southern Open Pits					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
	the Open Pits that forms part of the MAR to the local water courses will be removed from the catchment and may reduce the quantity of water available to downstream users.	Significance: **MEDIUM (-)**		Significance: **MEDIUM (-)**	(SRK Report No. 469113/SW, October 2014)
O7	**Alteration of catchment hydrology causing increased risk of flooding and scouring** Changes to surface water hydrology due to continued development of the open pit and the associated risk of flooding and scouring will continue from the Construction Phase.	• Magnitude: Moderate • Duration: Long term • Scale: Local • Consequence: Medium • Probability: Definite Significance: **MEDIUM (-)**	• Runoff from the catchment should be diverted away from the open pit areas by cut-off channels and diversion berms designed to handle the 1:50 year storm event. • Energy dissipaters should be constructed in areas of concentrated flows. • Routine inspections and maintenance should be conducted to keep the diversions free of debris (silt build up, vegetation etc.) and areas suitably graded.	• Magnitude: Moderate • Duration: Long term • Scale: Local • Consequence: Medium • Probability: Possible Significance: **MEDIUM (-)**	Der Brochen Project Environmental Impact Assessment/ Environmental Management Plan Amendment and Alignment: Surface Water Specialist Report (SRK Report No. 469113/SW, October 2014)
O8	**Deterioration in water quality in the Dwars River due to release of contaminated water from the open pit operations** The need to capture and contain dirty water generated in the	• Magnitude: Moderate • Duration: Long term • Scale: Local • Consequence: Medium	• Dirty water should be contained in pollution control or return water dams designed to enable settlement of solids and handle the 1:50 year event with a minimum	• Magnitude: Moderate • Duration: Long term • Scale: Local • Consequence: Medium	Der Brochen Project Environmental Impact Assessment/ Environmental Management Plan Amendment and

Operation of the Northern and Southern Open Pits					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
	Open Pits will increase the volume of contaminated water that needs to be managed on the mine. Release of dirty water can occur if the containment facilities are not appropriately managed or during periods of extended high rainfall. Overflow from the dirty water containment facilities can result in the formation of channels and the formation of drainage lines resulting in the water reaching the Groot-Dwars River.	• Probability: Definite Significance: **MEDIUM (-)**	freeboard of 0.8 metres above full supply level. • Routine inspections and maintenance should be conducted. • The contained dirty water should re-used as process water make-up.	• Probability: Possible Significance: **MEDIUM (-)**	Alignment: Surface Water Specialist Report (SRK Report No. 469113/SW, October 2014)
	Groundwater				
O9	**Dewatering of mine void (Reduction in borehole yield and river baseflow)** Groundwater inflows into the northern and southern pit will necessitate continuous dewatering of the Pits during life of mine with associated decline of groundwater levels in the vicinity and a reduction of groundwater baseflow towards the Groot-Dwars River.	• Magnitude: Moderate • Duration: Medium term • Scale: Local • Consequence: Medium • Probability: Definite Significance: **MEDIUM (-)**	• Continuous water level monitoring. • No groundwater users within the dewatering cone. • Replacement of water supply boreholes in event of yield losses.	• Magnitude: Minor • Duration: Medium term • Scale: Local • Consequence: Low • Probability: Possible Significance: **LOW (-)**	Der Brochen Project-Groundwater Investigation and Model Report (Delta H Report No. 2013.027-01, October 2014)

Operation of the Northern and Southern Open Pits					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
O10	**Impact on groundwater quality** The Open Pits will intercept ambient groundwater flow. Groundwater flowing into the Pits could potentially be contaminated.	• Magnitude: Moderate • Duration: Long term • Scale: Local • Consequence: Medium • Probability: Definite • Significance: **MEDIUM (-)**	• Excess groundwater in the Pits should either be used in the Mototolo Concentrator or contained in the pollution control dam.	• Magnitude: Minor • Duration: Long term • Scale: Local • Consequence: Medium • Probability: Unlikely Significance: **LOW (-)**	Der Brochen Project-Groundwater Investigation and Model Report (Delta H Report No. 2013.027-01, October 2014)
	Air Quality				
O11	**Increase in nuisance dust during operations** Dust will be generated by materials handling activities, windblown dust from drilling and blasting activities, crushing activities, vehicle tailpipe and vehicle entrainment. The main source of particulate impacts was due to vehicle entrainment. Simulated PM_{10} and $PM_{2.5}$ ground level concentrations at the closest identified sensitive receptors are illustrated in Figure 7-1 and Figure 7-2, respectively. The simulated PM_{10} and $PM_{2.5}$ impacts at the closest identified sensitive	• Magnitude: Minor • Duration: Medium term • Scale: Local • Consequence: Low • Probability: Possible Significance: **LOW (-)**	• Regular water sprays preferably combined with chemicals on unpaved haul roads. • Speed limit on haul roads not to exceed 40 km/hr.	• Magnitude: Minor • Duration: Medium term • Scale: Local • Consequence: Low • Probability: Possible Significance: **LOW (-)**	Air Quality Specialist Report for the Der Brochen EMP Alignment and Amendment (Airshed Report No. 13SRK25, September 2014)

Operation of the Northern and Southern Open Pits					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
	receptors were within the National Ambient Air Quality Standards (NAAQS). Dust fallout within the closest identified sensitive receptors were within the dust control regulation limits of 600mg/m^2/day. The simulated dust fallout rates are shown in Figure 7-3.				
	Noise				
O12	**Increase in ambient noise levels** The operation of the Open Pits will significantly increase noise levels in the areas. The impact would be highest at night time. The total noise levels are however limited to the activities and directly adjacent surrounding area due to the topography in the valley, which will prevent significant propagation of sound. The surrounding terrain will significantly assist in the attenuation of ambient sound	• Magnitude: Minor • Duration: Long term • Scale: Local • Consequence: Medium • Probability: Definite Significance: **MEDIUM (-)**	• Ensure that all equipment and machinery are well maintained and equipped with silencers where possible. • Environmental awareness training should include a noise component allowing employees and contractors to realise the potential noise risks that activities pose to the surrounding environment.	• Magnitude: Minor • Duration: Long term • Scale: Local • Consequence: Medium • Probability: Unlikely Significance: **LOW (-)**	Noise Impact Study for Environmental Impact Assessment (M^2 Environmental Connections cc, February 2012)

Operation of the Northern and Southern Open Pits					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
	levels with the high hills effectively acting as sound areas between the operation and potential noise sensitive developments.				
	Cultural heritage				
O13	No additional impacts are envisaged during the Operational Phase, however there are cultural heritage sites identified around the Open Pits area. Management measures should apply to these heritage sites.	Not applicable.	• Fence heritage sites with a significance rating of low to high. • Provide access to cemeteries and graves to families of the deceased.	Not applicable.	Not applicable.
	Visual				
O14	**Decrease in visual aesthetics of the area** Visual intrusion to the surrounding areas will be limited due to the surrounding terrain and topography in the valley which will provide a visual barrier.	• Magnitude: Minor • Duration: Long term • Scale: Local • Consequence: Medium • Probability: Unlikely Significance: **LOW (-)**	No mitigation applied.	• Magnitude: Minor • Duration: Long term • Scale: Local • Consequence: Medium • Probability: Unlikely Significance: **LOW (-)**	New impact.
	Traffic and transportation				
O15	**Increased generation of traffic on existing road networks**	• Magnitude: Minor	• Traffic conditions to be monitored annually, should	• Magnitude: Minor	Specialist Traffic and Transportation Study for

Operation of the Northern and Southern Open Pits

Impact Reference No.	Impact	Significance rating pre-mitigation	Recommended management measures	Significance rating post-mitigation	Source document
	during operations Operation activities will generate additional traffic along the Mine Access Road, the R557, D1261 and the R555 as well as some other roads within the study area.	• Duration: Long term • Scale: Regional • Consequence: Medium • Probability: Possible Significance: **MEDIUM (-)**	traffic congestion increase, appropriate mitigation measures will need to be explored and implemented.	• Duration: Long term • Scale: Local • Consequence: Medium • Probability: Unlikely Significance: **LOW (-)**	the Proposed EMP Alignment and Amendment of the Der Brochen Project to include open cast mining, tailings storage facilities and associated infrastructure (Aurecon, Report No. 9522, October 2014)
O16	**Impact on pedestrian and cyclists** The increase in light and heavy vehicles generated by Operational activities will have minimal impact on the existing road space available for pedestrians and cyclists. There is minimal pedestrian activity and no cycle activity in the immediate vicinity of the Der Brochen Project.	• Magnitude: Minor • Duration: Short term • Scale: Regional • Consequence: Low • Probability: Possible Significance: **LOW (-)**	• None required	• Magnitude: Minor • Duration: Short term • Scale: Regional • Consequence: Low • Probability: Unlikely Significance: **LOW (-)**	Specialist Traffic and Transportation Study for the Proposed EMP Alignment and Amendment of the Der Brochen Project to include open cast mining, tailings storage facilities and associated infrastructure (Aurecon, Report No. 9522, October 2014)
O17	**Impact on road safety conditions** The increase in traffic generated is expected to have an increase in heavy vehicle traffic flows on	• Magnitude: Minor • Duration: Long term • Scale: Regional	• Drivers of heavy Operation mining vehicles should attend a road safety and driving course to sensitise them to the impact they have on	• Magnitude: Minor • Duration: Long term • Scale: Regional	Specialist Traffic and Transportation Study for the Proposed EMP Alignment and Amendment of the Der

Operation of the Northern and Southern Open Pits

Impact Reference No.	Impact	Significance rating pre-mitigation	Recommended management measures	Significance rating post-mitigation	Source document
	the surrounding road network. Heavy vehicles have been identified as one of the major causes of accidents and incidents including fatalities on this road network.	• Consequence: Medium • Probability: Unlikely Significance: **LOW (-)**	driving conditions for other drivers on the road.	• Consequence: Medium • Probability: Unlikely Significance: **LOW (-)**	Brochen Project to include open cast mining, tailings storage facilities and associated infrastructure (Aurecon, Report No. 9522, October 2014)
O18	**Decreased condition of the road network** The increase in heavy vehicles will accelerate the deterioration of the R555 and R557 roads as the result of heavy vehicles using this road network during operations.	• Magnitude: Minor • Duration: Long term • Scale: Regional • Consequence: Medium • Probability: Unlikely Significance: **LOW (-)**	• A standard operating procedure is developed for all mine drivers to identify and report potholes and edge breaks to the operations manager who in turn will report it to the relevant authorities.	• Magnitude: Minor • Duration: Long term • Scale: Regional • Consequence: Medium • Probability: Unlikely Significance: **LOW (-)**	Specialist Traffic and Transportation Study for the Proposed EMP Alignment and Amendment of the Der Brochen Project to include open cast mining, tailings storage facilities and associated infrastructure (Aurecon, Report No. 9522, October 2014)
	Blasting and Vibration				
O19	**Ground vibration disturbance to Mototolo Concentrator and Helen TSF due to blasting in the Northern Pit** Blasting in the Northern Open Pit could have an impact on the Mototolo Concentrator and	• Magnitude: Major • Duration: Medium term • Scale: Local • Consequence: Medium • Probability: Definite	• Undertake survey to determine shear strength of tailings sediments. • Develop a blast design report adjusting the maximum “no go” PPV limit according to survey results.	• Magnitude: Moderate • Duration: Medium term • Scale: Local • Consequence: Medium • Probability: Possible	Assessment of Blasting Related Disturbances on the Infrastructure Adjoining the Der Brochen Planned Open Pits and Declines (Cambrian CC, Report Reference: Der

Operation of the Northern and Southern Open Pits					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
	Helena TSF. Disturbance levels at the Mototolo Concentrator will be noticed but within acceptable limits, however the impact on the Helena TSF could potentially be significant due to possible liquefaction of tailings sediment when subjected to ground vibrations. Blasting in the Southern Pit is unlikely to have an impact on the above mentioned infrastructure.	Significance: **MEDIUM (-)**	• Monitoring of the blasting and vibration levels.	Significance: **MEDIUM (-)**	Brochen/ Risk Assessment, June 2012)
O20	**Ground vibration disturbance to geology offices and coresheds due to blasting in the Northern Pit** Blasting in the Northern Open Pit could have a severe impact on the AAP office buildings and coresheds. Ground vibration levels at the offices will exceed the recommended United States Bureau of Mines (USBM) limits. In addition, the offices will fall within the 500 m safety blasting	• Magnitude: Major • Duration: Medium term • Scale: Local • Consequence: Medium • Probability: Definite Significance: **MEDIUM (-)**	• Evacuate AAP offices during blasting activities when blasting takes place in the centre and southern areas of the pit. • Consider relocation of AAP offices.	• Magnitude: Moderate • Duration: Medium term • Scale: Local • Consequence: Medium • Probability: Unlikely Significance: **LOW (-)**	Assessment of Blasting Related Disturbances on the Infrastructure Adjoining the Der Brochen Planned Open Pits and Declines (Cambrian CC, Report Reference: Der Brochen/ Risk Assessment, June 2012)

Operation of the Northern and Southern Open Pits					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
	radius. This will have a potential impact on employees within these offices. Blasting in the Southern Pit is unlikely to have an impact on the above mentioned infrastructure.				
O21	**Ground vibration disturbance to the Der Brochen dam wall due to blasting in the Open Pits** Blasting in the Open Pits should have minimal effect on the Der Brochen dam wall as the spillway structure should be able to withstand vibration amplitudes of 200 mm/sec and the earth wall should be able to withstand ground vibrations of 45 mm/sec without damage. Vibration levels predicted within the Blasting study were well within the thresholds, however given that the dam wall has shown signs of settlement, it would be prudent to minimise vibration levels.	• Magnitude: Moderate • Duration: Medium term • Scale: Local • Consequence: Medium • Probability: Possible Significance: **MEDIUM (-)**	• Ensure individual hole firing using electronic detonators. • Monitor ground vibrations at the dam wall. • Survey dam wall to determine present elevation and path of the top of the wall. Repeat this survey after last blasts to confirm that no movement has taken place.	• Magnitude: Moderate • Duration: Medium term • Scale: Local • Consequence: Medium • Probability: Unlikely Significance: **LOW (-)**	Assessment of Blasting Related Disturbances on the Infrastructure Adjoining the Der Brochen Planned Open Pits and Declines (Cambrian CC, Report Reference: Der Brochen/ Risk Assessment, June 2012)

Operation of the Northern and Southern Open Pits					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
O22	**Airblast and unwanted side effects such as flyrock during blasting of the Open Pits** Airblast activities during the blasting of the Open Pits could potentially result in unwanted side effects such as flyrock affecting surrounding communities. The closest community is the Mankge family, residing 3 kms away from the Northern Pit, and should therefore not be impacted by blasting.	• Magnitude: Moderate • Duration: Medium term • Scale: Local • Consequence: Medium • Probability: Possible Significance: **MEDIUM (-)**	• Airblast levels to be kept under 130 dB. • Evacuate AAP offices during blasting activities.	• Magnitude: Moderate • Duration: Medium term • Scale: Local • Consequence: Medium • Probability: Unlikely Significance: **LOW (-)**	Assessment of Blasting Related Disturbances on the Infrastructure Adjoining the Der Brochen Planned Open Pits and Declines (Cambrian CC, Report Reference: Der Brochen/ Risk Assessment, June 2012)

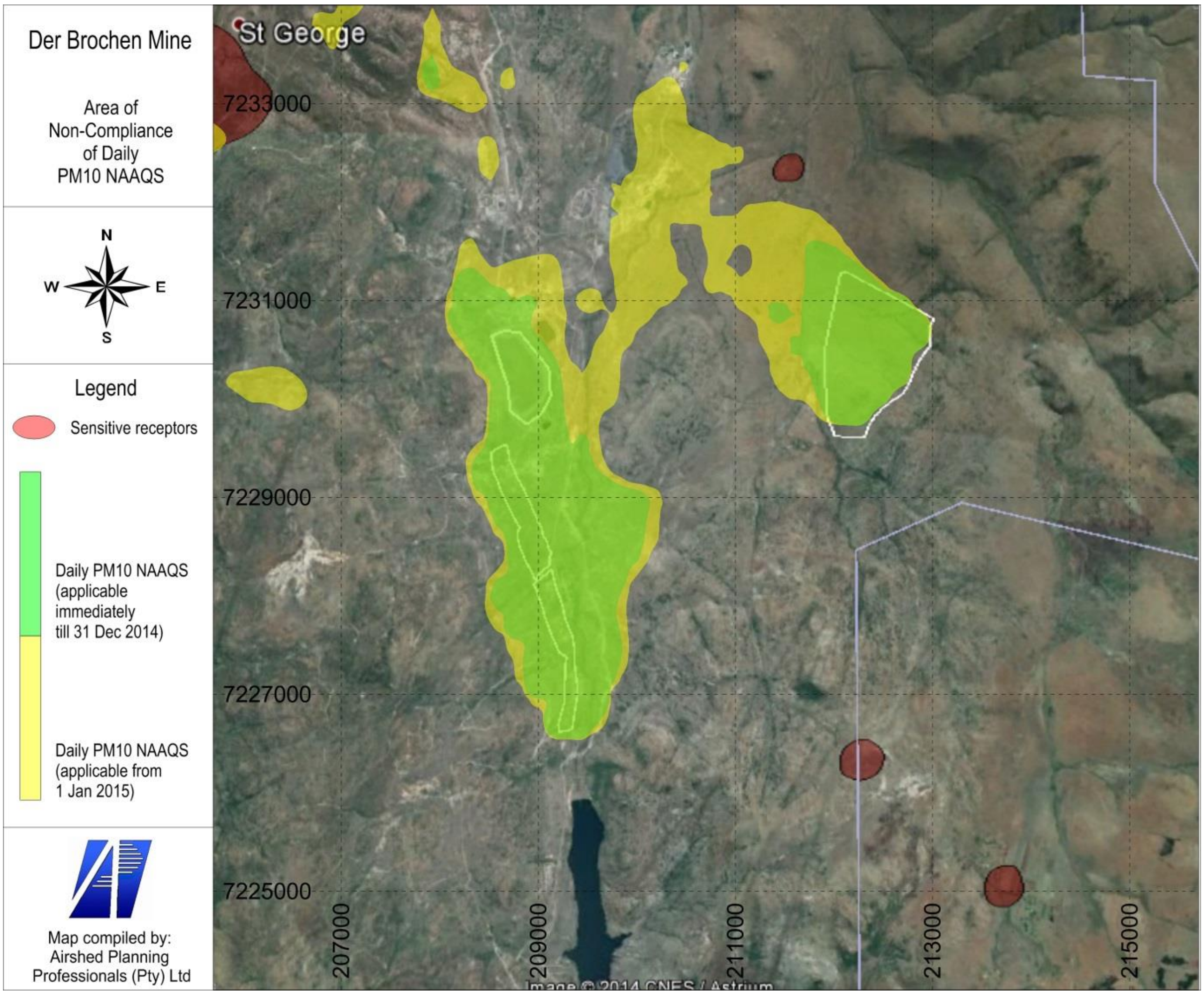


Figure 7-1: Area of non-compliance of daily PM10 NAAQS due to proposed Project operations

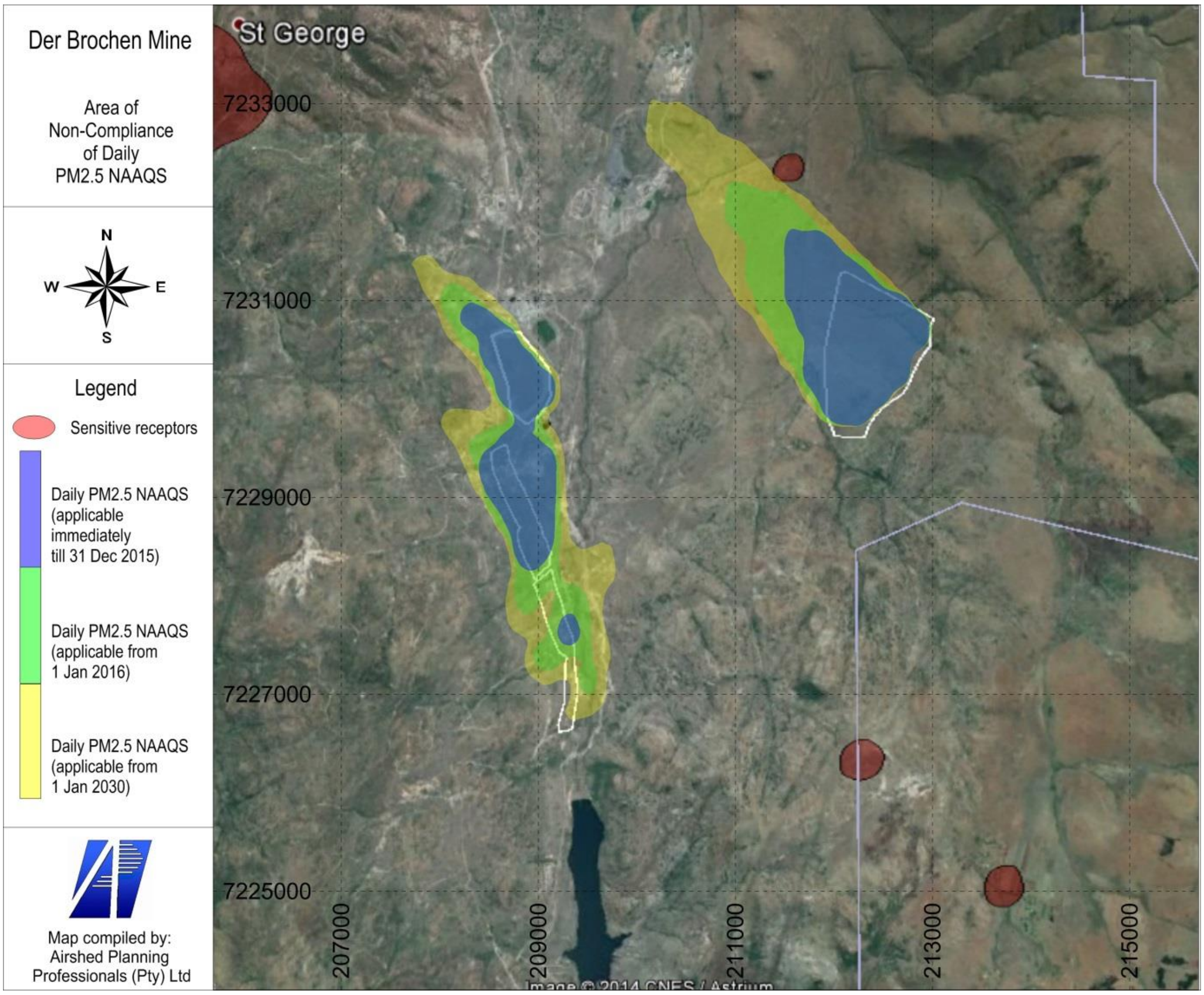


Figure 7-2: Area of non-compliance of daily PM2.5 NAAQS due to proposed Project operations

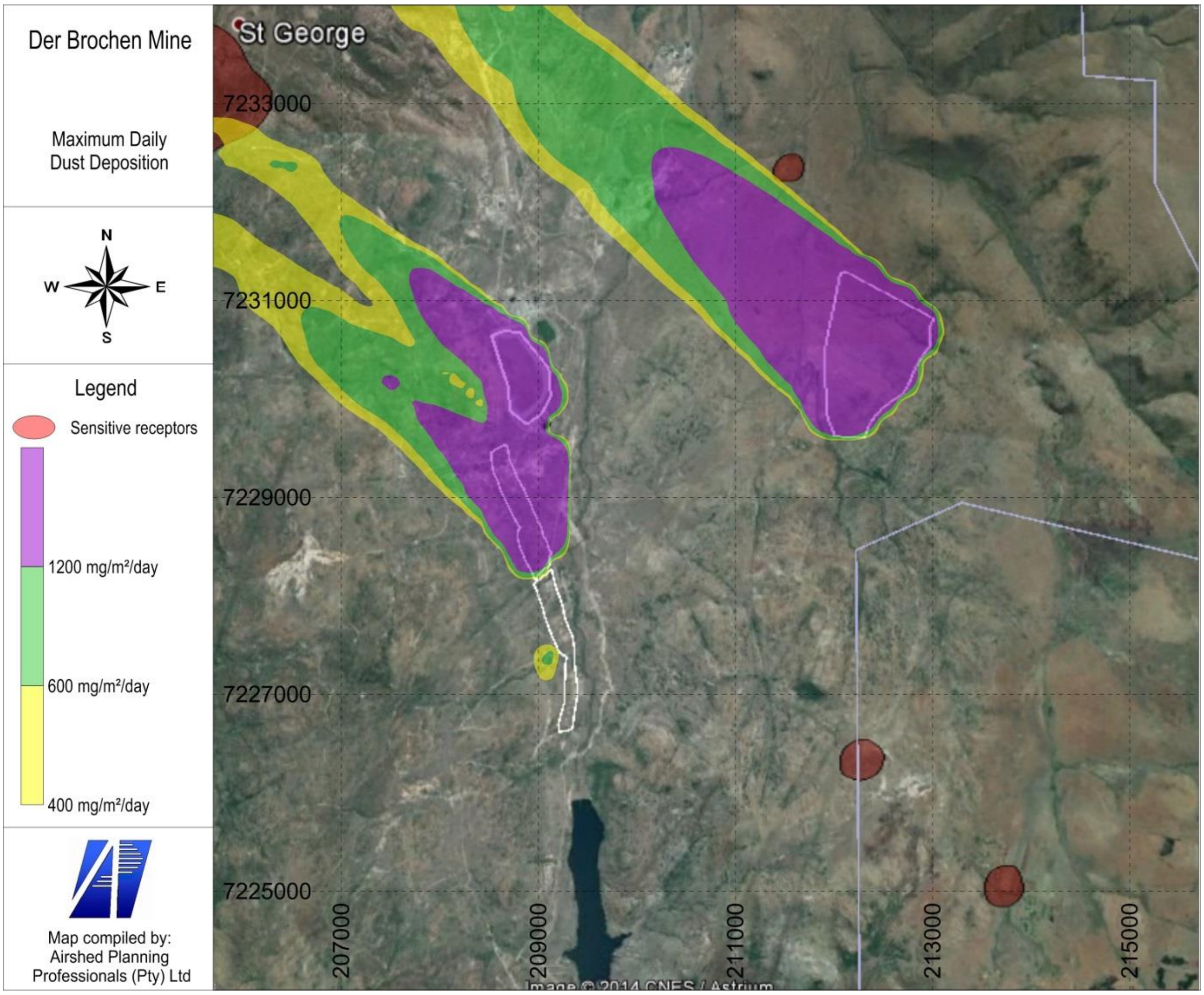


Figure 7-3: Maximum daily dust deposition due to proposed Project operations

7.3.2 Operation of the Co-Disposal Facility

Table 7-12 describes and rates the potential impacts associated with the Operation of the Co-Disposal Facility.

Table 7-12: Impacts associated with the Operation of the Co-Disposal Facility

Operation of the Co-Disposal Facility					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
	Geology				
	No impacts are envisaged for the Operational Phase.				
	Topography				
O23	**Permanent alteration of topography due to the Co-Disposal Facility** The Co-Disposal Facility will be located within the Groot-Dwars River valley and will have an elevation between 1075 masl and 1119 masl. The Co-Disposal Facility will reach a maximum height of approximately 70 metres above ground level (magl) will marginally influence topography and drainage patterns in the area. The ability of the area to free drain will decrease. The Co-Disposal Facility will become a permanent feature of the landscape.	• Magnitude: Moderate • Duration: Long term • Scale: Local area • Consequence: Medium • Probability: Definite Significance: **MEDIUM (-)**	• On closure, the Co-Disposal Facility should be shaped to be free draining. Erosion protection should be provided. • The Co-Disposal Facility will be re-vegetated to blend into the natural environment.	• Magnitude: Moderate • Duration: Long term • Scale: Local area • Consequence: Medium • Probability: Definite Significance: **MEDIUM (-)**	New impact.

Operation of the Co-Disposal Facility					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
	Soils, land capability and land use				
O24	No additional impacts are envisaged during the Operational Phase, when tailings will be deposited as topsoil would have been removed and stockpiled in the Construction Phase. Refer to Table 7-4, Impact Reference C1 and C2 for soil impacts associated during the Construction Phase. Management measures for stockpiling should take place.	Not applicable.	• Refer to management measures in Table 7-11, Impact Reference O3.	Not applicable.	Not applicable.
	Biodiversity				
O25	No additional impacts are envisaged during the Operational Phase, when tailings will be deposited as vegetation would have been cleared during the Construction Phase. However, the surrounding natural area should not be further impact upon. Management measures for the surrounding natural area should be implemented.	Not applicable.	• Refer to management measures in Table 7-11, Impact Reference O4.	Not applicable.	Not applicable.

Operation of the Co-Disposal Facility					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
	Wetlands				
O26	No additional impacts expected after the Construction Phase. However, the surrounding natural area should not be further impact upon. Management measures for the surrounding natural area should be implemented.	Not applicable.	• Clear separation of clean and dirty water must take place and diversion of clean water around the operational areas must ensure minimisation of the loss of catchment yield.	Not applicable.	Not applicable.
	Surface water				
O27	**Deterioration in water quality in the Dwars River due to release of tailings, return water or leachate to the natural environment** Changes to surface water hydrology due to development of the Co-Disposal Facility will continue from the Construction Phase. The rainfall water within the designated dirty water area of the Open Pits and Co-Disposal Facility that forms part of the MAR to the local water courses will continue to be removed from the catchment and may continue	• Magnitude: Moderate • Duration: Long term • Scale: Regional • Consequence: High • Probability: Possible Significance: **HIGH (-)**	• Routine inspections and maintenance should be conducted on all TSF infrastructure including Pipeline routes and crossings. • Surface water quality, and quantity, monitoring systems should be established for the open pit and Co-Disposal Facility. • Emergency action plans should be drawn up to deal with spillages.	• Magnitude: Minor • Duration: Long term • Scale: Local • Consequence: Medium • Probability: Possible Significance: **MEDIUM (-)**	Der Brochen Project Environmental Impact Assessment/ Environmental Management Plan Amendment and Alignment: Surface Water Specialist Report (SRK Report No. 469113/SW, October 2014)

Operation of the Co-Disposal Facility					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
	to reduce the quantity of water available to downstream users.				
	Groundwater				
O28	**Contaminant plume migration (deterioration of groundwater and surface water quality)** The simulated leachate plumes emanating from an unlined CDF and the de-commissioned Helena TSF will in all likelihood reach the Groot-Dwars River. While the installation of a lining system would limit the seepage rate and subsequently the spreading of potential contaminants (both laterally and vertically) emanating from the CDF, the plume is not likely to reach the Groot-Dwars River in the northern section. Refer to Figure 7-4 and Figure 7-5 for the expected sulfate migration plumes.	• Magnitude: Moderate • Duration: Long term • Scale: Site specific • Consequence: Medium • Probability: Definite Significance: **MEDIUM (-)**	• Install a lining system of either composite clay or HDPE. • Seepage collection drains should be installed to collect seepage. • Rehabilitation and capping of the facility to reduce seepages after closure. • Infiltration of process water towards the aquifer should be reduced to a minimum.	• Magnitude: Minor • Duration: Long term • Scale: Site specific • Consequence: Medium • Probability: Possible Significance: **MEDIUM (-)**	Der Brochen Project-Groundwater Investigation and Model Report (Delta H Report No. 2013.027-01, October 2014)
	Air Quality				
O29	Refer to Table 7-11, Impact Reference O11, for impacts associated with the Operational Phase.				
	Noise				

Operation of the Co-Disposal Facility					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
O30	**Increase in ambient noise** Noise impacts during the operation of the Co-Disposal Facility are considered negligible.	• Magnitude: Minor • Duration: Long term • Scale: Local • Consequence: Medium • Probability: Unlikely Significance: **LOW (-)**	No mitigation measures required.	• Magnitude: Minor • Duration: Long term • Scale: Local • Consequence: Medium • Probability: Unlikely Significance: **LOW (-)**	Not applicable.
	Cultural heritage				
O31	No additional impacts are envisaged during the Operational Phase, however there are cultural heritage sites identified around the Open Pits area. Management measures should apply to these heritage sites.	Not applicable.	• Fence heritage sites near infrastructure with a significance rating of low to high. • Provide access to cemeteries and graves to families of the deceased.	Not applicable.	Not applicable.
	Visual				
O32	**Decrease in visual aesthetics of the area** The Co-Disposal Facility will have a final height of 70 metres which may have a marginal impact on the visual aesthetics of the area. Although the Co-Disposal	• Magnitude: Moderate • Duration: Long term • Scale: Local area • Consequence: Medium • Probability: Definite	• Vegetate Co-Disposal walls to blend into the natural environment at closure.	• Magnitude: Minor • Duration: Long term • Scale: Local area • Consequence: Medium • Probability: Definite	New impact.

Operation of the Co-Disposal Facility					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
	Facility is visible from certain vantage points on the western and eastern mountain range slopes, facing the TSF, at a distance of between 6 and 10 km, the view will be outside of the "background" and views will be limited to indistinct at best. Refer to Figure 7-6 which shows the viewshed modelled for the Co-Disposal at closure.	Significance: **MEDIUM (-)**		Significance: **MEDIUM (-)**	
	Traffic and transportation				
O33	Refer to Table 7-11, Impact reference O15, O16, O17 and O18, for impacts associated with the Operational Phase.				
O34					
O35					
O36					

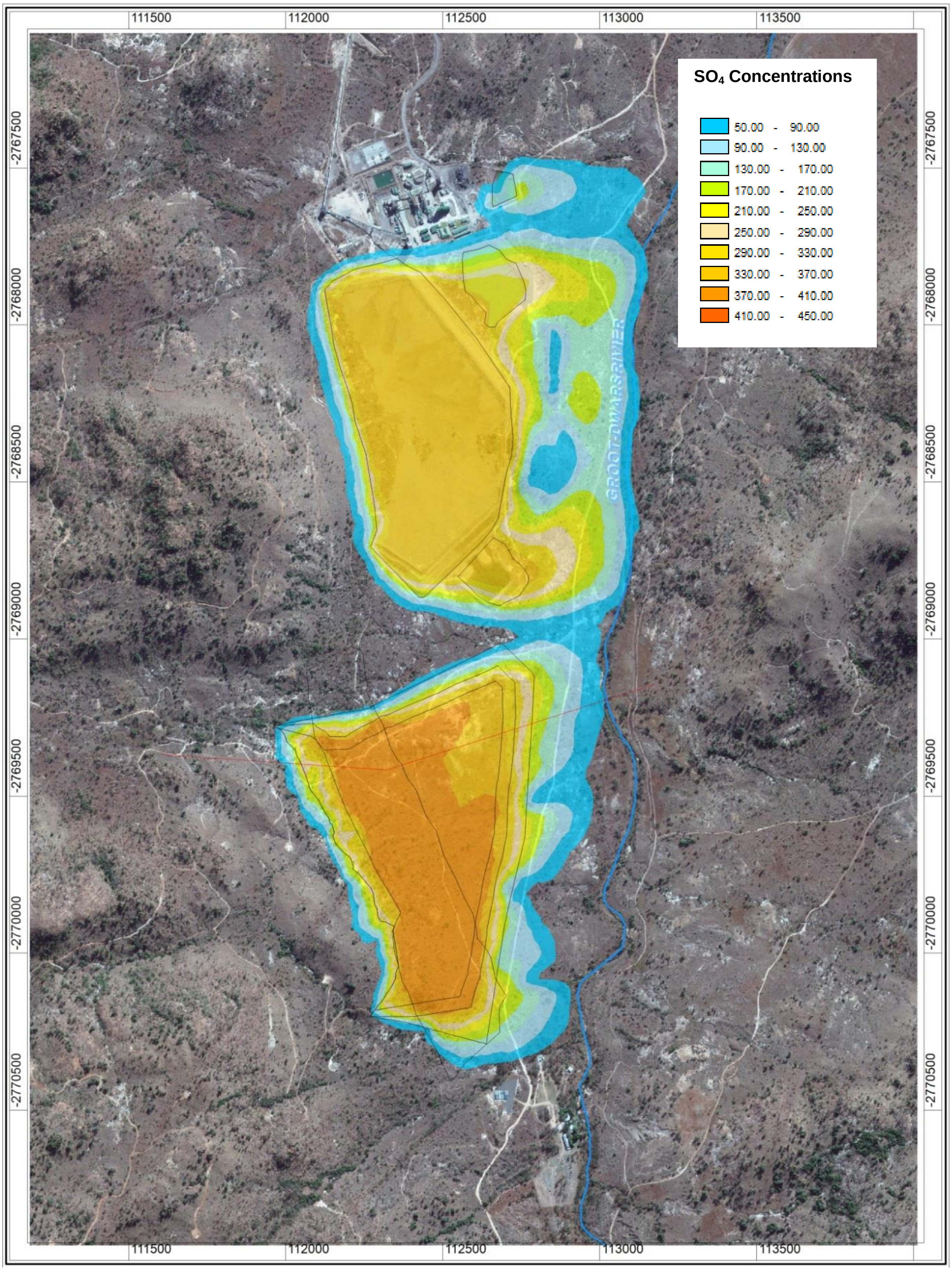


Figure 7-4: Simulated sulfate plume for the Helena TSF and lined Co-Disposal Facility (2028)

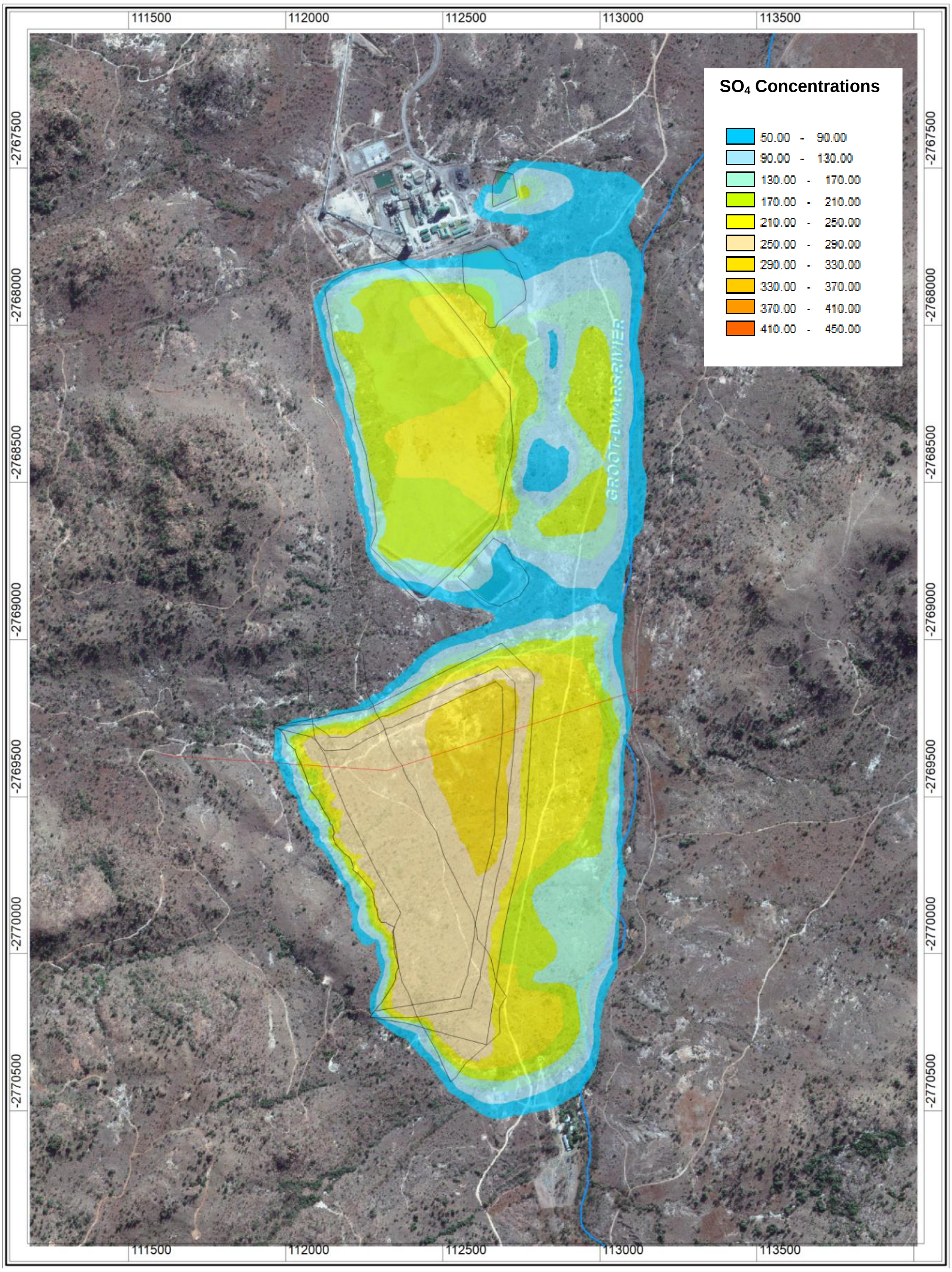
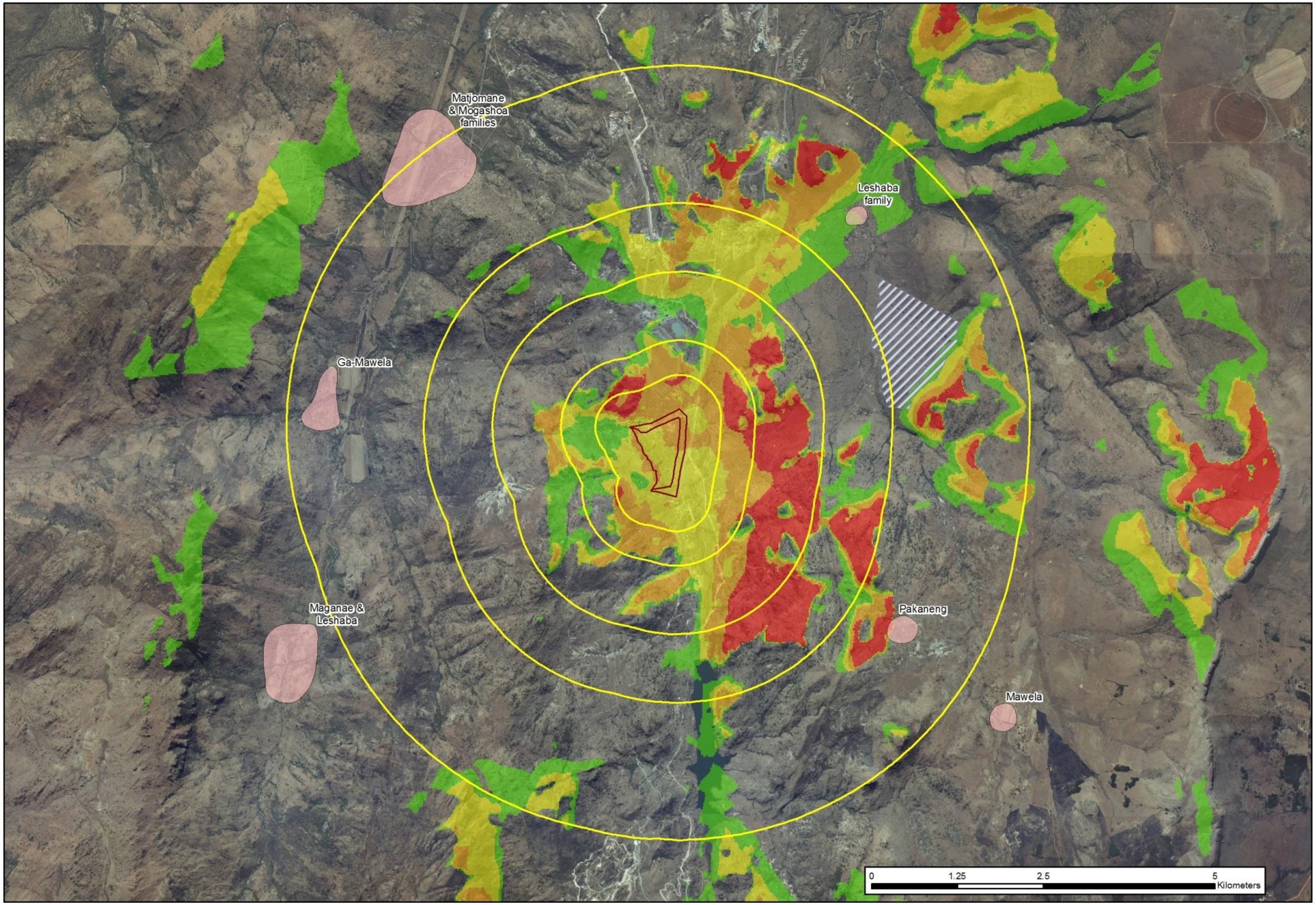


Figure 7-5: Simulated sulphate plume for the Helena TSF and lined Co-Disposal Facility (2044)



N

Legend
Der Brochen Co-Disposal Facility
Distance from facility
Identified Communities
Mareesburg TSF
Viewshed of the Facility
Visibility (%)
0
1 - 25
25 - 50
50 - 75
75 - 100

Data Source: Service Layer Credits: CD:NGI	
Scale: 1:55 000	
Projection: TM	Datum: HH94
Central Meridian/Zone: Lo 29	
Date: 27/11/2014	Compiled by: ALLK
Project No: 469113	Fig No: 7-6

srk consulting

DER BROCHEN
DER BROCHEN VIEWSHED OF THE CO-DISPOSAL FACILITY

Path: C:\Users\allk\Documents\SHelenaContours\469113_F7_6_DeBrochen_DerBrochenF_VS_A3L_27112014.mxd

Revision: A Date: 27 11 2014

7.3.3 Operation of the Mareesburg TSF and Pipeline

Table 7-13 describes and rates the potential impacts associated with the Operation of the Mareesburg TSF and Pipeline.

Table 7-13: Impacts associated with the Operation of Mareesburg Tailings Storage Facility

Operation of the Mareesburg TSF and Pipeline					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
	Geology				
	No impacts are envisaged during the Operational Phase.				
	Topography				
O37	***Changes in topography as a result of the Tailings Dam*** *The Tailings Dam will be situated in a valley dam on the Mareesburg farm. The dam will be situated against the side of a hill with the toe position beyond the 1:100 year floodline of the adjacent stream.* *An initial starter wall will be constructed at the toe position of the Tailings Dam. The starter wall will have a maximum outer slope of 1:3, will be covered with soil and will be grassed. Once tailings deposition has reached the top of the starter wall, the wall will be raised using tailings in the conventional Tailings Dam wall construction method and*	• *Magnitude: Moderate* • *Duration: Long term* • *Scale: Site specific* • *Consequence: Medium* • *Probability: Definite* *Significance: **MEDIUM (-)***	• Rehabilitation and vegetation of tailings walls: ○ *The outer slope of the Tailings Dam wall will be covered with soil and will be grassed.* ○ *On closure, the top surface of the Tailings Dam will be covered and grassed.*	• *Magnitude: Minor* • *Duration: Long term* • *Scale: Site specific* • *Consequence: Medium* • *Probability: Possible* *Significance: **MEDIUM (-)***	*Environmental Management Programme Report for the Der Brochen Mine Volume 1 of 3 (SRK Consulting Report No. 295606/4/ November 2002)*

Operation of the Mareesburg TSF and Pipeline					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
	will rise to approximately 110 m in height.				
	Soils, land capability and land use				
O38	***Loss of soil resources in the area to be covered by the Tailings Dam*** *During the Operational Phase, 200 000 m^3 of soil will be required for the ongoing rehabilitation of the Tailings Dam.* *Soil will be stripped sequentially ahead of each area to be covered. The total area disturbed will be 120 ha.*	• *Magnitude: Moderate* • *Duration: Long term* • *Scale: Site specific* • *Consequence: Medium* • *Probability: Definite* *Significance: **MEDIUM (-)***	• *A soil stripping, stockpiling and utilisation plan should be developed. Soil can be stripped sequentially ahead of areas being flooded such that the whole basin does not have to be stripped at the outset.* • *Soil stripped will either be used immediately for rehabilitation of the outer slope of the wall or will be stockpiled for later use.* • *Soil placed in stockpiles will not be compacted. It is anticipated that natural re-vegetation will provide an adequate cover to protect these stockpiles against erosion. In the event that this does not occur the areas will be seeded.* • Stripped soil not used for the starter wall and rehabilitation	• *Magnitude: Minor* • *Duration: Long term* • *Scale: Site specific* • *Consequence: Medium* • *Probability: Possible* *Significance: **MEDIUM (-)***	*Environmental Management Programme Report for the Der Brochen Mine Volume 1 of 3 (SRK Consulting Report No. 295606/4/ November 2002)*

Operation of the Mareesburg TSF and Pipeline					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
			of the outer slope of the wall will be stockpiled for later use.		
O39	***Loss of soil resources due to erosion*** *Concentrated water discharges at the return water dam could cause erosion due to the topography of the area, nature of rainfall and medium to high erodibility of the soil.*	• *Magnitude: Major* • *Duration: Short term* • *Scale: Site specific* • *Consequence: Medium* • *Probability: Definite* *Significance: **MEDIUM (-)***	• *Erosion control measures will have to be implemented throughout the site for the entire life of the mine.* • *Drainage facilities will be designed to minimise the potential for soil erosion.* • *Energy dissipaters will be provided in areas where concentrated discharges could cause significant erosion, such as the Tailings Dam, return water dam and the access/service roads.* • *All drainage facilities will be checked at approximately three monthly intervals during the rainy season and any undue erosion or siltation, especially at discharge points, will be noted and repaired. Der Brochen will identify the cause of such undue erosion or siltation and suitable remedial measures will be*	• *Magnitude: Moderate* • *Duration: Short term* • *Scale: Site specific* • *Consequence: Low* • *Probability: Possible* *Significance: **LOW (-)***	*Environmental Management Programme Report for the Der Brochen Mine Volume 1 of 3 (SRK Consulting Report No. 295606/4/ November 2002)*

Operation of the Mareesburg TSF and Pipeline					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
			implemented.		
O40	***Soil contamination due to leaching of contaminants and seepage*** *Contaminants from the return water dam and Tailings Dam could penetrate adjacent soils close to the foot of the return water dam and Tailings Dam.*	• *Magnitude: Minor* • *Duration: Short term* • *Scale: Site specific* • *Consequence: Low* • *Probability: Possible* *Significance: **LOW (-)***	• *Water pollution management measures are designed to contain all polluted water, thereby minimising the potential for soil contamination from this source.* • *Any spillage will be cleaned up and remediated.* • Monitoring will be implemented downstream of all Pipeline watercourse crossings to detect any impacts. • A leak/spill detection plan will be devised and implemented for all possible areas of leak/spillage. • An inspection and maintenance plan will be implemented to ensure that the Tailings Storage Facility and Pipelines always operate within specifications. • Storm water containment is	*Negligible*	*Environmental Management Programme Report for the Der Brochen Mine Volume 1 of 3 (SRK Consulting Report No. 295606/4/ November 2002)*

Operation of the Mareesburg TSF and Pipeline

Impact Reference No.	Impact	Significance rating pre-mitigation	Recommended management measures	Significance rating post-mitigation	Source document
			planned for the Tailings Storage Facility as per the Stormwater Management Plan. • Continuous rehabilitation on tailings walls during operation.		
	Biodiversity				
O41	**Changes in community structure and population dynamics of floral species** Increased tailings deposition within the rocky drainage lines will affect conservation important species population growth. Disturbance of drainage line areas may result in a change in structure of species composition in the long term. An increase in alien species around the footprint of the Mareesburg TSF due to unsuccessful rehabilitation of disturbed areas is also anticipated.	• Magnitude: Moderate • Duration: Long term • Scale: Regional • Consequence: High • Probability: Possible Significance: **HIGH (-)**	• Continuous education of staff – both permanent, and contractors is required on the importance of biodiversity in the region and why it should be conserved. • Regular dust suppression on gravel roads and TSF. • No off road driving should be permitted. • Long term monitoring of the Groot- Dwars River is required both in terms of habitat/community structural changes as well as bio-monitoring of the system. • Ensure the Alien and Invasive Management Plan and	• Magnitude: Moderate • Duration: Long term • Scale: Regional • Consequence: High • Probability: Possible Significance: **HIGH (-)**	Der Brochen Platinum Mine Floristic Assessment (Natural Scientific Services (NSS) Report 1995, May 2014)

Operation of the Mareesburg TSF and Pipeline					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
			Biodiversity Action Plan is continuously updated and implemented. • Revegetate areas on the TSF as soon as possible. Rehabilitation must include indigenous species of the area. Collection of seed and storage of plants would have occurred prior to vegetation clearing in the Construction Phase.		
O42	***Displacement or disturbance of animal life (and their migration paths) as a result of operation activities*** *Herpetofauna, birds, small mammals and insects will be displaced locally due to an increase in dust, noise and illumination during the operation of the Mareesburg TSF.*	• *Magnitude: Moderate* • *Duration: Long term* • *Scale: Site specific* • *Consequence: Medium* • *Probability: Definite* *Significance: **MEDIUM (-)***	• The delineated footprint of the Mareesburg TSF should not be exceeded. • Dust suppression on the gravel roads and TSF should be implemented to minimise dust fallout on vegetation surrounding the TSF. • *The area of habitat disturbed and isolated for the purpose of mining and processing activities will be limited, as far as is practical, to the minimum required for safe and efficient operation.* • *Noise disturbance to wildlife*	• *Magnitude: Minor* • *Duration: Long term* • *Scale: Site specific* • *Consequence: Medium* • *Probability: Possible* *Significance: **MEDIUM (-)***	*Environmental Management Programme Report for the Der Brochen Mine Volume 1 of 3 (SRK Consulting Report No. 295606/4/ November 2002)*

Operation of the Mareesburg TSF and Pipeline					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
			will be limited by using only pre-determined access routes and restricting noise to operational sites.		
O43	***Cumulative impacts on biota*** *The cumulative increase in mining developments in the Sekhukhune area has led to a cumulative loss of habitat and species. Natural areas of closed savanna and open savanna will remain intact, but disturbance and edge effects will increase, and the survival of species sensitive to disturbance cannot be ensured.*	• *Magnitude: Moderate* • *Duration: Long term* • *Scale: Site specific* • *Consequence: Medium* • *Probability: Definite* *Significance: **MEDIUM (-)***	• *To manage the area as a game farm / natural area, the carrying capacity of the total fenced area will be determined by evaluating the veld condition and available water.* • *The animal populations in the area will be monitored and managed (excess stock sold / culled / harvested).*	• *Magnitude: Minor* • *Duration: Long term* • *Scale: Site specific* • *Consequence: Medium* • *Probability: Possible* *Significance: **MEDIUM (-)***	*Environmental Management Programme Report for the Der Brochen Mine Volume 1 of 3 (SRK Consulting Report No. 295606/4/ November 2002)*
O44	***Disturbance/loss of aquatic animal species due to deterioration in surface water quality due to contamination from various forms of pollution from operational activities, increased sediment loads, oil and fuel spills and leaks.*** *Impact on surface water during operations from potential*	• *Magnitude: Major* • *Duration: Short term* • *Scale: Site specific* • *Consequence: Medium* • *Probability: Definite* *Significance: **MEDIUM (-)***	• *All effort will be made to maintain this "good" biotic status and continuous seasonal biological monitoring will be performed when mining operation commences. Such future monitoring together with the already gathered baseline information will then be used for early detection of possible future biotic degradation to*	• *Magnitude: Moderate* • *Duration: Short term* • *Scale: Site specific* • *Consequence: Low* • *Probability: Possible* *Significance: **LOW (-)***	*Environmental Management Programme Report for the Der Brochen Mine Volume 1 of 3 (SRK Consulting Report No. 295606/4/ November 2002)*

Operation of the Mareesburg TSF and Pipeline					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
	spillage. *Increased fuels, oils, cements and other waste from operational activities and vehicles may contaminate surface water bodies.*		*enable mitigation measures.* • *A long term monitoring programme will be implemented to monitor physico-chemical and biological components of the aquatic ecosystems within and below the mining area. The monitoring programme will commence as soon as mining operations start. This would enable the timely identification of required mitigation/environmental management procedures to maintain the high quality of this ecologically important aquatic ecosystem.* • Erosion control measures in the form of temporary erosion prevention berms should be implemented during construction. • Clean water diversion bunds should be constructed upstream of the construction site prior to clearing areas for new infrastructure.		

