Surface Water Hydrological Study for the Proposed Khulu TSF and Capital Projects at the Dwarsrivier Chrome Mine

Project Number:

ENG010

Prepared for:

EnviroGistics (Pty) Ltd

P.O. Box 22014, Helderkruin, 1733

Email: tanja@envirogistics.co.za

Tel: 082 412 1799

Fax: 086 551 5233

Compiled by:

Hydrospatial (Pty) Ltd

17 Sonop Place, Randpark, 2194

Email: andypirie82@gmail.com

Tel: 084 441 9539

January 2022

DOCUMENT CONTROL

Project Name	Surface Water Hydrological Study for the Proposed Khulu TSF and Capital Projects at the Dwarsrivier Chrome Mine
Report Type	Surface Water Study
Client	EnviroGistics (Pty) Ltd
Project Number	ENG010
Report Number	02
Report Status	Draft
Submission Date	17 January 2022
Author	Andy Pirie (*Pr.Sci.Nat.*)
Author Signature	

DISCLAIMER

The opinions, results and findings expressed in this report, are based on the authors best scientific knowledge, as well as on the information supplied to Hydrospatial as part of the project. The accuracy of the results and conclusions in this report, are reliant on the accuracy and completeness of the supplied information. Hydrospatial does not accept responsibility for any errors or omissions in the supplied information and does not accept any consequential liability arising from commercial decisions or actions resulting from them.

DECLARATION OF INDEPENDENCE

I, Andy Pirie declare that:

- I act as an independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have the expertise in conducting the specialist study relevant to this application, including knowledge of the various acts, regulations and any guidelines that have relevance to the proposed project;
- I will comply with the acts, regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the study;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing any decision to be taken with respect to the application by the competent authority; and the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority; and
- All the particulars furnished by me are true and correct.

....

Andy Pirie
Hydrologist
Pr.Sci.Nat (reg no. 114988)

ACRONYMS AND ABBREVIATIONS

BPG	Best Practice Guideline
DEM	Digital Elevation Model
DMRE	Department of Mineral Resources and Energy
DWAF	Department of Water Affairs and Forestry
DWS	Department of Water and Sanitation
DTM	Digital Terrain Model
ECO	Environmental Control Officer
EIA	Environmental Impact Assessment
EMPr	Environmental Management Programme
FPF	Filter Press Facility
GIS	Geographical Information Systems
GN704	Government Notice No. 704 - Regulations on the Use of Water for Mining and Related Activities aimed at the Protection of Water Resources
km	Kilometres
LoM	Life of Mine
mamsl	metres above mean sea level
MAE	Mean Annual Evaporation
MAP	Mean Annual Precipitation
MAR	Mean Annual Runoff
mbgl	Metres below ground level
MRA	Mining Right Area
MPRDA	Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002)
NEMA	National Environmental Management Act, 1998 (Act No. 107 of 1998)
mtpa	Million tons per annum
NWA	National Water Act, 1998 (Act No. 36 of 1998)
PCD	Pollution Control Dam
Pr.Sci.Nat.	Professional Natural Scientist
ROM	Run of Mine
RWD	Return Water Dam
SACNASP	South African Council for Natural Scientific Professions
SAWS	South African Weather Service
SCS	Soil Conservation Service
S-Pan	Symons Pan
SWMP	Stormwater Management Plan
WMA	Water Management Areas
WR2012	Water Resources of South Africa, 2012 Study
WRD	Waste Rock Dump
WUL	Water Use Licence
WULA	Water Use Licence Application

EXECUTIVE SUMMARY

Hydrospatial (Pty) Ltd was appointed by EnviroGistics (Pty) Ltd to undertake a surface water study for the following proposed projects at the Dwarsrivier Chrome Mine (hereafter referred to as “DCM” or the “Mine”):

- Project 1: Establishment of the new proposed Khulu Tailings Storage Facility (TSF) and associated infrastructure;
- Project 2: Establishment of a Diesel and Emulsion Batching area;
- Project 3: Main Parking Extension;
- Project 4: Widening of an Access Road between South Shaft/Main Offices and Plant; and
- Project 5: Subway Crossing between the Plant and North Mine

This report has been prepared for EnviroGistics (Pty) Ltd who have been appointed to undertake the Water Use Licence Application (WULA) and Environmental Authorisation processes.

The Mine is situated in the Limpopo Province of South Africa, 23 kilometres (km) south-west of the town of Steelpoort.

The scope of work included the following:

- Provide a baseline (pre-development) description of the surface water environment;
- Development of a conceptual Stormwater Management Plan (SWMP) in accordance with the DWS Best Practice Guideline G1: Storm Water Management and GN704 regulations;
- Undertake a floodline determination in accordance with GN704 regulations should there be watercourses in close proximity to the proposed projects;
- Provide the anticipated surface water impacts and mitigation measures; and
- Development of monitoring plans for surface water quality and stormwater infrastructure.

The Mean Annual Precipitation (MAP) for the study area is 650 mm, with the wettest months occurring from November to January, and the driest months from June to August. The mean annual Symons Pan (S-Pan) evaporation is 1 500 mm.

The proposed Khulu TSF and Capital Projects are located in quaternary catchment B41G which is situated within the Olifants Water Management Area (WMA). A number of non-perennial drainage lines drain the mountain ridges and hills within the Mining Right Area (MRA) These non-perennial drainage lines are ephemeral in nature (only flowing for short periods of time in response to high rainfall) and drain into the Klein and Groot Dwars Rivers. The Klein Dwars River flows through the centre of the MRA in a north-easterly direction, whilst the Groot Dwars River flows in a north-westerly direction. These two rivers form a confluence near the north of the MRA, forming the Dwars River, which flows into the Steelpoort River 8.5 km north-west of the MRA. The Steelpoort River flows into the Olifants River, 40 km north-east of the town of Steelpoort.

According to the 1:50 000 topographical map 2430CC Kennedy's Vale, a non-perennial drainage line runs along the north-eastern boundary of the Pollution Control Dam (PCD) and TSF site. During the site visit this area was assessed, and it was noted to be highly disturbed by what appeared to be old stockpiles and borrow pits, possibly from previous road construction in the area. As a result, water is likely to pond in this area and it is therefore highly unlikely that this area functions as a drainage line. Furthermore, the Freshwater Ecological Assessment (SAS, 2021) did not identify this area as a potential watercourse.

Surface water quality data was obtained from the Dwarsrivier Chrome Mine Quarterly Environmental Water Quality Report for the period January 2021 – March 2021 (Aquatico, 2021). The following provides a summary of the water quality of the instream receiving environment:

- The pH has been alkaline (> 7) and within limits at all monitoring points;
- TDS exceeded the WUL limit at all monitoring points and has been particularly elevated at SP4, S2 and S4. The elevated TDS at S2 is most likely from the upstream activities from the other mines in the Klein Dwars River catchment;
- Sulphate has been within the WUL limit at all monitoring points except on one occasion at S2 in February 2020;
- Nitrate exceeded the WUL limit at S1 – S4 between January 2021 and March 2021. Nitrate has regularly exceeded the limit in the past at S1, S3 and S4, however, between December 2020 and March 2021 levels significantly declined; and
- The water quality for all other variables monitored were within the WUL limits.

A conceptual stormwater management plan to separate clean and dirty water areas has been prepared under section 4 of the report.

An impact assessment and proposed mitigations measures are provided under section 5 of the report.

Monitoring plans for surface water quality and stormwater infrastructure have been provided under section 6 of the report.

The following provides a summary of the main recommendations of the study:

- GN704 exemptions are applied for, for the following proposed infrastructure located within a 100 m horizontal distance of a watercourse:
  - Main Parking Extension;
  - Widening of an Access Road between South Shaft/Main Offices and Plant; and
  - Subway Crossing between the Plant and North Mine
- A clean water diversion berm should be constructed upslope of the proposed Khulu TSF;
- Clean diversion berms are constructed on the upslope side of the proposed diesel and emulsion batching areas to divert any unnecessary clean water from flowing through these facilities;

- All diesel tanks must be appropriately bunded. The bunds should have sufficient capacity to contain 110 % of the diesel tank storage capacity and should be operated empty at all times;
- The area where the transfer of emulsion from the tanker will take place, should be on an impermeable hard surface area, that is sloped to a sump, to capture any possible spills. The sump should be inspected regularly and liquid within the sump disposed of at an appropriate facility;
- Vegetation clearance should be kept to absolute minimum;
- Erosion measures such as hessian nets should be employed around working areas when construction is taking place;
- The Khulu TSF silt trap must be regularly inspected and desilted. Desilted material must be placed temporarily on a lined bunded area and disposed of either back on the TSF or at an appropriate facility;
- The PCD must be lined and appropriately sized so as not to spill more than once in 50 years, in accordance with GN704 regulations. The freeboard of the PCD must be monitored daily;
- The proposed pipeline must be regularly inspected for leaks; and
- It is proposed that topsoil stockpile option A is selected as the most favourable option as there are no nearby drainage channels. Furthermore, this area has received environmental authorisation for vegetation clearance as part of the discard dump extension.

Should the mitigation measures, recommendations and monitoring plans provided in this study be adhered to, then from a surface water perspective, the proposed projects can commence.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

1 INTRODUCTION AND BACKGROUND

Hydrospatial (Pty) Ltd was appointed by EnviroGistics (Pty) Ltd to undertake a surface water study for the following proposed projects at the Dwarsrivier Chrome Mine (hereafter referred to as "DCM" or the "Mine"):

- Project 1: Establishment of the new proposed Khulu Tailings Storage Facility (TSF) and associated infrastructure;
- Project 2: Establishment of a Diesel and Emulsion Batching area;
- Project 3: Main Parking Extension;
- Project 4: Widening of an Access Road between South Shaft/Main Offices and Plant; and
- Project 5: Subway Crossing between the Plant and North Mine

This report has been prepared for EnviroGistics (Pty) Ltd who have been appointed to undertake the Water Use Licence Application (WULA) and Environmental Authorisation processes.

1.1 Project Location

The Mine is situated in the Limpopo Province of South Africa, 23 kilometres (km) south-west of the town of Steelpoort. Figure 1-1 indicates the location of the DCM mining right area.

1.2 Project Description

The following provides a brief summary of the proposed projects which are indicated on Figure 1-2.

1.2.1 Project 1: Khulu TSF and Associated Infrastructure

Dwarsrivier Mine is currently depositing tailings material at the existing North Tailings Storage Facility (North TSF) at the eastern side of their process plant on the Remaining Portion of the Farm Dwarsrivier 372KT. It is anticipated that the existing North TSF will reach its full capacity within the next three (3) to five (5) years. For this reason additional storage capacity on site is required.

The Mine initially identified seven (7) potential sites for the proposed new TSF, which were reduced to four (4) sites (TSF Options), namely Sites B, C, D and F. During the 2019 Site Selection Process, Site D was identified as the preferred site, however, subsequent to the 2019 Site Selection Process, further geotechnical and engineering studies were undertaken, which identified potential concerns for Site D, which include the proximity of a non-perennial tributary of the Dwarsrivier River to the site. Based on the initial view by the Environmental Assessment Practitioner (EAP), Site B was fatally flawed due to its location coinciding with that of the potential future Eskom substation, for which an Environmental Impact Assessment (EIA) has been granted and negotiations in terms of land use between the Mine and Eskom have commenced. However, the Eskom substation is no longer planned, which has reintroduced Site B into the overall assessment. The geotechnical and engineering studies excluded Site F as a potential site alternative due to the distance of this site from the plant, reducing the number of areas considered to three (3). Based on the Site Selection, Site B was the most favourable location for the establishment of the Khulu TSF.

In addition to the above, the following infrastructure is proposed:

- Filter Press Facility (FPF) – tailings will be pumped as slurry from the Plant to a FPF where the tailings will be dewatered. The dewatered tailings will be transported from the FPF to the TSF using trucks;
- Pollution Control Dam (PCD) – to contain dirty water from the Khulu TSF;
- Silt trap – to settle out and reduce the silt that will report to the PCD;
- Pipeline – to transfer water between the proposed PCD and existing Lower Return Water Dam (RWD). The pipeline will mostly follow an existing mine road;
- Haul road – A 1 kilometre (km) haul road is proposed between the TSF and existing mine roads for the hauling of tailings from the new FPF. The haul road will mostly follow an existing road. The haul road will be operated clean, and runoff generated from the haul road will be allowed to drain into the clean environment. The road will be 5 m wide to allow access for one-way 30 ADT traffic; and
- Topsoil stockpile – three topsoil stockpile locations are being considered, namely, options A, D and E. Option A is the most favourable option as it occurs in an area that already has environmental authorisation for the clearance of vegetation as part of the discard dump extension.

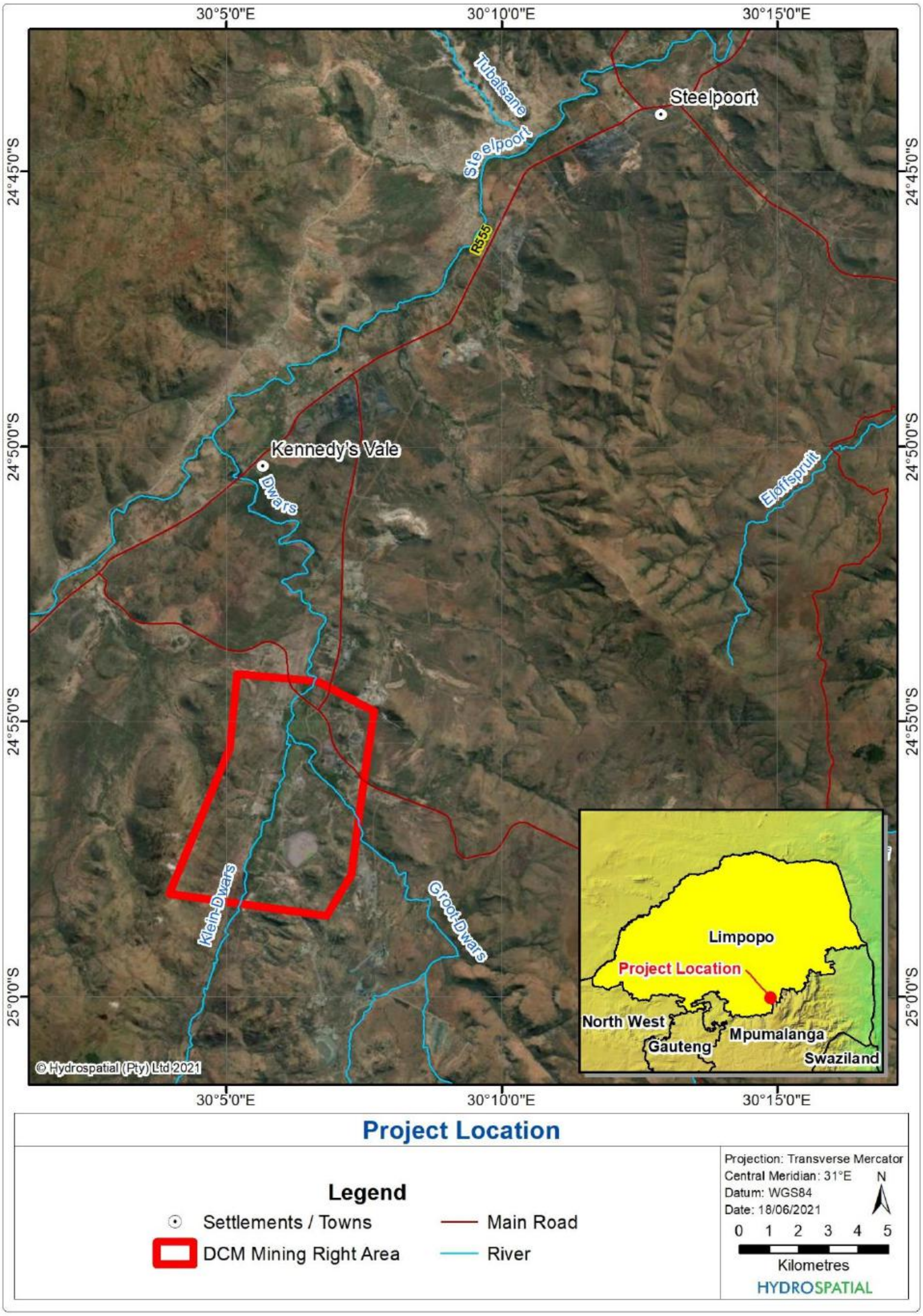


Figure 1-1: Location of the Dwarsrivier Chrome Mine

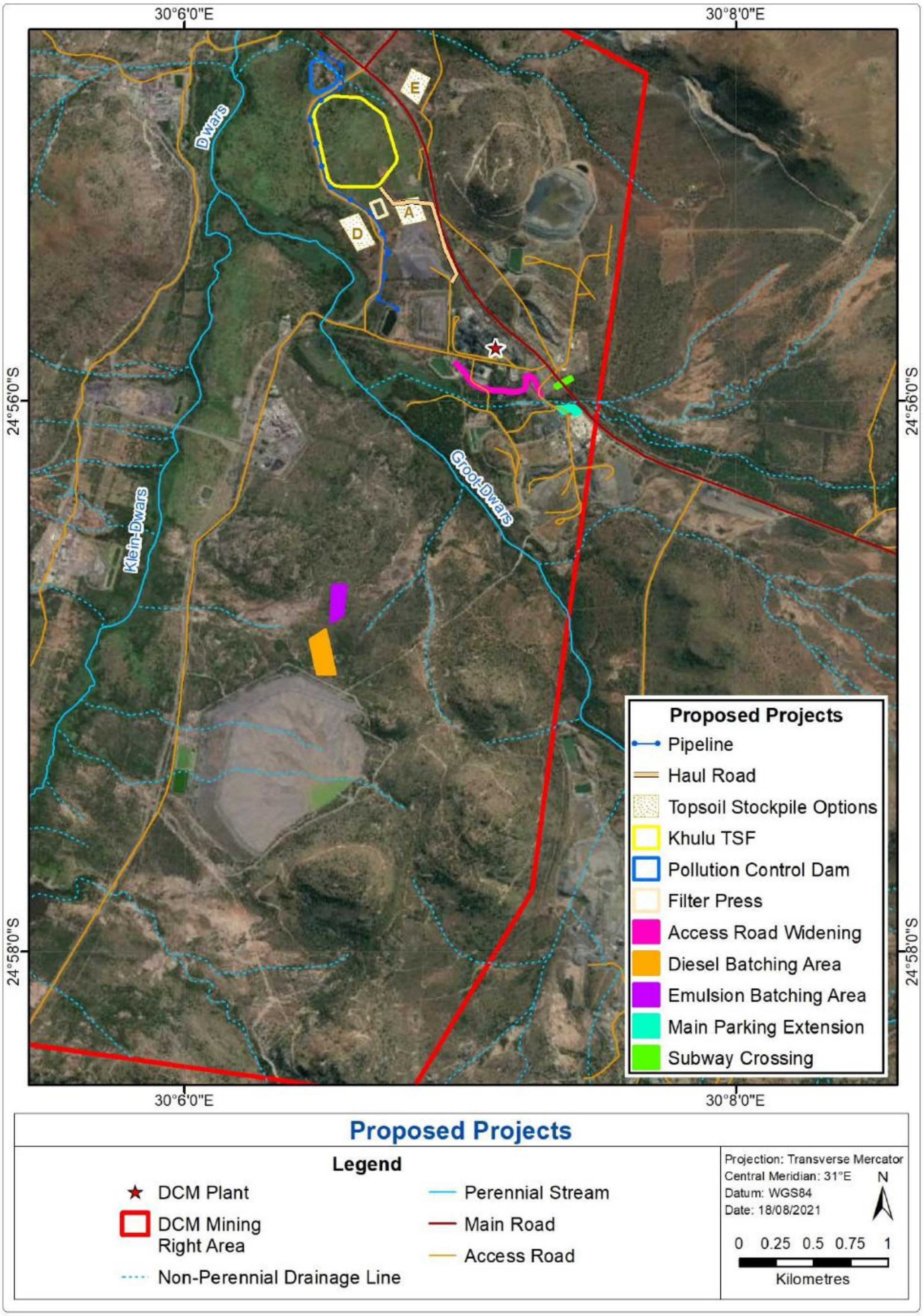


Figure 1-2: Proposed projects

The outcome of the site selection process was that Site B was the most favourable site and was selected for the establishment of the Khulu TSF. The Khulu TSF will have a footprint area of approximately 20 hectares (ha) and will be 42 m in height. The project will not involve typical tailings deposition techniques, but will involve the piping of tailings to a filter press facility from where the filter cake will be trucked to the new TSF. An operational life of about 20 years is currently considered as part of the design.

1.2.2 Project 2: Diesel and Emulsion Batching Areas

As the underground mining progresses in line with the approved Mining Works Programme, it is required that the surface infrastructure be adapted to suit the development of the mining operations. The surface developments are undertaken to provide efficient and safe operation from a life safety, environmental safety and cost-effective operation perspective. Given the current area of operation at South Shaft and considering the following five (5) year mining plan, the need to consider additional off-loading and bulk Storage of Emulsion and Diesel closer to the immediate work area to a surface position over current strikes at the South Shaft decline have arisen. The mine therefore identified the need to erect two (2) batching areas, for diesel and emulsion batching, respectively, to supply diesel and emulsion to the underground mining operations. The location of the diesel and emulsion batching areas are to the north-east of the old Two Rivers Platinum Mine (TRP) Tailings Storage Facility, with the Diesel Batching area just south of the new TRP tailings pipeline and the Emulsion Batching area just north of the pipeline. The project will include:

- Diesel Batching Area:
  - Construction of an access road, approximately 55 m in length and 6 m in width, to the Diesel Batching area; and
  - Due to the imposed limitations of the Mines Health and Safety Act, 29 of 1996, that limits the storage of hydrocarbons to 3 (Three) days of operation, the majority of the diesel, hydraulic oil and lube oil required will be stored at surface in a purpose designed and constructed terminal that provides the necessary life safety and environmental safety required. The project will involve the storage of two (2) horizontal, aboveground diesel tanks of 33 m^3 each (as well as a possible future 22 m^3 tank), a 40 m^3 API self-bunded tank (Isotainer) for Hydraulic Oil and a 20 m^3 API self-bunded tank for Lube Oil. A total combined storage of 148 m^3.
- Emulsion Batching Area:
  - Construction of an access road, approximately 80 m in length and 6 m in width, to the Emulsion Batching area;
  - No emulsion will be stored at the surface location and all product decanted will be stored underground at a purpose built depot located at Strike N15G / N17A. The surface location will be used for the express purpose of transferring emulsion from a designated road tanker, via the off-loading pipeline to the underground storage tanks; and

    - The mine intends storing a total of 60 (Sixty) tons (similarly 60 m^3) of Emulsion product underground, with no surface storage being done, and no pipeline inventory.
- General:
    - Parking and offloading area, with security offices at both areas (no dangerous goods storage is planned to take place at any time);
    - Other internal roads will be required to access the various pipelines, these are however included into the overall clearance consideration of the project, and not as stand-alone roads; and
    - The batching areas (diesel and emulsion) will feed into pipelines for underground use at both areas.

Clearance of indigenous vegetation will be required in the order of approximately 3 ha (including Diesel and Emulsion Batching and the access road).

1.2.3 Project 3: Main Parking Extension

The mine requires the expansion of the existing parking area at the Main Offices. The current parking area is about 0.8 ha with the parking bays not sufficient to cater for the number of vehicles. The current parking bay comprises of a paved surface area and steel roof parking bays. The same principle will be applied at the extension area, and no new entrances will be required. The planned parking bay extension will be located about 20 m from the Springkaanspruit.

Clearance of indigenous vegetation will be required in the order of approximately 0.5 ha.

1.2.4 Project 4: Widening of Access Road between South Shaft/Main Offices and Plant

To ensure more optimal logistical management of traffic between the South Mine and the North Mine, and to reduce the number of vehicles on the regional road, the mine is planning on constructing a road under the regional road bridge to allow for access between the two areas.

Clearance of indigenous vegetation will be required in the order of approximately 0.2 ha.

1.2.5 Project 5: Subway Crossing between the Plant and North Mine

To ensure more optimal logistical management of traffic between the South Mine and the North Mine, and to reduce the number of vehicles on the regional road, the Mine is planning on construction a road under regional road bridge to allow for access between the two areas.

Clearance of indigenous vegetation will be required in the order of approximately 1 700 m^2.

1.3 Legal Requirements and Guidelines

The following legal requirements and guidelines are applicable to the study:

- National Water Act, 1998 (Act No. 36 of 1998) (NWA);

- Government Notice No. 704 (GN704) of the NWA – Regulations on the Use of Water for Mining and Related Activities Aimed at the Protection of Water Resources;
- National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA) and associated Environmental Impact Assessment (EIA) 2014 Regulations;
- Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002) (MPRDA); and
- Department of Water and Sanitations (DWS) Best Practice Guideline documents.

1.4 Details of the Specialist

The study was undertaken by Andy Pirie who is a senior hydrologist at Hydrospatial (Pty) Ltd. Andy graduated with a Master of Science (M.Sc.) in Water Resource Management (cum laude). He is registered as a Professional Natural Scientist (Pr.Sci.Nat) (registration number: 114988) in Water Resources Science with the South African Council for Natural Scientific Professions (SACNASP). Work experience includes rainfall – runoff modelling, floodline determinations, stormwater management plans, water and salt balance modelling, setup of water monitoring networks and programmes, analysis of surface water quality and quantity, and surface water specialist studies for environmental and social impact assessments. He has worked on projects in South Africa, Cameroon, Senegal, Mali, Democratic Republic of the Congo (DRC), Botswana, Zambia and Namibia. He has more than 9 years' experience. A curriculum vitae is provided in Appendix A.

2 SCOPE OF WORK

The scope of work included the following:

- Provide a baseline (pre-development) description of the surface water environment;
- Development of a conceptual Stormwater Management Plan (SWMP) in accordance with the DWS Best Practice Guideline G1: Storm Water Management and GN704 regulations;
- Undertake a floodline determination in accordance with GN704 regulations should there be watercourses in close proximity to the proposed projects;
- Provide the anticipated surface water impacts and mitigation measures; and
- Development of monitoring plans for surface water quality and stormwater infrastructure.

3 BASELINE HYDROLOGY

3.1 Hydrological Setting

3.1.1 Climate

3.1.1.1 Rainfall

The proposed projects are located within quaternary catchment B41G, and therefore, the monthly rainfall for B41G was adopted to represent the rainfall for the study area, and was obtained from the Water Resources of South Africa Study 2012 (WR2012) (Table 3-1). The Mean Annual Precipitation (MAP) for the study area is 650 mm, with the wettest months occurring from November to January, and the driest months from June to August.

3.1.1.2 Evaporation

Monthly Symon's Pan (S-Pan) evaporation data was obtained from the WR2012 database for quaternary catchment B41G. In order to obtain natural open water body evaporation, S-Pan evaporation is multiplied by an evaporation factor. This is due to water temperatures in the S-Pan being higher than that of natural open water bodies, resulting in higher evaporation rates. Table 3-2 provides the monthly evaporation for the Project area. Evaporation is highest over the months of October to March, and lowest over May to August.

Table 3-1: Monthly rainfall for quaternary catchment B41G

Month	Monthly Rainfall (mm)
January	111.5
February	88.3
March	75.5
April	41.8
May	14.8
June	6.2
July	5.2
August	5.8
September	20.6
October	60.0
November	111.7
December	108.7
TOTAL	**650**

Table 3-2: Monthly evaporation for quaternary catchment B41G

Month	Symons Pan Evaporation (mm)	Evaporation Factor	Open Water Evaporation (mm)
January	165.0	0.84	138.6
February	137.6	0.88	121.0
March	135.8	0.88	119.5
April	104.4	0.88	91.9
May	87.9	0.87	76.5
June	71.4	0.85	60.7

Month	Symons Pan Evaporation (mm)	Evaporation Factor	Open Water Evaporation (mm)
July	78.2	0.83	64.9
August	103.5	0.81	83.8
September	134.1	0.81	108.6
October	161.7	0.81	131.0
November	152.6	0.82	125.1
December	168.0	0.83	139.4
TOTAL	**1500**	**N/A**	**1261**

3.1.1.3 Temperature and Wind

Average monthly wind and temperature was obtained from the Loclim programme (FAO, 2005). The method selected to obtain the wind and the temperature data is based on the nearest neighbour method for the ten closest stations to the Project (Table 3-3). Temperatures are highest over October to March, with wind generally being highest between September to November.

Table 3-3: Temperature and wind speed for the Projects

Month	Average Temperature (ºC)	Minimum Temperature (ºC)	Maximum Temperature (ºC)	Average Wind Speed (km/hour)
January	20	14.3	26.1	6.48
February	19.7	14.3	23.8	6.48
March	18.7	13.3	24.3	6.12
April	16.7	10	24.3	5.4
May	13.5	5.5	22.2	6.12
June	11	2.2	20	7.2
July	10.8	2.7	20	7.2
August	13.1	4.4	22.2	7.92
September	15.6	7.8	24.3	9.72
October	18	10.6	25.5	9.72
November	18.7	12.8	25.5	9.72
December	19.7	13.8	26.1	7.92

3.1.2 Regional Catchments and Drainage

The proposed Khulu TSF and Capital Projects are located in quaternary catchment B41G which is situated within the Olifants Water Management Area (WMA) (Figure 3-2). A number of non-perennial drainage lines drain the mountain ridges and hills within of the MRA. These non-perennial drainage lines are ephemeral in nature (only flowing for short periods of time in response to high rainfall) and drain into the Klein and Groot Dwars Rivers. The Klein Dwars River flows through the centre of the MRA in a north-easterly direction, whilst the Groot Dwars River flows in a north-westerly direction. These two rivers form a confluence near the north of the MRA, forming the Dwars River, which flows into the Steelpoort River 8.5 km north-west of the MRA. The Steelpoort River flows into the Olifants River, 40 km north-east of the town of Steelpoort. The Olifants River is a tributary of the Limpopo River, which flows into the Indian Ocean near the town of Xai-Xai in Mozambique.

3.1.3 Topography and Site-Specific Drainage

The topography of the MRA can be described as undulating with numerous mountain ridges and valleys (Figure 3-3). A mountain ridge runs along the western boundary of the MRA, where a maximum elevation of approximately 1 630 metres above mean sea level (mamsl) is reached. From this ridge, the elevation drops off to approximately 900 mamsl near the confluence of the Klein and Groot Dwars Rivers. A number of hills are located along the eastern portion of the MRA.

The proposed access road widening, subway crossing, topsoil stockpile option D and main parking extension, are located within a 100 m horizontal distance of the non-perennial Springkaanspruit, which is a tributary of the Klein Dwars River (Figure 3-3). The proposed emulsion batching area drains both east and west, whilst the diesel batching area drains west towards the Klein Dwars River. Both the emulsion batching area and the diesel batching area are located outside of the 100 m watercourse buffer.

The Khulu TSF site is located on fairly flat topography, dipping gradually in a north-westerly direction towards the Dwars River. According to the 1:50 000 topographical map 2430CC Kennedy's Vale, a non-perennial drainage line runs along the north-eastern boundary of the PCD and TSF site (Figure 3-3). During the site visit this area was assessed, and it was noted to be highly disturbed by what appeared to be old stockpiles and borrow pits, possibly from previous road construction in the area (Figure 3-1). As a result, water is likely to pond in this area and it is therefore highly unlikely that this area functions as a drainage line. Furthermore, the Freshwater Ecological Assessment (SAS, 2021) did not identify this area as a potential watercourse.

Figure 3-1: Disturbed area along the north-eastern section of the proposed Khulu TSF site and pollution control dam

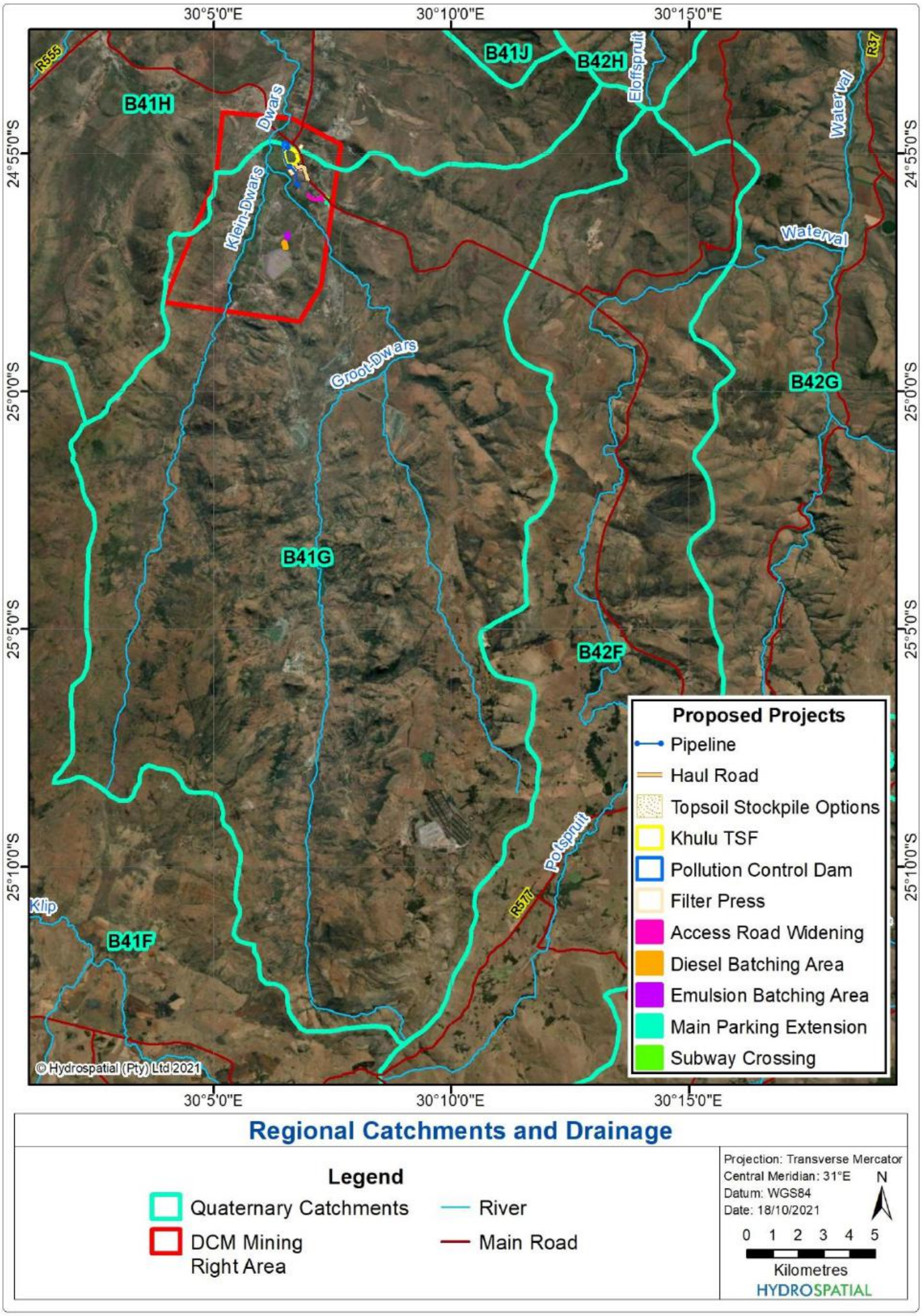


Figure 3-2: Regional catchments and drainage

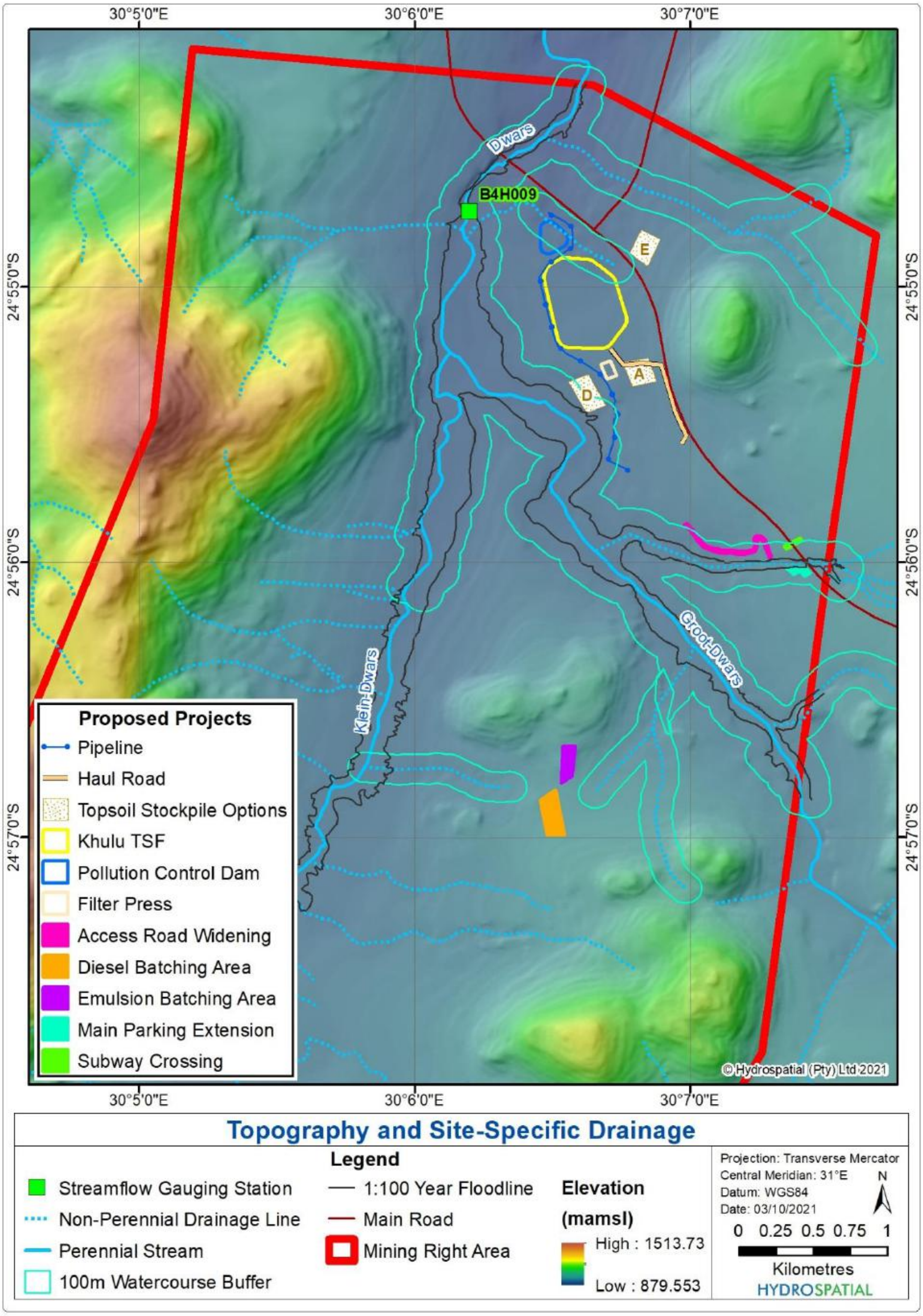


Figure 3-3: Topography and site-specific drainage

3.1.4 Vegetation and Land Cover

The proposed projects fall within the Sekhukhune Mountain Bushveld vegetation type, with vegetation characterised as open and closed broad leafed savannah on hills and mountain slopes (Mucina & Rutherford, 2006).