Operation of the Mareesburg TSF and Pipeline					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
			• Emergency action plans should be drawn up to deal with spillages. • Chemical toilets should be provided at operations sites.		
	Wetlands				
O45	No additional impacts expected after the Construction Phase. However, the surrounding natural area should not be further impact upon. Management measures for the surrounding natural area should be implemented.	Not applicable.	• Clear separation of clean and dirty water should take place and diversion of clean water around the operational areas must ensure minimisation of the loss of catchment yield.	Not applicable.	Not applicable.
	Surface water				
O46	***Alteration of drainage patterns caused by mining activities*** *The Tailings Dam site will be across minor drainage lines, causing them to disappear. This may result in the loss of a resource and contamination of runoff.*	• *Magnitude: Moderate* • *Duration: Long term* • *Scale: Site specific* • *Consequence: Medium* • *Probability: Possible* *Significance: **MEDIUM (-)***	• *Clean stormwater diversions will assist in directing water to natural river courses. River diversions will be implemented, where necessary.* • *All rainfall runoff originating on top of the Tailings Dam will be discharged via a penstock to the return water dam. This water, together with all rain*	• *Magnitude: Minor* • *Duration: Long term* • *Scale: Site specific* • *Consequence: Medium* • *Probability: Possible* *Significance: **MEDIUM (-)***	*Environmental Management Programme Report for the Der Brochen Mine Volume 1 of 3 (SRK Consulting Report No. 295606/4/ November 2002)*

Operation of the Mareesburg TSF and Pipeline					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
			falling on the return water dam, will therefore be removed from the catchment. The water will, however, be utilised in the mine's process water circuit thus reducing demand on the mine's primary raw water source. • *The slope faces will be topsoiled and re-vegetated.* • *Water management and erosion control measures will be inspected regularly, and appropriate remedial measures will be implemented where necessary.* • Contaminated runoff from the Tailings Dam will be collected on the dam and recycled to the process water circuit via the penstock and return water dam. • Clear separation of clean and dirty water must take place and diversion of clean water around the operational areas must ensure minimisation of		

Operation of the Mareesburg TSF and Pipeline					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
			the loss of catchment yield.		
O47	***Deterioration in surface water quality due to increased sediment load*** *Ineffective runoff control, for example from the Tailings Dam may lead to erosion and siltation of water bodies. Increased sediment loads may cause damage to the aquatic ecosystem due to substances in the discharge. Large volumes of water being discharged from small conduits will have a scouring effect on stream banks and beds.* *Erosion of the sides of the Tailings Dam will lead to siltation of watercourses and loss of fauna and flora in the vicinity.*	• *Magnitude: Major* • *Duration: Long term* • *Scale: Site specific* • *Consequence: High* • *Probability: Possible* *Significance: **HIGH (-)***	• *Re-vegetation of all denuded areas.* • *Water management and erosion control measures will be inspected regularly, and appropriate remedial measures will be implemented where necessary.* • Clear separation of clean and dirty water must take place and diversion of clean water around the operational areas must ensure minimisation of the loss of catchment yield.	• *Magnitude: Moderate* • *Duration: Long term* • *Scale: Site specific* • *Consequence: Medium* • *Probability: Possible* *Significance: **MEDIUM (-)***	*Environmental Management Programme Report for the Der Brochen Mine Volume 1 of 3 (SRK Consulting Report No. 295606/4/ November 2002)*
O48	***Contamination of surface water bodies due to diffuse pollution*** *Seepage from the Tailings Dam directly to surface water bodies can cause contamination.*	• *Magnitude: Major* • *Duration: Long term* • *Scale: Site specific* • *Consequence: High* • *Probability: Possible*	• *Stormwater runoff from the small catchment area above the dam, rainfall on the Tailings Dam and supernatant water will be decanted through penstocks and an underdrain into a lined return*	• *Magnitude: Moderate* • *Duration: Long term* • *Scale: Site specific* • *Consequence: Medium* • *Probability: Possible*	*Environmental Management Programme Report for the Der Brochen Mine Volume 1 of 3 (SRK Consulting Report No. 295606/4/ November*

Operation of the Mareesburg TSF and Pipeline					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
		*Significance: **HIGH (-)***	*water dam, from where it will be recycled back into the process. An emergency spillway will be provided to deal with extreme storm events.* • *Runoff from the side slopes of the dam will be caught on the step-in areas where solids will be trapped and the water evaporated. The step-in areas are designed to contain the 1:50 year storm.* • *The Tailings Dam will be provided with underdrains and a solution trench along the full length of the toe of the starter wall. Seepage water collected in this trench will be discharged to the return water dam.* • *Revegetation of the Tailings Dam both during the Operational Phase and following closure will greatly reduce groundwater recharge as the resultant evapotranspiration.*	*Significance: **MEDIUM (-)***	*2002)*

Operation of the Mareesburg TSF and Pipeline					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
			• Monitoring will be implemented downstream of all Pipeline watercourse crossings to detect any impacts. • A leak/spill detection plan will be devised and implemented for all possible areas of leak/spillage. • An inspection and maintenance plan will be implemented to ensure that the Tailings Storage Facility and Pipelines always operate within specifications. • Storm water containment is planned for the Tailings Storage Facility as per the Stormwater Management Plan. • Continuous rehabilitation on tailings walls during operation. • Implementation of good housekeeping practices at operational sites.		

Operation of the Mareesburg TSF and Pipeline					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
	Changes to the hydrology within the Mareesburg Stream catchment will continue from the Construction Phase. No additional mitigation is indicated. Please Refer to Table 7-4, Impact Reference C8, C9 and C10.				
O49	**Contamination of surface water quality at Mareesburg stream** Spillage of tailings and/or return water from the piped transfer systems has the potential to impact directly on the Mareesburg Stream and Groot-Dwars River via spills in the riparian zone at watercourse crossings or indirectly via runoff. The greatest consequence is for spillage occurring at the watercourse crossings.	• Magnitude: Moderate • Duration: Medium term • Scale: Local • Consequence: Medium • Probability: Possible Significance: **MEDIUM (-)**	• Regular inspections of the Pipeline route should be undertaken in order to detect leaks/ spillages timeously. • Monitoring should be implemented downstream of all Pipeline watercourse crossings to detect any impacts. • A leak/spill detection plan should be devised and implemented for all possible areas of leak/spillage. • An inspection and maintenance plan should be implemented to ensure that the Tailings Storage Facility and Pipelines always operate within specifications.	• Magnitude: Minor • Duration: Medium term • Scale: Local • Consequence: Medium • Probability: Unlikely Significance: **LOW (-)**	Der Brochen Project Environmental Impact Assessment/ Environmental Management Plan Amendment and Alignment: Surface Water Specialist Report (SRK Report No. 469113/SW, October 2014)
	Groundwater				
O50	***Deterioration of groundwater quality at the Tailings Dam*** *Deterioration of groundwater quality by downward recharge*	• *Magnitude: Major* • *Duration: Long term*	• *The Tailings Dam design will take into consideration the shallow depths to groundwater and close*	• *Magnitude: Moderate* • *Duration: Long term*	*Environmental Management Programme Report for the Der Brochen Mine*

Operation of the Mareesburg TSF and Pipeline					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**

	from surface to the underlying aquifers and contamination of surface water by spillage/ overflow from the Pipeline/ drains/ storage dams at the Tailings Dam and return water dams.
	
	Due to the large volumes of potentially contaminant material generated, the Tailings Dam is likely to provide the greatest risk to contamination of the risk to contamination of the underlying weathered bedrock aquifer, local primary aquifer and Mareesburg surface flow, due to the shallow nature of the aquifers and their hydraulic continuity.
	
	The main source of contamination in the Tailings Dam will be the slurry water and this may enter the groundwater system by vertical and lateral infiltration from the base and perimeter of the Tailings Dam and return water dam.
		• *Scale: Site specific*
		• *Consequence: High*
		• *Probability: Possible*
		
		*Significance: **HIGH (-)***
			proximity to the Mareesburg river and associated primary aquifer. The available runoff and downward/lateral infiltration available to recharge the aquifers and surface flow will be reduced to a minimum through proper Tailings Dam design.
			
			• *Due to the shallow depth of the groundwater aquifer, if the detailed geotechnical work proves the soil permeability to be a problem (<10-6 cm/s), the following management measures will be implemented to reduce seepage:*
			  ○ *The topsoil will be removed;*
			  ○ *Any clayey subsoil will be removed;*
			• *Implementation of a groundwater monitoring programme to monitor the boreholes at the Tailings Dam.*
			• The water management plan
				• *Scale: Site specific*
				• *Consequence: Medium*
				• *Probability: Possible*
				
				*Significance: **MEDIUM (-)***
					Volume 1 of 3 (SRK Consulting Report No. 295606/4/ November 2002)

Operation of the Mareesburg TSF and Pipeline					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
			for the tailings will be a closed circuit system with no discharge to the environment. • The return water from the Tailings Dam will be pumped in a closed circuit to the Concentrator process water tank. • Monitoring of water levels in monitoring boreholes as per the groundwater monitoring programme. Should the groundwater monitoring programme indicate that groundwater resources have been affected by dewatering, indicate alternative supply of water will be made available.		
O51	**Contaminant plume migration (deterioration of groundwater and surface water quality)** The simulated leachate plumes emanating from an unlined or lined Mareesburg TSF will in all likelihood reach the Mareesburg Stream due to its close proximity to the surface water course (~	• Magnitude: Major • Duration: Long term • Scale: Local • Consequence: High • Probability: Definite Significance: **HIGH (-)**	• Installation of a lining system, either composite clay or HDPE. • Seepage collection drains should be constructed to collect seepage emanating from the TSF. Seepage should be pumped to the Pollution Control Dam to be	• Magnitude: Moderate • Duration: Long term • Scale: Local • Consequence: Medium • Probability: Possible Significance: **MEDIUM (-)**	Der Brochen Project-Groundwater Investigation and Model Report (Delta H Report No. 2013.027-01, October 2014)

Operation of the Mareesburg TSF and Pipeline

Impact Reference No.	Impact	Significance rating pre-mitigation	Recommended management measures	Significance rating post-mitigation	Source document
	110 m towards the southern TSF wall). Although it's expected that the overall salt load reporting to the Mareesburg Stream will significantly be reduced by a lining system the spreading of the plume can be effectively be contained (from reaching the Mareesburg Stream) through the implantation of a hydraulic containment system. Refer to Figure 7-7 for the simulated sulphate plume for the lined Mareesburg TSF (2044).		contained. • Hydraulic containment system should be implemented during Operational and Closure Phases.		
	Air Quality				
O52	***Increased dust levels due to mining operations*** *Prevailing wind directions are north-westerly and south-easterly due to the topographical orientation of valleys and ridges in the area. As a result, dust from the Tailings Dam will be blown to the north-west and south-east.*	• *Magnitude: Moderate* • *Duration: Short term* • *Scale: Site specific* • *Consequence: Medium* • *Probability: Possible* *Significance:* ***MEDIUM (-)***	• *During this operation the top of the crest wall will either be similarly treated or provided with some other suitable form of cover such as a waste rock.* • *As areas dry out on the top of the Tailings Dam, a light crust will form. Provided the side walls and the tops of the crest walls are adequately protected, this crust is*	• *Magnitude: Minor* • *Duration: Short term* • *Scale: Site specific* • *Consequence: Low* • *Probability: Possible* *Significance:* ***LOW (-)***	*Environmental Management Programme Report for the Der Brochen Mine Volume 1 of 3 (SRK Consulting Report No. 295606/4/ November 2002)*

Operation of the Mareesburg TSF and Pipeline					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
			expected to remain largely intact for several weeks to months, depending on the prevailing weather conditions. This should therefore provide adequate protection against excessive dust generation. • Vegetation of the sides of the Tailings Dam wall to reduce surface erosion. • A dust monitoring programme is in place. • Dust suppression will be undertaken of the service roads and Tailings Facility where required.		
	Noise				
O53	**Increase in ambient noise** Noise impacts during the operation of the Mareesburg TSF are considered negligible.	• Magnitude: Minor • Duration: Long term • Scale: Local • Consequence: Medium • Probability: Unlikely Significance: **LOW (-)**	No mitigation measures required.	• Magnitude: Minor • Duration: Long term • Scale: Local • Consequence: Medium • Probability: Unlikely Significance: **LOW (-)**	Not applicable.

Operation of the Mareesburg TSF and Pipeline					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
	Visual				
O54	**Decrease in visual aesthetics of the area** The Mareesburg TSF will reach a height of 115 m which may have an impact on the visual aesthetics of the area. Refer to Figure 7-8 which shows the viewshed modelled for the raised Helena TSF. The Leshaba family on Welgevonden farm will have a full view of the Mareesburg TSF.	• Magnitude: Moderate • Duration: Long term • Scale: Local area • Consequence: Medium • Probability: Definite Significance: **MEDIUM (-)**	• Vegetate tailings walls to blend into the natural environment.	• Magnitude: Minor • Duration: Long term • Scale: Local area • Consequence: Medium • Probability: Definite Significance: **MEDIUM (-)**	Not applicable.
	Cultural heritage resources				
O55	No additional impacts are envisaged during the Operational Phase, however there are cultural heritage sites identified around the Mareesburg TSF area. Management measures should apply to these heritage sites.	Not applicable.	• Fence heritage sites near infrastructure with a significance rating of low to high. • Provide access to cemeteries and graves to families of the deceased.	Not applicable.	Not applicable.
	Traffic and transportation				
	Refer to Table 7-11, Impact Reference O15, O16, O17 and O18 for traffic impacts associated with the Operational Phase.				

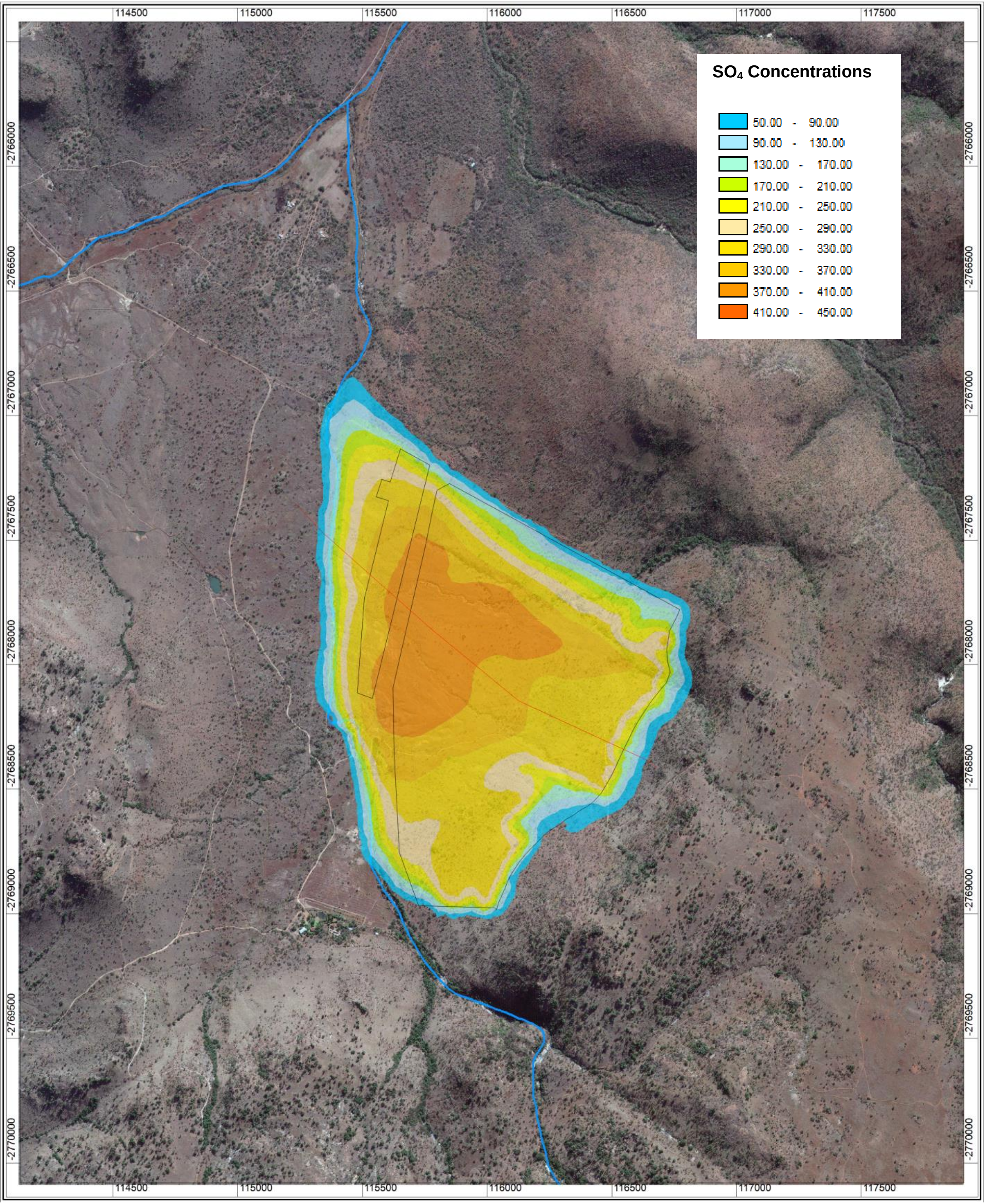
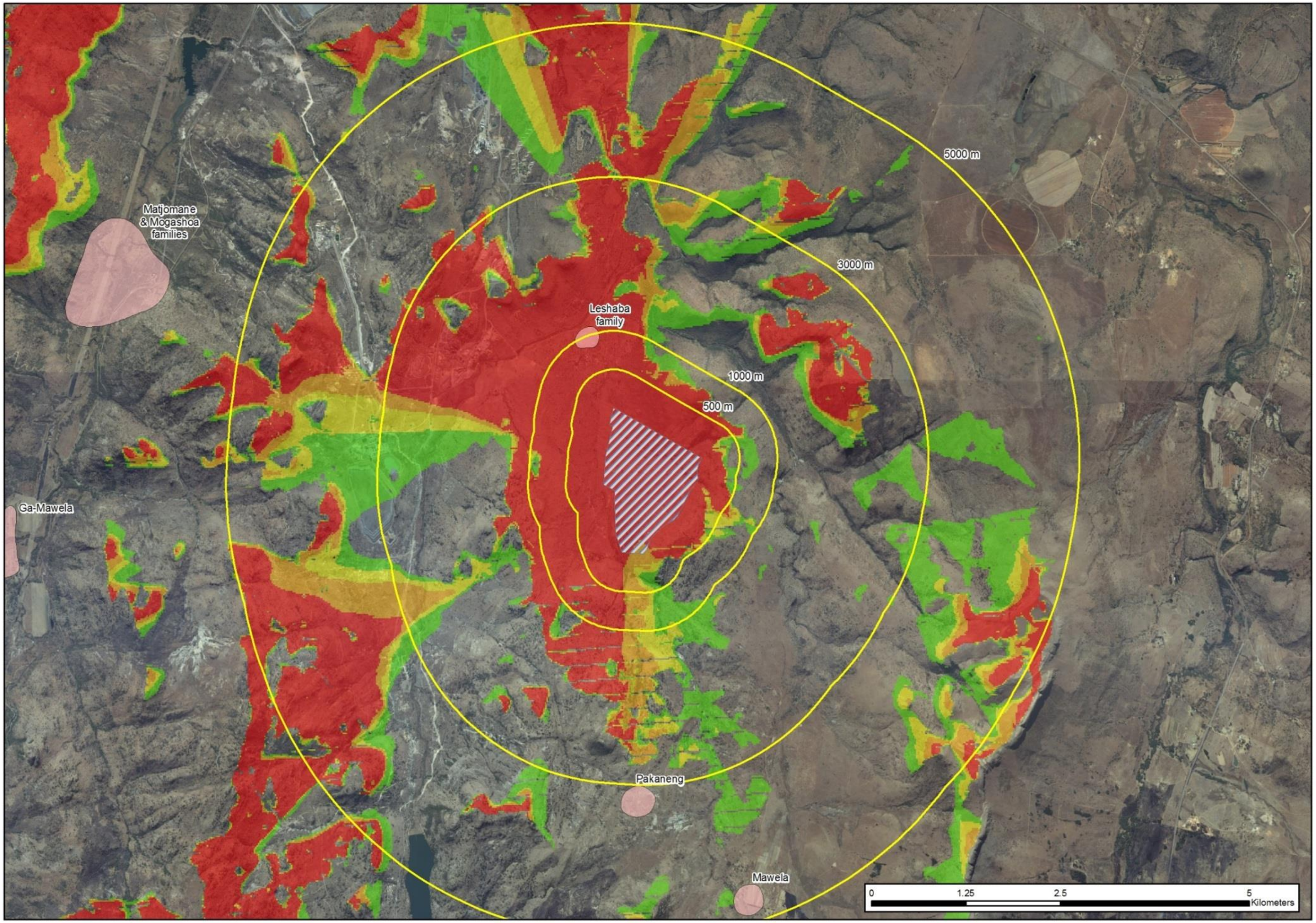


Figure 7-7: Simulated sulphate plume for the lined Mareesburg TSF 2044



N

Legend

Distance from TSF
Identified Communities
Mareesburg TSF
Viewshed of the Mareesburg TSF
0
1 - 25
25 - 50
50 - 75
75 - 100

Data Source:
Service Layer Credits: CD:NGI

Scale:
1:50 000

Projection: TM	Datum: HH94
Central Meridian/Zone: Lo 29	
Date: 03/11/2014	Compiled by: ALLK
Project No: 469113	Fig No: 7-8

srk consulting

DER BROCHEN
VIEWSHED OF THE MAREESBURG TSF

Path: C:\Users\allk\Documents\SHelenaContours\469113_F7_8_DeBrochen_MareesburgTSF_VS_A3L_03112014.mxd

Revision: A Date: 03 11 2014

7.3.4 Operation of the Helena TSF

Table 7-14 describes and rates the current impacts associated with the Operation of the Helena TSF and associated infrastructure, which includes two Return Water Dams, a Perimeter Drain and Pipeline servitude. This includes the proposed heightening of the Helena TSF from an original terminal height of 42 m to 63 m (increase of 21 m).

Table 7-14: Impacts associated with the Operation of the Helena Tailings Storage Facility and associated infrastructure

Operation of the Helena TSF and associated infrastructure					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Mitigation Measure**	**Significance rating post-mitigation**	**Source document**
	Geology				
	No impacts are envisaged during the Operational Phase.				
	Topography				
O56	***Permanent alteration of topography due to the raising of the TSF*** *The existing Helena TSF is located within a small valley adjacent to the Groot-Dwars River to an elevation between 1082 masl in the east and 1124 masl in the west. The final elevation of the Helena TSF will be 1145 masl. The increase in height of approximately 21 m will marginally influence topography and drainage patterns in the area. The ability of the area to free drain will decrease.* *The raised Helena TSF will*	• *Magnitude: Moderate* • *Duration: Long term* • *Scale: Local area* • *Consequence: Medium* • *Probability: Definite* *Significance: **MEDIUM (-)***	• *On closure, the TSF should be shaped to be free draining. Erosion protection should be provided.* • *The TSF will be re-vegetated to blend into the natural environment.*	• *Magnitude: Moderate* • *Duration: Long term* • *Scale: Local area* • *Consequence: Medium* • *Probability: Definite* *Significance: **MEDIUM (-)***	*Der Brochen Project EMP Amendment:: Raising of Helena Tailings Storage Facility EIA and EMP (SRK Consulting Report No. 475423/EIA/EMP; September 2014)*

Operation of the Helena TSF and associated infrastructure					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Mitigation Measure**	**Significance rating post-mitigation**	**Source document**
	become a permanent feature of the landscape.				
	Soils, land capability and land use				
O57	***Loss of soil resources*** *Due to the infilling of tailings material between the rockfill walls, 3 ha of soil resources will be lost. This area is, however, on a steep slope and only suitable for grazing.*	• *Magnitude: Moderate* • *Duration: Long term* • *Scale: Site specific* • *Consequence: Medium* • *Probability: Definite* *Significance: **MEDIUM (-)***	• *Soils should be stripped and stockpiled for use during rehabilitation.* • Shaped TSF to be covered in topsoil from stockpiles. • Revegetate topsoiled TSF.	• *Magnitude: Minor* • *Duration: Long term* • *Scale: Site specific* • *Consequence: Medium* • *Probability: Unlikely* *Significance: **LOW (-)***	*Der Brochen Project EMP Amendment:: Raising of Helena Tailings Storage Facility EIA and EMP (SRK Consulting Report No. 475423/EIA/EMP; September 2014)*
O58	***Contamination of soil resource*** *The potential contamination of soils as a result of seepage from deposited tailings and Pipeline spills.*	• *Magnitude: Moderate* • *Duration: Long term* • *Scale: Site specific* • *Consequence: Medium* • *Probability: Definite* *Significance: **MEDIUM (-)***	• *Soils will be stripped and stockpiled for use during rehabilitation.* • *Conduct weekly site inspections along the Pipeline to detect any spills or leakages.* • *Immediate remediation of tailings spillages along Pipeline routes.* • *An inspection and maintenance plan will be implemented to ensure that the TSF and Pipelines*	• *Magnitude: Minor* • *Duration: Long term* • *Scale: Site specific* • *Consequence: Medium* • *Probability: Unlikely* *Significance: **LOW (-)***	*Der Brochen Project EMP Amendment:: Raising of Helena Tailings Storage Facility EIA and EMP (SRK Consulting Report No. 475423/EIA/EMP; September 2014)*

Operation of the Helena TSF and associated infrastructure					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Mitigation Measure**	**Significance rating post-mitigation**	**Source document**
			operate within specifications.		
	Biodiversity				
O59	***Loss of insect species / communities of conservation value due to direct impacts such as loss of habitat or habitat fragmentation and indirect impacts such as dust and noise*** *The Cicada (Pycna sylvia) is of conservational importance and found within the Der Brochen Project area, on Helena farm. Cicada are sensitive to pollution, both dust and noise.* *It is expected that operational activities of the Tailings Dam will affect Cicada populations that are endemic to this area. However, this impact will be minimised as a result of the provision of the buffer zone between the Tailings Dam and Cicada habitat, as well as allocation of conservation areas for the species.*	• *Magnitude: Major* • *Duration: Long term* • *Scale: Site specific* • *Consequence: High* • *Probability: Definitely* *Significance: **HIGH (-)***	• *Regular monitoring of the Cicada population, as per the Biodiversity Action Plan.* • *Implementation of measures to reduce dust and noise impacts, including grassing and vegetation of the Tailings Dam and regular maintenance of operational vehicles and equipment.* • *Areas of disturbance will be limited to the footprints and vehicular movement outside of these demarcated areas will be restricted.* • *Method statements will be supplied to the ECO before commencement of any disturbing/destructive construction/operational activities such as removal/disturbance of trees or important species, vegetation, disturbance of streams, dry watercourses,*	• *Magnitude: Moderate* • *Duration: Long term* • *Scale: Site specific* • *Consequence: Medium* • *Probability: Possible* *Significance: **MEDIUM (-)***	*Der Brochen Mine: Environmental Impact Assessment Report and Environmental Management Programme (SRK Consulting Report No. 343158/ April 2005)*

Operation of the Helena TSF and associated infrastructure					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Mitigation Measure**	**Significance rating post-mitigation**	**Source document**
			drainage lines or riparian areas). • *Sufficient conservation areas, including all cicada habitat, will remain intact, as part of an integrated conservation management plan for the area.*		
O60	***Loss of biodiversity*** *Loss of vegetation as a result of clearing activities for the area earmarked for additional deposition of tailings material.*	• *Magnitude: Moderate* • *Duration: Long term* • *Scale: Site specific* • *Consequence: Medium* • *Probability: Definite* *Significance: **MEDIUM(-)***	• *Plants that are to be removed for rehabilitation purposes will be removed and replanted in a nursery under the guidance of a recognized landscaper. The mine will be responsible for the operation of the nursery until such time.*	• *Magnitude: Minor* • *Duration: Long term* • *Scale: Site specific* • *Consequence: Medium* • *Probability: Definite* *Significance: **MEDIUM(-)***	*Der Brochen Project EMP Amendment:: Raising of Helena Tailings Storage Facility EIA and EMP (SRK Consulting Report No. 475423/EIA/EMP; September 2014)*
	Surface water				

O61	***Deterioration of stormwater and surface water quality due to operations of the Tailings Dam and related activities***
	Spillages and leakages of engine oils and diesel/petrol from vehicles, as well as spills/leaks from the Tailings Dam during the Operational
		• *Magnitude: Major*
		• *Duration: Short term*
		• *Scale: Site specific*
		• *Consequence: Medium*
		• *Probability: Possible*
		*Significance: **MEDIUM (-)***
			• *Engineering designs include:*
			  ○ *Cut-off trenches and walls above the Tailings Dam to separate clean water from the Tailings Dam.*
			  ○ *Paddocks and solution trenches between the foot of the Tailings Dam*
				• *Magnitude: Moderate*
				• *Duration: Short term*
				• *Scale: Site specific*
				• *Consequence: Low*
				• *Probability: Possible*
				*Significance: **LOW (-)***
					Der Brochen Mine: Environmental Impact Assessment Report and Environmental Management Programme (SRK Consulting Report No. 343158/ April 2005)

Operation of the Helena TSF and associated infrastructure					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Mitigation Measure**	**Significance rating post-mitigation**	**Source document**
	Phase may potentially decrease stormwater and surface water quality. *This impact is reduced due to engineering designs during the construction for the Helena TSF which included cut-off trenches and walls to separate clean water from the Tailings Dam. However should a spill occur, it would Cicada habitat and the Groot-Dwarsrivier, which is in close proximity to the Tailings Dam.*		*and the Mareesburg stream channel to intercept migrating slurry water along the soil profile/bedrock contact zone.* ○ *Decanting of stormwater runoff from the small catchment area above the dam, rainfall on the Tailings Dam and supernatant water through penstocks and an underdrain into return water dams from where it will be recycled back into the process.* ○ *An emergency spillway to deal with extreme storm events.* ○ *Collection of runoff from the side slopes of the dam on step-in areas where solids will be trapped and collection of seepage from beneath the Tailings Dam in drains down slope of the dam to be returned into*		

Operation of the Helena TSF and associated infrastructure					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Mitigation Measure**	**Significance rating post-mitigation**	**Source document**
			the process. • *Good housekeeping practices will be maintained, including but not limited to separation of clean and dirty water, limiting exposed dirty surfaces and maximizing opportunities for re-use of water.* • *Linear infrastructure such as roads and Pipelines should be inspected at least monthly to check that the associated water management infrastructure is effective in controlling erosion.* • A fenced boundary has been constructed for the Tailings Dam site which is located 100 m beyond the 1:100 year floodline of the valley tributary, ensuring the upper catchment runoff is not affected. • Stormwater runoff from the small catchment area above the dam, rainfall on the Tailings Dam and supernatant		

Operation of the Helena TSF and associated infrastructure					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Mitigation Measure**	**Significance rating post-mitigation**	**Source document**
			water is decanted through penstocks and an underdrain into return water dams from where it is recycled back into the process. • An emergency spillway is provided to deal with extreme storm events. Runoff from the side slopes of the dam is collected on the step-in areas where solids are trapped. • Seepage from beneath the Tailings Dam is collected in drains down slope of the dam and returned into the process. • The Tailings Dams slopes/walls will be continuously revegetated to reduce surface areas exposed to runoff.		
O62	***Decrease of surface water quality*** *Existing clean water diversions currently divert runoff along the western boundary of the Helena TSF. The TSF will expand in a westerly direction therefore cut-*	• *Magnitude: Moderate* • *Duration: Long term* • *Scale: Local area* • *Consequence: Medium* • *Probability: Definite*	• *Re-align cut-off trench to divert clean stormwater around the TSF.* • *Manage separation of clean and dirty water as per the Stormwater Management Plan.*	• *Magnitude: Minor* • *Duration: Long term* • *Scale: Local area* • *Consequence: Medium* • *Probability:* Unlikely	*Der Brochen Project EMP Amendment:: Raising of Helena Tailings Storage Facility EIA and EMP (SRK Consulting Report No. 475423/EIA/EMP;*

Operation of the Helena TSF and associated infrastructure					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Mitigation Measure**	**Significance rating post-mitigation**	**Source document**
	off trenches will need to be re-aligned.	*Significance: **MEDIUM (-)***	• *Update water balance on an annual basis.*	Significance: **LOW (-)**	*September 2014)*
	Groundwater				
O63	***Discharge and development of seepage zones along the banks of the Groot-Dwars River channel*** *Process water/tailings slurry may potentially infiltrate downwards and enter the soil profile and shallow groundwater system directly from the Tailings Dam, particularly from the perimeter zones of the Tailings Dam, Perimeter Drain, Return Water Dams and from leakage/overflow events.* *Potential down slope migration of contaminated slurry water may take place along the contact zone between the soil profile and underlying bedrock (at depths of 0.5-2 m).* *Contaminated water could be expected to migrate rapidly to the valley bottom and enter the Groot-Dwarsrivier (via discharge into the surface environment*	• *Magnitude: Major* • *Duration: Short term* • *Scale: Site specific* • *Consequence: Medium* • *Probability: Possible* *Significance: **MEDIUM (-)***	• *Cut-off trenches and walls above the Tailings Dam divert clean water from the Tailings Dam, decanting runoff and supernatant water through penstocks and an underdrain into return water dams from where it is recycled back into the process.* • *An emergency spillway to deal with extreme storm events and collection of seepage from beneath the Tailings Dam in drains down slope of the dam to be returned into the process.* • *Paddocks and solution trenches have been constructed between the foot of the Tailings Dam and the Mareesburg stream channel to intercept migrating slurry water along the soil profile/bedrock contact zone.*	• *Magnitude: Moderate* • *Duration: Short term* • *Scale: Site specific* • *Consequence: Low* • *Probability: Possible* *Significance: **LOW (-)***	*Der Brochen Mine: Environmental Impact Assessment Report and Environmental Management Programme (SRK Consulting Report No. 343158/ April 2005)*

Operation of the Helena TSF and associated infrastructure					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Mitigation Measure**	**Significance rating post-mitigation**	**Source document**
	down slope or direct bank seepage into the river valley).		• *Regular monitoring through monitoring boreholes to ensure working of the tailings Pipelines through flow metres and visual inspections. Should seepage be detected, the repair of any damage will be undertaken.* • *Regular sampling of soils around the Tailings Dam to detect seepage and immediate clean-up and remediation of tailings spillage.* • *Continuous vegetation of Tailings Dam walls.*		
O64	**Contaminate plume migration (deterioration of groundwater and surface water quality)** *Downward infiltration of contaminated process/slurry water will increase groundwater recharge and eventual contamination of the shallow weathered fractured bedrock aquifer in the proposed TSF footprint area.*	• *Magnitude: Moderate* • *Duration: Short term* • *Scale: Site specific* • *Consequence: Low* • *Probability:* Definite Significance: **MEDIUM (-)**	• *Cut-off trenches and walls above the Tailings Dam divert clean water from the Tailings Dam, decanting runoff and supernatant water through penstocks and an underdrain into return water dams from where it is recycled back into the process.* • *An emergency spillway to deal with extreme storm*	• *Magnitude: Moderate* • *Duration: Short term* • *Scale: Site specific* • *Consequence: Low* • *Probability:* Definite Significance: **MEDIUM (-)**	*Der Brochen Mine: Environmental Impact Assessment Report and Environmental Management Programme (SRK Consulting Report No. 343158/ April 2005)*

Operation of the Helena TSF and associated infrastructure					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Mitigation Measure**	**Significance rating post-mitigation**	**Source document**
	However, due to the low bedrock permeability and the presence of dolerite dykes which represents a boundary condition between the TSF area and Groot-Dwarsrivier channel, the impact is likely to be small.		*events and collection of seepage from beneath the Tailings Dam in drains down slope of the dam to be returned into the process.* • *Paddocks and solution trenches have been constructed between the foot of the Tailings Dam and the Mareesburg stream channel to intercept migrating slurry water along the soil profile/bedrock contact zone.* • *Regular monitoring through monitoring boreholes to ensure working of the tailings Pipelines through flow metres and visual inspections. Should seepage be detected, the repair of any damage will be undertaken.* • *Regular sampling of soils around the Tailings Dam to detect seepage and immediate clean-up and remediation of tailings spillage.* • *Continuous vegetation of*		

Operation of the Helena TSF and associated infrastructure					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Mitigation Measure**	**Significance rating post-mitigation**	**Source document**
			Tailings Dam walls.		
O65	***Impact on groundwater quality*** *The leachate plume emanating from the Helena TSF will continue to encroach towards the Groot-Dwars River. According to simulations conducted, the sulfate seepage plumes from the Helena TSF extend to approximately 300 metres towards the Groot-Dwars River. The simulated plume migration is relatively slow due to the prevailing gradients, low aquifer conductivities and dispersion of constituents of concern along the flow path.* The tailings stream is the overall elevated expected salt load and nitrate concentration in the process water. The TSF is considered to pose the greatest pollution risk to the underlying aquifers as well as potential long-term liabilities.	• *Magnitude: Moderate* • *Duration: Long term* • *Scale: Local area* • *Consequence: Medium* • *Probability: Definite* *Significance:* ***MEDIUM (-)***	• *Continue with groundwater monitoring on a quarterly basis to detect groundwater contamination. Should groundwater be contaminated, it will be pumped to the TSF for recirculation.* • Assessment and facilitation of nitrate degradation or retardation within the TSF or shallow aquifer. • Hydraulic plume containment or reactive barriers to arrest emanating plume.	• *Magnitude: Moderate* • *Duration: Long term* • *Scale: Site specific* • *Consequence: Medium* • *Probability: Definite* *Significance:* ***MEDIUM(-)***	*Der Brochen Project EMP Amendment:: Raising of Helena Tailings Storage Facility EIA and EMP (SRK Consulting Report No. 475423/EIA/EMP; September 2014)* Der Brochen Project-Groundwater Investigation and Model Report (Delta H Report No. 2013.027-01, October 2014)
	Air Quality				
O66	***Decreased ambient air quality***	• *Magnitude: Moderate*	• *The outer side slopes of the*	• *Magnitude: Moderate*	*Der Brochen Mine:*

Operation of the Helena TSF and associated infrastructure					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Mitigation Measure**	**Significance rating post-mitigation**	**Source document**
	due to wind-blown respirable particulates (increased PM_{10} concentrations) affecting Cicada habitats *Increase in wind-blown dust from the Tailings Dam resulting in a decrease in air quality affecting Cicada habitat east of the Tailings Dam.*	• *Duration: Short term* • *Scale: Site specific* • *Consequence: Low* • *Probability: Possible* *Significance: **LOW (-)***	*Tailings Dam will continuously be vegetated.* • *The top of the Tailings Dam will be vegetated during closure and the side slopes fully vegetated to ensure a wilderness land capability.* • *Two single dust buckets will If dust is noted on the access roads, applicable measures such as a watercart or chemical dust suppression will be implemented.* • Frequent monitoring of dust buckets downwind of the Tailings Dam, as well as between the Tailings Dam and Cicada habitat to monitor dust fallout. Should dust monitoring determine that dust fallout levels exceed the limits, dust suppression measures will be put in place.	• *Duration: Short term* • *Scale: Site specific* • *Consequence: Low* • *Probability: Unlikely* *Significance: **LOW (-)***	*Environmental Impact Assessment Report and Environmental Management Programme (SRK Consulting Report No. 343158/ April 2005)*
O67	***Decreased ambient air quality due to increased wind-blown dust fallout*** *Total Suspended Particulates (TSP) concentrations within the Der Brochen Project area fall*	• *Magnitude: Major* • *Duration: Short term* • *Scale: Site specific* • *Consequence: Medium*	• *The outer side slopes of the Tailings Dam will continuously be vegetated.* • *The top of the Tailings Dam will be vegetated during closure and the side slopes*	• *Magnitude: Moderate* • *Duration: Short term* • *Scale: Site specific* • *Consequence: Low*	*Der Brochen Mine: Environmental Impact Assessment Report and Environmental Management Programme (SRK*

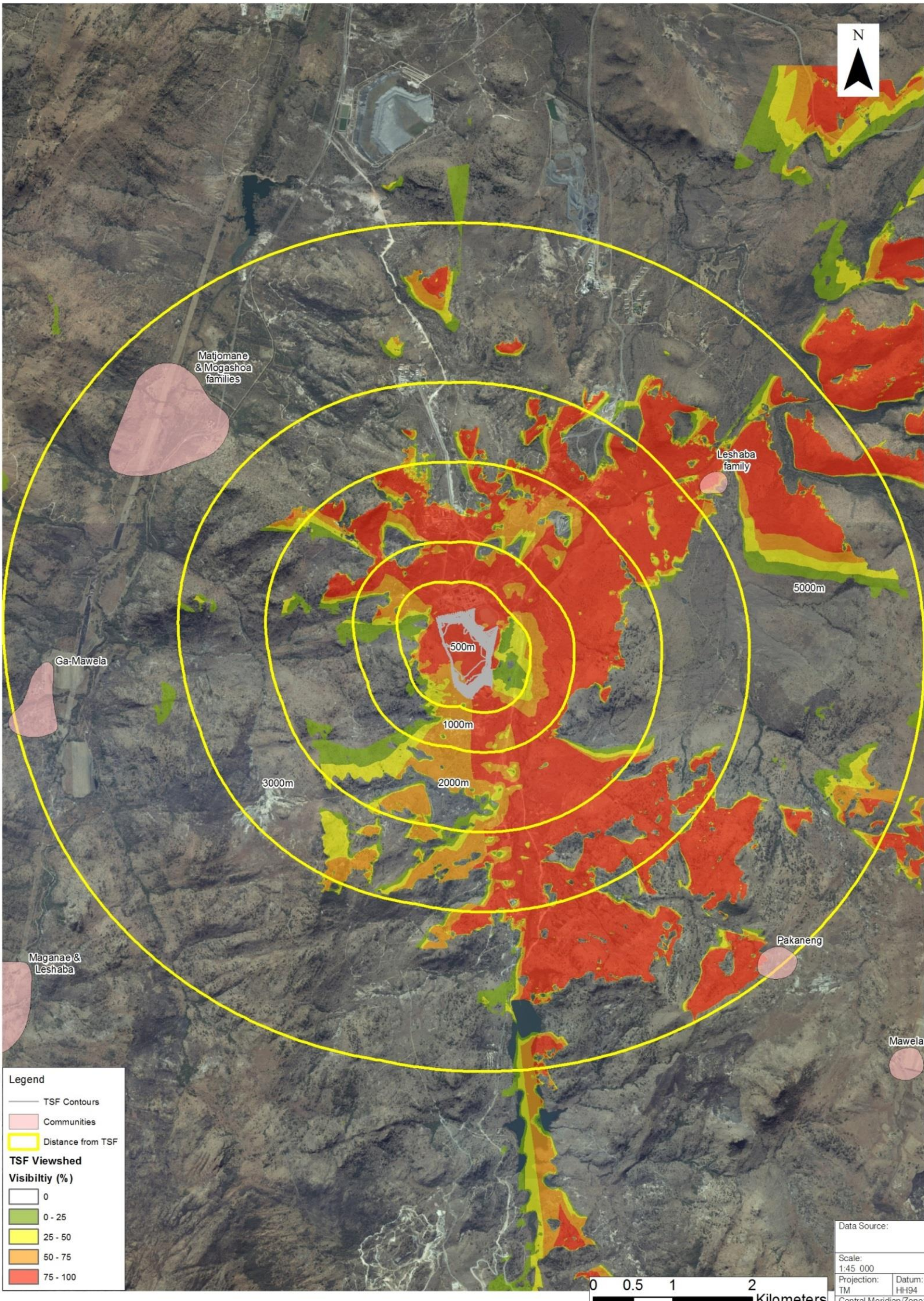
Operation of the Helena TSF and associated infrastructure					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Mitigation Measure**	**Significance rating post-mitigation**	**Source document**
	within the heavy fallout class (500-1 200 mg/m^2/day). *Given that no human receptors are in close proximity to the Tailings Dam, Cicada habitats are expected to be affected.*	• *Probability: Possible* *Significance:* ***MEDIUM (-)***	*fully vegetated to ensure a wilderness land capability.* • *Two single dust buckets will be placed on the eastern and south eastern sides of the Tailings Dam between the dam and the Cicada habitat, with a third bucket downwind (NW-WNW) of the dam, to monitor dust fallout.* • *If dust is noted on the access roads, applicable measures such as a watercart or chemical dust suppression will be implemented.* Frequent monitoring of dust buckets downwind of the Tailings Dam, as well as between the Tailings Dam and Cicada habitat to monitor dust fallout. Should dust monitoring determine that dust fallout levels exceed the limits, dust suppression measures will be put in place.	• *Probability: Possible* *Significance:* ***LOW (-)***	*Consulting Report No. 343158/ April 2005)*
O68	***Increase in nuisance dust*** *Deterioration of air quality (dust fallout) as a result of dust generation from deposition of*	• *Magnitude: Moderate* • *Duration: Long term*	• *Continue with dust fallout monitoring programme.*	• *Magnitude: Minor* • *Duration: Short term*	*Der Brochen Project EMP Amendment:: Raising of Helena*

Operation of the Helena TSF and associated infrastructure					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Mitigation Measure**	**Significance rating post-mitigation**	**Source document**
	tailings material. *There are no sensitive receptors in close proximity to the Helena TSF, except for the Mototolo Concentrator and Der Brochen Project offices.*	• *Scale: Local area* • *Consequence: Medium* • *Probability: Possible* *Significance: **MEDIUM (-)***	• *Use of dust suppression and watering on TSF area to reduce dust.* • *Vegetate side slopes of TSF continuously during operations.*	• *Scale: Local area* • *Consequence: Low* • *Probability: Possible* *Significance: **LOW (-)***	*Tailings Storage Facility EIA and EMP (SRK Consulting Report No. 475423/EIA/EMP; September 2014)*
	Noise				
O69	**Increase in ambient noise** Noise impacts during the operation of the Helena TSF are considered negligible.	• Magnitude: Minor • Duration: Long term • Scale: Local • Consequence: Medium • Probability: Unlikely Significance: **LOW (-)**	No mitigation measures required.	• Magnitude: Minor • Duration: Long term • Scale: Local • Consequence: Medium • Probability: Unlikely Significance: **LOW (-)**	Not applicable.
	Visual				
O70	***Reduced integrity of scenic views from roads in the surrounding area*** *The maximum height of the Tailings Dam at the end of the operations is anticipated to be 43 magl* (increased to 63 magl after heightening of Helena TSF, Refer to O61) *and will be visible within a 1 km buffer distance,*	• *Magnitude: Minor* • *Duration: Long term* • *Scale: Site specific* • *Consequence: Medium* • *Probability: Possible* *Significance: **MEDIUM (-)***	• *Progressive rehabilitation and dust control will be undertaken regularly.* • *Vegetate tailings walls to blend into the natural environment.* • *The outer slope of the rockfill starter wall will be topsoiled and vegetated.*	• *Magnitude: Minor* • *Duration: Long term* • *Scale: Site specific* • *Consequence: Medium* • *Probability: Unlikely* *Significance: **LOW (-)***	*Der Brochen Mine: Environmental Impact Assessment Report and Environmental Management Programme (SRK Consulting Report No. 343158/ April 2005)*

Operation of the Helena TSF and associated infrastructure					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Mitigation Measure**	**Significance rating post-mitigation**	**Source document**
	mainly from the north-east and south-east areas adjacent to the Tailings Dam site. However, the topography consists of the Groot-Dwarsrivier valley which provides a natural visual buffer to Der Brochen Project area and therefore the visual impact of the TSF is likely to be minimal.		• *The outer side slopes of the Tailings Dam will continuously be vegetated.* • *The top of the Tailings Dam will be vegetated during closure and the side slopes fully vegetated to ensure a wilderness land capability.* • *If dust is noted on the access roads, applicable measures such as a watercart or chemical dust suppression will be implemented.* • *Land to which soil has been applied will be rehabilitated under instruction and supervision of the ECO, through revegetation with indigenous species removed to nurseries and/or a combination of hydroseeding or other appropriate methods. Rehabilitation will be progressive throughout the life of the mine, and vegetation will be established as soon as a disturbing activity has ceased, to*		

Operation of the Helena TSF and associated infrastructure					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Mitigation Measure**	**Significance rating post-mitigation**	**Source document**
			stabilize soils and re-establish habitats. Following revegetation, the site will be monitored and maintained until an acceptable vegetation cover has been achieved. • *Areas of disturbance will be limited to the footprints given on the final layout drawings and vehicular movement*		
O71	***Decrease in visual aesthetics of the area*** *The Helena TSF will increase by 21 metres which may have a marginal impact on the visual aesthetics of the area.* *Although the TSF is visible from certain vantage points on the western and eastern mountain range slopes, facing the TSF, at a distance of between 6 and 10 km, the view will be outside of the "background" and views will be limited to indistinct at best.* *Refer to* Figure 7-9 *which shows the viewshed modelled for the raised Helena TSF. Currently*	• *Magnitude: Moderate* • *Duration: Long term* • *Scale: Local area* • *Consequence: Medium* • *Probability: Definite* *Significance: **MEDIUM (-)***	• *Vegetate tailings walls to blend into the natural environment.*	• *Magnitude: Minor* • *Duration: Long term* • *Scale: Local area* • *Consequence: Medium* • *Probability: Definite* *Significance: **MEDIUM (-)***	*Der Brochen Project EMP Amendment:: Raising of Helena Tailings Storage Facility EIA and EMP (SRK Consulting Report No. 475423/EIA/EMP; September 2014)*

Operation of the Helena TSF and associated infrastructure					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Mitigation Measure**	**Significance rating post-mitigation**	**Source document**
	the Leshaba community on Welgevonden farm has a full view of the Helena TSF. No additional visual impacts are expected.				
	Cultural heritage resources				
	No impacts are envisaged during the Operational Phase.				
	Traffic and transportation				
	No impacts are envisaged during the Operational Phase.				



Data Source:

Scale: 1:45 000

Projection: TM	Datum: HH94
Central Meridian/Zone: Lo 31	
Date: 04/09/2014	Compiled by: ALLK
Project No. 475423	Fig No. 7-9

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DER BROCHEN

VIEWSHED OF THE HELENA TSF

Path: C:\Users\allk\Documents\SHelenaContours\469113_F7_9_DeBrochen_ViewshedMap_A3L_04092014.mxd

Revision: A Date: 04 09 2014

7.3.5 Operation of the Mototolo Concentrator and Chrome Plant

Table 7-15 describes and rates the current impacts associated with the Mototolo Concentrator and Chrome Plant.

Table 7-15: Impacts associated with the Operation of the Mototolo Concentrator and Chrome Plant

Operation of the Mototolo Concentrator and Chrome Plant					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
	Geology				
	No impacts are envisaged during the Operational Phase.				
	Topography				
O72	***Increased visibility and change in topography due to placement of Chrome Plant infrastructure*** *The spiral plant has reached a height of 26.8 magl. The visibility of the plant is however disguised from the west by its location adjacent to the Concentrator infrastructure, of which the ROM silo is 40 magl.* *To the south, the Mototolo Tailings Dam* (Helena TSF) *has reached a height of 42 m* (raised to 63 m)*. On a broader scale, the Chrome Plant is located adjacent to the Groot-Dwarsrivier valley, which is flanked by steep mountains on*	• *Magnitude: Moderate* • *Duration: Long term* • *Scale: Site specific* • *Consequence: Medium* • *Probability: Definite* *Significance: **MEDIUM (-)***	• *All infrastructure should be demolished on closure of the Chrome Plant and all disturbed areas will be reinstated and rehabilitated to a known past state or to an approximation of the natural condition.* • *Land to which soils have been applied will be rehabilitated under instruction and supervision of the ECO, through revegetation with indigenous species removed to nurseries and/or a combination of hydroseeding or other appropriate methods. Following revegetation, the site will be monitored and maintained until an*	• *Magnitude: Minor* • *Duration: Long term* • *Scale: Site specific* • *Consequence: Medium* • *Probability: Unlikely* *Significance: **LOW (-)***	*Chrome Plant- Helena 6 JT, Eastern Limb of the Bushveld Complex, Mpumalanga, South Africa Final EIAR and EMP (ERM, May 2006)*

Operation of the Mototolo Concentrator and Chrome Plant					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
	either side.		*acceptable vegetation cover has been achieved.*		
	Soils, land capability and land use				
O73	***Loss of soil resources due to erosion*** *Concentrated water discharges at the plant could cause significant erosion. This impact has the potential to be significant due to the topography of the area and the nature of rainfall in the area.*	• *Magnitude: Major* • *Duration: Long term* • *Scale: Site specific* • *Consequence: High* • *Probability: Definite* *Significance: **HIGH (-)***	• Special erosion control measures will have to be implemented should erosion be detected. • *Drainage facilities will be designed to minimise the potential for soil erosion.* • *Energy dissipaters will be provided in areas where concentrated discharges could cause significant erosion, such as the plant.* • *All drainage facilities will be checked at approximately three monthly intervals during the rainy season and any undue erosion or siltation, especially at discharge points, will be noted and repaired. Der Brochen will identify the cause of such undue erosion or siltation and suitable remedial measures will be implemented.*	• *Magnitude: Moderate* • *Duration: Long term* • *Scale: Site specific* • *Consequence: Medium* • *Probability: Possible* *Significance: **MEDIUM (-)***	*Environmental Management Programme Report for the Der Brochen Mine Volume 1 of 3 (SRK Consulting Report No. 295606/4/ November 2002)*

Operation of the Mototolo Concentrator and Chrome Plant					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
			• *No random driving across the terrain (outside of authorised routes) will be allowed – this will destroy the soil structure, cause unsightly tracks and lead to unnecessary soil erosion*		
O74	***Disturbance/Loss of soil resources due to accelerated/ human induced soil erosion, or due to contamination of soils from spillages of fuels, oils, chemicals or waste*** *The soils in the Chrome Plant area have a moderate erosion potential. Operational mining activities could cause erosion of these soils only along the access roads, as the remainder of the footprint will be hardstanding.* *Spillages of oils and fuels at the workshop and from hauling vehicles during operations, could further lead to a loss of soils due to contamination.*	• *Magnitude: Moderate* • *Duration: Long term* • *Scale: Site specific* • *Consequence: Medium* • *Probability: Possible* *Significance: **MEDIUM (-)***	• The clean and dirty water management and separation at the Chrome Plant will form part of the overall Concentrator water management system. • Maintenance of vehicles in good running order. • *Disturbance will be restricted to footprint areas depicted with no random driving across the terrain allowed* • *All infrastructure will be demolished on closure of the Chrome Plant and all disturbed areas will be reinstated and rehabilitated to a known past state or to an approximation of the natural condition.*	• *Magnitude: Minor* • *Duration: Long term* • *Scale: Site specific* • *Consequence: Medium* • *Probability: Unlikely* *Significance: **LOW (-)***	*Chrome Plant- Helena 6 JT, Eastern Limb of the Bushveld Complex, Mpumalanga, South Africa Final EIAR and EMP (ERM, May 2006)*

Operation of the Mototolo Concentrator and Chrome Plant					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
			• *During reinstatement, surfaces will be ripped and stockpiled soil will be graded over previously disturbed/ stripped areas with as little compaction as possible, with vehicles avoiding running over stockpiles by spreading from one side only.* • *Land to which soils have been applied will be rehabilitated under instruction and supervision of the ECO, through revegetation with indigenous species removed to nurseries and/or a combination of hydroseeding or other appropriate methods. Following revegetation, the site will be monitored and maintained until an acceptable vegetation cover has been achieved.* • *Separate clean and dirty water systems will be constructed and will be maintained throughout the life of the Chrome Plant.*		

Operation of the Mototolo Concentrator and Chrome Plant					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
			• *Drainage, stormwater and erosion control measures/structures will be checked at three monthly intervals and after significant rainfall events for siltation and effectiveness in preventing erosion. Silted, damaged or ineffective structures will be cleaned, repaired or replaced regularly.* • *Energy dissipaters will be constructed at sites of concentrated stormwater discharge.* • *Silt and oil traps, and drip trays will be inspected frequently for effectiveness and cleaned/repaired/ replaced regularly. Impermeable hazardous waste containers will be disposed of as required to prevent spillage. All water pumps will be maintained to prevent spills/leaks, and placed in impermeable sumps to contain possible leakage.*		

Operation of the Mototolo Concentrator and Chrome Plant					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
			• *Vehicles will be inspected regularly and kept in good running order, and leaks repaired immediately.*		
	Biodiversity				
O75	***Effects of fugitive dust on vegetation*** *Fugitive dust from the plant will lead to the degradation of surrounding vegetation.*	• *Magnitude: Moderate* • *Duration: Long term* • *Scale: Site specific* • *Consequence: Medium* • *Probability: Definite* *Significance: **MEDIUM (-)***	• Dust monitoring to be undertaken as per the Dust Monitoring Plan. • Dust suppression to be undertaken on gravel roads. • *Water sprayers or dust plants, or other suitable methods, will be used to minimise dust at sources.* • *The effect will be monitored and adjusted accordingly. The conveyor will be fitted with doghouse sheeting.*	• *Magnitude: Moderate* • *Duration: Long term* • *Scale: Site specific* • *Consequence: Medium* • *Probability: Possible* *Significance: **MEDIUM (-)***	*Environmental Management Programme Report for the Der Brochen Mine Volume 1 of 3 (SRK Consulting Report No. 295606/4/ November 2002)*
	Surface water				
O76	***Disturbance/loss of aquatic animal species due to a deterioration in surface water quality due to contamination from various forms of pollution from operational activities, increased sediment***	• *Magnitude: Major* • *Duration: Short term* • *Scale: Site specific* • *Consequence: Medium* • *Probability: Definite*	• Regular inspections should be undertaken in order to detect spillages timeously. • Monitoring of Groot-Dwars River should be implemented upstream and downstream of the Concentrator and Chrome	• *Magnitude: Moderate* • *Duration: Short term* • *Scale: Site specific* • *Consequence: Low* • *Probability: Possible*	*Environmental Management Programme Report for the Der Brochen Mine Volume 1 of 3 (SRK Consulting Report No. 295606/4/ November*

Operation of the Mototolo Concentrator and Chrome Plant					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
	loads, oil and fuel spills and leaks. *Impact on surface water during operations from potential spillage from the Concentrator plant.* *Increased fuels, oils, cements and other waste from operational activities and vehicles may contaminate surface water bodies.*	*Significance:* ***MEDIUM (-)***	Plant to detect deterioration. • A spill detection plan should be devised and implemented for all possible areas of spillage. • An inspection and maintenance plan should be implemented to ensure that the Concentrator and Chrome Plant are operated within specifications. • *All effort will be made to maintain this "good" biotic status and continuous seasonal biological monitoring will be performed when mining operation commences. Such future monitoring together with the already gathered baseline information will then be used for early detection of possible future biotic degradation to enable mitigation measures.* • *A long term monitoring programme will be implemented to monitor physico-chemical and*	*Significance:* ***LOW (-)***	*2002)*

Operation of the Mototolo Concentrator and Chrome Plant					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
			biological components of the aquatic ecosystems within and below the mining area. The monitoring programme will commence as soon as mining operations start. This would enable the timely identification of required mitigation/environmental management procedures to maintain the high quality of this ecologically important aquatic ecosystem. • *An appropriate biological index based on fish (such as the Fish Assemblage Integrity Index, Kleynhans, 1997 or Sensitivity-weighted Index of Biotic Integrity will also be included in order to quantify and classify the longer-term changes in biotic integrity.*		
O77	***Deterioration of stormwater and surface water quality due to operational activities at the Chrome Plant*** *Spillages and leakage of engine oils and diesel/petrol will mainly*	• *Magnitude: Moderate* • *Duration: Long term* • *Scale: Site specific* • *Consequence: Medium*	• *The area around the Mototolo Concentrator, within which the Chrome Plant is positioned, is within a controlled stormwater area. All process water will be*	• *Magnitude: Moderate* • *Duration: Long term* • *Scale: Site specific* • *Consequence: Medium*	*Chrome Plant- Helena 6 JT, Eastern Limb of the Bushveld Complex, Mpumalanga, South Africa Final EIAR and EMP (ERM, May 2006)*

Operation of the Mototolo Concentrator and Chrome Plant					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
	originate from the dump trucks used to transport chrome concentrate.	• *Probability: Definite* *Significance:* ***MEDIUM (-)***	*recycled and re-used within the Mototolo Concentrator and Chrome Plant, with a zero discharge policy being maintained.* • *Measure and monitor surface water quality in the Groot-Dwarsrivier, within and below the Chrome Plant area.* • *Groundwater quality and quantity will be measured and monitored as per the monitoring protocol.* • *The dispersion of wastewater will be limited by using soak-away drains in the wash bay and domestic wash water discharge areas. Wastewater will be returned to the process.* • *Separate clean and dirty water systems will be constructed and will be maintained throughout the life of the Chrome Plant.* • *Drainage, stormwater and erosion control*	• *Probability: Unlikely* *Significance:* ***LOW (-)***	

Operation of the Mototolo Concentrator and Chrome Plant					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
			measures/structures will be checked at 3 monthly intervals and after significant rainfall events for siltation and effectiveness in preventing erosion. Silted, damaged or ineffective structures will be cleaned, repaired or replaced regularly. • *Energy dissipaters will be constructed at sites of concentrated stormwater discharge.* • *Silt and oil traps, and drip trays will be inspected frequently for effectiveness and cleaned/repaired/ replaced regularly. Impermeable hazardous waste containers will be disposed of as required to prevent spillage. All water pumps will be maintained to prevent spills/leaks, and placed in impermeable sumps to contain possible leakage.* • *Vehicles will be inspected regularly and kept in good*		

Operation of the Mototolo Concentrator and Chrome Plant					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
			running order, and leaks repaired immediately. • *Any spillage will be reported, cleaned up and soils remediated immediately. Any pollution or spills will be reported to the* DWS *regional director within 24 hours of the occurrence.* • *Drivers will be trained on how to deal with spillage of ore, hydrocarbons and other potential contaminants.*		
O78	***Contamination of surface water bodies due to diffuse pollution*** *Seepage/spills from plant that can give rise to diffuse pollution.*	• *Magnitude: Major* • *Duration: Short term* • *Scale: Site specific* • *Consequence: Medium* • *Probability: Definite* • *Significance:* ***MEDIUM (-)***	• *Implement good housekeeping at operational sites. The final dirty water stream fed from the spiral plant reports to the Concentrator process water tank.* • *Monitor pollution control infrastructure and the surrounding boreholes.* • *Much of the terrace areas will be paved with concrete and tar. Remaining areas will be*	• *Magnitude: Moderate* • *Duration: Short term* • *Scale: Site specific* • *Consequence: Low* • *Probability: Possible* • *Significance:* ***LOW (-)***	*Environmental Management Programme Report for the Der Brochen Mine Volume 1 of 3 (SRK Consulting Report No. 295606/4/ November 2002)*

Operation of the Mototolo Concentrator and Chrome Plant					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
			planted to lawns and gardens. • *Individual components such as stores, sub-stations, stockpiles, workshops and the Concentrator will be individually bunded to contain spills. Bunded areas will be designed to contain at least 110% of the volume of the maximum potential spillage. Spilled material will be recovered and either returned to the process or will be disposed of to an appropriate site.* • *A drain will be provided upslope of the plant terrace to divert clean stormwater runoff away from the terrace. This drain will be designed to cater for the 1:50 year return period flood. The discharge point will be designed to allow for the safe discharge of water without causing any erosion.* • *A drain designed to cater for the 1:50 year return period flood event will be constructed downslope of the*		

Operation of the Mototolo Concentrator and Chrome Plant					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
			terrace to direct contaminated water discharges from this area to the settlers. • *Water from the immediate plant area will drain to a lined sump designed to retain wash down water and water from small rainfall events.* • *All runoff from terraces not catered for by the sumps will flow to lined settlers. This settler system will be designed to provide sufficient capacity to allow for the settlement and containment of the 1:50 year return period flood event. A spillway sized for the 1:50 year event will be provided. Settled water will be recycled for use in the process water circuit.* • *The sumps and settlers will be checked regularly. Silt will be removed and disposed of on the Tailings Dam, as required, in order to retain sufficient capacity in these ponds.*		

Operation of the Mototolo Concentrator and Chrome Plant					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
			• *The quality of the water in the settlers will be monitored.*		
	Groundwater				
O79	***Deterioration of groundwater quality*** *Potential deterioration of groundwater quality by downward recharge from surface to the underlying aquifers and contamination of surface water by spillage/overflow from Pipeline/drains/storage dams from the Concentrator plant.*	• *Magnitude: Major* • *Duration: Short term* • *Scale: Site specific* • *Consequence: Medium* • *Probability: Definite* *Significance:* ***MEDIUM (-)***	• Continue with groundwater monitoring on a quarterly basis to detect groundwater contamination. Should groundwater be contaminated, it should be pumped to the Helena TSF for recirculation.	• *Magnitude: Moderate* • *Duration: Short term* • *Scale: Site specific* • *Consequence: Low* • *Probability: Possible* *Significance:* ***LOW (-)***	*Environmental Management Programme Report for the Der Brochen Mine Volume 1 of 3 (SRK Consulting Report No. 295606/4/ November 2002)*
	Air Quality				
O80	***Decreased ambient air quality due to the operation of the Chrome Plant*** *There are no point source emissions associated with the Chrome Plant, however fugitive dust may arise from transport of the chrome concentrate to the chrome stockpile area and trucking of chrome concentrate to the Xstrata Thorncliffe processing facilities.*	• *Magnitude: Moderate* • *Duration: Long term* • *Scale: Site specific* • *Consequence: Medium* • *Probability: Definite* *Significance:* ***MEDIUM (-)***	• *Dust generated on access roads will be managed through appropriate measures such as a watercart or chemical dust suppression.* • *Reinstatement and rehabilitation of all disturbed areas at closure.* • *Dust will be controlled on site with water carts or dust suppressants.*	• *Magnitude: Minor* • *Duration: Long term* • *Scale: Site specific* • *Consequence: Medium* • *Probability: Unlikely* *Significance:* ***LOW (-)***	*Environmental Management Programme Report for the Der Brochen Mine Volume 1 of 3 (SRK Consulting Report No. 295606/4/ November 2002)*

Operation of the Mototolo Concentrator and Chrome Plant					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
			• *A speed of 40 kmph will be strictly enforced on all mine access roads.* • *All infrastructure will be demolished on closure of the Chrome Plant and all disturbed areas will be reinstated and rehabilitated to a known past state or to an approximation of the natural condition.* • *Land to which soils have been applied will be rehabilitated under instruction and supervision of the ECO, through revegetation with indigenous species removed to nurseries and/or a combination of hydroseeding or other appropriate methods.* • *Following revegetation, the site will be monitored and maintained until an acceptable vegetation cover has been achieved.*		
	Noise				
O81	***Increase in ambient noise***	• *Magnitude: Moderate*	• *Keeping vehicles silencer*	• *Magnitude: Minor*	*Chrome Plant- Helena 6*

Operation of the Mototolo Concentrator and Chrome Plant					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
	levels due to operation of the Chrome Plant *Noise will be generated during operation of the spiral plant and transport of chrome concentrate.*	• *Duration: Long term* • *Scale: Site specific* • *Consequence: Medium* • *Probability: Definite* *Significance: **MEDIUM(-)***	*units in good working order and restricting activities to the dedicated mining areas.* • *Should community complaints be received with regard to noise generation, mine management will investigate these and implement appropriate management measures.*	• *Duration: Long term* • *Scale: Site specific* • *Consequence: Medium* • *Probability: Unlikely* *Significance: **LOW (-)***	*JT, Eastern Limb of the Bushveld Complex, Mpumalanga, South Africa Final EIAR and EMP (ERM, May 2006)*
	Visual				
O82	Refer to impact on Topography, Impact Reference O70, for visual impacts during the Operational Phase.				
	Cultural heritage resources				
	No impacts are envisaged during the Operational Phase.				
	Traffic and transportation				
	No impacts are envisaged during the Operational Phase.				

7.3.6 Operation of the Access Roads

Table 7-16 describes and rates the current impacts associated with the Access Roads.

Table 7-16: Impacts associated with the Operation of the Access Roads

Operation of the Access Roads					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
	Geology				
	No impacts are envisaged during the Operational Phase.				
	Topography				
	No impacts are envisaged during the Operational Phase.				
O83	***Loss of soil resources due to erosion*** *Concentrated water discharges at the road could cause significant erosion. This impact has the potential to be significant due to the topography of the area, the nature of rainfall in the area and the medium to high erodibility of the soil. The cleared areas will also be more susceptible to erosion due to the lack of vegetation binding the soils.*	• *Magnitude: Major* • *Duration: Long term* • *Scale: Site specific* • *Consequence: High* • *Probability: Possible* *Significance: **HIGH (-)***	• *Erosion control measures will have to be implemented throughout the site for the entire life of the mine.* • *Drainage facilities will be designed to minimise the potential for soil erosion.* • *Energy dissipaters will be provided in areas where concentrated discharges could cause significant erosion, such as access/service roads.* • *All drainage facilities will be checked at approximately three monthly intervals during the rainy season and any*	• *Magnitude: Moderate* • *Duration: Long term* • *Scale: Site specific* • *Consequence: Medium* • *Probability: Possible* *Significance: **MEDIUM (-)***	*Environmental Management Programme Report for the Der Brochen Mine Volume 1 of 3 (SRK Consulting Report No. 295606/4/ November 2002)*

Operation of the Access Roads					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
			undue erosion or siltation, especially at discharge points, will be noted and repaired. The mine will identify the cause of such undue erosion or siltation and suitable remedial measures will be implemented. • *Unused roads will be rehabilitated after exploration, while high traffic roads will be surfaced. Other roads still used will be maintained and any new roads will have proper engineered designs to prevent erosion. No random driving across the terrain (outside of authorised routes) will be allowed – this will destroy the soil structure, cause unsightly tracks and lead to unnecessary soil erosion.*		
O84	***Soil contamination due to spillage of fuel, oil and chemicals*** *Spills of oil, fuel and chemicals may emanate from vehicles*	• *Magnitude: Minor* • *Duration: Long term* • *Scale: Site specific*	• *Water pollution management measures are designed to contain all polluted water, thereby minimising the potential for soil*	• *Magnitude: Minor* • *Duration: Short term* • *Scale: Site specific*	*Environmental Management Programme Report for the Der Brochen Mine Volume 1 of 3 (SRK*

Operation of the Access Roads					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
	travelling along the main services road.	• *Consequence: Medium* • *Probability: Definite* *Significance:* ***MEDIUM (-)***	*contamination from this source. Any spillage will be cleaned up and remediated* • Any spills will be cleaned up. More serious spills will be reported and treated. • An inspection and maintenance plan will be implemented to ensure that the ore transportation operate within specifications. • Regular servicing of vehicles in well-constructed, bunded areas. • Regular cleaning and maintenance of drains and storm water control facilities. • Containment and management of spillage. • Spill kits will be provided on site for ad hoc spill clearing.	• *Consequence: Low* • *Probability: Possible* *Significance:* ***MEDIUM (-)***	*Consulting Report No. 295606/4/ November 2002)*
	Biodiversity				
	No impacts are envisaged during the Operational Phase.				
	Surface water				

Operation of the Access Roads					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
O85	**Deterioration of surface water quality due to erosion, spillages and accidental discharges on roads** Direct contamination of the Groot- Dwars River or its tributaries at road crossings can occur due to spillages and accidental discharges or due to erosion of disturbed areas alongside the roads.	• Magnitude: Moderate • Duration: Long term • Scale: Local • Consequence: Medium • Probability: Possible Significance: **MEDIUM (-)**	• Stormwater culverts at watercourse crossings should be designed and constructed to accommodate the 1:50 year storm event. • Erosion protection and energy dissipaters should be constructed at the crossings as applicable. • Emergency action plans should be drawn up to deal with spillages.	• Magnitude: Moderate • Duration: Long term • Scale: Local • Consequence: Medium • Probability: Unlikely Significance: **LOW (-)**	New impact.
	Groundwater				
	No impacts are envisaged during the Operational Phase.				
	Air Quality				
	No impacts are envisaged during the Operational Phase.				
	Noise				
O86	***Increase in ambient noise levels on the surrounding communities as a result of mining activities*** *Road haulage of concentrate and daily transport of mine personnel is expected to increase ambient noise on the*	• *Magnitude: Minor* • *Duration: Long term* • *Scale: Site specific* • *Consequence: Medium* • *Probability:* Possible	• Regular servicing and maintenance of vehicles.	• *Magnitude: Minor* • *Duration: Long term* • *Scale: Site specific* • *Consequence: Medium* • *Probability:* Unlikely	*Environmental Management Programme Report for the Der Brochen Mine Volume 1 of 3 (SRK Consulting Report No. 295606/4/ November 2002)*

Operation of the Access Roads					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
	access road during operations.	*Significance: **MEDIUM (-)***		Significance: **LOW (-)**	
	Visual				
	No impacts are envisaged during the Operational Phase.				
	Cultural heritage resources				
	No impacts are envisaged during the Operational Phase.				
	Traffic and transportation				
O87	Refer to Table 7-11, Impact Reference O15, O16, O17 and O18, for impacts associated with the Operational Phase.				
O88					
O89					
O90					

7.3.7 Operation of the Wellfield and ongoing prospecting boreholes

Table 7-17 describes and rates the current impacts associated with the Operation of the Wellfield and ongoing prospecting boreholes.

Table 7-17: Impacts associated with the Operation of the Wellfield and ongoing prospecting boreholes

Operation of the Wellfield and ongoing prospecting boreholes					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
	Geology				
	No impacts are envisaged during the Operational Phase.				
	Topography				
	No impacts are envisaged during the Operational Phase.				
	Soils, land capability and land use				
O91	***Soil erosion due to operational activities*** *The soils in the area are all have a moderate-high erodibility. The strongly structured clayey nature of the soils also increases surface runoff and the potential for erosion.* *During operation, erosion can be caused by driving of vehicles along the main access tracks to the boreholes, Pipelines and reservoir. Topsoil will also be removed at ongoing drillsites, which can cause erosion if not managed properly.*	• *Magnitude: Moderate* • *Duration: Long term* • *Scale: Site specific* • *Consequence: Medium* • *Probability: Possible* *Significance: **MEDIUM (-)***	• *Stormwater control measures will be implemented along all access roads, and will include energy dissipaters such as contour anti-erosion berms.* • *The Pipelines will be trench buried for most of their length except for areas where topography only allows for aboveground structures.* • *Frequent inspection of the effectiveness of stormwater control measures, as well reinstatement and rehabilitation of unused or disturbed areas.*	• *Magnitude: Minor* • *Duration: Short term* • *Scale: Site specific* • *Consequence: Low* • *Probability: Possible* *Significance: **LOW (-)***	*Addendum to the Environmental Management Programme Report for the Der Brochen Mine to include a Wellfield in the Klein-Dwarsrivier Valley on the Farms Richmond 370 Kt and St George 2 Jt (SRK Consulting Report No. 335470/1, April 2004)* *Environmental Management Programme (EMP): Amendment to the approved*

Operation of the Wellfield and ongoing prospecting boreholes					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
			• *Impermeable plastic liners should be placed on site during drilling to avoid pollution and contamination of soil.* • *In the event that a spill occurs, spilled material is dug up and placed in spill bin specific for contaminated soil and disposed of.*		*Environmental Management Programme Report (EMPR) for ongoing prospecting in support of current Mining Operations (ERM, 2007).*
	Biodiversity				
O92	***Disturbance/loss of plant species of conservation importance, habitat, endemism and biodiversity*** *Various plant species of conservation importance, as well as species endemic to the SCE, occur on Richmond and St George. All of these species are however found on surrounding farms. The frequency of the disturbing activities will be for the life of the operation.*	• *Magnitude: Moderate* • *Duration: Long term* • *Scale: Site specific* • *Consequence: Medium* • *Probability: Definite* *Significance: **MEDIUM (-)***	• *All temporary infrastructure will be demolished on mine closure (where not required for communities),* • *and all disturbed areas reinstated and rehabilitated to a known past state or to an approximation of the* • *natural condition. Infrastructure for which post-mining and approved uses have been identified, will not be demolished.* • *During reinstatement, surfaces will be ripped and stockpiled soil will be graded*	• *Magnitude: Minor* • *Duration: Long term* • *Scale: Site specific* • *Consequence: Medium* • *Probability: Unlikely* *Significance: **LOW (-)***	*Addendum to the Environmental Management Programme Report for the Der Brochen Mine to include a Wellfield in the Klein-Dwarsrivier Valley on the Farms Richmond 370 Kt and St George 2 Jt (SRK Consulting Report No. 335470/1, April 2004)* *Environmental Management Programme (EMP): Amendment to the approved*

Operation of the Wellfield and ongoing prospecting boreholes					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
			over previously disturbed/ stripped areas with as little compaction as possible, with vehicles avoiding running over stockpiles by spreading from one side only. • *Land to which soil has been applied will be rehabilitated under instruction and supervision of the ECO, through revegetation with indigenous species removed to nurseries and/or a combination of hydroseeding or other appropriate methods. Rehabilitation will be progressive throughout the burying of the Pipelines and throughout the life of the mine, and vegetation will be established as soon as a disturbing activity has ceased, to stabilise soils and re-establish habitats. Following revegetation, the site will be monitored and maintained until an acceptable vegetation cover has been achieved.* • *Energy dissipaters will be*		*Environmental Management Programme Report (EMPR) for ongoing prospecting in support of current Mining Operations (ERM, 2007).*

Operation of the Wellfield and ongoing prospecting boreholes					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
			constructed at sites of concentrated stormwater discharge. • *Drainage, stormwater and erosion control measures/structures will be checked at 3 monthly intervals and after significant rainfall events for siltation and effectiveness in preventing erosion. Silted, damaged or ineffective structures will be cleaned, repaired or replaced regularly.* • *Disturbance of vegetation cover and soils will be restricted to footprint areas with no random driving across the terrain allowed.* • *Vehicles will be inspected regularly and kept in good running order, and leaks repaired immediately.* • *Any spillage will be reported, cleaned up and soils remediated immediately.* • *After drilling is completed,*		

Operation of the Wellfield and ongoing prospecting boreholes					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
			sites should be rehabilitated and seeded.		
O93	***Proliferation of alien vegetation and associated impacts on groundwater*** *Two category 1 weeds, and four category 2 and 3 invaders were found along the Klein-Dwars River on Richmond and St George. The only specie currently affecting groundwater supplies is the large stand of Populus sp on St George.* *Due to disturbing activities during operations, alien/invasive species might spread and impact natural vegetation and groundwater supplies.*	• *Magnitude: Moderate* • *Duration: Long term* • *Scale: Site specific* • *Consequence: Medium* • *Probability: Possible* *Significance: **MEDIUM (-)***	• *All weeds and invaders will be eradicated to prevent impacts on natural vegetation and groundwater supplies.* • *Natural eradication methods, and replacement of the reed with indigenous Phragmites reeds will be investigated.* • *Regular monitoring and eradication of weeds and invaders along any newly disturbed areas. All disturbed areas will be progressively reinstated and rehabilitated with indigenous species.*	• *Magnitude: Minor* • *Duration: Long term* • *Scale: Site specific* • *Consequence: Medium* • *Probability: Unlikely* *Significance: **LOW (-)***	*Addendum to the Environmental Management Programme Report for the Der Brochen Mine to include a Wellfield in the Klein-Dwarsrivier Valley on the Farms Richmond 370 Kt and St George 2 Jt (SRK Consulting Report No. 335470/1, April 2004)*
O94	***Disturbance/loss of animals of conservation importance*** *The Cicada Pycna sylvia shows a clear preference for Vitex obovata subsp. wilmsii observed along the first 500 m along the Klein-Dwarsrivier on the northern boundary of Richmond and some scattered specimens*	• *Magnitude: Moderate* • *Duration: Long term* • *Scale: Site specific* • *Consequence: Medium* • *Probability: Possible* *Significance: **MEDIUM***	• *Cicada will continuously be monitored in the Klein- and Groot-Dwarsrivier valleys during the life of the mine and therefore the life of the Wellfield.* • *Progressive reinstatement and rehabilitation of disturbed areas will reduce the*	• *Magnitude: Minor* • *Duration: Long term* • *Scale: Site specific* • *Consequence: Medium* • *Probability: Unlikely* *Significance: **LOW***	*Addendum to the Environmental Management Programme Report for the Der Brochen Mine to include a Wellfield in the Klein-Dwarsrivier Valley on the Farms Richmond 370 Kt and*

Operation of the Wellfield and ongoing prospecting boreholes					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
	along the central and southern parts of St George. *The frequency of the disturbing operational activities on the cicada habitat will last for the life of the operation.*		*likelihood of the impact further.*		*St George 2 Jt (SRK Consulting Report No. 335470/1, April 2004)*
	Surface water				
O95	***Reduction in baseflow of the Klein-Dwars River*** *Due to the nature of the geology and thus aquifers in the area, recharge to the shallow weathered bedrock aquifer is primarily from downward leakage from the overlying alluvial primary aquifer.* *Due to low bedrock transmissivity and the presence of dolerite dykes which behave as barriers to groundwater flow, lateral flow and recharge from the mid- and upper valley sides is minimal.* *Boreholes will all abstract from this storage in this target aquifer. Water will not be abstracted from the primary alluvial aquifer*	• *Magnitude: Minor* • *Duration: Long term* • *Scale: Site specific* • *Consequence: Medium* • *Probability: Possible* *Significance: **MEDIUM (-)***	• *The mine will measure and monitor surface water levels and quality in the Klein-Dwars River, within and below the Wellfield area, and compare these with the baseline data. Any indication of lowering of surface water levels due to groundwater abstraction will be reported and adequate mitigation measures implemented.*	• *Magnitude: Minor* • *Duration: Long term* • *Scale: Site specific* • *Consequence: Medium* • *Probability: Unlikely* *Significance: **LOW***	*Addendum to the Environmental Management Programme Report for the Der Brochen Mine to include a Wellfield in the Klein-Dwarsrivier Valley on the Farms Richmond 370 Kt and St George 2 Jt (SRK Consulting Report No. 335470/1, April 2004)*

Operation of the Wellfield and ongoing prospecting boreholes					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
	(between the Klein-Dwars River and the shallow weathered aquifer). Recharge for this primary alluvial aquifer is primarily from the downward discharge from the overlying Klein-Dwars River, which is a losing system during high flow periods, as well as from direct rainfall. The frequency of the activity of abstracting groundwater is the life of the operation.				
	Groundwater				
O96	***Reduction in the water table levels of the alluvial aquifer*** *Water will be abstracted from storage in the weathered bedrock aquifer and not the alluvial aquifer. The alluvial aquifer is recharged primarily from the downward discharge from the overlying Klein-Dwarsrivier, which is a losing system during high flow periods, as well as from direct rainfall. The aquifer will thus be recharged whether water is abstracted from the aquifer*	• *Magnitude: Moderate* • *Duration: Long term* • *Scale: Site specific* • *Consequence: Medium* • *Probability: Unlikely* *Significance: **LOW (-)***	• *Various monitoring boreholes in both aquifers are/will be installed and data will continuously be monitored at the central control room at the* Mototolo Concentrator. *Data will be compared with the wealth of baseline data and any sign of lowering water table levels in either aquifer will be reported.* • *Due to the management of the Wellfield, and variable abstraction from a large*	• *Magnitude: Minor* • *Duration: Long term* • *Scale: Site specific* • *Consequence: Medium* • *Probability: Unlikely* *Significance: **LOW (-)***	*Addendum to the Environmental Management Programme Report for the Der Brochen Mine to include a Wellfield in the Klein-Dwarsrivier Valley on the Farms Richmond 370 Kt and St George 2 Jt (SRK Consulting Report No. 335470/1, April 2004)*

Operation of the Wellfield and ongoing prospecting boreholes					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
	below it or not. The frequency of the activity is the life of the operation.		*number of boreholes to obtain minimum drawdown, the duration of the impact at one given point (borehole) will also be reduced.*		
O97	***Contamination of groundwater resources during ongoing prospecting*** *During ongoing prospecting, there may be potential contamination of groundwater resources during drilling.*	• *Magnitude: Minor* • *Duration: Short term* • *Scale: Site specific* • *Consequence: Low* • *Probability: Possible* *Significance: **LOW (-)***	• *Impermeable plastic liners will be used beneath drill rigs and in drilling-mud sumps to prevent seepage of any liquids on site to water resources.*	• *Magnitude: Minor* • *Duration: Short term* • *Scale: Site specific* • *Consequence: Low* • *Probability: Unlikely* *Significance: **LOW (-)***	*Environmental Management Programme (EMP): Amendment to the approved Environmental Management Programme Report (EMPR) for ongoing prospecting in support of current Mining Operations (ERM, 2007).*
	Air Quality				
O98	***Increase in nuisance dust during ongoing prospecting*** *During prospecting, it is expected that there will be an increase in nuisance dust due to drilling activities and clearing of vegetation to prepare drill sites.* *The dust emissions will be*	• *Magnitude: Minor* • *Duration: Short term* • *Scale: Site specific* • *Consequence: Low* • *Probability: Possible* *Significance: **LOW (-)***	• *Dust suppression through watering as necessary.* • *Employees should wear appropriate Personal Protective Equipment (PPE)*	• *Magnitude: Minor* • *Duration: Short term* • *Scale: Site specific* • *Consequence: Low* • *Probability: Unlikely* *Significance: **LOW (-)***	*Environmental Management Programme (EMP): Amendment to the approved Environmental Management Programme Report (EMPR) for ongoing*

Operation of the Wellfield and ongoing prospecting boreholes					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
	minimal and of short duration and contained in the valley.				*prospecting in support of current Mining Operations (ERM, 2007).*
	Noise				
	No impacts are envisaged during the Operational Phase.				
	Visual				
O99	***Reduced quality of scenic value from vantage points*** *There will be small structures at each of the boreholes to protect the power feed and telemetry system, but the remainder of the borehole infrastructure such as the submersible pumps will be underground.* *Pipelines and powerlines will be trench buried for most of their route, except for a 1 km length on the steeper rock outcropping section of the mountain range between St George and Helena. Here the Pipeline and powerline will be installed on plinths.* *The central control room for borehole management will be located within the Helena plant*	• *Magnitude: Moderate* • *Duration: Long term* • *Scale: Site specific* • *Consequence: Medium* • *Probability: Possible* *Significance: **MEDIUM (-)***	• *The aesthetic quality of the site will be minimised through limiting areas of disturbance, and progressive reinstatement and rehabilitation of disturbed areas.*	• *Magnitude: Moderate* • *Duration: Long term* • *Scale: Site specific* • *Consequence: Medium* • *Probability: Unlikely* *Significance: **LOW (-)***	*Addendum to the Environmental Management Programme Report for the Der Brochen Mine to include a Wellfield in the Klein-Dwarsrivier Valley on the Farms Richmond 370 Kt and St George 2 Jt (SRK Consulting Report No. 335470/1, April 2004)*

Operation of the Wellfield and ongoing prospecting boreholes					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
	area, and will thus have no additional visual impact.				
	Cultural Heritage				
O100	***Disturbance/destruction of archaeological and cultural significant sites*** *Most of the sites along the Klein-Dwars River valley on Richmond and St George are of low significance due to the fact that to large parts of the valley floor had been intensively used for agricultural purposes and that much of these areas are now densely vegetated by invader plants and/or have dense grass coverage. However, there are graves on Richmond that need to be avoided.* *None of the significant sites will be disturbed by any Wellfield development, but as these sites are located in close proximity to the Wellfield development area, there will still be a slight likelihood of the impact occurring due to driving across the terrain during the life of the operation.*	• *Magnitude: Moderate* • *Duration: Long term* • *Scale: Site specific* • *Consequence: Medium* • *Probability: Possible* *Significance: **MEDIUM (-)***	• *No random driving will be allowed on site and vehicles will be restricted to designated access roads.* • *Relevant contractors and mine personnel will be trained in the identification of significant archaeological sites. These will immediately be reported to the relevant mine manager and a specialist archaeologist will be informed.* • *Sites of medium and high significance will be avoided (fenced if deemed necessary), while sites to be disturbed along the trench will be inspected and sampled by a specialist during trench excavations.*	• *Magnitude: Minor* • *Duration: Long term* • *Scale: Site specific* • *Consequence: Medium* • *Probability: Unlikely* *Significance: **LOW (-)***	*Addendum to the Environmental Management Programme Report for the Der Brochen Mine to include a Wellfield in the Klein-Dwarsrivier Valley on the Farms Richmond 370 Kt and St George 2 Jt (SRK Consulting Report No. 335470/1, April 2004)*

Operation of the Wellfield and ongoing prospecting boreholes					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
	Traffic and transportation				
	No impacts are envisaged during the Operational Phase.				

7.3.8 Socio-economic impacts associated with the Operational Phase

Table 7-18 describes and rates the socio-economic impacts associated with the Operational Phase of the Der Brochen Project.

Table 7-18: Socio-economic impacts associated with the Operational Phase

Socio-economic impacts during Operations					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
	Socio-economic				
O101	***Prolonged employment opportunities*** *The raising of the height of the Helena TSF will prolong its life and that of the Mototolo Concentrator. This will have an ongoing beneficial impact on the socio-economic environment.*	• *Magnitude: Moderate* • *Duration: Medium term* • *Scale: Regional area* • *Consequence: Medium* • *Probability: Definite* Significance: **MEDIUM (+)**	• Enhance local employment and procurement opportunities where possible	• *Magnitude: Moderate* • *Duration: Medium term* • *Scale: Regional area* • *Consequence: Medium* • *Probability: Definite* Significance: **MEDIUM (+)**	*Der Brochen Project EMP Amendment:: Raising of Helena Tailings Storage Facility EIA and EMP (SRK Consulting Report No. 475423/EIA/EMP; September 2014)*
O102	***Contribution to the local and regional economy*** *The Mototolo Joint Venture makes a significant positive contribution at both the macro- and micro-economic level. This contribution to the national, regional and local economy includes a substantial boost to the Gross Geographical and Domestic Product through the creation of new jobs and the associated improvement in the*	• *Magnitude: Moderate* • *Duration: Medium term* • *Scale: Regional area* • *Consequence: Medium* • *Probability: Possible* Significance: **MEDIUM (+)**	• *Participation in Local Economic Development Programmes.* • Der Brochen will inject investment into the local and regional economy through the employment of labour, use of local support services and the use of local infrastructure. Der Brochen will ensure that as much of this as possible is directed to the local economy. Since it is unlikely that	• *Magnitude: Moderate* • *Duration: Medium term* • *Scale: Regional area* • *Consequence: Medium* • *Probability: Possible* Significance: **MEDIUM (+)**	*Chrome Plant- Helena 6 JT, Eastern Limb of the Bushveld Complex, Mpumalanga, South Africa Final EIAR and EMP (ERM, May 2006)* *Der Brochen Mine: Environmental Impact Assessment Report and Environmental Management Programme (SRK Consulting Report No.*

Socio-economic impacts during Operations					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
	annual per capita and household income of these workers and their families. *In addition, the anticipated multiplier effect of the proposed mining project through new business opportunities and the provision of improved physical infrastructure and social services, underline the significant long-term and cumulative positive impact the proposed project will have on the local and regional socioeconomic structure in particular and the regional economy in general.*		suppliers from within the study area (local level) will be suitable, goods should be preferentially procured in the immediate focus area and, if unsuccessful, only then in the broader focus area. • AAP will inform businesses, where appropriate, through appropriate business fora about available opportunities and how business may access these. For example the Steelpoort Business Forum could be used to engage with businesses in the local and regional areas. • The revised SLP should reflect the targets for procuring goods locally and regionally, and to develop local suppliers. Contractors will be required to submit annual reports on how they are attaining these targets as part of AAP's SLP reporting to Government. • AAP will identify potential service providers for longer		*343158/ April 2005)* Social Baseline and Impact Assessment for the Der Brochen EMP Alignment (SRK Report No. 469113/SIA, September 2014)

Socio-economic impacts during Operations					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
			term procurement. • Develop a social strategy, once mining has commenced, in line with the life of mine plan to assist in leaving a positive legacy According to the Anglo Social Way, all AAP mines are now required to develop long term strategies so that when the mine closes, the mine leaves a positive legacy where mine communities continue to be economically and socially sustainable. These strategies will be reviewed and monitored for implementation.		
O103	**Contribution to national economic growth** Some goods and services will be procured from national suppliers. Further, Der Brochen will contribute income taxes and royalties during the LOM. Timeous payment of taxes will contribute towards the ability of government to pursue national development objectives.	• Magnitude: Moderate • Duration: Medium term • Scale: National • Consequence: Medium • Probability: Unlikely Significance: **LOW (+)**	• Der Brochen will inject investment into the local and regional economy through the employment of labour, use of local support services and the use of local infrastructure. Der Brochen will ensure that as much of this as possible is directed to the local economy. Since it is unlikely that suppliers from within the study area (local level) will be	• Magnitude: Moderate • Duration: Medium term • Scale: National • Consequence: Medium • Probability: Possible Significance: **MEDIUM (+)**	Social Baseline and Impact Assessment for the Der Brochen EMP Alignment (SRK Report No. 469113/SIA, September 2014)

Socio-economic impacts during Operations					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
			suitable, goods should be preferentially procured in the immediate focus area and, if unsuccessful, only then in the broader focus area. • AAP will inform businesses, where appropriate, through appropriate business fora about available opportunities and how business may access these. For example the Steelpoort Business Forum could be used to engage with businesses in the local and regional areas. • The revised SLP should reflect the targets for procuring goods locally and regionally, and to develop local suppliers. Contractors will be required to submit annual reports on how they are attaining these targets as part of AAP's SLP reporting to Government. • AAP will identify potential service providers for longer term procurement. Develop a social strategy, once mining		

Socio-economic impacts during Operations					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
			has commenced, in line with the life of mine plan to assist in leaving a positive legacy.		
O104	***Social disruption*** *Some social disruption is to be expected during the project, due to the presence of a non-local workforce, an influx of job seekers (including family visits), increased traffic and temporary disturbance of access roads. General physical disruption could be further aggravated by a perceived threat by the local community to existing safety and security levels.*	• *Magnitude: Moderate* • *Duration: Long term* • *Scale: Local* • *Consequence: Medium* • *Probability: Definite* *Significance:* ***MEDIUM (-)***	• *If managed correctly, the proposed development could contribute towards improved social and physical mobility in the medium to long term, as well as a general improvement in safety and security measures. This includes policing services and patrolling by mine security personnel, as well as improved health, education and related social services, and the provision of public transport and telecommunications.* • *Development and implementation of a Social and Labour Plan (SLP).* • *Local economic development plans, which will include infrastructure and poverty eradication projects in line with the area's Integrated Development Plan.*	• *Magnitude: Minor* • *Duration: Long term* • *Scale: Local* • *Consequence: Medium* • *Probability: Unlikely* *Significance:* ***LOW (-)***	*Chrome Plant- Helena 6 JT, Eastern Limb of the Bushveld Complex, Mpumalanga, South Africa Final EIAR and EMP (ERM, May 2006)*

Socio-economic impacts during Operations					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
O105	**Generation of jobs** Temporary jobs will be created during operations. It is expected that there will be a moderate number of jobs created (magnitude), in the short term and regionally.	• Magnitude: Moderate • Duration: Medium term • Scale: Regional • Consequence: Medium • Probability: Definite Significance: **MEDIUM (+)**	• Employ as many locals as possible so that mining in the area maximises benefits to immediate affected communities. • Identify temporary employees for further training and incorporation in the longer term staff complement.	• Magnitude: Moderate • Duration: Medium term • Scale: Regional • Consequence: Medium • Probability: Definite Significance: **MEDIUM (+)**	Social Baseline and Impact Assessment for the Der Brochen EMP Alignment (SRK Report No. 469113/SIA, September 2014)
O106	**Procurement of goods and services** Procurement of goods and services during operations will result in maintaining and possibly creation of jobs since those companies providing goods and services will have contracts.	• Magnitude: Minor • Duration: Medium term • Scale: National • Consequence: Medium • Probability: Definite Significance: **MEDIUM (+)**	• Procure as many goods and services as possible from local communities and the local municipal area so that the project benefits immediate affected communities. • Identify potential service providers for longer term procurement. Advise and support these companies so that they can be incorporated as long term suppliers.	• Magnitude: Minor • Duration: Medium term • Scale: National • Consequence: Medium • Probability: Definite Significance: **MEDIUM (+)**	Social Baseline and Impact Assessment for the Der Brochen EMP Alignment (SRK Report No. 469113/SIA, September 2014)
O107	**Influx of employees** The arrival of non-local employees in the area may have negative health consequences. Some employees brought in	• Magnitude: Major • Duration: Long term • Scale: Regional	• Enhance employment of people and procurement of service providers in the study area and the region. • Accommodation should	• Magnitude: Moderate • Duration: Medium term • Scale: Regional	Social Baseline and Impact Assessment for the Der Brochen EMP Alignment (SRK Report No. 469113/SIA,

Socio-economic impacts during Operations					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
	by contracting companies may be sourced nationally; making it possible that the diseases may be transmitted nationally.	• Consequence: High • Probability: Possible Significance: **HIGH (-)**	preferably be provided in towns in close proximity to the project area and workers bussed in. • Should accommodation be required in close proximity to Der Brochen: ○ RPM should require the contractors to promote HIV/AIDS prevention amongst employees. ○ RPM and the contractors should work with the health authorities to provide HIV/AIDS prevention and treatment interventions in a culturally appropriate manner. AAP will confirm if this is possible. ○ Sub-contractors should adhere to the contract with the contractor. ○ A strategy and protocol for camp management should be developed and implemented, should an existing worker	• Consequence: Medium • Probability: Possible Significance: **MEDIUM (-)**	September 2014)

Socio-economic impacts during Operations					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
			accommodation facility be used.		
O108	**Collection of medicinal plants during the Operational Phase** There are potential risks associated with community members collecting medicinal plants on the Der Brochen Project property. Although the property is privately owned and fenced off people may still access the area. This increases their potential exposure to hazards as a result of mining activity. It is understood that a small number of community members are collecting medicinal plants from the property.	• Magnitude: Moderate • Duration: Long term • Scale: Site • Consequence: Medium • Probability: Possible Significance: **MEDIUM (-)**	• A land access protocol for visiting graves is currently in place and AAP Land Use Management will explore the possibility of extending this protocol for enabling the collection of medicinal plants on the property.	• Magnitude: Minor • Duration: Short term • Scale: Site • Consequence: Low • Probability: Possible Significance: **LOW (-)**	Social Baseline and Impact Assessment for the Der Brochen EMP Alignment (SRK Report No. 469113/SIA, September 2014)

7.4 Decommissioning and Closure

The activities envisaged during the Decommissioning and Closure Phase can be seen in Table 7-19.

Table 7-19: Decommissioning and Closure activities at Der Brochen

Activity	Activity Description	Reference Table
Decommissioning and Closure of the Mareesburg TSF, Helena TSF, Co-Disposal Facility. This includes the demolition of the Mareesburg Pipeline.	• The TSFs will be shaped to be free draining. • The TSFs will be topsoiled and re-vegetated. • The RWDs will be retained until the drainage from the toe of the TSF to the RWDs is negligible. • When the RWDs are decommissioned, the following will take place: o All concrete structures will be demolished; o Liners will be removed; and o Excavations will be backfilled.	Table 7-20
Decommissioning and Closure of the Northern Open Pit	• The Northern Pit will be transformed into the proposed Co-Disposal Facility upon closure. • Should the Co-Disposal Facility be deemed not feasible, the Northern pit will be backfilled concurrently with waste rock. At closure, the backfilled pit will be shaped to be free draining, topsoiled, and revegetated. • Refer to the Decommissioning and Closure of the Co-Disposal Facility below.	
Decommissioning and Closure of the Southern Open Pit	• The Southern Pit will be backfilled with waste rock material concurrent with Open Pit mining activities during Operation. • At Closure, waste rock backfilled in the Southern Pit will create a slight mound/ dome due to the swelling factor. Raised waste rock from the Southern Pit will be shaped to be free-draining, topsoiled and revegetated.	Table 7-21
Decommissioning and Closure of the Mototolo Concentrator and Chrome Plant, as well as offices.	• The Concentrator, Chrome Plant, paved areas and associated disused infrastructure will be demolished.	

7.4.1 Decommissioning and Closure of the Mareesburg, Helena and Co-Disposal TSFs

Table 7-20 describes and rates the socio-economic impacts associated with the Decommissioning and Closure of the Mareesburg, Helena and Co-Disposal TSFs.