The proposed diesel and emulsion batching areas are located within open bushveld and shrubland/grassland areas. The proposed access road widening, subway and parking extension, are located within open woodland areas that are surrounded by mining activities.

The Khulu TSF site is located within an open bush and shrubland/grassland area (Figure 3-4) but was previously used for crop cultivation.

3.1.5 Soils

The SOTER database indicates that the majority of the MRA comprises of strongly weathered acid soils with low base saturation, classified as Luvisols with the remaining portions classified as Lithic Leptosols. The soils within the MRA are generally shallow.

3.1.6 Surface Water Use

Surface water use within the region is mostly used for mining and agricultural purposes.

3.2 Surface Water Runoff

The non-perennial drainage lines within the MRA are ephemeral, and runoff will only be generated when sufficient rainfall is received. The Groot Dwars and Klein Dwars are perennial rivers and will generally flow throughout year, barring dry years, when they may potentially stop flowing.

Monthly flows for river gauging station B4H009 was downloaded from the DWS hydrological services website for the period October 1966 to January 2019. B4H009 is located on the Dwars River below the confluence of the Klein and Groot Dwars Rivers, near the northern boundary of the MRA (Figure 3-3). The mean monthly flows are indicated in Figure 3-5. The highest flows occur over the months of December to March, whilst the low flows occur over the months of June to October. According to the WR2012 study, quaternary catchment B41G has a Mean Annual Runoff (MAR) of 25.46 million cubic metres (mcm).

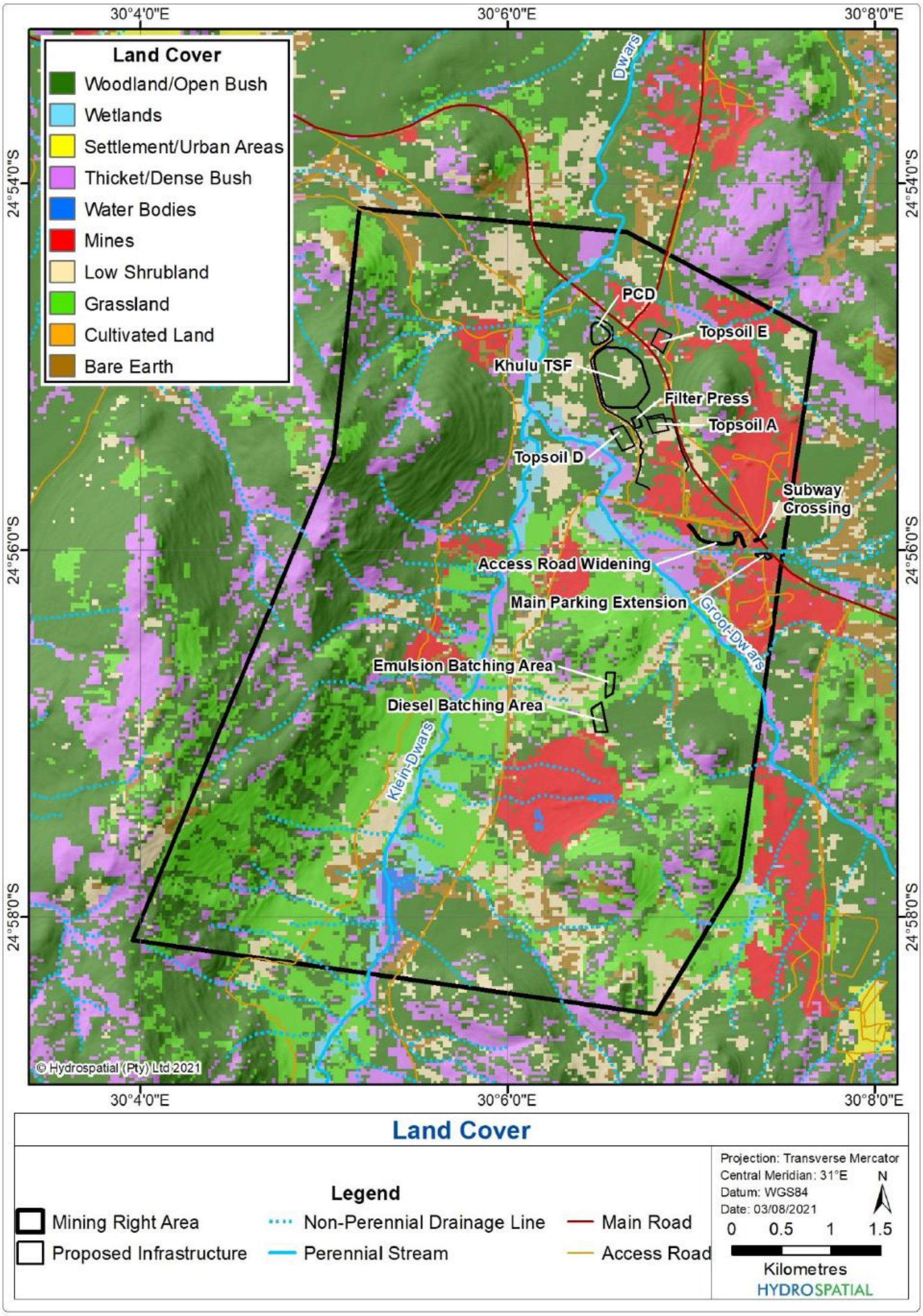


Figure 3-4: Land cover

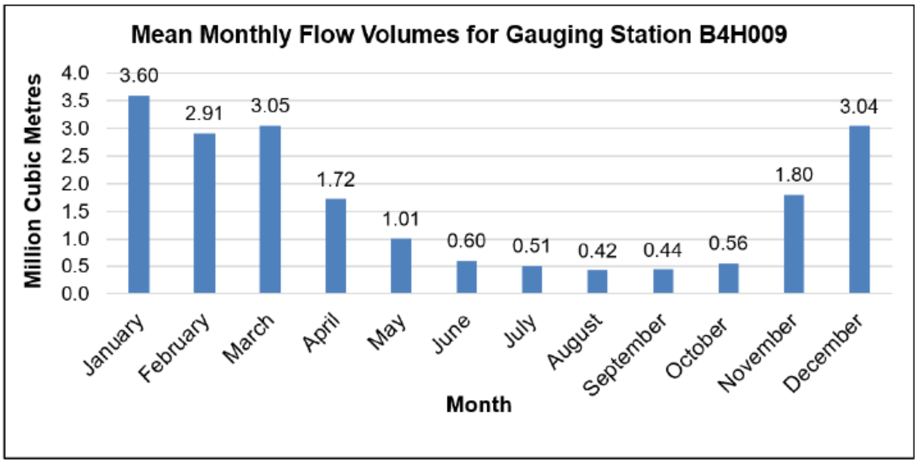


Figure 3-5: Mean monthly flows for river gauging station B4H009

3.3 Surface Water Quality

Surface water quality data was obtained from the Dwarsrivier Chrome Mine Quarterly Environmental Water Quality Report for the period January 2021 – March 2021 (Aquatico, 2021). The instream monitoring points were used to describe the surface water quality status of the receiving environment. Monitoring is undertaken on a monthly basis. Details of the monitoring points are summarised in Table 3-4 and their locations are shown on Figure 3-6.

Table 3-4: Instream surface water quality monitoring points

Monitoring Point	Location Description	Latitude	Longitude	Monitoring Frequency
S1	Groot Dwars River upstream of operations	-24.94224	30.12034	Monthly
S2	Klein Dwars Rivier (Helipad Bridge north of Landing Strip)	-24.92921	30.10105	Monthly
S3	Groot Dwars River before confluence with Groot Dwars River and Springkaanspruit (Clinic Bridge)	-24.92833	30.1084	Monthly
S4	After confluence of Groot Dwars and Klein Dwars (Main Public Road Bridge)	-24.91199	30.10325	Monthly
S5	First stream next to DRM6 (Klein Dwars)	-24.94315	30.12238	Monthly
SP1	Bridge crossing Springkaanspruit (Upstream of Operation)	-24.93336	30.12379	Monthly
SP2	Springkaanspruit on mine premises (Close to Main Sewage Plant)	-24.93351	30.11982	Monthly
SP3	Springkaanspruit on mine premises (Downstream at mine perimeter)	-24.93299	30.11686	Monthly
SP4	Klein Dwarsriver (Downstream of Truck Parking Area)	-24.94138	30.12976	Monthly
SP5	Groot Dwarsrivier (Bridge to Thorncliff Mine)	-24.9553	30.12781	Monthly

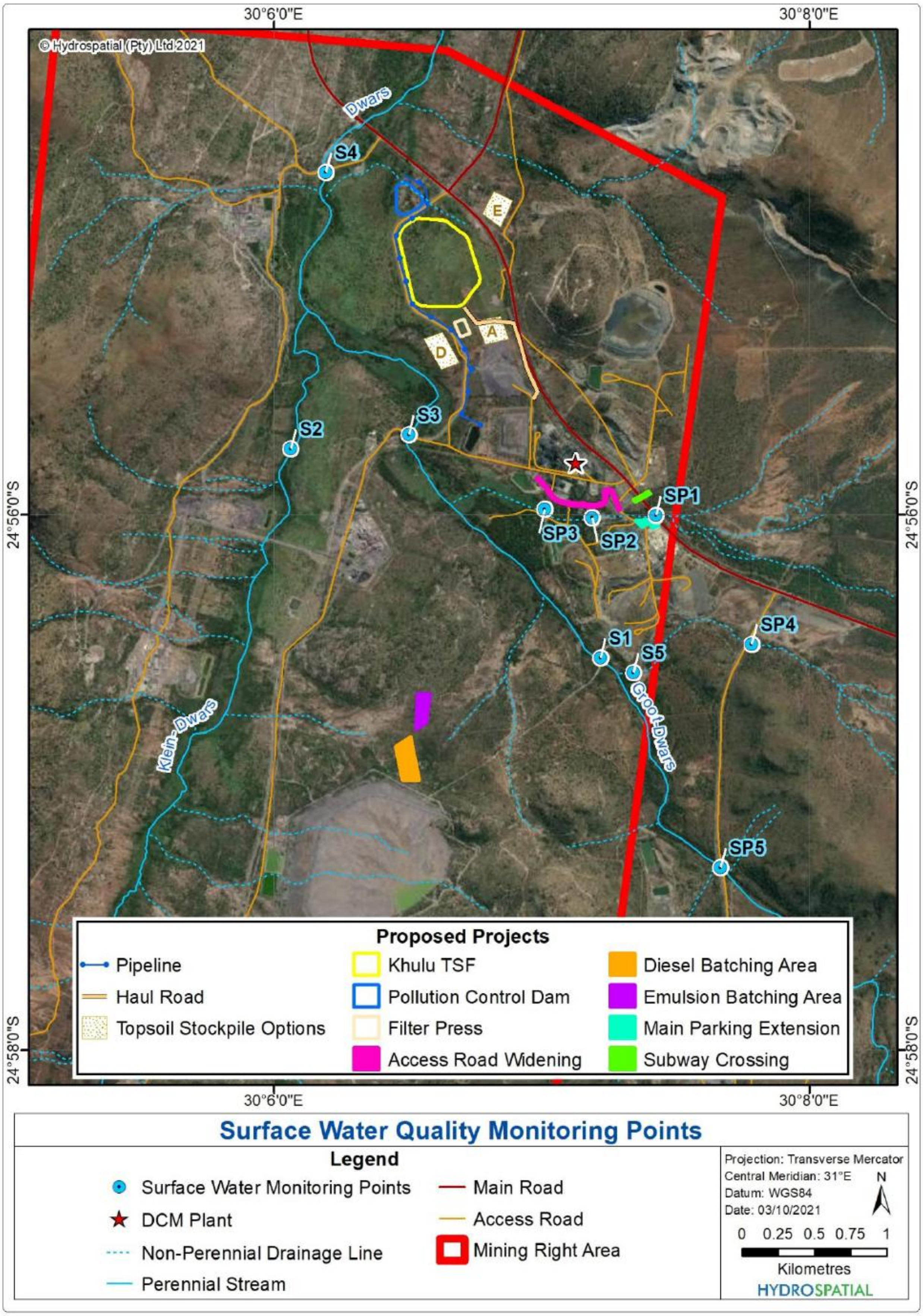


Figure 3-6: Surface water quality monitoring points

The average monthly water quality between January 2021 and March 2021 is indicated in Table 3-5. Monthly trends in pH, Total Dissolved solids (TDS), sulphate and nitrate are indicated in Figure 3-7 to Figure 3-10. The water quality was compared to the following limits:

- Assessment 1: DCM 2008 Water Use License (WUL) limits (Licence No. 24053346, Ref. 16/2/7/B400/C83); and
- Assessment 2: General Authorisation Special limit for non-listed water resources (as per DWS published in Government Gazette No 36820, Notice No665, dated 6 September 2013).

The following provides a summary of the water quality of the instream receiving environment:

- The pH has been alkaline (> 7) and within limits at all monitoring points;
- TDS exceeded the WUL limit at all monitoring points and has been particularly elevated at SP4, S2 and S4. The elevated TDS at S2 is most likely from the upstream activities from the other mines in the Klein Dwars River catchment;
- Sulphate has been within the WUL limit at all monitoring points except on one occasion at S2 in February 2020;
- Nitrate exceeded the WUL limit at S1 – S4 between January 2021 and March 2021. Nitrate has regularly exceeded the limit in the past at S1, S3 and S4, however, between December 2020 and March 2021 levels significantly declined; and
- The water quality for all other variables monitored were within the WUL limits.

Table 3-5: Average monthly water quality between January 2021 – March 2021 (Aquatico, 2021)

AVERAGE DATA TABLE:	
PROJECT NAME	Dwarsrivier Chrome Mine
ASSESSMENT SET 1	Dwarsrivier IWUL (2008) Interim WQMO for Klein Dwars River
ASSESSMENT SET 2	General Authorisation Limit, Section 21f and h, 2013
	Value exceeds the assessment set 1

VARIABLE	UNITS	ASSESSMENT 1	ASSESSMENT 2	MONITORING LOCALITIES									
				S1	S2	S3	S4	S5	SP1	SP2	SP3	SP4	SP5
pH @ 25°C	pH	-	5.5/9.5	8.34	7.86	8.24	8.16					8.47	8.29
Electrical conductivity (EC) @ 25°C	mS/m	-	150	21.7	41.3	22.8	23.6					63.8	20.2
Total Dissolved solids @ 180°C	mg/l	100	-	156	283	151	168					421	150
Calcium (Ca)	mg/l	-	-	20.7	37.5	19.1	20.1					35.4	17.3
Magnesium (Mg)	mg/l	-	-	13	19.9	13.3	14.1					71.8	13
Sodium (Na)	mg/l	-	-	5.8	17.5	6.37	6.4					7.09	5.68
Potassium (K)	mg/l	-	-	1.22	2.8	1.35	1.48					2	1.22
Total alkalinity	mg CaCO3/l	-	-	95.8	176	92.5	105					371	98.3
Chloride (Cl)	mg/l	62	-	4.35	19.7	5.17	5.27					6.16	5.01
Sulphate (SO_4)	mg/l	70	-	9.3	*20.3*	15	10.7					28.1	10.1
Fluoride (F)	mg/l	1.485	1	*0.132*	*0.132*	*0.132*	*0.132*					*0.132*	*0.132*
Nitrite (NO_2) as N	mg/l	-	-	*0.081*	*0.127*	*0.087*	*0.088*	Dry	Dry	Dry	Dry	*0.08*	*0.083*
Nitrate (NO_3) as N	mg/l	-	15	3.13	2.06	2.97	2.34					0.358	1.15
Nitrate as NO_3	mg/l	6	-	13.8	9.11	13.2	10.4					1.59	5.1
Ammonia (NH_3) as N	mg/l	-	-	0.009	*0.007*	0.013	0.014					0.03	0.019
Ammonium (NH_4) as N	mg/l	-	6	0.094	0.237	0.169	0.212					0.25	0.22
Hexavalent chromium (Cr^{6+})	mg/l	0.014	0.05	*0.001*	*0.001*	*0.001*	*0.001*					*0.001*	*0.001*
Cadmium (Cd)	mg/l	-	0.005	*0.001*	*0.001*	*0.001*	*0.001*					*0.001*	*0.001*
Chromium (Cr)	mg/l	-	-	*0.002*	*0.002*	*0.002*	*0.002*					*0.002*	*0.002*
Copper (Cu)	mg/l	0.005	0.01	*0.001*	*0.001*	*0.001*	*0.001*					*0.001*	*0.001*
Manganese (Mn)	mg/l	0.3663	0.1	*0.001*	*0.001*	*0.001*	*0.001*					*0.011*	*0.001*
Total suspended solids (TSS)	mg/l	0.0891	25	38	33	46	76					*51*	42

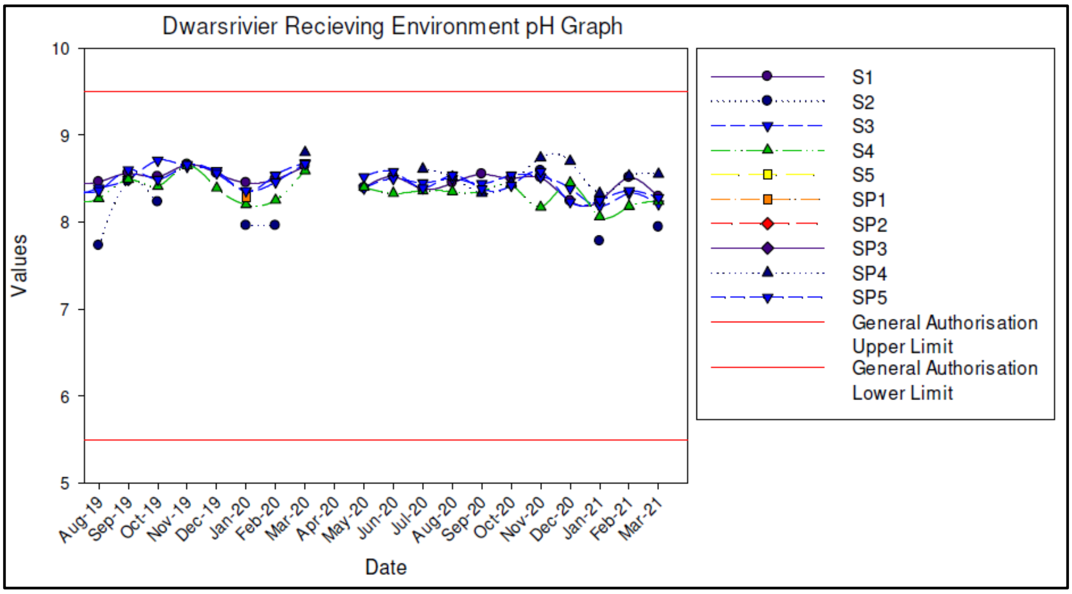


Figure 3-7: Trends in monthly pH between August 2019 and March 2021 (Aquatico, 2021)

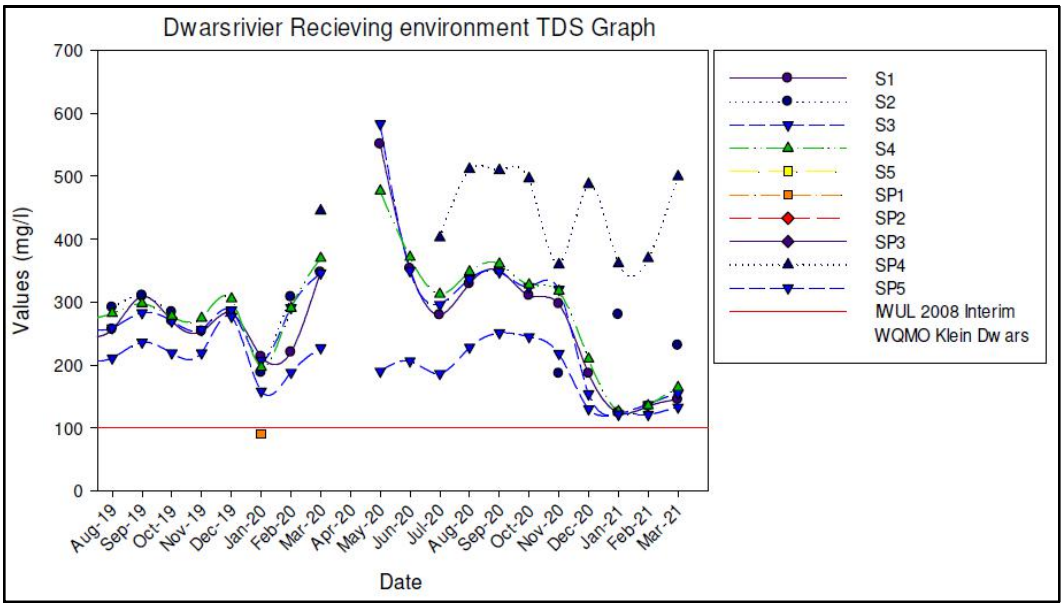


Figure 3-8: Trends in monthly TDS between July 2019 and March 2021 (Aquatico, 2021)

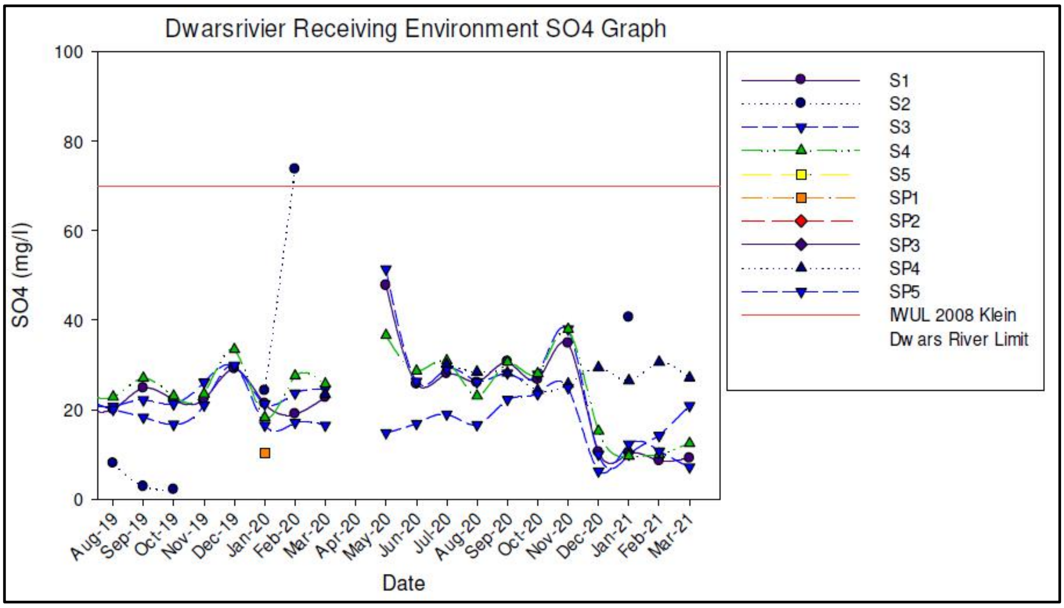


Figure 3-9: Trends in monthly sulphate between August 2019 and March 2021 (Aquatico, 2021)

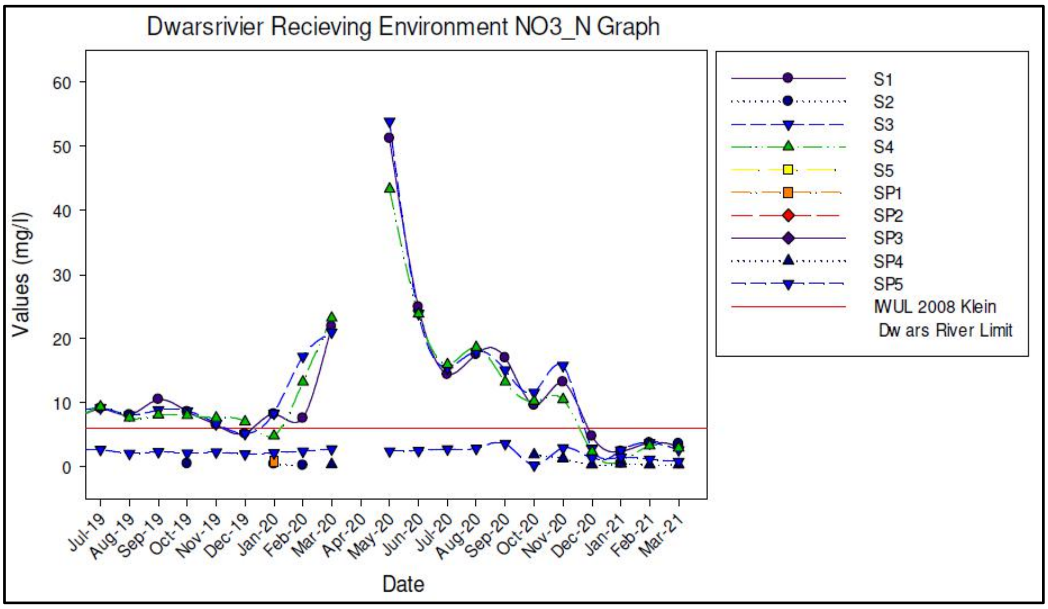


Figure 3-10: Trends in monthly nitrate between July 2019 and March 2021 (Aquatico, 2021)

4 CONCEPTUAL STORMWATER MANAGEMENT PLAN

4.1 Purpose

The purpose of the conceptual Stormwater Management Plan (SWMP) is to ensure that clean and dirty water are adequately separated, by diverting clean water away from dirty areas, and ensuring that dirty water is captured, contained and managed appropriately in accordance with GN704 regulations and the DWS Best Practice Guideline G1: Storm Water Management.

4.2 Terminology

The following definitions are relevant to the SWMP:

- **Activity:** Any mining related process on the mine including the operation of washing plants, mineral processing facilities, mineral refineries and extraction plants; the operation and the use of mineral loading and off-loading zones, transport facilities and mineral storage yards, whether situated at the mine or not; in which any substance is stockpiled, stored, accumulated, dumped, disposed of or transported;
- **Clean area:** This refers to any area at or near a mine or activity, which is not impacted by mining activities, but has the potential to become contaminated if not managed appropriately;
- **Clean water system:** This includes any dam, other form of impoundment, canal, works, pipeline and any other structure or facility constructed for the retention or conveyance of clean unpolluted water;
- **Dam:** This includes any return water dam, settling dam, tailings dam, evaporation dam, catchment or barrier dam and any other form of impoundment used for the storage of unpolluted water or water containing waste;
- **Dirty area:** This refers to any area at a mine or activity which causes, has caused or is likely to cause pollution of a water resource (i.e. generate contaminated water as a result of mining activities);
- **Partially dirty area:** These are areas that are unlikely to produce contaminated runoff other than elevated suspended solids;
- **Dirty water system:** This includes any dam, other form of impoundment, canal, works, pipeline, residue deposit and any other structure or facility constructed for the retention or conveyance of water containing waste; and
- **Watercourse:** This is defined in the NWA as -
  - A river or spring;
  - A natural channel in which water flows regularly or intermittently;
  - A wetland, lake or dam into which, or from which, water flows; and
  - Any collection of water which the Minister may, by notice in the *Gazette,* declare to be a watercourse, and a reference to a watercourse includes, where relevant, its bed and banks.

4.3 Clean and Dirty Areas

The following should be managed as dirty areas:

- Khulu TSF footprint area; and
- Diesel and emulsion batching areas.

The main parking extension, widening of the access road and access crossing below the regional road will only require temporary measures while construction is taking place.

The areas surrounding the above-mentioned dirty areas should be managed as clean areas.

4.4 Proposed Stormwater Measures

4.4.1 Khulu TSF

According to the I031 - DCM Khulu Dry TSF Concept Layout Feedback presentation (Jones & Wagener, 2021), the Khulu TSF will consist of the following stormwater measures:

- TSF sides slopes of 1V:3H, with 5 m benches at every 10 m height interval;
- Dirty water perimeter canal (solution trench) of 1.2 m deep, bottom width of 1 m wide, and side slopes of 1V:2H;
- Clean water diversions;
- PCD to contain water from the filter press as well as stormwater runoff from the TSF; and
- Silt trap to settle out silt from stormwater runoff from the TSF.

Figure 4-2 indicates the layout of the Khulu TSF SWMP. The solution trench will capture and convey stormwater runoff from the TSF to the silt trap. The silt trap will settle out silt and overflow to the PCD. Water from the PCD will be reused at the plant. The proposed clean diversion trench will divert clean water runoff around the TSF to an existing culvert to the north, and around the filter press to the south. Figure 4-1 shows the proposed clean water diversion trench design. It is proposed that the clean water trench is trapezoidal in shape, vegetated with natural occurring grass, and has side slopes of 1V:2H.

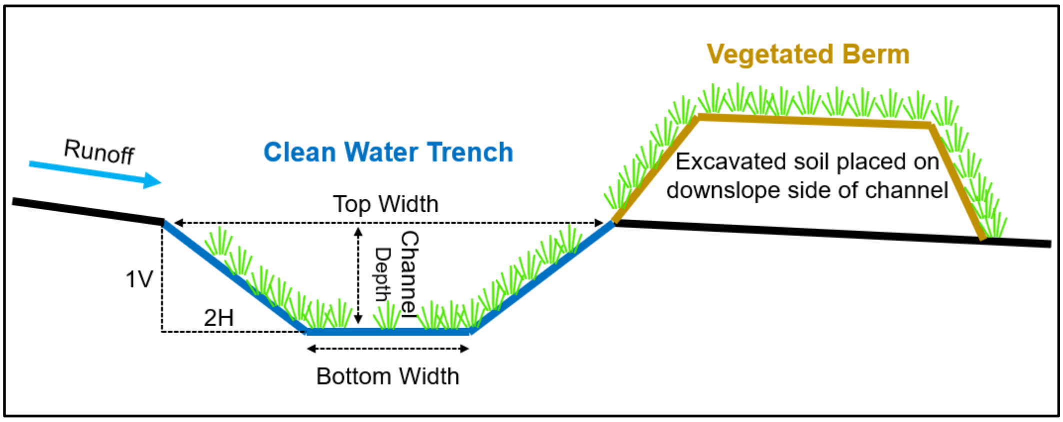


Figure 4-1: Proposed Khulu TSF clean water diversion trench design

The Soil Conservation Service (SCS) method (Schmidt and Schulze, 1987) was used to determine the 1:50 year 24 hour peak flow for the clean water catchment. The Manning Equation (SANRAL, 2013) was used to calculate the trench size to convey the 1:50 year peak flow as required by GN704 regulations. Table 4-1 provides the proposed clean water diversion trench sizing.

Table 4-1: Proposed Khulu TSF clean water diversion trench sizing

Catchment Area (km^2)	1:50 Year 24 Hour Peak Flow (m^3/s)	Bottom Width (m)	Top Width (m)	Channel Depth (m)	Length (m)
0.48	8.5	1	5	1	1 075

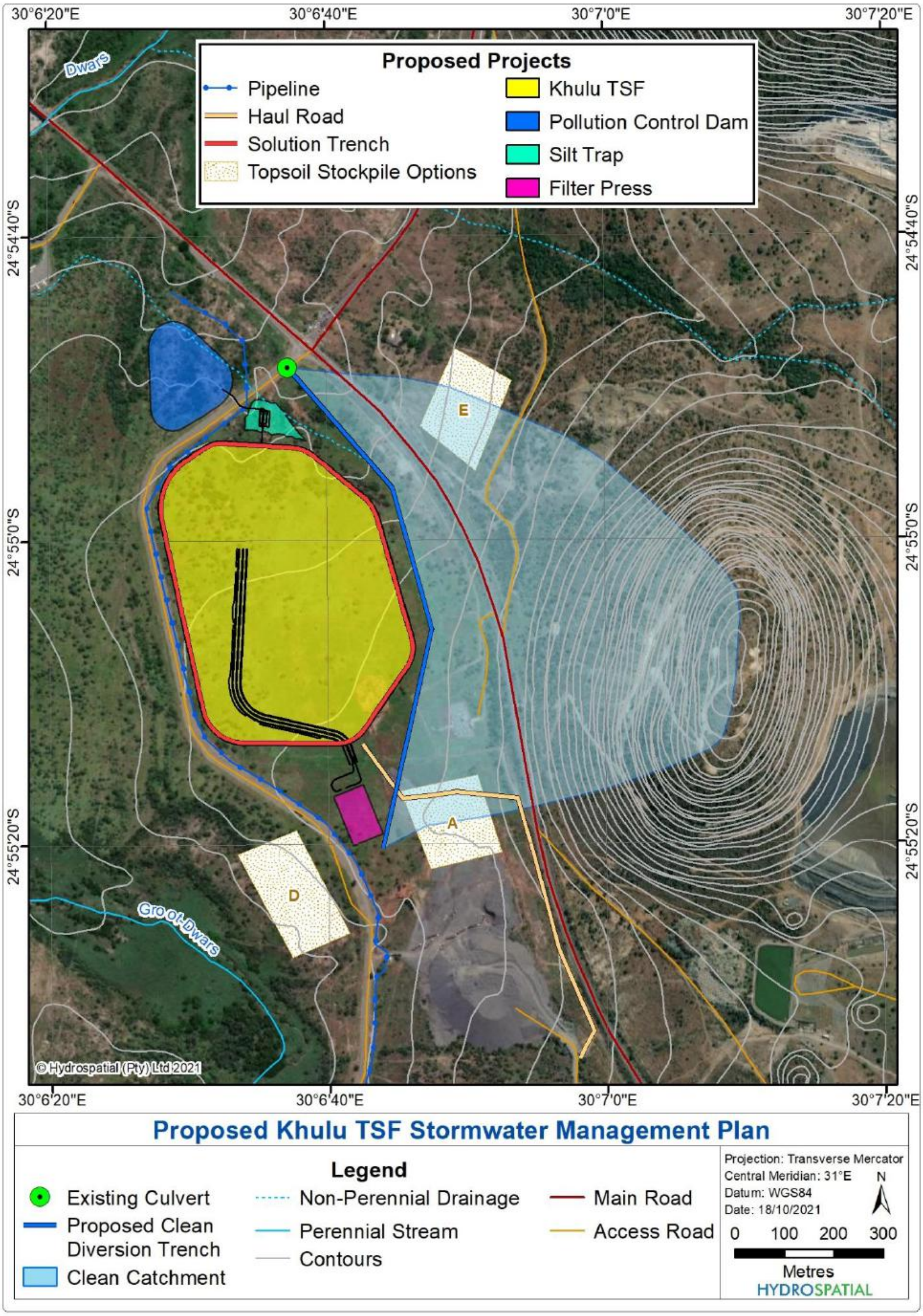


Figure 4-2: Proposed Khulu TSF stormwater management plan

4.4.2 Diesel and Emulsion Batching Area

The diesel batching area will involve the storage of two horizontal, aboveground diesel tanks of 33 m^3 each (as well as a possible future 22 m^3 tank), a 40 m^3 API self-bunded tank (Isotainer) for Hydraulic Oil and a 20 m^3 API self-bunded tank for Lube Oil. This will be a total combined storage of 148 m^3. An access road of approximately 55 m in length and 6 m in width, to the Diesel Batching area will be required.

The surface location of the emulsion batching area will only be used for the transfer of emulsion from a designated road tanker, via the off-loading pipeline to underground storage tanks. A total of 60 tons (60 m^3) of emulsion product is proposed to be stored underground. Emulsion will not be stored on surface. An access road of approximately 80 m in length and 6 m in width, to the Emulsion Batching area will be required.

Figure 4-3 indicates the proposed diesel and emulsion batching areas and access roads. The following stormwater measures are proposed:

- Clean diversion berms are constructed on the upslope side, to divert any unnecessary clean water from flowing through the proposed diesel and emulsion batching areas;
- All diesel tanks must be appropriately bunded. The bunds should have sufficient capacity to contain 110 % of the diesel tank storage capacity and should be operated empty at all times;
- The area where the transfer of emulsion from the tanker will take place, should be on an impermeable hard surface area, that is sloped to a sump, to capture any possible spills; and
- Erosion measures such as hessian nets should be employed around the proposed access roads when construction is taking place.

4.4.3 Main Parking Extension, Access Road Widening and Subway Crossing

Figure 4-4 indicates the proposed main parking extension, access road widening and subway crossing. All three of the proposed projects are located outside of the 1:100 year floodline and should therefore not be at risk of floodling, however, they are located within a 100 m horizontal distance from a watercourse, and therefore, a GN704 exemption will be required. The following measures are proposed during construction:

- Vegetation clearance should be kept to absolute minimum; and
- Erosion measures such as hessian nets should be employed around working areas when construction is taking place.

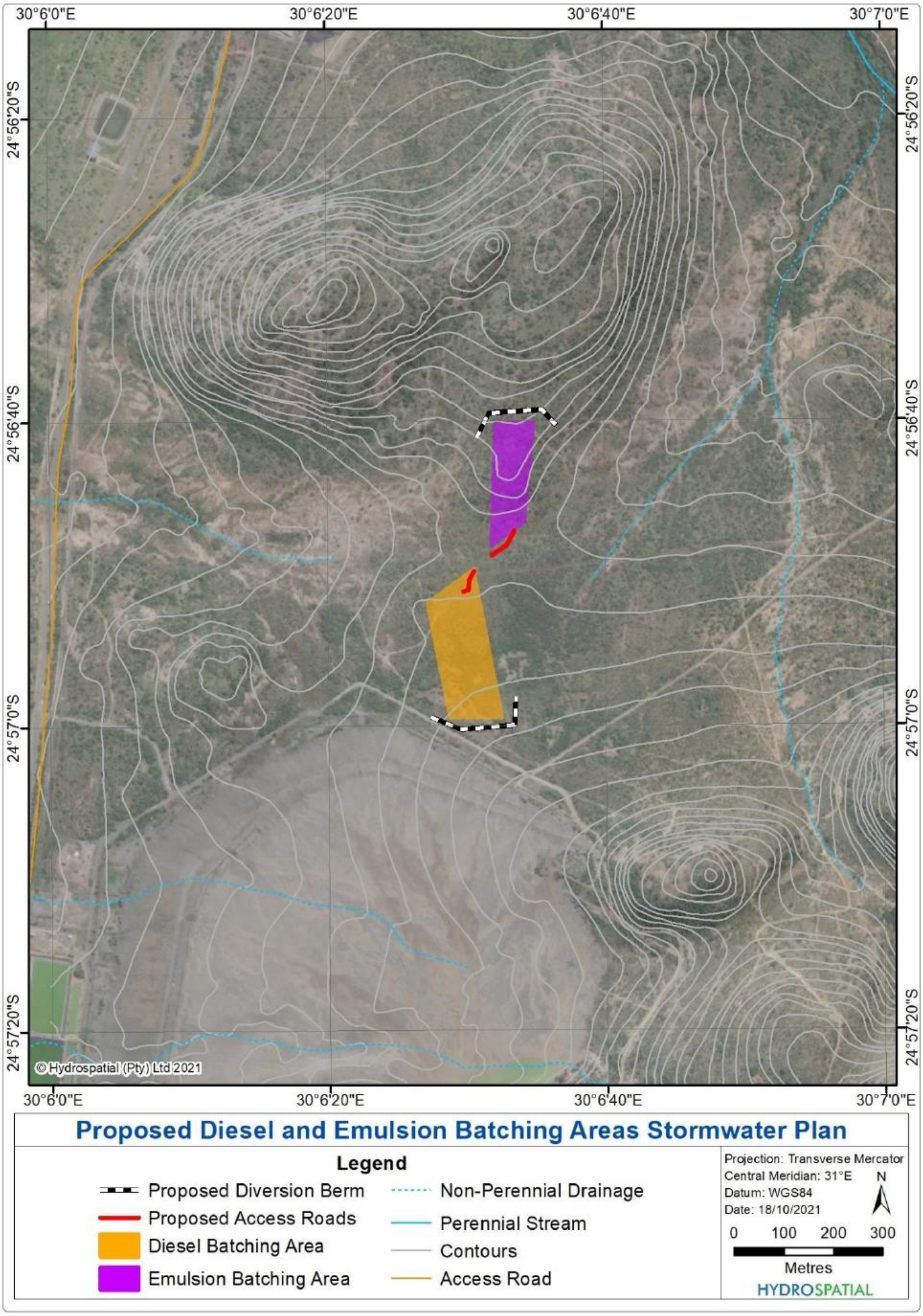


Figure 4-3: Proposed diesel and emulsion batching areas

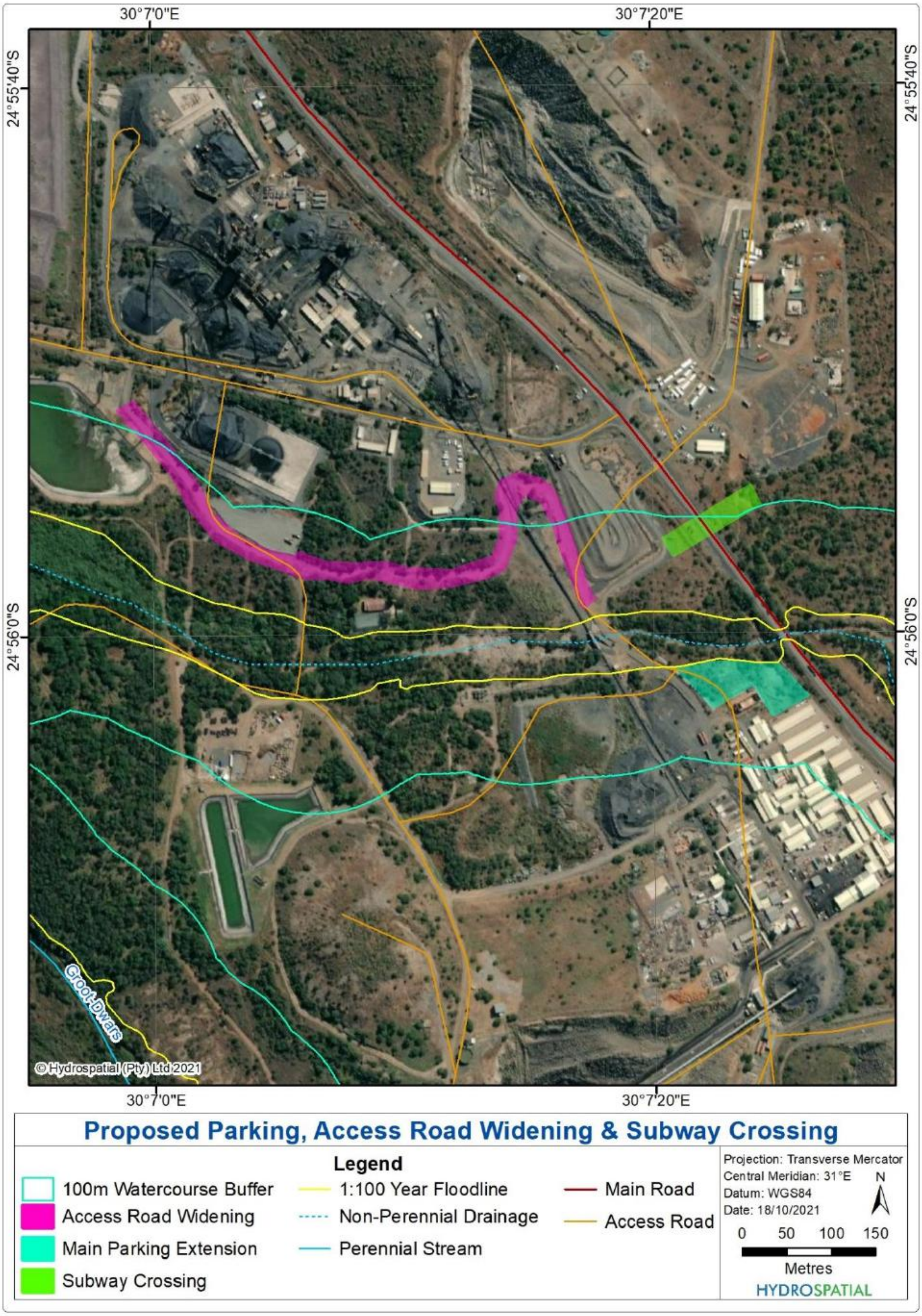


Figure 4-4: Proposed main parking extension, access road widening and subway crossing

5 SURFACE WATER IMPACT ASSESSMENT

5.1 Methodology

The impact assessment methodology used to rate the potential surface water impacts pre- and post-mitigation is provided below. The evaluation of impacts is conducted in terms of the criteria detailed in Table 5-1 to Table 5-6. The various impacts of the project are discussed in terms of impact status, extent, duration, probability and intensity. Impact significance is the sum of the impact extent, duration, probability and intensity, and a numerical rating system is applied to evaluate impact significance. Therefore, an impact magnitude and significance rating is applied to rate each identified impact in terms of its overall magnitude and significance in Table 5-6. The various components of impact methodology are discussed below.

5.1.1 Impact Status

The nature or status of the impact is determined by the conditions of the environment prior to construction and operation. The nature of the impact can be described as negative, positive or neutral (Table 5-1).

Table 5-1: Impact status

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

5.1.2 Impact Extent

The extent of an impact is considered as to whether impacts are either limited in extent or affects a wide area. Impact extent can be site-specific (within the boundaries of the development area), local, regional or national and/or international (Table 5-2).

Table 5-2: Extent of the impact

Rating	Description	Quantitative Rating
Low	**Site-specific**; occurs within the site boundary.	1
Medium	**Local**; extends beyond the site boundary; affects the immediate surrounding environment (i.e. up to 5 km from the project site boundary).	2
High	**Regional**; extends far beyond the site boundary; widespread effect (i.e. 5 km and more from the project site boundary).	3
Very High	**National and/or international**; extends far beyond the site boundary; widespread effect.	4

5.1.3 Impact Duration

The duration of the impact refers to the time scale of the impact or benefit (Table 5-3).

Table 5-3: Duration of the impact

Rating	Description	Quantitative Rating
Low	**Short-term**; quickly reversible; less than the project lifespan; 0 – 5 years.	1
Medium	**Medium-term**; reversible over time; approximate lifespan of the project; 5 – 17 years.	2
High	**Long-term**; permanent; extends beyond the decommissioning phase; >17 years.	3

5.1.4 Impact Probability

The probability of the impact describes the likelihood of the impact actually occurring (Table 5-4).

Table 5-4: Probability of the impact

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

5.1.5 Impact Intensity

The intensity of the impact is determined to quantify the magnitude of the impacts and benefits associated with the proposed project (Table 5-5).

Table 5-5: Intensity of the impact

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

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

5.1.6 Impact Significance

The impact magnitude and significance rating is utilised to rate each identified impact in terms of its overall magnitude and significance (Table 5-6).

Table 5-6: Impact magnitude and significance rating

Impact	Rating	Description	Quantitative Rating
Positive	**High**	Of the highest positive order possible within the bounds of impacts that could occur. +	+12 to -16
	Medium	Impact is real, but not substantial in relation to other impacts that might take effect within the bounds of those that could occur. Other means of achieving this benefit are approximately equal in time, cost and effort	+6 to -11
	Low	Impacts is of a low order and therefore likely to have a limited effect. Alternative means of	+1 to –5

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

5.2 Impact Assessment Ratings and Mitigation Measures

The impact description, impact ratings pre- and post-mitigation, and mitigation measures are provided in Table 5-7.

Table 5-7: Impact assessment

Phase	Activity	Impact Description	Pre-Mitigation					Mitigation/Management Measures & Recommendations	Post-Mitigation				
			Extent	Duration	Probability	Intensity	Significance		Extent	Duration	Probability	Intensity	Significance
Construction Phase	Removal of vegetation for the Khulu TSF, Capital Projects and associated infrastructure.	Erosion of exposed soils leading to siltation and sedimentation of downslope drainage channels.	Local (2)	Short-term (1)	Probable (2)	Minor (-2)	Medium (-6 to -11)	Vegetation clearance should be kept to an absolute minimum. Temporary erosion measures should be employed at exposed areas. Exposed areas should be vegetated as soon as possible.	Site-specific (1)	Short-term (1)	Improbable (1)	Negligible (-1)	Low (-1 to -5)
Construction Phase	Use of heavy machinery, trucks and vehicles for construction purposes.	Potential hydrocarbon spillages washed into downslope drainage channels.	Local (2)	Short-term (1)	Probable (2)	Average (-3)	Medium (-6 to -11)	Machinery, trucks and vehicles must be well maintained and serviced regularly as per a recommended service guide. Refuelling must be undertaken over hard park bunded areas that adequately sized to capture and contain spillages. Machinery and vehicles should be parked on appropriately lined areas. Drip trays must be employed under stationary machinery. Spillages should be reported immediately, and spill kits should be readily available at all times.	Site-specific (1)	Short-term (1)	Improbable (1)	Negligible (-1)	Low (-1 to -5)
Operational Phase	Use of heavy machinery, trucks and vehicles during the operational phase.	Potential hydrocarbon spillages washed into drainage lines and depressions	Local (2)	Long-term (3)	Probable (2)	Average (-3)	Medium (-6 to -11)	Machinery, trucks and vehicles must be well maintained and serviced regularly as per the recommended service guide. Refuelling must be undertaken over hard park bunded areas that adequately capture and contain spillages. Machinery and vehicles should be parked on appropriately lined areas. Drip trays must be used under leaking machinery. Spillages should be reported immediately and spill kits should be readily available at all times.	Site-specific (1)	Short-term (1)	Probable (2)	Negligible (-1)	Low (-1 to -5)

Phase	Activity	Impact Description	Pre-Mitigation					Mitigation/Management Measures & Recommendations	Post-Mitigation				
			Extent	Duration	Probability	Intensity	Significance		Extent	Duration	Probability	Intensity	Significance
Operational Phase	Loss of contributing catchment area due to the containment of dirty water runoff.	Due to the small size of the TSF and Capital Projects, the loss of contributing area will be negligible (less than 0.5 %) in comparison to the runoff area of quaternary catchment B41G.	Site-specific (1)	Medium-term (2)	Improbable (1)	Negligible (-1)	Low (-1 to -5)	Runoff from dirty areas must be contained according to GN704 regulations. There are no mitigation measures for a loss of contributing catchment area. The loss of catchment area is extremely small and would therefore have a negligible impact on reducing the catchment yield.	Site-specific (1)	Medium-term (2)	Improbable (1)	Negligible (-1)	Low (-1 to -5)
Operational Phase	Placement of the Khulu TSF infrastructure in a potential non-perennial drainage line located towards the north-eastern side of the TSF.	According to the 1:50 000 topographical map 2430CC Kennedy's Vale, a non-perennial drainage line runs along the north-eastern boundary of the Khulu TSF site. This area was assessed on the site visit and it was noted that the area was highly disturbed by what appeared to be old stockpiles and borrow pits, most likely from previous road construction in the area. Water is likely to pond in this area as a result of the disturbance, and therefore it is highly unlikely that this area functions as a drainage line.	Local (2)	Long-term (3)	Probable (2)	Average (-3)	Medium (-6 to -11)	The implementation of the proposed clean water diversion trench around the TSF will assist with drainage in this area.	Site-specific (1)	Medium-term (2)	Improbable (1)	Negligible (-1)	Low (-1 to -5)

Phase	Activity	Impact Description	Pre-Mitigation					Mitigation/Management Measures & Recommendations	Post-Mitigation				
			Extent	Duration	Probability	Intensity	Significance		Extent	Duration	Probability	Intensity	Significance
Operational Phase	Contamination of clean areas from dirty areas.	The proposed Khulu TSF, silt trap, PCD, diesel storage tanks and emulsion transfer area have the potential to contaminate the surrounding clean environment should spills occur.	Regional (3)	Long-term (3)	Highly Probable (3)	Severe (-4)	High (-12 to -17)	Runoff from the Khulu TSF will be captured in a perimeter trench (solution trench) which must be lined and sized appropriately according to GN704 regulations. Clean water should be diverted around the TSF through the implementation of a diversion trench. The TSF silt trap must be regularly inspected and desilted. Desilted material must be placed temporarily on a lined bunded area and disposed of either back on the TSF or at an appropriate facility. The PCD must be lined and appropriately sized so as not to spill more than once in 50 years, in accordance with GN704 regulations. The freeboard of the PCD must be monitored daily. Lined bunded areas that are sized to accommodate 110 % of the storage capacity of the diesel tanks must be implemented beneath the tanks and should be operated empty at all times. The emulsion transfer area must be lined and sloped towards a sump to capture any potential spills. The sump should be inspected and emptied on a regular basis and disposed at an appropriate facility. Clean water should be diverted around the diesel and emulsion batching areas to prevent any unnecessary cross contamination.					

Phase	Activity	Impact Description	Pre-Mitigation					Mitigation/Management Measures & Recommendations	Post-Mitigation				
			Extent	Duration	Probability	Intensity	Significance		Extent	Duration	Probability	Intensity	Significance
Closure, Decommissioning & Rehabilitation Phase	Removal of infrastructure and rehabilitation.	It is likely that the Khulu TSF will remain, however, the other infrastructure will most likely be removed and rehabilitated. Rehabilitation activities can potentially result in exposed soils leading to erosion and sedimentation.	Local (2)	Long-term (3)	Probable (2)	Average (-3)	Medium (-6 to -11)	If possible, the Khulu TSF should be vegetated. Temporary erosion measures should be employed at exposed areas until vegetated. The topography should be returned to its former state (as far as practically possible). Exposed areas should be vegetated as soon as possible. The topsoil stockpiles should be used to fill in areas and to create a suitable substrate to re-vegetate areas.	Site-specific (1)	Medium-term (2)	Improbable (1)	Negligible (-1)	Low (-1 to -5)

6 MONITORING PLANS

6.1 Surface Water Quality

It is recommended that the water quality is monitored at the proposed Khulu PCD as well as on the Klein Dwars River immediately upstream of the proposed diesel batching area.

6.2 Stormwater Infrastructure

Stormwater infrastructure must be monitored on a monthly basis during the dry season, and on a weekly basis during the wet season. The freeboard of the proposed dirty water containment facilities must be inspected daily and records must be kept. Water infrastructure should further be monitored immediately after any large storm event. Should blockages, silted up structures or breaches occur, then immediate action must be undertaken to remove debris and repair breaches. Monitoring should be undertaken by the onsite Environmental Control Officer (ECO) or maintenance manager. Inspections must be recorded and should include the following:

- Date of inspection;
- Rainfall amount received in a 24-hour period prior to inspection;
- Photographs of blockages, silted up structures or breaches witnessed;
- Actions taken to fix issues and the amount of time taken to address them; and
- Photographs post action taken.

Inspection reports should be prepared on a monthly/quarterly basis and should be kept ready and supplied to the DWS when requested, or as part of the WUL conditions.

7 CONCLUSIONS AND RECOMMENDATIONS

Hydrospatial (Pty) Ltd was appointed by EnviroGistics (Pty) Ltd to undertake a surface water study for the following proposed projects at the Dwarsrivier Chrome Mine (hereafter referred to as “DCM” or the “Mine”):

- Project 1: Establishment of the new proposed Khulu Tailings Storage Facility (TSF);
- Project 2: Establishment of a Diesel and Emulsion Batching area;
- Project 3: Main Parking Extension;
- Project 4: Widening of an Access Road between South Shaft/Main Offices and Plant; and
- Project 5: Subway Crossing between the Plant and North Mine

No watercourses are located within the 1:100 year floodline or within 100 m of the Khulu TSF or diesel and emulsion batching areas, however, the proposed main parking extension, access road widening and subway crossing, are located within a 100 m horizontal distance of a watercourse (but not within the 1:100 year floodline).

A conceptual stormwater management plan to separate clean and dirty water areas has been prepared under section 4 of the report.

An impact assessment and proposed mitigations measures are provided under section 5 of the report.

Monitoring plans for surface water quality and stormwater infrastructure have been provided under section 6 of the report.

The following provides a summary of the main recommendations of the study:

- GN704 exemptions are applied for, for the following proposed infrastructure located within a 100 m horizontal distance of a watercourse:
  - Main Parking Extension;
  - Widening of an Access Road between South Shaft/Main Offices and Plant; and
  - Subway Crossing between the Plant and North Mine
- A clean water diversion berm should be constructed upslope of the proposed Khulu TSF;
- Clean diversion berms are constructed on the upslope side of the proposed diesel and emulsion batching areas to divert any unnecessary clean water from flowing through these facilities;
- All diesel tanks must be appropriately bunded. The bunds should have sufficient capacity to contain 110 % of the diesel tank storage capacity and should be operated empty at all times;
- The area where the transfer of emulsion from the tanker will take place, should be on an impermeable hard surface area, that is sloped to a sump, to capture any possible spills. The sump should be inspected regularly and liquid within the sump disposed of at an appropriate facility;
- Vegetation clearance should be kept to absolute minimum;
- Erosion measures such as hessian nets should be employed around working areas when construction is taking place;
- The Khulu TSF silt trap must be regularly inspected and desilted. Desilted material must be placed temporarily on a lined bunded area and disposed of either back on the TSF or at an appropriate facility;
- The PCD must be lined and appropriately sized so as not to spill more than once in 50 years, in accordance with GN704 regulations. The freeboard of the PCD must be monitored daily;
- The proposed pipeline must be regularly inspected for leaks; and
- It is proposed that topsoil stockpile option A is selected as the most favourable option as there are no nearby drainage channels. Furthermore, this area has received environmental authorisation for vegetation clearance as part of the discard dump extension.

Should the mitigation measures, recommendations and monitoring plans provided in this study be adhered to, then from a surface water perspective, the proposed projects can commence.

8 REFERENCES

Aquatico. 2021. Dwarsrivier Chrome Mine Quarterly Environmental Water Quality Report. January 2021 – March 2021.

Food and Agriculture Organisation (FAO) of the United Nations. 2005. New LocClim - Local Climate Estimator.

Jones & Wagener. 2021. I031 - DCM Khulu Dry TSF Concept Layout Feedback Presentation. Jones & Wagener (Pty) Ltd. 14/07/2021.

SANRAL. 2013. The South African National Roads Agency SOC Limited (SANRAL) Drainage Manual, 6th edition.

SAS. 2021. FRESHWATER ECOLOGICAL ASSESSMENT AS PART OF THE ENVIRONMENTAL AUTHORISATION AND WATER USE LICENCE APPLICATION PROCESS FOR THE PROPOSED DEVELOPMENT OF A NEW TAILINGS STORAGE FACILITY AND FUEL STORAGE AREAS AT THE DWARS RIVER CHROME MINE, LIMPOPO PROVINCE. Scientific Aquatic Services.

Schmidt, E.J. and Schulze, R.E. 1987. Flood volume and peak discharge from small catchments in southern Africa, based on the SCS technique. Water Research Commission, Pretoria, WRC-TT 31/87. 164 pp.

Smithers J.C. and Schulze R.E. 2002. Design Rainfall and Flood Estimation in South Africa. WRC Project No. K5/1060.

APPENDIX A: CURRICULUM VITAE

Dwarsrivier Chrome Mine (Pty) Ltd

DRAFT Environmental Impact Assessment for the new Khulu Tailings Storage Facility (TSF) and other Capital Projects

Report Purpose

Stakeholder Review

Report Status

DRAFT

Report Reference

EnviroGistics Ref.: 21828_F

Departmental Ref.: 30/5/1/3/2/1(179) EM

Mining Right Ref: 30/5/1/3/2/1(179) EM

Report Author

Tanja Bekker
MSc. Environmental Management; Pr.Sci.Nat
EAPASA Reg No: 306/2019; SACNASP Reg No: 400198/09

25 February 2022

Author

Tanja Bekker is registered as a Professional Natural Scientist in the field of Environmental Science with the South African Council for Natural Scientific Professions (SACNASP) and is also a registered Environmental Assessment Practitioner (EAP) with the Environmental Assessment Practitioners Association of South Africa (EAPASA), a legal requirement stipulated by the National Environmental Management Act, 1998. She is further certified as an ISO 14001 Lead Auditor. Her qualifications include BSc. Earth Sciences (Geology and Geography), BSc. (Hons.) Geography and MSc. Environmental Management. In addition to her tertiary qualifications, she obtained a Certificate in Project Management, and completed the Management Advancement Programme at Wits Business School.

With more than 20 years' experience in environmental management and the consulting industry, she follows a methodical and practical approach in attending to environmental problems and identifying environmental solutions throughout the planning, initiation, operation and decommissioning or closure of projects.

Disclaimer

The findings, results, observations, conclusions and recommendations given in this report are based on the author's best scientific and professional knowledge, as well as available information. Information utilised and contained in this report is based on data/information supplied to EnviroGistics (Pty) Ltd by the client and other external sources (including previous site investigation data and external specialist studies). EnviroGistics (Pty) Ltd exercises due care and diligence in rendering services and preparing documents, however it has been assumed that the information provided to EnviroGistics (Pty) Ltd is correct and as such the accuracy of the conclusions made are reliant on the accuracy and completeness of the data supplied. No responsibility is accepted by EnviroGistics (Pty) Ltd for incomplete or inaccurate data supplied by the client and/or other external sources. Opinions expressed in this report apply to the site conditions and features that existed at the time of the start of the relevant investigations and the production of this document. For this reason, EnviroGistics (Pty) Ltd accepts no liability, and the client by receiving and therefore accepting this document, indemnifies EnviroGistics (Pty) Ltd and its directors against all actions, claims, demands, losses, liabilities, costs, damages and expenses arising from or in connection with the services rendered, directly or indirectly.

The document may not be altered or added to without the prior written consent of the author. This also refers to electronic copies of the report which are supplied for the purposes of inclusion as part of other reports.

Copyright

Quality Control

Report Title	EIA AND EMPR FOR THE PROPOSED KHULU TSF AND OTHER CAPITAL PROJECTS	
Report Ref. No.	21828	
Report Status	DRAFT	
Report Purpose	For Stakeholder Review	
	Signature	**Date**
Author	Tanja Bekker	2 February 2022
Reviewer	Michelle Pretorius	13 February 2022

Amendments

Report Ref:	Nature of Amendment	Date	Report Output Ref:
21828_D	External Review	13 February 2022	21828_D2
21828_D2	Inclusion of Stakeholder Consultation undertaken during February 2022	23 February 2022	21828_FD
21828_FD			21828_F

Distribution

Distributed To:	Purpose:	Date	Format/Amount
Michelle Pretorius	External Review	3 February 2022	Electronic
Tanja Bekker	Incorporation of external review	13 February 2022	Electronic
Pieter Schoeman	Client Review	13 February 2022	Electronic
Tanja Bekker	Finalise Report	22 February 2022	Electronic
DWS, Municipality, DFFE, DMRE, Registered Stakeholders, LEDET SAHRA (online submission)	Stakeholder Review	24 February 2022	Hard Copy and Electronic Copy – Review: 28 February to 30 March 2022
DMRE	FINAL REPORT		Three Hard Copies and one Electronic Copy

Executive Summary

Introduction

Dwarsrivier Chrome Mine (Pty) Ltd (hereafter referred to as "Dwarsrivier Mine" or "the mine") is wholly owned by Assore Ltd ("Assore").

Dwarsrivier Mine is situated approximately 60km northwest of Lydenburg, 25km south of Steelpoort and 63km northeast of Roossenekal in the Limpopo Province. The mine currently holds the surface rights for Portion 1 (Remaining Extent (RE)) and Portion 0 (RE) of the farm Dwarsrivier 372KT, as well as Portion 4 (a portion of Portion 3) of the farm De Grooteboom 373KT.

The operation is located in the Fetakgomo Tubatse Local Municipality, within the boundaries of the Sekhukhune District Municipality.

The mine originated as a result of neighbouring properties to the north and south thereof, which had existing chrome mining operations at the time of purchase in 1998. The owners of Dwarsrivier Mine therefore invested in a feasibility study for the Plant, the old Tailings Storage Facility (TSF) and the mining of chrome. The designs for the opencast and underground mines then commenced. Approval to proceed with the final design and construction of work was given in July 1999 (http://www.assmang.co.za/chrome.asp). The mine ceased opencast operations in 2006 and is currently operating as an underground (trackless, board and pillar operation) mine, producing chromite ore, with a Dense Medium Separation and Spiral Beneficiation Plant. Dwarsrivier Mine currently produces approximately 200 000 tons of chromite ore per month.

The mine was previously owned by Assmang (Pty) Ltd ("Assmang") with a 50% share. This resulted from the approval by the then Department of Mineral Resources (DMR) (now Department of Mineral Resources and Energy (DMRE)) of the Section 11 Transfer in terms of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002) (MPRDA) of Dwarsrivier Mine from African Rainbow Minerals (ARM) to Assore. The change of ownership officially came into effect on 1 August 2016. All Environmental Authorisations and Waste Management Licences (WMLs) were transferred with approval issued by the Competent Authority (DMRE) during May 2019. Currently the Water Use Licence, 2008 (WUL, 2008) has also been transferred to Dwarsrivier Mine, with the WUL, 2011 and WUL, 2013 amendments currently pending.

It is the intention of Dwarsrivier Mine to initiate certain additional infrastructure and activities on site. These will include:

- Project 1: Khulu TSF Project;
- Project 2: Diesel and Emulsion Batching;
- Project 3: Main Parking Extension;
- Project 4: Widening of access road between South Shaft/ Main Offices and Plant; and
- Project 5: Access Crossing between Plant and North Mine (Subway Crossing).

Project Description

Project 1: Khulu TSF

Dwarsrivier Mine is currently depositing tailings material at the existing North Tailings Storage Facility (North TSF) at the eastern side of their process plant on Portion RE of the Farm Dwarsrivier 372KT. It is anticipated that the existing North TSF will reach its full capacity within the next three (3) to five (5) years. For this reason, additional storage capacity on site is required.

The mine initially identified seven (7) potential site alternatives for the proposed new TSF (to be referred to as the "Khulu TSF"), which were then reduced to four (4) sites, namely Sites B, C, D and F. During the 2019 Site Selection Process, Site D was identified as the preferred site, however, subsequent to the 2019 Site Selection Process, further geotechnical and engineering studies were undertaken, which identified potential concerns for Site D, such as the proximity of a non-perennial tributary of the Dwars River to the site. Based on the initial view of the Environmental Assessment Practitioner (EAP), Site B was fatally flawed due to its location coinciding with that of a potential future Eskom substation, for which an Environmental Authorisation has been granted and negotiations in terms of land use between the mine and Eskom have commenced. The aforementioned Eskom substation is however no longer planned, which has reintroduced Site B into the overall assessment. The geotechnical and engineering studies have excluded Site F as a potential site alternative due to the distance of this site from the Plant, reducing the number of site alternatives considered to three (3), namely Sites B, C and D.

The site alternatives and corresponding footprint areas and anticipated heights, are as follows:

- Site B: 22.5ha (ha), 42m high;
- Site C: 28ha, 29m high; and
- Site D: 21ha, 49m high.

The project will not involve typical tailings deposition techniques, but will involve the piping of tailings to a filter press facility from where the filter cake will be trucked to the new TSF. The project will also in this instance involve the construction of a Filter press (to dewater tailings prior to disposal), located at the approved Old TSF, as well as a new Pollution Control Dam (PCD) located north of the proposed Khulu TSF. Ancillary infrastructure will include a topsoil stockpile (10ha, located on the approved footprint for the future Discard Dump expansion, access roads and service roads to the TSF and PCD, pipeline between the Lower Return Water Dam (LRWD) and the new PCD of about 3ha. An operational life of about 20 years is currently considered as part of the design.

Project 2: Diesel and Emulsion Batching

As the underground mining progresses in line with the approved Mining Work Programme, it is required that the surface infrastructure be adapted to suit the development of the mining operations. The surface developments are undertaken to provide efficient and safe operation from a life safety, environmental safety and cost-effective operation perspective. Given the current area of operation at South Shaft and considering the current five (5) year mining plan, the need to consider additional off-loading and bulk storage of diesel and emulsion closer to the immediate work area, to a surface position over current strikes at the South Shaft decline, has arisen. The mine therefore identified the need to erect two (2) batching areas, for diesel and emulsion batching, respectively, to supply diesel and emulsion to the underground mining operations. The proposed location of the diesel and emulsion batching areas is to the northeast of the old Two Rivers Platinum Mine (TRP) Tailings Storage Facility, with the Diesel Batching Area just south of the new TRP Tailings Pipeline, and the Emulsion Batching Area just north of the pipeline. The project will include:

- Diesel Batching Area:
  - Construction of an access road, approximately 55m in length and 6m in width, to the Diesel Batching Area.
  - Due to the imposed limitations of the Mine Health and Safety Act, 1996 (Act No. 29 of 1996) that limit the storage of hydrocarbons to three (3) days of operation, the majority of the diesel, hydraulic oil and lube oil required will be stored at surface in a purpose designed and constructed terminal that provides the necessary life safety and environmental safety required. The project will involve the storage of two (2) horizontal, aboveground diesel tanks of 33m^3 each (as well as a possible future 22m^3 tank); a 40m^3 API self-bunded tank (Isotainer) for hydraulic oil; and a 20m^3 API self-bunded tank for lube oil. A total combined storage of 148m^3 is therefore required.
- Emulsion Batching Area:
  - Construction of an access road, approximately 80m in length and 6m in width, to the Emulsion Batching area.
  - No emulsion will be stored at the surface location and all product decanted will be stored underground at a purpose-built depot located at Strike N15G/ N17A. The surface location will be used for the express purpose of transferring emulsion from a designated road tanker, via the off-loading pipeline to the underground storage tanks.
  - The mine intends storing a total of sixty (60) tons (similarly 60m^3) of emulsion product underground, with no surface storage or pipeline inventory required.
- General:
  - Parking and Offloading Areas, with security offices at both areas (no dangerous good storage is planned to take place at any time).
  - Other internal roads will be required to access the various pipelines; these are however included into the overall clearance consideration of the project, and not as stand-alone roads.
  - The Diesel and Emulsion Batching Areas will feed into pipelines for underground use at both areas.

Clearance of indigenous vegetation will be required in the order of approximately 5ha (including Diesel and Emulsion Batching Areas and the access roads required).

Project 3: Main Parking Extension

The mine requires the expansion of the existing parking area at the Main Offices. The current parking area is about 0.8ha with the parking bays not sufficient to cater for the number of vehicles. The current parking area comprises of a paved surface area and steel roof parking bays. The same principle will be applied at the extension area, and no new entrances will be required. The planned parking bay extension will be located about 20m from the Springkaanspruit.

Clearance of indigenous vegetation will be required in the order of approximately 0.5ha.

<u>Project 4: Widening of Access Road between South Shaft/ Main Offices and Plant</u>

An existing road provides access between the Main Office Buildings and the Plant. The current width of the road ranges between 5m and 6m. The mine is planning on increasing a section of 700m of this road to a width of 16m to allow for two-way traffic. The purpose is to improve the safe operation of traffic on this road.

Clearance of indigenous vegetation will be required in the order of approximately 0.3ha.

<u>Project 5: Access Crossing between Plant and North Mine (Subway Crossing)</u>

To ensure more optimal logistical management of traffic between the South Mine, where the Beneficiation Plant is located, and the North Mine, and to reduce the number of vehicles on the regional Sekhukhune Road, the mine is planning on constructing a road under the regional road bridge to allow for access between the two areas.

Clearance of indigenous vegetation will be required in the order of approximately 0.2ha.

Listed Activities

In terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA), there are three (3) listing notices which should be considered for this application. These listing notices were amended during 2017. Listing Notice 1 (Regulation 983) activities require a Basic Assessment Process, whereas Listing Notice 2 (Regulation 984) activities require a full Environmental Impact Assessment (EIA) Process. Listing Notice 3 (Regulation 985) activities require a Basic Assessment Process if the area falls within certain geographic zones. At the time of undertaking the specialist assessments for this application, the majority of the Dwarsrivier Mine was located in a Critical Biodiversity Area 1 (CBA1) with a small portion thereof falling within an Ecological Support Area 2 (ESA2). The extent of the mine is also located within the original extent of a threatened ecosystem, namely the Sekhukhuneland Mountainlands ecosystem, which is listed as Endangered and within 10km of the De Hoop Dam Protected Environment. Therefore, Listing Notice 3 is applicable when considering infrastructure and activities planned on site.

NOTE: Important to note that Subsequent to the specialist assessments, the CBAs for the Sekhukhune District Municipality were updated to align these with the Sekhukhune District Bioregional Plan, and the current mining area, including the proposed project footprint areas, no longer falls within a CBA, but still in a listed threatened ecosystem. This report therefore still refers to CBAs, as it has minimal impact on the assessment. It should also be noted that based on current available information, the Sekhukhune Mountainlands threatened ecosystem is proposed to fall away once the Draft Revised Threatened Ecosystem Regulations of 2021 are promulgated. The Sekhukhune Mountainlands threatened ecosystem is however still in place, in line with the undertaking of the current specialist studies.

The following table details the listed activities relevant to this project.