Table 7-20: Impacts associated with the Decommissioning and Closure of Mareesburg, Helena and Co-Disposal TSFs

Decommissioning and Closure of the Mareesburg, Helena and Co-Disposal TSFs					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
	Geology				
	No impacts are envisaged during Decommissioning/ Closure Phase.				
	Topography				
D1	**Changes in topography** ***Mareesburg TSF*** *The change in topography as a result of the Mareesburg Tailings Dam will be definite and will be a permanent visual impact on the environment, even after revegetation.* *As the disused infrastructure will be demolished, there is potential for the creation of dangerous excavations and steep embankments which will need to be backfilled and landscaped.* ***Helena TSF*** *Surface level after rehabilitation is not expected to change. The*	• *Magnitude: Moderate* • *Duration: Long term* • *Scale: Site specific* • *Consequence: Medium* • *Probability: Definite* *Significance: **MEDIUM (-)***	• *Re-vegetation and slope establishment to ensure the TSF is free draining and blends in with the natural environment.*	• *Magnitude: Minor* • *Duration: Long term* • *Scale: Site specific* • *Consequence: Medium* • *Probability: Possible* *Significance: **MEDIUM (-)***	*Environmental Management Programme Report for the Der Brochen Mine Volume 1 of 3 (SRK Consulting Report No. 295606/4/ November 2002)*

Decommissioning and Closure of the Mareesburg, Helena and Co-Disposal TSFs					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
	Helena TSF is likely to become a permanent feature of the landscape. **Co-Disposal** After Closure, the Co-Disposal Facility will become a permanent feature of the landscape and will therefore permanently change the natural topography of the area.				*Der Brochen Project EMP Amendment: Raising of Helena Tailings Storage Facility EIA and EMP (SRK Consulting Report No. 475423/EIA/EMP; September 2014)*
	Soils, land capability and land use				
D2	***Loss of soil resources due to erosion*** *As buildings and infrastructure are demolished, large areas denuded of vegetation will develop. These freshly disturbed areas will be potentially vulnerable to soil erosion.* *Sections of the Mareesburg Tailings Dam requiring revegetation will be susceptible to wind and water erosion.* This impact will be applicable for the Helena TSF and Co-Disposal Facility during the	• *Magnitude: Major* • *Duration: Short term* • *Scale: Site specific* • *Consequence: Medium* • *Probability: Definite* *Significance:* ***MEDIUM (-)***	• Compilation/ update of a detailed Closure Management Plan.	• *Magnitude: Moderate* • *Duration: Short term* • *Scale: Site specific* • *Consequence: Low* • *Probability: Possible* *Significance:* ***LOW (-)***	*Environmental Management Programme Report for the Der Brochen Mine Volume 1 of 3 (SRK Consulting Report No. 295606/4/ November 2002)*

Decommissioning and Closure of the Mareesburg, Helena and Co-Disposal TSFs					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
	Closure Phase.				
D3	***Contamination of soils*** *Potential contamination from hydrocarbons due to accidental spillages from vehicles, during demolition activities.* This impact will be applicable for the Mareesburg TSF and Co-Disposal Facility during the Closure Phase.	• *Magnitude: Moderate* • *Duration: Medium term* • *Scale: Site specific* • *Consequence: Medium* • *Probability: Possible* *Significance: **MEDIUM (-)***	• *Conduct daily site inspections to detect leaks on equipment which may lead to hydrocarbon spills.* • *Regular maintenance of vehicles.* • *Placement of drip trays under vehicles when parked and during fuel transfer.* • *Undertake on-site bioremediation or remove contaminated soils and dispose of at a licensed hazardous waste storage facility.* • *Contaminated soils will be remediated or removed off site where required.* • *Soils will be remediated and used in rehabilitation activities as per the Closure Plan*	• *Magnitude: Minor* • *Duration: Medium term* • *Scale: Site specific* • *Consequence: Low* • *Probability: Possible* *Significance: **LOW (-)***	*Der Brochen Project EMP Amendment: Raising of Helena Tailings Storage Facility EIA and EMP (SRK Consulting Report No. 475423/EIA/EMP; September 2014)*
	Biodiversity				
D4	***Loss of aquatic life due to deterioration of water quality***	• *Magnitude: Moderate*	• *Monitoring will be conducted until it can be proven that no*	• *Magnitude: Minor*	*Environmental Management*

Decommissioning and Closure of the Mareesburg, Helena and Co-Disposal TSFs					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
	There might be a continual loss of aquatic animal species due to continual deterioration in water quality due to pollution from seepage of facilities such as the Mareesburg Tailings Dam. This impact will be applicable for the Helena TSF and Co-Disposal Facility during the Closure Phase.	• *Duration: Short term* • *Scale: Site specific* • *Consequence: Low* • *Probability: Possible* *Significance:* ***LOW (-)***	*more seepage and deterioration in water quality will take place.*	• *Duration: Short term* • *Scale: Site specific* • *Consequence: Low* • *Probability: Possible* *Significance:* ***LOW (-)***	*Programme Report for the Der Brochen Mine Volume 1 of 3 (SRK Consulting Report No. 295606/4/ November 2002)*
	Wetlands				
	No impacts are envisaged during Decommissioning and Closure.				
	Surface water				
D5	***Contamination of surface water resources*** *Deterioration of surface water quality as result of seepage from the TSF and RWDs. Platinum tailings are usually found to be non-acid generating, although have a potential to generate alkaline, salt-rich drainage dominated by calcium, magnesium, sodium and potassium. In some cases it may contain nitrate, sulfate and chloride. The mobility of*	• *Magnitude: Moderate* • *Duration: Long term* • *Scale: Local area* • *Consequence: High* • *Probability: Possible* *Significance****: HIGH (-)***	• *During Closure, inflows into the return water dams will be reduced to seepage from the TSF together with direct rainfall onto the TSF. Remaining volumes be pumped to the Concentrator to allow for additional storage for any major storm event.* • *Maintain stormwater control to divert clean water away from the TSF.* • *Monitoring of seepage from the TSF and the return water*	• *Magnitude: Moderate* • *Duration: Long term* • *Scale: Local area* • *Consequence: Medium* • *Probability: Possible* *Significance:* ***MEDIUM (-)***	*Der Brochen Project EMP Amendment:: Raising of Helena Tailings Storage Facility EIA and EMP (SRK Consulting Report No. 475423/EIA/EMP; September 2014)*

Decommissioning and Closure of the Mareesburg, Helena and Co-Disposal TSFs					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
	chromium is an environmental risk often associated with leachate. *During Rehabilitation and Closure activities, there is a risk of spills of hydrocarbons from equipment undertaking rehabilitation work.* This impact will be applicable for the Helena TSF, Mareesburg TSF and the Co-Disposal Facility during the Closure Phase.		*dams, together with water quality should be undertaken for a period of ten years after closure.* • *Hydrocarbon spillages will be remediated immediately.*		
	Groundwater				
D6	***Contamination of groundwater*** *Continued deterioration of groundwater quality due to volume of leachate seeping into the underlying aquifer from the TSF and Return Water Dams.* *Platinum tailings are usually found to be non-acid generating, although have a potential to generate alkaline, salt-rich drainage dominated by calcium, magnesium, sodium and potassium. In some cases it may*	• *Magnitude: Major* • *Duration: Long term* • *Scale: Local area* • *Consequence: High* • *Probability: Possible* *Significance: **HIGH (-)***	• *Continue with groundwater monitoring after rehabilitation to detect groundwater contamination, as per the closure plan.* • *Detailed measures to arrest any unacceptable seepage during this monitoring period will be implemented in consultation with the Competent Authorities*	• *Magnitude: Moderate* • *Duration: Long term* • *Scale: Local area* • *Consequence: Medium* • *Probability: Possible* *Significance: **MEDIUM (-)***	*Der Brochen Project EMP Amendment: Raising of Helena Tailings Storage Facility EIA and EMP (SRK Consulting Report No. 475423/EIA/EMP; September 2014)*

Decommissioning and Closure of the Mareesburg, Helena and Co-Disposal TSFs					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
	contain nitrate, sulfate and chloride. The mobility of chromium is an environmental risk often associated with leachate. This impact will be applicable for the Helena TSF, Mareesburg TSF and the Co-Disposal Facility during the Closure Phase.				
	Air Quality				
D7	***Increase in nuisance dust*** *Dust from rehabilitation activities may increase dust fallout in the immediate area of the activities.* This impact will be applicable for the rehabilitation of the Helena TSF, Mareesburg TSF and the Co-Disposal Facility during the Closure Phase.	• *Magnitude: Minor* • *Duration: Short term* • *Scale: Local area* • *Consequence: Low* • *Probability: Definite* *Significance**: MEDIUM(-)***	• *Re-vegetate levelled and top-soiled areas as soon as possible.* • *Continue to use dust suppression on unpaved roads.*	• *Magnitude: Minor* • *Duration: Short term* • *Scale: Local area* • *Consequence: Low* • *Probability: Possible* *Significance**: LOW (-)***	*Der Brochen Project EMP Amendment:: Raising of Helena Tailings Storage Facility EIA and EMP (SRK Consulting Report No. 475423/EIA/EMP; September 2014)*
D8	***Dust generation from the Mareesburg and Helena TSFs*** *The Tailings Dams are a potential significant source of wind-blown dust impacting intermittently on the land in and*	• *Magnitude: Moderate* • *Duration: Short term* • *Scale: Site specific* • *Consequence: Medium*	• Cladding/ vegetation and rehabilitation of Tailings Storage Facility. • Regular inspection of vegetation establishment.	• *Magnitude: Minor* • *Duration: Short term* • *Scale: Site specific* • *Consequence: Low*	*Environmental Management Programme Report for the Der Brochen Mine Volume 1 of 3 (SRK Consulting Report No. 295606/4/ November*

Decommissioning and Closure of the Mareesburg, Helena and Co-Disposal TSFs

Impact Reference No.	Impact	Significance rating pre-mitigation	Recommended management measures	Significance rating post-mitigation	Source document
	around the Tailings Dam complex from sections that still require vegetation. *Dust blown from the Tailings Dams will not be continuous and will be very much dependent on the wind conditions.* This impact will also be applicable for the Co-Disposal Facility during the Closure Phase.	• *Probability: Possible* *Significance: **MEDIUM (-)***		• *Probability: Possible* *Significance: **LOW (-)***	*2002)* *Der Brochen Mine: Environmental Impact Assessment Report and Environmental Management Programme (SRK Consulting Report No. 343158/ April 2005)*
	Noise				
D9	***Increase in ambient noise levels*** *An increase in ambient noise levels as a result of demolishing and rehabilitation activities and vehicles.* *There are no sensitive receptors in close proximity to the Helena TSF, except for the Concentrator and Der Brochen offices.* This impact will also be applicable for the Mareesburg TSF and the Co-Disposal Facility during the Closure	• *Magnitude: Minor* • *Duration: Short term* • *Scale: Site specific* • *Consequence: Low* • *Probability: Possible* *Significance: **LOW (-)***	• *Demolition and rehabilitation activities will be confined to daylight hours.* • *Vehicles will be serviced at regular intervals to minimise noise generation.*	• *Magnitude: Minor* • *Duration: Short term* • *Scale: Site specific* • *Consequence: Low* • *Probability: Unlikely* *Significance: **LOW (-)***	*Der Brochen Project EMP Amendment:: Raising of Helena Tailings Storage Facility EIA and EMP (SRK Consulting Report No. 475423/EIA/EMP; September 2014)*

Decommissioning and Closure of the Mareesburg, Helena and Co-Disposal TSFs					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
	Phase. The Leshaba family lives approximately 1 km away from the Mareesburg TSF and therefore may be directly affected by an increase in noise levels. There are no sensitive receptors in close proximity to the Co-Disposal Facility, except for the Concentrator and Der Brochen offices located to the North.				
	Cultural heritage				
	No additional impacts are envisaged during Decommissioning/Closure Phase.				
	Visual				
	No additional impacts are envisaged during Decommissioning/Closure Phase.				
	Traffic and transportation				
	No significant additional impacts are envisaged during Decommissioning/Closure Phase.				

7.4.2 Decommissioning and Closure of the Der Brochen Project and associated infrastructure

Table 7-21 describes and rates the socio-economic impacts associated with the Decommissioning and Closure of the Der Brochen Project and associated activities.

Table 7-21: Impacts associated with the Decommissioning and Closure of the Der Brochen Project and associated infrastructure

Decommissioning and Closure of the Der Brochen Project and associated infrastructure					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
	Geology				
	No impacts are envisaged during the Decommissioning/ Closure phase.				
	Topography				
D10	**Changes in topography** The Southern Pit will be rehabilitated concurrently during the Operational Phase, where waste rock will be backfilled into the Pit. At the end of the Operational Phase, the Pit would be filled with waste rock, creating a mound dome due to the swelling factor of the waste rock. During Closure, the mound dome will be shaped to be free-draining, thereafter it will be topsoiled and revegetated. This will result in a minimum impact on topography. Demolition of the Mototolo	• Magnitude: Minor • Duration: Long term • Scale: Site specific • Consequence: Medium • Probability: Possible Significance: **MEDIUM (-)**	• Shape mound dome to be free-draining. • Cover the mound dome with topsoil and revegetate.	• Magnitude: Minor • Duration: Long term • Scale: Site specific • Consequence: Medium • Probability: Unlikely Significance: **LOW (-)**	New impact.

Decommissioning and Closure of the Der Brochen Project and associated infrastructure					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
	Concentrator, Chrome Plant and offices will have a negligible impact on the topography.				
	Soils, land capability and land use				
D11	***Loss of soil resources due to erosion*** *As buildings and infrastructure are demolished, large areas denuded of vegetation will develop. These freshly disturbed areas will be potentially vulnerable to soil erosion.* *Denuded areas surrounding the Concentrator plant as a result of pollutant spills contaminating the soil during the Operational Phase are susceptible to erosion during the decommissioning phase.* This impact is also applicable for the Chrome Plant and offices.	• *Magnitude: Major* • *Duration: Short term* • *Scale: Site specific* • *Consequence: Medium* • *Probability: Definite* *Significance: **MEDIUM (-)***	• Compilation/ update of a detailed Closure Management Plan. • *Building foundations will be removed to a depth of 1 m. All land exposed by the demolition of infrastructure and other land disturbed by the mine's activities will be rehabilitated.* • *Rehabilitation of the surfaces which are disturbed within the proposed Mining Authorisation area will be carried out in compliance with the Environmental Management Plan (as detailed in the Environmental Management Plan Report (EMPR)) and in terms of Anglo Platinum's environmental policy and procedures. This will entail both an ongoing process as*	• *Magnitude: Moderate* • *Duration: Short term* • *Scale: Site specific* • *Consequence: Low* • *Probability: Possible* *Significance: **LOW (-)***	*Environmental Management Programme Report for the Der Brochen Mine Volume 1 of 3 (SRK Consulting Report No. 295606/4/ November 2002)*

Decommissioning and Closure of the Der Brochen Project and associated infrastructure					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
			well as specific work during and after mine closure. • *On closure, disused infrastructure will be demolished and the site will be rehabilitated. The available stockpiled soil will be used during this rehabilitation exercise.* • *Disturbed areas will be rehabilitated through landscaping, soil replacement and the establishment of vegetation. Where practical, rehabilitation will take place during the life of the mine (construction, operational and decommissioning phases).* • *The soil which has been conserved in stockpiles will be used strategically in the rehabilitation of disturbed land.* • *Vegetation establishment in disturbed areas will be undertaken as soon as is practical, with growing season and water availability being*		

Decommissioning and Closure of the Der Brochen Project and associated infrastructure					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
			the primary time constraints.		
	Biodiversity				
	No additional impacts are envisaged for the Decommissioning and Closure Phase.				
	Wetlands				
	No additional impacts are envisaged for the Decommissioning and Closure Phase.				
	Surface water				
D12	**Deterioration of surface water quality due to increased sediment loads as a result of erosion** Demolition of infrastructure and earthworks will leave soils bare and exposed to erosion agents, as well as potentially increase the volume and flow rate of surface runoff entering surface water bodies. This will in turn result in an increase in sediment loads in these water bodies.	• Magnitude: Major • Duration: Short term • Scale: Site specific • Consequence: Medium • Probability: Definite Significance: **MEDIUM (-)**	• A stormwater management plan should be implemented up until Closure Phase. This should include diversion of clean water around demolition sites and containment of dirty water on site.	• Magnitude: Moderate • Duration: Short term • Scale: Site specific • Consequence: Low • Probability: Possible Significance: **LOW (-)**	New impact.
D13	**Deterioration of surface water quality due to contamination of runoff by oil and fuel spills and leaks, and other demolition activities** Impact on surface water from	• Magnitude: Major • Duration: Short term • Scale: Site specific • Consequence: Medium	• A leak/spill detection plan will be devised and implemented for all possible areas of leak/spillage within the demolition site.	• Magnitude: Moderate • Duration: Short term • Scale: Site specific • Consequence: Low	New impact.

Decommissioning and Closure of the Der Brochen Project and associated infrastructure					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
	heavy vehicles during demolition due to spillage of hydrocarbons. This may contaminate surface water bodies.	• Probability: Definite Significance: **MEDIUM (-)**		• Probability: Possible Significance: **LOW (-)**	
	Groundwater				
	No additional impacts are envisaged for the Decommissioning and Closure Phase.				
	Air Quality				
D14	**Increased nuisance dust during Decommissioning and Closure** Dust will be generated by rehabilitation activities. Exposed surfaces are susceptible to erosional forces including wind. Vehicles and machinery moving along roads will generate dust.	• Magnitude: Minor • Duration: Short term • Scale: Site specific • Consequence: Low • Probability: Possible Significance: **LOW (-)**	• Water sprays where vehicle activity is high.	• Magnitude: Minor • Duration: Short term • Scale: Site specific • Consequence: Low • Probability: Possible Significance: **LOW (-)**	Air Quality Specialist Report for the Der Brochen EMP Alignment and Amendment (Airshed Report No. 13SRK25, September 2014)
	Noise				
D15	**Increase in ambient noise levels as a result of demolition activities** Demolition activities such as movement of trucks and earthmoving equipment and machinery will cause an increase in ambient noise levels.	• Magnitude: Minor • Duration: Short term • Scale: Site specific • Consequence: Low • Probability: Possible Significance: **LOW (-)**	• Demolition activities will be confined to daylight hours. • A noise monitoring programme will be implemented during Decommissioning and Closure activities. • Heavy vehicles will be	• Magnitude: Minor • Duration: Short term • Scale: Site specific • Consequence: Low • Probability: Unlikely Significance: **LOW (-)**	New impact.

Decommissioning and Closure of the Der Brochen Project and associated infrastructure					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
			serviced at regular intervals to minimise noise generation.		
	Visual				
	No additional impacts are envisaged during the Decommissioning/Closure phase.				
	Cultural heritage				
	No additional impacts are envisaged during the Decommissioning/Closure phase.				
	Traffic and transportation				
	No additional impacts are envisaged during the Decommissioning/Closure phase.				

7.4.3 Socio-economic impacts associated with the Decommissioning and Closure Phase

Table 7-22 describes and rates the socio-economic impacts associated with the Decommissioning and Closure of the Der Brochen Project and associated activities.

Table 7-22: Socio-economic impacts associated with the Decommissioning and Closure Phase

Socio-economic impacts during Decommissioning and Closure					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
D16	***Sustainability of livelihoods at mine closure*** *The closure of the mine is likely to have a negative impact on the local communities. During the decommissioning phase and closure, staff will be retrenched or re-deployed and thus result in significant job losses.* *The effects of job loss could spill over into the informal economy, as the cash flow from mine employees is terminated. Any businesses providing services to the mine may also lose their income source with associated job losses. Mine closure could thus lead to a destabilisation of the local economy and may result in a rise in incidence of poverty.* *Mining infrastructure would*	• Magnitude: Moderate • Duration: Long term • Scale: Regional • Consequence: High • Probability: Definite Significance: **HIGH (-)**	• *Der Brochen will commission a socio-economic investigation of the impact of mine closure in advance of the event to estimate short term, medium term and long terms impacts of mine closure. The recommendations of the study will be implemented.*	• *Magnitude: Minor* • *Duration: Long term* • *Scale:* Regional • *Consequence: Medium* • *Probability: Definite* *Significance:* ***MEDIUM (-)***	*Environmental Management Programme Report for the Der Brochen Mine Volume 1 of 3 (SRK Consulting Report No. 295606/4/ November 2002)* *Chrome Plant- Helena 6 JT, Eastern Limb of the Bushveld Complex, Mpumalanga, South Africa Final EIAR and EMP (ERM, May 2006)*

Socio-economic impacts during Decommissioning and Closure					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
	reduce the available agricultural and grazing land in the area, however land land taken by the tailings facility would be permanently lost and cannot be rehabilitated to its current land use capability.				
D17	***Negative social and socio-economic impacts as a result of mine decommissioning and closure*** *Decommissioning and closure of the mine will negatively impact on the mine service providers and their employees. Large-scale retrenchments can flood the job markets and result in people being unable to find new positions for long periods of time. This will not only affect direct employees of the mine, but also their dependants as well as informal business sectors in the area that had been dependent on the employees' buying power.* *People who have derived income directly and indirectly*	• *Magnitude: Major* • *Duration: Long term* • *Scale: Regional* • *Consequence: High* • *Probability: Definitely* *Significance: **HIGH (-)***	• *The Social and Labour Plan (SLP) developed by Der Brochen includes management measures for downscaling and retrenchment. Management includes the establishment of forums, mechanisms to ameliorate social and economic impacts on individuals and contractors considering mechanisms for creating alternative solutions for creating job security on closure.*	• *Magnitude: Moderate* • *Duration: Long term* • *Scale: Regional* • *Consequence: High* • *Probability: Possible* *Significance: **HIGH (-)***	*Der Brochen Mine: Environmental Impact Assessment Report and Environmental Management Programme (SRK Consulting Report No. 343158/ April 2005)*

Socio-economic impacts during Decommissioning and Closure					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
	from the mine activities may be inclined to leave the region and this could result in a further decline in the economy of the region as well as abandonment of infrastructure.				

7.5 Post-Closure

The impacts envisaged Post-Closure can be seen in Table 7-23.

7.5.1 Post-Closure impacts at Der Brochen

Table 7-23 describes and rates the socio-economic impacts Post-Closure of the Der Brochen Project.

Table 7-23: Impacts Post-Closure of the Der Brochen Project

Post closure impacts at Der Brochen					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
	Geology				
	No impacts are envisaged during Post-closure.				
	Topography				
	No additional impacts are envisaged during Post-closure.				
	Soils, land capability and land use				
PC1	***Long-term stability of rehabilitated land*** *The areas which will be rehabilitated include Tailings Dams, the Concentrator area and other areas where surface infrastructure is demolished.* *At mine closure, surface infrastructure will either be demolished or an alternative use for the infrastructure will be decided upon by a regional planning committee to be established for the area.*	• *Magnitude: Moderate* • *Duration: Long term* • *Scale: Site specific* • *Consequence: Medium* • *Probability: Unlikely* *Significance: **LOW (-)***	• *The mine intends to revegetate the Tailings Dam utilising a practical revegetation programme which will ensure adequate rehabilitation and stability of the dams.* • *Monitoring of the Tailings Dams will be carried out to ensure overall stability. Areas where instability is encountered will be addressed by the mine in an appropriate manner.*	*Negligible*	*Environmental Management Programme Report for the Der Brochen Mine Volume 1 of 3 (SRK Consulting Report No. 295606/4/ November 2002)*

Post closure impacts at Der Brochen					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
	Biodiversity				
	No impacts are envisaged during Post-closure.				
	Wetlands				
	No impacts are envisaged during Post-closure.				
	Surface water				
PC2	***Potential for acid mine drainage or poor quality leachate emanating from mine residue deposits*** *Rain falling on the Tailings Dam facilities is considered to become "dirty", resulting seepage from these residue deposits is also considered to be potentially polluting.* *The Tailings Dams are likely to generate saline leachate, the duration and magnitude of which will depend on the salts present in the dam and on management activities to control infiltration and seepage.*	• *Magnitude: Minor* • *Duration: Long term* • *Scale: Site specific* • *Consequence: Medium* • *Probability: Unlikely* *Significance: **LOW (-)***	• Acid Mine Drainage (AMD) tests will be undertaken on tailings material in the mine lease area. • The acid generation potential of the tailings is to be tested to confirm AMD potential, together with the potential for salinity production by the proposed tailings.	*Negligible*	*Environmental Management Programme Report for the Der Brochen Mine Volume 1 of 3 (SRK Consulting Report No. 295606/4/ November 2002)*
	Groundwater				
PC3	**Contaminant plume migration (deterioration of groundwater**	• Magnitude: Moderate • Duration: Long term	• Install a lining system of either composite clay or	• Magnitude: Minor • Duration: Long term	Der Brochen Project-Groundwater Investigation and Model

Post closure impacts at Der Brochen					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
	and surface water quality) The simulated leachate plumes emanating from a Co-Disposal Facility (CDF) and the de-commissioned Helena TSF will in all likelihood reach the Groot-Dwars River. While the installation of a lining system would limit the seepage rate and subsequently the spreading of potential contaminants (both laterally and vertically) emanating from the CDF, the plume is not likely to reach the Groot-Dwars River in the northern section. Concentrations during post-closure the simulated contaminant plume will reach the Groot-Dwars River by 2044. The remainder of the plume (post-2044) (with lower expected concentrations) will undergo natural attenuation.	• Scale: Site specific • Consequence: Medium • Probability: Definite Significance: **MEDIUM (-)**	HDPE. • Seepage collection drains should be considered. • Rehabilitation and capping of the facility to reduce seepages after closure. • After closure will be an effective remedial option. • Infiltration of process water towards the aquifer should be reduced to a minimum.	• Scale: Site specific • Consequence: Medium • Probability: Possible Significance: **MEDIUM (-)**	Report (Delta H Report No. 2013.027-01, October 2014)
PC4	**Dewatering of mine void (Reduction in borehole yield and river baseflow)** Groundwater inflows into the	• Magnitude: Moderate • Duration: Medium term • Scale: Local site	• Continuous water level monitoring. • Replacement of water supply boreholes in event of yield	• Magnitude: Minor • Duration: Medium term • Scale: Local site	Der Brochen Project-Groundwater Investigation and Model Report (Delta H Report

Post closure impacts at Der Brochen

Impact Reference No.	Impact	Significance rating pre-mitigation	Recommended management measures	Significance rating post-mitigation	Source document
	northern and southern pit will necessitate continuous dewatering of the Pits during life of mine with associated decline of groundwater levels in the vicinity and a reduction of groundwater baseflow towards the Groot-Dwars River. However, Decommissioning and post-closure of the Open Pits will lead to recovery of groundwater levels. This will lead to the re-establishment of groundwater levels, flow directions and flow gradients to near pre-mining levels.	• Consequence: Medium • Probability: Definite Significance: **MEDIUM (-)**	losses.	• Consequence: Low • Probability: Possible Significance: **LOW (-)**	No. 2013.027-01, October 2014)
PC5	**Contaminant plume migration (deterioration of groundwater and surface water quality)** The simulated leachate plumes emanating from an unlined and lined Mareesburg TSF will in all likelihood reach the Mareesburg Stream due to its close proximity to the surface water course (~ 110 m towards the southern TSF wall). Although it's expected that the	• Magnitude: Moderate • Duration: Long term • Scale: Site specific • Consequence: Medium • Probability: Definite Significance: **MEDIUM (-)**	• Install a lining system of either composite clay or HDPE. • Seepage collection drains should be considered. • Rehabilitation and capping of the facility to reduce seepages after closure. • Infiltration of process water towards the aquifer should be reduced to a minimum.	• Magnitude: Minor • Duration: Long term • Scale: Site specific • Consequence: Medium • Probability: Unlikely Significance: **LOW (-)**	Der Brochen Project-Groundwater Investigation and Model Report (Delta H Report No. 2013.027-01, October 2014)

Post closure impacts at Der Brochen					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
	overall salt load reporting to the Mareesburg Stream will significantly be reduced by a lining system the spreading of the plume can be effectively be contained (from reaching the Mareesburg Stream) through the implantation of a hydraulic containment system.				
	Air Quality				
	No impacts are envisaged Post-closure.				
	Noise				
	No impacts are envisaged Post-closure.				
	Visual				
	No impacts are envisaged Post-closure.				
	Cultural heritage resources				
	No impacts are envisaged Post-closure.				
	Traffic and transportation				
	No impacts are envisaged Post-closure.				

7.6 Impact of the potential failure of the Helena TSF, Co-Disposal Facility and Mareesburg TSF

The Helena TSF, Co-Disposal Facility and Mareesburg TSF were designed by professional and experienced engineers, and will be operated according to the mandatory code of practice. SRK has conducted a flow-slide analysis to assess the potential Zone of Influence should the TSFs fail during the Operational Phase.

Please note that the failure of the TSFs is a highly unlikely occurrence, however SRK have identified and rated impacts should this event occur.

7.6.1 Potential Failure of the Mareesburg, Helena TSFs or Co-Disposal Facility

Table 7-24 describes and rates the potential impacts should Mareesburg, Helena TSFs or Co-Disposal Facility fail.

Table 7-24 outlines the potential impacts associated with the operation of the TSFs.

Please refer to Figure 4-5, Figure 4-9 and Figure 4-11, for the potential Zone of Influence of the Helena TSF, Co-Disposal Facility and Mareesburg TSF, respectively.

7.6.2 Potential Failure of the Mareesburg, Helena TSFs or Co-Disposal Facility

Table 7-24 describes and rates the potential impacts should Mareesburg, Helena TSFs or Co-Disposal Facility fail.

Table 7-24: Impacts associated with the potential failure of the Mareesburg, Helena TSFs or Co-Disposal Facility during Operational Phase

Failure of the Mareesburg and Helena TSFs during Operations					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
	Geology				
	There are no impacts envisaged should the TSFs fail.				
	Topography				
	There are no significant impacts envisaged should the TSFs fail.				
	Soils, land capability and land use				
F1	***Loss and contamination of soil resources due to failure of TSF*** This impact is applicable to the all three tailings storage facilities.	• *Magnitude: Major* • *Duration: Long term* • *Scale: Local area* • *Consequence: High* • *Probability: Unlikely* *Significance: **MEDIUM (-)***	• *Ensure that the raising of the TSFs is designed by professional and experienced engineers.* • *Operate the TSFs as per the Operational Manual and undertake regular monitoring of its stability;* • *Develop an Emergency Preparedness and Response Plan to be implemented should there be signs of distress in the TSFs.*	• *Magnitude: Major* • *Duration: Medium term* • *Scale: Local area* • *Consequence: Medium* • *Probability: Unlikely* *Significance: **LOW (-)***	*Der Brochen Project EMP Amendment:: Raising of Helena Tailings Storage Facility EIA and EMP (SRK Consulting Report No. 475423/EIA/EMP; September 2014)*
	Biodiversity				
F2	***Loss of biodiversity due to the deposition of tailings material***	• *Magnitude: Major*	• *Ensure that the raising of the*	• *Magnitude: Major*	*Der Brochen Project EMP Amendment::*

Failure of the Mareesburg and Helena TSFs during Operations

Impact Reference No.	Impact	Significance rating pre-mitigation	Recommended management measures	Significance rating post-mitigation	Source document
	on banks and within the Groot-Dwars River and* Mareesburg Stream flowing into the *Dwars River due to the failure of the TSF This impact is applicable to the Mareesburg TSF and Helena TSF.	• *Duration: Long term* • *Scale: Local area* • *Consequence: High* • *Probability: Unlikely* *Significance: **MEDIUM (-)***	*TSF is designed by professional and experienced engineers.* • *Operate the TSF as per the Operational Manual and undertake regular monitoring of its stability;* • *Develop an Emergency Preparedness and Response Plan to be implemented should there be signs of distress in the TSF.*	• *Duration: Medium term* • *Scale: Local area* • *Consequence: Medium* • *Probability: Unlikely* *Significance: **LOW(-)***	*Raising of Helena Tailings Storage Facility EIA and EMP (SRK Consulting Report No. 475423/EIA/EMP; September 2014)*
	Wetlands				
F3	**Loss of riparian vegetation** The potential failure of the Mareesburg, Helena TSFs and Co-Disposal Facility will result in the loss of riparian vegetation.	• Magnitude: Major • Duration: Long term • Scale: Local area • Consequence: High • Probability: Unlikely Significance: **MEDIUM (-)**	• Ensure that the raising of the TSF is designed by professional and experienced engineers. • Operate the TSF as per the Operational Manual and undertake regular monitoring of its stability; • Develop an Emergency Preparedness and Response Plan to be implemented should there be signs of distress in the TSF.	• Magnitude: Major • Duration: Medium term • Scale: Local area • Consequence: Medium • Probability: Unlikely Significance: **LOW(-)**	New impact.

Failure of the Mareesburg and Helena TSFs during Operations					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
	Surface water				
F4	***Contamination of surface water resources*** *Decrease in surface water quality due to the inflow of tailings material into the Groot-Dwars and Dwars rivers.* This impact is applicable to the all three tailings storage facilities.	• *Magnitude: Major* • *Duration: Long term* • *Scale: Local area* • *Consequence: High* • *Probability: Unlikely* *Significance:* ***MEDIUM (-)***	• *Ensure that the raising of the TSF is designed by professional and experienced engineers.* • *Operate the TSF as per the Operational Manual and undertake regular monitoring of its stability;* • *Develop an Emergency Preparedness and Response Plan to be implemented should there be signs of distress in the TSF.*	• *Magnitude: Major* • *Duration: Medium term* • *Scale: Regional* • *Consequence: Medium* • *Probability: Unlikely* *Significance:* ***LOW(-)***	*Der Brochen Project EMP Amendment:: Raising of Helena Tailings Storage Facility EIA and EMP (SRK Consulting Report No. 475423/EIA/EMP; September 2014)*
	Groundwater				
	There are no impacts envisaged should the Mareesburg or Helena TSF fail.				
	Air Quality				
	There are no impacts envisaged should the Mareesburg or Helena TSF fail. Although there will be no impact during the failure of the TSF, after the failure the tailings material will dry out, which could increase nuisance dust.				
	Noise				
	There are no impacts envisaged should the Mareesburg or Helena TSF fail.				
	Cultural heritage				
F5	***Impact on culturally significant heritage sites***	• *Magnitude: Major*	• *Ensure that the raising of the TSF is designed by*	• *Magnitude: Major*	*Der Brochen Project EMP Amendment::*

Failure of the Mareesburg and Helena TSFs during Operations					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
	There are three kraals and several pot shards all of medium to low importance within the Zone of Influence if the Helena TSF should fail. *There is also an informal cemetery with five graves in the vicinity of the existing Tailings Dam, which are considered highly significant.* *Refer to* Table 7-26 *and* Figure 4-5*,* Figure 4-9 *and* Figure 4-11 *for the locations of the above mentioned sites that will be potentially impacted.* This impact is applicable to the all three tailings storage facilities.	• *Duration: Long term* • *Scale: Local area* • *Consequence: High* • *Probability: Unlikely* *Significance:* ***MEDIUM (-)***	*professional and experienced engineers.* • *Operate the TSF as per the Operational Manual and undertake regular monitoring of its stability;* • *Develop an Emergency Preparedness and Response Plan, which will include relevant communication mechanisms with key stakeholders, to be implemented should there be signs of distress in the TSF.*	• *Duration: Medium term* • *Scale: Local area* • *Consequence: Medium* • *Probability: Unlikely* *Significance:* ***LOW (-)***	*Raising of Helena Tailings Storage Facility EIA and EMP (SRK Consulting Report No. 475423/EIA/EMP; September 2014)*
	Visual				
F6	***Decrease in visual aesthetics to the area*** *The visual aesthetics will be affected by the tailings material deposited on the banks of the Groot-Dwars and Dwars rivers.*	• *Magnitude: Major* • *Duration: Long term* • *Scale: Local area* • *Consequence: High* • *Probability: Unlikely*	• *Ensure that the raising of the TSF is designed by professional and experienced engineers.* • *Operate the TSF as per the Operational Manual and undertake regular monitoring*	• *Magnitude: Major* • *Duration: Medium term* • *Scale: Local area* • *Consequence: Medium* • *Probability: Unlikely*	*Der Brochen Project EMP Amendment:: Raising of Helena Tailings Storage Facility EIA and EMP (SRK Consulting Report No. 475423/EIA/EMP;*

Failure of the Mareesburg and Helena TSFs during Operations					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
		*Significance: **MEDIUM (-)***	*of its stability;* • *Develop an Emergency Preparedness and Response Plan to be implemented should there be signs of distress in the TSF.*	*Significance: **LOW (-)***	*September 2014)*
	Traffic and transportation				
F7	***Disruptions to existing road networks*** *The access road to the Der Brochen Project, Mototolo JV and Booysendal Mine will be inaccessible should the Tailings Dam fail and wet tailings be deposited on the road surface.*	• *Magnitude: Major* • *Duration: Long term* • *Scale: Local area* • *Consequence: High* • *Probability: Unlikely* *Significance: **MEDIUM (-)***	• *Ensure that the raising of the TSF is designed by professional and experienced engineers.* • *Operate the TSF as per the Operational Manual and undertake regular monitoring of its stability;* • *Develop an Emergency Preparedness and Response Plan to be implemented should there be signs of distress in the TSF.*	• *Magnitude: Major* • *Duration: Medium term* • *Scale: Local area* • *Consequence: Medium* • *Probability: Unlikely* *Significance: **LOW (-)***	*Der Brochen Project EMP Amendment:: Raising of Helena Tailings Storage Facility EIA and EMP (SRK Consulting Report No. 475423/EIA/EMP; September 2014)*

7.6.3 Socio-economic impacts associated with the potential failure of the TSFs

Table 7-24 describes and rates the potential socio-economic impacts should Mareesburg of Helena TSF fail.

Table 7-25: Socio-economic impacts associated with the potential failure of the TSFs

Socio-economic impacts from the potential failure of the TSFs					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
	Socio-economic				
F8	***Disruptions to mining activities and communities within the TSF Zone of Influence*** *The following mining related infrastructure has been identified within the Zone of Influence:* • *The Helena Chrome mine decline shaft ; and* • *Helena Chrome Mine ventilation shaft complex.* *The Leshaba community on the Welgevonden farm lies just outside the Zone of Influence and could be potentially impacted should there be a failure of the TSFs.*	• *Magnitude: Major* • *Duration: Long term* • *Scale: Local area* • *Consequence: High* • *Probability: Unlikely* *Significance: **MEDIUM (-)***	• *Ensure that the raising of the Helena TSF is designed by professional and experienced engineers.* • Ensure that the Mareesburg TSF and Co-Disposal Facility is designed by professional and experienced engineers. • Operate the TSFs as per the Operational Manual and undertake regular monitoring of its stability. • Develop an Emergency Preparedness and Response Plan, *which will include relevant communication mechanisms with key stakeholders,* to be implemented should there be signs of distress in the TSFs. ***Decline shaft complex*** **(Helena**	• *Magnitude: Major* • *Duration: Medium term* • *Scale: Local area* • *Consequence: Medium* • *Probability: Unlikely* *Significance: **LOW (-)***	*Der Brochen Project EMP Amendment:: Raising of Helena Tailings Storage Facility EIA and EMP (SRK Consulting Report No. 475423/EIA/EMP; September 2014)*

Socio-economic impacts from the potential failure of the TSFs					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
			TSF)*:* • *Construct a flow diversion structure at the location of the riverside edge of the working platform at the Helena Chrome working decline shaft.* ***Mine vent shaft complex (*Helena TSF)** • *Construct a flow diversion structure to divert tailings flow around the vent shaft.* ***Communities* (all TSFs)** • *Develop an Emergency Preparedness and Response Plan to inform the Leshaba* and Mankge communities *timeously should the Helena TSF,* Mareesburg TSF or Co-Disposal Facility fail. • The Leshaba community on the low reaches of the right bank of the Groot-Dwars River falls marginally outside the zone of influence of the Mareesburg TSF. To divert any potential flow of tailings		

Socio-economic impacts from the potential failure of the TSFs					
Impact Reference No.	**Impact**	**Significance rating pre-mitigation**	**Recommended management measures**	**Significance rating post-mitigation**	**Source document**
			material away from the existing and any potential future dwellings, a flow diversion berm should be constructed on the eastern side of the settlement. ***General*** • *Should the TSF fail, tailings material should be cleaned up timeously and remediated immediately.*		

Table 7-26: Heritage sites within the Helena TSF, Mareesburg TSF and Co-disposal Zones of Influence

Number and description		**Coordinates**	**Significance**
AA88a	Stone terraces, upper maize grindstone and sundried brick marking household of African tenants	25° 00’ 21.5’’S, 30° 08’ 28.8’’E	Low importance
AA88b		25° 00’ 22.5’’S, 30° 08’ 27.8’’E	Low importance
AA90	Single terrace line, lower maize grindstone, upper grindstones on boundary road marking household of African tenants	25° 00’ 13.2’’S, 30° 08’ 31.4’’E	Low importance
AA91	Rectangular house foundations, lower maize grindstone and midden marking household of African tenants.	25° 01’ 00.2’’S, 30° 08’ 34.9’’E	Low importance
AA 107	Tenants	25° 00’ 13.4’’S, 30° 07’ 48.3’’E	Low importance
AA 115	Open area	25° 00’ 23.5’’S, 30° 07’ 33.4’’E	Low importance
AA 116	Tenants	25° 00’ 26.9’’S, 30° 07’ 30.6’’E	Low importance

8 Environmental Management Programme

8.1 Environmental Objectives and Goals

According to the Anglo American Environmental Way, The Anglo American Environmental Vision is to: “minimise harm to the environment by designing, operating and closing all of its operations in an environmentally responsible manner” (Anglo American, 2009).

There are three main principles:

“**Zero mindset:** Anglo American shall apply the mitigation hierarchy of avoiding, minimising and mitigating environmental impacts arising from its activities, products and services;

No repeats: all necessary steps will be taken to learn from environmental impacts, incidents, audit findings and other non-conformances, to prevent their recurrence; and

Non-negotiable standards and rules: common, non-negotiable Environmental Performance Standards and Procedures shall be applied throughout the Group as a minimum requirement” (Anglo American, 2009).

8.2 Management Programme

The objectives of this EMP are to:

- Provide a method to ensure performance and compliancy with the relevant regulatory authority provisions and guidelines while monitoring of the commitments allows for continual feedback and opportunities to improve;
- Identify a range of mitigation measures which could reduce and mitigate the potential identified impacts to minimal or insignificant levels;
- Provide RPM with management measures to conduct activities at Der Brochen with due care and diligence;
- Control predicted impacts that may occur so as to meet acceptable standards, both as a legal and a social responsibility to the environment within which they operate;
- Establish a method of monitoring and auditing environmental management practices during all phases of the operation;
- Ensure that safety recommendations are complied with; and
- Specify time periods within which mitigation measures must be implemented, where appropriate.

Management measures for activities associated with the Der Brochen Project have been described in the following sequence:

Table 8-1: Activities requiring management in the Construction and

Activity/ infrastructure	Reference
Northern and Southern Pits	Table 8-4
Co-Disposal Facility	Table 8-5
Mareesburg TSF and Pipeline	Table 8-6
Mareesburg Pipeline	Table 8-7
Removal of existing 132 kV powerline route and Construction of the powerline on the proposed new route	Table 8-8
Socio-economic impacts associated with the Construction Phase for the Der Brochen Project.	Table 8-9

Table 8-2: Activities requiring management in the Operational Phase

Activity/ infrastructure	Reference
Northern and Southern Pits	Table 8-10
Co-Disposal Facility	Table 8-11
Mareesburg TSF and Pipeline	Table 8-12
Helena TSF	Table 8-13
Mototolo Concentrator and Chrome Plant	Table 8-14
Access Roads	Table 8-15
Wellfield	Table 8-16
Socio-economic impacts associated with the Operational Phase for the Der Brochen Project	Table 8-17

Table 8-3: Activities requiring management in the Decommissioning and Closure Phases

Activity/ infrastructure	Reference
Mareesburg, Helena and Co-Disposal TSFs	Table 8-18
Der Brochen Project activities and associated infrastructure	Table 8-19
Socio-economic impacts associated with the Decommissioning and Closure Phase for the Der Brochen Project.	Table 8-20

Post-closure and Failure

Management measures during the post-closure phase of the Der Brochen Projects are listed in Table 8-21. Management measures associated with the unlikely failure of the TSFs are listed in Table 8-22.

Management measures described in italics have been copied from previous EIA/EMPs and have been marginally modified so as to only remove activities no longer covered by the current application and measures that are no longer applicable. New measures covering the proposed activities are presented in regular font.

In dealing with the management measures as described above, there is considerable repetition, because of the requirement by the DMR to describe the management measures for each project activity.

The various project phases are abbreviated as follows:

- Closure: C;
- Operational: O;
- Decommissioning and Closure: D;
- Post Closure: PC; and
- Potential Failure: F.

Table 8-4: Environmental Management Programme for the Construction of the Northern and Southern Pits

Impact Reference No.	Aspect	Impact	Management Objectives	Management Measures/ Actions	Responsible Party	Performance Criteria to be adhered to	Project Phase C	O	D	PC	Source
Construction of the Northern and Southern Pits											
C1	Soils, Land Capability and Land Use	Loss of soil resources	• To minimise the loss of soil by removing and storing soil to enable its reuse for rehabilitation.	• Soils will be stripped and stockpiled for use during rehabilitation. The following conservation principles will apply: ○ Stripped soil will be stored with as little compaction as possible; ○ Ensure the conservation of the seed bank; ○ Single handing will be practiced where possible; ○ Stockpiles that are likely to remain undisturbed for 12 months or more will be revegetated; ○ Land to which soil has been applied will be revegetated	• Environmental Coordinator • Mining Engineer • Contractor	• Topsoil stockpiled • Development according to block plans • Revegetated soil stockpiles	✓				New impact
C2		Contamination of soil resource due to hydrocarbon spills during construction	• To prevent and minimise soil contamination. • To remediate contaminated soils.	• Conduct daily equipment inspections to detect leaks which may lead to hydrocarbon spills. • Regular maintenance of vehicles. • Placement of drip trays under vehicles when parked and during fuel transfer. • Undertake on-site bioremediation or remove contaminated soils and dispose of at a licensed hazardous waste storage facility.	• Environmental Coordinator • Mining Engineer • Contractor • Land Manager	• Leak/spill Procedure • Topsoil stockpiles • Environmental Incident Report • Inspection and Maintenance Plan	✓				
C3	Biodiversity	Removal and loss of vegetation communities with a High / Medium- High Significance including wetland/ephemeral systems	• To demonstrate active stewardship of land and biodiversity.	• The Open Pit footprint areas will be clearly marked to contain activities within the designated area. • Prior to construction, the areas surrounding each footprint area will be marked to prevent further destruction of the surrounding vegetation communities, specifically near the riparian areas Protect surrounding sensitive areas. • Consideration will be given to the harvesting of vegetation (trees and medicinal plants) by stakeholders prior to final stripping of vegetation. Such a programme will be developed in consultation with stakeholders and access to the mine area will be controlled by RPM. • Create biodiversity awareness with construction crew and Environmental Control Officer (ECO) on site through training sessions and the preparation of a Biodiversity Awareness Programme. • Appoint a biodiversity specialist to identify CI species within the Open Pits footprint for potential relocation or to be grown in the on-site nursery for use during rehabilitation. • All CI species identified within the footprint of the Open Pits that can grow successfully ex situ will be translocated and the necessary permits applied for. • Establish an onsite nursery for the growing and storing of plants for use in rehabilitation, including *Vitex* species. • The cicada population will be monitored during the mining phases. The mine is participating in ongoing studies of the invertebrate fauna.	• Environmental Coordinator • Contractor • Land Manager	• Identify and remove relevant species if necessary • Established onsite nursery • Development according to block plans • Biodiversity Action Plan • Environmental Awareness Plan	✓				Der Brochen Platinum Mine Floristic Assessment (Natural Scientific Services (NSS) Report 1995, May 2014)

Impact Reference No.	Aspect	Impact	Management Objectives	Management Measures/ Actions	Responsible Party	Performance Criteria to be adhered to	Project Phase				Source
							C	O	D	PC	
Construction of the Northern and Southern Pits											
C4		Increase in alien invasive species impacting on natural plant community structures	• To prevent the spread of alien invasive species	• Ensure excavation equipment entering the site is cleaned and free of any seed propagules (this includes soil imports into the area-certificates required from source). • An Alien Invasive Management Plan is required for all current and future operations. • Educate the Construction crew on the identification and eradication of the top 10 alien species found within the area. Create an induction programme at commencement of the project.	• Environmental Coordinator • Contractor • Land Manager	• Alien Invasive Management Plan • Induction Programme on Alien Invasive species • Biodiversity Action Plan	✓				
C5	Wetlands	Increase in erosion and sediment loads	• To prevent or minimise erosion	• Clearly demarcate areas to be cleared and ensure that vegetation clearing only occurs within the demarcated areas. • Ensure that erosion management and sediment controls are strictly implemented from the beginning of site clearing activities.	• Environmental Coordinator • Contractor • Land Manager	• Development of method statement for Construction as part of the IWWMP	✓				Wetland and Aquatic Ecological Assessment for the Proposed Anglo Platinum Der Brochen Project, Limpopo Province (Scientific Aquatic Services (SAS), SAS Report No. 214035, April 2014
C6		Impact on riparian zone	• To minimise the disturbance on riparian zones and habitats	• Provide adequate contractor laydown areas. • Contractor laydown areas will not encroach into drainage line / riparian areas or their respective buffer zones. • Vehicles will remain on demarcated roads and not encroach into drainage line / riparian areas or their respective buffer zones.	• Environmental Coordinator • Contractor • Land Manager	• Established contractor laydown area as per the block plan	✓				
C7		Impact on drainage line habitats vegetation habitats	• To minimise disturbance to drainage line habitats	• Where possible, infrastructure will be placed outside of drainage line areas to reduce loss of habitats. • Topsoil stockpiles will not be placed directly adjacent to drainage line or riparian features and measures such as provision of berms and hessian curtains will be implemented to prevent erosion and sedimentation. • Clear separation of clean and dirty water will take place and diversion of clean water around operational areas must ensure minimisation of the loss of catchment yield.	• Environmental Coordinator • Contractor • Land Manager	• Topsoil stockpiles • Development according to block plans • Stormwater Management Plan	✓				
C8	Surface Water	Increase in erosion from areas of exposed soils during site clearing and grubbing	• Prevent/ minimise soil erosion	• Flood protection berms will be constructed where the Southern pit footprint falls within the 1:100 year floodline. • Erosion control measures in the form of temporary erosion prevention berms will be implemented during construction. • Clean water diversion bunds will be constructed upstream of a construction site prior to clearing areas for new infrastructure. • Paddocks will be constructed downstream of the working activities to minimise uncontrolled runoff from the site. • Areas disturbed by construction activities will be rehabilitated immediately on completion of construction at each area.	• Environmental Coordinator • Mining Engineer • Project Manager	• Stormwater Management Plan • Erosion Control measures	✓				Der Brochen Project Environmental Impact Assessment/ Environmental Management Plan Amendment and Alignment: Surface Water Specialist Report (SRK Report No. 469113/SW, October 2014)
C9		Increased potential for damming and flooding and subsequent damage to property and infrastructure due to hardstanding areas	• Reduce the risk of flooding	• Stormwater measures will be appropriately designed to allow for free flow of water. • Areas will be appropriately graded to prevent ponding.	• Environmental Coordinator • Mining Engineer • Project Manager	• Stormwater Management Plan	✓				

Impact Reference No.	Aspect	Impact	Management Objectives	Management Measures/ Actions	Responsible Party	Performance Criteria to be adhered to	Project Phase C	O	D	PC	Source
Construction of the Northern and Southern Pits											
C10		Deterioration in surface water quality due to spillages and accidental discharges	• To avoid or where not possible, minimise and remedy pollution of surface water during construction.	• Clean water diversions will be constructed prior to clearing areas for new infrastructure. • Hazardous substances and potentially polluting materials will be stored in appropriately bunded areas located outside of the riparian zone. Bunds will be designed for a capacity of 110% of the stored material. • Servicing and maintenance of vehicles and equipment will be done outside the riparian zone in appropriate facilities designed for this purpose. • Contractors will be adequately trained in handling of hazardous substances and potentially polluting materials especially during transport in the vicinity of the riparian zone, e.g. over river crossings. • Contractors will be made aware of the WUL conditions that apply during construction and will be held liable for environmental damages caused by spillages. • Emergency action plans will be drawn up to deal with spillages. • Contaminated runoff (excluding that contaminated by hydrocarbons) will be contained and reused as necessary e.g. for dust suppression. • Chemical toilets will be provided at construction sites.	• Environmental Coordinator • Mining Engineer • Project Manager • Contractor	• Stormwater Management Plan • Leak/spill Procedure • Water monitoring reports	✓				
C11		Alteration of catchment hydrology causing change in watercourse functionality and increased risk of flooding and scouring	• Reduce the risk of flooding and scouring	• Runoff from the catchment will be diverted away from the open pit areas by cut-off channels and diversion berms designed to handle the 1:50 year storm event. • Energy dissipaters will be constructed in areas of concentrated flows. • Routine inspections and maintenance will be conducted to keep the diversions free of debris (silt build up, vegetation etc.) and areas suitably graded.	• Environmental Coordinator • Mining Engineer • Project Manager	• Stormwater Management Plan • Inspection and Maintenance Plan • Water monitoring reports • Routine inspection reports	✓				Der Brochen Project Environmental Impact Assessment/ Environmental Management Plan Amendment and Alignment: Surface Water Specialist Report (SRK Report No. 469113/SW, October 2014)
C12	Air Quality	Increase in nuisance dust potentially impacting sensitive receptors	• To minimise the amount of dry material susceptible to wind erosion. • To minimise the entrainment potential of dust. • To respond with corrective action to public complaints about dust related health and nuisance impacts.	• Undertake dust suppression where feasible on stockpiles and materials handling activities. • Undertake dust suppression or chemical stabilization of unpaved roads. • Haul trucks to be restricted to specified haul roads. • Speed limit on unpaved roads not to exceed 40 km/hr.	• Project Manager • Environmental Coordinator • Safety, Health and Environment (SHE) Manager • Community Engagement and Development (CED) Manager	• Monthly air quality monitoring records • Complaints register to record complaints regarding nuisance dust • Reports advising on establishment of vegetation	✓				Air Quality Specialist Report for the Der Brochen EMP Alignment and Amendment (Airshed Report No. 13SRK25, September 2014)
C13	Noise	Increase in ambient noise levels potentially affecting community well-being	• To prevent or minimise adverse noise impacts from construction.	• Construction activities will be confined to daylight hours. • Construction vehicles will be serviced at regular intervals to minimise noise generation.	• Environmental Coordinator • CED Manager • SHE Manager	• Complaints register to record complaints regarding noise • Record of vehicle	✓				Noise Impact Study for Environmental Impact Assessment (M^2