NAME OF ACTIVITY	Aerial extent of the Activity (Ha or m²)	LISTED ACTIVITY	APPLICABLE LISTING NOTICE (*GNR 983, GNR 984 or GNR 985*) *Note that Listing Notice 3 is applicable in this event as the activities was at the time of the assessment located in a CBA and still located within a Threatened Ecosystem.*	WASTE MANAGEMENT AUTHORISATION	WATER USES
Project 1					
Construction and operation of the new Khulu TSF	Option B: 22.5ha	x	Listing Notice 2, Activity 15: The clearance of an area of 20 hectares or more of indigenous vegetation, excluding where such clearance of indigenous vegetation is required for— the undertaking of a linear activity. Listing Notice 3, Activity 12: The clearance of an area of 300 square metres or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a Maintenance management plan. (Presence of endangered ecosystem within portions of the footprint) Listing Notice 3, Activity 10: The development and related operation of facilities or infrastructure for the storage, or storage and handling of a dangerous good where such storage occurs in containers with a combined capacity of 30 but not exceeding 80 cubic metres (if required during construction and maintenance).	Regulation 921, as amended by Regulation 633 dated 24 July 2015: Waste Management Activity, Category B, Activity 11: The establishment or reclamation of a residue stockpile or residue deposit resulting from activities which require a mining right, exploration right or production right in terms of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002).	Section 21(g) water uses
Construction and operation of associated infrastructure – Pollution Control Dam (PCD)	3ha	x	Listing Notice 1, Activity 13: The development of facilities or infrastructure for the off-stream storage of water, including dams and reservoirs, with a combined capacity of 50 000 cubic meters or more (depending on the Return Water Dam requirements). Listing Notice 2, Activity 6: The development of facilities or infrastructure for any process or activity which requires a permit or license or an amended permit or license in terms of national or provincial legislation governing the generation or release of emissions, pollution or effluent. – this activity is triggered as the proposed dam would require approval in terms of a new Water Use (Section 21g) in terms of the National Water Act, 1998 (Act No. 36 of 1998) (NWA). Listing Notice 3, Activity 12: The clearance of an area of 300 square metres or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a Maintenance management plan. (Presence of endangered ecosystem within the footprint)	-	Section 21(g) water uses
Construction and operation of pipelines	Pipeline from Plant to Filter Press: 350m in length	x	Listing Notice 1, Activity 10: The development and related operation of infrastructure exceeding 1 000 metres in length for the bulk	-	-

NAME OF ACTIVITY	Aerial extent of the Activity (Ha or m²)	LISTED ACTIVITY	APPLICABLE LISTING NOTICE (*GNR 983, GNR 984 or GNR 985)* *Note that Listing Notice 3 is applicable in this event as the activities was at the time of the assessment located in a CBA and still located within a Threatened Ecosystem.*	WASTE MANAGEMENT AUTHORISATION	WATER USES
	Pipeline from PCD to Lower Return Water Dam (RWD): 2.1km (350mm diameter, steel, above ground)		transportation of sewage, effluent, process water, waste water, return water, industrial discharge or slimes – (i) with an internal diameter of 0,36 metres or more; or (ii) with a peak throughput of 120 litres per second or more. Listing Notice 3, Activity 12: The clearance of an area of 300 square metres or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a maintenance management plan. (Presence of endangered ecosystem within portions of the footprint)		
Establishment of laydown areas and temporary offices	This will be a temporary site, within the footprint of the TSF demarcated area.	x	Listing Notice 3, Activity 10: The development and related operation of facilities or infrastructure for the storage, or storage and handling of a dangerous good where such storage occurs in containers with a combined capacity of 30 but not exceeding 80 cubic metres (if required). It is not foreseen that any reservoirs in excess of 250m^3 will be constructed for the purposes of any of the activities. Note that the clearance activity is included within the overall TSF footprint clearance.	-	-
Construction of roads	PCD Access and Service Road: 250m; 6m in width. Pipeline service road will not be wider than 4m with a length of about 2.1km. Haul road between mine and existing Plant roads: 1km; 5m in width (two 90m bypass sections) TSF Service Road: Around the TSF (about 2km), 5m wide	x	Listing Notice 1, Activity 24: The development of a road with a reserve wider than 13,5 meters, or where no reserve exists where the road is wider than 8 metres; but excluding a road — which is 1 kilometre or shorter. Listing Notice 3, Activity 4: The development of a road wider than 4 metres with a reserve less than 13,5 metres. (Within 10km of a protected area) Listing Notice 3, Activity 12: The clearance of an area of 300 square metres or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a maintenance management plan. (presence of engendered ecosystem within portions of the footprints)	-	-
Construction of a Topsoil Stockpile	Less than 1ha	x	Clearance is not applicable, as this has already been approved as part of the Discard Dump Extension Environmental Authorisation, 2018.	-	-
Project 2: Diesel and Emulsion Batching					

NAME OF ACTIVITY	Aerial extent of the Activity (Ha or m²)	LISTED ACTIVITY	APPLICABLE LISTING NOTICE (*GNR 983, GNR 984 or GNR 985*) *Note that Listing Notice 3 is applicable in this event as the activities was at the time of the assessment located in a CBA and still located within a Threatened Ecosystem.*	WASTE MANAGEMENT AUTHORISATION	WATER USES
Dispatching of diesel and emulsion to the underground via pipelines.	• 80m and 55m access roads of about 6m in width. • Diesel Batching: two (2) aboveground diesel tanks of $33m^3$ each (as well as a possible $22m^3$ tank), a $40m^3$ API self-bunded tank (Isotainer) for hydraulic oil and a $20m^3$ API self-bunded tank for lube oil. A total combined storage of $148m^3$ is required. • Emulsion Batching: 60 tons (similarly $60m^3$) of Emulsion product stored underground, with no surface storage or pipeline inventory required. • Feed into pipelines for underground use at both areas. • Parking and offloading areas around the batching areas. Clearance of indigenous vegetation will be required in the order of approximately 5ha.	x	<u>Listing Notice 1, Activity 14:</u> The development and related operation of facilities or infrastructure, for the storage, or for the storage and handling, of a dangerous good, where such storage occurs in containers with a combined capacity of 80 cubic metres or more but not exceeding 500 cubic metres. (combined capacity of both facilities). <u>Listing Notice 1: Activity 27</u>: The clearance of an area of 1 hectare or more, but less than 20 hectares of indigenous vegetation (combined clearance). <u>Listing Notice 3, Activity 4</u>: The development of a road wider than 4 metres with a reserve less than 13,5 metres (due to presence of protected area within 5km). (Within 10km of a protected area) <u>Listing Notice 3, Activity 10</u>: The development and related operation of facilities or infrastructure for the storage, or storage and handling of a dangerous good where such storage occurs in containers with a combined capacity of 30 but not exceeding 80 cubic metres (Diesel Batching Area). <u>Listing Notice 3, Activity 12</u>: The clearance of an area of 300 square metres or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a maintenance management plan (Diesel Batching Area). (presence of engendered ecosystem within the footprints)	-	-
Project 3: Main Parking Extension					
Extension of existing Main Parking Area by 4 900m² within close proximately (20m) to the Springkaanspruit. No additional	Less than 1ha	x	<u>Listing Notice 1: Activity 12</u>: The development of- (ii) infrastructure or structures with a physical footprint of 100 square metres or more; where such development occurs- (a) within a watercourse;	-	Section 21(c) & (i) water uses

NAME OF ACTIVITY	Aerial extent of the Activity (Ha or m²)	LISTED ACTIVITY	APPLICABLE LISTING NOTICE (*GNR 983, GNR 984 or GNR 985*) *Note that Listing Notice 3 is applicable in this event as the activities was at the time of the assessment located in a CBA and still located within a Threatened Ecosystem.*	WASTE MANAGEMENT AUTHORISATION	WATER USES
specific roads will be required; traffic will be managed within the overall parking bay layout.			(b) in front of a development setback; or (c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse. Listing Notice 1: Activity 48: The expansion of infrastructure or structures where the physical footprint is expanded by more than 100m2 or more, where such expansion occurs within a watercourse or within 32m of a watercourse. Listing Notice 3, Activity 12: The clearance of an area of 300 square metres or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a maintenance management plan. (presence of engendered ecosystem within the footprints) Listing Notice 3, Activity 14: The development of— (xii) infrastructure or structures with a physical footprint of 10 square metres or more; where such development occurs— (a) within a watercourse; (c) if no development setback has been adopted, within 32 metres of a watercourse, measured from the edge of a watercourse.		
Project 4: Widening of Access Road between South Shaft/Main Offices and Plant					
An existing road provides access between the Main Office Buildings and the Plant. The current width of the road ranges between 5m and 6m. The mine is planning on increasing a section of 700m of this road to a width of 16m to allow for two-way traffic. Clearance of indigenous vegetation will be required in the order of approximately 0.3ha.	Less than 1ha	x	Listing Notice 1: Activity 48: The expansion of infrastructure or structures where the physical footprint is expanded by more than 100m^2 or more, where such expansion occurs within a watercourse or within 32m of a watercourse. (This is a potential activity, as the expansion will commence after the existing road crossing over the Springkaanspruit.) Listing Notice 3, Activity 12: The clearance of an area of 300 square metres or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a maintenance management plan. Listing Notice 3: Activity 18: The widening of road by more than 4m, or the lengthening of a road by more than 1km. (within 100m from a watercourse; within 5km from a protected area)	-	Section 21(c) & (i) water uses
Project 5: Access Crossing between Plant and North Mine (Subway Crossing)					
The mine is planning on constructing a road under the regional road bridge to allow for access between the two areas. Clearance of indigenous	Less than 1ha	x	Listing Notice 3, Activity 4: The development of a road wider than 4 metres with a reserve less than 13,5 metres. (within and CBA, 100m from a watercourse; within 5km from a protected area) Listing Notice 3, Activity 12: The clearance of an area of 300 square metres or more of indigenous vegetation except where such clearance	-	Section 21(c) & (i) water uses

NAME OF ACTIVITY	Aerial extent of the Activity (Ha or m²)	LISTED ACTIVITY	APPLICABLE LISTING NOTICE (*GNR 983, GNR 984 or GNR 985)* *Note that Listing Notice 3 is applicable in this event as the activities was at the time of the assessment located in a CBA and still located within a Threatened Ecosystem.*	WASTE MANAGEMENT AUTHORISATION	WATER USES
vegetation will be required in the order of approximately 0.2ha.			of indigenous vegetation is required for maintenance purposes undertaken in accordance with a maintenance management plan. (within an CBA and small portion within Endangered Ecosystem)		

Aim and Motivation of the Project

Dwarsrivier Mine is serviced by approximately 1,200 permanent and 800 contractor employees. The majority of the employees are locals drawn from Lydenburg and villages around the mine, including Steelpoort Park, Kalkfontein and Buffelshoek.

In terms of the Fetakgomo Tubatse Local Municipality Integrated Development Plan (IDP), mining is regarded as an opportunity offered by the municipality, with the IDP stating that the mining activities and natural resources available in the area have created a definite potential to develop tourism and thereby to diversify the economic base of the municipality. When one further considers the importance of chrome in the global market it should be noted that according to an article by S&P Global Plats, 6 March 2017 (https://www.platts.com/latest-news/metals/tokyo/strong-chrome-demand-to-hold-but-views-divided-26678512), "strong demand for chromite feedstock of ferrochrome will continue to hold on the back of robust Chinese stainless steel output, but views are divided on whether global supply will move into deficit due to constraints of South African production to meet that demand, industry sources told S&P Global Platts Monday". According to the article, "sources said there are two possible scenarios arising from South Africa trying to meet Chinese demand amid stagnated output: the market will be short on chrome ore supply as other global suppliers will not be able to fully meet China's demand, or China will reduce dependency on South African chromite supply and diversify to other resources." According to the Mining Weekly Online (http://m.miningweekly.com/article/strong-outlook-for-recovering-ferrochrome-industry-merafe-2017-03-08/rep_id:3861): "The Chinese economy, on which the ferrochrome and chrome ore markets are heavily dependent, grew by 6.7% year-on-year, underpinning pleasing growth in stainless steel production. Ferrochrome-using stainless steel production is projected to grow by 3.5% in 2017 and by 3.8% in 2018, which should be followed by increased ferrochrome demand."

Project 1: Khulu Tailings Storage Facility

Dwarsrivier Mine is currently depositing tailings material at the existing North TSF to the east of the mine's Beneficiation Plant, located on the remaining portion (Portion RE) of the Farm Dwarsrivier 372KT. It is anticipated that the existing active North TSF will reach its full capacity sooner than anticipated due to tonnage ramp-ups. The existing North TSF was designed to contain production tonnages for 23 years, with 29 000 tonnes received for the first two (2) years of operation and allowing for a deposition rate of 17 280 tonnes per month for the remaining twenty-one (21) years. The deposited tonnage rate was later revised to allow for deposition of 33 500 tonnes per month for the first two (2) years, which is higher than what was originally designed for and is anticipated to reduce the expected life of the North TSF of 23 years. It is anticipated that the existing North TSF will reach its full capacity within the next three (3) to five (5) years. For this reason, additional storage capacity on site is required. The mine therefore proposes the development of a new TSF, to be referred to as the Khulu TSF, in order to accommodate tailings material once the full capacity of the North TSF is reached. In consideration of the above, the overall aim of the proposed activities is to ensure that a well-designed tailings disposal system is operated on site to allow for the production requirements on site.

The mine initially identified seven (7) potential TSF sites, which have since been reduced to three (3) site alternatives, namely Sites B, C and D, with Site B being the most favourable for the mine based on the findings of the engineering and geotechnical studies. Site F was also considered during the specialist investigations, however, this area was excluded from the future assessments due to the distance from the Plant.

The surface areas and anticipated heights of the proposed Khulu TSF that each of the site alternatives can accommodate are as follows (please take note that the heights are approximate heights at this time and will be subject to further design finalisation):

- Site B: 20ha, 42m high;
- Site C: 28ha, 29m high; and
- Site D: 21ha, 49m high.

Project 2: Diesel and Emulsion Batching

The placement of the Diesel and Emulsion Batching Areas were developed in line with the underground mining operations. The placement will ensure the opportunity to directly pipe diesel and emulsion to the underground workings without excessive surface pipeline systems, which could lead to spills.

Project 3: Main Parking Extension

This project is purely for logistical purposes. The current parking area is about 0.8ha with the parking bays not sufficient to cater for the number of vehicles. The current parking area comprises of a paved surface area and steel roof parking bays. The same principle will be applied at the proposed extended area. No new entrances will be required.

Project 4: Widening of Access Road between South Shaft/Main Offices and Plant

This project is purely for safety and logistical purposes. The purpose is to improve the safe operation of traffic on this access road.

Project 5: Access Crossing between Plant and North Mine (Subway Crossing)

This project is purely for logistical purposes. In order to ensure more optimal logistical management of traffic between the South Mine, where the Beneficiation Plant is located and the North Mine, and to reduce the number of vehicles on the regional road, the mine is planning on construction a road under the regional Sekhukhune Road bridge to allow for access between the two areas.

Alternatives Considered

Alternatives which were assessed as part of this project included:

- Location of the TSF;
- Location of the proposed Pollution Control Dam (PCD);
- TSF Deposition Technology; and
- No Go alternatives (i.e. should the projects not be approved).

TSF Location

Based on the outcomes of the current site selection process undertaken during the Environmental Scoping Report (ESR), Site B presents as the most feasible location alternative. Note that Site B was initially thought to be fatally flawed due to its location coinciding with that of a potential future Eskom substation. The substation is however no longer planned, removing the initial fatal flaw.

The outcomes of the site selection process are presented in the table below.

Table 1: Site Selection Matrix (1 preferred, 3 least preferred)

Discussion	Site B	Site C	Site D
Engineering			
Engineering considerations, including topography	1	3	2
Engineering Outcomes	1	3	2
Environmental			
Soils, Land Use and Land Capability	2	3	1
Terrestrial Ecology	1	3	2
Hydrology/ Surface Water	1	3	2
Hydrogeology	2	3	1
Freshwater Resources (wetlands)	1	3	2
Visual Character	3	2	1
Air Quality	2	3	1
Heritage	1	2	3*
Socio-Economic	1	1	1
Ranking	14	23	14
Environmental Outcomes	1	3	1
Combined	1	3	2

**Subsequent to the site selection and with ongoing consultation with the land claimants, a grave was identified in the footprint of Site D, rendering this site least preferred in terms of heritage considerations, where previously it was considered preferred in terms of this context.*

The following concluding statements are included in the specialist reports:

Soils, Land Use and Land Capability: From a soil, land use and land capability perspective, Site D is recommended as the preferred site for TSF development, in comparison to the other two (2) TSF alternatives, given the proximity to existing mining infrastructure, thus eliminating the need for significant further disturbance of undisturbed soils in other areas within the mining area.

However, considering the location of Site B and the fact that this is also located in close proximately to the mining activities, it is the view of the EAP that either Site B or D would be suitable options. As a result, Site B is also highlighted for consideration.

Terrestrial Ecology: From a long-term ecological maintenance perspective Site B is deemed to be the preferred option, as this site is already disturbed, is located adjacent to the current mine operations and will not lead to the loss of habitat connectivity. This option does however pose a potential risk to the Groot Dwars River, which needs to be investigated in terms of mitigatory and management requirements.

Hydrology/ Surface Water: The site selection assessment indicated that the most preferred option from a surface water perspective is Site B, followed by Site D and C, respectively, as Site B has no direct impact on watercourse (not located with 1:100 year flood lines).

Hydrogeology: Site B scored similar to Site D and could therefore also be considered as a preferred alternative, provided that the risks identified are managed to avoid or minimise negative impacts on groundwater. The risks associated with Site B include the presence of the alluvial aquifer under or near the TSF footprint, the presence of potential preferential flow paths to groundwater and shallow groundwater level conditions.

Freshwater Resources: The construction of the proposed TSF within Site C or Site D has the potential to have an unacceptably high impact on the watercourse within each respective site. Such impacts may also potentially affect downstream systems. From a freshwater ecological perspective therefore, Site B is the preferred option, as no direct impacts arising from the construction and operation of the TSF within that location to the receiving freshwater environment are anticipated. Nevertheless, indirect impacts, including potential failure of the TSF, could occur and may potentially be detrimental to the Dwars River specifically, if suitable mitigation measures are not strictly implemented throughout all phases.

Visual Character: Site C has the smallest visible area and least number of visual receptors impacted, and is therefore ranked most favourable, followed by Site B and then Site D.

Although Site C is the most favourable in terms of the criteria used to assess the TSF site alternatives, it must be noted that all alternatives fall within an area dominated by mining activities and infrastructure. Due to the visual aesthetics and sense of place of the area being previously altered from rural bushveld to mining, it is unlikely that the implementation of any of the TSF options would result in a significant visual impact.

Air Quality: This study comprises an environmentally conservative/'worst-case' air quality impact assessment and did not find predicted pollutant concentrations to exceed regulated ambient air quality standards. Further, impacts predicted at Site D were anticipated to be the lowest and as such, it is recommended that the proposed TSF be located at Site D.

Heritage and Palaeontology: Initially in terms of the site selection report, Site D was the preferred site from a heritage point of view, but Site B was also considered as this was previously agricultural land. Both Sites B and D have previously been disturbed. For Site D, no heritage resources were identified inside the footprint area of this proposed TSF site alternative. *Subsequent to the site selection and with ongoing consultation with the land claimants, a grave was identified in the footprint of Site D, rendering this site least preferred in terms of heritage considerations, where previously it was considered preferred in terms of this context.* At Site B, the stone wall foundations of a ruin and a possible Early Iron Age site were recorded. The Site B study area is however disturbed, possibly by previous cultivation reducing the significance of the recorded finds. It should be noted that a cemetery occurs on the periphery of Site C, and this area should be demarcated and avoided. From a heritage point of view the heritage sensitivity associated with Site C is considered to be high due to the high number of sites in the impact area and this alternative is not recommended for the proposed development.

Socio-Economic: It is concluded that either Site B, Site C or Site D would be most preferred from a socio-economic perspective.

Pollution Control Dam (PCD) Location

It is important to note that the proposed PCD was previously considered to be located on Portion 6 of the Farm Dwarsrivier or on Portion RE of the Farm Dwarsrivier. The former property is owned by TRP, and to ensure that all activities are placed on land owned by the applicant, this location has therefore been rejected and the proposed PCD site is located on Portion RE of the Farm Dwarsrivier, owned by the applicant.

TSF Deposition Technology

The mine is planning on changing the TSF technology of deposition to a filter press system. The filter press methods involve equipment used in liquid/solid separation. The filter press separates liquids and solids utilising pressure filtration. A slurry/slimes is pumped into the filter press and is dewatered under pressure. The filter cake will be deposited via trucks or a conveyor system onto the proposed Khulu TSF, and water will be recirculated to the Plant or proposed PCD. The filter press will be designed based on the volume and type of slurry that needs to be dewatered. This project will reduce water storage on the facility, which will be advantageous in terms of groundwater and surface water management, as well as giving effect to Water Conservation and Demand principles.

No Go Option

Should the project not be approved (No Go Option) the following implications may arise:

The demand for chrome has increased globally due to the increase in China Markets. With the current North TSF reaching its operational capacity, a new facility is required to ensure ongoing mining and processing practices. Without this facility, the mine will not be able to continue with beneficiation processes and the primary mining activities. This will result in a severe loss of the beneficiation of chrome and optimal mining of chrome in terms of the approved Mining Work Programme, loss of income to the local municipality, loss of employment opportunities, and loss of opportunities in terms of the Social and Labour Plan contributions the mine is making into the Local Municipality.

The other Capital Projects are required for the safe and logistically efficient operation of the mining operations.

Application and Consultation Process

The application for the Environmental Authorisation Process was submitted to the DMRE on 13 July 2021. A letter of acknowledgement from the DMRE was received on 11 August 2021.

Once the application was submitted the stakeholder consultation process was initiated with the following steps:

- Identification of existing stakeholders on the existing database;
- In accordance with GNR 982 Section 41(2)(a-b), a site notice was developed and placed at three visible locations close to the site on 15 July 2021, in order to inform surrounding communities and adjacent landowners of the proposed project.
- Key stakeholders, including members of the following sectors, were directly informed of the proposed development by e-mail through the submission of the Background Information Document (BID) and Registration Sheet, providing the details on how stakeholders can become involved in the consultation process and also a registration sheet to provide comments in writing:
  - Authorities;
  - Municipalities;
  - Residential Associations;
  - Non-Governmental Organisations (NGOs);
  - General Public;
  - Parastatals/ Service providers; and
  - Adjacent Landowners.
- In accordance with GNR 982 41(2)(c) of Chapter 6, an advert was placed in the Steelburger Newspaper on 15 July 2021.

The Draft ESR was made available to all registered stakeholders from 23 July 2021 to 23 August 2021. A period of 30 days was awarded for comments during the Scoping Phase. The Final ESR was submitted to the DMRE on 11 October 2021. All comments received from stakeholders and Commenting Authorities have been included into this Report.

Comments were received from the following stakeholders as detailed below:

NO.	THEME: GENERAL COMMENTS / ISSUES			
	ISSUE RAISED	DATE AND HOW ISSUE WAS RAISED	COMMENTATOR	RESPONSE
1	The Department is the custodian of the National Forestry Act, 1996, which among others provide special measures for the protection of forests and trees. If the project is going to affect a Natural Forest, it is required you apply for a licence. A specific application form listing all the indigenous tress that are going to be directly affected by the project should be indicated. Recommendations made: - Identification of protected trees in terms of the National Forest Act, 1998; - All identified trees must be marked; - Relocation/transplanting of protected trees is highly recommended (as opposed to cutting and destroying of trees); - Application for all activities affecting protected trees and natural forest must be made to the DFFE; - Mitigation plan in place and implemented. Furthermore: - Fire management plan must be put in place; - The mine should adhere to preventative measures below: o Construction of fire belts around the boundaries of the mine; o Adherence to the daily fire danger ratings; and o Must have equipment, protecting clothing and trained personnel for extinguishing fires. - The mine should do everything in their power to stop the spread of veld fires in their land.	Letter dated 3 August 2021	Department of Forestry, Fisheries and Environment (DFFE)	The recommendations issued by the DFFE have been included into the EMPr of this report. Please refer to Table 89 to Table 92.
2	Main area of interest: Haulage/ Installation and maintenance of HDPE pipes. Supply of haulage equipment. Strategic partner for haulage and HDPE installation and maintenance.	16 July 2021: Registration sheet submitted	Mr. Totolo Makola: Morwakola Construction	Dwarsrivier Mine has internal and external procurement processes. For more information with regards to the governance process and procurement processes we can refer you to the Dwarsrivier Mine's supplier portal. Please refer to Table 89 to Table 92.
3	My main interest is to be part of the construction and civil engineering companies that will be appointed to build up the infrastructure.	16 July 2021: Registration sheet submitted	Mr. Lancelot Masha: Masha Lancelot Supply Development	
4	I am in full support and confident that this project will create new job opportunities to our surrounding communities and help to combat poverty and many other socio-economic challenges which will lead to economic development.	16 July 2021: Registration sheet submitted	Mr. Lancelot Masha: Masha Lancelot Supply Development	The socio-economic impact referred to is noted. Please refer to Table 89 to Table 92.
5	More information is required on the construction entities, civil and engineering firms to be appointed.	16 July 2021: Registration sheet submitted	Mr. Lancelot Masha: Masha Lancelot Supply Development	The interest is noted. Dwarsrivier Mine has internal and external procurement processes. For more information with regards to the governance process and procurement processes we can refer you to the Dwarsrivier Mine's supplier portal. Please refer to Table 89 to Table 92.
6	What exactly will be involved in the capital project and lastly when will infant prospective small organisations be summoned for development.	16 July 2021: Registration sheet submitted	Mr. Lancelot Masha: Masha Lancelot Supply Development	
7	Main area of interest: Environmental Pollution and/or contamination. Although it would have positive spin-offs there is a concern that of impeding or diverting the water course. The prevention of waste and all spillage – is there any plan in place to control and manage waste?	19 August 2021: Registration sheet submitted	Mr. Lawrence Magolego: Naswana NPO: Chairman	Please refer to Table 89 to Table 92 for the measures included in terms of clean and dirty water management. Management of water runoff has also been incorporated into the TSF design, please refer to Section 1.d.ii.1. In addition to this, no concerns have been noted by the Hydrological or Freshwater Resources Studies should the required management measures be included. Please refer to Annexure 9 and Annexure 10. A detailed waste management plan will be included as part of the EMPr. Please refer to Table 89 to Table 92.
8	Project 1: Khulu Tailings Storage Facility: Option B: 20 Ha Location: Very close to the road and tributary. Areas of concern for the site: Impact on water resources due to the proximity of the activities located near drainage lines Project 1: Khulu Tailings Storage Facility: A portion of the suggested area is under TRP area and currently there is no agreement between Dwarsrivier Mine and Two Rivers Platinum Mine for this area Project 1: Khulu Tailings Storage Facility: Option C: 28 Ha Location: Very close to TRP current pipeline – seems to be on top of current constructed pipeline	23 August 2021: Comments submitted via e-mail	Tintswalo Kanyongolo: Environmental Manager: Two Rivers Platinum Mine	The area of concern in terms of the PCD placed on Two Rivers Platinum surface rights have been reconsidered. The PCD will be located on surface rights owned by Dwarsrivier Mine. Please refer to Figure 6 and Figure 7. The TSF and PCD will be located outside of the Dwars River floodlines and 100m buffer. Please refer to Annexure 10. Please refer to Table 89 to Table 92 for the measures included in terms of clean and dirty water management. Management of water runoff has also been incorporated into the TSF design; please refer to Section

NO.	THEME: GENERAL COMMENTS / ISSUES			
	ISSUE RAISED	**DATE AND HOW ISSUE WAS RAISED**	**COMMENTATOR**	**RESPONSE**
	Areas of concern for the site: Disturbance on the pipeline Project 2: Diesel and emulsion batching: No comment for these two activities as long as it does not impact on the current TRP Pipeline.			1.d.ii.1. In addition to this, no concerns have been noted by the Hydrological or Freshwater Resources Studies with the required management measures included. Please refer to Annexure 9 and Annexure 10. The proposed Diesel and Emulsion Batching Areas are located on Dwarsrivier Mine owned property, however, with the two facilities located on either side of the pipeline route and associated access route of the TRP TSF Pipeline. Construction of the two facilities may impact on the pipeline route if not suitably planned. For this reason, the EMPr recommends that the mine should consult with TRP in terms of the construction plan and schedule to ensure that the activities and associated access requirements do not impact on either of the two mines' activities.
9	Any water uses related activities associated with this project that are not permissible as indicated on Section 22(1) of the NWA shall have to be authorised by the DWS prior to such water uses taking place.	13 December 2021: Letter submitted via e-mail	Patheka Mfinyezi (DWS)	The purpose of the current Water Use Licence Application (WULA) is to make technical amendments to the existing authorised water uses and include new water uses associated with the proposed new activities. The following amendment to the existing water uses and new water uses will be captured: - Section 21(a) – taking water from a water resource (amendment and replacement of boreholes – the mine is currently approved to abstract water from the Dwars River itself, and wishes to augment this with abstraction from alluvial aquifer boreholes). - Section 21(b) – storing water in tanks – no Section 21(b) water tanks are currently authorised. Most of the existing water tanks on site are Generally Authorised, however for the purposes of the WULA these existing tanks, as well as the existing fire water tank and fissure water tank will be applied for. - Section 21(c) & (i) – impeding or diverting the flow of water in a watercourse; altering the bed, banks, course or characteristics of a watercourse. (The mine is located in close proximity to the Groot Dwars River, as well as the Springkaanspruit. The Groot Dwars River water system is characterised by a riparian zone, which results in the 100m and 500m buffer being triggered for most of the mining activities. - Section 21(g) – disposal of waste in a manner which may detrimentally impact in a water resource (inclusion of the proposed Khulu TSF – dry system, and associated PCD). The online Water Use Licence Application and Authorisation System (EWULAAS) process has been initiated on 15 January 2022.
10	The applicant is requested to liaise with the DWS for guidance on the requirements for water use authorisation applications for the water use activities associated with the proposed project.			
11	Pollution of underground and surface water: this shall be avoided by the implementing of proper water and management during the entire life of the operation.			Please refer to Table 89 to Table 92 for the measures included in terms of clean and dirty water management. Management of water runoff

NO.	THEME: GENERAL COMMENTS / ISSUES			
	ISSUE RAISED	DATE AND HOW ISSUE WAS RAISED	COMMENTATOR	RESPONSE
				has also been incorporated into the TSF design; please refer to Section 1.d.ii.1. In addition to this, no concerns have been noted by the Hydrological or Freshwater Resources Studies with the required management measures included. Please refer to Annexure 9 and Annexure 10.
12	Water and soil contamination: this shall be avoided by implementing proper storm water management during the entire life of the operation. The applicant must ensure that storm water is diverted away from all the working areas. The storm water leaving the construction area must not be contaminated by any substance, whether that substance is a solid, liquid, vapour or any combination thereof. The soil must be stablished in order to prevent resulting washdown into any water resource.			Please refer to Table 89 to Table 92 for the measures included in terms of clean and dirty water management. Management of water runoff has also been incorporated into the TSF design; please refer to Section 1.d.ii.1. In addition to this, no concerns have been noted by the Hydrological or Freshwater Resources Studies with the required management measures included. Please refer to Annexure 9 and Annexure 10.
13	Construction and operation of the new Khulu TSF and associated infrastructure (Return Water Dam – now the PCD): the applicant shall note that the construction and operation of the TSF and PCD are water use activities in terms of Section 21(g) of the NWA and requires authorisation by the DWS. The applicant shall provide DWS with details on how the waste will be disposed or utilised within the activity.			The purpose of the current WULA is to make technical amendments to the existing authorised water uses and include new water uses associated with the expansion activities. The EWULAAS process has been initiated on 15 January 2021.
14	Wetland and stream: It is indicated on Page 32 of the Scoping Report that the extension of the main parking for the proposed site is within the regulated area of the Springkaanspruit river, as well as construction of roads and pipelines, therefore the applicant should also note that any destruction of watercourse requires water use authorisation in terms of the Section 21(c) and (i) of the NWA.			
15	Storage Facilities: it is indicated that the diesel and emulsion batching areas will be on site. The applicant shall ensure that the diesel is stored and handled properly in a concrete or cement lined surface with berm walls to avoid any seepage into the groundwater resources and also ensure that the design of the storage area is such that any leakages or spillages can be contained. The applicant also need to adhere to the Mines health and Safety Act.			Please refer to Table 89 to Table 92. Storage facilities will be suitably designed to containe 110% of hazardous or dangerous goods stored.
16	Waste management: it should be noted that disposal or discard of unwanted waste must be collected and disposed of at a licenced waste disposal site. A signed copy of service agreement shall be submitted to the DWS to demonstrate that provision will be made to render such service.			A detailed waste management plan has been included as part of the EMPr. Please refer to Table 89 to Table 92. The mine is registered with South African Waste Information System (SAWIS) for the following: - D11951-01 (05 February 2018) - Disposal of waste to landfill (Dwarsrivier Mine Discard Area). - D11951-02 (05 February 2018) - Disposal of waste to land (Dwarsrivier Mine Tailings). - D11951-03 (09 April 2018) - Hazardous Waste Generator. Waste is removed to the Salvage Yards, from where it is then sorted. The management of waste is undertaken in line with procedure ENV-OP-03. A detailed record of all wastes produced on site is kept on an electronic spreadsheet, which provides the monthly generation figures in comparison to the previous month. The mine uses the following contractors to dispose of waste: - Oils - Used oils are removed by Oilkol (Pty) Ltd for reworking. - Hazardous waste - Hazardous waste is removed by Waste Legends (Pty) Ltd and disposed of at Holfontein landfill site. - General waste - General Waste is removed by Waste Legends (Pty) Ltd and disposed of at the Roossenekal Landfill Site (Elias Motsoaledi Local Municipality).

NO.	THEME: GENERAL COMMENTS / ISSUES			
	ISSUE RAISED	**DATE AND HOW ISSUE WAS RAISED**	**COMMENTATOR**	**RESPONSE**
				• Sewage - Sludge is removed by LaFancy (Pty) Ltd and taken to Lydenburg Sewage Treatment Works. In addition to the aforementioned, Interwaste (Pty) Ltd assists with sewage sludge removal when required. The sewage sludge is disposed at the Interwaste (Pty) Ltd Klinkerstene Landfill Site. • Water Treatment Plant (WTP) Sludge - Sludge is collected by Interwaste (Pty) Ltd and is disposed at the Interwaste (Pty) Ltd Klinkerstene landfill site. • Medical waste – Averda South Africa (Pty) Ltd and Compass Waste Services (Pty) Ltd manage the mine's medical waste.
17	The applicant should consult with the biodiversity and heritage department for removal of indigenous vegetation for roads and comments be made available to the DWS.			Consultation with DFFE and the South African Heritage Resources Agency (SAHRA) has been initiated and comments received, please refer to this table, as well as Annexure 6.
18	The applicant shall note that in terms of section 19(1) of the NWA it is stated that: An owner of land, a person in control of land or a person who occupies or uses the land on which a) any activities or process is or was performed or undertaken or b) any other situation exists, which causes, has cause or is likely to cause water pollution of a water resource must take all reasonable measures to prevent any such pollution from occurring, continuing or recuring. Any pollution incident(s) originating from the proposed project shall be reported to the Provincial Head of the DWS within 24 hours.			The Applicant is aware of this responsibility. Reporting of incidents are also included into the EMPr. Please refer to Table 89 to Table 92.

19	The SAHRA Archaeology, Palaeontology and Meteorites (APM) accepts the HIA report and its proposed recommendations. Furthermore, we grant the development from undertaking an assessment of impacts to palaeontological resources as it is located in a very low palaeo sensitivity zone according to the SAHRIS Palaeomap. The SAHRA has no objection to the development going ahead on the following conditions: If the mine is unable to conserve the identified archaeological sites in situ then the sites must be mitigated by a suitably qualified archaeologist. A permit issued under s35 of the NHRA will be required to conduct such work. On completion of the mitigation work the developer can apply for a destruction permit with the backing of the mitigation report. If fossil remains or trace fossils are discovered during any phase of construction, either on the surface or exposed by excavations the Environmental Officer (EO) in charge of these developments must be informed. These discoveries ought to be protected and the ECO must report to SAHRA. In the event that fossils are uncovered during construction then construction must cease within the immediate vicinity, a buffer of 30 m must be established, and a palaeontologist called in to inspect the finds. The palaeontologist must obtain a section 35(4) permit in terms of NHRA and Chapter IV NHRA Regulations, before any fossils are collected. If there are any new heritages resources are discovered during construction and operation phases of the proposed development, then a professional archaeologist or palaeontologist, depending on the nature of the finds, must be contracted as soon as possible to inspect the findings at the expense of the developer. If the newly discovered heritage resources prove to be of archaeological or palaeontological significance, a Phase 2 rescue operation may be required at the expense of the developer. Mitigation will only be carried out after the archaeologist or palaeontologist obtains a permit in terms of section 35 of the NHRA (Act 25 of 1999). You may contact SAHRA APM Unit for further details: (Nokukhanya Khumalo/Phillip Hine 021 202 8654). The Burial Grounds and Graves (BGG) Unit accepts the recommendations provided in the HIA report. If a TSF alternative D is chosen then a 100m buffer zone must be adhered to in order to conserve the cemetery against any potential damage during construction. A social consultation process in terms of Chapter XI of the NHRA Regulations, must be carried out to identify the descendants of the burials and to obtain permission to fence in the identified cemetery. If the mine is unable to retain the grave in situ the permission must be obtained from the families of the deceased, if they agree to the relocation of their graves then a section 36 of the NHRA permit application must be logged on SAHRIS. If any unmarked human burials are uncovered and the archaeologist called in to inspect the finds and/or the police find them to be heritage graves, then mitigation may be necessary and the SAHRA Burial Grounds and Graves (BGG) Unit must be contacted for processes to follow (Thingahangwi Tshivase/Mimi Seetelo 012 320 8490). The Final EIA and its appendices must be submitted to the case and once a Record of Decision from the	23 December 2021: Letter submitted via e-mail	Nokukhanya Khumalo	A detailed Heritage Impact Assessment (HIA) was conducted, as well as a Paleontological Desktop Assessment. Please refer to Annexure 12.
				
				Please take note of Table 89 to Table 92 for further management measures stipulated in the EMPr.
				
				Note that Site D is no longer considered as an alternative location for the TSF, with Site B being the preferred alternative.
				
				Further recommendations regarding the conservation of heritage features made in the EMPr include:
				• The mine should conduct an overall heritage assessment in consultation with the land claimants to determine the presence of any other graves not currently known of.
				• The stone cairn of unknown purpose at Feature 1 (west of proposed PCD) should be avoided with a 30m buffer. If this is not possible, it should be confirmed whether this is a grave through stakeholder consultation/ Ground Penetrating Radar/ Test Excavations and if confirmed to be a grave, it should be relocated as per all the relevant legal requirements. Should this be determined a grave, two options will be considered:
				  o Excavation permits will be applied for; or
				  o A 30m buffer zone (as recommended by the HIA report as no blasting or invasive activities are planned during construction the proposed TSF) must be adhered to in order to conserve the grave against any potential damage during construction. A social consultation process in terms of Chapter XI of the National Heritage Resources Act (Act No. 25 of 1999) (NHRA) Regulations must be carried out to identify the descendants of the burials and to obtain permission to fence in the

NO.	THEME: GENERAL COMMENTS / ISSUES			
	ISSUE RAISED	**DATE AND HOW ISSUE WAS RAISED**	**COMMENTATOR**	**RESPONSE**
	competent authority is issued, it must also be submitted to the case. Should you have any further queries, please contact the designated official using the case number quoted above in the case header.			identified grave. If the mine is unable to retain the grave *in situ*, permission to relocate the grave must be obtained from the families of the deceased. If they agree to the relocation of the graves, then a Section 36 of the NHRA permit application must be logged on the South African Heritage Resources Information System (SAHRIS). - Features 2 and 3 (both at the Emulsion and Diesel Batching Areas) and Feature 5 (south of proposed TSF) should be shovel pit tested (with the required mitigation measures and permit in place) to determine the presence of subsurface deposit after which a destruction permit can be applied for. - The lack of graves at Feature 4 (Emulsion and Diesel Batching) and Feature 6 (proposed TSF) should be confirmed prior to construction by the social team and monitored during construction.
20	As CPA, they have a concern with regards to the consultation processes followed. The Ba-Mmadi CPA was consulted as part of the renewal license application for DCM. DCM, through the consultants, is just engaging the CPA during public participation processes for the required EIA's. There are no other direct consultation and since the last renewal process there has been no engagement with the CPA's. As CPA, they are unwilling to agree to DCM renewing their license without proper consultation. They will not approve the submission, until they have been properly consulted	15 February 2022: Comments made during meeting	Mr Jim Mosotho: Bakoni Ba-Mmadi CPA	The challenge in this regard refer to two processes that have to be undertaken by DCM. The meeting was part of the EIA application and is regulated by government who mandates these types of meetings
21	The frustration of the Bakoni Ba-Mmadi CPA relates to the socio-economic aspects of projects and thus links to the social commitments of DCM	15 February 2022: Comments made during meeting	Mr Jim Mosotho: Bakoni Ba-Mmadi CPA	The concern raised will be duly considered and will be further discussed with the relevant sections of DCM to determine how best these concerns can be address and what the way forward will entail. These concerns specifically relate to the mandate of the economic division of the mine. The representatives of DCM at the meeting are only involved with the environmental aspects and the EIA application. In terms of the regulations of the EIA process, various Interested and Affected parties (I&APs) and stakeholders are consulted with. As part of the EIA process, the consultants also attend to these types of comments and aim to resolve these as part of the EIA process, where possible. The Dwarsrivier Heritage Management Plan is not seen in isolation, and hence the involvement of the CPA together with their representatives as part of a group discussion.
22	He agreed with the concerns raised by Mr. Mosotho with regards to consultation. DCM is now engaging them, but prior to these EIA meetings, they were not consulted as the Dwarsrivier Claimants Committee (DCC).	15 February 2022: Comments made during meeting	Mr. Caswell Pokwane: Dwarsrivier Claimants Committee	In terms of the regulations of the EIA process, various Interested and Affected parties (I&APs) and stakeholders are consulted with. As part of the EIA process, the consultants also attend to these types of comments and aim to resolve these as part of the EIA process, where possible.
23	The DCC will respond to the graves assessed and identified during the presentation, as part of the site visit that will follow the meeting.	15 February 2022: Comments made during meeting	Mr. Caswell Pokwane: Dwarsrivier Claimants Committee	The Dwarsrivier Heritage Management Plan is not seen in isolation, and hence the involvement of the CPA together with their representatives as part of a group discussion.

NO.	THEME: GENERAL COMMENTS / ISSUES			
	ISSUE RAISED	**DATE AND HOW ISSUE WAS RAISED**	**COMMENTATOR**	**RESPONSE**
24	It is important for the mine to incorporate grey water management principles as part of its design. This is to ensure the sustainability of the project. The mine also needs to ensure that water and energy efficiency is assessed. The mine should not only investigate one element but build on to more elements that can form part of sustainable design elements.	15 February 2022: Comments made during meeting	Mr. Caswell Pokwane: Dwarsrivier Claimants Committee	Noted.
25	Will the project result in dust and/or dust pollution?	15 February 2022: Comments made during meeting	Mr. Caswell Pokwane: Dwarsrivier Claimants Committee	There are no dust pollution linked to the Khulu application. The following impacts were considered in the EIA and assessed by the Air Quality Specialist: • Sensitive receptors are identified as areas that may be impacted negatively due to emissions from the proposed TSF. Four receptors (villages and dwellings) were identified in the area surrounding the proposed project area, within a 10 km radius, and were used for this assessment. PM10 • Highest predicted 24-hour average off-site concentrations during Scenario 2 are non-compliant with the relevant 24-hour standard, due to the close proximity of the new TSF road to the boundary of the mine. However, the highest predicted annual average concentrations remain compliant with the standard; and • However, despite the non-compliance predicted for the 24-hour PM10 off-site concentrations (Scenario 2), all concentrations predicted at neighbouring sensitive receptors remain compliant with their relevant standard, as noted previously. PM2.5 • Predicted concentrations at all receptors remain well below the standards during Scenario 2; and • Highest predicted 24-hour average and annual average off-site concentrations remain compliant with the relevant standards for both scenarios. Dust Fallout • Overall levels of dust fallout anticipated to occur as a result of the proposed TSF are below the respective National Dust Control Regulations. The DCM tailings have a very course material / particulate compared to other mines. Platinum tailings also differ from chrome tailings.
26	He acknowledges that a Heritage Impacts Assessment was done for the Khulu project. He is satisfied that DCM is undertaking a Heritage Management Plan for the entire Dwarsrivier area. Their concerns raised at the previous meeting seem to be attended to, and this is a step in the right direction. However, the DCC is not a CPA, but are the claimants. DCC is still waiting for their CPA structure to be finalised. They are thus attending this meeting as the Dwarsrivier Claimants Committee (DCC), as they are family representatives	15 February 2022: Comments made during meeting	Mr. Caswell Pokwane: Dwarsrivier Claimants Committee	The Dwarsrivier Heritage Management Plan is not seen in isolation, and hence the involvement of the CPA together with their representatives as part of a group discussion.
27	As CPA they are satisfied that they are consulted with. They understand that the EIA is a separate process and that this meeting forms part of the EIA application. However, what they highlight is the need for DCM to engage with them as the Bakoni Ba-Mmadi Communal Property Association (CPA). Since 2018, DCM have not engaged with them. They requested that DCM meet with the Bakoni Ba-Mmadi CPA within 7days from the date of this meeting. This will not be their first request for additional meetings with DCM outside of the EIA processes. They will not commit to this process as the application will not benefit them.	15 February 2022: Comments made during meeting	Mr Jim Mosotho: Bakoni Ba-Mmadi CPA	Noted. Batho Earth was informed after the meeting that DCM did meet with the CPA Bakoni Ba-Mmadi at the beginning of February 2022. DCM will continue to meet with all the relevant stakeholders as part of their internal processes, these matter fall outside the scope of the EIA.

NO.	THEME: GENERAL COMMENTS / ISSUES			
	ISSUE RAISED	**DATE AND HOW ISSUE WAS RAISED**	**COMMENTATOR**	**RESPONSE**
28	They are satisfied with t the EIA process and that they were invited to this meeting, but they are not satisfied with DCM and therefore provides DCM with 7 days to respond to their request.			Noted. Batho Earth was informed after the meeting that DCM did meet with the CPA Bakoni Ba-Mmadi at the beginning of February 2022. DCM will continue to meet with all the relevant stakeholders as part of their internal processes, these matter fall outside the scope of the EIA.
29	What is the objective of the meeting, and will it be achieved? The DMRE is the decision-making authority, and can only observe. The DMRE still need to make a decision on the said application. There are other parties that also need to be involved in the process.	16 February 2022: Comments made during meeting	Mr Nicholas Chavalala (NC):DMRE:	The objectives of the meeting will be reached and achieved. All relevant authorities were invited to the meeting. The Department of Water and Sanitation (Limpopo) did provide an apology indicating that they could not attend the meeting. A separate meeting was held with the Land Claimants affected by the proposed project on 15 Feb 2022. The presentation also provides a summary of the stakeholder engagement process followed to date. Key stakeholders, that included the following sectors, were directly informed of the proposed development through the distribution of the Background Information Document and Registration Sheet: • Authorities; • Municipalities; • Residential Associations; • Non-governmental organisations; • General Public; • Parastatals / Service providers, and • Adjacent Landowners. The Draft Environmental Scoping Report (ESR) was made available to all registered stakeholders from 23 July 2021 to 23 August 2021. Comments were received from DFFE, SAHRA, DWS, surrounding mines and stakeholders. It is proposed that the draft EIA report will be made available at the end of February 2022. The different interest groups were grouped, as part of the consultation process, and separate meetings were held for each interest group. The aim of the meeting is to provide feedback on the project and the results of the specialists' studies.
30	Have you received proof from the land claimant that they are the actual land claimant of the site. It must be ensured that the correct stakeholders are involved as land claimants. As FTLM, they are also assessing the information with regards to the Land Claimants.	16 February 2022: Comments made during meeting	Councillor Mabowa: Ward 27 Fetakgomo Tubatse Local Municipality (FTLM)	A meeting was held with two land claimant groupings on 15 Feb 2022. The consultants have also consulted with the Commission of Restitution of Land Rights/Land Claims Commissioner to determine the status of the land claims on the affected farm portions and the stakeholders involved in the land claims.
31	It is critical that the correct information is used and that the legitimate land claimants are involved.	16 February 2022: Comments made during meeting	Councillor Mabowa: Ward 27 Fetakgomo Tubatse Local Municipality (FTLM)	Batho Earth will also consult with the FTLM in terms of information obtained and sharing of the information already received with regards to the issue of land claimants.
32	How many protective species will be removed as part of the diesel and emulsion batching area? Do we have the quantity (number) of trees available that will require removal?	16 February 2022: Comments made during meeting	Tshifhiwa Mathase: Department of Forestry, Fisheries and the Environment (DFFE): Limpopo	No quantity/numbers are yet available. It is proposed that a walk-over is done before construction commence. The information obtained during this walk-over will be submitted to the department as part of the permitting process.
33	What is the size of the project area, thus how much land will be cleared as part of the diesel and emulsion project?	16 February 2022: Comments made during meeting	Tshifhiwa Mathase: Department of Forestry, Fisheries and the Environment (DFFE): Limpopo	It is planned to clear approximately 5ha of land for both sites, which is the Diesel area and the Emulsion area.

NO.	THEME: GENERAL COMMENTS / ISSUES			
	ISSUE RAISED	DATE AND HOW ISSUE WAS RAISED	COMMENTATOR	RESPONSE
34	Are all the protected trees within the same study area? Will we be attending to these trees as part of the site visit?	16 February 2022: Comments made during meeting	Tshifhiwa Mathase: Department of Forestry, Fisheries and the Environment (DFFE): Limpopo	The entire study area and the affected areas that form part of the various capital projects and the location of the Tailings facility will be visited and investigated as part of the site visit that took place after the meeting
35	Have you already applied for these tree permits?	16 February 2022: Comments made during meeting	Patricia Makhuvele: DMRE	The permitting process can only be undertaken once the mine has received approval in terms of the EIA process. This permitting process takes approximately 12 months and one cannot apply in advance. The process can only commence after approvals from the DMRE. SAS Environmental Group of Companies will be appointed to undertake the required permitting process. They have substantial knowledge of the area and the process required.
36	In terms of the Emulsion and Diesel project, will the project be underground or above ground?	16 February 2022: Comments made during meeting	Patricia Makhuvele: DMRE	The infrastructure (tanks) associated with the Diesel plant will be above ground, but the diesel will not be "used" above ground, but will connect to the underground mining operations, to supply diesel to these areas. The Emulsion plant will also be above ground in terms of infrastructure, but for usage as part of the underground mining operations. No emulsion will be stored at the surface location and all product decanted will be stored underground at a purpose-built depot located at Strike N15G / N17A. The surface location will be used for the express purpose of transferring emulsion from a designated road tanker, via the off-loading pipeline to the underground storage tanks. The mine intends storing a total of 60 (Sixty) tons (similarly 60m3) of Emulsion product underground, with no surface storage being done and, no pipeline inventory.
37	It is important to remember that although the area to be cleared only refer to the construction site, it is also important for the mine to highlight the areas surrounding the "site clearance". The surrounding areas are also affected, not only the construction area. These areas are normally not regarded as protected, especially the protected trees outside the construction footprint. It is suggested that as part of your onsite training that you also demarcate an additional buffer around the construction site. It is also important to include as part of the training manual a description (a picture of all the trees that were identified) of all the protected trees located in the area	16 February 2022: Comments made during meeting	Tshifhiwa Mathase: Department of Forestry, Fisheries and the Environment (DFFE): Limpopo	The proposed application makes provision for this to be included into the EMPr. The consultant will ensure that this is included into the document
38	Before construction can commence, a site visit needs to be undertaken by representatives of the DFFE to ensure that the mitigation measures are in place	16 February 2022: Comments made during meeting		The EMPr requires that an Environmental Control Officer (ECO) is appointed to oversee all the construction activities. The ECO as per the regulation needs to be independent. The ECO will thus ensure that all the mitigation measures are implemented. The inclusion of an Ecologist as part of the construction phase is also seen as a possible management measure to ensure that the wider area is protected, and not only the construction site
39	The EIA also needs to ensure that a proper Fire management plan is implemented. The EMPr should include measures, that no protected trees may be used for harvesting of firewood. Again, this needs to be included as part of the general induction training.	16 February 2022: Comments made during meeting	Tshifhiwa Mathase: Department of Forestry, Fisheries and the Environment (DFFE): Limpopo	There is an induction training manual in place for Dwarsrivier Chrome Mine (DCM), which includes the protection of trees, including that trees are not allowed to be used for firewood.
40	The issue of veldfires in the area is of great concern. There need to be strict measures in place to ensure that veldfires are minimized. No smoking must be allowed other than at the dedicated smoking areas. No open fires must be allowed for cooking purposes.	16 February 2022: Comments made during meeting	Tshifhiwa Mathase: Department of Forestry, Fisheries and the Environment (DFFE): Limpopo	All the comments received are included into the EIA report. The said report also has a separate table with all the listed conditions. This then also gets documented in the EMPr for use on site. The consultant can also provide the separate list of conditions to the departments.

NO.	THEME: GENERAL COMMENTS / ISSUES			
	ISSUE RAISED	**DATE AND HOW ISSUE WAS RAISED**	**COMMENTATOR**	**RESPONSE**
41	As part of the final EIA, all the comments received need to be incorporate into the report such as the comments from the Land Claimant and SAHRA. The Ecology report also needs to form part of the submission as we would like to avoid any appeals. A full public participation process needs to be incorporated.	16 February 2022: Comments made during meeting	Patricia Makhuvele: DMRE	All specialist studies will be included into the draft EIA report. The report will also provide a summary of all the findings. The inclusion of a detailed public participation report is noted and will be included.
42	We would like to place on record that Eskom has knowledge of the proposals as per your report and that several discussions and meetings took place between Eskom and Dwarsrivier Chrome Mine (DCM) to determine the impact on Eskom's network and plant. It was agreed between Eskom and DCM that, before execution of the final project/s by DCM, Eskom will either enter upon a Co-Use agreement with DCM, or DCM will, at their cost, relocate Eskom network and/or plant components.	21 February 2022 Formal comments submitted via letter	Xander Neethling: Eskom: Supervisor: Land and Rights	Noted.

Please refer to the following table for the comments raised by the DMRE:

#	Comment	Response
1	Please ensure that all relevant stakeholders are consulted, and comments are submitted to the Department with the Environmental Impact Assessment Report. This includes but is not limited to the Provincial Heritage Resources Authority, Provincial Environmental Department, Department of Agriculture, Forestry and Fisheries (DAFF), Department of Water and Sanitation (DWS), Eskom and the Local Municipality. Proof of correspondence with the various stakeholders must be included into the EIA. Should you be unable to obtain comments, proof of attempts that were made to obtain comments should be submitted to the Department.	Please refer to Section 1.g.iv for details of the Stakeholder consultation process. Also refer to Annexure 6.
2	In addition, the following amendments and additional information are required for the EIA and EMPr: Details of the future land use for the site and infrastructure after decommissioning in 20-30 years. The total footprint of the proposed development should be indicated. Possible impacts and effects of the development on the vegetation ecology with regards to low land-highland interface in the locality should be indicated. Possible impacts and effects of the development on the surrounding industrial area. Information on services required on the site, e.g. sewage, refuse removal, water and electricity. Who will supply these services and has an agreement and confirmation of capacity been obtained? A construction and operational phase EMPr to include mitigation and monitoring measures. Should blasting be required, appropriate mitigation measures should be provided.	The current financial rehabilitation plan makes provision for the end land use of the mine to be Wilderness land. Please refer to Section 1.s of the EIA and Section 1.e of the EMPr for the outcomes of the Financial Provision. Please refer to Table 10 for a summary of each of the activities. In addition to this, please refer to Section 1.d.ii for detailed descriptions of each of the projects and lastly Table 82 for the financial provision quantity. Please refer to Annexure 8 and Annexure 9 for the findings of the ecological and Freshwater Resources studies. No low-land/ high-land interface has been identified. Various different ecological habitats requiring management have been demarcated with management of these presented in Table 89 to Table 92. The mine is an existing operation, and no additional services are required. Existing services will be utilised for the proposed projects. Please refer to Table 89 to Table 92. No blasting is required for the purposes of this project.

#	Comment	Response
3	The applicant is hereby reminded to comply with the requirements of regulation 3 of the EIA Regulations, 2014 with regards to the time period allowed for complying with the requirements of the Regulations.	Noted.
4	Please ensure that the Report includes A3 size locality maps of the area and illustrates the exact location of the proposed development. The maps must be of acceptable quality and as a minimum, have the following attributes (maps are relatable to one another; coordinates legible legends; indicate alternatives; scale and vegetation types of the study area).	Please refer to Annexure 16.
5	Further, it must be reiterated that, should an application for Environmental Authorisation be subjected to any permits or authorisations in terms of the provision of any Specific Environmental Management Acts (SEMAs), proof of such application will be required.	The purpose of the current WULA is to make technical amendments to the existing authorised water uses and include new water uses associated with the expansion activities. The EWULAAS process has been initiated on 15 January 2022.
6	Your attention is brought to Section 24F of the NEMA which stipulates that no activity may commence prior to an Environmental Authorisation being granted by the Competent Authority.	The Applicant is aware of this responsibility. Reporting of incidents are also included into the EMPr.
7	Ensure that financial provision quantum form part of the EIAr and it caters for the proposed additional listed activities.	Please refer to Section 1.s of the EIA and Section 1.e of the EMPr for the outcomes of the Financial Provision.
8	You are requested to consult with relevant state departments that adjudicate mining activities and submit three hard copies of the report and at least one electronic copy (CD/DVD) of the complete EIA/EMPr to this Regional Office.	Noted.

With reference to Regulation 3(7) of the 2014 EIA Regulations (GNR 982) (as amended), on behalf of the applicant, Dwarsrivier Chrome Mine (Pty) Ltd ("Dwarsrivier Mine") and EnviroGistics (Pty) Ltd, appointed as the independent Environmental Assessment Practitioner (EAP), requested an additional two (2) months (60 days) extension in addition to the prescribed 106 day period to submit the Final Environmental Impact Assessment Report (EIAR) and Environmental Management Programme (EMPr) to the competent authority (DMRE). The request was based on the following:

- This submission of the draft EIA and EMPr report initially planned on 30 November 2021 would have necessitated review over the Regulated December block out period. Although additional time would have been offered, the risk of Stakeholders not reviewing this report with sufficient time provided, needed to be considered and managed.
- Due to various engineering considerations, and the replacement of the original engineering firm, the TSF designs were still underway and would have impacted the outcomes of the Water Balance and Groundwater Studies. The designs only became available in November 2021.

This request was submitted on 29 October 2021 and was approved by the DMRE on 29 October 2021.

This Draft Environmental Impact Assessment Report and Environmental Management Programme (EIA/EMPr) is submitted for a 30-day comment period from 28 February 2022 to 30 March 2022.

Water Use Licence Process

The mine has three (3) approved Water Use Licences (WULs).

- Licence Number: 24053346, dated 21 January 2008;
- Licence Number: 04/B41G/G/792, dated 8 July 2011; and
- Licence Number: 04/B41G/CL/2240, dated 4 October 2013.

The first WUL was issued on 21 January 2008 (Ref. No.: 24053346), by the Chief Director of Water Use in the Department of Water Affairs and Forestry (DWAF; now Department of Water and Sanitation (DWS)). The WUL is issued under Chapter 4 (Sections 21 – 55) of the National Water Act (Act No. 39 of 1998) (NWA) and makes provision for the following water uses:

- Section 21(a) – Taking water from the Groot Dwars River, a surface water resource, subject to conditions set out in Appendices I and II.
- Section 21(c) – Impeding or diverting the flow of water in a watercourse and, subject to the conditions set out in Appendices I and IV.
- Section 21(g) – Disposing of waste or water containing waste in a manner that may detrimentally impact on a water resource, subject to the conditions set out in Appendices I and V.
- Section 21(i) – Altering the bed, banks, course or characteristics of a watercourse, subject to the conditions set out in Appendices I and IV.
- Section 21(j) – Taking water from a groundwater resource, and removing water from underground, subject to the conditions set out in Appendices I and III.

The second WUL, a stand-alone application, i.e. not integrated with the initial WUL, was issued on 8 July 2011 (Ref. No.: 04/B41G/G/792), by the Acting Director General in the Department of Water Affairs (DWA; now DWS). The WUL is issued under Chapter 4 (Sections 21 – 55) of the NWA and makes provision for the following water uses:

- Section 21(g) – Disposing of waste or water containing waste in a manner that may detrimentally impact on a water resource, subject to the conditions set out in Appendices I and II.

This last mentioned 2011 WUL was specifically undertaken for the North TSF and associated RWD.

The third WUL was issued on 4 October 2013 (Ref. No.: 04/B41G/CL/2240) and was specific for the Low-Level River Crossing (bridge) construction over Groot Dwars River and the existing pipeline crossing over Springkaanspruit. This WUL makes provision for the following water uses:

- Section 21(c) – Impeding or diverting the flow of water in a watercourse and, subject to the conditions set out in Appendices I and IV.
- Section 21(i) – Altering the bed, banks, course or characteristics of a watercourse, subject to the conditions set out in Appendices I and IV.

In addition to the above, the mine also has Exemptions issued by the DWS (then known as DWAF). The Exemptions issued by DWS are as follows:

- Exemption 16/2/7/B400/C83/1 - "Dwars River Chrome Mine is hereby exempted in terms of Regulation 3 of Government Notice 704 as published in the Government Gazette for the undermining of the Dwars River on the properties set out in 3 (a) below and subject to the conditions set out in Appendix A of the license".
- Dwarsrivier was exempted from the following GN 704 Activities as part of the 2008 WUL:
  - Exemption from Regulation 4(a) and 4(b) for the conveyor belt, haul road crossings, non-perennial stream diversions; and
  - Exemption from Regulation 4(c) and 4(d) for the disposal of tailings in the North and South Pits.

The DWS issued amended WULs to all three the WULs to correct various administrative conditions in 2021:

- WUL 2008 – Amended 10 June 2021;
- WUL 2011 – Amended 28 June 2021; and
- WUL 2013 – Amended 10 August 2021.

A Water Use Licence Application (WULA) has been initiated with the DWS on the online Water Use Licence Application and Authorisation System (EWULAAS) system. No activities will be undertaken without the necessary water use approvals.

The WUL will not only cater for the projects applied for as part of this current application, but will be an update of the overall mine WUL to correct all technical amendments and water uses required for inclusion. For this project, the following activities may trigger water uses as indicated:

- Section 21(c) & (i) applications where these activities are located within the 500m and 100m riparian buffer zones: the 100m and 500m buffer specifically relates to the Main Parking Extension, Widening of the Access Road and the Subway Crossing between the Plant and North Mine.
- Section 21(g) for the construction of the TSF and associated PCD.

<u>Khulu TSF Other Licences</u>

The Khulu TSF will require the following approvals from the DWS in terms of the NWA:

- Section 21(g) for the disposal of a waste (TSF and PCD and TSF).
- Section 21(c) and (i) for placement within 500m of a riparian zone (TSF, pipeline, and filter press).

In terms of the National Heritage Resources Act (Act No. 25 of 1999) (NHRA), the following will be required:

- The stone cairn of unknown purpose at Feature 1 (west of proposed PCD) should be avoided with a 30m buffer. If this is not possible, it should be confirmed whether this is a grave through stakeholder consultation/ Ground Penetrating Radar/ Test Excavations and if confirmed to be a grave it should be relocated as per all the relevant legal requirements. Should this be determined a grave, two options must will be considered:
  - Excavation permits are to be applied for; or
  - A 30m buffer zone (as recommended by the HIA report as no blasting or invasive activities are planned with the construction the TSF) must be adhered to in order to conserve the grave against any potential damage during construction. A social consultation process in terms of Chapter XI of the NHRA Regulations must be carried out to identify the descendants of the burials and to obtain permission to fence in the identified grave. If the mine is unable to retain the grave *in situ,* permission must be obtained from the families of the deceased to relocate the grave. If they agree to the relocation of the grave, then a Section 36 of the NHRA permit application must be logged on SAHRIS.
- Feature 5 (south of proposed TSF) should be shovel pit tested (with the required mitigation measures and permit in place) to determine the presence of subsurface deposit, after which a destruction permit can be applied for.
- The lack of graves at Feature 6 (proposed TSF) should be confirmed prior to construction by the social team and monitored during construction.

<u>Diesel and Emulsion Batching Area</u>

The Diesel and Emulsion Batching Areas will require no approvals from the DWS in terms of the NWA.

In terms of the NHRA, the following will be required:

- The lack of graves at Feature 4 should be confirmed prior to construction by the social team and monitored during construction.
- Should graves be confirmed, two options must will be considered:
  - Excavation permits will be applied for; or
  - Excavation permits are to be applied for; or
  - A 30m buffer zone (as recommended by the HIA report as no blasting or invasive activities are planned with the construction the TSF) must be adhered to in order to conserve the grave against any potential damage during construction. A social consultation process in terms of Chapter XI of the NHRA Regulations must be carried out to identify the descendants of the burials and to obtain permission to fence in the identified grave. If the mine is unable to retain the grave *in situ,* permission must be obtained from the families of the deceased to relocate the grave. If they agree to the relocation of the grave, then a Section 36 of the NHRA permit application must be logged on SAHRIS.
- Features 2 & 3 (both located at the Diesel and Emulsion Batching Areas) should be shovel pit tested (with the required mitigation measures and permit in place) to determine the presence of subsurface deposit after which a destruction permit can be applied for.

<u>Main Parking Area, Widening of Access Road and Subway Crossing</u>

The proposed Main Parking Area, Widening of Access Road and Subway Crossing Projects will require the following approvals from the DWS in terms of the NWA:

- Section 21(c) and (i) for placement of infrastructure within 500m of a riparian zone (majority of the area associated with the Widening of the Access Road)
- Section 21(c) and (i) for placement of infrastructure within 100m of a Springkaanspruit (Main Parking Area; majority of the area associated with the Widening of the Access Road; approximately half the areas associated with the proposed Subway Crossing).

The EWULAAS process has been initiated on 15 January 2022.

No heritage features were recorded in the vicinity of these projects and in terms of the NHRA, no permits or specific mitigation will be required.

Summary of Specialist Reports

The following table details the summary of the Specialist Report outcomes:

<table>
<tr><th>List of studies undertaken</th><th>Recommendations of specialist reports</th></tr>
<tr><td>Soils, Land Use and Capability</td><td>
General Discussion
None of the footprint areas earmarked for the various projects are currently under cultivation or have been utilised for agricultural purposes in the past, with the exception of the proposed Khulu TSF area which has previously been cultivated for subsistence purposes, but has since been laid fallow. Scrutiny of the satellite imagery indicate that the dominant land uses in the surrounding areas are mining and wilderness, with very few residential areas northeast of the Mining Right Area (MRA). No cultivated agriculture was observed within the immediate vicinity of the MRA.
Overall, relatively small areas of the footprint areas comprise of arable soils with a moderate potential for agriculture, whilst the rest of the footprint area is located on very shallow soils not considered suitable for agricultural production. The extent of arable Bonheim soils are not considered sufficient for viable cultivated small commercial farming. In addition, low rainfall (less than 600-650mm per annum) further disqualifies the area from being ideal for agricultural production, and high temperatures occurring in this area are also likely to cause crop permanent wilting, thus affecting crop yield. Given these constraints, the extent of the high productivity soils is not considered sufficient for viable cultivated commercial farming. Based on the above-mentioned limiting factors the proposed project is anticipated to have a relatively low cumulative loss of arable land and medium low cumulative loss of natural vegetation for grazing and/or ecological conservation.
Livestock commercial farming is not considered an optimum land use for the footprint areas due to the veld being classified as having a low grazing capacity of 6 ha Per Large Animal Unit.
Impact Statement
From a soil, land use and land capability point of view, this project is not regarded as being fatally flawed due to various natural constraints posed by the local soil types and climate for commercial agricultural production, however mitigation measures and recommendations outlined in this document need to be strongly considered and implemented accordingly in efforts to conserve soil resources and general pedological processes important in terms of sustainable development.
The proposed Project 2 will most likely result in the clearance of vegetation as part of the construction phase which has the potential to lead to loss of soil through erosion and subsequent loss of land capability. Given the small footprint of this project, the loss of land capability is however not anticipated to be significant, provided that the project footprint remains within the demarcated areas and mitigation measures are implemented during all phases of development. The extent of the access road required for this project will be limited since this project is located adjacent the current TRP mine’s new TSF pipeline and service road. The TSF maintenance road will serve as the main access road and as such the impact of the access road will be negligibly low.
The proposed Projects 3, 4 & 5 are located within the existing mine operational footprint where soils have already been subjected to significant disturbance associated with mining and related infrastructure. The extension of the existing infrastructure will not lead to a significant losses of land capability given the disturbance that has occurred on the surrounding soils. Impact such as soil erosion, compaction and soil contamination are however likely to occur during the construction phase which will lead to further degradation of the surrounding soils and the subsequent loss of land capability. However, the overall impact significance of the proposed project will be negligibly low, after mitigation measures have been put in place during all phases of development.
Management Measures
The management measures presented in this report, focusses on:

Soil Stripping and Stockpile Management;
Soil Erosion and Dust Emission Management;
Soil Compaction Management;
Soil Contamination Management; and
Loss of Land Capability Management.

Specialist Opinion
It is the opinion of the specialist that this study provides the relevant information to ensure that appropriate consideration of the agricultural resources in the project site will be made in support of the principles of Integrated Environmental Management (IEM) and sustainable development.
</td></tr>
</table>

List of studies undertaken	Recommendations of specialist reports
Ecological Assessment	**General Discussion** The proposed five projects are situated within the Savanna Biome and the Central Bushveld Bioregion. The project areas are further associated with the Sekhukhune Mountain Bushveld which is listed as least concern (Mucina & Rutherford, 2006), whilst the National Threatened Ecosystems database (2011) indicated that the project areas are located in the Sekhukhune Mountainlands which is listed as endangered. Based on the results of the field investigation of three broad habitat units were distinguished for the proposed 5 projects: 1. The Sekhukhune Mountain Bushveld, which is considered to be representative of the reference vegetation type (Mucin & Rutherford, 2006); SAS 218221 October 2021 48 2. The Secondary Bushveld, which comprises of old agricultural lands and areas which have historically been cleared during construction and mining activities, which are in a state of secondary succession. This habitat unit is not considered representative of the reference vegetation type; and 3. The Transformed areas, associated with existing gravel roads and the active mining area, comprising of little to no remaining vegetation. Sekhukhune Mountain Bushveld habitat: The majority of Project 2 is located within the habitat unit, with smaller portions of the other project footprint areas being located in this habitat unit. The vegetation structure and floral species composition is representative of the vegetation type as described by Mucina & Rutherford (2006), and as such, is generally considered to be intact and of increased sensitivity. During the assessment, the National Forestry Act (1998) (NFA) listed tree species *Sclerocarya birrea subsp. caffra* was observed in the footprint area of Project 2. The intact vegetation structure supports an increased diversity of faunal species, with the endemic insect species *Pycna sylvia* (Cicada) also being observed. Secondary Bushveld habitat: This habitat unit is associated with areas of historical agriculture as well as areas where vegetation clearance associated with mining took place. Vegetation has been allowed to naturally recovery, however these areas are largely dominated by pioneer and subclimax plant species and of a decreased species diversity. This habitat unit is not considered representative of the reference vegetation type. Faunal species diversity was notably lower in this habitat unit, attributable to the decreased habitat and food resource availability herein. No faunal or floral SCC are expected to occur within this habitat unit. Transformed areas: Associated with existing gravel roads and the active mining area, comprising of little to no remaining vegetation. **Impact Statement** Prior to mitigation measures implemented, impact significance on faunal habitat and diversity varies between Medium high and Very Low. With mitigation measures implemented, the impacts on the faunal habitat, diversity and SCC can mostly be reduced to Low and Very low. In summary, but are not limited to, the following: - Clearance of vegetation within the footprint areas; - Impacts on Floral and Faunal species of conservation importance; - Impact on Critical Biodiversity Areas (CBAs), Ecological Support Areas (ESAs), a listed Threatened Ecosystem and Protected Areas - Habitat fragmented and resulting in reduced movement of species and reduced dispersal opportunities for plant species; - Increased risk of erosion and poor stormwater management - resulting in loss of soils, the downslope sedimentation of habitat and the consequent loss of habitat beyond the planned footprints; and - Alien and Invasive Plant (AIP) species proliferation and woody encroachment into natural vegetation, displacing indigenous flora and altering favourable habitat conditions for the establishment of indigenous species. **Management Measures** - Habitat Diversity Management; - AIP Management; - Manage Impacts on Floral and Faunal Species of Conservation Importance - Edge Effect Management; - Rehabilitation

List of studies undertaken	Recommendations of specialist reports
	Specialist Opinion It is the opinion of the ecologists that this study provides the relevant information required in order to implement Integrated Environmental Management (IEM) and to ensure that the best long-term use of the ecological resources in the proposed five project areas will be made in support of the principle of sustainable development.

Freshwater Ecological Assessment	**General Description**
	Two primary freshwater ecosystems were identified in association with the five project area, namely the Dwars River, and the Springkaanspruit (a tributary of the Groot Dwars River). Both rivers have been subjected to various impacts relating to ongoing mining activities within the MRA and the greater catchment and are considered moderately modified (Present Ecological State (PES) Category C). The Dwars River is deemed of very high Ecological Importance and Sensitivity (EIS) whilst the Springkaanspruit is of High EIS.
	No freshwater ecosystems were identified directly within the proposed footprint areas of the Diesel and Emulsion Batching Areas, although the headwaters of two small ephemeral drainage systems are located within 500m thereof. Those ephemeral drainage systems are not deemed at risk from the proposed project and were therefore not assessed in detail, although it is strongly recommended that mitigation measures be implemented throughout all phases of the proposed batching areas to ensure that no risks or impacts are posed by edge effects.
	Impact Statement
	There are four key ecological impacts on the watercourses that are anticipated to occur namely:
	- Loss of habitat and ecological structure;
	- Changes to the sociocultural and service provision;
	- Impacts on the hydrology and sediment balance; and
	- Impacts on water quality.
	The outcome of the DWS Risk Assessment applied to the proposed activities indicated that, provided a high level of mitigation takes place throughout all phases of each project, the risk significance associated with each is ‘Low’, largely due to the distances of most projects from the applicable watercourse. Nevertheless, this does not preclude the necessity for the implementation of well-developed, environmentally sound, site-specific mitigation measures.
	Management Measures
	The key mitigation measures are summarised below:
	- Sound environmental management practices, such as dust suppression, limiting disturbance footprints, alien vegetation management, erosion monitoring and soil management and continued monitoring of ground and surface water quality (amongst others) must be applied to all activities throughout the life of mine to minimise the impact significance of edge effects;
	- The construction of sediment traps around the downgradient boundary of all construction areas is strongly recommended to minimise the volume of sediment transported in runoff from the construction site which would ultimately report to the Dwars River;
	- The watercourses must be protected against erosion arising from the discharge of stormwater. In this regard, energy dissipating structures should be installed to prevent erosion. Water should also be distributed in a diffuse manner to prevent canalisation;
	- With specific regards to the proposed TSF:
	  o An Emergency Response Plan must be compiled, and must include the measures below:
	    ▪ In the case of failure, as much sediment as possible, contaminated by the spill, must be removed from the point of its source, following the spill path to the affected watercourse. Sediment must be removed until the natural *in situ* substrate is reached or until a clear change in the sediment colour is reached indicating that the natural soil level has been reached;
	    ▪ All silt removed should be returned to the TSF or disposed of at a suitably managed site;
	    ▪ Following the removal of the contaminated sediment, it must be ensured the slope of the excavated areas is in line with the natural topography – i.e. a low gradient no more than 1:3;
	    ▪ Edge effects must be strictly controlled – for example no removal of sediment must take place beyond the spill pathway;

List of studies undertaken	Recommendations of specialist reports
	▪ Possible seepage and contamination of the groundwater resources is possible and should be monitored at suitable groundwater monitoring points; and ▪ Toxicological monitoring of the receiving environment and of the PCD must occur immediately following the first rain event after rehabilitation and again at the end of the wet season. A suitably qualified aquatic ecologist should make a recommendation concerning the necessity of future monitoring following the assessment. **Specialist Opinion** Based on the outcome of the ecological assessment and risk assessment, provided that strict implementation of cogent, site-specific and general 'good practice' mitigation measures takes place throughout the life of all proposed projects, it is the specialist's opinion that the five projects may be considered for authorisation with the knowledge that the significance of risk to the receiving environment is limited.
Hydrology	**General Description** The Mean Annual Precipitation (MAP) for the study area is 650mm, with the wettest months occurring from November to January, and the driest months from June to August. The mean annual Symons Pan (S-Pan) evaporation is 1 500mm. The proposed Khulu TSF and Capital Projects are located in quaternary catchment B41G which is situated within the Olifants Water Management Area (WMA). A number of non-perennial drainage lines drain the mountain ridges and hills within the MRA. These non-perennial drainage lines are ephemeral in nature (only flowing for short periods of time in response to high rainfall) and drain into the Klein and Groot Dwars Rivers. The Klein Dwars River flows through the centre of the MRA in a north-easterly direction, whilst the Groot Dwars River flows in a north-westerly direction. These two rivers form a confluence near the north of the MRA, forming the Dwars River, which flows into the Steelpoort River 8.5km northwest of the MRA. The Steelpoort River flows into the Olifants River, 40km north-east of the town of Steelpoort. According to the 1:50 000 topographical map 2430CC Kennedy's Vale, a non-perennial drainage line runs along the north-eastern boundary of the proposed Khulu TSF and PCD site. During the site visit, this area was assessed, and it was noted to be highly disturbed by what appeared to be old stockpiles and borrow pits, possibly from previous road construction in the area. As a result, water is likely to pond in this area and it is therefore highly unlikely that this area functions as a drainage line. Furthermore, the Freshwater Ecological Assessment (SAS, 2021) did not identify this area as a potential watercourse. Surface water quality data was obtained from the Dwarsrivier Chrome Mine Quarterly Environmental Water Quality Report for the period January 2021 – March 2021 (Aquatico, 2021). The following provides a summary of the water quality of the instream receiving environment: - The pH has been alkaline (> 7) and within limits at all monitoring points; - Total Dissolved Solids (TDS) exceeded the WUL limit at all monitoring points and have been particularly elevated at SP4, S2 and S4. The elevated TDS at S2 is most likely from the upstream activities from the other mines in the Klein Dwars River catchment; - Sulphate has been within the WUL limit at all monitoring points except on one occasion at S2 in February 2020; - Nitrate exceeded the WUL limit at S1 – S4 between January 2021 and March 2021. Nitrate has regularly exceeded the limit in the past at S1, S3 and S4, however, between December 2020 and March 2021 levels significantly declined; and - The water quality for all other variables monitored were within the WUL limits. **Impact Statement** No watercourses are located within the 1:100 year floodline or within 100m of the Khulu TSF or Diesel and Emulsion Batching Areas, however, the proposed Main Parking Extension, Access Road Widening and Subway Crossing are located within a 100m horizontal distance of a watercourse (but not within the 1:100 year floodline). The impact assessment indicated that all identified impacts would have a medium significance pre-mitigation, and that these impacts can be mitigated to a low significance should mitigation measures be adhered to. Typical impacts identified include: - Erosion of exposed soils leading to siltation and sedimentation of downslope drainage channels; - Potential hydrocarbon spillages washed into downslope drainage channels; - Alteration in natural drainage patterns leading to erosion and siltation; - Loss of hydrological connection and water quantity; - Loss of natural seasonal storage areas; and - Loss of water quantity to downstream users. Due to the arid climate this is likely to be a very small to negligible impact.