Impact Reference No.	Aspect	Impact	Management Objectives	Management Measures/ Actions	Responsible Party	Performance Criteria to be adhered to	Project Phase				Source
							C	O	D	PC	
Construction of the Northern and Southern Pits											
			• To respond with corrective action to public complaints about noise.	• The contractors/RPM will respond to public complaints about noise.		services					Environmental Connections cc, February 2012)
C14	Cultural Heritage	Demolition or relocation of cultural heritage sites resulting in the disturbance of significant sites and graves	• To demonstrate active stewardship towards culturally significant heritage sites. • To avoid disturbance of sites and activities of cultural significance and where not possible to determine mitigation in consultation with local communities	• Graves and cemeteries in the footprint areas are to be exhumed and relocated in accordance with mandated procedure by a qualified Archaeologist. • Heritage sites within the footprint areas rated low to high significance, require a permit from SAHRA for the demolition thereof. • The necessary permits for grave relocation will be obtained from the South African Heritage Resources Agency (SAHRA). • The identified ruins (AA110) will be mapped by a qualified Archaeologist and permits should be obtained prior to demolishment. • Undertake a Phase 2 Heritage Impact Assessment to further assess heritage sites identified during the impact assessment.	• Environmental Coordinator • CED Manager • Project Manager	• All findings documented and finds recorded by a qualified (as per SAHRA) specialist	✓				Der Brochen Project and Mototolo Complex- An Integrated Report prepared for Anglo American Platinum Limited (Archaeological Resources Management, April 2012)
C15	Visual	Decrease in visual aesthetics of the area	• To minimise the visual impact of the Pits and ensure it blends into the natural environment.	• Minimise vegetation clearing to the demarcated footprint area of the Open Pits.	• Environmental Coordinator • Contractor • Mining Engineering	• Development according to block plans	✓				New impact
C16	Traffic and Transportation	Increased generation of traffic on existing road networks potentially resulting in an increase in road traffic	• To minimise/ prevent road accidents.	• Traffic conditions to be monitored annually, should traffic congestion increase, appropriate mitigation measures will be explored and implemented.	• SHE Manager • Environmental Coordinator • Project Manager	• Annual reporting on traffic related incidents and traffic increase.	✓				Specialist Traffic and Transportation Study for the Proposed EMP Alignment and Amendment of the Der Brochen Project to include open cast mining, tailings storage facilities and associated infrastructure (Aurecon, Report No. 9522, October 2014)
C17		Impact on pedestrians and cyclists	• To minimise/ prevent road accidents.	• Control access by cyclists and pedestrians to the site	• SHE Manager • Environmental Coordinator • Project Manager	• Annual reporting on traffic related incidents and traffic increase.	✓				
C18		Impact on road safety conditions resulting in a potential increase in road accidents	• To minimise/ prevent road accidents.	• Drivers of heavy construction vehicles should attend a road safety and driving course to sensitise them to the impact they have on driving conditions for other drivers on the road.	• SHE Manager • Environmental Coordinator • Project Manager	• Annual reporting on traffic related incidents and traffic increase.	✓				
C19		Decreased condition of the road network	• To minimise/ prevent further damage to roads.	• Develop a standard operating procedure for mine drivers to identify and report on potholes and road edge breaks to the operations manager who in turn will report it to the relevant authorities.	• SHE Manager • Environmental Coordinator • Project Manager	• Regular reporting of potholes and poor road conditions.	✓				

Table 8-5: Environmental Management Programme for the Construction of the Co-Disposal Facility

Impact Reference No.	Aspect	Impact	Management Objectives	Management Measures/ Actions	Responsible Party	Performance Criteria to be adhered to	Project Phase				Source
							C	O	D	PC	
Construction of the Co-Disposal Facility											
C20	Soils, Land Capability and Land Use	Loss of soil resources		• Refer to C1 in this table for applicable management measures			✓				New impact
C21		Contamination of soil resource		• Refer to C2 in this table for applicable management measures			✓				
C22	Biodiversity	Removal and loss of vegetation communities with a High / Medium- High Significance including wetland/ephemeral systems		• Refer to C3 in this table for applicable management measures			✓				Der Brochen Platinum Mine Floristic Assessment (Natural Scientific Services (NSS) Report 1995, May 2014)
C23		Increase in Alien invasive species		• Refer to C4 in this table for applicable management measures			✓				
C24	Wetlands	Increase in erosion and sediment loads		• Refer to C5 in this table for applicable management measures			✓				Wetland and Aquatic Ecological Assessment for the Proposed Anglo Platinum Der Brochen Project, Limpopo Province (Scientific Aquatic Services (SAS), SAS Report No. 214035, April 2014
C25		Impact on riparian zone		• Refer to C6 in this table for applicable management measures			✓				
C26		Loss of habitat and increased erosion during construction of the starter wall	• To prevent/ minimise erosion. • To prevent/minimise loss of wetland habitat.	• Wherever possible, infrastructure will be placed outside of drainage line areas to reduce loss of habitats. • Topsoil stockpiles will not be placed directly adjacent to drainage lines or riparian features and measures such as berms and hessian curtains will be implemented to prevent erosion and sedimentation.	• Environmental Coordinator • Contractor • Land Manager	• Development of method statement for construction as part of the IWWMP	✓				
C27	Surface Water	Increase in erosion from areas of exposed soils during site clearing and grubbing		• Refer to C8 in this table for applicable management measures			✓				Der Brochen Project Environmental Impact Assessment/ Environmental Management Plan Amendment and Alignment: Surface Water Specialist Report (SRK Report No. 469113/SW, October 2014)
C28		Increased potential for damming and flooding and subsequent damage to property and infrastructure due to hardstanding areas		• Refer to C9 in this table for applicable management measures			✓				
C29		Deterioration in surface water quality due to spillages and accidental discharges		• Refer to C10 in this table for applicable management measures			✓				
C30		Alteration of catchment hydrology causing change in watercourse functionality and increased risk of flooding and scouring	• To reduce the risk of flooding	• Runoff from the catchment will be diverted away from the Co-Disposal Facility by cut-off channels and diversion berms designed to handle the 1:50 year storm event. • Energy dissipaters will be constructed in areas of concentrated flows. • Routine inspections and maintenance will be conducted to keep the diversions free of debris (silt build up, vegetation etc.) and areas suitably graded.	• Environmental Coordinator • Mining Engineer • Project Manager	• Stormwater Management Plan • Water monitoring reports	✓				
C31		Deterioration of surface water quality due to use of waste rock in construction	• To avoid or where not possible, minimise and remedy pollution of surface water during construction.	• Dirty water that is generated will be contained on site for reuse. • Provide chemical toilets at construction sites.	• Environmental Coordinator • Mining Engineer • Project Manager	• Stormwater Management Plan • Leak/spill Procedure • Water monitoring reports	✓				

Impact Reference No.	Aspect	Impact	Management Objectives	Management Measures/ Actions	Responsible Party	Performance Criteria to be adhered to	Project Phase				Source
							C	O	D	PC	
Construction of the Co-Disposal Facility											
C32	Air Quality	Increase in nuisance dust		• Refer to C12 in this table for applicable management measures			✓				Air Quality Specialist Report for the Der Brochen EMP Alignment and Amendment (Airshed Report No. 13SRK25, September 2014)
C33	Noise	Increase in ambient noise levels	• To prevent or minimise adverse noise impacts from construction. • To respond with corrective action to public complaints about noise.	• Construction vehicles will be serviced at regular intervals to minimise noise generation. • The contractors/RPM will respond to public complaints about noise.	• Environmental Coordinator • CED Manager • SHE Manager	• Complaints register to record complaints regarding noise • Record of vehicle services	✓				Noise Impact Study for Environmental Impact Assessment (M^2 Environmental Connections cc, February 2012)
C34	Cultural Heritage	Impact on cultural heritage sites		• Refer to C14 in this table for applicable management measures			✓				Der Brochen Project and Mototolo Complex- An Integrated Report prepared for Anglo American Platinum Limited (Archaeological Resources Management, April 2012)
C35	Visual	Decrease in visual aesthetics of the area	• To minimise the visual impact of the Co-Disposal Facility and ensure it blends into the natural environment.	• Minimise vegetation clearing to the demarcated footprint area of the Co-Disposal Facility.	Environmental Coordinator	• Closure and Rehabilitation Plan	✓				New impact
C36	Traffic and transportation	Increased generation of traffic on existing road networks during construction		• Refer to C16 in this table for applicable management measures			✓				Specialist Traffic and Transportation Study for the Proposed EMP Alignment and Amendment of the Der Brochen Project to include open cast mining, tailings storage facilities and associated infrastructure (Aurecon, Report No. 9522, October 2014)
C37		Impact on pedestrian and cyclists		• Refer to C17 in this table for applicable management measures			✓				
C38		Impact on road safety conditions		• Refer to C18 in this table for applicable management measures			✓				
C39		Decreased condition of the road network		• Refer to C19 in this table for applicable management measures			✓				

Table 8-6: Environmental Management Programme for the Construction of the Mareesburg TSF

Impact Reference No.	Aspect	Impact	Management Objectives	Management Measures/ Actions	Responsible Party	Performance Criteria to be adhered to	Project Phase C	O	D	PC	Source
Construction of the Mareesburg TSF											
C40	Soils, Land Capability and Land Use	Loss of soil resources at sites where Tailings Dam started walls will be located	• To minimise the loss of soil by removing and storing soil to enable its reuse for rehabilitation.	• *Topsoil of the Tailings Dam is to be removed to build the starter walls, where feasible, part of the topsoil will be left to form a clay floor layer. Wet tailings are to be deposited into the dam.* • *A soil stripping plan will be developed to ensure that, as far as is practical, sufficient soil can be obtained at each site to provide for the rehabilitation requirements at that site.* • *Soil which has been stripped will be stockpiled for use in rehabilitation.* • *Soil will be cleared only from those areas to be affected by immediate construction.* • *Where the contractors are required to spoil material, spoil sites will be identified which are environmentally acceptable and approved by the ECO.* • *Following construction, all remaining denuded areas such as dam walls will be ripped if necessary, graded to an even surface and covered with available topsoil to a depth of approximately 150 mm prior to re-vegetation.* • *Soil not used for rehabilitation on completion of the Construction Phase will be retained for use in rehabilitation of parts of the site during operations and following closure.* • *Energy dissipaters will be constructed at points where there are concentrated discharges of water to the environment (such as at culverts and outflows of water from diversion canals) which can cause significant erosion. The effectiveness of these energy dissipaters will be checked periodically.* • *Stormwater berms will be provided downslope of areas recently stripped of vegetation to ensure that silt-laden stormwater does not flow directly into the Groot-Dwars River or the Der Brochen dam.* • *Monitoring of the contractors' activities to identify areas of erosion.* • *Eroded areas will be repaired where necessary.* • Construction of water management infrastructure will commence prior to the construction of Tailings Storage Facility to prevent soil erosion.	• Contractor • Environmental Coordinator • Mining Engineering	• Topsoil stockpiles • Development according to block plans • Revegetated soil stockpiles • Stormwater Management Plan • Water monitoring reports • Soil stripping plan	✓				*Environmental Management Programme Report for the Der Brochen Mine Volume 1 of 3 (SRK Consulting Report No. 295606/4/ November 2002)*
C41		Loss of land of arable/grazing potential	• To ensure that the footprint area is not exceeded in order to protect current resources.	• *The area of land to be disturbed and isolated for the purpose of construction, mining and processing activities will be limited, as far as is practical, to the minimum required for safe and efficient operation.* • *Preparation of a detailed land management plan as part of the feasibility work for the possible conservancy. This plan will determine the use and management of natural areas.* • The footprint extent of the project has been designed to where possible, only impact on	• Environmental Coordinator • CED Manager • Anglo Legal	• Minimise footprint by ensuring construction follows block plans • Land Management Plan	✓				

Impact Reference No.	Aspect	Impact	Management Objectives	Management Measures/ Actions	Responsible Party	Performance Criteria to be adhered to	Project Phase				Source
							C	O	D	PC	
Construction of the Mareesburg TSF											
				the Tailings Storage Facility and associated infrastructure. • Minimise the area that can be potentially impacted on (eroded, compacted, sterilised or de-nutrified).							
C42	Biodiversity	Loss of natural habitat	• To demonstrate active stewardship of land and biodiversity. • To avoid the damage or loss of plants and where not possible to ensure the conservation of representative habitats.	• *The area of land disturbed and isolated for the purpose of construction, mining and processing activities will be limited, as far as is practical, to the minimum required for safe and efficient operation* • *No unnecessary destruction of vegetation will be allowed and, in particular, construction workers will not be allowed to harvest any trees for use as firewood or any other purpose.* • *The ECO will undertake periodic audits of the effectiveness of the EMP on site.* • *The following principles will apply to bush and tree clearing:* - *any bush or tree clearing outside of prescribed areas will require the approval of the ECO;* - *bush and tree clearing will be kept to the absolute minimum within the prescribed areas;* - *where temporary structures are to be erected, it will be done so as to maximise the protection of trees and other natural features;* - *the ECO will inspect all areas, in consultation with a specialist, prior to bush and tree clearing, and mark the species to stay intact or to be transplanted;* - *all timber derived from bush or tree clearing will be made available, free of charge, to local inhabitants (where applicable). Contractors will not be allowed to sell any wood.* • *A medicinal plant nursery will be established under direct supervision of the ECO.* • *Priority, rare and endangered species will be identified and removed.* • *On completion of the Construction Phase, disturbed areas will be graded and topsoiled. The topsoiled areas will then be re-vegetated using indigenous pasture species.* • *Prior to revegetating the disturbed areas, soil samples will be collected and analysed. If necessary, the soil will be fertilised in accordance with the findings of the soil analysis.* • *Following re-vegetation the site will be monitored and maintained until a sound cover that will prevent erosion has been achieved.* • The biodiversity specialists will be required to survey the marked out surface infrastructure area in detail prior to clearing to identify plants (number and location) ahead of clearing for purposes of the permit applications. • The necessary permits will be obtained before	• Environmental Coordinator • CED Manager • Land Manager • Contractor	• Identify and remove relevant species if necessary • Implementation of the Biodiversity Action Plan	✓				*Environmental Management Programme Report for the Der Brochen Mine Volume 1 of 3 (SRK Consulting Report No. 295606/4/ November 2002)*

Impact Reference No.	Aspect	Impact	Management Objectives	Management Measures/ Actions	Responsible Party	Performance Criteria to be adhered to	Project Phase C	O	D	PC	Source
Construction of the Mareesburg TSF											
				any clearing of the site takes place. • Plants that are to be translocated for conservation purposes will be removed under the guidance of a recognized taxonomist/ecologist and planted in a conservation area of similar habitat. • Plants that are to be removed for rehabilitation purposes will be removed and replanted in a nursery under the guidance of a recognized landscaper. The mine will be responsible for the operation of the nursery until such time as rehabilitation has been completed.							
C43		Disturbance/loss of vegetation species and communities of conservation importance, loss of biodiversity and the risk of losing unknown biodiversity due to clearing of vegetation	• To demonstrate active stewardship of land and biodiversity. • To avoid the damage or loss of plants and where not possible to ensure the conservation of representative habitats.	• The necessary permits for removal of CI plants will be obtained before any clearing of the site takes place. • *A qualified horticulturist will supervise mitigation measures for Priority Plant Species* (Conservation Important Species) *activities.* • *The horticulturist will search the transportation corridor area for more individuals of the priority species, especially of <u>Cyphostemma wilmsii</u> (which will not be translocated unless unavoidable).* • *Any decisions regarding the fate of populations of these priority species will only be made after consultation with the vegetation specialists.* • *Vegetation specialists will be employed to identify individual specimens or populations for possible relocation. Specialists will be involved in establishing a relocation procedure that will include timing and selecting new locations for the plants.* • *A medicinal plant nursery will be established under direct supervision of the ECO. Any natural building materials will also be made available to neighbouring rural dwellers following their application to the ECO. The access to the area for harvesting of such materials will be controlled and supervised by the ECO.* • *Specialist interest groups such as Operation Wildflower will be invited to participate in plant rescues prior to the commencement of activities*.	• Environmental Coordinator • CED Manager • Land Manager • Contractor	• Identify and remove relevant species if necessary • Establishment of an onsite nursery • Development according to block plans	✓				*Environmental Management Programme Report for the Der Brochen Mine Volume 1 of 3 (SRK Consulting Report No. 295606/4/ November 2002)*
C44		Displacement or disturbance of animal life (and their migration paths) as a result of construction activities	• To prevent/ minimise the disturbance to animal life.	• The Mareesburg TSF footprint area will be clearly demarcated to contain construction activities within the designated area. • *The area of habitat disturbed and isolated for the purpose of mining and processing activities will be limited, as far as is practical, to the minimum required for safe and efficient operation.* • *Staff will be instructed that no hunting or unnecessary disturbance of wildlife will be allowed on mine property and that transgressors will be severely dealt with. Strict anti-poaching measures will be enforced and the mine will promptly investigate and respond to complaints of*	• Environmental Coordinator • Land Manager • Contractor	• Monitor footprint clearing by contractor • Biodiversity awareness Campaign	✓				*Environmental Management Programme Report for the Der Brochen Mine Volume 1 of 3 (SRK Consulting Report No. 295606/4/ November 2002)*

Impact Reference No.	Aspect	Impact	Management Objectives	Management Measures/ Actions	Responsible Party	Performance Criteria to be adhered to	Project Phase				Source
							C	O	D	PC	
Construction of the Mareesburg TSF											
				poaching. Measures include: - *Access control;* - *Specific travel routes;* - *Area to be fenced;* - *The area will be patrolled;* - *Disciplining and prosecution of offenders; and* - *Separate rules may emanate from the possible conservancy.* • *Noise disturbance to wildlife will be limited by using only pre-determined access routes and restricting noise.* • Biodiversity awareness will be created with the construction crew and Environmental Officer on site.							
C45		Disturbance/loss of insect species/communities of conservation value due to loss of habitat and habitat fragmentation	• To prevent/minimise disturbance to habitats.	• *Following construction, all disturbed areas will be rehabilitated.* • *The cicada population will be monitored during the mining phases. The mine is participating in ongoing studies of the invertebrate fauna.* • If possible, *Vitex* species identified within the footprint of the Mareesburg TSF will be translocated.	• Environmental Coordinator • Land Manager • Contractor	• Minimise foot print by ensuring construction follows block plans • Monitoring reports	✓				*Environmental Management Programme Report for the Der Brochen Mine Volume 1 of 3 (SRK Consulting Report No. 295606/4/ November 2002)*
C46		Loss of communities that have a National, Provincial and Local significance and Conservation Importance species	• To ensure the protection of Conservation Important species	• Consider implementation of biodiversity offsets which will require a detailed investigation to find similar habitat to conserve. • Appoint a biodiversity specialist to identify CI species that can grow successfully ex situ. These species must be translocated and the necessary permits from DWS must be applied for. • Obtain the necessary regulatory authorisation for crossing any of the streams / drainage lines or wetlands. • Where the road/Pipeline traverses a wetland, measures will be implemented to ensure that the road has minimal effect on the flow of water through the wetland, e.g. by using box culverts rather than pipes.	• Environmental Coordinator • Land Manager • Contractor	• Implementation of the Biodiversity Action Plan	✓				Der Brochen Platinum Mine Floristic Assessment (Natural Scientific Services (NSS) Report 1995, May 2014)
C47		Increase in Alien invasive species		• Refer to C4 in this table for applicable management measures			✓				Der Brochen Platinum Mine Floristic Assessment (Natural Scientific Services (NSS) Report 1995, May 2014)
C48	Wetlands	Increase in erosion and sediment loads resulting in the loss of wetland habitats and ecoservices	• To prevent/ minimise erosion. • To prevent/minimise edge effects.	• Clearly demarcate areas to be cleared and ensure that vegetation clearing only occurs within the demarcated areas. • Ensure that erosion management and sediment controls are strictly implemented from the beginning of site Minimise the footprint and control edge effects. • Restrict preparation of the construction site to drier months to decrease the potential for erosion caused by rainfall.	• Environmental Coordinator • Contractor • Land Manager	• Development of method statement for Construction as part of the IWWMP	✓				Wetland and Aquatic Ecological Assessment for the Proposed Anglo Platinum Der Brochen Project, Limpopo Province (Scientific Aquatic Services (SAS), SAS Report No. 214035, April 2014)
C49		Impact on riparian zone		• Refer to C6 in this table for applicable management measures			✓				

Impact Reference No.	Aspect	Impact	Management Objectives	Management Measures/ Actions	Responsible Party	Performance Criteria to be adhered to	Project Phase C	O	D	PC	Source
Construction of the Mareesburg TSF											
C50		Impact on drainage line habitat		• Refer to C7 in this table for applicable management measures			✓				
C51	Surface Water	Deterioration of surface water quality due to increased sediment loads as a result of erosion	• To prevent/ minimise erosion.	• *A stormwater management plan, including watercourse diversions, will be implemented at the onset of construction.* • Construction of water management infrastructure will commence prior to the TSF.	• Environmental Coordinator • Mining Engineer • Project Manager	• Stormwater Management Plan • Water monitoring reports	✓				*Environmental Management Programme Report for the Der Brochen Mine Volume 1 of 3 (SRK Consulting Report No. 295606/4/ November 2002)*
C52		Deterioration of surface water quality due to contamination of runoff by oil and fuel spills and leaks, and other construction activities	• To avoid or where not possible, minimise and remedy pollution of surface water during construction.	• *Construction areas and construction campsites will be provided with earth berms which will divert clean stormwater runoff and prevent this water from entering such working areas.* • *Re-vegetation of all denuded area.* • A leak/spill detection plan will be devised and implemented for all possible areas of leak/spillage within the construction site.	• Environmental Coordinator • Mining Engineer • Project Manager	• Stormwater Management Plan • Leak/spill Procedure • Water monitoring reports	✓				*Environmental Management Programme Report for the Der Brochen Mine Volume 1 of 3 (SRK Consulting Report No. 295606/4/ November 2002)*
C53		Deterioration of surface water quality due to erosion, spillages and accidental discharges at the Pipeline crossings	• To avoid or where not possible, minimise and remedy pollution of surface water during construction.	• *Clean stormwater cut-off drains with diversion berms will be positioned to divert stormwater from the sites. The drains will be designed to accommodate a 1:50 year storm and diversion berms will assist to divert a 1:100 year storm. Stormwater diverted by these drains and berms will be redirected towards the natural watercourses in the area.* • *All storage areas will be bunded and will have a peripheral collection drain, with oil interceptors (if required).* • *Daily checks will be conducted by the contractors on the dispensing mechanism of above-ground storage tanks to ensure the timeous identification of faults.* • *Collection containers (e.g. drip trays) will be placed under all dispensing mechanisms of hydrocarbon or hazardous liquid substances to ensure contamination from leaks and dispensing is contained.* • *The dispensing mechanism of diesel will be stored in a container when not in use.* • *Liquid wastes will not be disposed of to stormwater drains. Details regarding proposed methods for treatment of pollutants will be submitted by contractors to the ECO for acceptance prior to treatment.* • *Any spillage, irrespective of its size, will be contained and cleaned up immediately.* • *Contractors will ensure that adequate measures (e.g. attenuation/settlement dams or oil absorbent products) are in place to prevent pollution. A method statement will be required from the contractors to this effect.* • Stormwater culverts at watercourse crossings will be designed and constructed to accommodate the 1:50 year storm event. • Areas disturbed by linear construction activities will be rehabilitated immediately on completion of construction of each area. • Erosion protection and energy dissipaters will	• Environmental Coordinator • Mining Engineer • Project Manager	• Stormwater Management Plan • Leak/spill Procedure • Water monitoring reports	✓				*Environmental Management Programme Report for the Der Brochen Mine Volume 1 of 3 (SRK Consulting Report No. 295606/4/ November 2002)* Der Brochen Project Environmental Impact Assessment/ Environmental Management Plan Amendment and Alignment: Surface Water Specialist Report (SRK Report No. 469113/SW, October 2014)

Impact Reference No.	Aspect	Impact	Management Objectives	Management Measures/ Actions	Responsible Party	Performance Criteria to be adhered to	Project Phase C	Project Phase O	Project Phase D	Project Phase PC	Source
Construction of the Mareesburg TSF											
				be constructed at the crossings as applicable. • Contractors will be made aware of the WUL conditions that apply during construction and made liable for environmental damages caused by spillages. • Emergency action plans should be drawn up to deal with spillages. • Chemical toilets will be provided at construction sites.							
C54		Increase in erosion from areas of exposed soils during site clearing and grubbing		• Refer to C8 in this table for applicable management measures			✓				Der Brochen Project Environmental Impact Assessment/ Environmental Management Plan Amendment and Alignment: Surface Water Specialist Report (SRK Report No. 469113/SW, October 2014)
C55		Increased potential for damming and flooding and subsequent damage to property and infrastructure due to hardstanding areas		• Refer to C9 in this table for applicable management measures			✓				
C56		Deterioration in surface water quality due to spillages and accidental discharges		• Refer to C10 in this table for applicable management measures			✓				
C57	Air Quality	Increased dust levels during construction of infrastructure and roads	• To minimise the amount of dry material susceptible to wind erosion. • To minimise the entrainment potential of dust. • To respond with corrective action to public complaints about dust related health and nuisance impacts.	• *The contractors and the mine will control dust on the site and access roads to acceptable levels, with water, chemical soil stabilisers or temporary surfacing.* • *The mine will undertake monthly dust monitoring at various locations along the main access road and shaft access roads until these are tarred.* • *Fines (cement spills and dried sludge) will be collected at regular intervals so as not to contribute to excessively dusty conditions.* • *Dust control measures (which may also include spraying of water) will be sufficient to ensure that dust will not have significant impacts in terms of the biophysical and social environments. These impacts include visual pollution, decreased safety due to reduced visibility, health aspects and ecological impacts due to dust particle accumulation in the watercourses and on vegetation.* • *Vehicle speeds on any gravel or earth roads will be limited to 40 kph.* • Movement of vehicles on site will be restricted. • Dust suppression will be undertaken of the service roads and TSF where required. • Only the immediate footprint of the area will be cleared of vegetation.	• Project Manager • Environmental Coordinator • SHE Manager • CED Manager	• Monthly air quality monitoring records • Complaints register to record complaints regarding nuisance dust • Dust suppression	✓				*Environmental Management Programme Report for the Der Brochen Mine Volume 1 of 3 (SRK Consulting Report No. 295606/4/ November 2002)*
C58		Increase in nuisance dust		• Refer to C12 in this table for applicable management measures			✓				Air Quality Specialist Report for the Der Brochen EMP Alignment and Amendment (Airshed Report No. 13SRK25, September 2014)

Impact Reference No.	Aspect	Impact	Management Objectives	Management Measures/ Actions	Responsible Party	Performance Criteria to be adhered to	Project Phase				Source
							C	O	D	PC	
Construction of the Mareesburg TSF											
C59	Noise	Increase in ambient noise levels to surrounding communities (Leshaba family) as a result of construction activities	• To prevent or minimise adverse noise impacts from construction • To respond with corrective action to public complaints about noise.	• *Machinery and vehicle silencer units will be maintained in good working order. Non-compliant machinery and/or vehicles will be removed from service until repaired.* • *Should community complaints be received with regard to noise generation, mine management will, at the discretion of the ECO, investigate this, model the noise against the baseline information obtained during the specialist survey and implement appropriate measures. Possible best practice management measures regarding noise mitigation include:* • Construction activities will be confined to daylight hours. • A noise monitoring programme will be implemented prior to construction. • Construction vehicles will be serviced at regular intervals to minimise noise generation.	• Environmental Coordinator • CED Manager • SHE Manager	• Complaints register to record complaints regarding noise • Record of vehicle services	✓				*Environmental Management Programme Report for the Der Brochen Mine Volume 1 of 3 (SRK Consulting Report No. 295606/4/ November 2002)*
C60	Cultural Heritage	Disturbance or destruction of historical and cultural sites	• To demonstrate active stewardship towards culturally significant heritage sites. • To avoid disturbance of sites and activities of cultural significance and where not possible to determine mitigation in consultation with local communities	• Cemeteries near infrastructure will be fenced to ensure their protection. • Heritage sites within the footprint area rated low to high significance, require a permit from SAHRA for the demolition t thereof. • Graves identified within the footprint area will be exhumed and relocated, following the mandated procedure by a qualified Archaeologist. • The necessary permits for grave relocation will be obtained from SAHRA. • Undertake a Phase 2 Heritage Impact Assessment to further assess heritage sites identified during the impact assessment.	• Environmental Coordinator • CED Manager • Project Manager	• All findings documented and finds recorded by a qualified (as per SAHRA) specialist	✓				*Environmental Management Programme Report for the Der Brochen Mine Volume 1 of 3 (SRK Consulting Report No. 295606/4/ November 2002)*
C61	Visual	Decrease in visual aesthetics of the area	• To minimise the visual impact of the TSF and ensure it blends into the natural environment.	• Minimise vegetation clearing to the demarcated footprint area of the Mareesburg TSF • The Tailings Dam has been sited in a position against a hill where it will not stand out from the surrounding topography and be less noticeable than other potential sites. The starter wall will be covered with a soil layer and will be re-vegetated early in the Operational Phase.	• Environmental Coordinator	• Closure and Rehabilitation Plan	✓				New impact
C62	Traffic and Transportation	Increased generation of traffic on existing road networks during construction		• Refer to C16 in this table for applicable management measures			✓				Specialist Traffic and Transportation Study for the Proposed EMP Alignment and Amendment of the Der Brochen Project to include open cast mining, tailings storage facilities and associated infrastructure (Aurecon, Report No. 9522, October 2014)
C63		Impact on pedestrian and cyclists		• Refer to C17 in this table for applicable management measures			✓				
C64		Impact on road safety conditions		• Refer to C18 in this table for applicable management measures			✓				
C65		Decreased condition of the road network		• Refer to C19 in this table for applicable management measures			✓				

Table 8-7: Environmental Management Programme for the Construction of the Mareesburg Pipelines (tailings delivery and return water)

Impact Reference No.	Aspect	Impact	Management Objectives	Management Measures/ Actions	Responsible Party	Performance Criteria to be adhered to	Project Phase				Source
							C	O	D	PC	
Construction of the Mareesburg Pipelines (tailings delivery and return water)											
C66	Soils, Land Capability and Land Use	Loss of soil resources as a result of sterilisation from Pipeline and road	• To prevent/ minimise loss of soil resources.	• Place Pipelines on plinths to avoid compaction of soils.	• Environmental Coordinator • Mining Engineering	• Topsoil stockpiles • Development according to block plans • Revegetated stockpiles	✓				New impact
C67		Contamination of soil resource		• Refer to C2 in this table for applicable management measures			✓				
C68	Biodiversity	Removal and loss of vegetation communities with a High / Medium- High Significance including wetland/ephemeral systems		• Refer to C3 in this table for applicable management measures			✓				Der Brochen Platinum Mine Floristic Assessment (Natural Scientific Services (NSS) Report 1995, May 2014)
C69		Increase in Alien invasive species		• Refer to C4 in this table for applicable management measures			✓				
C70	Wetlands	Impact on drainage line features and riparian areas on the Pipeline route	• To minimise disturbance to drainage lines. • To protect drainage line and riparian habitats.	• Support structures for the Pipelines will, if possible, be placed outside of drainage line or riparian habitat. • The crossing designs of any bridges will ensure that the creation of turbulent flow in the system is minimised in order to prevent downstream erosion. • No support pillars will be constructed within the active channels. • The Pipelines will be constructed as close as possible to existing or planned roads in order to minimise the need for maintenance personnel to access the Pipeline	• Environmental Coordinator • Contractor • Land Manager	• Implementation of the Biodiversity Action Plan	✓				New impact
C71	Surface Water	Deterioration of surface water quality due to erosion, spillages and accidental discharges at the Pipeline crossings	• To avoid or where not possible, minimise and remedy pollution of surface water during construction.	• Stormwater culverts at watercourse crossings will be designed and constructed to accommodate the 1:50 year storm event. • Areas disturbed by construction activities will be rehabilitated immediately on completion of construction of each area. • Erosion protection and energy dissipaters will be constructed at the crossings as applicable • Contractors will be made aware of the WUL conditions that apply during construction and made liable for environmental damages caused by spillages. • Emergency action plans will be drawn up to deal with spillages. • Chemical toilets will be provided at construction sites.	• Environmental Coordinator • Mining Engineer • Project Manager	• Stormwater Management Plan • Leak/spill Procedure • Water monitoring reports	✓				Der Brochen Project Environmental Impact Assessment/ Environmental Management Plan Amendment and Alignment: Surface Water Specialist Report (SRK Report No. 469113/SW, October 2014)
C72	Air Quality	Increase in nuisance dust		• Refer to C12 in this table for applicable management measures			✓				Air Quality Specialist Report for the Der Brochen EMP Alignment and Amendment (Airshed Report No. 13SRK25, September 2014)
C73	Noise	Increase in ambient noise levels		• Refer to C13 in this table for applicable management measures			✓				Noise Impact Study for Environmental Impact Assessment (M^2 Environmental Connections cc, February 2012)

Impact Reference No.	Aspect	Impact	Management Objectives	Management Measures/ Actions	Responsible Party	Performance Criteria to be adhered to	Project Phase				Source
							C	O	D	PC	
Construction of the Mareesburg Pipelines (tailings delivery and return water)											
C74	Cultural Heritage	Impact on cultural heritage sites		• Refer to C60 in this table for applicable management measures			✓				*Environmental Management Programme Report for the Der Brochen Mine Volume 1 of 3 (SRK Consulting Report No. 295606/4/ November 2002)*
C75	Traffic and Transportation	Increased generation of traffic on existing road networks during construction		• Refer to C16 in this table for applicable management measures			✓				Specialist Traffic and Transportation Study for the Proposed EMP Alignment and Amendment of the Der Brochen Project to include open cast mining, tailings storage facilities and associated infrastructure (Aurecon, Report No. 9522, October 2014)
C76		Impact on pedestrian and cyclists		• Refer to C17 in this table for applicable management measures			✓				
C77		Impact on road safety conditions		• Refer to C18 in this table for applicable management measures			✓				
C78		Decreased condition of the road network		• Refer to C19 in this table for applicable management measures			✓				

Table 8-8: Environmental Management Programme for the removal of the existing 132kV Powerline Route and Construction of the Powerline on the proposed new route

Impact Reference No.	Aspect	Impact	Management Objectives	Management Measures/ Actions	Responsible Party	Performance Criteria to be adhered to	Project Phase				Source
							C	O	D	PC	
Removal of existing 132kV Powerline Route and Construction of the Powerline on the proposed new route											
C79	Soils, Land Capability and Land Use	Impact on soil resources	• To minimise the loss of soil by removing and storing soil to enable its reuse for rehabilitation.	• Topsoil will be stockpiled separately and spread around the foundation at completion of construction to facilitate natural revegetation processes. • Backfilled material will be compacted to limit the possibility of erosion.	• Contractor • Environmental Coordinator • Mining Engineering	• Topsoil stockpiles • Development according to block plans • Revegetated soil stockpiles • Compacted backfilled material	✓				New impact
C80	Biodiversity	Loss of vegetation along the re-routed Powerline route	• To demonstrate active stewardship towards biodiversity.	• Ensure erecting of poles remains out of any wetland/ riparian areas. • Limit access to pole positions through existing road networks. • Remove and replant any CI species within the direct footprint of the pole.	• Contractor • Environmental Coordinator • Land Manager	• Identify and remove relevant species if necessary • Establishment of an onsite nursery • Development according to block plans	✓				Der Brochen Platinum Mine Floristic Assessment (Natural Scientific Services (NSS) Report 1995, May 2014)
C81		Increase in Alien invasive species		• Refer to C4 in this table for applicable management measures			✓				
C82	Wetlands	Impact on riparian habitats due to demolition and construction activities	• To minimise disturbance to riparian habitats	• All waste resulting from the demolition of the existing Powerline will be removed from site and disposed of at a Licensed Waste Disposal Facility. • Inspect all adjacent drainage lines/ riparian habitats on both the former and new routes for sedimentation on a regular basis. • Ensure that support structures for the new Powerline poles are not placed within drainage line areas and their associated buffers. • Re-profile topsoil and revegetate disturbed areas once demolition is complete.	• Environmental Coordinator • Contractor • Land Manager	• Establishment of contractor laydown areas outside riparian habitats	✓				Wetland and Aquatic Ecological Assessment for the Proposed Anglo Platinum Der Brochen Project, Limpopo Province (Scientific Aquatic Services (SAS), SAS Report No. 214035, April 2014.
C83	Surface Water	Increase in erosion from areas of exposed soils exacerbated by increased runoff volume and velocity from soil compacted areas	• To minimise the loss of soil	• Areas disturbed by demolition and construction activities will be rehabilitated immediately on completion in each area. • Areas disturbed by linear infrastructure will be rehabilitated progressively as construction progresses.	• Environmental Coordinator • Mining Engineer • Project Manager	• Stormwater Management Plan	✓				Der Brochen Project Environmental Impact Assessment/ Environmental Management Plan Amendment and Alignment: Surface Water Specialist Report (SRK Report No. 469113/SW, October 2014)
C84	Air Quality	Increase in nuisance dust		• Refer to C12 in this table for applicable management measures			✓				Air Quality Specialist Report for the Der Brochen EMP Alignment and Amendment (Airshed Report No. 13SRK25, September 2014)
C85	Noise	Increase in ambient noise levels		• Refer to C13 in this table for applicable management measures			✓				Noise Impact Study for Environmental Impact Assessment (M^2 Environmental Connections cc, February 2012)
C86	Cultural Heritage	Disturbance or destruction of historical and cultural sites	• To demonstrate active stewardship towards culturally	• Graveyards near infrastructure will be fenced to ensure their protection. • Poles will not be spaced closer than 30 m	• Environmental Coordinator • CED Manager	• All findings documented and finds recorded by a qualified	✓				New impact

Impact Reference No.	Aspect	Impact	Management Objectives	Management Measures/ Actions	Responsible Party	Performance Criteria to be adhered to	Project Phase				Source
							C	O	D	PC	
Removal of existing 132kV Powerline Route and Construction of the Powerline on the proposed new route											
			significant heritage sites. • To avoid disturbance of sites and activities of cultural significance and where not possible to determine mitigation in consultation with local communities	from graves to ensure that they are not disturbed. Graves beneath or within 30 m of powerlines will be fenced to ensure their protection. • The necessary permits for grave relocation will be obtained from the South African Heritage Resources Agency (SAHRA) should grave relocation be required. • Heritage sites that were rated low to high require a permit from SAHRA for the demolition thereof, if required. • Undertake a Phase 2 Heritage Impact Assessment to further assess heritage sites identified during the impact assessment.	• Project Manager	(as per SAHRA) specialist					
C87	Visual	Impact on the visual aesthetics of the area	• To minimise the visual impact of the Powerline and ensure it blends into the natural environment.	• Ensure that the servitude area is maintained and kept neat by clearing the area on a regular basis.	• Environmental Coordinator	• Closure and Rehabilitation Plan	✓				New impact

Table 8-9: Environmental Management Programme for the socio-economic impacts envisaged during Construction

Impact Reference No.	Aspect	Impact	Management Objectives	Management Measures/ Actions	Responsible Party	Performance Criteria to be adhered to	Project Phase				Source
							C	O	D	PC	
Socio-economic impacts envisaged during Construction											
C88	Socio-economic	Contribution to the local and regional economy	• To enhance benefits from the development of the Project • To maximise opportunities for local residents • To facilitate employment of local labour on the Project	• The mine has developed a SLP which will guide the operation on social issues. This is updated every five years. • Der Brochen will inject investment into the local and regional economy through the employment of labour, use of local support services and the use of local infrastructure. Der Brochen will ensure that as much of this as possible is directed to the local economy. Since it is unlikely that suppliers from within the study area (local level) will be suitable, goods should be preferentially procured in the immediate focus area and, if unsuccessful, only then in the broader focus area. • AAP will inform businesses through appropriate business fora about available opportunities and how business may access these. For example the Steelpoort Business Forum will be used to engage with businesses in the local and regional areas. • The revised SLP should reflect the targets for procuring goods locally and regionally, and to develop local suppliers. Contractors will be required to submit annual reports on how they are attaining these targets as part of AAP's SLP reporting to Government. • AAP will identify potential service providers for longer term procurement. Anglo Zimele can assist Broad Based Black Economic Empowerment (BBBEE) businesses (who meet their requirements) with funding and these businesses will be provided with ongoing support. • Develop a social strategy, once mining has commenced, in line with the life of mine plan to assist in leaving a positive legacy. These strategies will be reviewed and monitored for implementation.	• CED Manager • Environmental Coordinator • Construction Manager	• Employment records • SLP	✓				*Environmental Management Programme Report for the Der Brochen Mine Volume 1 of 3 (SRK Consulting Report No. 295606/4/ November 2002)*
C89		Contribution to national economic growth	• To enhance benefits from the development of the Project • To maximise opportunities for local residents • To facilitate employment of local labour on the Project	• Der Brochen will inject investment into the local and regional economy through the employment of labour, use of local support services and the use of local infrastructure. Der Brochen will ensure that as much of this as possible is directed to the local economy. Since it is unlikely that suppliers from within the study area (local level) will be suitable, goods should be preferentially procured in the immediate focus area and, if unsuccessful, only then in the broader focus area. • AAP will inform businesses through appropriate business fora about available opportunities and how business may access these. For example, the Steelpoort Business Forum can be used to engage with businesses in the local and regional areas. • The revised SLP should reflect the targets for procuring goods locally and regionally, and to develop local suppliers. Contractors will be required to submit annual reports on how they	• CED Manager • Environmental Coordinator • Construction Manager	• Employment records • SLP	✓				Social Baseline and Impact Assessment for the Der Brochen EMP Alignment (SRK Report No. 469113/SIA, September 2014)

Impact Reference No.	Aspect	Impact	Management Objectives	Management Measures/ Actions	Responsible Party	Performance Criteria to be adhered to	Project Phase				Source
							C	O	D	PC	
Socio-economic impacts envisaged during Construction											
				are attaining these targets as part of AAP's SLP reporting to Government. • AAP will identify potential service providers for longer term procurement. Anglo Zimele can assist BBBEE businesses (who meet their requirements) with funding and these businesses will be provided with ongoing support. • Develop a social strategy, once mining has commenced, in line with the life of mine plan to assist in leaving a positive legacy. These strategies will be reviewed and monitored for implementation.							
C90		Social disruption	• To facilitate continued movement around the site along routes that are as close as possible to existing movement networks • To ensure that individuals do not travel any further than they do prior to the Project development	• Der Brochen will implement management commitments with respect to noise, dust, safety, blasting and vibrations and other activities. • Der Brochen should consult with CPAs and tribal authorities to discuss possibilities of the influx of people into the area. • Implementation of an HIV/AIDS awareness campaign targeting construction workers, employees and surrounding communities. • Contractors *will be required to find their own accommodation. Der Brochen will provide appropriate policies and procedures with regards to employee accommodation and related transport assistance.* Construction contractors will not be housed on the Der Brochen Property. • *If incidences of squatting as result of mine development are encountered, Der Brochen will report this to the relevant authorities. Since no permanent housing will be provided on site, the option for some non-locals may simply be to make their own arrangements as close as possible to the workplace.* • *All construction sites will be fenced* where necessary *to prevent public access and access by game. No loitering by employees outside the designated working hours will be allowed in the vicinity of the mining areas and mine entrance. No employment at the gate will be allowed.* • *No traversing or access to neighbouring properties by contractors' staff will be permitted.* • *Complaints from neighbours and the public with regard to interference from contractors' or mine staff will be promptly addressed* and due process followed. • *A community forum will be established whereby the mine, its contractors and local residents communicate on a regular basis to ensure that the mine is in a position to attend to valid concerns of the local community in an appropriate manner.* • *No informal settlement on mine property will be permitted and illegal structures and their inhabitants will be removed in accordance with the law.*	• CED Manager • Construction Manager • Procurement Manager • Human Resources Manager	• Complaints register	✓				*Environmental Management Programme Report for the Der Brochen Mine Volume 1 of 3 (SRK Consulting Report No. 295606/4/ November 2002)*

Impact Reference No.	Aspect	Impact	Management Objectives	Management Measures/ Actions	Responsible Party	Performance Criteria to be adhered to	Project Phase				Source
							C	O	D	PC	
Socio-economic impacts envisaged during Construction											
				• *The site project management staff contractors will be required to comply with all security procedures as determined from time to time on the project. All employees will be issued with a security card and the contractor will be responsible for ensuring these cards are carried by employees at all times whilst on site and that employees are kept fully aware of the applicable security procedures.* • *There will be no accommodation on site.*							
C91		Disturbance of the local community, social infrastructure and services		• Local communities will be prioritised for local employment to avoid increased pressure on local and sub-regional services and facilities, provided the skills and qualifications are available.			✓				
C92		Generation of jobs	• To enhance benefits from the development of the Project • To maximize opportunities for local residents • To facilitate employment of local labour on the Project • To avoid creating unrealistic expectations	• It is expected that contractors will bring in their own workers with the required core skills. Contractors must submit annual reports on how they are attaining these targets as part of AAP's. Where it is not possible to meet targets for employing people from the immediately affected areas, contractors will be required to source personnel in the immediate focus area, and then only in the broader focus area. Potential workers in the local area will be assessed for their suitability for contract work at Der Brochen. Dover tests can be conducted to screen potential local contract workers. • AAP will investigate the potential and applicability assisting with training of local contract workers on theoretical and safety aspects of pit mining. This however requires facilities for practical training and as all open pits have different mining methods and machinery which may not be the same as those required at Der Brochen the feasible of this is not yet know as at this point, it is unclear what machine-specific skills will be required by contractors working at Der Brochen. • Should Der Brochen be able to assist with training a database of trained potential local workers will be generated and provided to contractors to consider for employment. Local contract workers will be registered on the AAP database so that they may have access to other employment options in AAP and other companies AAP shares its database with. • AAP also provides learnerships and bursaries in engineering and hospitality and will implement this programme in the Der Brochen local communities. Upskilling particularly of contract workers from the local area will be undertaken by AAP during the operations phase of Der Brochen. • Procedures for employing locals will be discussed and agreed with the Community Engagement Forum (CEF). Existing fora will be used to implement AAP's local recruitment	• CED Manager • Construction Manager • Procurement Manager • Human Resources Manager	• Employment records • Public Involvement Programme • SLP	✓				Social Baseline and Impact Assessment for the Der Brochen EMP Alignment (SRK Report No. 469113/SIA, September 2014)

Impact Reference No.	Aspect	Impact	Management Objectives	Management Measures/ Actions	Responsible Party	Performance Criteria to be adhered to	Project Phase				Source
							C	O	D	PC	
Socio-economic impacts envisaged during Construction											
				process, to communicate the recruitment process and to identify and recruit suitable candidates. • AAP will meet the SLP requirements and commitments for downscaling and retrenchments, including the establishment, implementation and monitoring of a Future Forum.							
C93		Procurement of goods and services	• Ensure that local communities benefit from the proposed Project by means of procurement preference.	• Der Brochen will inject investment into the local and regional economy through the employment of labour, use of local support services and the use of local infrastructure. Der Brochen will ensure that as much of this as possible is directed to the local economy. Since it is unlikely that suppliers from within the study area (local level) will be suitable, goods should be preferentially procured in the immediate focus area and, if unsuccessful, only then in the broader focus area. • AAP will inform businesses through appropriate business fora about available opportunities and how business may access these. For example the Steelpoort Business Forum and Tubatse Business Forum will be used to engage with businesses in the local and regional areas. • The revised SLP should reflect the targets for procuring goods locally and regionally, and to develop local suppliers. Contractors will be required to submit annual reports on how they are attaining these targets as part of AAP's SLP. • AAP will identify potential service providers for longer term procurement Anglo Zimele can assist BEE businesses (who meet their requirements) with funding and these businesses will be provided with ongoing support. • Develop a social strategy, once mining has commenced, in line with the life of mine plan to assist in leaving a positive legacy This strategies will be reviewed and monitored for implementation.	• CED Manager • Procurement Manager	• Implementation of the Social and Labour Plan	✓				
C94		Influx of job seekers	• To support systems currently in place to control influx • To prevent the introduction of social pathologies	• Enhance employment of people and procurement of service providers in the study area and the region. • Accommodation should preferably be provided in towns in close proximity to the project area and workers bussed in. • Should accommodation be required in close proximity to Der Brochen: ○ RPM should require the contractors to promote HIV/AIDS prevention amongst employees. ○ RPM and the contractors should work with the health authorities to provide HIV/AIDS prevention and treatment interventions in a culturally appropriate manner. AAP will confirm if this is possible. ○ Sub-contractors should adhere to the	• CED Manager • Project Manager • SHE Manager	• Influx Management Plan • Policing forums • Awareness campaigns	✓				

Impact Reference No.	Aspect	Impact	Management Objectives	Management Measures/ Actions	Responsible Party	Performance Criteria to be adhered to	Project Phase				Source
							C	O	D	PC	
Socio-economic impacts envisaged during Construction											
				contract with the contractor. ○ A strategy and protocol for camp management should be developed and implemented, should an existing worker accommodation facility be used.							
C95		Impacts on medicinal plants during land clearing activities during the Construction Phase	• To prevent/ minimise the destruction/ disturbance of medicinal plants. • To enable community access to plants if required.	• A land access protocol for visiting graves is currently in place and AAP Land Use Management will explore the possibility of extending this protocol for enabling the collection of medicinal plants on the property. • A complaints register will be kept and issues raised will be investigated, and a grievance procedure will be developed and implemented.	• CED Manager	• Complaints Register	✓				

Table 8-10: Environmental Management Programme for the Operation of the Northern and Southern Pits

Impact Reference No.	Aspect	Impact	Management Objectives	Management Measures/ Actions	Responsible Party	Performance Criteria to be adhered to	Project Phase				Source
							C	O	D	PC	
Operation of the Northern and Southern Pits											
O1	Geology	Impact on Geology	• To minimise the impact on geological strata.	• Waste rock from the Northern Pit will be used to construct the embankment for the proposed Co-Disposal Facility. • Should the Co-Disposal Facility be deemed not feasible, waste rock will be backfilled to the Northern pit concurrently to mining. • Ongoing rehabilitation of the Southern Pit area will take concurrently as the operation phase progresses. • The Southern Pit will be backfilled with waste rock material.	• Environmental Coordinator • Project Manager • Mining Engineer	• Delineation of reserves		✓			New impact
O2	Topography	Change in local topography	• To limit the impact on topography to the footprint of the opencast operations.	• Upon Closure, the Co-Disposal Facility and backfilled Southern Pit will be shaped to be free-draining. • Stockpiled topsoils will be used to cover the closed Co-Disposal Facility and backfilled Southern Pit and will be revegetated. • Should the Co-Disposal Facility be deemed not feasible, waste rock will be backfilled to the Northern pit concurrently to mining. The backfilled Northern pit will be shaped to be free-draining, covered with topsoil and revegetated.	• Environmental Coordinator	• Closure and Rehabilitation Plan • Development according to block plans • Vegetated topsoil stockpiles		✓			New impact
O3	Soils, Land Capability and Land Use	No additional impacts are envisaged during the Operational Phase, however management measures for topsoil stockpiling are included.	• To remove and store soil to enable its reuse for rehabilitation	• Soil for the purpose of rehabilitation that has been stripped from cleared areas during the Construction Phase will be stockpiled. The following conservation principles will apply: ○ Stripped soil will be stored with as little compaction as possible; ○ Stockpile areas will have their soil stripped to conserve the seed bank; ○ Single handing will be practiced where possible; ○ Stockpiles that are likely to remain undisturbed for 12 months or more will be revegetated; and ○ Usable soil will be respread with as little compaction as possible. ○ Land to which soil has been applied will be revegetated	• Environmental Coordinator	• Topsoil stockpiles • Development according to block plans • Revegetated soil stockpiles		✓			Not applicable
O4	Biodiversity	No additional impact expected after the Construction Phase (clearing of vegetation), however the surrounding natural area should not be further impacted upon.	• To demonstrate active stewardship towards biodiversity.	• Continuous education of staff – both permanent, and contractors is required on the importance of biodiversity in the region and why it will be conserved. • Dust suppression on the roads will be undertaken when required. • No off road driving permitted. • Long term monitoring of the Groot- Dwars River is required both in terms of habitat/community structural changes as well as bio-monitoring of the system. • Ensure the Alien and Invasive Management Plan and Biodiversity Action Plan is continuously updated	• Environmental Coordinator	• Alien Invasive Management Plan • Biodiversity Action Plan		✓			Not applicable
O5	Wetlands	No additional impact expected after the Construction Phase (clearing of vegetation), however the surrounding	• To ensure the separation of clean and dirty water and compliance to	• Clear separation of clean and dirty water will be undertaken and diversion of clean water around the operational areas will ensure minimisation of the loss of catchment yield.	• Environmental Coordinator	• Biodiversity Action Plan • Stormwater Management Plan		✓			Not applicable

Impact Reference No.	Aspect	Impact	Management Objectives	Management Measures/ Actions	Responsible Party	Performance Criteria to be adhered to	Project Phase				Source
							C	O	D	PC	
Operation of the Northern and Southern Pits											
		natural area should not be further impacted upon.	GN704.								
O6	Surface Water	Reduced availability of water to surrounding water users due to physical obstruction from the Open Pits resulting in loss of MAR	• To ensure the separation of clean and dirty water and compliance to GN704.	• Appropriately placed clean water diversions, designed to handle the 1:50 year storm event, will be constructed to divert water away from the Pits and return it to the natural environment.	• Environmental Coordinator	• Stormwater Management Plan.		✓			Der Brochen Project Environmental Impact Assessment/ Environmental Management Plan Amendment and Alignment: Surface Water Specialist Report (SRK Report No. 469113/SW, October 2014)
O7		Alteration of catchment hydrology causing increased risk of flooding and scouring	• Reduce the risk of flooding	• Runoff from the catchment will be diverted away from the open pit areas by cut-off channels and diversion berms designed to handle the 1:50 year storm event. • Energy dissipaters will be constructed in areas of concentrated flows. • Routine inspections and maintenance will be conducted to keep the diversions free of debris (silt build up, vegetation etc.) and areas suitably graded.	• Environmental Coordinator • Mining Engineer • Project Manager	• Stormwater Management Plan.		✓			
O8		Deterioration in water quality in the Dwars River due to release of contaminated water from the open pit operations	• To avoid or where not possible, minimise and remedy pollution of surface water during operations.	• Dirty water will be contained in a pollution control or return water dams designed to enable settlement of solids and handle the 1:50 year event with a minimum freeboard of 0.8 metres above full supply level. • Routine inspections and maintenance will be conducted. • The contained dirty water will re-used as process water make-up or for dust suppression.	• Environmental Coordinator • Mining Engineer • Project Manager	• Stormwater Management Plan. • Leak/spill Procedure. • Water monitoring reports.		✓			
O9	Groundwater	Dewatering of mine void (Reduction in borehole yield and river baseflow)	• To minimise the impact of loss of water resources	• Continuous water level monitoring will be undertaken. • Replacement of water supply boreholes in event of yield losses.	• Environmental Coordinator • Mining Engineer • Project Manager	• Water monitoring reports • Water Balance		✓			Der Brochen Project-Groundwater Investigation and Model Report (Delta H Report No. 2013.027-01, October 2014)
O10		Impact on groundwater quality	• To minimise/ prevent contamination of water resources	• Excess groundwater in the Pits will either be used in the Mototolo Concentrator or contained in the pollution control dam.	• Environmental Coordinator • Plant Manager	• Re-use of water in the Mototolo Concentrator		✓			
O11	Air Quality	Increase in nuisance dust during operations	• To minimise the amount of dry material susceptible to wind erosion. • To minimise the entrainment potential of dust. • To respond with corrective action to public complaints about dust related health and nuisance impacts.	• Regular water sprays preferably combined with chemicals on unpaved haul roads. • Speed limit on haul roads not to exceed 40 km/hr.	• Environmental Coordinator • CED Manager	• Dust monitoring records. • Complaints register to record complaints regarding nuisance dust.		✓			Air Quality Specialist Report for the Der Brochen EMP Alignment and Amendment (Airshed Report No. 13SRK25, September 2014)
O12	Noise	Increase in ambient noise levels	• To prevent or minimise adverse impacts arising from operations • To respond with corrective action to public complaints about noise	• Ensure that all equipment and machinery are well maintained and equipped with silencers where possible. • Environmental awareness training will include a noise component allowing employees and contractors to realise the potential noise risks that activities pose to the surrounding environment.	• Environmental Coordinator • CED Manager	• Complaints register to record complaints regarding noise • Monitoring reports.		✓			Noise Impact Study for Environmental Impact Assessment (M^2 Environmental Connections cc, February 2012)
O13	Cultural Heritage	No additional impacts are envisaged during the Operational Phase, however there are cultural heritage	• To respect the culture and heritage of the people in the area	• Fence heritage sites near infrastructure with a significance rating of low to high. • Provide access to cemeteries and graves to families of the deceased.	• Environmental Coordinator • CED Manager	• Complaints register • Induction programme		✓			Not applicable.