<table>
<tr><th>List of studies undertaken</th><th>Recommendations of specialist reports</th></tr>
<tr><td></td><td> Management Measures
The following provides a summary of the main recommendations of the study:

GN704 exemptions must be applied for, for the following proposed infrastructure located within a 100m horizontal distance of a watercourse:

Main Parking Extension;
Widening of an Access Road between South Shaft/Main Offices and Plant; and
Subway Crossing between the Plant and North Mine

A clean water diversion berm should be constructed upslope of the proposed Khulu TSF;
Clean diversion berms are constructed on the upslope side of the proposed diesel and emulsion batching areas to divert any unnecessary clean water from flowing through these facilities;
All diesel tanks must be appropriately bunded. The bunds should have sufficient capacity to contain 110 % of the diesel tank storage capacity and should be operated empty at all times;
The area where the transfer of emulsion from the tanker will take place, should be on an impermeable hard surface area, that is sloped to a sump, to capture any possible spills. The sump should be inspected regularly and liquid within the sump disposed of at an appropriate facility;
Vegetation clearance should be kept to absolute minimum;
Erosion measures such as hessian nets should be employed around working areas when construction is taking place;
The Khulu TSF silt trap must be regularly inspected and desilted. Desilted material must be placed temporarily on a lined bunded area and disposed of either back on the TSF or at an appropriate facility; and
The PCD must be lined and appropriately sized so as not to spill more than once in 50 years, in accordance with GN704 regulations. The freeboard of the PCD must be monitored daily.

Specialist Opinion
Should the mitigation measures, recommendations and monitoring plans provided in this study be adhered to, then from a surface water perspective, the proposed projects can commence. </td></tr>
<tr><td>Hydrogeology</td><td> General Discussion
Three aquifers are typically present in the region. These include an alluvial aquifer associated with the floodplains of the Groot and Klein Dwars Rivers; a shallow weathered aquifer present in the upper 15m of the geological succession; and a deeper fractured rock aquifer in the pyroxenites, anorthosites and norites.
The geohydrological specialist study completed for the EIA includes the results of a fieldwork programme geared at obtaining sufficient information with which to characterise the aquifers present. The fieldwork includes a hydrocensus to identify and quantify existing groundwater use near the Khulu TSF footprint. The only private borehole is located 230m northeast of the TSF.
A geophysical survey was completed to confirm the locations of perceived faults and dykes that are present near the TSF. A total of seven new monitoring boreholes were drilled on the geophysical targets, including three sets of shallow and deep monitoring boreholes to target the aquifers present and one shallow borehole adjacent to an existing old deep monitoring borehole identified during the hydrocensus. Aquifer tests were completed in the deep monitoring boreholes, while observations were made in the shallow boreholes. The drilling programme and aquifer tests were used to obtain information to characterise the aquifers present.
Based on the information evaluated, a north-south trending fault, associated with a replacement pegmatoid body mapped in the underground mine plan, is identified as a preferential flow path to groundwater and therefore also for potential contamination associated with the Khulu TSF. This fault intersects the eastern edge of the TSF. A second southwest-northeast trending fault was also identified and characterised. This fault transects the Khulu TSF footprint and also exhibits enhanced aquifer conditions, which are variable along its strike. A borehole situated down gradient of the Khulu TSF on this fault line was dry at the time of drilling. Groundwater seepage was recorded afterwards in the borehole. This structure may therefore also be considered as a preferential flow path to groundwater, but with less significance compared to the north-south trending fault. A dyke situated east of the Khulu TSF could act as a preferential flow path to groundwater, south of the TSF footprint. In the vicinity of the Khulu TSF, the significance of the preferential flow along the dyke contact is considered less prominent as it does not intersect the footprint area.
An analysis of aquifer transmissivities calculated from field data was undertaken. The information suggests that the N-S striking fault is the most prominent preferential flow path to groundwater. </td></tr>
</table>

List of studies undertaken	Recommendations of specialist reports
	Evaluation of monitoring data obtained during aquifer tests suggest that there is limited vertical movement between the shallow weathered and deeper fractured aquifers at the Khulu TSF footprint. Further south in the plant area, high transmissivities were recorded for the N-S striking fault in shallow and deep boreholes. It is thought that contamination from surface enters the fractured rock aquifer in this area. Groundwater flow patterns confirm preferential flow along the N-S striking fault and to a lesser extent along the SW-NW striking fault and the dyke. Groundwater levels measured in shallow boreholes indicate that groundwater follows the topography in the weathered aquifer and discharges towards rivers and streams. Groundwater flow in the underlying fractured rock aquifer is only partially governed by the topography. Preferential flow along geological structures and the impact of mine dewatering also affects the fractured rock aquifer. The average rate of recharge to the aquifers was calculated from groundwater level and rainfall data as around 4% of the mean annual precipitation. This is within the expected range for the aquifers present. Existing groundwater abstraction by Dwarsrivier Mine to supply the operational with potable and process water was taken into consideration during simulations. An assessment of process water quality and rock leach tests completed indicates that the risk of acid mine drainage associated with the operations is low. An analysis of the mine's monitoring database confirms that nitrate is the indicator element for the project. The impact assessment presented in this report is therefore completed at the hand of nitrate concentrations in groundwater. The latest available groundwater quality sampling data shows that the nitrate concentration in the existing dirty water dams linked to the Plant and the North TSF are comparable and exceed 1,000mg/l. Water quality in the Lower RWD, which is used to supply the plant and will impact on seepage quality in tailings deposited on the Khulu TSF has a nitrate concentration exceeding 1,500mg/l. Groundwater quality data further indicate that the fractured rock already exhibits elevated nitrate concentrations at the Khulu TSF footprint. This contamination is thought to originate in the Plant area and migrate preferentially along the faults and dykes in a northerly direction. Groundwater quality in the shallow weathered aquifer is not impacted at the TSF footprint. An analysis of the rate of contaminant migration in the alluvial aquifer and along the dyke structure confirms similar aquifer permeabilities/transmissivities to those calculated with aquifer testing data. The available dataset was used to conceptualise the aquifers present at the Khulu TSF and generate input for the numerical groundwater flow and contaminant transport model updated and re-calibrated to complete the impact assessment. The source term used to simulate the impact of the project on nitrate concentrations in groundwater was generated from existing monitoring and leach test data. Jones and Wagner calculated the potential rate of leakage through the TSF and PCD liners. This information was incorporated in the groundwater model to complete the impact prediction simulations. <u>Model calibration and sensitivity analysis</u> Model calibration was undertaken with field-measured groundwater levels from the latest monitoring dataset. Both steady state and transient calibration was completed. Calibration results complied with the pre-set calibration criteria set. The results indicate that the model is most sensitive to changes in the permeabilities of the regional geological structures that act as preferential flow paths, including the N-S dyke, the SW-NE fault, the rock matrix and the N-S fault. The level of confidence in the outcome of simulations can be improved if additional monitoring data is obtained to characterise aquifer characteristics. This can be done through ongoing water level monitoring in the existing boreholes as well as monitoring on-site rainfall rates. Modelling further indicates that the contaminant transport model is sensitive to changes in the porosity of the rocks and the geological structures. The porosities used to complete the impact assessment were kept low in order to avoid under-estimating impacts. Adjustments to the porosities were undertaken to match monitoring data. It is however recommended that more work is undertaken to improve the understanding of aquifer porosities to be included in future simulations. **Impact Assessment** The designs and operational life of the Khulu TSF was integrated into the model to complete the geohydrological impact assessment for the project. The estimated impact at the end of the operational phase of the TSF and mine was calculated. An assessment of the no-project option is also included in the report. Three long-term liner scenarios were tested, namely: - **Scenario 1:** Good liner installation for the Khulu TSF and PCD. Exposure to the atmosphere is managed and limited to a minimum, resulting in a life of liner of 280 years. During this time, it is assumed that seepage will be collected above and below the TSF and PCD liner and that this water will be transferred to the PCD. No seepage is therefore expected to infiltrate to the underlying aquifers. This is considered the best case scenario.

List of studies undertaken	Recommendations of specialist reports
	- **Scenario 2:** Good liner installation for the Khulu TSF and PCD. Exposure to the atmosphere cannot be managed, resulting in a life of liner of 69 years. After 69 years, the liner starts seeping into the aquifers according to the rates presented provided by JAW. - **Scenario 3:** Poor liner installation for the Khulu TSF and PCD. Exposure to the atmosphere cannot be managed, resulting in a life of liner of 69 years. After 69 years, the liner starts seeping into the aquifers at the maximum rate. This is considered the worst case scenario. During simulations, the specifications and findings of the latest overall annual rehabilitation plan for the operations were incorporated. The requirements of the 2018 Groundwater Remediation Strategy were not considered in this report. This strategy will be updated and finalised based on the outcome of fieldwork completed in 2021 and is outside of this project. Groundwater management scenarios will be assessed as part of a separate study during 2022 after which the implementation of the Groundwater Remediation Strategy will be finalised. It is acknowledged that groundwater management measures implemented as part of the remediation strategy will also benefit impacts associated with the Khulu TSF. The simulated plumes presented in this report are delineated by the 30 mg/l nitrate concentration contour. This is equivalent to the long-term average nitrate concentration for the receiving water quality in the Groot Dwars River. Activities upstream of Dwarsrivier Mine already impact on nitrate concentrations, which affect surface water and to some extent groundwater quality in the Dwarsrivier Mine mining area. The South African Drinking Water nitrate standard of 11mg/l is also indicated on simulated plumes as reference. *Impacts on groundwater quality at the end of the operational phase:* - Nitrate contamination in the weathered aquifer will be contained to the Plant and opencast mining areas. Based on the current characterisation of the alluvial and shallow weathered aquifers, it is unlikely that nitrate concentrations in the weathered aquifer would exceed 11mg/l in the vicinity of the Groot Dwars River down-gradient of the Khulu TSF. - No impact on groundwater quality is expected in the vicinity of the Klein Dwars River west and northwest of the Khulu TSF and PCD at the end of the operational phase. - Based on the conceptualisation of preferential groundwater flow in the fractured rock aquifer, the nitrate plume is expected to migrate in a northerly direction along the N-S striking fault. This contamination originates from the plant, historical TSF, dirty water dams, open cast and underground mining areas and not from the Khulu TSF and PCD. *Long-term impacts on groundwater quality if the project is not implemented:* - The simulations indicate that the nitrate plume will recede in the long-term in the weathered aquifer if all sources of contamination are removed at mine closure as part of the rehabilitation programme. - At the Khulu TSF foot, nitrate concentrations are not expected to significantly exceed 11mg/l in the long-term for this scenario. - The impact on the Groot and Klein Dwars River is expected to reduce significantly in the long-term for this scenario. Nitrate concentrations in groundwater reaching these rivers in the weathered and alluvial aquifers are not expected to exceed 11mg/l. - The plume in the fractured aquifer is expected to continue to migrate along the preferential flow paths and to a lesser extent in unfractured rock matrix in the long-term. Nitrate concentrations are however expected to reduce inside the affected area as a result of plume dilution from recharge of fresh rainwater and groundwater throughflow. Over the footprint area of the Khulu TSF, nitrate concentrations are expected to reduce to below 160mg/l on average. *Long-term impacts on groundwater quality associated with Scenario 1:* - Seepage through the TSF and PCD liners are expected to increase nitrate concentrations in the weathered aquifer underneath the Khulu TSF and PCD footprint areas. Nitrate concentrations may increase to above 600mg/l over the footprint areas in the weathered and alluvial aquifers in the long-term. - The nitrate plume is expected to migrate in a north-westerly direction towards the Klein Dwars River in the weathered and alluvial aquifers. At 300 years after mine closure, simulations suggest that it is unlikely that groundwater with nitrate concentrations exceeding 11mg/l would reach the Klein Dwars River from the Khulu TSF and PCD to any significant extent. - The effect of liner failure at the Khulu TSF and PCD on the fractured rock aquifer is not expected to add significantly to the pollution load associated with other Dwarsrivier Mine mining and mineral processing activities. - Nitrate concentrations may increase to above 180mg/l in the fractured rock aquifer as a result of infiltration over the Khulu TSF and PCD footprint areas. This is an estimated 20mg/l increase in concentration compared to the no project option discussed above. - The nitrate plumes originating from the Khulu TSF and PCD are expected to migrate in a northerly direction along the preferential flow paths identified. Contamination along these geological structures is however expected to be dominated by Dwarsrivier Mine mining and mineral processing activities and not significantly as a result of seepage from the Khulu TSF and PCD.

List of studies undertaken	Recommendations of specialist reports
	• The nitrate plume is expected to migrate more than 900m north outside the Dwarsrivier Mine MRA along the N-S striking in the long-term for this scenario. *Long-term impacts on groundwater quality associated with Scenario 2:* • The extent of the impact on groundwater quality for this scenario is similar to that reported for Scenario 1. The extent of the plume is driven by aquifer parameters like permeability and porosity and to a lesser extent by the concentration gradient for Scenarios 1 and 2. This is due to the fact that the rate of seepage from the Khulu TSF liner for good installation is reported to be comparatively low, which means the concentration gradient from the source to the aquifer is low. • Nitrate concentrations inside the delineated plumes are however expected to increase for this scenario compared to Scenario 1, as the seepage will take place for a longer period of time. The liner failure occurs after 69 years for this scenario, compared to after 280 years for Scenario 1. • In the weathered and alluvial aquifers, nitrate concentrations may increase to above 800 mg/l in the long-term for this scenario. This is an increase of 200mg/l compared to Scenario 1. • The contamination is expected to migrate in a north-westerly direction towards the Klein Dwars River in the long-term. Nitrate concentrations are however not expected to significantly exceed 11mg/l in groundwater reaching the Klein Dwars River in this time. • The nitrate plume in the fractured rock aquifer will migrate preferentially along the N-S striking fault and the other preferential flow paths identified. As reported for Scenario 1, the nitrate plume may migrate more than 900m north along the N-S striking fault outside the Dwarsrivier Mine MRA in the long-term. • Nitrate concentrations in the fractured rock aquifer immediately underneath the Khulu TSF and PCD may increase to above 240mg/l for this scenario. This is an increase of 60mg/l in nitrate concentration compared to Scenario 1. • Nitrate concentrations at the Farm House borehole may decrease to around 170mg/l in the long-term compared to the 200mg/l expected at the end of the operational phase. This is however an increase of around 70mg/l compared to the results of Scenario 1. • Plume movement in unfractured rock matrix is expected to be low. Nitrate concentrations in the fractured rock aquifer immediately down gradient of the Khulu TSF and PCD are not likely to exceed 11mg/l near the Klein Dwars River in the long-term. *Long-term impacts on groundwater quality associated with Scenario 3:* • Liner failure and maximum seepage rates to the underlying aquifers for this scenario is expected to result in a significant negative impact on groundwater quality. With the increased seepage rate, the concentration gradient at the Khulu TSF and PCD footprint will increase significantly, resulting in an accelerated spread of contamination in the long-term. The plume is also expected to migrate radially away from the Khulu TSF footprint area due to the high infiltration rates. A mound in groundwater levels is expected around the footprint in this case. It is noted that the rate of infiltration is significantly high and is most probably not a reality. • The extent of the impact on the weathered and alluvial aquifers is expected to significantly increase for this scenario. Over the footprint area, nitrate concentrations may increase to 1,500mg/l in the long-term. • The plume is expected to migrate in a north-westerly and westerly direction towards the Klein Dwars River. Nitrate concentrations in groundwater reaching the Klein Dwars River are expected to increase to above 30mg/l over a length of 250m along the river. In places, nitrate concentrations in groundwater reaching the Klein Dwars River in the weathered and alluvial aquifers could exceed 200mg/l for this scenario. This is expected to result in a noticeable impact on surface quality in the long-term. • The plume is also likely to reach the Groot Dwars River southwest of the Khulu TSF due to the anticipated radial flow from the footprint area. Groundwater reaching the Groot Dwars River may have nitrate concentrations exceeding 30mg/l over a stretch of around 200m along the river. In places, nitrate concentrations in groundwater may increase to above 150mg/l at the river. This is also expected to result in a noticeable impact on surface water quality in the long-term. • The high seepage rates from the Khulu TSF and PCD are also expected to result in significant vertical flow to the underlying fractured rock aquifer. This is different to the outcome of Scenarios 1 and 2, where the concentration gradient under lower seepage rates did not result in significant impacts on the fractured rock aquifer. • Once the nitrate concentrations reach the fractured rock aquifer, preferential flow is expected along the N-S and the SW-NE striking fault lines. • Over the Khulu TSF and PCD footprint areas, nitrate concentrations may increase to above 1,200mg/l in the fractured rock aquifer for this scenario, which is a significant increase from the impacts associated with Scenarios 1 and 2.

List of studies undertaken	Recommendations of specialist reports
	- Along the N-S striking fault, nitrate concentrations may exceed 700 mg/l in the long-term. This plume is also expected to migrate more than 1300m north and outside the Dwarsrivier Mine mineral rights area, as indicated. - Nitrate concentrations in the SW-NE striking fault may increase to above 1000 mg/l in the long-term. In addition, a nitrate plume is expected to migrate along this structure in a south westerly direction towards the Groot Dwars River. In the long-term, nitrate concentrations may increase to around 450 mg/l in the fault line at the intersection with the Groot Dwars River. - The groundwater mound that will develop underneath the Khulu TSF and PCD footprint areas is also expected to drive migration of the nitrate plume in the unfractured rock matrix towards the Klein Dwars River west of the site. On the long-term, this could result in an increase in nitrate concentrations in the fractured rock aquifer at the river of more than 30mg/l, possibly as high as 50mg/l. *An evaluation of the simulated nitrate concentration fluctuation with time indicate the following:* - The residual long-term impact on groundwater associated with other Dwarsrivier Mine mining and mineral processing activities will continue to impact on groundwater quality in the long-term, especially in the fractured rock aquifer. Even if the Khulu TSF and PCD is not constructed, nitrate concentrations are expected to be elevated above the average receiving surface water concentration of 30mg/l in this aquifer. - With the implementation of rehabilitation measures at mine closure aimed at source reduction, the long-term nitrate concentrations in the fractured rock aquifer is expected to reduce by between 100 and 200mg/l in the long-term for no project option and Scenarios 1 and 2. - Similar trends are observed for the weathered aquifer, but at lower concentrations compared to the fractured rock aquifer. This is as a result of preferential groundwater flow associated with the regional faults and dykes targeted in the fractured rock aquifer as part of this study. - Liner failure for Scenario 1 will only impact on groundwater quality 280 years after liner installation, as discussed above. The increased nitrate concentrations in monitoring boreholes around the Khulu TSF footprint as a result of increased seepage rate after liner failure is expected manifest over a period of 40 – 60 years, after which concentrations are expected to plateau at 300 – 400mg/l in the weathered aquifer. - Liner failure for Scenario 2 will impact on groundwater quality 69 years after installation. At this point, nitrate concentrations are expected to increase to 300 – 400 mg/l over a period of 40 – 80 years and start to plateau at concentrations of between 300 – 400mg/l. - The significant impact of liner failure under Scenario 3 is evident from the graphs. It is shown that nitrate concentrations will increase significantly in both the shallow weathered and deeper fractured rock aquifers over a period of 10 – 20 years. In the weathered aquifer, nitrate concentrations may increase to above 1,200mg/l during this period. After the initial rapid increase in concentration, nitrate is expected to plateau at between 800 and 1,300mg/l in the weathered aquifer over a period of 100 years or longer. *Summary of impacts on groundwater quality and the receiving water body* - As discussed above, even without construction of the Khulu TSF and PCD, the existing Dwarsrivier Mine mining and mineral processing activities will continue to impact on groundwater quality in the long-term. Dwarsrivier Mine is in the process of developing and implementing a Groundwater Remediation Strategy that will be designed to reduce nitrate concentrations in groundwater. This strategy will be developed as part of a separate study. - Liner failure under good installation conditions is expected to result in an increase in nitrate concentrations of between 20 and 80mg/l in the long-term. The outcome of Scenario 1 resulted in the least significant impacts on groundwater and the receiving water quality. - If the liners are poorly installed and managed, negative impacts are expected on the receiving water bodies (the Klein and Groot Dwars Rivers) as well as on groundwater quality. Groundwater baseflow to the rivers at the concentrations reported will most likely result in an increase in nitrate concentrations in the rivers. The increased nitrate concentrations in groundwater will result in an unacceptable long-term impact. - Based on the outcome of the assessment, the preferred option in terms of liner design for the Khulu TSF and PCD is Scenario 1. For this scenario, good liner installation will be implemented and the liner will not be exposed to the atmosphere excessively. If this is achieved, the life of the liner is estimated to be 280 years. Simulations indicate that even if the liner fails, long-term impacts on the receiving water bodies are not expected to be significant. **Recommendations** The following recommendations are made:

List of studies undertaken	Recommendations of specialist reports
	Groundwater management and monitoring programme The results of the impact assessment were used to develop a groundwater management and monitoring programme for the Khulu TSF and PCD. The main objective of the management programmes is to reduce adverse impacts on the receiving water bodies and to prevent further deterioration of groundwater quality at the operations. In order to achieve this, overarching general groundwater management measures are proposed, mostly linked to good house-keeping measures. Specific groundwater management measures to address impacts on groundwater quality are provided. These include: - Finalise the implementation plan for the Groundwater Remediation Strategy for the operations, based on the outcome of fieldwork completed during 2021. The most effective groundwater management strategies must be developed and implemented as part of a groundwater impact assessment study to be completed during 2022. Due to the fact that groundwater quality at the Khulu TSF is affected by preferential flow along regional faults and dykes, it is accepted that the Groundwater Remediation Strategy will also improve groundwater quality at the TSF and PCD in the long-term. - The outcome of the groundwater impact assessment presented in this report indicates that the Scenario 1 liner design is the preferred option to ensure that long-term impacts on groundwater quality are limited. This entails good installation of the liner and limited exposure of the HDPE to the atmosphere. Under these measures, the liner is expected to have a life of 280 years. Once the liner fails, the rate of seepage to the underlying aquifers is minimised with good liner installation. - The liner design must include the above and below liner capture of seepage. Any seepage collected must be diverted to the PCD for containment. - The water level in the PCD must be diligently monitored to avoid spills and/or seepage. If excess water collects in the PCD, this water must be pumped to the Lower RWD for reuse in the mine water balance. - Dwarsrivier Mine must monitor the volumes of water transferred to and from the Khulu TSF and PCD as part of its flow meter monitoring network. Instruments installed to measure flow must be maintained and calibrated to ensure that accurate measurements are made. The data collected from the flow meters must be used to confirm that the assumptions on which this impact assessment are based, remain valid. If significant deviations in terms of water flow volumes are recorded, the impact assessment presented in this report must be re-evaluated, especially in terms of the volume of seepage available for infiltration from the TSF and PCD. - All newly drilled monitoring boreholes must be surveyed to confirm accurate positions and elevations. The coordinates presented in this report were recorded with a hand-held GPS. - Groundwater monitoring must be maintained in all boreholes dedicated to the Khulu TSF. Both groundwater quality and groundwater levels must be monitored in the boreholes according to the strategy below. The information from the monitoring programme must be kept in a spreadsheet. Trends must be analysed to ensure that any exceedances are immediately detected. - In the event of deterioration in groundwater quality, an inspection must be held to identify the source of contamination. Any non-compliances must be rectified immediately to avoid prolonged negative impacts on groundwater. - If any of the monitoring boreholes are destroyed during construction and/or operation of the TSF, these must be placed as a matter of urgency. Of specific concern is the location of boreholes DRM11S and D, which is located on the edge of the Khulu TSF design. These boreholes target the SW-NE trending fault and must be redrilled on this structure if destroyed to ensure efficient monitoring of groundwater in this position. - Additional monitoring boreholes, as detailed below, must be drilled prior to the commencement of construction of the Khulu TSF and PCD to ensure that a baseline can be generated. Based on the outcome of this assessment, three additional groundwater monitoring boreholes are recommended. These include a shallow and deep monitoring borehole northwest of the PCD. These boreholes must target the fault line indicated in this area, which is perceived to be a preferential flow path to groundwater. The third borehole is a shallow borehole on the north-western corner of the TSF located in the delineated plume of the weathered aquifer. No geological structures are thought to be present in this area. Specific monitoring requirements and trigger response criteria were set for the project. These include monitoring of groundwater levels and quality at the Khulu TSF and PCD, the volumes of water pumped to and from the Khulu TSF and PCD and rainfall. A monitoring trigger-response criteria is set for each monitoring parameter, which must be reviewed on an annual basis and updated as necessary based on monitoring results. If significant exceedances are recorded, appropriate and timeous action must be taken to address these and to limit adverse impacts on groundwater. **Specialist Opinion**

<table>
<tr><th>List of studies undertaken</th><th>Recommendations of specialist reports</th></tr>
<tr><td></td><td>Based on the outcome of the assessment, the preferred option in terms of liner design for the Khulu TSF and PCD is Scenario 1. For this scenario, good liner installation will be implemented and the liner will not be exposed to the atmosphere excessively. If this is achieved, the life of the liner is estimated to be 280 years. Simulations indicate that even if the liner fails, long-term impacts on the receiving water bodies are not expected to be significant.</td></tr>
<tr><td>Air Quality</td><td>General Discussion

The main pollutants of concern at the Dwarsrivier Mine is particulate matter and dust fallout. Particulate matter and dust fallout originate from a variety of sources on-site including loading and unloading, crushing, vehicle entrainment on unpaved roads and wind erosion.

Impact Statement

Sensitive receptors are identified as areas that may be impacted negatively due to emissions from the proposed TSF. Four receptors (villages and dwellings) were identified in the area surrounding the proposed project area, within a 10km radius, and were used for this assessment.

Long-term (annual) and short-term (24-hour average) concentrations for the pollutants of concern were compared with the South African National Ambient Air Quality Standards (NAAQS) and dust fallout rates with the National Dust Control Regulations (NDCR) standards.

Sensitive receptors are identified as areas that may be impacted negatively due to emissions from the proposed TSF. Four receptors (villages and dwellings) were identified in the area surrounding the proposed project area, within a 10 km radius, and were used for this assessment.

PM10 Concentrations

- For Scenario 1 (current mining operations) and Scenario 2 (current with proposed TSF) ambient 24-hour (P99) and annual average PM10 concentrations are predicted to be compliant at all sensitive receptors;
- Changes in predicted PM10 concentrations between Scenario 1 and Scenario 2 are substantial, with a 66% average increase in the 24-hour (P99) concentrations and a 69% average increase in annual average concentrations across all sensitive receptors. However, despite the increase, predicted concentrations at all receptors remain well below the standards during Scenario 2;
- Highest predicted 24-hour and annual average off-site concentrations are compliant with the respective standards for Scenario 1. Highest concentrations are predicted on the north-western portion of the mine, predominately around the areas of existing haulage roads;
- Highest predicted 24-hour average off-site concentrations during Scenario 2 are non-compliant with the relevant 24-hour standard, due to the close proximity of the new TSF road to the boundary of the mine. However, highest predicted annual average concentrations remain compliant with the standard; and
- However, despite the non-compliance predicted for the 24-hour PM10 off-site concentrations (Scenario 2), all concentrations predicted at neighbouring sensitive receptors remain complaint with their relevant standard, as noted previously.

PM2.5 Concentrations

- For Scenario 1 (current mining operations) and Scenario 2 (current with proposed TSF), ambient 24-hour (P99) and annual average PM2.5 concentrations are predicted to be compliant at all sensitive receptors;
- Changes in predicted PM2.5 concentrations between Scenario 1 and Scenario 2 are substantial, with a 72% average increase in the 24-hour (P99) concentrations and a 68% average increase in annual average concentrations across all sensitive receptors. However, despite the increase, predicted concentrations at all receptors remain well below the standards during Scenario 2; and
- Highest predicted 24-hour average and annual average off-site concentrations remain compliant with the relevant standards for both scenarios.

Dust Fallout

- For both scenarios, no exceedances of the dust fallout residential standard are predicted at any of the neighbouring sensitive receptors;</td></tr>
</table>

List of studies undertaken	Recommendations of specialist reports
	- Scenario 1 and Scenario 2 highest predicted off-site dust fallout rates remain compliant with the non-residential standard; and - Overall levels of dust fallout anticipated to occur as a result of the proposed TSF are below the respective National Dust Control Regulations. Cumulative Assessment - During both scenarios, the cumulative concentrations are below the respective 24-hour and annual average standard for PM10 and PM2.5; - Changes in predicted PM10 concentrations between Scenario 1 and Scenario 2 are substantial, with a 24-hour average increase of 66% and annual average increase of 69% across all sensitive receptors; and - Changes in predicted PM2.5 concentrations between Scenario 1 and Scenario 2 are substantial, with a 24-hour average increase of 72% and annual average increase of 68% across all sensitive receptors. **Management Measures** Important mitigation measures to be implemented during mining operations are: - All incoming and outgoing truck loads must be covered; - Use of water sprays at crushing and transfer points; - Continuous wetting of the access road during vehicle transport; - Wetting of exposed stockpiles to limit the dispersion of wind-blown dust and particulate emissions; - Avoid dust generating works during the most windy conditions; and - Frequent wetting of the access roads. In addition to the above, the Visual Impact Assessment recommended the planting of trees along the road to mitigate visual intrusion; this could also aid in the mitigation of dust. **Specialist Opinion** The proposed TSF will result in minimal air quality impacts on nearby receptors. Given the low impacts on the receiving environment, based on the findings of this Air Quality Impact Assessment, it is recommended the proposed TSF be authorised.
Heritage and Palaeontology	**General Description** Key findings of the assessment include: - The study area is characterised by extensive mining activities; - The survey recorded two areas with historical/recent residential elements (Feature 4 and 6), the remains of Iron Age sites (Features 2,3, and 5) marked by a scatter of ceramics, and a stone cairn (Feature 1) of unknown purpose that although unlikely could possibly indicate a grave site; and - The study area is of insignificant and low paleontological sensitivity and no further studies are required for this aspect. The potential impact of the project on the recorded heritage resources is high prior to mitigation but can be mitigated to an acceptable level. The project can commence provided that the recommendations in this report are adhered to, based on the South African Heritage Resource Authority's (SAHRA) approval. **Impact Statement** Impacts to heritage resources are permanent and irreversible. Based on the high significance of burial sites (Feature 1) the impact will be high if it is confirmed to be a grave. If the feature is not a grave it is of no heritage significance. Features 4 and 6 (possible labourer dwelling and structural remains) is of low heritage significance (unless proven that there are graves) and the impact will be low, unless the presence of graves is confirmed, if this is the case the graves will be of high social significance.

<table>
<tr><th>List of studies undertaken</th><th>Recommendations of specialist reports</th></tr>
<tr><td></td><td>Features 2, 3 and 5 is of medium significance and with no mitigation measures the impact will be medium to high. With the implementation of the correct mitigation measures at each feature the impact can be mitigated to an acceptable level.

Management Measures

- The stone cairn of unknown purpose at Feature 1 should be avoided with a 30 m buffer. If this is not possible it should be confirmed whether this is a grave through stakeholder consultation/ Ground Penetrating Radar/ Test Excavations and if confirmed to be a grave it should be relocated as per all the relevant legal requirements;
- Features 2,3 and 5 should be shovel pit tested (with the required mitigation measures and permit) to determine the presence of subsurface deposit after which a destruction permit can be applied for;
- The lack of graves at Features 4 and 6 should be confirmed prior to construction by the social team and monitored during construction; and
- A chance find procedure for the project should be developed and implemented.

Specialist Opinion

The overall impact can be mitigated to an acceptable level. Residual impacts can be managed to an acceptable level through implementation of the recommendations made in this report. The socio-economic benefits also outweigh the possible impacts of the development if the correct mitigation measures are implemented for the project.</td></tr>
<tr><td>Visual</td><td>General Description

Due to the limited infrastructure height of the capital projects (establishment of Diesel and Emulsion Batching infrastructure, Main Parking Extension at the mine, Widening of an Access Road and an Access Crossing between the Plant and North Mine), the focus of the Visual Impact Assessment is solely on the proposed TSF.

The following were the main findings of the study:

- The regional topography can be described as undulating with numerous mountain ridges and valleys;
- The study area falls within the Sekhukhune Mountain Bushveld with vegetation characterised as open and closed broad leafed savannah on hills and mountain slopes (Mucina & Rutherford, 2006). According to the 2018 South African National Land Cover map (GeoTerraImage, 2019), the land cover of the study area consists mostly of grassland, forested land, cultivated areas and mining areas;
- The landscape of the study area can be broadly divided into two main categories:
    o Natural areas – consisting of natural bushveld areas; and
    o Mining areas – consisting of mine dumps, bare areas and mine infrastructure.
- The visual receptors identified within the study area include:
    o Houses;
    o Lodges; and
    o Motorists travelling on roads within the study area.
- The natural mountainous bushveld sense of place has largely been converted into a mining landscape by the existing mines in the area;
- The cultural landscape of the region is characterised by a rural area that has extensively been disturbed by mining activities and in the recent past by agricultural activities.

Impact Statement

The following were the main findings of the study:

- Viewshed modelling indicated that the proposed Khulu TSF will affect much of the same area and visual receptors that are already visually disturbed by the existing TSFs in the area;
- The visual quality of the area prior to any mining activities would have been high, with the bushveld and mountainous landscape that would have fully characterised the area. However, much of this has been converted and the dominant land use in the area is now mining. The remaining bushveld and mountainous backdrops still provide scenic views, and for this reason, a medium scenic quality was assigned to the study area.
- In terms of the Visual Absorption Capacity (VAC), the mountainous terrain on either side of the Dwars River conceals views of the Khulu TSF to within the valley. The vegetation immediately surrounding the Khulu TSF site is fairly open, as this area was previously used for agriculture, and therefore, the vegetation will provide very little cover to conceal the proposed TSF. Further away from the TSF,</td></tr>
</table>

List of studies undertaken	Recommendations of specialist reports
	particularly along the rivers, thicker vegetation occurs, which will conceal views of the TSF. Taking into account the general vegetation and topography of the study area, the VAC was determined to be moderate; - Due to a number of existing TSFs in the area, as well as other mine infrastructure, the visual intrusion of the proposed Khulu TSF in the landscape was determined to be low; - The viewer sensitivity of the proposed TSF from farmhouses in the area was determined to have a moderate sensitivity, as the area is already dominated by mining activities. Motorists travelling on the main roads in the area will pass a number of mining activities other than the proposed TSF, and the lodges in the area provide accommodation for people working on the mines and are therefore dependent on the mines. The viewer sensitivity of motorists and the lodges was determined to be low; and - The impact assessment indicated that all impacts would have a medium significance pre-mitigation, with most achieving a low significance post-mitigation. **Management Measures** - Vegetation clearance should be kept to an absolute minimum. - Exposed areas should be vegetated as soon as possible. - Dust suppression measures should be implemented to limit the generation of dust. - Trees should be planted along the main roads to conceal the TSF from motorists. - There are no real mitigation measures as the TSF will increase in height and will be approved for a certain height, however, the TSF should be vegetated as soon as practicably possible and should not exceed the approved height. - In terms of closure, The TSF should be vegetated to blend into the surrounding area. **Specialist Opinion** The natural bushveld landscape of the area has already been altered by mining activities. The proposed mine infrastructure is in line with the current land use and will add to the already altered landscape. It is not foreseen that the current visual quality of the area will be significantly altered by the proposed Khulu TSF. It is therefore the opinion of the specialist that the project can commence, provided that the recommendations and mitigation measures provided are implemented.
Socio Economic	**General Description** The area falls under the jurisdiction of the Sekhukhune District and the Fetakgomo Tubatse Local Municipality. According to the recent official demographic survey results (2016), the Fetakgomo Tubatse Local Municipality has a total population of 490 381 people (Statistics South Africa Community Survey, 2016). There is overwhelming strong statistical evidence that the population is growing at an exponential rate. There are more females 251 923 (51%) than males 238 458 (49%) in the population pyramid. Of the total population within the Fetakgomo Tubatse Local Municipality, 223 214 are young people. The youth thus represent 46% of the total population figure. The Dwarsrivier Mine falls within Ward 27 of the Fetakgomo Tubatse Local Municipality and has a population of 12 527 (Statistics from 2011). Ward 27 has the following villages: Moshate, Tsakane, Kalkfontein, Mabelane, Makakatela, Kutullo A&B, Shushumela & Matepe, Kutullo C&D, Dithamaga and Madibeng. The main economic sectors within Fetakgomo Tubatse Local Municipality include agriculture, mining and quarrying, trade, tourism, manufacturing, general government, community, social and personal services, catering and accommodation. **Impact Statement** During the **construction phase** the following **<u>negative impacts</u>** could occur: - Possible visual impacts on neighbouring landowners/operators; although it is not anticipated that the possible visual impacts would differ significantly from the existing visual impacts created by the mining activities; - Intrusion impacts (although limited) as a result of the increased traffic flows and movement of workers to and from the construction sites; - Increase in nuisance factors (e.g. noise, dust/air pollution) especially with regards to the extension of the main parking area due to the proximity to the office complex, with limited off-site intrusions;

List of studies undertaken	Recommendations of specialist reports
	- Possible impact on existing infrastructure and servitudes; - Possible impact on traffic flow on Sekhukhune Road when the access crossing between the existing Plant and the North Mine will be constructed with subsequent intrusion impacts; and - Safety and security risks due to movement of heavy vehicles and machinery. During the **operational phase** the following negative impacts could occur: - Safety and security risks related to general mining activities and the new TSF; - Nuisance factors (e.g. increase in fallout dust and noise disturbances); - Negative visual impacts with impacts on the sense of place, although the character of the area would not change as mining is already taking place at different sites within the larger study area; - Potential negative impact on surface water pollution and groundwater pollution if leachate and seepage are not effectively contained. This could have negative downstream impacts on communities reliant on water from the river or boreholes; - Health related risks due to possible water pollution, dust pollution, emissions, migrant employees bringing health risks, and nowadays the threat of Covid-19 infection, to mining areas or small towns, as well as the storage of hazardous substances; and - Impact on daily movement patterns at the mine and surrounding area. During the **decommissioning phase** the following negative impacts could occur: - Reduced economic activities within the area with subsequent negative trickle-down economic impacts; - Negative impact on the revenue base of the local municipality; - Loss of jobs and income of households due to closure; and - Reduced or no benefits to the local communities experienced through the Mine's Social and Labour Plan (SLP). The **<u>positive impacts</u>** associated with the proposed project include the continuation of employment during the operational phase and some employment creation as part of the various construction activities. This could also have potential positive impacts on the adjacent local area. Dwarsrivier Mine will further continue with local procurement, capacity building and the overall socio-economic development within the area. Targets for the procurement of capital goods, consumer goods and services should be set and Dwarsrivier Mine can develop an action plan to meet these targets. No negative social impacts that could be classified as fatal have been identified and there are also no impacts of such a high significance that they could prevent the project from continuing. It is thus concluded that the proposed project is acceptable from a social point of view, provided that mitigation measures are implemented. **Management Measures** - Mitigation and enhancement measures proposed should be noted as recommendation measures and should be included as part of the EMPr. - The use of local labour, if any additional labour would be required, should be maximised as it could assist in mitigating various other social impacts, but would also enhance the potential benefits of the proposed project to the local community members. - Local procurement, especially during the operational phase, would have various trickle down positive socio-economic impacts on the beneficiary communities and local businesses. This aspect should thus be pursued as far as possible. - Capacity building and skills training among employees are critical and would be highly beneficial to those involved, especially if they receive portable skills to enable them to also find work elsewhere and in other similar environments. - Local residents, with the focus on the surrounding landowners and communities, should receive accurate information with regards to the project status, timeframes for construction and other relevant information about issues that could influence their daily living and movement patterns. - Socio-economic issues and concerns could arise during the implementation of the project. These should be thoroughly dealt with taking the sensitivities into consideration.

List of studies undertaken	Recommendations of specialist reports
	Specialist Opinion From a social perspective it can be concluded that the socio-economic benefits associated with the project outweigh the negative social impacts. The negative impacts can be successfully mitigated if appropriate and successful environmental management, as well as the strict implementation of pro-active mitigation and management measures are applied. The proposed Dwarsrivier Mine Khulu TSF and Capital Project can thus be supported. It is recommended that the development of these projects be approved by the relevant authorities.

Impact Statement

The key aspects to be managed during the Planning Phase to ensure that the Construction Phase can proceed include:

- Obtain approval from the DWS for all Water Uses triggered by the various projects applied for (Khulu TSF and Capital Projects);
- Pro-active management of groundwater resources, through implementation of groundwater remediation studies as recommended in the Hydrogeological Report (Annexure 11);
- Pro-active management of the ecological character, by conducting site walk overs and applying for the required tree and plant removal permits where required;
- Loss of heritage resources, by npro-actively investigating the specific status of the identified areas of concern as per the Heritage Impact Assessment (Annexure 12);
- Considering the above point, it is important to consult with the owners of the graves prior to any decision made in terms of protection and/or excavation;
- Risk with the placement of the PCD in an area previously undermined by a neighbouring mine;
- Risk to the existing TRP pipeline route, without proper planning of the construction activities associated with the Diesel and Emulsion Batching Areas.

<u>Direct Impacts during the Construction Phase</u>

The main impacts during the construction phase includes:

Topography:

- Changes to the topography could lead to unstable land, resulting in increased erosion.

Soils (no fatal flaw or activity which cannot be managed to reduce or avoid impacts has been identified):

- Loss of soil and future land capability should topsoil stripping not be optimised;
- Loss of soil due to erosion taking place should the necessary stabilising and water management structures not be included into designs;
- Soil compaction and loss of land capability, should activities not be strictly demarcated;
- Soil contamination due to poor management of hydrocarbons, construction phase and other dangerous goods.

Ecology (no fatal flaw or activity which cannot be managed to reduce or avoid impacts has been identified). Direct impacts on floral habitat and species diversity will be greatest during the construction phase, with secondary impacts from poorly managed edge effects (e.g., AIP proliferation, disturbed areas left unrehabilitated and erosion) to be most significant during the operational and maintenance phases:

- Clearance of floral species within the proposed footprint areas as well as nationally and provincially protected floral species;
- Habitat fragmented and reduced dispersal opportunities for plant species as the disturbed / impacted areas will be less attractive to faunal species who are important mechanisms for seed dispersal;
- Increased risk of erosion and poor stormwater management resulting in loss of soils, the down-slope sedimentation of habitat and the consequent loss of habitat beyond the planned footprint;
- AIP proliferation and woody encroachment into natural vegetation, displacing indigenous flora and altering favourable habitat conditions for the establishment of indigenous species.
- Species of conservation importance recorded on site (*Sclerocarya birrea subsp. caffra*) (Marula Tree) is protected under the NFA. Additionally, there is an increased chance that several other NFA and Limpopo Environmental Management Act (Act 7 of 2003) (LEMA) listed floral species may occur within the footprint area:
  - *Boscia foetida* (Shepherds Tree) (NFA, LEMA);
  - *Lydenburgia cassinoides* (Sekhukhune Bushman' Tea Tree) (NFA);
  - *Aloe castanea* (LEMA) (Cat's Tail Aloe);
  - *Chlorophytum cf. cyperaceum* (*Anthericum cyperaceum*) (LEMA); and
  - *Euphorbia* spp. (LEMA).
    - Without mitigation implemented, the anticipated impact significance on floral species of conservation importance (nationally and provincially protected species) varies between Medium Low and Very Low. The impacts on such species are deemed to be mitigatable and thus with mitigation measures implemented, the impact significance can be reduced

to Low and Very Low significance levels. The proposed five (5) projects are not anticipated to have a high impact on floral species of conservation importance and with mitigation measures implemented the impacts can remain localised in extent. Succulents and geophytes are good candidates for rescue and relocation to suitable sites outside of the proposed footprints, either to surrounding natural habitat or to the Dwarsrivier Mine nursery. Woody species, , especially larger individuals, are less likely to be successfully relocated. Where protected trees are to be cleared and not relocated, it must be ensured that the same species are currently being propagated in the nursery. If this is not the case, seeds can be harvested from the surrounding areas and/or from the individuals that will be cleared as part of vegetation clearing activities to be propagated off-site and reinstated as part of rehabilitation activities:
    - Disturbance, fragmentation and alteration of floral species of conservation importance habitat;
    - Destruction, removal or harvesting of floral species of conservation importance and medicinal species during construction and operational activities; and
    - Potentially poorly implemented and monitored rescue and relocation of protected species or not ensuring that the same species are being propagated in the Dwarsrivier Mine nursery.
- The proposed five (5) projects will impact on a Critical Biodiversity Area (CBA 1) and the Sekhukhune Mountainlands threatened ecosystem, however, following the site assessment, this is more accurately only applicable to the PCD associated Project 1 and the footprint areas of Project 2. The remaining areas associated with the TSF (Project 1) and Projects 3-5 have all been impacted on and are associated with the active mining footprint. According to the desktop database, a small portion of Project 4 will impact on an Ecological Support Area (ESA) however, this section of the ESA has been degraded in terms of habitat integrity and is located within the active mining area.

Faunal Impacts (no fatal flaw or activity which cannot be managed to reduce or avoid impacts has been identified). Direct impacts on faunal habitat and species diversity will be greatest during the construction phase with secondary impacts stemming from poorly managed edge effects and potential hunting/snaring of species during this phase:

- Clearance of habitat leading to the displacement of faunal species;
- Habitat fragmention resulting in reduced movement of species and potentially reduced dispersal opportunities;
- Increased risk of trapping/ snaring and the potential collection for the pet/ traditional medicine trade;
- Edge effects such as habitat fragmentation, AIP proliferation and bush encroachment limiting faunal species habitat utilisation;
- AIP proliferation and woody encroachment into natural vegetation, displacing indigenous vegetation and altering favourable habitat conditions for faunal species;
- Potential loss of SCC/ protected faunal species and suitable habitat for such species. One SCC was recorded on site, namely *Pycna sylvia* (Cicada) whilst *Python natalensis* (African Python, Vulnerable (VU)) has also been recorded in the adjacent areas. *Panthera pardus* (Leopard, VU, a listed Threatened or Protected Species (TOPS) in terms of the National Environmental Management: Biodiversity Act (Act No. 10 of 2004) (NEMBA)), *Parahyaena brunnea* (Brown hyaena, NT, TOPS Listed), *Sagittarius serpentarius* (Secretary bird, VU), *Polemaetus bellicosus* (Martial Eagle, VU) and *Neotis denhami* (Denham's Bustard, Near Threatened (NT)) are also considered to have a medium probability of occurring, however such occurrences are likely to be transitionary and not permanent, as the footprint areas are not sufficient in extent to permanently host these species nor are there sufficient food resources within the five proposed project footprint areas alone to support these species; and
- It is unlikely that disturbed areas will be rehabilitated to an ecologically functioning state resulting in significant loss of habitat and species diversity, with reinstatement to pre-mining levels being unlikely.

Freshwater and Hydrological Impacts (no fatal flaw or activity which cannot be managed to reduce or avoid impacts has been identified):

- No activities are planned in the 1:100 year floodline, however the subway crossing, main parking extension and access road between main offices and the plant is located within the 100m watercourse buffer;
- Loss of Habitat;
- Impact on Catchment Yield:
    - Due to the small size of the TSF and Capital Projects, the loss of contributing area will be negligible (less than 0.5 %) in comparison to the runoff area of quaternary catchment B41G.
    - According to the 1:50 000 topographical map 2430CC Kennedy's Vale, a non-perennial drainage line runs along the north-eastern boundary of the Khulu TSF site. This area was assessed during

the site visit and it was noted that the area was highly disturbed by what appeared to be old stockpiles and borrow pits, most likely from previous road construction in the area. Water is likely to pond in this area as a result of the disturbance, and therefore it is highly unlikely that this area functions as a drainage line.

- Changes to the Sociocultural and Service Provision:
  - Altered vegetation community structure and diversity due to moisture stress and changes to goods and service provision;
  - Decreased ecoservice provision and biodiversity maintenance capacity; and
  - Reduction in volume of water entering the watercourse, leading to loss of recharge of the watercourse.
- Impacts on hydrology and sediment balance:
  - Exposure of soil, leading to increased runoff, erosion and stream incision, and thus potentially increased sedimentation of the Dwars River;
  - Potential of backfill material to enter the down-gradient watercourse, increasing the sediment load of the watercourse; and
  - Increased flood peaks into the watercourse as a result of formalisation and concentration of surface runoff.
- Impacts on Water Quality:
  - Increased sedimentation of the watercourse may lead to smothering of flora and benthic biota and potentially further alter surface water quality;
  - Potential impacts on the water quality of runoff which may potentially enter the downgradient watercourse and contamination of soils; and
  - Potential impacts on water quality due to leaks and spills from construction machinery and increased sediment availability.

Hydrogeology:

- No specific impacts associated with the Construction Phase.

Air Quality:

- No significant impacts associated with the Construction Phase.

Visual:

- No significant impacts associated with the Construction Phase.

Heritage and Palaeontology (no fatal flaw or activity which cannot be managed to reduce or avoid impacts has been identified):

- Impacts to heritage resources are permanent and irreversible;
- Based on the high significance of burial sites (Feature 1) (Khulu TSF PCD) the impact will be high if it is confirmed to be a grave. If the feature is not a grave it is of no heritage significance;
- Feature 4 (Diesel and Emulsion Batching Area) and 6 (Khulu TSF) (possible labourer dwelling and structural remains) is of low heritage significance (unless proven that there are graves) and the impact will be low, unless the presence of graves is confirmed, if this is the case the graves will be of high social significance;
- Feature 2 (Diesel and Emulsion Batching Area), Feature 3 (Diesel and Emulsion Batching Area) and Feature 5 (Khulu TSF) are of medium significance and with no mitigation measures the impact will be medium to high. With the implementation of the correct mitigation measures at each feature the impact can be mitigated to an acceptable level;
- It is assumed that the pre-construction phase involves the removal of topsoil and vegetation as well as the establishment of infrastructure. These activities can have a negative and irreversible impact on heritage features if any occur. Impacts include destruction or partial destruction of non-renewable heritage resources; and
- During this phase, the impacts and effects are similar in nature but more extensive than the pre-construction phase. Potential impacts include destruction or partial destruction of non-renewable heritage resources.

Noise

- No impact is foreseen as part of the operational phase.

Socio-Economic Impacts (no fatal flaw or activity which cannot be managed to reduce or avoid impacts has been identified):

- Positive employment and income opportunities during construction phase:
    - For the construction of the Khulu TSF, a total of 64 construction workers would be employed for the whole duration. Forty (40) of these would be contractors. From the total employees required, twelve (12) would be medium skilled (workers with technical qualifications up to Grade 12) and sixteen (16) would be low skilled (Grade 10 and lower);
    - Furthermore, some outside contractors will be involved with specific projects such as the construction of the Diesel and Emulsion Batching Areas (five (5) individuals on a part-time basis); main parking extension (five (5) individuals on a part-time basis), widening of the existing access road (ten (10) full time contractors) and new access crossing (sixteen (16) full time contractors);
    - A section of the workforce would consist of low skilled workers (e.g. general construction laborer's), as well as medium skilled site operators and skilled supervisors;
    - As existing mining is taking place at Dwarsrivier Mine, some of the above employment opportunities will be filled by existing employees. It is anticipated that a total of 36 new employment positions will be created which will result in positive economic impacts. Dwarsrivier Mine is further committed to source all the individuals falling within the medium and lower skilled categories from the local labour pool, and as many as possible falling within the high skilled category. To enhance the benefit to the local communities, it is recommended that local labour (from within the local municipal area) be procured as far as possible for all levels of skills.

<u>Direct Impacts during the Operational Phase</u>

Topography (no fatal flaw or activity which cannot be managed to reduce or avoid impacts has been identified):

- Ongoing development of the TSF will lead to an ongoing change in the topography and potential impact on land stability (i.e. increased erosion) if not managed.

Soils, Land Use and Land Capability (no fatal flaw or activity which cannot be managed to reduce or avoid impacts has been identified):

- Loss of soil due to erosion taking place should the necessary stabilising and water management structures not be included into designs;
- Soil compaction and loss of land capability, should activities not be strictly demarcated; and
- Soil contamination due to poor management of hydrocarbons, construction phase and other dangerous goods.

Ecology (no fatal flaw or activity which cannot be managed to reduce or avoid impacts has been identified:)

- The establishment of AIPs;
- Unmanaged fires could lead to loss of faunal and floral species;
- Poaching of animals;
- Harvesting of medicinal plants; and
- Accidental death of animals on the existing roads.

Hydrology (no fatal flaw or activity which cannot be managed to reduce or avoid impacts has been identified):

- Contamination of surface water resources. Although there are no surface water resources in the area where the infrastructure is proposed, the natural runoff, which must be managed internally on site could become impacted.

Geohydrology (no fatal flaw or activity which cannot be managed to reduce or avoid impacts has been identified)

- Three (3) scenarios have been assessed in the Numerical Model (Annexure 11).:
    - Scenario 1: Good liner installation for the Khulu TSF and PCD. Exposure to the atmosphere is managed and limited to a minimum, resulting in a life of liner of 280 years. During this time, it is assumed that seepage will be collected above and below the TSF and PCD liner and that this water will be transferred to the PCD. No seepage is therefore expected to infiltrate to the underlying aquifers. This is considered the best-case scenario.
    - Scenario 2: Good liner installation for the Khulu TSF and PCD. Exposure to the atmosphere cannot be managed, resulting in a life of liner of 69 years. After 69 years, the liner starts seeping into the aquifers according to the rates presented in Table 56.
    - Scenario 3: Poor liner installation for the Khulu TSF and PCD. Exposure to the atmosphere cannot be managed, resulting in a life of liner of 69 years. After 69 years, the liner starts seeping into the aquifers at the maximum rate. This is considered the worst-case scenario.

- Based on the outcomes of the study, the only option going forward would be the option of Scenario 1.
  - Seepage through liner:
    - Based on a good liner installation, the estimated seepage through the liner to be installed underneath the Khulu TSF is 2.4E-2m^3/d per ha (0.024m^3/ha). If proper quality control is not implemented and the liner system is constructed poorly, this seepage rate may increase to 2.7m^3/d per ha. The Khulu TSF design includes a below liner drainage system designed to collect seepage through the liner and the relieve possible pressure build up under the liner. The below liner drainage system is designed to remove the seepage volumes calculated.
    - Similar calculations were made for the Khulu TSF PCD. The results indicate that the seepage rate through the PCD liner is around 4.7E-1m^3/d per ha (0.47m^3/ha). The below liner drainage system is however designed to remove 23 times more seepage than the estimated volume. With good installation, no seepage should escape the liner system and therefore no seepage is expected to reach the underlying aquifers.
  - Preferential Flow:
    - Preferential flow along the alluvial aquifer, due slightly elevated permeability. This aquifer is associated with the floodplains of the rivers and streams. The Khulu TSF and PCD footprint areas are located on the alluvium. It is however noted that the designs for the facilities take the interception of seepage above and below the liners into consideration.
    - Vertical flow through the soil horizon from surface sources of contamination to the underlying aquifers. The rate at which the vertical flow can take place is governed by the vertical permeability of the soils and the weathered aquifer, which was assumed to be 1/10th of the horizontal permeabilities.
    - Lateral flow through the weathered and alluvial aquifers to the receiving water bodies, which are the rivers and streams down gradient of the mining area. At the Khulu TSF and PCD, the receiving water body is the Groot Dwars River.
    - Vertical flow from the weathered and alluvial aquifers to the underlying fractured rock aquifer. There is no geological evidence that these two aquifers are separated by an impermeable layer. For this reason, it is assumed that the two aquifers are interconnected (however, not a strong interconnection according to the fieldwork).
    - Once the possible contamination reaches the fractured rock aquifer, the preferential flow paths include the N-S and SW-NE striking faults and the contact zone with the N-S striking dyke. The locations of dykes and faults were inferred from Gap Geophysics (2018) and are discussed above. Aquifer testing data from monitoring boreholes that intersect these structures confirm enhanced aquifer conditions.
    - Groundwater will also flow through the rock matrix, but at much lower rates compared to the preferential pathways listed above. Flow in the rock matrix is considered insignificant in the context of this study.
  - Receptors
    - Watercourses associated with the rivers and streams, including the Groot and Klein Dwars Rivers.
    - The Farm House borehole identified during the hydrocensus is located up-gradient of the Khulu TSF and as such will not be affected by any impacts from the operation and management of tailings deposition in this area. No other private boreholes are located between the Khulu TSF and the Groot Dwars River.
  - Anticipated Impacts:

- During the operational phase, it is assumed that the liner at the TSF and the PCD will remain intact and that seepage from the tailings material will be collected above and below the drains to installed. As such, no significant seepage from the Khulu TSF to the underlying aquifers is expected.
- Impacts associated with other sources of contamination to groundwater, including the plant, the historical TSF (before it is reworked), the dirty water dams, pit backfill areas and the underground workings are assumed to continue to impact over the life of the operations. It is noted that Dwarsrivier Mine is in the process of developing a groundwater remediation strategy to reduce nitrate concentrations in groundwater in the plant area. This project will be evaluated in a separate study.
- No impact on groundwater quality is expected in the vicinity of the Klein Dwars River west and northwest of the Khulu TSF and PCD at the end of the operational phase.
- Based on the conceptualisation of preferential groundwater flow in the fractured rock aquifer, the nitrate plume is expected to migrate in a northerly direction along the N-S striking fault. This contamination originates from the plant, historical TSF, dirty water dams, open cast and underground mining areas and not from the Khulu TSF and PCD.

Air Quality (no fatal flaw or activity which cannot be managed to reduce or avoid impacts has been identified)

- Increase in PM10, and PM2.5, as well as dust fallout from the proposed operations, especially from the TSF associated activities:
  - Ambient 24-hour (P99) and annual average PM10 concentrations are predicted to be compliant at all sensitive receptors. No exceedances were predicted at sensitive receptors with predicted concentrations well below the standard.
    - Maximum predicted 24-hour off-site concentrations are non-compliant with the relevant standard due to the close proximity of the new TSF road to the boundary of the mine. Maximum predicted annual average off-site concentrations remain compliant with the annual standard.
    - However, despite the non-compliance predicted for the 24-hour off-site concentrations, all concentrations predicted at neighbouring sensitive receptors remain complaint with their relevant standard.
  - Ambient 24-hour (P99) and annual average PM2.5 concentrations are predicted to be compliant at all sensitive receptors with the proposed TSF activities. No exceedances were predicted at sensitive receptors, with concentrations remaining below the respective standards.
  - Highest predicted 24-hour and annual average off-site concentrations are compliant with the 24-hour and annual average standard respectively.
  - Highest concentrations are predicted on the north-western portion of the mine, predominately around the areas of the new TSF and TSF road.
  - Maximum daily dust deposition rates as a result of mining and TSF activities were well within the NDCR residential and non-residential standards at all sensitive receptors.
  - Highest predicted daily average off-site dust fallout rates remain compliant with the non-residential standard.
  - Highest predicted dust fallout rates are along the new TSF road close to the boundary of the mine.

Visual (no fatal flaw or activity which cannot be managed to reduce or avoid impacts has been identified)

- The visual quality of the area prior to any mining activities would have been high, with the bushveld and mountainous landscape that would have fully characterised the area. However, much of this has been converted and the dominant land use in the area is now mining. The remaining bushveld and mountainous backdrops still provide scenic views, and for this reason, a medium scenic quality has been assigned to the study area;
- Taking into account the general vegetation and topography of the study area, the VAC was determined to be moderate;
- Due to a number of existing TSFs in the area, as well as other mine infrastructure, the proposed project is in line with the current land use of the area, and will have a low visual intrusion; and

- The proposed project will cumulatively add to the historical and active mining in the area. Since the landscape has already been transformed by mining activities, it is not foreseen that the visual quality of the area would be further significantly reduced. The visual quality, will however, be improved once rehabilitation has been successfully implemented.

Noise (no fatal flaw or activity which cannot be managed to reduce or avoid impacts has been identified)

- No further impact is foreseen as part of the operational phase.

Heritage (no fatal flaw or activity which cannot be managed to reduce or avoid impacts has been identified)

- No impact on heritage resources is foreseen. However, change findings must be managed.

Socio-Economic (no fatal flaw or activity which cannot be managed to reduce or avoid impacts has been identified)

- The proposed Khulu TSF and capital projects form part of the Dwarsrivier Mine's overall objective to ensure continued mining and sufficient supply of their product to chrome markets. The proposed projects will thus assist in achieving this objective as it will improve logistics on site and ensure a proper disposal system for the production requirements;
- Existing employees would continue to be responsible for the overall mining activities. Limited additional temporary workers could over time be required for specific tasks associated with the proposed Khulu TSF and capital projects. When that occurs, new mining activities can then be allocated to appointed specialist contractors;
- The socio-economic impact of the proposed projects would be based on the mine's continued contribution to the Gross Geographical Product (GGP) and the number of direct (continued employment at the mine) and indirect jobs that would be created. Therefore, except for ongoing direct employment, that would generate income and increase local spending, people living in the vicinity of the study area is also expected to benefit by the earnings of those employed by the mine and the local buying power in the area; and
- Through employment and income generation during the mining processes, some economic benefits to the region and local communities therefore accrue. The mine would continue to contribute to the local economy through its employee wages, procurement of local contractors and services, purchasing of water and electricity and through payment of taxes to the Fetakgomo Tubatse Local Municipality.

<u>Direct Impacts during Decommissioning and Closure</u>

Generally similar impacts than that of the construction phase will be relevant during the decommissioning and closure phase, with increase potential for encroachment beyond footprint boundaries, which could result in vegetation loss, disturbances to ecosystems and habitat and soil compaction.

The above could result in increased erosion and the associated siltation of watercourses if not managed.

Increase in the number of contractors and personnel on site may also give rise to increase in the potential for poaching and harvesting of medicinal plants.

The main impact however to take note of is the long-term impact associated with groundwater (Annexure 11). A modelling scenario was run to estimate the long-term impact (300 years after mine closure) on groundwater quality if the Khulu TSF project does not go ahead. The following is concluded from the simulations presented:

- The simulations indicate that the nitrate plume will recede in the long-term in the weathered aquifer. Nitrate concentrations are expected to reduce to below 60mg/l in the plant area if all sources of contamination are removed at mine closure as part of the rehabilitation programme.
- At the Khulu TSF, nitrate concentrations are not expected to significantly exceed 11mg/l in the long-term for this scenario.
- The impact on the Groot and Klein Dwars Rivers is expected to reduce significantly in the long-term for this scenario. Nitrate concentrations in groundwater reaching these rivers in the weathered and alluvial aquifers are not expected to exceed 11 mg/l.
- Long-term impacts associated with leakage through the North TSF and the associated dirty water dam liners are however expected to impact on groundwater quality in the long-term. A detailed discussion of this impact falls outside the scope of this report.
- The plume in the fractured aquifer is expected to continue to migrate along the preferential flow paths and to a lesser extent in unfractured rock matrix in the long-term. Nitrate concentrations are however expected to reduce inside the affected area as a result of plume dilution from recharge of fresh rainwater and

groundwater throughflow. Over the footprint area of the Khulu TSF, nitrate concentrations are expected to reduce to below 160mg/l on average.

Scenario 1 (recommended for this project) assumes that the TSF and PCD liners will fail after 280 years. In this event, seepage from the TSF and PCD may reach the underlying aquifers at a rate of 0.024m^3/d per ha.

The following is concluded from the results of the simulations:

- Seepage through the TSF and PCD liners are expected to increase nitrate concentrations in the weathered aquifer underneath the footprint areas. Nitrate concentrations may increase to above 600 mg/l over the footprint areas in the weathered and alluvial aquifers in the long-term.
- The nitrate plume is expected to migrate in a north-westerly direction towards the Klein Dwars River in the weathered and alluvial aquifers. At 300 years after mine closure, simulations suggest that it is unlikely that groundwater with nitrate concentrations exceeding 11mg/l would reach the Klein Dwars River from the Khulu TSF and PCD to any significant extent.
- The effect of liner failure at the Khulu TSF and PCD on the fractured rock aquifer is not expected to add significantly to the pollution load associated with other Dwarsrivier Mine mining and mineral processing activities.
- Nitrate concentrations may increase to above 180 mg/l in the fractured rock aquifer as a result of infiltration over the Khulu TSF and PCD footprint areas. This is an estimated 20 mg/l increase in concentration compared to the no project option discussed above.
- The nitrate plumes originating from the Khulu TSF and PCD are expected to migrate in a northerly direction along the preferential flow paths identified. Contamination along these geological structures are however expected to be dominated by Dwarsrivier Mine mining and mineral processing activities and not significantly as a result of seepage from the Khulu TSF and PCD.
- In the long-term, nitrate concentrations in the Farm House borehole could reduce to below 100 mg/l from the anticipated 200 mg/l at the end of the operational phase. This borehole is located along a preferential groundwater flow path, which means that long-term plume migration will result in elevated nitrate in this borehole under the rehabilitation measures implemented.
- The nitrate plume is expected to migrate more than 900m north outside the Dwarsrivier Mine MRA boundary along the N-S striking in the long-term for this scenario.
- Additional measures to reduce nitrate concentrations associated with the plant and historical TSF areas will be investigated and developed as part of the Dwarsrivier Mine Groundwater Remediation Strategy, which will be undertaken in a separate study. These measures will be focussed on the preferential flow paths identified and will be geared at reducing long-term contamination.

However, should good liner installation be undertaken, but be exposed to atmosphere (reduced liner life of 69 years) the following is expected:

- The extent of the impact on groundwater quality for this scenario is similar to that reported for Scenario 1. The extent of the plume is driven by aquifer parameters like permeability and porosity and to a lesser extent by the concentration gradient for Scenarios 1 and 2. This is due to the fact that the rate of seepage from the Khulu TSF liner for good installation is reported to be comparatively low, which means the concentration gradient from the source to the aquifer is low.
- Nitrate concentrations inside the delineated plumes are however expected to increase for this scenario compared to Scenario 1, as the seepage will take place for a longer period of time. The liner failure occurs after 69 years for this scenario, compared to after 280 years for Scenario 1.
- In the weathered and alluvial aquifers, nitrate concentrations may increase to above 800 mg/l in the long-term for this scenario. This is an increase of 200 mg/l compared to Scenario 1.
- The contamination is expected to migrate in a north-westerly direction towards the Klein Dwars River in the long-term. Nitrate concentrations are however not expected to significantly exceed 11 mg/l in groundwater reaching the Klein Dwars River in this time.
- The nitrate plume in the fractured rock aquifer will migrate preferentially along the N-S striking fault and the other preferential flow paths identified. As reported for Scenario 1, the nitrate plume may migrate more than 900m north along the N-S striking fault outside the Dwarsrivier Mine MRA in the long-term.
- Nitrate concentrations in the fractured rock aquifer immediately underneath the Khulu TSF and PCD may increase to above 240mg/l for this scenario. This is an increase of 60mg/l in nitrate concentration compared to Scenario 1.

- Nitrate concentrations in at the Farm House borehole may decrease to around 170mg/l in the long-term compared to the 200mg/l expected at the end of the operational phase. This is however an increase of around 70mg/l compared to the results of Scenario 1.
- Plume movement in unfractured rock matrix is expected to be low. Nitrate concentrations in the fractured rock aquifer immediately down-gradient of the Khulu TSF and PCD are not likely to exceed 11mg/l near the Klein Dwars River in the long-term.

If the Khulu TSF and PCD liners are poorly installed and exposed to the atmosphere, the life of the liner is 69 years.

The following is concluded from the simulation results:

- Liner failure and maximum seepage rates to the underlying aquifers for this scenario is expected to result in a significant negative impact on groundwater quality. With the increased seepage rate, the concentration gradient at the Khulu TSF and PCD footprint will increase significantly, resulting in an accelerated spread of contamination in the long-term. The plume is also expected to migrate radially away from the Khulu TSF footprint area due to the high infiltration rates. A mound in groundwater levels is expected around the footprint in this case. It is noted that the rate of infiltration is significantly high and is most probably not a reality.
- The extent of the impact on the weathered and alluvial aquifers is expected to significantly increase for this scenario. Over the footprint area, nitrate concentrations may increase to 1500 mg/l in the long-term.
- The plume is expected to migrate in a north-westerly and westerly direction towards the Klein Dwars River. Nitrate concentrations in groundwater reaching the Klein Dwars River are expected to increase to above 30mg/l over a length of 250m along the river. In places, nitrate concentrations in groundwater reaching the Klein Dwars River in the weathered and alluvial aquifers could exceed 200mg/l for this scenario. This is expected to result in a noticeable impact on surface quality in the long-term.
- The plume is also likely to reach the Groot Dwars River southwest of the Khulu TSF due to the anticipated radial flow from the footprint area. Groundwater reaching the Groot Dwars River may have nitrate concentrations exceeding 30mg/l over a stretch of around 200m along the river. In places, nitrate concentrations in groundwater may increase to above 150mg/l at the river. This is also expected to result in a noticeable impact on surface water quality in the long-term.
- The high seepage rates from the Khulu TSF and PCD are also expected to result in significant vertical flow to the underlying fractured rock aquifer. This is different to the outcome of Scenarios 1 and 2, where the concentration gradient under lower seepage rates did not result in significant impacts on the fractured rock aquifer.
- Once the nitrate concentrations reach the fractured rock aquifer, preferential flow is expected along the N-S and the SW-NE striking fault lines.
- Over the Khulu TSF and PCD footprint areas, nitrate concentrations may increase to above 1200 mg/l in the fractured rock aquifer for this scenario, which is a significant increase from the impacts associated with Scenarios 1 and 2.
- Along the N-S striking fault, nitrate concentrations may exceed 700mg/l in the long-term. This plume is also expected to migrate more than 1,300m north and outside the Dwarsrivier Mine MRA,.
- Nitrate concentrations in the SW-NE striking fault may increase to above 1,000mg/l in the long-term. In addition, a nitrate plume is expected to migrate along this structure in a south westerly direction towards the Groot Dwars River. In the long-term, nitrate concentrations may increase to around 450mg/l in the fault line at the intersection with the Groot Dwars River.
- The groundwater mound that will develop underneath the Khulu TSF and PCD footprint areas is also expected to drive migration of the nitrate plume in the unfractured rock matrix towards the Klein Dwars River west of the site. On the long-term, this could result in an increase in nitrate concentrations in the fractured rock aquifer at the river of more than 30mg/l, possibly as high as 50mg/l.

Please refer to Table 59 which presents a summary of the groundwater impact prediction simulations.

<u>Direct Cumulative Impacts</u>

The cumulative impacts are associated with:

- The proliferation of AIP species;
- The Dwars River Valley and notably the Sekhukhune Mountain Bushveld vegetation type, which have over the years been exposed to significant impacts in terms of vegetation clearance for mining development. This has led to a notable decrease in species diversity and abundance levels in the region. The remaining intact areas are as such becoming of increased importance for the remaining species. The five proposed

projects will result in the loss of habitat, pushing faunal species within those areas into the adjacent remaining habitats. This may result in increased competition for space and food resources, potentially leading to further loss of species. It is important to note that the TRP mine has recently constructed a new TSF pipeline between the two proposed footprints of Project 2, further adding to the cumulative loss of habitat and species displacement in that area. Projects 1 and 3 - 5 are all located adjacent to the current active Dwarsrivier Mine mining footprint and as such, these projects will further add to the cumulative loss of habitat in this area, although much of this habitat has already been somewhat disturbed. Such additional impacts will, however add to potential long term impacts and impact on rehabilitation efforts during mine closure.
- Groundwater impacts, in the event that Scenario 1 is not achieved – i.e. good installation of liner with no atmospheric contact.

Assumptions and Gaps

The following assumptions, uncertainties and gaps are applicable to this project:

- Specific assumptions are included in each of the specialist reports provided.
- This EIA and EMPr Report is based on existing available environmental information and those presented by the specialists and is considered as true and correct;
- Specific to the groundwater study, the potential liner seepage rates for the Khulu TSF and PCD were calculated by JAW (2021) and are considered true and correct. The designs of the facilities include above and below liner drains, which means that all seepage should be captured and removed before it can impact on aquifers. Scenario modelling will be undertaken as part of this study to estimate the impact of tailings seepage on aquifers should the design measures fail.
- In terms of the Heritage Impact Assessment (HIA), it should be noted that due to the nature of heritage resources and pedestrian surveys, the possibility exists that some features or artefacts may not have been discovered/recorded and the possible occurrence of unrecorded graves and other cultural material cannot be excluded. Similarly, the depth of cultural deposits and the extent of heritage sites cannot be accurately determined due its subsurface nature. This study only dealt with the footprint areas of the proposed development and consisted of non-intrusive surface surveys. This study did not assess the impact on medicinal plants and intangible heritage as it is assumed that these components would have been highlighted through the public consultation process if relevant. It is possible that new information could come to light in future, which might change the results of the HIA.
- The project description is based on the information presented by the applicant and is considered as true and correct.