Impact Reference No.	Aspect	Impact	Management Objectives	Management Measures/ Actions	Responsible Party	Performance Criteria to be adhered to	Project Phase C	O	D	PC	Source
Operation of the Northern and Southern Pits											
		sites identified around the Open Pits area. Management measures should apply to these heritage sites.	• To avoid disturbance of sites and activities of cultural significance and where not possible to determine mitigation in consultation with local communities								
O14	Visual	Decrease in visual aesthetics of the area		• No mitigation applied.				✓			New impact
O15	Traffic and Transportation	Increased generation of traffic on existing road networks during operations	• To minimise/ prevent road accidents.	• Traffic conditions to be monitored annually, should traffic congestion increase, appropriate mitigation measures will need to be explored and implemented.	• SHE Manager • Environmental Coordinator • Project Manager	• Annual reporting on traffic related incidents.		✓			Specialist Traffic and Transportation Study for the Proposed EMP Alignment and Amendment of the Der Brochen Project to include open cast mining, tailings storage facilities and associated infrastructure (Aurecon, Report No. 9522, October 2014)
O16		Impact on pedestrian and cyclists	• To minimise/ prevent road accidents.	• Control access by cyclists and pedestrians to the site.	• SHE Manager • Environmental Coordinator • Project Manager	• Annual reporting on traffic related incidents.		✓			
O17		Impact on road safety conditions	• To minimise/ prevent road accidents.	• Drivers of heavy Operation mining vehicles will attend a road safety and driving course to sensitise them to the impact they have on driving conditions for other drivers on the road.	• SHE Manager • Environmental Coordinator • Project Manager	• Annual reporting on traffic related incidents.		✓			
O18		Decreased condition of the road network	• To minimise/ prevent further damage to roads.	• A standard operating procedure is developed for all mine drivers to identify and report potholes and edge breaks to the operations manager who in turn will report it to the relevant authorities.	• SHE Manager • Environmental Coordinator • Project Manager	• Regular reporting of potholes and decreased road conditions.		✓			
O19	Blasting and Vibration	Ground vibration disturbance to Mototolo Concentrator and Helena TSF due to blasting in the Northern pit	• To minimise/prevent damage to Mototolo Concentrator and Helena TSF • To prevent the Helena TSF possible liquifaction	• Undertake survey to determine shear strength of tailings sediments. • Develop a blast design report adjusting the maximum "no go" PPV limit according to survey results. • Monitoring of the blasting and vibration levels	• SHE Manager • Plant Manager • Mining Engineer	• Tailings shear strength survey • Blast design report	✓	✓			Assessment of Blasting Related Disturbances on the Infrastructure Adjoining the Der Brochen Planned Open Pits and Declines (Cambrian CC, Report Reference: Der Brochen/ Risk Assessment, June 2012)
O20		Ground vibration disturbance to geology offices and coresheds due to blasting in the Northern Pit	• To ensure safety of AAP employees on site	• Evacuate AAP offices during blasting activities when blasting takes place in the centre and southern areas of the pit. • Consider relocation of AAP offices.	• SHE Manager • Mine Engineer	• Blast management plan • Evacuation procedure during blasting	✓	✓			
O21		Ground vibration disturbance to the Der Brochen dam wall due to blasting in the Open Pits	• To prevent damage to the Der Brochen dam wall due to blasting	• Ensure individual hole firing using electronic detonators. • Monitor ground vibrations at the dam wall. • Survey dam wall to determine present elevation and path of the top of the wall. Repeat this survey after last blasts to confirm that no movement has taken place.	• SHE manager • Mine Engineer	• Blast management plan • Ground vibration monitoring report • Der Brochen dam wall surveys	✓	✓			
O22		Airblast and unwanted side effects such as flyrock during blasting of the Open Pits	• To prevent/ minimise the effects of airblast	• Airblast levels to be kept under 130 dB. • Evacuate AAP offices during blasting activities.	• SHE manager • Mine Engineer	• Blast management plan		✓			Assessment of Blasting Related Disturbances on the Infrastructure Adjoining the Der Brochen Planned Open Pits and Declines (Cambrian CC, Report Reference: Der Brochen/ Risk Assessment, June 2012)

Table 8-11: Environmental Management Programme for the Operation of the Co-Disposal Facility

Impact Reference No.	Aspect	Impact	Management Objectives	Management Measures/ Actions	Responsible Party	Performance Criteria to be adhered to	Project Phase				Source
							C	O	D	PC	
Operation of the Co-Disposal Facility											
O23	Topography	Permanent alteration of topography due to the Co-Disposal Facility	• To rehabilitate the Co-Disposal Facility to blend into the natural environment.	• On closure, the Co-Disposal Facility will be shaped to be free draining. Erosion protection will be provided. • The Co-Disposal Facility will be re-vegetated to blend into the natural environment.	• Environmental Coordinator • Mining Engineer	• Establishment of vegetation on Co-Disposal Facility • Closure and Rehabilitation Plan		✓	✓		New impact
O24	Soils, Land Capability and Land Use	No additional impacts are envisaged during the Operational Phase, when tailings will be deposited as topsoil would have been removed and stockpiled in the Construction Phase. Refer to Impact Reference C1 and C2 for soil impacts associated during the Construction Phase. Management measures for stockpiling should take place.		• Refer to Impact Reference O3.				✓			Not applicable
O25	Biodiversity	No additional impacts are envisaged during the Operational Phase, when tailings will be deposited as vegetation would have been cleared during the Construction Phase. However, the surrounding natural area should not be further impact upon. Management measures for the surrounding natural area should be implemented.	• To demonstrate active stewardship towards biodiversity.	• Refer to Impact Reference O4.	• Environmental Coordinator	• Alien Invasive Management Plan • Biodiversity Action Plan		✓			Not applicable
O26	Wetlands	No additional impacts expected after the Construction Phase. However, the surrounding natural area should not be further impact upon. Management measures for the surrounding natural area should be implemented.	• To ensure the separation of clean and dirty water and compliance to GN704.	• Clear separation of clean and dirty water will take place and diversion of clean water around the operational areas will ensure minimisation of the loss of catchment yield.	• Environmental Coordinator	• Stormwater Management Plan		✓			Not applicable
O27	Surface Water	Deterioration in water quality in the Dwars River due t inadvertent release of tailings, return water or leachate to the natural environment	• To avoid or where not possible, minimise and remedy pollution of water during operations.	• Routine inspections and maintenance will be conducted on all TSF infrastructure including Pipeline routes and crossings. • Surface water quality, and quantity, monitoring systems will be established for the open pit and Co-Disposal Facility. • Emergency action plans will be drawn up to deal with spillages.	• Environmental Coordinator • Project Manager	• Inspection and Maintenance Plan • Leak/spill clean-up Procedure • Water monitoring reports • Environmental Incident Report		✓			Der Brochen Project Environmental Impact Assessment/ Environmental Management Plan Amendment and Alignment: Surface Water Specialist Report (SRK Report No. 469113/SW, October 2014)
O28	Groundwater	Contaminant plume migration (deterioration of groundwater and surface water quality)	• To minimise the degradation of groundwater and surface quality. • Infiltration of process water towards the aquifer will be reduced to a	• Install a lining system of either composite clay or HDPE. • Seepage collection drains will be installed to collect seepage. • Rehabilitation and capping of the facility to reduce seepages after closure.	• Environmental Coordinator • Project Manager • Mining Engineer	• Installation of a liner system • Closure and Rehabilitation Plan.	✓	✓			Der Brochen Project-Groundwater Investigation and Model Report (Delta H Report No. 2013.027-01, October 2014)

Impact Reference No.	Aspect	Impact	Management Objectives	Management Measures/ Actions	Responsible Party	Performance Criteria to be adhered to	Project Phase				Source
							C	O	D	PC	
Operation of the Co-Disposal Facility											
			minimum.								
O29	Air Quality	Increase in nuisance dust during operations		• Refer to Impact Reference O11for applicable management measures				✓			Air Quality Specialist Report for the Der Brochen EMP Alignment and Amendment (Airshed Report No. 13SRK25, September 2014)
O30	Noise	Increase in ambient noise		• No mitigation measures required due to the insignificant noise from the Co-Disposal Facility.				✓			Not applicable
O31	Cultural Heritage	No additional impacts are envisaged during the Operational Phase, however there are cultural heritage sites identified around the Open Pits area. Management measures should apply to these heritage sites.	• To respect the culture and heritage of the people in the area. • To avoid disturbance of sites and activities of cultural significance and where not possible to determine mitigation in consultation with local communities.	• Fence heritage sites near infrastructure with a significance rating of low to high. • Provide access to cemeteries and graves to families of the deceased.	• Environmental Coordinator • CED Manager	• Complaints Register		✓			Not applicable
O32	Visual	Decrease in visual aesthetics of the area	• To minimise the visual impact of the Co-Disposal Facility	• Vegetate Co-Disposal Facility walls to blend into the natural environment at closure.	• Environmental Coordinator • CED Manager	• Complaints Register • Closure and Rehabilitation Plan. • Establishment of vegetation.		✓			New impact
O33	Traffic and Transportation	Increased generation of traffic on existing road networks during operations		• Refer to O15 in this table for applicable management measures				✓			Specialist Traffic and Transportation Study for the Proposed EMP Alignment and Amendment of the Der Brochen Project to include open cast mining, tailings storage facilities and associated infrastructure (Aurecon, Report No. 9522, October 2014)
O34		Impact on pedestrian and cyclists		• Refer to O16 in this table for applicable management measures				✓			
O35		Impact on road safety conditions		• Refer to O17 in this table for applicable management measures				✓			
O36		Decreased condition of the road network		• Refer to O18 in this table for applicable management measures				✓			

Table 8-12: Environmental Management Programme for the Operation of the Mareesburg TSF and Pipeline

Impact Reference No.	Aspect	Impact	Management Objectives	Management Measures/ Actions	Responsible Party	Performance Criteria to be adhered to	Project Phase C	O	D	PC	Source
Operation of the Mareesburg TSF and Pipeline											
O37	Topography	Changes in topography as a result of the Tailings Dam	• To minimise the visual impact of the Mareesburg TSF on the surrounding environment.	• Rehabilitation and vegetation of tailings walls: ○ *The outer slope of the Tailings Dam wall will be covered with soil and will be grassed.* ○ *On closure, the top surface of the Tailings Dam will be covered and grassed.*	• Environmental Coordinator	• Closure and Rehabilitation Plan. • Establishment of vegetation.		✓			*Environmental Management Programme Report for the Der Brochen Mine Volume 1 of 3 (SRK Consulting Report No. 295606/4/ November 2002)*
O38	Soils, Land Capability and Land Use	Loss of soil resources in the area to be covered by the Tailings Dam	• To prevent/ minimise loss of soil resources.	• *A soil stripping, stockpiling and utilisation plan will be developed. Soil can be stripped sequentially ahead of areas being flooded such that the whole basin does not have to be stripped at the outset.* • *Soil stripped will either be used immediately for rehabilitation of the outer slope of the wall or will be stockpiled for later use.* • *Soil placed in stockpiles will not be compacted. It is anticipated that natural re-vegetation will provide an adequate cover to protect these stockpiles against erosion. In the event that this does not occur the areas will be seeded.* • *Soil stockpiles will be maintained in a weed free condition (i.e. no 'broad-leafed' plants regarded as weeds or those plants regarded as a 'general nuisance' in the area, will be allowed to grow on the stockpiles). The ECO will provide guidance as to which plants are weeds and require removal.* • *During the Operational Phase, the outer slope of the Tailings Dam will be covered with a layer of soil concurrently with construction.* • *On closure, the top surface of the Tailings Dam will be covered with a layer of soil.* • Stripped soil not used for the starter wall and rehabilitation of the outer slope of the wall will be stockpiled for later use.	• Environmental Coordinator • Mining Engineer	• Topsoil stockpiles. • Revegetated stockpiles		✓			*Environmental Management Programme Report for the Der Brochen Mine Volume 1 of 3 (SRK Consulting Report No. 295606/4/ November 2002)*
O39		Loss of soil resources due to erosion	• To prevent/ minimise soil erosion	• *Erosion control measures will be implemented throughout the site for the entire life of the mine.* • *Drainage facilities will be designed to minimise the potential for soil erosion.* • *Energy dissipaters will be provided in areas where concentrated discharges could cause significant erosion, such as the Tailings Dam, return water dam and the access/service roads.* • *All drainage facilities will be checked at approximately three monthly intervals during the rainy season and any undue erosion or siltation, especially at discharge points, will be noted and repaired. Der Brochen will identify the cause of such undue erosion or siltation and suitable remedial measures will be implemented.*	• Environmental Coordinator • Mining Engineer	• Erosion control measures		✓			*Environmental Management Programme Report for the Der Brochen Mine Volume 1 of 3 (SRK Consulting Report No. 295606/4/ November 2002)*
O40		Soil contamination due to leaching of contaminants and seepage	• To prevent and minimise soil contamination.	• *Water pollution management measures are designed to contain all polluted water, thereby minimising the potential for soil contamination*	• Environmental Coordinator • SHE Manager	• Leak/ spill clean-up Procedure • Stormwater		✓			*Environmental Management Programme Report for*

Impact Reference No.	Aspect	Impact	Management Objectives	Management Measures/ Actions	Responsible Party	Performance Criteria to be adhered to	Project Phase				Source
							C	O	D	PC	
Operation of the Mareesburg TSF and Pipeline											
			• To minimise seepage and accidental spills. • To remediate contaminated soils.	*from this source.* • *Any spillage will be cleaned up and remediated.* • Monitoring will be implemented downstream of all Pipeline watercourse crossings to detect any impacts. • A leak/spill detection plan will be devised and implemented for possible areas of leaks/spillage. • An inspection and maintenance plan will be implemented to ensure that the Tailings Storage Facility and Pipelines always operate within specifications. • Storm water containment will be implemented for the TSF as per the Stormwater Management Plan. • Continuous rehabilitation on tailings walls during operation.	• Land manager	Management Plan • Inspection and Maintenance Plan • Environmental Incident Report • Water monitoring reports					*the Der Brochen Mine Volume 1 of 3 (SRK Consulting Report No. 295606/4/ November 2002)*
O41	Biodiversity	Changes in community structure and population dynamics of floral species	• To prevent/ minimise the change in plant community structure. • To prevent/ minimise the spread of alien invasive weeds.	• Continuous education of staff – both permanent staff, and contractors, is required to advise on the importance of biodiversity in the region and why it should be conserved. • Dust suppression on gravel roads and TSF will be undertaken when required. • No off road driving will be permitted. • Long term monitoring of the Groot- Dwars River is required both in terms of habitat/community structural changes as well as bio-monitoring of the system. • Ensure the Alien and Invasive Management Plan and Biodiversity Action Plan is continuously updated and implemented. • Revegetate areas on the TSF as soon as possible. Rehabilitation will include indigenous species of the area. Collection of seed and storage of plants would have occurred prior to vegetation clearing in the Construction Phase.	• Environmental Coordinator	• Alien Invasive Management Plan • Dust suppression on dirt roads • Biodiversity Action Plan		✓			Der Brochen Platinum Mine Floristic Assessment (Natural Scientific Services (NSS) Report 1995, May 2014)
O42		Displacement or disturbance of animal life (and their migration paths) as a result of operation activities	• To minimise the disturbance of animal life.	• The delineated footprint of the Mareesburg TSF will not be exceeded. • Dust suppression on the gravel roads and TSF will be implemented to minimise dust fallout on vegetation surrounding the TSF. • *The area of habitat disturbed and isolated for the purpose of mining and processing activities will be limited, as far as is practical, to the minimum required for safe and efficient operation.* • *Noise disturbance to wildlife will be limited by using only pre-determined access routes and restricting noise to operational sites.*	• Environmental Coordinator	• Development according to block plans • Dust suppression		✓			*Environmental Management Programme Report for the Der Brochen Mine Volume 1 of 3 (SRK Consulting Report No. 295606/4/ November 2002)*
O43		Cumulative impacts on biota	• To prevent/ minimise the impact on biota	• *To manage the area as a game farm / natural area, the carrying capacity of the total fenced area will be determined by evaluating the veld condition and available water.* • Fencing requirements will be determined by the Der Brochen's game management plan. • *The animal populations in the area will be monitored and managed (excess stock sold / culled / harvested).*	• Environmental Coordinator	• Land/Game Management Plan • Fencing • Biodiversity Management Plan		✓			*Environmental Management Programme Report for the Der Brochen Mine Volume 1 of 3 (SRK Consulting Report No. 295606/4/ November 2002)*

Impact Reference No.	Aspect	Impact	Management Objectives	Management Measures/ Actions	Responsible Party	Performance Criteria to be adhered to	Project Phase				Source
							C	O	D	PC	
Operation of the Mareesburg TSF and Pipeline											
O44		Disturbance/loss of aquatic animal species due to deterioration in surface water quality due to contamination from various forms of pollution from operational activities, increased sediment loads, oil and fuel spills and leaks.	• To prevent/ minimise the disturbance to aquatic fauna • To avoid or where not possible, minimise and remedy pollution of water during operations.	• *All effort will be made to maintain this "good" biotic status and continuous seasonal biological monitoring will be performed when mining operation commences. Such future monitoring together with the already gathered baseline information will then be used for early detection of possible future biotic degradation to enable mitigation measures.* • *A long term monitoring programme will be implemented to monitor physico-chemical and biological components of the aquatic ecosystems within and below the mining area. The monitoring programme will commence as soon as mining operations start. This would enable the timely identification of required mitigation/environmental management procedures to maintain the high quality of this ecologically important aquatic ecosystem.* • *An appropriate biological index based on fish (such as the Fish Assemblage Integrity Index, Kleynhans, 1997 or Sensitivity-weighted Index of Biotic Integrity will also be included in order to quantify and classify the longer-term changes in biotic integrity*. • Erosion control measures in the form of temporary erosion prevention berms will be implemented during construction. • Clean water diversion bunds will be constructed upstream of the construction site prior to clearing areas for new infrastructure. • Emergency action plans will be drawn up to deal with spillages. • Chemical toilets will be provided at operations sites.	• Environmental Coordinator	• Stormwater Management Plan • Erosion control measures • Environmental Incident Report • Leak/ spill clean-up Procedure • Emergency Response Plan • Biodiversity Action Plan • Biomonitoring reports		✓			*Environmental Management Programme Report for the Der Brochen Mine Volume 1 of 3 (SRK Consulting Report No. 295606/4/ November 2002)*
O45	Wetlands	No additional impacts expected after the Construction Phase. However, the surrounding natural area should not be further impact upon. Management measures for the surrounding natural area should be implemented.	• To ensure the separation of clean and dirty water and compliance to GN704.	• Clear separation of clean and dirty water will take place and diversion of clean water around the operational areas will ensure minimisation of the loss of catchment yield.	• Environmental Coordinator	• Stormwater Management Plan		✓			Not applicable
O46	Surface Water	Alteration of drainage patterns caused by mining activities	• To contain contaminated runoff. • To ensure the separation of clean and dirty water and compliance to GN704.	• Contaminated runoff from the Tailings Dam will be collected on the dam and recycled to the process water circuit via the penstock and return water dam. • Clear separation of clean and dirty water will take place and diversion of clean water around the operational areas will ensure minimisation of the loss of catchment yield. • *Clean stormwater diversions will assist in directing water to natural river courses. River diversions will be implemented, where necessary.* • *All rainfall runoff originating on top of the Tailings Dam will be discharged via a penstock to the return water dam. This water, together with all rain falling on the return water dam, will therefore be removed from the catchment. The water will, however, be*	• Environmental Coordinator	• Stormwater Management Plan • Water monitoring reports • Establishment of vegetation		✓			*Environmental Management Programme Report for the Der Brochen Mine Volume 1 of 3 (SRK Consulting Report No. 295606/4/ November 2002)*

Impact Reference No.	Aspect	Impact	Management Objectives	Management Measures/ Actions	Responsible Party	Performance Criteria to be adhered to	Project Phase C	O	D	PC	Source
Operation of the Mareesburg TSF and Pipeline											
				utilised in the mine's process water circuit thus reducing demand on the mine's primary raw water source. • *The slope faces will be topsoiled and re-vegetated.* • *Water management and erosion control measures will be inspected regularly, and appropriate remedial measures will be implemented where necessary.*							
O47		Deterioration in surface water quality due to increased sediment load	• To prevent/ minimise the deterioration of water quality.	• Clear separation of clean and dirty water will take place and diversion of clean water around the operational areas will ensure minimisation of the loss of catchment yield. • *Re-vegetation of all denuded areas.* • *Water management and erosion control measures will be inspected regularly, and appropriate remedial measures will be implemented where necessary.*	• Environmental Coordinator	• Stormwater Management Plan • Water monitoring reports • Establishment of vegetation		✓			*Environmental Management Programme Report for the Der Brochen Mine Volume 1 of 3 (SRK Consulting Report No. 295606/4/ November 2002)*
O48		Contamination of surface water bodies due to diffuse pollution	• To avoid or where not possible, minimise and remedy pollution of water during operations.	• *Stormwater runoff from the small catchment area above the dam, rainfall on the Tailings Dam and supernatant water will be decanted through penstocks and an underdrain into a lined return water dam, from where it will be recycled back into the process. An emergency spillway will be provided to deal with extreme storm events.* • *Runoff from the side slopes of the dam will be caught on the step-in areas where solids will be trapped and the water evaporated. The step-in areas are designed to contain the 1:50 year storm.* • *The Tailings Dam will be provided with underdrains and a solution trench along the full length of the toe of the starter wall. Seepage water collected in this trench will be discharged to the return water dam.* • *Revegetation of the Tailings Dam both during the Operational Phase and following closure will greatly reduce groundwater recharge as the resultant evapotranspiration.* • Monitoring will be implemented downstream of all Pipeline watercourse crossings to detect any impacts. • *Monitoring boreholes will be located below the return water dam solution trenches to detect any possible seepage beyond this point. Should seepage be detected, interceptor boreholes will be installed and the water pumped back to the return water dam.* • A leak/spill detection plan will be devised and implemented for all possible areas of leak/spillage. • An inspection and maintenance plan will be implemented to ensure that the Tailings Storage Facility and Pipelines always operate within specifications. • Storm water containment is planned for the TSF as per the Stormwater Management Plan. • Implementation of good housekeeping	• Environmental Coordinator • Project Manager	• Water monitoring reports • Leak/ spill clean-up procedure • Inspection and Maintenance Plan • Stormwater Management Plan • Closure and Rehabilitation Plan • Establishment of Vegetation		✓			*Environmental Management Programme Report for the Der Brochen Mine Volume 1 of 3 (SRK Consulting Report No. 295606/4/ November 2002)*

Impact Reference No.	Aspect	Impact	Management Objectives	Management Measures/ Actions	Responsible Party	Performance Criteria to be adhered to	Project Phase				Source
							C	O	D	PC	
Operation of the Mareesburg TSF and Pipeline											
				practices at operational sites.							
O49		Contamination of surface water quality at Mareesburg stream	• To prevent/ minimise the deterioration of water quality. • To avoid or where not possible, minimise and remedy pollution of water during operations.	• Regular inspections of the Pipeline route will be undertaken in order to detect leaks/ spillages timeously. Greater detail of the monitoring system are dealt with in Chapter 4. • Monitoring will be implemented downstream of all Pipeline watercourse crossings to detect any impacts. • A leak/spill detection plan will be devised and implemented for all possible areas of leak/spillage. • An inspection and maintenance plan will be implemented to ensure that the Tailings Storage Facility and Pipelines always operate within specifications.	• Environmental Coordinator • Project Manager	• Water monitoring reports • Leak/ spill clean-up procedure • Inspection and Maintenance Plan. • Stormwater Management Plan • Closure and Rehabilitation Plan • Establishment of Vegetation		✓			Der Brochen Project Environmental Impact Assessment/ Environmental Management Plan Amendment and Alignment: Surface Water Specialist Report (SRK Report No. 469113/SW, October 2014)
O50	Groundwater	Deterioration of groundwater quality at the Tailings Dam	• To minimise the degradation of groundwater quality.	• *The Tailings Dam design will take into consideration the shallow depths to groundwater and close proximity to the Mareesburg river and associated primary aquifer. The available runoff and downward/lateral infiltration available to recharge the aquifers and surface flow will be reduced to a minimum through proper Tailings Dam design.* • *Due to the shallow depth of the groundwater aquifer, if the detailed geotechnical work proves the soil permeability to be a problem (<10-6 cm/s), the following management measures will be implemented to reduce seepage:* ○ *The topsoil will be removed;* ○ *Any clayey subsoil will be removed;* • *Implementation of a groundwater monitoring programme to monitor the boreholes at the Tailings Dam.* • The water management plan for the tailings will be a closed circuit system with no discharge to the environment. • The return water from the Tailings Dam will be pumped in a closed circuit to the Concentrator process water tank. • Monitoring of water levels in monitoring boreholes as per the groundwater monitoring programme. Should the groundwater monitoring programme indicate that groundwater resources have been affected by dewatering, an alternative supply of water will be made available.	• Environmental Coordinator • Project Manager	• Groundwater monitoring records • Water manager plan • Groundwater monitoring programme		✓			*Environmental Management Programme Report for the Der Brochen Mine Volume 1 of 3 (SRK Consulting Report No. 295606/4/ November 2002)*
O51		Contaminant plume migration (deterioration of groundwater and surface water quality)	• To prevent/ minimise the spread of the groundwater pollution plume towards the Mareesburg Stream.	• Installation of a lining system, either composite clay or HDPE, as per the requirements of the relevant legislation. • Seepage collection drains will be constructed to collect seepage emanating from the TSF. Seepage will be pumped to the Pollution Control Dam to be contained. • Hydraulic containment system will be implemented during Operational and Closure Phases.	• Environmental Coordinator • Project Manager	• Groundwater monitoring reports • Modelling of pollution plume	✓	✓			Der Brochen Project-Groundwater Investigation and Model Report (Delta H Report No. 2013.027-01, October 2014)

Impact Reference No.	Aspect	Impact	Management Objectives	Management Measures/ Actions	Responsible Party	Performance Criteria to be adhered to	Project Phase				Source
							C	O	D	PC	
Operation of the Mareesburg TSF and Pipeline											
O52	Air Quality	Increased dust levels due to mining operations	• To minimise the amount of dry material susceptible to wind erosion. • To minimise the entrainment potential of dust. • To respond with corrective action to public complaints about dust related health and nuisance impacts.	• *During this operation the top of the crest wall will either be similarly treated or provided with some other suitable form of cover such as a waste rock.* • *As areas dry out on the top of the Tailings Dam, a light crust will form. Provided the side walls and the tops of the crest walls are adequately protected, this crust is expected to remain largely intact for several weeks to months, depending on the prevailing weather conditions. This should therefore provide adequate protection against excessive dust generation.* • Vegetation of the sides of the Tailings Dam wall will be undertaken to reduce surface erosion. • A dust monitoring programme is in place and will be continued. • Dust suppression will be undertaken of the service roads and Tailings Facility when required.	• Environmental Coordinator • CED Manager	• Dust monitoring records • Complaints register to record complaints regarding nuisance dust • Establishment of vegetation on side slopes of the TSF		✓			*Environmental Management Programme Report for the Der Brochen Mine Volume 1 of 3 (SRK Consulting Report No. 295606/4/ November 2002)*
O53	Noise	Increase in ambient noise		• No mitigation measures required due to the insignificant noise impact of the Mareesburg TSF during operations.				✓			Not applicable
O54	Visual	Decrease in visual aesthetics of the area	• To minimise the visual impact of the TSF and ensure it blends into the natural environment	• Vegetate tailings walls to blend into the natural environment.	• Environmental Coordinator	• Closure and Rehabilitation Plan		✓			Not applicable
O55	Cultural Heritage	No additional impacts are envisaged during the Operational Phase, however there are cultural heritage sites identified around the Mareesburg TSF area. Management measures should apply to these heritage sites.	• To respect the culture and heritage of the people in the area. • To avoid disturbance of sites and activities of cultural significance and where not possible to determine mitigation in consultation with local communities.	• Fence heritage sites near infrastructure with a significance rating of low to high. • Provide access to cemeteries and graves to families of the deceased through agreed mechanism.	• Environmental Coordinator • CED Manager	• Complaints Register		✓			Not applicable

Table 8-13: Environmental Management Programme for the Operation of the Helena TSF

Impact Reference No.	Aspect	Impact	Management Objectives	Management Measures/ Actions	Responsible Party	Performance Criteria to be adhered to	Project Phase				Source
							C	O	D	PC	
Operation of the Helena TSF											
O56	Topography	Permanent alteration of topography due to the raising of the TSF	• To minimise the visual impact of the Helena TSF on the surrounding environment.	• *On closure, the TSF will be shaped to be free draining. Erosion protection will be provided.* • *The TSF will be re-vegetated to blend into the natural environment.*	• Environmental Coordinator • Mining Engineer	• Establishment of vegetation • Closure and Rehabilitation Plan		✓	✓		*Der Brochen Project EMP Amendment:: Raising of Helena Tailings Storage Facility EIA and EMP (SRK Consulting Report No. 475423/EIA/EMP; September 2014)*
O57	Soils, Land Capability and Land Use	Loss of soil resources	• To prevent/ minimise loss of soil resources.	• *Soils will be stripped and stockpiled for use during rehabilitation.* • Shaped TSF to be covered in topsoil from stockpiles. • Revegate topsoiled TSF.	• Environmental Coordinator • Mining Engineering	• Topsoil stockpiles • Development according to block plans. • Revegetated stockpiles		✓			*Der Brochen Project EMP Amendment:: Raising of Helena Tailings Storage Facility EIA and EMP (SRK Consulting Report No. 475423/EIA/EMP; September 2014)*
O58		Contamination of soil resource	• To prevent and minimise soil contamination. • To minimise seepage and accidental spills. • To remediate contaminated soils.	• *Soils will be stripped and stockpiled for use during rehabilitation.* • *Conduct weekly site inspections along the Pipeline to detect any spills or leakages.* • *Immediate remediation of tailings spillages along Pipeline routes.* • *An inspection and maintenance plan will be implemented to ensure that the TSF and Pipelines operate within specifications.*	• Environmental Coordinator • SHE Manager • Land manager	• Leak/ spill clean-up Procedure • Topsoil stockpile • Inspection and Maintenance Plan • Environmental Incident Report		✓			*Der Brochen Project EMP Amendment:: Raising of Helena Tailings Storage Facility EIA and EMP (SRK Consulting Report No. 475423/EIA/EMP; September 2014)*
O59	Biodiversity	Loss of insect species / communities of conservation value due to direct impacts such as loss of habitat or habitat fragmentation and indirect impacts such as dust and noise	• To minimise the impact on insect species and habitat	• *Regular monitoring of the Cicada population, as per the Biodiversity Action Plan.* • *Implementation of measures to reduce dust and noise impacts, including grassing and vegetation of the Tailings Dam and regular maintenance of operational vehicles and equipment.* • *Areas of disturbance will be limited to the footprints and vehicular movement outside of these demarcated areas will be restricted.* • *Method statements will be supplied to the ECO before commencement of any disturbing/destructive construction/operational activities such as removal/disturbance of trees or important species, vegetation, disturbance of streams, dry watercourses, drainage lines or riparian areas)* • *Sufficient conservation areas, including all cicada habitat, will remain intact, as part of an integrated conservation management plan for the area.* • *The top of the Tailings Dam will be vegetated during closure and the side slopes fully vegetated to ensure a wilderness land capability.* • *Land to which soil has been applied will be rehabilitated under instruction and supervision of the ECO, through revegetation with indigenous species removed to nurseries and/or a combination of hydroseeding or other appropriate methods. Rehabilitation will be progressive throughout the life of the mine, and vegetation will be established as soon as*	• Environmental Coordinator	• Biodiversity Action Plan • Dust suppression • Dust and noise monitoring reports		✓			*Der Brochen Mine: Environmental Impact Assessment Report and Environmental Management Programme (SRK Consulting Report No. 343158/ April 2005)*

Impact Reference No.	Aspect	Impact	Management Objectives	Management Measures/ Actions	Responsible Party	Performance Criteria to be adhered to	Project Phase				Source
							C	O	D	PC	
Operation of the Helena TSF											
				a disturbing activity has ceased, to stabilize soils and re-establish habitats. Following revegetation, the site will be monitored and maintained until an acceptable vegetation cover has been achieved. • *All equipment and vehicles will be maintained in good operating condition. Any worn or faulty exhaust- and/or intake silencers will be replaced immediately.* • *Noise emission levels will be checked regularly during construction and operation, and whenever a change in noise emission characteristics of any equipment is detected*, it will be withdrawn for a maintenance check.							
O60		Loss of biodiversity	• To prevent/ minimise the loss of biodiversity.	• *Plants that are to be removed for rehabilitation purposes will be replanted in a nursery under the guidance of a recognized landscaper. The mine will be responsible for the operation of the nursery* during the operational and closure phases.	• Environmental Coordinator	• Identify and remove relevant species if necessary • Establishment of an onsite nursery • Development according to block plans		✓			*Der Brochen Project EMP Amendment:: Raising of Helena Tailings Storage Facility EIA and EMP (SRK Consulting Report No. 475423/EIA/EMP; September 2014)*
O61	Surface Water	Deterioration of stormwater and surface water quality due to operations of the Tailings Dam and related activities	• To prevent/ minimise the deterioration of water quality.	• *Engineering designs include:* ○ *Cut-off trenches and walls above the Tailings Dam to separate clean water from the Tailings Dam.* ○ *Decanting of stormwater runoff from the small catchment area above the dam, rainfall on the Tailings Dam and supernatant water through penstocks and an underdrain into return water dams from where it will be recycled back into the process.* ○ *An emergency spillway to deal with extreme storm events.* ○ *Collection of runoff from the side slopes of the dam on step-in areas where solids will be trapped and collection of seepage from beneath the Tailings Dam in drains down slope of the dam to be returned into the process.* ○ *Location of the proposed fenced boundary of the site 100 m beyond the estimated 1:100 year flood line of the valley tributary thereby ensuring the upper catchment runoff is not affected.* • *Good housekeeping practices will be maintained, including but not limited to separation of clean and dirty water, limiting exposed dirty surfaces and maximizing opportunities for re-use of water.* • *Linear infrastructure such as roads and Pipelines will be inspected at least monthly to check that the associated water management infrastructure is effective in controlling erosion.* • *All surface water management infrastructure constructed from soil (berms, canals and bunds) will be inspected at least monthly, with more frequent inspections during periods of high rainfall and after major rainfall events.*	• Environmental Coordinator • Project Manager	• Stormwater Management Plan • Inspection and Maintenance Plan • Emergency Preparedness and Response Plan		✓			*Der Brochen Mine: Environmental Impact Assessment Report and Environmental Management Programme (SRK Consulting Report No. 343158/ April 2005)*

Impact Reference No.	Aspect	Impact	Management Objectives	Management Measures/ Actions	Responsible Party	Performance Criteria to be adhered to	Project Phase				Source
							C	O	D	PC	
Operation of the Helena TSF											
				• *Energy dissipaters will be constructed at points where there are concentrated discharges of water that can cause significant erosion, such as in the clean water diversions around the Tailings Dam or along roads and Pipelines. The effectiveness of these dissipaters will be checked on a monthly basis.* • *If any of the inspections detailed above identify eroded areas, these should be repaired where necessary as soon as practicable.* • *Clean water diversions and dirty water collection facilities will be established before land clearing and construction commences, to prevent clean rainfall runoff becoming contaminated by construction activities.* • *Seepage will be monitored through annual sampling of soils around the Tailings Dam.* • *Any tailings spillage will immediately be cleaned up and the area remediated.* • *Suitable engineering designs such as lining of the return water dams and perimeter drainage trenches will be implemented.* • *The outer slope of the rockfill starter wall will be topsoiled and vegetated. The outer side slopes of the Tailings Dam will continuously be vegetated~~,~~* • *The top of the Tailings Dam will be vegetated during closure and the side slopes fully vegetated to ensure a wilderness land capability.* • *Spillages of oil, grease and hydraulic fluids will be reported, cleaned up by removing the soil and disposing such soil in a waste receptacle or at a licensed site, or through biological treatment.* • *Contractors, staff and drivers will be trained on how to deal with spillage of tails, hydrocarbons and other potential contaminants.* • A fenced boundary has been constructed for the Tailings Dam site which is located 100 m beyond the 1:100 year floodline of the valley tributary, ensuring the upper catchment runoff is not affected. • Stormwater runoff from the small catchment area above the dam, rainfall on the Tailings Dam and supernatant water is decanted through penstocks and an underdrain into return water dams from where it is recycled back into the process. • An emergency spillway is provided to deal with extreme storm events. Runoff from the side slopes of the dam is collected on the step-in areas where solids are trapped. • Seepage from beneath the Tailings Dam is collected in drains down slope of the dam and returned into the process. • The Tailings Dams slopes/walls will be continuously revegetated to reduce surface							

Impact Reference No.	Aspect	Impact	Management Objectives	Management Measures/ Actions	Responsible Party	Performance Criteria to be adhered to	Project Phase C	O	D	PC	Source
Operation of the Helena TSF											
				areas exposed to runoff.							
O62		Decrease of surface water quality	• To avoid or where not possible, minimise and remedy pollution of water during operations. • To ensure the separation of clean and dirty water and compliance to GN704.	• *Re-align cut-off trench to divert clean stormwater around the TSF.* • *Manage separation of clean and dirty water as per the Stormwater Management Plan.* • *Update water balance on an annual basis*.	• Environmental Coordinator • Project Manager	• Re-aligned cut-off trench • Stormwater Management Plan • Annual updated water balance • Water monitoring reports		✓			*Der Brochen Project EMP Amendment:: Raising of Helena Tailings Storage Facility EIA and EMP (SRK Consulting Report No. 475423/EIA/EMP; September 2014)*
O63	Groundwater	Discharge and development of seepage zones along the banks of the Groot-Dwars River channel	• Protection of groundwater resources	• *Cut-off trenches and walls above the Tailings Dam divert clean water from the Tailings Dam, decanting runoff and supernatant water through penstocks and an underdrain into return water dams from where it is recycled back into the process.* • *An emergency spillway to deal with extreme storm events and collection of seepage from beneath the Tailings Dam in drains down slope of the dam to be returned into the process.* • *Paddocks and solution trenches have been constructed between the foot of the Tailings Dam and the Mareesburg stream channel to intercept migrating slurry water along the soil profile/bedrock contact zone.* • *Regular monitoring through monitoring boreholes to ensure working of the tailings Pipelines through flow metres and visual inspections. Should seepage be detected, the repair of any damage will be undertaken.* • *Regular sampling of soils around the Tailings Dam to detect seepage and immediate clean-up and remediation of tailings spillage.* • *Continuous vegetation of Tailings Dam walls*.	• Environmental Coordinator	• Groundwater monitoring reports • Stormwater Management Plan • Modelling on pollution plume		✓			*Der Brochen Mine: Environmental Impact Assessment Report and Environmental Management Programme (SRK Consulting Report No. 343158/ April 2005)*
O64		Contaminate plume migration (deterioration of groundwater and surface water quality)	• To minimise the degradation of groundwater quality.	• *Cut-off trenches and walls above the Tailings Dam divert clean water from the Tailings Dam, decanting runoff and supernatant water through penstocks and an underdrain into return water dams from where it is recycled back into the process.* • *An emergency spillway to deal with extreme storm events and collection of seepage from beneath the Tailings Dam in drains down slope of the dam to be returned into the process.* • *Paddocks and solution trenches have been constructed between the foot of the Tailings Dam and the Mareesburg stream channel to intercept migrating slurry water along the soil profile/bedrock contact zone.* • *Regular monitoring through monitoring boreholes to ensure working of the tailings Pipelines through flow metres and visual inspections. Should seepage be detected, the repair of any damage will be undertaken.* • *Regular sampling of soils around the Tailings*	• Environmental Coordinator	• Groundwater monitoring records		✓			*Der Brochen Mine: Environmental Impact Assessment Report and Environmental Management Programme (SRK Consulting Report No. 343158/ April 2005)*

Impact Reference No.	Aspect	Impact	Management Objectives	Management Measures/ Actions	Responsible Party	Performance Criteria to be adhered to	Project Phase				Source
							C	O	D	PC	
Operation of the Helena TSF											
				Dam to detect seepage and immediate clean-up and remediation of tailings spillage. • *Continuous vegetation of Tailings Dam walls*							
O65		Impact on groundwater quality	• To minimise the degradation of groundwater quality.	• *Continue with groundwater monitoring on a quarterly basis to detect groundwater contamination. Should groundwater be contaminated, it will be pumped to the TSF for recirculation.* • Assessment and facilitation of nitrate degradation or retardation within the TSF or shallow aquifer. • Hydraulic plume containment or reactive barriers to arrest emanating plume	• Environmental Coordinator • Project Manager	• Groundwater monitoring records • As built drawings of Helena TSF		✓			*Der Brochen Project EMP Amendment:: Raising of Helena Tailings Storage Facility EIA and EMP (SRK Consulting Report No. 475423/EIA/EMP; September 2014)* Der Brochen Project-Groundwater Investigation and Model Report (Delta H Report No. 2013.027-01, October 2014)
O66	Air Quality	Decreased ambient air quality due to wind-blown respirable particulates (increased PM_{10} concentrations) affecting Cicada habitats	• To minimise the impact on Cicada habitat due to wind-blown dust.	• *The outer side slopes of the Tailings Dam will continuously be vegetated.* • *The top of the Tailings Dam will be vegetated during closure and the side slopes fully vegetated to ensure a wilderness land capability.* • *Use of dust suppression and watering on TSF area to reduce dust.* • *If dust is noted on the access roads, applicable measures such as a watercart or chemical dust suppression will be implemented.* • Frequent monitoring of dust buckets downwind of the Tailings Dam, as well as between the Tailings Dam and Cicada habitat to monitor dust fallout. Should dust monitoring determine that dust fallout levels exceed the limits, dust suppression measures will be put in place.	• Environmental Coordinator	• Dust suppression on the Tailings Dam • Irrigation of Tailings Dam • Establishment of vegetation on the Tailings Dam • Dust monitoring reports		✓			*Der Brochen Mine: Environmental Impact Assessment Report and Environmental Management Programme (SRK Consulting Report No. 343158/ April 2005)*
O67		Decreased ambient air quality due to increased wind-blown dust fallout	• To minimise the amount of dry material susceptible to wind erosion. • To minimise the entrainment potential of dust. • To respond with corrective action to public complaints about dust related health and nuisance impacts.		• Environmental Coordinator	• Establishment of vegetation on the Helena TSF • Dust monitoring reports • Dust suppression		✓			*Der Brochen Mine: Environmental Impact Assessment Report and Environmental Management Programme (SRK Consulting Report No. 343158/ April 2005)*
O68		Increase in nuisance dust	• To minimise the amount of dry material susceptible to wind erosion. • To minimise the entrainment potential of dust. • To respond with corrective action to public complaints about dust related health and nuisance impacts.	• *Continue with dust fallout monitoring programme.* • *Use of dust suppression and watering on TSF area to reduce dust.* • *Vegetate side slopes of TSF continuously during operations.*	• Environmental Coordinator • CED Manager	• Dust monitoring records • Complaints register to record complaints regarding nuisance dust • Establishment of vegetation on side slopes of the TSF		✓			*Der Brochen Project EMP Amendment:: Raising of Helena Tailings Storage Facility EIA and EMP (SRK Consulting Report No. 475423/EIA/EMP; September 2014)*
O69	Noise	Increase in ambient noise		• No mitigation measures required.				✓			Not applicable
O70	Visual	Reduced integrity of scenic views from roads in the surrounding area	• To minimise the visual impact of the TSF and ensure it blends into the natural environment	• *Progressive rehabilitation and dust control will be undertaken regularly.* • *Vegetate tailings walls to blend* into the natural environment. • *The outer side slopes of the Tailings Dam will*	• Environmental Coordinator	• Closure and Rehabilitation Plan • Revegetated topsoil stockpiles		✓			*Der Brochen Mine: Environmental Impact Assessment Report and Environmental Management Programme (SRK*

Impact Reference No.	Aspect	Impact	Management Objectives	Management Measures/ Actions	Responsible Party	Performance Criteria to be adhered to	Project Phase				Source
							C	O	D	PC	
Operation of the Helena TSF											
				continuously be vegetated.							*Consulting Report No. 343158/ April 2005)*
O71		Decrease in visual aesthetics of the area		• *The top of the Tailings Dam will be vegetated during closure and the side slopes fully vegetated to ensure a wilderness land capability.* • *If dust is noted on the access roads, applicable measures such as a watercart or chemical dust suppression will be implemented.* • *Land to which soil has been applied will be rehabilitated under instruction and supervision of the ECO, through revegetation with indigenous species removed to nurseries and/or a combination of hydroseeding or other appropriate methods. Rehabilitation will be progressive throughout the life of the mine, and vegetation will be established as soon as a disturbing activity has ceased, to stabilize soils and re-establish habitats. Following revegetation, the site will be monitored and maintained until an acceptable vegetation cover has been achieved.* • *Areas of disturbance will be limited to the footprints given on the final layout drawings and vehicular movement*							*Der Brochen Project EMP Amendment:: Raising of Helena Tailings Storage Facility EIA and EMP (SRK Consulting Report No. 475423/EIA/EMP; September 2014)*

Table 8-14: Environmental Management Programme for the Operation of the Mototolo Concentrator and Chrome Plant

Impact Reference No.	Aspect	Impact	Management Objectives	Management Measures/ Actions	Responsible Party	Performance Criteria to be adhered to	Project Phase				Source
							C	O	D	PC	
Operation of the Mototolo Concentrator and Chrome Plant											
O72	Topography	Increased visibility and change in topography due to placement of the Mototolo Concentrator and Chrome Plant infrastructure	• To minimise the visual impact of the Concentrator and Plant on the surrounding environment.	• *All infrastructure will be demolished on closure of the* Mototolo Concentrator and *Chrome Plant and all disturbed areas will be reinstated and rehabilitated to a known past state or to an approximation of the natural condition.* • *Land to which soils have been applied will be rehabilitated under instruction and supervision of the ECO, through revegetation with indigenous species removed to nurseries and/or a combination of hydroseeding or other appropriate methods. Following revegetation, the site will be monitored and maintained until an acceptable vegetation cover has been achieved.*	• Environmental Coordinator	• Establishment of vegetation • Closure and Rehabilitation Plan		✓			*Chrome Plant- Helena 6 JT, Eastern Limb of the Bushveld Complex, Mpumalanga, South Africa Final EIAR and EMP (ERM, May 2006)*
O73	Soils, Land Capability and Land Use	Loss of soil resources due to erosion	• To prevent/ minimise loss of soil resources.	• *Special erosion control measures will have to be implemented should erosion be detected* • *Drainage facilities will be designed to minimise the potential for soil erosion.* • *Energy dissipaters will be provided in areas where concentrated discharges could cause significant erosion, such as the plant.* • *All drainage facilities will be checked at approximately three monthly intervals during the rainy season and any undue erosion or siltation, especially at discharge points, will be noted and repaired. Der Brochen will identify the cause of such undue erosion or siltation and suitable remedial measures will be implemented.* • *No random driving across the terrain (outside of authorised routes) will be allowed – this will destroy the soil structure, cause unsightly tracks and lead to unnecessary soil erosion.*	• Environmental Coordinator • Mining Engineer	• Erosion control measures		✓			*Environmental Management Programme Report for the Der Brochen Mine Volume 1 of 3 (SRK Consulting Report No. 295606/4/ November 2002)*
O74		Disturbance/Loss of soil resources due to accelerated/ human induced soil erosion, or due to contamination of soils from spillages of fuels, oils, chemicals or waste	• To prevent and minimise soil contamination. • To minimise seepage and accidental spills. • To remediate contaminated soils.	• The clean and dirty water management and separation at the Mototolo Concentrator and Chrome Plant will form part of the overall Mototolo Concentrator water management system. • Maintenance of vehicles to ensure vehicles are in good running order. • *Disturbance will be restricted to footprint areas depicted with no random driving across the terrain allowed* • *All infrastructure will be demolished on closure of the* Mototolo Concentrator and *Chrome Plant and all disturbed areas will be reinstated and rehabilitated to a known past state or to an approximation of the natural condition.* • *During reinstatement, surfaces will be ripped and stockpiled soil will be graded over previously disturbed/ stripped areas with as little compaction as possible, with vehicles avoiding running over stockpiles by spreading from one side only.* • *Land to which soils have been applied will be rehabilitated under instruction and*	• Environmental Coordinator • SHE Manager • Land Manager	• Leak/ spill clean-up Procedure • Inspection and Maintenance Plan • Stormwater Management Plan • Environmental Incident Report		✓	✓		*Chrome Plant- Helena 6 JT, Eastern Limb of the Bushveld Complex, Mpumalanga, South Africa Final EIAR and EMP (ERM, May 2006)*

Impact Reference No.	Aspect	Impact	Management Objectives	Management Measures/ Actions	Responsible Party	Performance Criteria to be adhered to	Project Phase				Source
							C	O	D	PC	
Operation of the Mototolo Concentrator and Chrome Plant											
				supervision of the ECO, through revegetation with indigenous species removed to nurseries and/or a combination of hydroseeding or other appropriate methods. Following revegetation, the site will be monitored and maintained until an acceptable vegetation cover has been achieved. • *Separate clean and dirty water systems will be constructed and will be maintained throughout the life of the* Mototolo Concentrator and *Chrome Plant.* • *Drainage, stormwater and erosion control measures/structures will be checked at three monthly intervals and after significant rainfall events for siltation and effectiveness in preventing erosion. Silted, damaged or ineffective structures will be cleaned, repaired or replaced regularly.* • *Energy dissipaters will be constructed at sites of concentrated stormwater discharge.* • *Silt and oil traps, and drip trays will be inspected frequently for effectiveness and cleaned/repaired/ replaced regularly. Impermeable hazardous waste containers will be disposed of as required to prevent spillage. All water pumps will be maintained to prevent spills/leaks, and placed in impermeable sumps to contain possible leakage.* • *Vehicles will be inspected regularly and kept in good running order, and leaks repaired immediately.*							
O75	Biodiversity	Effects of fugitive dust on vegetation	• To minimise the entrainment potential of dust.	• Dust monitoring to be undertaken as per the Dust Monitoring Plan. • Dust suppression to be undertaken on gravel roads. • *Water sprayers or dust plants, or other suitable methods, will be used to minimise dust at sources.* • *The effect will be monitored and adjusted accordingly. The conveyor will be fitted with doghouse sheeting.*	• Environmental Coordinator	• Dust monitoring Plan • Dust monitoring records		✓			*Environmental Management Programme Report for the Der Brochen Mine Volume 1 of 3 (SRK Consulting Report No. 295606/4/ November 2002)*
O76	Surface Water	Disturbance/loss of aquatic animal species due to a deterioration in surface water quality due to contamination from various forms of pollution from operational activities, increased sediment loads, oil and fuel spills and leaks.	• To avoid or where not possible, minimise and remedy pollution of water during operations.	• Regular inspections will be undertaken in order to detect spillages timeously. • Monitoring of Groot-Dwars River will be implemented upstream and downstream of the Mototolo Concentrator and Chrome Plant to detect deterioration. • A spill detection plan will be devised and implemented for all possible areas of spillage. • An inspection and maintenance plan will be implemented to ensure that the Mototolo Concentrator and Chrome Plant are operated within specifications. • *All effort will be made to maintain this "good" biotic status and continuous seasonal biological monitoring will be performed when mining operation commences. Such future monitoring together with the already gathered baseline information will then be used for*	• Environmental Coordinator • Plant Manager	• Leak/ spill clean-up Procedure • Topsoil stockpile • Inspection and Maintenance Plan • Environmental Incident Report • Water monitoring reports		✓			*Environmental Management Programme Report for the Der Brochen Mine Volume 1 of 3 (SRK Consulting Report No. 295606/4/ November 2002)*

Impact Reference No.	Aspect	Impact	Management Objectives	Management Measures/ Actions	Responsible Party	Performance Criteria to be adhered to	Project Phase				Source
							C	O	D	PC	
Operation of the Mototolo Concentrator and Chrome Plant											
				early detection of possible future biotic degradation to enable mitigation measures. • *A long term monitoring programme will be implemented to monitor physico-chemical and biological components of the aquatic ecosystems within and below the mining area. The monitoring programme will commence as soon as mining operations start. This would enable the timely identification of required mitigation/environmental management procedures to maintain the high quality of this ecologically important aquatic ecosystem.* • *An appropriate biological index based on fish (such as the Fish Assemblage Integrity Index, Kleynhans, 1997 or Sensitivity-weighted Index of Biotic Integrity will also be included in order to quantify and classify the longer-term changes in biotic integrity.*							
O77		Deterioration of stormwater and surface water quality due to operational activities at the Chrome Plant	• To ensure the separation of clean and dirty water on site.	• *The area around the* Mototolo *Concentrator, within which the Chrome Plant is positioned, is within a controlled stormwater area. All process water will be recycled and re-used within the* Mototolo *Concentrator and Chrome Plant, with a zero discharge policy being maintained.* • *Measure and monitor surface water quality in the Groot-Dwarsrivier, within and below the* Mototolo Concentrator and *Chrome Plant area.* • *Groundwater quality and quantity will be measured and monitored as per the monitoring protocol.* • *The dispersion of wastewater will be limited by using soak-away drains in the wash bay and domestic wash water discharge areas. Wastewater will be returned to the process.* • *Separate clean and dirty water systems will be constructed and will be maintained throughout the life of the* Mototolo Concentrator and *Chrome Plant.* • *Drainage, stormwater and erosion control measures/structures will be checked at 3 monthly intervals and after significant rainfall events for siltation and effectiveness in preventing erosion. Silted, damaged or ineffective structures will be cleaned, repaired or replaced regularly.* • *Energy dissipaters will be constructed at sites of concentrated stormwater discharge.* • *Silt and oil traps, and drip trays will be inspected frequently for effectiveness and cleaned/repaired/ replaced regularly. Impermeable hazardous waste containers will be disposed of as required to prevent spillage. All water pumps will be maintained to prevent spills/leaks, and placed in impermeable sumps to contain possible leakage.* • *Vehicles will be inspected regularly and kept in good running order, and leaks repaired immediately.*	• Environmental Coordinator	• Stormwater Management Plan		✓			*Chrome Plant- Helena 6 JT, Eastern Limb of the Bushveld Complex, Mpumalanga, South Africa Final EIAR and EMP (ERM, May 2006)*

Impact Reference No.	Aspect	Impact	Management Objectives	Management Measures/ Actions	Responsible Party	Performance Criteria to be adhered to	Project Phase C	O	D	PC	Source
Operation of the Mototolo Concentrator and Chrome Plant											
				• *Any spillage will be reported, cleaned up and soils remediated immediately. Any pollution or spills will be reported to the* DWS *regional director within 24 hours of the occurrence.* • *Drivers will be trained on how to deal with spillage of ore, hydrocarbons and other potential contaminants.*							
O78		Contamination of surface water bodies due to diffuse pollution	• To avoid or where not possible, minimise and remedy pollution of water during operations.	• *Implement good housekeeping at operational sites. The final dirty water stream fed from the spiral plant reports to the* Mototolo *Concentrator process water tank.* • *Monitor pollution control infrastructure and the surrounding boreholes.* • *Much of the terrace areas will be paved with concrete and tar. Remaining areas will be planted to lawns and gardens.* • *Individual components such as stores, sub-stations, stockpiles, workshops and the Concentrator will be individually bunded to contain spills. Bunded areas will be designed to contain at least 110% of the volume of the maximum potential spillage. Spilled material will be recovered and either returned to the process or will be disposed of to an appropriate site.* • *A drain will be provided upslope of the plant terrace to divert clean stormwater runoff away from the terrace. This drain will be designed to cater for the 1:50 year return period flood. The discharge point will be designed to allow for the safe discharge of water without causing any erosion.* • *A drain designed to cater for the 1:50 year return period flood event will be constructed downslope of the terrace to direct contaminated water discharges from this area to the settlers.* • *Water from the immediate plant area will drain to a lined sump designed to retain wash down water and water from small rainfall events.* • *All runoff from terraces not catered for by the sumps will flow to lined settlers. This settler system will be designed to provide sufficient capacity to allow for the settlement and containment of the 1:50 year return period flood event. A spillway sized for the 1:50 year event will be provided. Settled water will be recycled for use in the process water circuit.* • *The sumps and settlers will be checked regularly. Silt will be removed and disposed of on the Tailings Dam, as required, in order to retain sufficient capacity in these ponds.* • *The quality of the water in the settlers will be monitored.*	• Environmental Coordinator • Plant Manager	• Leak/spill Procedure • Water monitoring reports • Stormwater Management Plan • Complaints register		✓			*Environmental Management Programme Report for the Der Brochen Mine Volume 1 of 3 (SRK Consulting Report No. 295606/4/ November 2002)*
O79	Groundwater	Deterioration of groundwater quality	• To minimise/ prevent contamination of water resources	• Continue with groundwater monitoring on a quarterly basis to detect groundwater contamination. Should groundwater be contaminated, it will be pumped to the Helena TSF for recirculation.	• Environmental Coordinator • Plant Manager	• Water monitoring reports		✓			*Environmental Management Programme Report for the Der Brochen Mine Volume 1 of 3 (SRK Consulting Report No. 295606/4/ November*

Impact Reference No.	Aspect	Impact	Management Objectives	Management Measures/ Actions	Responsible Party	Performance Criteria to be adhered to	Project Phase				Source
							C	O	D	PC	
Operation of the Mototolo Concentrator and Chrome Plant											
											2002)
O80	Air Quality	Decreased ambient air quality due to the operation of the Chrome Plant	• To minimise the amount of dry material susceptible to wind erosion. • To minimise the entrainment potential of dust. • To respond with corrective action to public complaints about dust related health and nuisance impacts.	• *Dust generated on access roads will be managed through appropriate measures such as a watercart or chemical dust suppression.* • *Reinstatement and rehabilitation of all disturbed areas at closure.* • *Dust will be controlled on site with water carts or dust suppressants.* • *A speed of 40 kmph will be strictly enforced on all mine access roads.* • *All infrastructure will be demolished on closure of the* Mototolo Concentrator and *Chrome Plant and all disturbed areas will be reinstated and rehabilitated to a known past state or to an approximation of the natural condition.* • *Land to which soils have been applied will be rehabilitated under instruction and supervision of the ECO, through revegetation with indigenous species removed to nurseries and/or a combination of hydroseeding or other appropriate methods.* • *Following revegetation, the site will be monitored and maintained until an acceptable vegetation cover has been achieved.*	• Environmental Coordinator • Plant Manager • CED Manager	• Complaints register • Dust monitoring reports		✓			*Environmental Management Programme Report for the Der Brochen Mine Volume 1 of 3 (SRK Consulting Report No. 295606/4/ November 2002)*
O81	Noise	Increase in ambient noise levels due to operation of the Chrome Plant	• To prevent or minimise adverse impacts arising from operations. • To respond with corrective action to public complaints about noise.	• *Keeping vehicles silencer units in good working order and restricting activities to the dedicated mining areas.* • *Should community complaints be received with regard to noise generation, mine management will investigate these and implement appropriate management measures.*	• Environmental Coordinator • Plant Manager	• Complaints register • Noise monitoring reports		✓			*Chrome Plant- Helena 6 JT, Eastern Limb of the Bushveld Complex, Mpumalanga, South Africa Final EIAR and EMP (ERM, May 2006)*
O82	Visual	Decrease in visual aesthetics of the area		• Refer to O28 for applicable management measures				✓			New impact

Table 8-15: Environmental Management Programme for the Operation of the Access Roads

Impact Reference No.	Aspect	Impact	Management Objectives	Management Measures/ Actions	Responsible Party	Performance Criteria to be adhered to	Project Phase C	O	D	PC	Source
Operation of the Access Roads											
O83	Soils, Land Capability and Land Use	Loss of soil resources due to erosion	• To prevent/ minimise soil erosion	• *Erosion control measures will have to be implemented throughout the site for the entire life of the mine.* • *Drainage facilities will be designed to minimise the potential for soil erosion.* • *Energy dissipaters will be provided in areas where concentrated discharges could cause significant erosion, such as access/service roads.* • *All drainage facilities will be checked at approximately three monthly intervals during the rainy season and any undue erosion or siltation, especially at discharge points, will be noted and repaired. The mine will identify the cause of such undue erosion or siltation and suitable remedial measures will be implemented.* • *Unused roads will be rehabilitated after exploration, while high traffic roads will be surfaced. Other roads still used will be maintained and any new roads will have proper engineered designs to prevent erosion. No random driving across the terrain (outside of authorised routes) will be allowed – this will destroy the soil structure, cause unsightly tracks and lead to unnecessary soil erosion.*	• Environmental Coordinator	• Erosion control measures		✓			*Environmental Management Programme Report for the Der Brochen Mine Volume 1 of 3 (SRK Consulting Report No. 295606/4/ November 2002)*
O84		Soil contamination due to spillage of fuel, oil and chemicals	• To prevent and minimise soil contamination.	• *Water pollution management measures are designed to contain all polluted water, thereby minimising the potential for soil contamination from this source. Any spillage will be cleaned up and remediated.* • Any spills will be cleaned up. More serious spills will be reported and treated. • An inspection and maintenance plan will be implemented to ensure that the ore transportation operates within specifications. • Regular servicing of vehicles in well-constructed, bunded areas. • Regular cleaning and maintenance of drains and stormwater control facilities. • Containment and management of spillage. • Spill kits will be provided on site for ad hoc spill clearing.	• Environmental Coordinator • SHE Manager	• Leak/spill Procedure • Environmental Incident Report • Stormwater Management Plan • Inspection and Maintenance Plan		✓			*Environmental Management Programme Report for the Der Brochen Mine Volume 1 of 3 (SRK Consulting Report No. 295606/4/ November 2002)*
O85	Surface Water	Deterioration of surface water quality due to erosion, spillages and accidental discharges on roads	• To avoid or where not possible, minimise and remedy pollution of water during operations.	• Stormwater culverts at watercourse crossings will be designed and constructed to accommodate the 1:50 year storm event. • Erosion protection and energy dissipaters will be constructed at the crossings as applicable. • Emergency action plans will be drawn up to deal with spillages.	• Environmental Coordinator • SHE Manager • CED Manager	• Leak/spill Procedure • Stormwater Management Plan • Complaints register		✓			New impact
O86	Noise	Increase in ambient noise levels on the surrounding communities as a result of mining activities	• To prevent or minimise adverse impacts arising from operations. • To respond with corrective action to public complaints	• Regular servicing and maintenance of vehicles.	• Environmental Coordinator • CED Manager	• Complaints register • Noise monitoring reports		✓			*Environmental Management Programme Report for the Der Brochen Mine Volume 1 of 3 (SRK Consulting Report No. 295606/4/ November*

Impact Reference No.	Aspect	Impact	Management Objectives	Management Measures/ Actions	Responsible Party	Performance Criteria to be adhered to	Project Phase				Source
							C	O	D	PC	
Operation of the Access Roads											
			about noise.								*2002)*
O87	Traffic and Transportation	Increased generation of traffic on existing road networks during operations		• Refer to O15 in this table for applicable management measures				✓			Specialist Traffic and Transportation Study for the Proposed EMP Alignment and Amendment of the Der Brochen Project to include open cast mining, tailings storage facilities and associated infrastructure (Aurecon, Report No. 9522, October 2014)
O88		Impact on pedestrian and cyclists		• Refer to O16 in this table for applicable management measures				✓			
O89		Impact on road safety conditions		• Refer to O17 in this table for applicable management measures				✓			
O90		Decreased condition of the road network		• Refer to O18 in this table for applicable management measures				✓			

Table 8-16: Environmental Management Programme for the Operation of the Wellfield and ongoing prospecting boreholes

Impact Reference No.	Aspect	Impact	Management Objectives	Management Measures/ Actions	Responsible Party	Performance Criteria to be adhered to	Project Phase				Source
							C	O	D	PC	
Operation of the Wellfield and ongoing prospecting boreholes											
O91	Soils, Land Capability and Land Use	Soil erosion due to operational activities	• To prevent/ minimise soil erosion	• *Stormwater control measures will be implemented along all access roads, and will include energy dissipaters such as contour anti-erosion berms.* • *The Pipelines will be trench buried for most of their length except for areas where topography only allows for aboveground structures.* • *Frequent inspection of the effectiveness of stormwater control measures, as well reinstatement and rehabilitation of unused or disturbed areas.* • *Impermeable plastic liners should be placed on site during drilling to avoid pollution and contamination of soil.* • *In the event that a spill occurs, spilled material is dug up and placed in spill bin specific for contaminated soil and disposed of.*	• Environmental Coordinator • Mining Engineer	• Stormwater Management Plan • Establishment of vegetation		✓			*Addendum to the Environmental Management Programme Report for the Der Brochen Mine to include a Wellfield in the Klein-Dwarsrivier Valley on the Farms Richmond 370 KT and St George 2 JT (SRK Consulting Report No. 335470/1, April 2004) Environmental Management Programme (EMP): Amendment to the approved Environmental Management Programme Report (EMPR) for ongoing prospecting in support of current Mining Operations (ERM, 2007).*
O92	Biodiversity	Disturbance/loss of plant species of conservation importance, habitat, endemism and biodiversity	• To demonstrate active stewardship of land and biodiversity	• *All temporary infrastructure will be demolished on mine closure (where not required for communities), and all disturbed areas reinstated and rehabilitated to a known past state or to an approximation of the natural condition. Infrastructure for which post-mining and approved uses have been identified, will not be demolished.* • *During reinstatement, surfaces will be ripped and stockpiled soil will be graded over previously disturbed/ stripped areas with as little compaction as possible, with vehicles avoiding running over stockpiles by spreading from one side only.* • *Land to which soil has been applied will be rehabilitated under instruction and supervision of the ECO, through revegetation with indigenous species removed to nurseries and/or a combination of hydroseeding or other appropriate methods. Rehabilitation will be progressive throughout the burying of the Pipelines and throughout the life of the mine, and vegetation will be established as soon as a disturbing activity has ceased, to stabilise soils and re-establish habitats. Following revegetation, the site will be monitored and maintained until an acceptable vegetation cover has been achieved.* • *Energy dissipaters will be constructed at sites of concentrated stormwater discharge.* • *Drainage, stormwater and erosion control measures/structures will be checked at 3 monthly intervals and after significant rainfall events for siltation and effectiveness in*	• Environmental Coordinator • CED Manager	• Identify and remove relevant species if necessary • Implementation of the Biodiversity Action Plan		✓			*Addendum to the Environmental Management Programme Report for the Der Brochen Mine to include a Wellfield in the Klein-Dwarsrivier Valley on the Farms Richmond 370 KT and St George 2 JT (SRK Consulting Report No. 335470/1, April 2004)*

Impact Reference No.	Aspect	Impact	Management Objectives	Management Measures/ Actions	Responsible Party	Performance Criteria to be adhered to	Project Phase				Source
							C	O	D	PC	
Operation of the Wellfield and ongoing prospecting boreholes											
				preventing erosion. Silted, damaged or ineffective structures will be cleaned, repaired or replaced regularly. • *Disturbance of vegetation cover and soils will be restricted to footprint areas with no random driving across the terrain allowed.* • *Vehicles will be inspected regularly and kept in good running order, and leaks repaired immediately.* • *Any spillage will be reported, cleaned up and soils remediated immediately.* • *After drilling is completed, sites should be rehabilitated and seeded.*							
O93		Proliferation of alien vegetation and associated impacts on groundwater	• To prevent/ minimise the establishment and spread of alien invasive species	• All weeds and invaders will be eradicated to prevent impacts on natural vegetation and groundwater supplies. • Natural eradication methods, and replacement of the reed with indigenous Phragmites reeds will be investigated. • Regular monitoring and eradication of weeds and invaders along any newly disturbed areas. All disturbed areas will be progressively reinstated and rehabilitated with indigenous species. • *A land management plan is being compiled and will form part of a possible conservancy feasibility study. This plan will determine the use and management of natural areas.* • *Existing invaders/aliens/weeds/bush encroaches (where considered a problem) will be eradicated on site and on an ongoing basis. The Populus sp. will be eradicated immediately. The ECO will develop an eradication programme in consultation with a specialist. Biological or mechanical eradication methods will be developed for Arundo donax to prevent water contamination and impact on surrounding natural vegetation. Replacement of the reed with indigenous Phragmites will be investigated to maintain river functioning and water quality.* • *Newly disturbed areas, as well as rehabilitated areas, will be monitored for invader/weed seedlings, which will be removed and monitored.*	• Environmental Coordinator	• Alien Invasive Management Plan • Biodiversity Action Plan		✓			*Addendum to the Environmental Management Programme Report for the Der Brochen Mine to include a Wellfield in the Klein-Dwarsrivier Valley on the Farms Richmond 370 KT and St George 2 JT (SRK Consulting Report No. 335470/1, April 2004)* *Environmental Management Programme (EMP): Amendment to the approved Environmental Management Programme Report (EMPR) for ongoing prospecting in support of current Mining Operations (ERM, 2007).*
O94		Disturbance/loss of animals of conservation importance	• To prevent/ minimise the impact on *Pycna sylvia* populations.	• Cicada situation will continuously be monitored in the Klein- and Groot-Dwarsrivier valleys during the life of the mine and therefore the life of the Wellfield. • Progressive reinstatement and rehabilitation of disturbed areas will reduce the likelihood of the impact further. • *A land management plan is being compiled and will form part of a possible conservancy feasibility study. This plan will determine the use and management of natural areas.* • *All environmental method statements (for any disturbing/destructive construction/ operational activities such as removal/disturbance of trees or important*	• Environmental Coordinator	• Biodiversity Action Plan • Dust suppression on dirt roads		✓			*Addendum to the Environmental Management Programme Report for the Der Brochen Mine to include a Wellfield in the Klein-Dwarsrivier Valley on the Farms Richmond 370 KT and St George 2 JT (SRK Consulting Report No. 335470/1, April 2004)*

Impact Reference No.	Aspect	Impact	Management Objectives	Management Measures/ Actions	Responsible Party	Performance Criteria to be adhered to	Project Phase				Source
							C	O	D	PC	
Operation of the Wellfield and ongoing prospecting boreholes											
				vegetation, disturbance of streams, dry watercourses, drainage lines or riparian areas) will be submitted to the ECO for approval before commencement of the works. • *All areas to be disturbed will be surveyed by the ECO. Marked important/priority plant will remain in situ and where not possible will be removed to designated nurseries by the ECO prior to any disturbance. All species of Vitex obovata subsp. wilmsii will be marked and remain in situ for the life of the mine. These possible Cicada habitats will be continuously monitored. Nurseries will be maintained under supervision of the ECO. Pegged no-go areas will remain natural features and will not be disturbed. Special care will be taken at watercourses and along dongas to avoid spoil material being dumped or sliding downslope into these sensitive areas.* • *Existing invaders/aliens/weeds/bush encroaches (where considered a problem) will be eradicated on site and on an ongoing basis. The Populus sp. will be eradicated immediately. The ECO will develop an eradication programme in consultation with a specialist. Biological or mechanical eradication methods will be developed for Arundo donax to prevent water contamination and impact on surrounding natural vegetation. Replacement of the reed with indigenous Phragmites will be investigated to maintain river functioning and water quality.* • *Newly disturbed areas, as well as rehabilitated areas, will be monitored for invader/weed seedlings, which will be removed and monitored.*							
O95	Surface Water	Reduction in baseflow of the Klein-Dwars River	• To minimise the impact on the baseflow of the Klein-Dwars River	• *The mine will measure and monitor surface water levels and quality in the Klein-Dwars River, within and below the Wellfield area, and compare these with the baseline data. Any indication of lowering of surface water levels due to groundwater abstraction will be reported and adequate mitigation measures implemented.*	• Environmental Coordinator	• Water monitoring reports		✓			*Addendum to the Environmental Management Programme Report for the Der Brochen Mine to include a Wellfield in the Klein-Dwarsrivier Valley on the Farms Richmond 370 KT and St George 2 JT (SRK Consulting Report No. 335470/1, April 2004)*
O96	Groundwater	Reduction in the water table levels of the alluvial aquifer	• To minimise the impact of loss groundwater resources	• *Various monitoring boreholes in both aquifers are/will be installed and data will continuously be monitored at the central control room at the* Mototolo *Concentrator. Data will be compared with the wealth of baseline data and any sign of lowering water table levels in either aquifer will be reported.* • *Due to the management of the Wellfield, and variable abstraction from a large number of boreholes to obtain minimum drawdown, the duration of the impact at one given point (borehole) will also be reduced.* • *Groundwater monitoring boreholes are/will be*	• Environmental Coordinator • Mining Engineer	• Water monitoring reports		✓			*Addendum to the Environmental Management Programme Report for the Der Brochen Mine to include a Wellfield in the Klein-Dwarsrivier Valley on the Farms Richmond 370 KT and St George 2 JT (SRK Consulting Report No. 335470/1, April 2004)*

Impact Reference No.	Aspect	Impact	Management Objectives	Management Measures/ Actions	Responsible Party	Performance Criteria to be adhered to	Project Phase				Source
							C	O	D	PC	
Operation of the Wellfield and ongoing prospecting boreholes											
				established. A groundwater monitoring programme will be developed. The Wellfield will consist of approximately 53 boreholes from which water will be abstracted at variable rates and intervals to obtain minimum drawdown.							
O97		Contamination of groundwater resources during ongoing prospecting	• To prevent/ minimise groundwater contamination during drilling	• *Impermeable plastic liners will be used beneath drill rigs and in drilling-mud sumps to prevent seepage of any liquids on site to water resources.*	• Environmental Coordinator • Mining Engineer	• Plastic liners		✓			*Environmental Management Programme (EMP): Amendment to the approved Environmental Management Programme Report (EMPR) for ongoing prospecting in support of current Mining Operations (ERM, 2007).*
O98	Air Quality	Increase in nuisance dust during ongoing prospecting	• To minimise dust emissions	• *Dust suppression through watering as necessary.* • *Employees will wear appropriate Personal Protective Equipment (PPE)*	• Environmental Coordinator • Mining Engineer	• Dust suppression • PPE		✓			*Environmental Management Programme (EMP): Amendment to the approved Environmental Management Programme Report (EMPR) for ongoing prospecting in support of current Mining Operations (ERM, 2007).*
O99	Visual	Reduced quality of scenic value from vantage points	• To minimise the visual impact of the Wellfield	• *The aesthetic quality of the site will be minimised through limiting areas of disturbance, and progressive reinstatement and rehabilitation of disturbed areas.*	• Environmental Coordinator • CED Manager • Engineering Manager	• Complaints register • Closure and Rehabilitation Plan • Establishment of Vegetation on rehabilitated areas		✓			*Addendum to the Environmental Management Programme Report for the Der Brochen Mine to include a Wellfield in the Klein-Dwarsrivier Valley on the Farms Richmond 370 KT and St George 2 JT (SRK Consulting Report No. 335470/1, April 2004)*
O100	Cultural Heritage	Disturbance/destruction of archaeological and cultural significant sites	• To respect the culture and heritage of the people in the area • To avoid disturbance of sites and activities of cultural significance and where not possible to determine mitigation in consultation with local communities	• *No random driving will be allowed on site and vehicles will be restricted to designated access roads.* • *Relevant contractors and mine personnel will be trained in the identification of significant archaeological sites. These will immediately be reported to the relevant mine manager and a specialist archaeologist will be informed.* • *Sites of medium and high significance will be avoided (fenced if deemed necessary), while sites to be disturbed along the trench will be inspected and sampled by a specialist during trench excavations.* • *The Eiland site will be avoided (fenced if deemed necessary by the specialist archaeologist) or test pit excavations conducted by a specialist archaeologist if*	• Environmental Coordinator	• All findings documented and finds recorded by a qualified (as per SAHRA) specialist • Complaints register		✓			*Addendum to the Environmental Management Programme Report for the Der Brochen Mine to include a Wellfield in the Klein-Dwarsrivier Valley on the Farms Richmond 370 KT and St George 2 JT (SRK Consulting Report No. 335470/1, April 2004)*

Impact Reference No.	Aspect	Impact	Management Objectives	Management Measures/ Actions	Responsible Party	Performance Criteria to be adhered to	Project Phase				Source
							C	O	D	PC	
Operation of the Wellfield and ongoing prospecting boreholes											
				disturbance is deemed necessary. • *Archaeological sites to be disturbed along the trenches, will be inspected (and sampled if necessary) by a specialist during trench excavations along the Klein-Dwarsrivier valley.* • *Relevant contractors and mine personnel will, as in the past on this project, be trained in the identification of significant archaeological sites. These will immediately be reported to the relevant mine manager and the specialist archaeologist will be informed.*							

Table 8-17: Environmental Management Programme for the Socio-Economic impacts envisaged during Operations

Impact Reference No.	Aspect	Impact	Management Objectives	Management Measures/ Actions	Responsible Party	Performance Criteria to be adhered to	Project Phase C	O	D	PC	Source
Socio-economic impacts during Operations											
O101	Socio-economic	Prolonged employment opportunities	• To enhance benefits from the prolonged operations .	• Enhance local employment and procurement opportunities where possible.	• Project Manager • CED Manager • Human Resources • Supply Chain	• Employment records • Social and Labour Plan (SLP)		✓			*Der Brochen Project EMP Amendment:: Raising of Helena Tailings Storage Facility EIA and EMP (SRK Consulting Report No. 475423/EIA/EMP; September 2014)*
O102		Contribution to the local and regional economy	• To enhance benefits from the development of the Project • To maximize opportunities for local residents • To facilitate employment of local labour on the Project • To avoid creating unrealistic expectations	• *Participation in Local Economic Development Programmes.* • Der Brochen will inject investment into the local and regional economy through the employment of labour, use of local support services and the use of local infrastructure. Der Brochen will ensure that as much of this as possible is directed to the local economy. Since it is unlikely that suppliers from within the study area (local level) will be suitable, goods should be preferentially procured in the immediate focus area and, if unsuccessful, only then in the broader focus area. • AAP will inform businesses, where appropriate, through appropriate business fora about available opportunities and how business may access these. For example, the Steelpoort Business Forum can be used to engage with businesses in the local and regional areas. • The revised SLP should reflect the targets for procuring goods locally and regionally, and to develop local suppliers. Contractors will be required to submit annual reports on how they are attaining these targets as part of AAP's SLP reporting to Government. • AAP will identify potential service providers for longer term procurement. • Develop a social strategy, once mining has commenced, in line with the life of mine plan to assist in leaving a positive legacy. These strategies will be reviewed and monitored for implementation.	• CED Manager • Procurement Manager • Project Manager	• Social and Labour Plan		✓			*Chrome Plant- Helena 6 JT, Eastern Limb of the Bushveld Complex, Mpumalanga, South Africa Final EIAR and EMP (ERM, May 2006)* *Der Brochen Mine: Environmental Impact Assessment Report and Environmental Management Programme (SRK Consulting Report No. 343158/ April 2005)* Social Baseline and Impact Assessment for the Der Brochen EMP Alignment (SRK Report No. 469113/SIA, September 2014)
O103		Contribution to national economic growth	• To enhance benefits from the development of the Project • To maximize opportunities for local residents • To facilitate employment of local labour on the Project • To avoid creating unrealistic expectations	• Der Brochen will inject investment into the local and regional economy through the employment of labour, use of local support services and the use of local infrastructure. Der Brochen will ensure that as much of this as possible is directed to the local economy. Since it is unlikely that suppliers from within the study area (local level) will be suitable, goods should be preferentially procured in the immediate focus area and, if unsuccessful, only then in the broader focus area. • AAP will inform businesses, where appropriate, through appropriate business fora about available opportunities and how business may access these. For example the Steelpoort Business Forum could be used to engage with businesses in the local and regional areas.	• CED Manager • Procurement Manager • Project Manager	• Social and Labour Plan		✓			Social Baseline and Impact Assessment for the Der Brochen EMP Alignment (SRK Report No. 469113/SIA, September 2014)

Impact Reference No.	Aspect	Impact	Management Objectives	Management Measures/ Actions	Responsible Party	Performance Criteria to be adhered to	Project Phase C	O	D	PC	Source
Socio-economic impacts during Operations											
				• The revised SLP should reflect the targets for procuring goods locally and regionally, and to develop local suppliers. Contractors will be required to submit annual reports on how they are attaining these targets as part of AAP's SLP reporting to Government. • AAP will identify potential service providers for longer term procurement. • Develop a social strategy, once mining has commenced, in line with the life of mine plan to assist in leaving a positive legacy. These strategies will be reviewed and monitored for implementation.							
O104		Social disruption	• To facilitate continued movement around the site along routes that are as close as possible to existing movement networks • To ensure that individuals do not travel any further than they do prior to the Project development	• *If managed correctly, the proposed development could contribute towards improved social and physical mobility in the medium to long term, as well as a general improvement in safety and security measures. This includes policing services and patrolling by mine security personnel, as well as improved health, education and related social services, and the provision of public transport and telecommunications.* • *Implement the Social and Labour Plan (SLP).* • *Implement Local economic development plans, which will include infrastructure and poverty eradication projects in line with the area's Integrated Development Plan.*	• CED Manager • Procurement Manager • Project Manager	• Complaints Register		✓			*Chrome Plant- Helena 6 JT, Eastern Limb of the Bushveld Complex, Mpumalanga, South Africa Final EIAR and EMP (ERM, May 2006)*
O105		Generation of jobs	• To enhance benefits from the development of the Project • To maximize opportunities for local residents • To facilitate employment of local labour on the Project • To avoid creating unrealistic expectations	• It is expected that contractors will bring in their own workers with the required core skills. The revised SLP will reflect the levels of local employment that will be required. Contractors must submit annual reports on how they are attaining these targets as part of AAP's reporting to Government. Where it is not possible to meet targets for employing people from the immediately affected areas, contractors will be required to source personnel in the immediate focus area, and then only in the broader focus area. Potential workers in the local area will be assessed for their suitability for contract work at Der Brochen. Dover tests can be conducted to screen potential local contract workers. • AAP will investigate the potential and applicability of training local contract workers on theoretical and safety aspects of pit mining at its facility in Mogalakwena. The Mogalakwena pit is much larger than the proposed pit at Der Brochen, and different methods and machinery may be employed at the two mines. At this point, it is unclear what machine-specific skills will be required by contractors working at Der Brochen. • A database of trained potential local workers will be generated and provided to contractors to consider for employment. Local contract workers will be registered on the AAP database so that they may have access to other employment options in AAP and other companies AAP shares its database with.	• Project Manager • CED Manager • Human Resources Manager • Supply Chain	• Employment records • SLP		✓			Social Baseline and Impact Assessment for the Der Brochen EMP Alignment (SRK Report No. 469113/SIA, September 2014)

Impact Reference No.	Aspect	Impact	Management Objectives	Management Measures/ Actions	Responsible Party	Performance Criteria to be adhered to	Project Phase				Source
							C	O	D	PC	
Socio-economic impacts during Operations											
				• AAP also provides learnerships and bursaries in engineering and hospitality and will implement this programme in the Der Brochen local communities. Upskilling particularly of contract workers from the local area will be undertaken by AAP during the Operational Phase of Der Brochen. • Procedures for employing locals will be discussed and agreed with the Community Engagement Forum (CEF). Existing fora will be used to implement AAP's local recruitment process, to communicate the recruitment process and to identify and recruit suitable candidates. • AAP will meet the SLP requirements and commitments for downscaling and retrenchments, including the establishment, implementation and monitoring of a Future Forum.							
O106		Procurement of goods and services	• Ensure that local communities benefit from the proposed Project by means of procurement preference.	• Der Brochen will inject investment into the local and regional economy through the employment of labour, use of local support services and the use of local infrastructure. Der Brochen will ensure that as much of this as possible is directed to the local economy. Since it is unlikely that suppliers from within the study area (local level) will be suitable, goods should be preferentially procured in the immediate focus area and, if unsuccessful, only then in the broader focus area. • AAP will inform businesses through appropriate business fora about available opportunities and how business may access these. The Steelpoort Business Forum will be used to engage with businesses in the local and regional areas. • The revised SLP should reflect the targets for procuring goods locally and regionally, and to develop local suppliers. Contractors will be required to submit annual reports on how they are attaining these targets as part of AAP's SLP reporting to Government. • AAP will identify potential service providers for longer term procurement. AAP will advise and support these companies using Zimele Hub and other AAP institutions so that they can be incorporated as long term suppliers. • According to the Anglo Social Way, all AAP mines are now required to develop long term strategies so that when the mine closes, the mine leaves a positive legacy where mine communities continue to be economically and socially sustainable. These strategies will be reviewed and monitored for implementation.	• CED Manager • Procurement Manager • Project Manager	• Implementation of the Social and Labour Plan		✓			Social Baseline and Impact Assessment for the Der Brochen EMP Alignment (SRK Report No. 469113/SIA, September 2014)
O107		Influx of employees	• To prevent/ minimise the influx of job seekers into local areas. • To prevent/ minimise community	• Enhance employment of people and procurement of service providers in the study area and the region. • Accommodation should preferably be provided in towns in close proximity to the project area and workers bussed in. • Should accommodation be required in close	• CED Manager • Project Manager • SHE Manager	• Influx Management Plan • Policing forums • Awareness campaigns		✓			Social Baseline and Impact Assessment for the Der Brochen EMP Alignment (SRK Report No. 469113/SIA, September 2014)

Impact Reference No.	Aspect	Impact	Management Objectives	Management Measures/ Actions	Responsible Party	Performance Criteria to be adhered to	Project Phase C	O	D	PC	Source
Socio-economic impacts during Operations											
			disruption.	proximity to Der Brochen: o RPM should require the contractors to promote HIV/AIDS prevention amongst employees. o RPM and the contractors should work with the health authorities to provide HIV/AIDS prevention and treatment interventions in a culturally appropriate manner. AAP will confirm if this is possible. o Sub-contractors should adhere to the contract with the contractor. • A strategy and protocol for camp management should be developed and implemented, should an existing worker accommodation facility be used.							
O108		Collection of medicinal plants during the Operational Phase	• To prevent/minimise hazards to community members collection plants. • To ensure safeguard measures are in place for community members entering the property.	• A land access protocol for visiting graves is currently in place and AAP Land Use Management will explore the possibility of extending this protocol for enabling the collection of medicinal plants on the property.	• CED Manager	• Safeguard measures • Policing forums		✓			

Table 8-18: Environmental Management Programme for the Decommissioning and Closure of the Mareesburg, Helena and Co-Disposal TSFs

Impact Reference No.	Aspect	Impact	Management Objectives	Management Measures/ Actions	Responsible Party	Performance Criteria to be adhered to	Project Phase				Source
							C	O	D	PC	
Decommissioning and Closure of the Mareesburg, Helena and Co-Disposal TSFs											
D1	Topography	Changes in topography	• To rehabilitate the TSFs to blend into the natural environment. • To ensure that the TSFs is free draining at Closure	• On closure, the TSFs will be shaped to be free draining. Erosion protection will be provided. • *Re-vegetation and slope establishment to ensure the TSF is free draining and blends in with the natural environment.*	• Rehabilitation Officer • Environmental Coordinator	• Establishment of vegetation • Closure and Rehabilitation Plan			✓		*Environmental Management Programme Report for the Der Brochen Mine Volume 1 of 3 (SRK Consulting Report No. 295606/4/ November 2002)* *Der Brochen Project EMP Amendment: Raising of Helena Tailings Storage Facility EIA and EMP (SRK Consulting Report No. 475423/EIA/EMP; September 2014)*
D2	Soils, Land Capability and Land Use	Loss of soil resources due to erosion	• To prevent/ minimise loss of soil resources	• Compilation/ update of a detailed Closure Management Plan.	• Rehabilitation Officer • Environmental Coordinator	• Closure and Rehabilitation Plan			✓		*Environmental Management Programme Report for the Der Brochen Mine Volume 1 of 3 (SRK Consulting Report No. 295606/4/ November 2002)*
D3		Contamination of soils	• To prevent/ minimise soil contamination. • To prevent accidental spills.	• *Conduct daily site inspections to detect leaks on equipment which may lead to hydrocarbon spills.* • *Regular maintenance of vehicles.* • *Placement of drip trays under vehicles when parked and during fuel transfer.* • *Undertake on-site bioremediation or remove contaminated soils and dispose of at a licensed hazardous waste storage facility.* • *Contaminated soils will be remediated or removed off site where required.* • *Soils will be remediated and used in rehabilitation activities as per the Closure Plan*	• Rehabilitation Officer • Environmental Coordinator	• Closure and Rehabilitation Plan • Leak/spill clean-up Procedure • Maintenance reports • Waste disposal certificates			✓		*Der Brochen Project EMP Amendment: Raising of Helena Tailings Storage Facility EIA and EMP (SRK Consulting Report No. 475423/EIA/EMP; September 2014)*
D4	Biodiversity	Loss of aquatic life due to deterioration of water quality	• To prevent impact on aquatic biodiversity during demolition activities	• *Monitoring will be conducted until it can be proven that no more seepage and deterioration in water quality will take place*.	• Rehabilitation Officer • Environmental Coordinator	• Closure and Rehabilitation Plan • Biodiversity Action Plan • Biomonitoring reports			✓		*Environmental Management Programme Report for the Der Brochen Mine Volume 1 of 3 (SRK Consulting Report No. 295606/4/ November 2002*
D5	Surface Water	Contamination of surface water resources	• To prevent/ minimise accidental spills. • To ensure the separation of clean and dirty water and compliance to GN704.	• *During Closure, inflows into the return water dams will be reduced to seepage from the TSF together with direct rainfall onto the TSF. Remaining volumes will be pumped to the Concentrator to allow for additional storage for any major storm event.* • *Maintain stormwater control to divert clean water away from the TSF.* • *Monitoring of seepage from the TSF and the return water dams, together with water quality should be undertaken for a period of ten years after closure.* • *Hydrocarbon spillages will be remediated*	• Rehabilitation Officer • Environmental Coordinator	• Stormwater Management Plan • Surface water monitoring records • Leak/spill procedure • Closure and Rehabilitation Plan			✓		*Der Brochen Project EMP Amendment:: Raising of Helena Tailings Storage Facility EIA and EMP (SRK Consulting Report No. 475423/EIA/EMP; September 2014)*

Impact Reference No.	Aspect	Impact	Management Objectives	Management Measures/ Actions	Responsible Party	Performance Criteria to be adhered to	Project Phase				Source
							C	O	D	PC	
Decommissioning and Closure of the Mareesburg, Helena and Co-Disposal TSFs											
				immediately.							
D6	Groundwater	Contamination of groundwater	• To minimise contamination of groundwater resources. • To avoid or where not possible, minimize and remedy pollution of water during decommissioning and closure.	• *Continue with groundwater monitoring after rehabilitation to detect groundwater contamination, as per the closure plan.* • *Detailed measures to arrest any unacceptable seepage during this monitoring period will be implemented in consultation with the Competent Authorities*	• Rehabilitation Officer • Environmental Coordinator	• Groundwater monitoring records • Closure and Rehabilitation Plan			✓		*Der Brochen Project EMP Amendment: Raising of Helena Tailings Storage Facility EIA and EMP (SRK Consulting Report No. 475423/EIA/EMP; September 2014)*
D7	Air Quality	Increase in nuisance dust	• To minimise the amount of dry material susceptible to wind erosion. • To minimise the entrainment potential of dust. • To respond with corrective action to public complaints about dust related health and nuisance impacts.	• *Re-vegetate levelled and top-soiled areas as soon as possible.* • *Continue to use dust suppression on unpaved roads.*	• Environmental Coordinator • Closure and Rehabilitation Coordinator • CED Manager	• Closure and Rehabilitation Plan • Complaints register to record complaints regarding nuisance dust • Dust monitoring records • Dust suppression			✓		*Der Brochen Project EMP Amendment: Raising of Helena Tailings Storage Facility EIA and EMP (SRK Consulting Report No. 475423/EIA/EMP; September 2014)*
D8		Dust generation from the Mareesburg, Helena and Co-Disposal TSFs.	• To prevent. Minimise wind-blown dust from the TSFs	• Cladding/ vegetation and rehabilitation of Tailings Storage Facility. • Regular inspection of vegetation establishment.	• Rehabilitation Officer • Environmental Coordinator	• Rehabilitation Plan. • Complaints register to record complaints regarding nuisance dust. • Dust monitoring records • Dust suppression.			✓		*Environmental Management Programme Report for the Der Brochen Mine Volume 1 of 3 (SRK Consulting Report No. 295606/4/ November 2002)* *Der Brochen Mine: Environmental Impact Assessment Report and Environmental Management Programme (SRK Consulting Report No. 343158/ April 2005)*
D9	Noise	Increase in ambient noise levels	• To minimise noise pollution during demolition activities	• *Demolition and rehabilitation activities will be confined to daylight hours.* • *Vehicles will be serviced at regular intervals to minimise noise generation.*	• Environmental Coordinator • SHE Manager • CED Manager	• Noise monitoring records. • Complaints register to record complaints regarding noise pollution			✓		*Der Brochen Project EMP Amendment:: Raising of Helena Tailings Storage Facility EIA and EMP (SRK Consulting Report No. 475423/EIA/EMP; September 2014)*

Table 8-19: Environmental Management Programme for the Decommissioning and Closure of the Der Brochen Project and associated infrastructure

Impact Reference No.	Aspect	Impact	Management Objectives	Management Measures/ Actions	Responsible Party	Performance Criteria to be adhered to	Project Phase C	O	D	PC	Source
Decommissioning and Closure of the Der Brochen Project and associated infrastructure											
D10	Topography	Changes in topography	• To rehabilitate the Project area to blend into the natural environment as much as possible, • To ensure that the area is free draining at Closure.	• Shape mound from backfilled Open Pits to be free-draining. • Cover the mound with topsoil and revegetate.	• Rehabilitation Officer • Environmental Coordinator	• Establishment of vegetation • Closure and Rehabilitation Plan			✓		New impact
D11	Soils, Land Capability and Land Use	Loss of soil resources due to erosion	• To prevent/ minimise soil erosion in Project the area.	• Compilation/ update of a detailed Closure Management Plan. • *Building foundations will be removed to a depth of 1 m. All land exposed by the demolition of infrastructure and other land disturbed by the mine's activities will be rehabilitated.* • *Rehabilitation of the surfaces which are disturbed within the proposed Mining Authorisation area will be carried out in compliance with the Environmental Management Plan (as detailed in the Environmental Management Plan Report (EMPR)) and in terms of Anglo Platinum's environmental policy and procedures. This will entail both an ongoing process as well as specific work during and after mine closure.* • *On closure, disused infrastructure will be demolished and the site will be rehabilitated. The available stockpiled soil will be used during this rehabilitation exercise.* • *Disturbed areas will be rehabilitated through landscaping, soil replacement and the establishment of vegetation. Where practical, rehabilitation will take place during the life of the mine (construction, operational and decommissioning phases).* • *The soil which has been conserved in stockpiles will be used strategically in the rehabilitation of disturbed land.* • *Vegetation establishment in disturbed areas will be undertaken as soon as is practical, with growing season and water availability being the primary time constraints.*	• Rehabilitation Officer • Environmental Coordinator	• Closure and Rehabilitation Plan			✓		*Environmental Management Programme Report for the Der Brochen Mine Volume 1 of 3 (SRK Consulting Report No. 295606/4/ November 2002)*
D12	Surface Water	Deterioration of surface water quality due to increased sediment loads as a result of erosion	• To prevent/ minimise deterioration in surface water quality.	• A stormwater management plan will be implemented up until Closure Phase. This will include diversion of clean water around demolition sites and containment of dirty water on site.	• Environmental Coordinator	• Stormwater Management Plan • Closure and Rehabilitation Plan			✓		New impact
D13		Deterioration of surface water quality due to contamination of runoff by oil and fuel spills and leaks, and other demolition activities	• To avoid or where not possible, minimise and remedy pollution of water during operations.	• A leak/spill detection plan will be devised and implemented for all possible areas of leak/spillage within the demolition site.	• Environmental Coordinator	• Leak/spill clean-up procedure			✓		New impact
D14	Air Quality	Increased nuisance dust during Decommissioning and Closure	• To minimise the amount of dry material	• Water sprays will be applied where vehicle activity is high. • Ensure site is restored to pre-mining	• Environmental Coordinator	• Closure and Rehabilitation Plan. • Complaints register			✓		Air Quality Specialist Report for the Der Brochen EMP

Impact Reference No.	Aspect	Impact	Management Objectives	Management Measures/ Actions	Responsible Party	Performance Criteria to be adhered to	Project Phase				Source
							C	O	D	PC	
Decommissioning and Closure of the Der Brochen Project and associated infrastructure											
			susceptible to wind erosion. • To minimise the entrainment potential of dust. • To respond with corrective action to public complaints about dust related health and nuisance impacts.	conditions.		• Dust monitoring records					Alignment and Amendment (Airshed Report No. 13SRK25, September 2014)
D15	Noise	Increase in ambient noise levels as a result of demolition activities	• To minimise noise pollution	• Demolition activities will be confined to daylight hours. • A noise monitoring programme will be implemented during Decommissioning and Closure activities. • Heavy vehicles will be serviced at regular intervals to minimise noise generation.	• Environmental Coordinator	• Closure and Rehabilitation Plan • Noise Monitoring Programme. • Noise monitoring reports • Complaints register			✓		New impact

Table 8-20: Environmental Management Programme for the social impacts envisaged during Decommissioning and Closure

Impact Reference No.	Aspect	Impact	Management Objectives	Management Measures/ Actions	Responsible Party	Performance Criteria to be adhered to	Project Phase				Source
							C	O	D	PC	
Socio-economic impacts during Decommissioning and Closure											
D16	Socio-economic	Sustainability of livelihoods at mine closure	• To minimise the reversal of benefits that have accrued through the life of the Project	• *Der Brochen will commission a socio-economic investigation of the impact of mine closure at least 15 years in advance of the event to estimate short term, medium term and long terms impacts of mine closure. The recommendations of the study will be implemented.* • AAP will meet the SLP requirements and commitments for downscaling and retrenchments, including the establishment, implementation and monitoring of a Future Forum. • Identify potential employees in the study area (local) for further training with a view to increasing their potential for being employed at other AAP operations or other mines in the area following cessation of operations at Der Brochen.	• CED Manager • Project Manager	• Closure and Rehabilitation Plan. • Social and Labour Plan (SLP) • Socio-Economic Assessment Toolbox (SEAT)			✓		*Environmental Management Programme Report for the Der Brochen Mine Volume 1 of 3 (SRK Consulting Report No. 295606/4/ November 2002)* *Chrome Plant- Helena 6 JT, Eastern Limb of the Bushveld Complex, Mpumalanga, South Africa Final EIAR and EMP (ERM, May 2006*
D17		Negative social and socio-economic impacts as a result of mine decommissioning and closure	• To minimise the reversal of benefits that have accrued through the life of the Project	• *The Social and Labour Plan (SLP) developed by Der Brochen includes management measures for downscaling and retrenchment and will be implemented. Management includes the establishment of forums, mechanisms to ameliorate social and economic impacts on individuals and* contractors considering *mechanisms for creating alternative solutions for creating job security on closure.*	• CED Manager • Project Manager	• Closure and Rehabilitation Plan. • Social and Labour Plan (SLP) • SEAT			✓		*Der Brochen Mine: Environmental Impact Assessment Report and Environmental Management Programme (SRK Consulting Report No. 343158/ April 2005)*

Table 8-21: Environmental Management Programme for Post-Closure Phase of the Der Brochen Project

Impact Reference No.	Aspect	Impact	Management Objectives	Management Measures/ Actions	Responsible Party	Performance Criteria to be adhered to	Project Phase				Source
							C	O	D	PC	
Post-Closure management measures at Der Brochen											
PC1	Soils, Land Capability and Land Use	Long-term stability of rehabilitated land	• To revegetate the Tailings Dams	• *The mine intends to revegetate the Tailings Dam utilising a practical revegetation programme which will ensure adequate rehabilitation and stability of the dams.* • *Monitoring of the Tailings Dams will be carried out to ensure overall stability. Areas where instability is encountered will be addressed by the mine in an appropriate manner.*	• Rehabilitation Officer • Environmental Coordinator	• Closure and Rehabilitation Plan • Establishment of vegetation				✓	*Environmental Management Programme Report for the Der Brochen Mine Volume 1 of 3 (SRK Consulting Report No. 295606/4/ November 2002)*
PC2	Surface Water	Potential for acid mine drainage or poor quality leachate emanating from mine residue deposits	• To prevent/ minimise acid mine drainage from tailings material.	• *Acid Mine Drainage (AMD) tests will be undertaken on tailings material in the mine lease area.* • *The acid generation potential of the tailings is to be tested to confirm AMD potential, together with the potential for salinity production by the proposed tailings.*	• Environmental Coordinator • Project Manager	• Geochemical analysis of tailings material • Lining of Tailings Dam			✓	✓	*Environmental Management Programme Report for the Der Brochen Mine Volume 1 of 3 (SRK Consulting Report No. 295606/4/ November 2002)*
PC3	Groundwater	Contaminant plume migration (deterioration of groundwater and surface water quality)	• To prevent/ minimise the spread of the groundwater pollution plume towards surface water bodies.	• *Install a lining system of either composite clay or HDPE.* • *Seepage collection drains will be considered.* • *Rehabilitation and capping of the facility to reduce seepages after closure.*	• Environmental Coordinator • Project Manager	• Groundwater monitoring reports • Modelling of pollution plume	✓	✓	✓	✓	Der Brochen Project- Groundwater Investigation and Model Report (Delta H Report No. 2013.027-01, October 2014)
PC4		Dewatering of mine void (Reduction in borehole yield and river baseflow)	• Minimise reduction in borehole yield and river baseflow	• *Continuous water level monitoring.* • *Replacement of water supply boreholes in event of yield losses.*	• Environmental Coordinator • Project manager	• Backfilling of Open Pits with either tailings material or waste rock will lead to the re-establishment of groundwater levels, flow direction and flow gradients to near pre-mining levels				✓	
PC5		Contaminant plume migration (deterioration of groundwater and surface water quality)		• *Refer to Impact Reference PC3 in this table for applicable management measures.*						✓	

Table 8-22: Environmental Management Programme for the Potential Failure of the Mareesburg, Helena or Co-Disposal Facility

Impact Reference No.	Aspect	Impact	Management Objectives	Management Measures/ Actions	Responsible Party	Performance Criteria to be adhered to	Project Phase C	O	D	PC	Source
Potential Failure of the Mareesburg, Helena or Co-Disposal TSF											
F1	Soils, Land Capability and Land Use	Loss and contamination of soil resources due to failure of TSF	• To prevent the failure of the TSFs	• *Ensure that the raising of the Helena TSF, the CDF and the Mareesburg TSF are designed by professional and experienced engineers.* • *Operate the TSFs as per the Operational Manual and undertake regular monitoring of its stability as described in Section 4.4.2* • *Develop an Emergency Preparedness and Response Plan,* which will include relevant communication mechanisms with key stakeholders, *to be implemented should there be signs of distress in the TSFs.* • *As the Leshaba community makes use of water from the Dwars River, should this supply be contaminated by a tailings spill or failure, the water supply will be replaced by RPM.*	• Project Engineer • Project Manager • SHE Manager • Environmental Coordinator • CED Manager	• Emergency Preparedness and Response Plan • Operations manual for operating a TSF • Engineering designs		✓	✓		*Der Brochen Project EMP Amendment:: Raising of Helena Tailings Storage Facility EIA and EMP (SRK Consulting Report No. 475423/EIA/EMP; September 2014)*
F2	Biodiversity	Loss of biodiversity due to the deposition of tailings material on banks and within the Groot-Dwars River and Mareesburg Stream flowing into the Dwars River due to the failure of the TSF						✓	✓		
F3	Wetlands	Loss of riparian vegetation						✓	✓		New impact
F4	Surface Water	Contamination of surface water resources						✓	✓		*Der Brochen Project EMP Amendment:: Raising of Helena Tailings Storage Facility EIA and EMP (SRK Consulting Report No. 475423/EIA/EMP; September 2014)*
F5	Cultural Heritage	Impact on culturally significant heritage sites						✓	✓		
F6	Visual	Decrease in visual aesthetics to the area						✓	✓		
F7	Traffic and Transportation	Disruptions to existing road networks						✓	✓		

Table 8-23: Environmental Management Programme for the Socio-economic Impacts Associated with the Potential Failure of the Mareesburg, Helena or Co-Disposal Facility

Impact Reference No.	Aspect	Impact	Management Objectives	Management Measures/ Actions	Responsible Party	Performance Criteria to be adhered to	Project Phase				Source
							C	O	D	PC	
Socio-economic impacts associated with the potential failure of the Mareesburg, Helena or Co-Disposal TSF											
F8	Socio-economic	Disruptions to mining activities and communities within the TSF Zone of Influence		• *Ensure that the raising of the TSF is designed by professional and experienced engineers.* • *Operate the TSF as per the Operational Manual and undertake regular monitoring of its stability;* • *Develop an Emergency Preparedness and Response Plan to be implemented should there be signs of distress in the TSF.* ***Decline shaft complex (Helena TSF):*** • *Construct a flow diversion structure at the location of the riverside edge of the working platform at the Helena Chrome working decline shaft.* ***Mine vent shaft complex (Helena TSF):*** • *Construct a flow diversion structure to divert tailings flow around the vent shaft.* ***Communities*** • *Develop an Emergency Preparedness and Response Plan to inform the Leshaba* and Mankge communities *timeously should the Helena TSF,* Mareesburg TSF or Co-Disposal Facility fail. • The Leshaba community on the low reaches of the right bank of the Groot-Dwars River falls marginally outside the zone of influence of the Mareesburg TSF. To divert any potential flow of tailings material away from the existing and any potential future dwellings, a flow diversion berm should be constructed on the eastern side of the settlement. ***General*** • *Should the TSF fail, tailings material will be cleaned up timeously and remediated immediately.*	• Project Engineer • Project Manager • SHE Manager • Environmental Coordinator • CED Manager	• Emergency Preparedness and Response Plan • Operations manual for operating a TSF • Engineering designs		✓	✓		*Der Brochen Project EMP Amendment:: Raising of Helena Tailings Storage Facility EIA and EMP (SRK Consulting Report No. 475423/EIA/EMP; September 2014)*

8.3 Environmental Monitoring Programmes

The key to the success of environmental management lies in the effective implementation of the proposed mitigation and management measures. Monitoring provides qualitative and quantitative information pertaining to the possible impacts of the development on the environment, and enables the measurement of the effectiveness of environmental management measures.

8.3.1 Environmental monitoring programmes

Monitoring programmes have been developed for several aspects of the environment that will be potentially impacted upon by the proposed activities at Der Brochen. These monitoring programmes will allow the proposed mine to monitor its compliance with the approved EMP for the proposed mining and related activities. The following monitoring programmes have been developed for the Der Brochen Project, and as described in more detail in Table 8-2.:

- Surface water and groundwater monitoring;
- Biodiversity monitoring (Flora, Fauna and Aquatic Ecosystems);
- Air quality monitoring; and
- Post rehabilitation monitoring.

The monitoring points referred to are shown on Figure 8-1.

Table 8-24: Environmental Monitoring Programmes for the Der Brochen Project

<table>
<tr><th>Environmental Aspect</th><th>Monitoring objectives</th><th>Parameters</th><th>Location</th><th>Frequency</th></tr>
<tr><td rowspan="6">Surface Water Quality</td><td rowspan="6">To ensure that:
• The water management systems perform according to specifications;
• To act as an early warning system for pollution; and
• To check compliance with license requirements and for reporting purposes.</td><td>• pH;
• Electrical Conductivity (EC);
• Total Dissolved Solids (TDS); and
• Suspended solids.</td><td rowspan="6">Up and down stream of construction activities:
<u>Monitoring points:</u>
Dwars upstream: 30.11963; -25.02360
Dwars downstream: 30.12122; -25.01064
G_Drs2: 30.12057; -25.04964
G_Drs3: 30.13244; -24.99895
G_Drs4: 30.13767; -24.96257
G_Drs5: 30.12488; -25.00608
M1: 30.14362; -24.99450
K_Drs1: 30.07225; -25.01235
K_Drs2: 30.08122; -24.98573</td><td>Weekly sampling for three months after construction</td></tr>
<tr><td>Temperature</td><td>Daily</td></tr>
<tr><td>Humidity</td><td>Daily</td></tr>
<tr><td>Rainfall</td><td>Daily</td></tr>
<tr><td>Wind speed</td><td>Daily</td></tr>
<tr><td>Wind direction</td><td>Daily</td></tr>
<tr><td rowspan="2">Groundwater</td><td rowspan="2">To ensure that:
• The water management systems perform according to specifications;
• To act as an early warning system for pollution; and
• To check compliance with license requirements and for reporting purposes.</td><td>• Groundwater level</td><td>DB-BH07: (newly drilled)*30.12030-25.04650
HEGW15*: 30.12014-25.02566
HEGW27*: 30.12022 -25.02763
HEGW28*: 30.11720 -25.03269
HEGW31 30.11989 -25.04146
HEGW32: 30.11954 -25.04000
HEGW60: 30.12066 -25.03167
HEGW61: 30.12041 -25.03017
HEGW63: 30.12007 -25.03689
HEGW66: 30.12073 -25.02434
* included into the groundwater quality monitoring programme</td><td>Monthly</td></tr>
<tr><td>• Groundwater level
• Groundwater quality
o Physico-chemical parameters (pH, EC, TDS);
o Major anions (F, Cl, NO_3, SO_4, HCO_3);
o Major cations (K, Na, Mg, Ca); and
o ICP scan for metals</td><td><u>Helena TSF and Mototolo Concentrator</u>
MBH1: -25.01117 30.11668
MBH2: -25.01120 30.11692
MBH3: -25.02144 30.11663
MBH4: -25.01103 30.11851
MBH5: -25.02170 30.11804
MBH6: -25.00933 30.11700
MBH7: -25.01267 30.11042
MBH7R: -25.01100 30.11100
MBH8: -25.01300 30.11600
MBH9: -25.01800 30.11700
MBH10: -25.01900 30.11900
MBH11: -25.02300 30.11200
<u>Co-Disposal Facility and North Pit</u>
HE27: 30.11266 -25.02990
HEGW03: 30.11762 -25.02346
HEGW15*: 30.12014 -25.02566
HEGW20: 30.11769 -25.03407
HEGW23: 30.11566 -25.02264
HEGW27*: 30.12022 -25.02763
HEGW28*: 30.11720 -25.03269
HEGW32*: 30.11954 -25.04000
HEGW76: 30.11663 -25.02201
HEGW88: 30.11947 -25.02287
HEGW93: 30.11775 -25.03005</td><td>Quarterly</td></tr>
</table>

Environmental Aspect	Monitoring objectives	Parameters	Location	Frequency
			South Pit: HEGW98: 30.11994 -25.04439 **Mareesburg TSF:** MBGW03: 30.14283 -25.00460 MBGW15: 30.14189 -25.01207 HEGW40: 30.14470 -25.01541 MBGW10: 30.14511 -25.01655 MBGW01: 30.14967 -25.00758 MBGW14: 30.14446 -25.01948	
Biodiversity	To ensure that there is a continual flow of data, enabling all parties involved to accurately assess and manage biodiversity related progress and issues.	Flora	As per the BAP	Annually in the summer growing season.
		Fauna	As per the BAP	Annually in the summer growing season.
		Aquatic ecosystems: • pH; • Conductivity; • Dissolved oxygen; • Temperature; • Index of Habitat Integrity (IHI) • Present Ecological State (PES); • Aquatic macro invertebrates (SASS5); • Macro-invertebrate Response Assessment Index (MIRAI); • Habitat Cover Rating (HCR) and Fish Habitat Assessment (FHA); • Fish Response Assessment Index (FRAI)	**Biomonitoring points** GD2: 25° 05" 12.5 S, 30° 07" 29.9 E GD3: 25º 02" 26.6 S, 30º 07" 12.8 E GD4: 25º 00" 21.6 S, 30º 07" 28.3 E GD5: 24º 59" 26.3 S, 30º 08" 42.5 E T0: 25° 1'19.70" S, 30° 8'44.41"E T1: 24º 59" 35.3 S, 30º 08" 37.7 E	Every six months, once in Spring and once in Autumn.
Air Quality	The objectives of the Air Quality monitoring programme are to: • Establish a regular and up-to-date monitoring programme for significant emissions (point and fugitive) arising from the operations activities, products and services; • Monitor emissions to air; and • Monitor the ambient concentrations of the air pollutants of concern in locations where members of the public may be exposed at a frequency or duration which could influence averaging periods of the EC Limit Values.	Dust fallout, PM_{10} and $PM_{2.5}$	**Dust bucket locations** S1: S25.03136, E30.11570 S2: S25.02517, E30.11024 S3: S25.04228, E30.11503 S4: S25.02823, E30.11790 S5: S25.00789, E30.15049 S6: S25.03117, E30.12504 S7: S24.98050, E30.08749 S8: S24.99958, E30.07391 D1: S25.02823, E30.12102 D2: S25.00480, E30.12102	Monthly
Noise	The objectives of the noise monitoring programme are to: • Monitor noise for the first year of operation; • Monitor noise at locations of the closest noise-sensitive developments; and • Monitor noise every time a noise complaint is registered.	• L_{AeqT}: The Equivalent A-weighted noise level (dBA), similar to an average noise level noise level during the measurement period (T); • L_{A90}: The noise level exceeded for 90% of the time, general representative of the steady background noise at a location. • L_{Amax}: the instantaneous maximum sound level (dBA) measured during the sample period; • L_{Amin}: the minimum sound pressure (dBA) measured during the sample period; • Average wind speed (m/s); and • Max wind speed (m/s).	**Noise monitoring points** DBBN01: -25.070501°, 30.114244° DBBN02: -25.043582°, 30.117927° DBBN03: -25.032095°, 30.115345° DBBN04: -25.035380°, 30.117920° DBBN05: -25.019747°, 30.118951° DBBN06: -25.003689°, 30.122287°	Quarterly
Post Rehabilitation	The objective of the post rehabilitation programme is to track the recovery of the site towards the long-term post-closure land use goals, in accordance with the overall closure	Surface water: • As required by WUL	To be determined upon Closure of the Der Brochen Project	Sampled monthly for a three year post-closure

Environmental Aspect	Monitoring objectives	Parameters	Location	Frequency
	objectives. The monitoring programme will be designed to collect information to demonstrate that the Relinquishment criteria have been achieved.			period
		Groundwater: • Shallow and deep aquifers against parameters required by WUL		Sampled quarterly for a three year post-closure period
		Erosion: • Determine erosion rate		Once a year at the end of the wet season for a three year post-closure period
		Vegetation establishment: • Standard field techniques used to determine whether the vegetation has been established with a species composition and density similar to that of a reference analogue site established in a similar ecotype		For a three year post-closure period
		Biomonitoring: • Upstream and downstream of mining activities • Monitor physico-chemical and biological components of the aquatic ecosystems within the mining area. An appropriate biological index will also be included in order to quantify and classify the longer-term changes in biotic integrity		For a three year post-closure period
		Reclamation Performance: • Comparing the reclaimed areas to analogue sites of pre-mining vegetation where vegetation and soil chemical and physical properties are measured		For a three year post-closure period

Figure 8-1: Environmental Monitoring Points for Der Brochen

8.4 EMP Performance Assessment

Regulation 55 (2)(b) of the MPRDA stipulates that an EMP performance assessment must be undertaken every two years, or as required by the Minister, by an external auditor.

Once operational, internal environmental inspections will need to be done once a week by the mine's Environmental personnel. An internal peer audit is done at least once a year by Anglo American Platinum Environmental Services. This involves environmental personnel from other mines coming to audit the mine on the EMS and other environmental parameters.

8.5 Environmental Emergencies and Remediation Procedures

An Emergency Preparedness and Response Plan (EPRP) entails an integrated systems approach to the prevention and management of emergencies. It is compiled for the implementation in emergency situations such as oil or fuel leaks and spills, fires, sewage spillage. The EPRP includes requirements to contact the Environmental Coordinator following an emergency or incident.

An EPRP should include:

- Organizational intent and commitment (corporate policy, management commitment and leadership);
- Risk management (identification, assessment and control of hazards and risks);
- Definition of measures to manage an unplanned event, incident or emergency;
- Definition of emergency organization (strategies, structure, staffing, skills, systems and procedures);
- Provision of facilities, equipment, supplies and materials;
- Training of personnel in the identification, containment and notification of incidents and their roles in the mobilization, deployment and post-incident activities;
- Evaluation and enhancement of the overall system through regular auditing procedures and trials;
- Periodic risk and capability reassessment; and
- Critique and evaluation of the response in the event of an emergency, coupled with necessary system enhancement.

The EPRP should also include an action plan for the following aspects:

- Emergency preparedness measures;
- Detection and early warning systems;
- Communication systems;
- Emergency medical care;
- Evacuation and escape procedures;
- Emergency response measures;
- Rescue and response capabilities;
- Management of emergencies; and
- Reporting and recording.

The EPRP is subject to annual review and updating with records being retained of key changes, and those responsible for changes. A protocol for distribution and accessibility of components of the plan will need to be developed should aspects of the plan require confidentiality, such as for security reasons.

8.6 Environmental Awareness Plan

Section 39 (3) (c) of the MPRDA states that:

(3) An applicant who prepares and environmental management programme or an environmental management plan must –

(c) develop and environmental awareness plan describing the manner in which the applicant intends to inform his or her employees of any environmental risks which may result from their work and the manner in which he risks must be dealt with in order to avoid pollution or the degradation of the environment.

RPM is committed to identifying training needs and ensuring that all personnel whose work may create a significant impact upon the environment receive appropriate training. The Environmental Awareness Plan describes the training available and the manner in which environmental training needs are identified and continually reassessed.

8.6.1 Purpose

The purpose of the Environmental Awareness Plan is as follows:

- To ensure that staff are competent through Environmental training. Competence will only be proven through assessments;
- Training is essential to ensure that the responsibilities in the Environmental Management System (EMS) can be fulfilled at each relevant function and level, and to meet the challenge of continual improvement. It is essential that key personnel whose work may create a significant impact on the Environment be trained;
- Resources for training should ensure that adequate competent personnel are available to cover any eventuality;
- To explain and aid personnel involved in training with regards to the EMS; and
- To clarify the EMS training and ensure that all employees are correctly instructed with regards the environment.

8.6.2 Scope

This section sets out the mine's training objectives with regard to environmental awareness and EMS (Table 8-25). It contains no detail on the actual training initiatives, but rather serves to ensure that a responsible person is appointed to deal with and increase environmental awareness on the mine.

Table 8-25: Environmental Awareness Plan

No	Activity / Procedure	Roles and responsibility
1	**GENERAL**	
1.1	Awareness training must include the potential consequences of departure from specified operating procedures as well as significant environmental impacts, actual or potential, of their work activities.	
1.2	Training will be appropriate to the activity of individual employees.	
2	**INDUCTION PROGRAMME**	
2.1	Training programmes shall, be established and maintained for colliery personnel contractors and visitors, refer to Training, Competency & Awareness IIMS SP 1.006. Training shall include the following: Administrative requirements and procedures which will include the Emergency Procedures. Resource conservation and environmental reporting and general environmental awareness for mine related environmental issues.	Environmental Coordinator & Training Manager
2.2	Contractors that are employed on the colliery must, prior to any starting of working activities, complete the contractor's pack. This package requires the contractor to perform Safety, Health and Environment (SHE) Risk assessments on the activities to be undertaken. The entire risk assessment process and the applicable EMS procedures are referenced within the contractor's package.	
2.3	Environmental Induction slides/presentation shall be revised annually. Induction is valid for the period of one year hence refresher shall be done after 365 days or following annual leave.	All employees and contractors
2.4	Reporting of oil spills and incidents shall form part of induction program.	Environmental Coordinator
3	**TRAINING NEEDS**	
3.1	Training and awareness needs shall be identified as per the significant impact per job category. • Training needs shall be identified through: • Performance appraisal; • Analysis of non-conformances and incidents;	Training Manager and Section Heads

	• Audit findings and recommendations; • At time of recruitment (in the work place); • Training needs analysis; • Impact/Aspect Register • Additions to scope in services provided; • The updating of procedures (quality, technical and administrative). Training needs will also be identified through work performance, request by employee and work area review as per to Training, Competency & Awareness IIMS SP 1.006.	
3.2	Once training needs have been established it is up to the supervisor to notify the Training Department of the requirements. The training department will then identify pertinent and relevant courses (if not already done so by employee/supervisor) and schedule training accordingly.	Training Manager and Section Heads
3.3	A training matrix will be generated from Training needs analysis. Monthly Environmental Theme will be distributed to all in the mine including contractors.	Environmental Co-ordinator, Section Heads & SHE Document Controller
3.4	Environmental Days celebrations are done to enhance awareness to employees and local communities (Water week, environmental Week, Arbour week etc.) Daily Safety, Health and Environmental Report (SHERMAN Report) bulletin is used to communicate environmental tips to all employees.	Environmental Co-ordinator
4	**<u>TRAINING PLANNING</u>**	
4.1	Identified and agreed training needs shall be included in budgets and processed as described below. Course attendance (other than at the internal induction courses) shall be scheduled on the basis of the importance of task contribution to the maintenance, effectiveness and improvement of the objectives.	Section Heads
4.2	Training expenses, including conferences and symposia would be checked and approved by the Head of Department. The Training Department shall complete a course authorisation form and ensure that the procedures are followed regarding course bookings, confirmations and payments.	Section Heads & Training Department
4.3	The Trainee shall : • Obtain approval from the Head of Department	HODs

	• Request Training Department to make official booking.	
4.4	External training courses shall be assessed through : • Attendance by, and the formal reports and recommendations of, staff • Recommendation by known competent external personnel • Review of course content, presenters, location and facilities by knowledgeable personnel	Training Manager And Section Heads
5	**<u>EMS TRAINING</u>**	
5.1	***Mine Personnel:*** All employees, current or new, and contractors will undergo induction, a part of which is environmental awareness training and includes the Safety, Health and Environmental policy. Depending on a person's job category training will be performed on significant aspects pertinent to his/her area of work. At the end of this training, personnel will be required to complete the awareness test and the level of awareness assessed by the Training Department. Re-testing or induction may be required if test was failed. All personnel performing tasks which can cause significant or major environmental impacts shall be competent on the basis of training, education and/or experience.	Training Manager
5.2	***Visitors:*** All visitors to any controlled access areas of the mine will undertake a short "visitors' induction", which highlights the main safety and environmental aspects relevant to short term visitors at the mine.	Training Instructor
5.3	***EMS Representatives:*** The EMS Representatives shall have additional EMS knowledge requirements. The EMS Representatives shall receive the training required to manage the EMS efficiently in their areas of responsibility. Such skills include the operation of the SHE legal register and the electronic database (PIVOT V6-Training Manual 1.03), as well as thorough knowledge of the environmental procedures.	Section Heads
5.4	***Standard Procedures:*** Employees and contractors shall be made aware of Environmental Standard Operating procedure related to their activities which might have environmental impacts e.g. waste management, oil management etc.	Environmental Coordinator
5.5	***Evaluation and Competence:*** **<u>Definition:</u>** The Training Department and Line Management's role is to ensure that all mine regulations and procedures required by the various indicated legislation (paragraph 6) are such that theoretical knowledge and operational skills all pivot around	Section Heads

	competency. A competent person means a person who: 1. a) is qualified by virtue of his/her knowledge, training, skills and experience to organise the work and its performance; b) is familiar with the provisions of legislation applicable to his/her work; c) has been trained to recognise any potential or actual danger (significant aspects) to the environment, but also safety and health, in the performance of the work; and/or 2. is in the possession of the appropriate certificates of competency where such certificate is required by these regulations or legislations. • Competency does not merely mean showing or training an employee on a task so that he knows how to do it. • Proving competency, the employee must know the Who, What, When, How and Why pertaining to the task as well as the hazards and risks associated with performing the task. Capacity and awareness training will be carried out by Environmental Coordinator and Training Manager and evaluation of awareness and competency training (implementation of training in the work place) will be carried out by the Line Managers through PTOs or through approved accredited training providers. Awareness and competence will also be reviewed during audits, events of an emergency, and incident. Typical competence assessments include training programmes both formal and informal, PTOs, questioning employees, experience, checklists, qualifications and ability to do the work. Gaps identified shall be referred to Training department.	
5.6	This awareness plan shall be kept up to date.	Training Manager and Environmental Coordinator

8.6.3 Records

The following records will be maintained by the Training Department:

- Personnel qualifications;
- Training needs and Training Matrix;
- Certificates;
- Licenses;
- Training programmes/courses attended; and
- Staff induction.

Copies of checklists and Planned Task Observation will be kept by the relevant sections and the training department.

All foregoing records will be maintained in the employee's personnel files, Training Department records section and Site Manager's records where applicable.

Induction training is the responsibility of the Training Manager as well as all other forms of external training facilities/courses/venues etc. EMS training is co-responsibility shared with the Environmental Co-ordinator.

9 Closure and Financial Provision

9.1 Closure Plan

The Closure Plan is a requirement in terms of MPRDA Regulation 56 which states that:

In accordance with applicable legislative requirements for mine closure, the holder of a prospecting right, mining right, retention permit or mining permit must ensure that-

a) *the closure of its mining operation incorporates a process which starts at the commencement of operation and continues throughout the life of mine;*

b) *risks pertaining to environmental impact are quantified and managed proactively, which includes gathering relevant information throughout the mine's operations;*

c) *safety and health requirements of the Mine Health and Safety Act 29 of 1996 are complied with;*

d) *residual and possible latent environmental impacts are identified and quantified;*

e) *the land is rehabilitated, as far as practicable, to its natural state, or to a predetermined and agreed standard or land use which conforms with the concept of sustainable development; and*

f) *mining operations are closed efficiently and cost effectively.*

The sections below outline the closure plan for the Der Brochen Project. The full Closure Plan for the Der Brochen Project is available in Appendix C11.

9.2 Closure Vision

The overall closure goal for the De Brochen project area is to progressively re-instate an area that is safe, stable, and non-polluting with the final landform not adversely affecting water resources.

9.3 Closure Objectives

The following closure objectives have been developed to support the closure vision for the Der Brochen Project.

- Decommissioning all surface infrastructure that has no beneficial post-closure use;
- Identify potential post-closure uses of the land occupied by mine infrastructure in consultation with the surrounding land owners and land users. Should a suitable use for mine infrastructure not be found, it will be removed;
- Rehabilitate all disturbed land to a state that is suitable for its post-closure uses;
- Rehabilitate all disturbed land to a state that facilitates compliance with applicable environmental quality objectives (air quality objectives and water quality guidelines);
- Reduce the visual impact of the site through rehabilitation of all disturbed land and residue deposits;
- Reclamation that results in landforms that emulate the surroundings and would facilitate drainage and ensuring that all other remaining embankments are shaped and trimmed and that these are free draining; and
- Rehabilitate all disturbed land and residue deposits to a state where post-closure management is minimised.

9.4 Post Closure Land Use

Post closure land use (PCLU) is normally determined in consultation with stakeholders so that the PCLU meets the requirements of the stakeholders, within the context of the closure plan. This activity is normally undertaken for the whole mine lease area affected by mining activities and integrates stakeholder requirements with risk mitigation.

Identify potential post-closure uses of the land occupied by mine infrastructure in consultation with the surrounding land owners and land users (this is to be done during the Operational Phase). Should a suitable use for mine infrastructure not be found, it will be removed.

The closure framework for the Der Brochen Project is not specific regarding PCLU and requires PCLU to be developed as mining progresses during operations. However, for purposes of current planning and liability costing, the assumption is made that post rehabilitation and closure, the land use and capability that existed prior to the development, will be returned.

9.5 Environmental issues affecting rehabilitation

To guide rehabilitation activities it is necessary to understand the potential issues that would require addressing once the life of project is completed. The issues listed below are not necessarily those that are identified at the impact assessment phase, as SRK assumes that management measures would be included in project design to address the issues. Rather, the issues listed below are those that potentially may exist at the end of the life of mine and therefore would require mitigation:

Given the steep topography of the region, water management post closure is going to be a key component of the closure plan. There will be a requirement to divert clean runoff away from the mine residue facilities that remain in the landscape in a manner where the rehabilitation activities on the facilities are not impacted. Footprints where infrastructure is demolished, soils replaced and vegetation established will also require protection from erosion;

Closure material is going to be required to place growth medium covers over footprints once demolition is complete as well as on the backfilled Open Pits. As soil resources are naturally limited in the area, there may be a deficit of cover material at closure to utilise for closure activities particularly as a minimum depth of soil is required for vegetation establishment. This may necessitate the use of alternative growth media or importing soils from borrow Pits.

The MPRDA and the Department of Water Affairs and Forestry (DWAF, now the Department of Water and Sanitation) Best Practice Guidelines 5 (BGP) requires that a risk assessment process be adopted during closure planning, where all risks are initially identified, followed by an assessment of the potential residual risk remaining after the implementation. The approach to ranking these risks is dictated by the Anglo American Plc risk matrix assessment procedure where Safety (S), Environmental (E), Financial (F), Legal (L) and Reputational/Social (R) elements are considered. Table 9-1 describes the risks that are expected to exist at closure. Included in the table is the ranking of the element(s) that has the highest risk ranking according to the Anglo American Plc risk matrix. The last column in the table reflects the residual risk - post implementation of the actions. Refer to Section 9.1.5. The ranking of the risks is as per Table 9-2.

Table 9-1: Risks associated with the Project at closure

Risk	Initial Risk	Residual Risk
Trespassers falling down steep slopes and suffering injury or fatality.	Significant: L & S	Significant: L & S
Potential for drowning in water management structures	High: L & S	Significant: L & S
Dust emissions that exceed required standards	Medium: F & L	Low: F & L
Contact water with quality outside of licence conditions released to the environment	Medium: E & L	Low: E & L
Seepage to groundwater with quality outside of licence conditions	Medium: E & L	Low: E & L
Storage capacity on the top surface of TSF insufficient to manage storm events, resulting in uncontrolled releases from the top, or stability of the dam impacted on.	High: L	Low: L
Insufficient topsoil to return area to suitable post closure land use, with the result that closure vision not obtained and closure not granted by	Medium F	Low F

Risk	Initial Risk	Residual Risk
authority		
Backfilled pit not meeting PCLU	Medium F & R	Low F & R

Table 9-2: Risks ranking guideline

Risk Level	GUIDELINES FOR RISK MATRIX
H - High	A high risk exists that management's objectives may not be achieved. Appropriate mitigation strategy to be devised immediately.
S - Significant	A significant risk exists that management's objectives may not be achieved. Appropriate mitigation strategy to be devised as soon as possible.
M - Medium	A moderate risk exists that management's objectives may not be achieved. Appropriate mitigation strategy to be devised as part of the normal management process.
L - Low	A low risk exists that management's objectives may not be achieved. Monitor risk, no further mitigation required.

9.6 Rehabilitation Action Plan

The rehabilitation actions plan details the actions that the mine intends undertaking at the end of the life of the project. These actions are designed to comply with the requirements of this rehabilitation plan's objectives, as well as the requirements of Best Practice Guidelines (BPG). The following aspects at the Der Brochen Project have actions assigned to them to be undertaken during closure and rehabilitation. Appendix C11 details these actions.

- Tailings storage facilities:
  - Helena TSF;
  - Co-disposal TSF; and
  - Mareesburg TSF;
- Mototolo Concentrator, workshops, offices and associated infrastructure;
- Open Pits;
- Roads and parking areas;
- Stormwater management;
- Fuel storage and dispensing;
- Fencing and walling; and
- Vegetation and wildlife.

9.7 Relinquishment Criteria

Following the implementation of the closure actions described in Section 6, it is necessary to have measurable criteria against which to assess the effectiveness of the plan and its implementation. These criteria will assist RPM in identifying when the standard of closure achieved is sufficient to relinquish responsibility for a specific area. The site specific relinquishment criteria for the Der Brochen Project are documented in Table 9-3.

Also included in the table are the indicators required to demonstrate achievement with the relinquishment criteria and the reporting requirements. The reporting requirements are those that are expected to fulfil the monitoring requirements set out by legislation.

Table 9-3: Relinquishment Criteria

Category	Closure criteria	Indicators	Reporting requirements
Ground and Surface water	Compliance with the WUL	Downstream/gradient water quality monitoring	Monitoring report
Air	Compliance with the standards as per the National Environmental Management: Air Quality (Act 39 of 2004)	Records of air quality measurements for PM10 and PM2.5	Monitoring report
Soil quality	Soil quality as assessed against the Norms and Standards to support Chapter 8 of NEM:WA	Soil quality in areas where contamination is identified	Results of soil quality and risk assessment
Land productivity	Land capability and productivity similar to that which existed prior to mining	Land capability and productivity	Comparison to analogue areas and pre-mining aerial photographs
			Socio-economic survey with the focus on understanding the achieved productivity on closed areas that the communities may be utilising
Erosion	Implementation or construction of erosion control measures	Engineered structures to control water flow	Evidence in rehabilitation report that required structures are in place and functioning
		Establishment of vegetation	See Vegetation row in this table
Safety / stability	The site is safe for use by humans and animals, including in the foreseeable future	Geotechnical and hydrological studies of existing structures - outer batter slopes of tailings storage facilities, pit stability	Evidence in rehabilitation report that appropriate risk assessment has been undertaken and control measures are in place
Aquatic ecosystem	Wetland and aquatic macro invertebrate populations at crossing using appropriate biomonitoring techniques	Species and composition	Monitoring report
Vegetation	Establishment of self-sustaining vegetation population which stabilizes soils and is not invasive to the region.	Species cover and composition	Monitoring report

9.8 Post rehabilitation monitoring and maintenance

The objective of the monitoring programme will be to track the recovery of the site towards the long-term post-closure land use goals, in accordance with the overall closure objectives. The monitoring programme will be designed to collect information to demonstrate that the Relinquishment criteria have been achieved. The anticipated monitoring will include:

- Surface Water – Quality monitoring against parameters as required by the WUL. Sampled monthly for a three-year post-closure period;
- Groundwater – Quality monitoring of both the shallow and deep aquifers against the parameters required by the WUL. Sampled quarterly for a three year post-closure period;

- Erosion monitoring. This will take the form of developing a representative reference site on the disturbed both footprints and undertaking visual and topographic assessments to determine erosion rate, using standard erosion monitoring techniques. This will be undertaken once a year at the end of the wet season for a three year post-closure period;
- Vegetation establishment: Vegetation condition will be monitored using standard field techniques to determine whether the vegetation has been established with a species composition and density similar to that of a reference analogue site established in a similar ecotype, for a three year post-closure period; and
- Bio-monitoring: upstream and downstream of the mining activities. A long-term bio-monitoring programme will be implemented to monitor physico-chemical and biological components of the aquatic ecosystems within the mining area. Appropriate biological index will be included in order to quantify and classify the longer-term changes in biotic integrity.

9.9 Financial Provision

The closure liability for the closure of the aspects associated with the Der Brochen Project has been determined using the approach advocated in the Department of Minerals and Energy (DME) now the Department of Mineral Resources (DMR) Guideline Document for the Evaluation of the Quantum of Closure-Related Financial Provisions Provided by a Mine (2005).

The approach to calculating the closure quantum as specified in the DMR Guideline which was utilised in this assessment is as summarised as follows:

- Step 1: Determine the Mineral Mined
  - In the first step the mineral mined has been identified in the tables provided in the DMR guideline (Table B.12) as “Platinum.”
- Step 2A: Determine Primary Risk Class
  - The “Primary Risk Class” has been determined from Table B.12 of the DMR Guideline as “B (Medium Risk)”.
- Step 2B: Revision of Primary Risk Class
  - The Primary Risk Class can be revised on the basis of saleable by-products if required. However, this is not applicable at Der Brochen.
- Step 3: Determine Environmental Sensitivity
  - The “Environmental Sensitivity” has been determined by reference to Table B.4 of the DMR Guideline as “Medium”.
- Step 4.4 determination of weighting factors:
  - Weighting Factor 1: The nature of the terrain where the operation is located is rugged.
  - Weighting Factor 2: The proximity of the operation to an urban centre. In this instance the Der Brochen Project is considered remote.

As Mototolo Concentrator and the Helena TSF are already operational, the liability for these aspects is assessed on an annual basis by AAP and the provision for closure is adjusted on an annual basis with the DMR to cover the liability for closure of these aspects. The liability for the Mototolo Concentrator and existing Helena TSF was last assessed in June 2014 for an amount of R41 760 046. To cover this liability AAP and Xstrata have various Financial Guarantees (FGs)to cover the liability at Mototolo, as documented in Table 9-4.

Table 9-4: Financial Guarantees for Mototolo Concentrator

FG Number	Amount	Company
8951105475	R2 473 223	Xstrata
227-02-0009569	R2 473 223	Anglo Platinum
20651001861	R20 884 869	Xstrata
M513370	R20 884 869	Anglo Platinum

FG Number	Amount	Company
TOTAL		**R46 716 184**

The June 2014 assessment, however, did not include the change in liability as a result of increasing the height of the Helena TSF, nor did it include the Co-Disposal Facility, the Mareesburg TSF nor any of the other infrastructure associated with the Der Brochen Project.

Although the June 2014 assessment did not include the infrastructure mentioned above, for the approval of the 2002 EMP, AAP raised a number of FG to cover the liability as calculated in the 2002 EMP, with the FG still being in place. The details of the FG for the Der Brochen Project are presented in Table 9-5

Table 9-5: Financial Guarantees for Der Brochen

FG Number	Amount
M415303(07-11-2002)	R1 560 000
M436121 (21-04-2004)	R1 768 000
M449643 (07-04-2005)	R1 875 000
M491735 (30-05-2008)	R21 600 000
M526001 (23-05-2011)	R23 200 000
TOTAL	**R50 003 000**

As there are two potential scenarios for the closure of the Der Brochen Project, dependant on whether the Co-Disposal Facility is constructed or not, these scenarios have been summarised in the tables below. Table 9-6 is a summary of the liability for the scenario where the Co-Disposal Facility is not constructed and therefore includes the closure of:

- The Mototolo Concentrator;
- The raise on the Helena TSF;
- The Mareesburg TSF; and
- The closure of the northern and southern Open Pits and associated mining infrastructure at Der Brochen.

Table 9-7 is a summary of the liability for the scenario where the Co-Disposal Facility is constructed and therefore includes the closure of:

- The Mototolo Concentrator;
- The raise on the Helena TSF;
- The Mareesburg TSF;
- The Co-Disposal Facility; and
- The closure of the southern open pit and associated mining infrastructure at Der Brochen.

Table 9-6: Closure Liability Assessment for the Der Brochen Project (No Co-Disposal Facility)

Activity/ infrastructure	Amount
No Co Disposal	
Mototolo Concentrator	R 41 760 046
Helena TSF	R 782 594
Mareesburg TSF	R 54 156 975
Der Brochen infrastructure (including N & S Pits)	R 28 755 769
Total	**R 125 455 384**

Activity/ infrastructure	Amount
Existing Provision	***R 46 716 184***
Shortfall	**R 78 739 200**

Table 9-7: Closure Liability Assessment for the Der Brochen Project (including-disposal facility)

Activity/ infrastructure	Amount
Co-Disposal	
Mototolo Concentrator	R 41 760 046
Helena TSF	R 782 594
Mareesburg TSF	R 54 156 975
Co-Disposal TSF Lined	R 25 384 366
Der Brochen infrastructure (including the S pit)	R 16 105 305
Total	**R 138 189 287**
Existing Provision	***R 46 716 184***
Shortfall	**R 91 473 103**

Also included in the table above is the existing provision for the Mototolo Concentrator and the Der Brochen Project, which is then used to calculate the shortfall in the provision, with this being the amount that AAP is required to provide for the closure liability for the Der Brochen and Mototolo operations to be fully funded. Under the first scenario where the Co-Disposal Facility is not included in the project the Shortfall is R 78 739 200 and under the second scenario where the Co-Disposal Facility is included, the Shortfall is R 91 473 103.

The full breakdown of the closure cost assessment is available in Appendix C11.

10 Knowledge Gaps

Section 50(g) of the MPRDA requires the applicant to identify knowledge gaps and report on the adequacy of predictive methods, underlying assumptions and uncertainties encountered in compiling the required information.

During the Impact Assessment Phase of the Der Brochen Project, all specialists conducted their individual specialist assessment and compiled the relevant specialist's reports. However, during the compilation and assessment of their studies, some specialists have identified gaps within the data they worked with, or highlighted some assumptions made during the discussion of their results or discussed some limitations to their studies. Specialists' gaps, assumptions and limitations are summarised in the sections below.

Biodiversity

- The ecological assessment is confined to the study area and does not include the neighbouring and adjacent properties; these were, however, considered as part of the desktop assessment;
- With ecology being dynamic and complex, some aspects (some of which may be important) may have been overlooked. It is, however, expected that most floral communities have been accurately assessed and considered; and
- Sampling by its nature, means that not all individuals are assessed and identified. Some species and taxa on the study area may therefore have been missed during the assessment.

Wetland and Aquatics

- The wetland delineation as presented in this report is regarded as a best estimate of the wetland boundary based on the site conditions present at the time of assessment. Global Positioning System (GPS) technology is inherently inaccurate and some inaccuracies, due to the use of handheld GPS instrumentation, may occur. If more accurate assessments are required the wetland will need to be surveyed and pegged according to surveying principles;
- Wetlands and terrestrial zones create transitional areas where an ecotone is formed as vegetation species change from terrestrial to wetland species. Within this transition zone some variation of opinion on the wetland boundary may occur, however, if the DWA 2005 method is followed, all assessors should get largely similar results;
- The composition of aquatic biota in the study area prior to major disturbance is unknown. For this reason, reference conditions are hypothetical, and are based on professional judgement and/or inferred from limited data available;
- The wetland data presented in this report are based on a 2 day site visit, undertaken in March 2014. The effects of natural seasonal and long-term variation in the ecological conditions are therefore unknown; and
- Aquatic and wetland ecosystems are dynamic and complex; it is likely that aspects, some of which may be important, could have been overlooked. A more reliable assessment of the biota would require seasonal sampling with sampling being undertaken under both low flow and high flow conditions.

Groundwater

The following uncertainties have been identified and information will be gathered throughout the Operational Phase through careful monitoring, to amend, where required, the operational activities to reduce the observed impacts.

- Uncertainty of operation of liner option selected; and
- Uncertainties with long term predictions (beyond ten years) of groundwater impacts which may lead to definitive changes in catchment hydrology, land use and mining activities.

Air Quality

The main assumptions, exclusions and limitations for the Air Quality report consisted of the following:

- Use was made of modelled MM5 meteorological data for the Project area as obtained from the air quality assessment previously completed for Der Brochen (von Gruenewaldt, 2012);
- The quantification of sources of emission was restricted to the proposed Project activities, as well as the existing Mototolo Concentrator and TSF only;
- The construction and closure phases were assessed qualitatively due to the temporary nature of these operations, whilst the Operational Phase was assessed quantitatively;
- Background ozone concentrations required for the oxidation of NO to NO_2 were based on literature studies (Zunkel, et al., 2004); and
- No on-site ambient NO_2, SO_2, CO, $PM_{2.5}$ and PM_{10} baseline measurements were available for cumulative assessment.

Traffic

- The distribution of the traffic generated by the proposed additional activities at the Der Brochen Project, when fully operational, was assumed based on the distribution of existing mine generated traffic that travels on the road network as well as the location of the towns and villages that will provide the accommodation for the additional labour. In addition, the location of potential suppliers and the neighbouring towns as well as the most likely end destination of the mined ore, were also taken into consideration; and
- It was also assumed that the road network that is likely to be used for the transportation of the mined ore from the proposed Der Brochen Open Pits is expected to be north towards the Steelpoort area, to one of the other existing mines, using the mine access road, R557, D1261, and R555. The final destination of the mined ore, however, was not confirmed at the time of compiling this report.

Heritage

- Heritage sites that were identified as significant during the Impact Assessment Phase will require permits to remove or relocate them. The sites to be removed or relocated will only be determined by a qualified Archaeologist following a Phase 2 Heritage assessment.

Social

The socio-economic study gained information, amongst others, information from communities by means of household surveys. The following limitations and knowledge gaps were identified:

- In light of the dispersed locations of the communities, the difficulties experienced travelling in the area, and in order to avoid any misconceptions that might arise regarding the purposes for the surveys (e.g. household relocation) surveys were conducted at central venues. Communities were informed about the survey through the public consultation process and through leadership structures. This approach could result in a biased representation of the community, since only certain sectors of the community might have attended, might have been able to afford the time and money to attend, and might have received news of the opportunity to participate. However, results have been triangulated against the focus group discussions, key informant interviews and rural appraisal as well as secondary data sources;
- The intention was to survey the Head of Household (HoH) of each family. Where the HoH was not available, the next of kin (partner or any household member above the age of 18) was interviewed. Results are therefore not consistently representative of the HoH;
- Some households residing on Schaapkraal 42 JT were informed that SRK was registering people for jobs, and therefore some misinformed family members travelled from elsewhere hoping to register. It may therefore be possible that these people were included in the survey which influenced the results; and
- The survey team depended upon the information that was provided by the respondents and assumed that this information was given truthfully.

11 Summary and Conclusions

SRK was appointed by RPM to facilitate and manage the environmental and social studies required for the Der Brochen environmental impact assessment. This included a comprehensive stakeholder engagement process which has sought to identify stakeholders, provide these parties with an adequate opportunity to participate in the project process and guide technical investigations that have taken place as part of the impact assessment phase of this study. Specialist input has been sought for all key environmental aspects.

This EIA/EMP has been compiled to meet the requirements of Section 39 of the MPRDA and Regulations 50 and 51 in terms of the MPRDA, as well as Sections 31(2) and 33 and Regulations R543 of NEMA.

This EIA/EMP included the following components:

- A consolidation and alignment of all existing Der Brochen EMPs;
- An amendment to include all proposed new activities requiring authorisation;
- A description of the EIA/EMP process undertaken, as well as stakeholder documentation including the key issues and concerns raised by stakeholders during the EIA/EMP process;
- An overview of the specialist studies undertaken for the project;
- An impact assessment, evaluating the significance of identified potential impacts that could occur as a result of the proposed activities associated with the Der Brochen Project;
- A management programme which includes environmental and social mitigation measures to manage the identified potential impacts during all project phases. This management programme also includes monitoring programmes for surface and groundwater, biomonitoring, air quality and noise; and
- A Closure and Rehabilitation Plan.

The impact assessment confirmed that the proposed activities are expected to have additional significant impacts to those already resulting from the current Der Brochen project operations and activities, namely on soil resources, biodiversity, groundwater, surface water, air quality (dust generation), heritage and socio-economic conditions. These impacts have been identified and RPM has committed to mitigation/ management measures which are incorporated in the EMP.

11.1 Impacts identified

Biodiversity

The Der Brochen project is located within the Sekhukhuneland Centre of Plant Endemism which is an area of high conservation importance.

There are numerous Conservation Importance (CI), endemic and protected species within the Project area. In total, 277 hectares (Pits, CDF and Mareesburg TSF) of indigenous vegetation will be removed in order to develop the proposed project infrastructure and associated activities. Various areas will be rehabilitated to grassland including the completed Helena, and Mareesburg TSFs and Co-disposal Facility. Several plant species also need to be relocated and will require the appropriate permits. Various plants will be grown in the on-site nursery to be re-planted during the rehabilitation phase.

Socio-economic

In terms of the zones of influence, immediate focus areas (defined as regional for the purposes of the impact assessment) identified for Der Brochen were: Steelpoort and Burgersfort in the Greater Tubatse Local Municipality (GTLM), and Mashishing (formerly Lydenburg) in the (Thaba Chweu Local Municipality) TCLM. Potential social changes and impacts identified include employment status (loss of employment as a result of mine closure), and loss of potential arable/grazing land.

The additional activities at Der Brochen will have continued input into the local and regional economy even with the few additional permanent jobs, however there is also the risk of influx of non-local job seekers in the study area.

Heritage

Several graves and heritage sites ranging from low to high significance have been identified in the Der Brochen Project area. Clearing and construction activities will result in the demolition or relocation of these identified significant sites. These sites will require permits from SAHRA for the demolition or relocation thereof.

Groundwater

The potential impact of seepage water emanating from the TSFs (Mareesburg, Helena and Co-Disposal Facility) is considered to be high. The simulated leachate plumes emanating from unlined Helena TSF indicate that the plumes will reach the Groot-Dwars River. The Mareesburg TSF and the Co-disposal Facility will be lined and any seepage still emanating from these facilities will be collected in seepage collection drains. Seepage will then be pumped to a Pollution Control Dam to be contained. Rehabilitation and capping of the facility will also be undertaken after closure to reduce potential seepages.

Surface Water

The identified potential surface water related environmental impacts associated with the proposed activities range from medium–high to very low significance in the absence of appropriate mitigation measures. The identified impacts can be largely mitigated reducing the significance to low-medium to very low. The proposed mitigation measures have been incorporated into a surface water management plan for the project area. The plan includes applicable best practices and requirements related to inspection, maintenance, monitoring and management of incidents.

Air quality

Air quality within the Der Brochen project area is influenced by various sources of SO_2 and NO_x that occur in the region including industrial emissions, blasting operations at mines, veld burning, vehicle exhaust emissions and household fuel burning. Local sources include wind erosion from exposed areas, fugitive dust from agricultural and mining operations, vehicle entrainment from roadways and veld burning.

Clearing and stripping of topsoil activities associated with the construction of proposed new infrastructure are likely to have a medium to low short term impact in the Project area vegetation and sensitive receptors. The closest sensitive receptor to the proposed infrastructure is the Mankge and Leshaba families, 300 m and 1 km from the proposed Mareesburg TSF respectively. However due to prevailing and modelled wind direction, these families are unlikely to be affected by dust pollution.

Soils

The Der Brochen project area is characterised by Mispah, Arcadia, Glenrosa, Hutton and Clovelly soils, all of which have grazing land capabilities. The construction of the open pits, Co-disposal facility and Mareesburg TSF is most likely to have the largest impact on soils, particularly during the clearing of vegetation and removal of topsoil for stockpiling. A total of 81 ha will be permanently removed for the pits, an additional 35 ha for the Co-disposal facility and 150 ha for the Mareesburg TSF.

11.2 Concluding remarks

This EIA/EMP outlines the existing activities and the proposed new activities associated with the Der Brochen Project, as well as provides sufficient information to inform the environmental authorisation decision for the new activities. Once approved, this report will serve as the newly aligned and amended Der Brochen EMP, which will supersede all previous Der Brochen project and project-related (Helena) EMPs.

No fatal flaws in the project have been identified thus far through the EIA process. However several environmental and social impacts are envisaged from construction phase through to post-closure, which require careful mitigation and monitoring. It is the opinion of the EAP that all major impacts have been identified and have been assigned appropriate management measures, as discussed in Chapters 7 and 8. Most HIGH negative impacts, with mitigation are reduced to a MEDIUM or LOW significance, and can be managed accordingly.

Monitoring of the potential impacts will form an important aspect of the mine’s operation. Where necessary, management measures will be amended to address the impacts if analysis of monitoring trends indicates this may be necessary. Monitoring of the operation of the TSFs, in accordance with their operating plans and protocols will also form an important activity to ensure their long-term stability.

It is recommended that the proposed Der Brochen Project is allowed to proceed, on the assumption that the environmental and social management commitments are adhered to, the project description remains as per the description provided in this document and considering the positive social impacts associated with the project. The Der Brochen Project will ensure continued employment for those at the existing Mototolo Concentrator and Der Brochen, as well as new employment opportunities associated with the new proposed activities.

Through its internal auditing and reporting processes and bi-annual performance assessment reporting (as per the requirements of Regulation 55 of the MPRDA) and other legislated reporting, RPM should continue to examine its existing management commitments for the life of mine with a view to continual improvement and reduction of negative impacts and enhancement of positive impacts where achievable.

Prepared by

Charissa Tomlin

Environmental Scientist

Suzanne Venter *Pr.Sci.Nat*

Senior Environmental Scientist

Reviewed by

Joe de Beer *Pr.Sci.Nat*

Principal Environmental Scientist

Briony Liber *CEAPSA*

Partner

All data used as source material plus the text, tables, figures, and attachments of this document have been reviewed and prepared in accordance with generally accepted professional engineering and environmental practices.

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13 Undertaking to implement the contents of the EMP Amendment and Alignment

I ______________________________ the undersigned and duly authorised by Rustenburg Platinum Mines Limited hereby undertake to give effect to every undertaking contained in Chapter 8 of this document, and accept full responsibility therefor.

Signed at ______________________ on this _____ day of ______________.

____

Witnesses:

1. ________________________ 2. __________________________

________________________ __________________________

Signature Signature

Approved

Approved in terms of the provisions of the Minerals and Petroleum Resources Development Act (Act No. 28 of 2002) (MPRDA).

Signed at ______________________ on this _____ day of ______________.

____

Director

Region: ____

Appendices

Appendix A: Specialist Terms of Reference

Appendix B: Stakeholder Engagement Documentation

Appendix B1: Summary of historical stakeholder engagement undertaken

Appendix B2: Stakeholder database and list of registered I&APs

Appendix B3: Pre-announcement Consultation: Attendance Lists

Appendix B4: Comments and Responses Report (CRR)

Appendix B5: Project Announcement Documentation

Appendix B5a: Background Information Document

Appendix B5b: Announcement Letter and Registration and Comment sheet (English and Sepedi)

Appendix B6: Project Announcement Documentation: Document issue receipts or public places

Appendix B7: Project Announcement Documentation: Site Notices (English and Sepedi)

Appendix B8: Project Announcement Documentation: Advertisements

Appendix B9: Project Announcement Documentation: Personal delivery documentation

Appendix B10: Project Announcement Documentation: Focus Group Meetings

Appendix B10a: Project Announcement Documentation: Focus Group Meetings Presentation

Appendix B10b: Project Announcement Documentation: Focus Group Meetings Attendance lists

Appendix B11: Draft Scoping Report: Announcement of availability for comment letter

Appendix B12: Draft Scoping Report: Announcement of availability advertisements

Appendix B13: Draft Scoping Report: Document issue receipts for public places

Appendix B14: Draft Scoping Report: Focus Group Meetings

Appendix B14a: Draft Scoping Report: Focus Group Meetings Presentation (English and Sepedi)

Appendix B14b: Draft Scoping Report: Focus Group Meetings Attendance lists

Appendix B15: FSR availability for public comment letter

Appendix B16: FSR Acceptance letter

Appendix B17: Draft EIA/EMP availability for public comment letter

Appendix B18: Advertisements for Draft EIA/EMP

Appendix B19a : Draft EIA/EMP presentation for focus group meetings

Appendix B19b : Draft EIA/EMP attendance registers from focus group meetings

Appendix B20 : Final EIA/EMP availability letter

Appendix C: Specialist Reports

Appendix C1: Geochemical Study

Appendix C2: Floristic Assessment

Appendix C3: Surface Water Study

Appendix C4: Groundwater Study

Appendix C5: Wetlands and Aquatics Ecological Study

Appendix C6: Air Quality Study

Appendix C7: Noise Study

Appendix C8: Cultural Heritage Study

Appendix C9: Traffic and Transportation Study

Appendix C10: Socio-Economic Study

Appendix C11: Closure and Rehabilitation Plan

SRK Report Distribution Record

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