Aspects for Inclusion into Environmental Authorisation

It is recommended that, due to the importance of the following conditions on the required management measures to address potential impacts, these should be included in the Environmental Authorisations in addition to the general conditions recommended by the Competent Authority:

- Finalise the implementation plan for the Groundwater Remediation Strategy for the operations, based on the outcome of fieldwork completed during 2021. The most effective groundwater management strategies must be developed and implemented as part of a Hydrogeological Study to be completed during 2022. Due to the fact that groundwater quality at the Khulu TSF is affected by preferential flow along regional faults and dykes, it is accepted that the Groundwater Remediation Strategy will also improve groundwater quality at the TSF and PCD in the long-term. This strategy will be developed as part of a separate study, but the strategy to be implemented must be finalised within six (6) months of the issuance of the Environmental Authorisation, with the implementation of the studies within 12 months from the issuance of the Environmental Authorisation.
- The outcome of the groundwater impact assessment presented in this report indicates that the Scenario 1 liner design, as recommended in the TSF Design Report must be implemented ensure that long-term impacts on groundwater quality are limited.
- Additional monitoring boreholes, as recommended in the Hydrogeological Report, 2022, must be drilled prior to the commencement of construction of the Khulu TSF and PCD to ensure that a baseline can be generated.
- The stone cairn of unknown purpose at Feature 1 (as stipulated in the Heritage Assessment Report, 2021) should be avoided with a 30m buffer. If this is not possible it should be confirmed whether this is a grave through

stakeholder consultation/ Ground Penetrating Radar/ Test Excavations and if confirmed to be a grave it should be relocated as per all the relevant legal requirements;

- Features 2,3 and 5 (as stipulated in the HIA, 2021) should be shovel pit tested (with the required mitigation permit) to determine the presence of subsurface deposit after which a destruction permit can be applied for.
- The lack of graves at Features 4 and 6 (as stipulated in the Heritage Assessment Report, 2021) should be confirmed prior to construction by the social team and monitored during construction.

Concluding Statement

The projects in question are recommended to ensure an ongoing life of mine in excess of 27 years for Dwarsrivier Mine. Tailings disposal is an integral part of the beneficiation process utilised by the mine. The applicant has initiated studies to determine the best disposal technology and has committed to the disposal of a dried material, achieved through filter press technology. The Capital Projects are recommended to further improve logistical considerations on the mine surface layout, as well as to support mining operations.

In addition to this, the applicant is investigating the option of reprocessing or selling tailings dependent on whether the mine will obtain approval to exclude tailings from the definition of a waste in terms of GNR 715 of the National Environmental Management: Waste Act (Act No. 59 of 2008) (NEMWA) (18 July 2018). This is in an attempt to further improve economic benefits from the facility, but also to reduce the volumes of waste to be disposed to give effect to the National Waste Management Hierarchy.

Based on the outcomes of the specialist studies, no fatal flaws have been identified by the specialists or the EAP. Impacts identified as part of this project, have been proven based on the findings of the various specialist studies to be avoidable, reversible or mitigated by the implementation of the management measures provided in the EMPr.

Financial provision will be made available in the form of a bank guarantee to ensure that the recommended rehabilitation activities be undertaken.

It is the opinion of the EAP that this EIA and EMPr provides the necessary and relevant information required in order to implement the principles of Integrated Environmental Management so as to ensure that the best long-term use of the natural resources in the project footprint areas will be made in support of the principle of sustainable development.

Recommendations of the EAP and specialists have been considered favourably by the applicant and the final project plan has incorporated these recommendations. If the proposed management and mitigation measures are not properly applied or if the applicant intentionally disregards any of these measures, it will negatively affect the environment and have potential consequences, and for this reason it is important that the recommendations for conditions for inclusion as presented in Section 1.p.ii.1 be included should the Environmental Authorisation be considered favourably by the Competent Authority.

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

Contents Page

List of Figures

List of Tables

List of Graphs

List of Annexures

mineral resources
Department:
Mineral Resources
REPUBLIC OF SOUTH AFRICA

PART A

ENVIRONMENTAL IMPACT ASSESSMENT REPORT

And

ENVIRONMENTAL MANAGEMENT PROGRAMME REPORT

DMR REFERENCE NUMBER MP: LP 30/5/1/3/2/1(179) EM

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

NAME OF APPLICANT:	**Dwarsrivier Chrome Mine (Pty) Ltd**
TEL NO:	**+27 (0) 13 230 5300**
FAX NO:	**+27 (0) 13) 230 5318**
POSTAL ADDRESS:	**PO Box 567, Lydenburg, 1120**
PHYSICAL ADDRESS:	**Dwarsrivier Farm 372KT, Sekhukhune Road, Steelpoort Area, 1133**
FILE REFERENCE NUMBER SAMRAD:	**Mining Right Reference Number: LP 30/5/1/3/2/1(179) EM**

IMPORTANT NOTICE

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

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

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

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

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

OBJECTIVE OF THE ENVIRONMENTAL IMPACT ASSESSMENT PROCESS

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

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

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

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

(d) Determine the—-

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

(ii) Degree to which these impacts—

(aa) can be reversed;

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

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

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

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

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

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

PART A

SCOPE OF ASSESSMENT AND ENVIRONMENTAL IMPACT ASSESSMENT REPORT

The application for the Environmental Authorisation Process was submitted to the Department of Mineral Resources and Energy (DMRE) on 13 July 2021. A letter of acknowledgement from the DMRE was received on 11 August 2021.

The Draft Environmental Scoping Report (ESR) was made available to all registered Stakeholders an Interested and Affected Parties (I&APs) from 23 July 2021 to 23 August 2021. A period of 30 days was awarded for comments during the Scoping Phase. The Final ESR was submitted to the DMRE on 11 October 2021. All comments received from Stakeholders and Commenting Authorities have been included into reports submitted to the DMRE and are also included into this Report.

The Final ESR was approved by the DMRE on 11 October 2021.

With reference to Regulation 3(7) of the 2014 EIA Regulations (GNR 982) (as amended), on behalf of the applicant, Dwarsrivier Chrome Mine (Pty) Ltd ("Dwarsrivier Mine"), EnviroGistics (Pty) Ltd, appointed as the independent Environmental Assessment Practitioner (EAP) for the project, requested an additional two (2) months (60 days) extension in addition to the prescribed 106 day period to submit the Final Environmental Impact Assessment Report (EIAR) and Environmental Management Programme (EMPr) to the competent authority (DMRE). The request was based on the following:

- This submission of the draft EIA and EMPr report initially planned on 30 November 2021 would have necessitated review by Stakeholders and I&APs over the Regulated December block-out period. Although additional time for review would have been offered, the risk of Stakeholders and I&APs not reviewing this report with sufficient time provided, needed to be considered and managed.
- Due to various engineering considerations, and the replacement of the original engineering firm involved in the project design, the TSF designs were still underway and only available during November 2021, which would have impacted the outcomes of the Water Balance and Groundwater Studies. The designs were only made available in November 2021.

This request was submitted on 29 October 2021 and was approved by the DMRE on 29 October 2021.

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

1 CONTACT PERSON AND CORRESPONDENCE ADDRESS

1.a Contact Person and Correspondence Address

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

Table 2: Details of EAP

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

1.a.ii *Expertise of the EAP*

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

Table 3: Experience of EAP

Name	Position	Qualification	Professional Registrations	Experience
Tanja Bekker	Principal Practitioner	M.Sc. Environmental Management (RAU; now	Registered member of the Environmental Assessment Practitioners Association of South Africa (EAPASA; Ref 306/2019)	20 Years

		University of Johannesburg)	Registered with the South African Council for National Scientific Professions (SACNASP: Pr.Sci.Nat. Reg No. 400198/09) Member of International Association of Impact Assessors (IAIA) Member of the Environmental Law Association of South Africa (ELA)	

Please refer to Annexure 2 for the EAPs Curriculum Vitae.

<u>Education</u>

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

<u>Career Enhancing Courses</u>

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

<u>Professional Affiliations</u>

Registered member of EAPASA
Registered as a Professional Natural Scientist with SACNASP
Certified ISO 14001 Environmental Management System Auditor
Member of the South African affiliate of the IAIA
Member of the Environmental Law Association of South Africa (ELA).

<u>Summary of the EAP's past experience</u>

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

With more than 20 years' working experience in environmental management and the consulting industry and managing various Large Account Clients, she understands the South African Regulatory System, and can advise clients with due diligence on their environmental regulatory requirements and offer a solution driven service to their project life cycle. She is equipped with exceptional project management and coordination skills, which especially enhances the service she offers clients within the environmental permitting system.

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

1.a.iii Details of the Applicant

Dwarsrivier Chrome Mine (Pty) Ltd (hereafter referred to as "Dwarsrivier Mine" or "the mine") is wholly owned by Assore Ltd ("Assore").

According to information obtained from the official Dwarsrivier Mine Web Page, the mine originated as a result of neighbouring properties to the north and south thereof, which had existing chrome mining operations at the time of purchase in 1998. The owners of Dwarsrivier Mine, therefore invested in a feasibility study for the Plant, old Tailings Storage Facility (hereafter referred to as the "Old TSF") and the mining of chrome. The designs for the opencast and underground mines then commenced. Approval to proceed with the final design and construction of work was given in July 1999 (http://www.assmang.co.za/chrome.asp). The mine ceased opencast operations in 2006 and is currently operating as an underground (trackless, board and pillar operation) mine, producing chromite ore, with a Dense Medium Separation and Spiral Beneficiation Plant. Dwarsrivier Mine currently produces approximately 200 000 tons of chromite ore per month.

The mine was previously owned by Assmang (Pty) Ltd ("Assmang") with a 50% share. This results from the approval by the Department of Mineral Resources (DMR) (now the Department of Mineral Resources and Energy (DMRE)) of the Section 11 Transfer in terms of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002) (MPRDA) of Dwarsrivier Mine from African Rainbow Minerals (ARM) to Assore. The change of ownership officially came into effect on 1 August 2016.

Table 4: Details of Applicant

Project applicant:	Dwarsrivier Chrome Mine (Pty) Ltd		
Registration no (if any):	2011/105280/07		
Trading name (if any):	N/A		
Responsible Person, (e.g. Director, CEO, etc.):	Environmental Representative		
Contact person:	Mr Pieter Schoeman		
Physical address:	The mine is situated 25km outside of Steelpoort on Portion 1 (Remaining Extent) and Portion 0 (Remaining Extent) of the farm Dwarsrivier 372KT and Portion 4 (a Portion of Portion 3) of the Farm De Grooteboom 373KT		
Postal address:	PO Box 567, Lydenburg		
Postal code:	1120	Cell:	+27 (0) 76 028 7680
Telephone:	+27 (0) 13 230 5300	Fax:	+27 (0) 13 230 5318
E-mail:	pieters@dwarsrivier.co.za		

1.a.iv Environmental Authorisations

The mine is operating with all required environmental authorisations in terms of the following (The two authorisations highlighted are applicable to the current application):

Table 5: List of Environmental Authorisations

#	Legislation	Licence	Reference	Date
1	Minerals Act, 1991 (Act No. 50 of 1991)	Approval for Dwarsrivier Phase II Chrome Project	OT6/2/2/426A	14 December 1999
2	National Water Act, 1998 (Act No. 36 of 1998) (NWA)	Regulation 4b (GN704) Exemption for undermining 2006	16/2/7/B400/C83/1	12 September 2006 (no longer applicable, replaced by the WUL, 2008)
3	NWA	Overall Water Use Licence (WUL)	16/2/7/B4000/C83 (24053346)	21 January 2008, amended 10 June 2021
4	Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002) (MPRDA)	Environmental Management Programme (EMPr)	-	December 2010
5	NWA	WUL – Tailings Dam	04/B41G/G/792	8 July 2011, amended 28 June 2021
6	National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA)	Environmental Authorisation for the proposed construction of a new Tailings Storage Facility	12/1/9-7/1e/GS4	9 July 2011
7	National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) (NEMWA)	Waste Licence – Hazardous Waste Temporary Storage Facilities[1]	12/9/11/L290/5	21 July 2011
8	MPRDA	Dwarsrivier Mine Tailings Storage Facility Environmental Management Programme	LP30/5/1/3/2/1(179)EM	22 August 2011
9	MPRDA	Approval for Three Plants	LP30/5/1/3/2/1 (179)EM	11 January 2012
10	NEMWA	Waste Licence – Temporary General Waste Storage Facilities	12/4/10-A/1/GS3	29 March 2012

[1] Note that the Licence Holder has not and will not be commissioning the activity. The Environmental Authorisation has therefore not been implemented on site. The Licence Holder is not in contravention with the Environmental Authorisation.

#	Legislation	Licence	Reference	Date
11	NEMA	Construction of a Low-Level Bridge over the Groot Dwarsrivier	12/1/9/1-GS22	11 June 2012
12	NEMA	Environmental Permission for Construction of a Bridge over the Springkaanspruit River	12/1/9/1-GS62	19 September 2013
13	NWA	WUL – River Crossings	04/B41G/CI/2240	4 October 2013, amended 10 August 2021
14	NEMA	Section 24G Rectification	12/1/9-7/S24G/7-GS1	26 August 2014
15	NEMWA & NEMA	Integrated Environmental Authorisation	179EM	15 February 2018
16	NEMA	Integrated Environmental Authorisation	179EM	29 May 2019
17	NEMA	Centralised Store	179EM	15 March 2021

1.b Description of the Property

1.b.i Location of the Mine

Dwarsrivier Mine is situated approximately 60km northwest of Lydenburg, 25km south of Steelpoort and 63km northeast of Roossenekal in the Limpopo Province. The mine currently holds the surface rights for the Remainder of Portion 1 (RE of Portion 1) and the Remainder Portion (Portion 0) of the farm Dwarsrivier 372KT, as well as Portion 4 (a portion of Portion 3) of the farm De Grooteboom 373KT.

The operation is located in the Fetakgomo Tubatse Local Municipality, within the boundaries of the Sekhukhune District Municipality.

The R577 (Sekhukune Road) roadway that connects to the R555 (Lydenburg-Roossenekal road), is situated to the north of the Plant and Mine Offices. The overall area is characterised by intensive mining development. Various servitudes traversing the site are present, which include gravel roads, telephone lines and electricity lines. Please refer Figure 1 and Figure 2 illustrating the location and cadastral setting of the mine.

Dwarsrivier Mine falls in the quaternary catchments B41G and B41H in the Olifants Water Management Area (WMA B4). All surface water draining from the properties ultimately flows into the Groot Dwarsrivier and the Klein Dwarsrivier, the confluence of which is located on the north-western portion of the property. From the confluence, the Dwarsrivier flows northwards into the Steelpoort River. Dwarsrivier Mine has an exemption (Reference Number 16/2/7/B400/C83/1) from the then Department of Water Affairs (DWA, now the Department of Water and Sanitation (DWS)), which allows the operation to undermine the Groot Dwars River.

Several of the neighbouring farms, namely Tweefontein 380JT, Thorncliffe 374KT, portions of De Grooteboom 373KT and portions of Dwarsrivier 372KT are owned by mining houses with existing and operational chrome and platinum mines. On the remainder of the neighbouring farms, agricultural activities take place, in the form of stock grazing and the production of vegetables, lucerne and cotton.

Please refer to the following table for the registered name, administrative jurisdiction and summary of location of the land (please refer to Figures 1 and 2).

Table 6: Property Information

Farm Name:	- Farm Dwarsrivier 372KT Portion 0 (RE):
	  o TSF Option B (Project 1)
	  o TSF Option D (Project 1)
	  o Plant to North Mine road crossing (Project 5)
	  o Potential location of Option B TSF PCD (Project 1).
	- Farm Dwarsrivier 372KT Remainder (RE) of Portion 1:
	  o TSF Option C (Project 1)
	  o TSF Option F (Project 1)
	  o Diesel and Emulsion Batching (Project 2)
	  o Main Parking Extension (Project 3)
	  o Road Widening (Project 4)
	- Farm Dwarsrivier 372KT Portion 6:
	  o Potential PCD for Option B (Project 1)
	
	Preferred Alternatives:
	- Farm Dwarsrivier 372KT Portion 0 (RE):
	  o Site (TSF Option) B (Project 1)
	  o Road Crossing between Plant and North Mine (subway crossing) (Project 5)
	  o Site (TSF PCD Option) B (Project 1).
	- Farm Dwarsrivier 372KT Remainder (RE) of Portion 1:

	◦ Diesel and Emulsion Batching Areas (Project 2) ◦ Main Parking Extension (Project 3) ◦ Widening of Access Road between South Shaft/ Main Offices and Plant (Project 4)
Magisterial district:	The mine falls within the Fetakgomo Tubatse Local Municipality, within the boundaries of the Sekhukhune District Municipality.
Distance and direction from nearest town:	Dwarsrivier Mine is situated approximately 25km southwest of Steelpoort and 60km from Lydenburg on the border between Limpopo and Mpumalanga Provinces. The mine itself falls under the jurisdiction of the Limpopo Province.
21 digit Surveyor General Code for each farm portion:	• Farm Dwarsrivier 372KT RE - T0KT00000000037200000 • Farm Dwarsrivier 372KT RE of Portion 1 - T0KT00000000037200001 • Farm Dwarsrivier 372KT Portion 6 - T0KT00000000037200006
Land Claims	Bakone Ba Masha are the owners of various graves located within the vicinity of Dwarsrivier Mine, specifically in terms of the two (2) farm portions in question and was identified as an interested and affected party.

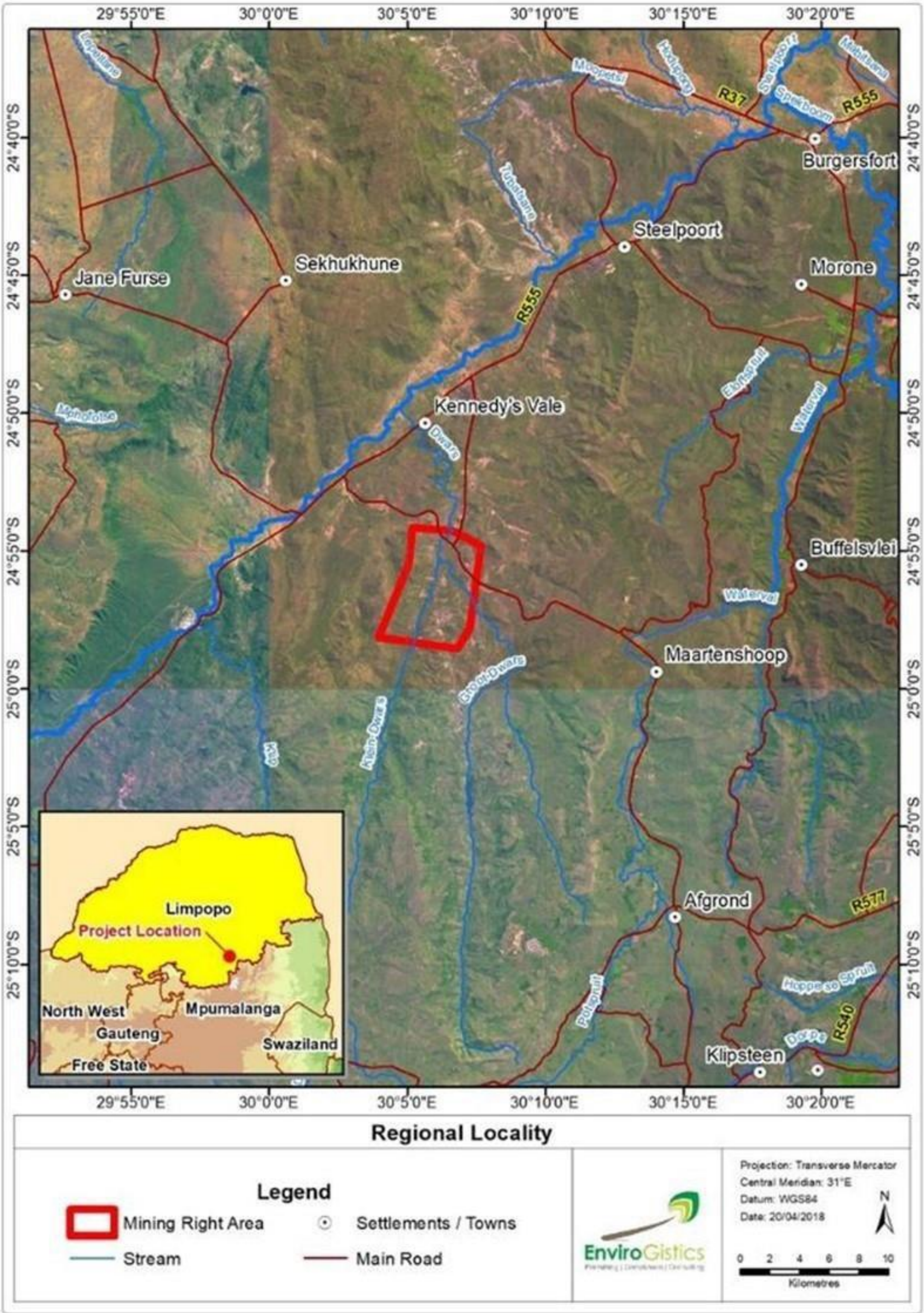


Figure 1: Local and Regional Setting of the Dwarsrivier Mine surface operations

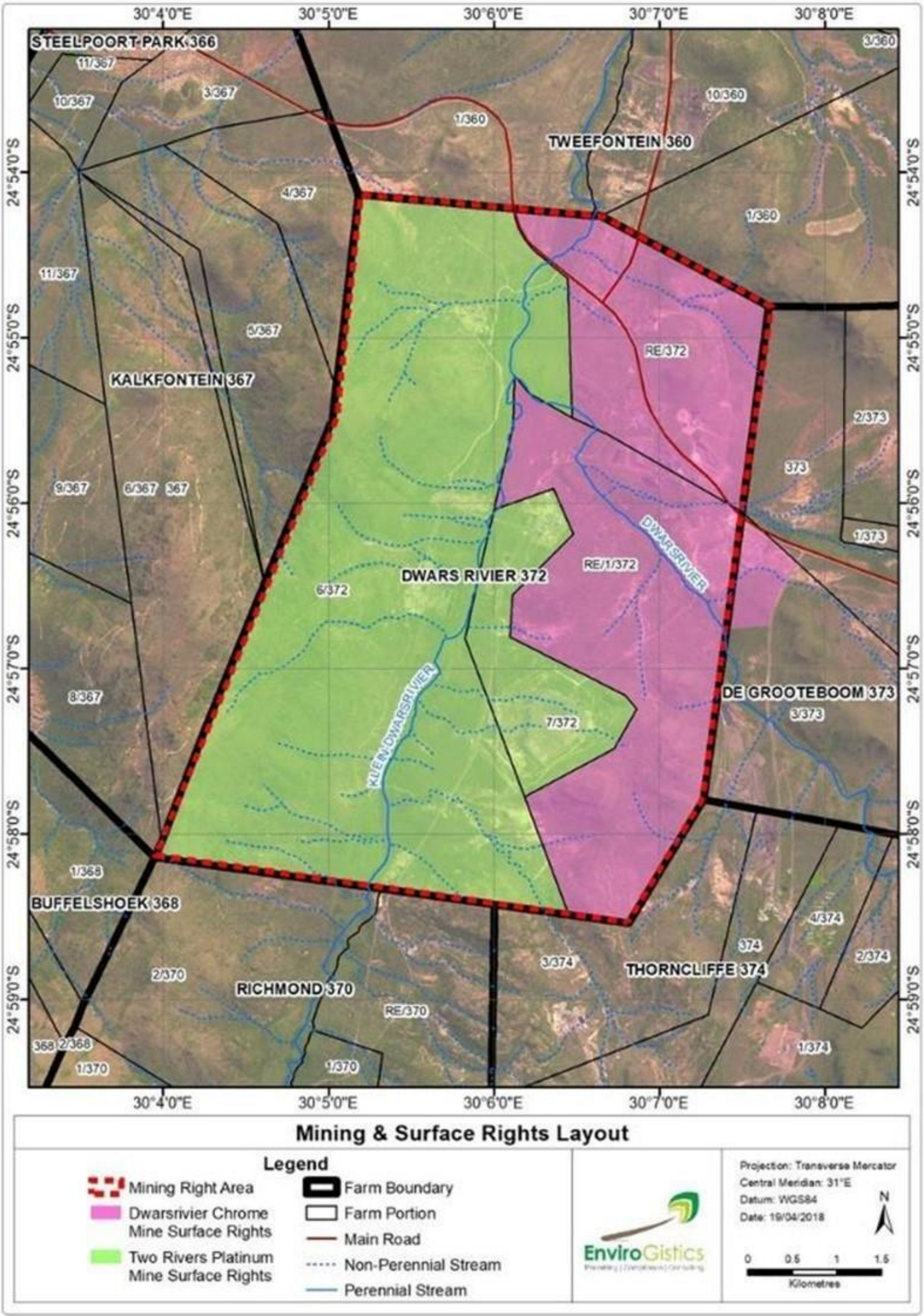


Figure 2: Cadastral Information

1.b.ii Ownership of Land

Dwarsrivier Mine has been mining chromite ore from the LG6 seam since 1999. Between 1999 and 2005, ore was mined using opencast methods. The six (6) pits have subsequently been mined out and backfilled with the exception of the South and North Pit portals from which access is gained to the underground workings. The current mine plan extends the life of the operations to the year 2042.

Assmang bought the farm Dwarsrivier 372KT (Portions 1 and the Remaining Extent), including all surface and mineral rights, in October 1998 for R163 million. In 2002, the mine purchased a portion of the farm De Grooteboom 373KT, subdividing this portion into Portion 4 (a portion of Portion 3).

The mine holds the surface rights on RE of Portion 1, Portion 0 (RE) of the farm Dwarsrivier 372KT and Portion 4 (a Portion of Portion 3) of the farm De Grooteboom 373KT. The mining rights are held over RE of Portion 1, Portion 0 (RE), Portion 6 and Portion 7 of the farm Dwarsrivier 372KT. The surface rights of Portions 6 and 7 of the farm Dwarsrivier 372KT are owned by Two Rivers Platinum Mine (TRP).

The property details are presented in the following table:

Table 7: Landownership

Farm Name	Portion	Title Deed Number	Property Size	Ownership	Mining Rights
Dwarsrivier 372KT	0	T24/2021	489ha	Assore Ltd	Assore Ltd
Dwarsrivier 372KT	1	T24/2021	843ha	Assore Ltd	Assore Ltd
De Grooteboom 373KT	Portion 4 (a Portion of Portion 3)	T24/2021	52ha	Assore Ltd	Assore Ltd
Dwarsrivier 372KT	6	48140/2005PTA	1879ha	Two Rivers Platinum (Pty) Ltd	Assore Ltd
Dwarsrivier 372KT	7	T9520/2008PTA	261ha	Two Rivers Platinum (Pty) Ltd	Assore Ltd

A Section 11 transfer in terms of the MPRDA has been applied for whereby Assore takes over all administrative and technical services, as well as the sales and marketing function of the mine. This application has been successful and therefore Assore is now 100% owners of Dwarsrivier Mine in terms of the mineral and surface rights. Refer to Figure 2 for the cadastral setting of the mine.

There are registered land claims on the Dwarsrivier Mine surface rights area (see Annexure 3) (note the error in the letter received with the Bakoni Ba Mmadi the land claimants on the farm De Grooteboom. The Masha LA – Masha Lengwai community should be listed as the Mmadi family).

The Bakone Ba Masha is represented by Mr Caswell Pokwane (makgalepokwane@gmail.com) (he is replacing the previous representative – Mr Mashegoane). The Bakone Ba Masha are the land claimants of the farm Dwarsrivier.

The Bakoni Ba Mmadi is represented by Mr. Dudu Mmadi and Mr. Chris Mmadi of the Bakoni Ba Mmadi Communal Property Association (CPA bakonibammadic236@gmail.com; proteafarm.community@gmail.com; ledubatrading02@gmail.com). The Bakoni Ba Mmadi are the land claimants of the farm De Grooteboom. These land claimants are not impacted by the Khulu TSF and Capital Projects.

1.c Locality Map

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

Table 8: Property Location

Farm Name:	Farm Dwarsrivier 372KT Remaining Extent of Portion 1 (RE of Portion 1) Farm Dwarsrivier 372KT Remainder Portion (Portion 0)

Application area (Ha)	- Project 1 – Khulu TSF
	  - Farm Dwarsrivier 372KT RE (TSF and ancillary infrastructure):
	    - TSF Site B: 20a (preferred)
	    - TSF Site D: 21ha
	  - Farm Dwarsrivier 372KT Remainder of Portion 1:
	    - TSF Site C: 28ha

	o Farm Dwarsrivier 372KT RE: ▪ Proposed PCD for Site B: 3ha • Project 2 – Diesel and Emulsion Batching Area o Farm Dwarsrivier 372KT Remainder of Portion 1: 5ha ▪ Emulsion Batching: 1.6ha ▪ Diesel Batching: 3ha (clearance of about 0.37ha) ▪ Emulsion Batching Access Road: 80m at 6m width: 0.048ha (480m^2) (clearance of about 480m^2) ▪ Diesel Batching Access Road: 55m at 6m width: 0.033ha (330m^2) – no (no clearance, existing road will be used) • Project 3 – Extension of Main Parking Area o Farm Dwarsrivier 372KT Remainder of Portion 1: 0.5ha • Project 4 – Widening of Access Road between South Shaft/Main Offices and Plant o Mainly on Farm Dwarsrivier 372KT Remainder of Portion 1: 0.3ha • Project 5 – Access Crossing between Plant and North Mine (Subway Crossing) o Farm Dwarsrivier 372KT RE: 0.2ha
Magisterial district:	The mine falls within the Fetakgomo Tubatse Local Municipality, within the boundaries of the Sekhukhune District Municipality.
Distance and direction from nearest town	Dwarsrivier Mine is situated approximately 25km southwest of Steelpoort and 60km from Lydenburg on the border between Limpopo and Mpumalanga Provinces. The mine itself falls under the jurisdiction of the Limpopo Province.
21 digit Surveyor General Code for each farm portion	Farm Dwarsrivier 372KT Portion 0 (Remainder) - T0KT00000000037200000 Farm Dwarsrivier 372KT Remainder of Portion 1 - T0KT00000000037200001

The following table presents the coordinates for the proposed activity involved in this application:

Table 9: Coordinates

Activity	Farm Portion	Coordinate	Size (ha approx.)
Khulu TSF Project	Dwarsrivier 372KT RE	24°55'3.57"S 30° 6'38.21"E	25ha (including PCD) Topsoil Stockpile (additional 10ha on approved area for clearance EA, 2019) Pipeline from Plant to Filter Press: 350m in length Pipeline from PCD to Lower Return Water Dam (RWD): 2.1km (350mm diameter, steel, above ground) PCD Access and Service Road: 250m; 6m in width. Pipeline service road will not be wider than 4m with a length of about 2.1km. Haul road between mine and existing Plant roads: 1km; 5m in width (two 90m bypass sections) TSF Service Road: Around the TSF (about 2km), 5m wide
Diesel and Emulsion Batching ARea to the underground via pipelines	Dwarsrivier 372KT RE of Portion 1	Diesel Batching Area: 24°56'54.50"S 30° 6'28.96"E Emulsion Batching Area: 24°56'44.16"S 30° 6'33.50"E	5ha 80m and 55m access roads of about 6m in width.
Extension of existing Main Parking Area by 4 900m^2 within close proximately 20m of the Springkaanspruit. No additional specific roads will be required, traffic will be managed within the overall parking bay layout.	Dwarsrivier 372KT RE of Portion 1	24°56'2.34"S 30° 7'22.70"E	0.5ha
An existing road provides access between the Main Office Buildings and the Plant. The current width of the road ranges between 5m and 6m. The mine is planning on increasing a section of 700m of this road to a width of 16m to allow for two-way traffic.	Dwarsrivier 372KT RE of Portion 1	Start 24°55'51.77"S 30° 6'58.99"E End 24°55'59.12"S 30° 7'17.29"E	0.3ha

Activity	Farm Portion	Coordinate	Size (ha approx.)
To ensure more optimal logistical management of traffic between the South Mine and the North Mine, and to reduce the number of vehicles on the regional road, the mine is planning on constructing a road under regional road bridge to allow for access between the two areas.	Dwarsrivier 372KT RE	24°55'56.30"S 30° 7'22.34"E	0.2ha

The following figure presents the location of the listed activities within the approved mine surface rights.

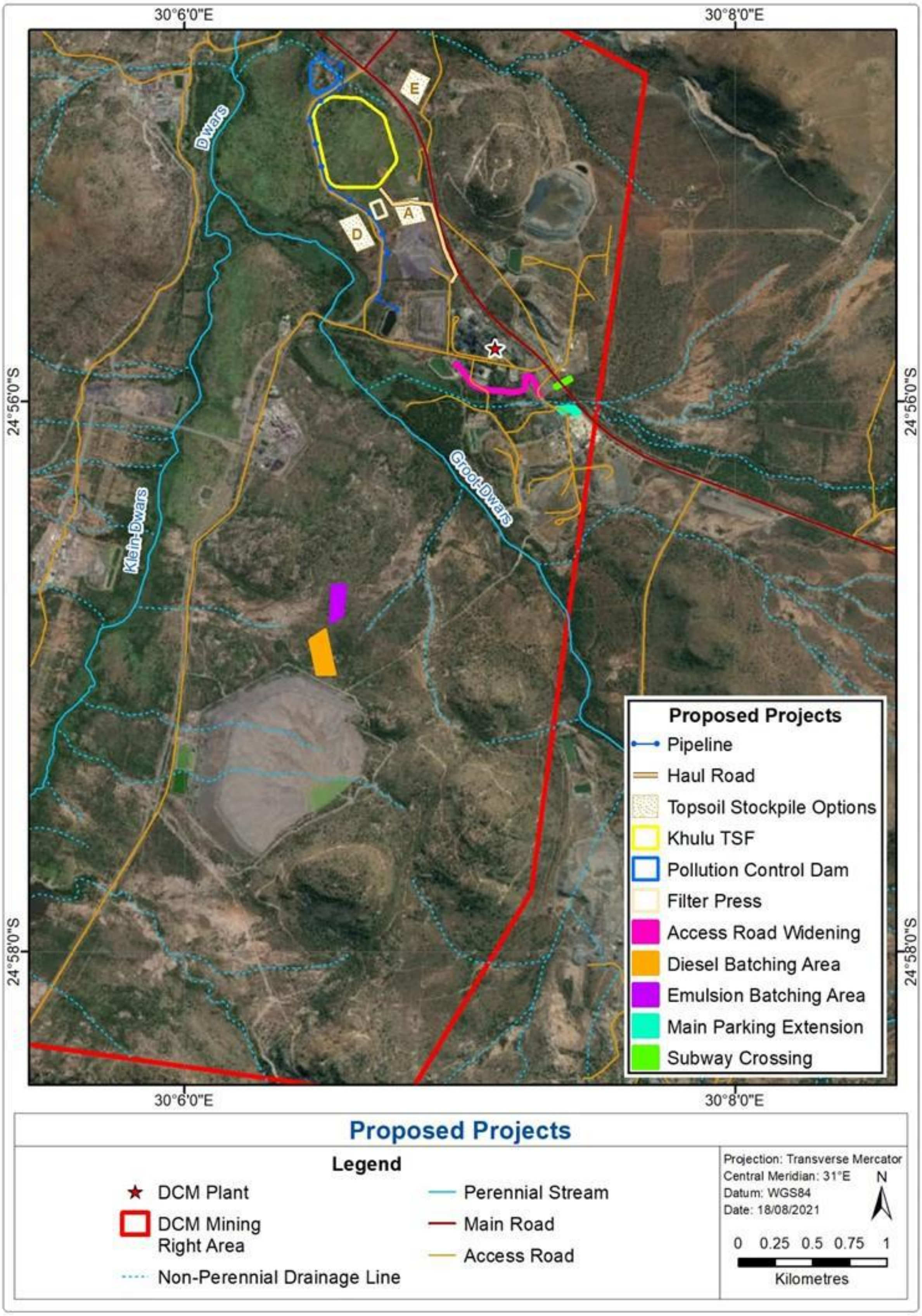


Figure 3: Location of Activities

1.d Description of the Scope of the Proposed Activity

1.d.i Listed and Specific Activities

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

In terms of the NEMA, there are three (3) listing notices which should be considered for this application. These listing notices were amended during April 2017. Listing Notice 1 (Regulation 983) activities require a Basic Assessment Process, whereas Listing Notice 2 (Regulation 984) activities require a full Environmental Impact Assessment (EIA) Process. Listing Notice 3 (Regulation 985) activities require a Basic Assessment Process if the area falls within certain geographic zones. The majority of Dwarsrivier Mine is located in a Critical Biodiversity Area 1 (CBA1) with small portions thereof falling within Ecological Support Areas 2 (ESA2), while certain areas are also located within a threatened ecosystem, namely the Sekhukhuneland Mountainlands ecosystem, which is listed as being Endangered. The mine is also located within 10km of the De Hoop Dam Proteted Environment, a protected environment (2019). Therefore, Listing Notice 3 is applicable when considering infrastructure and activities planned on site.

NOTE: Important to note that Subsequent to the specialist assessments, the CBAs for the Sekhukhune District Municipality were updated to align these with the Sekhukhune District Bioregional Plan, and the current mining area, including the proposed project footprint areas, no longer falls within a CBA, but still in a listed threatened ecosystem. This report therefore still refers to CBAs, as it has minimal impact on the assessment. It should also be noted that based on current available information, the Sekhukhune Mountainlands threatened ecosystem is proposed to fall away once the Draft Revised Threatened Ecosystem Regulations of 2021 are promulgated. The Sekhukhune Mountainlands threatened ecosystem is however still in place, in line with the undertaking of the current specialist studies.

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

According to Regulation 38 of the NHRA, any development or other activity which will change the character of a site exceeding 5 000m^2 in extent requires notification to the South African Heritage Resources Agency (SAHRA). No change in the character of the site or clearance of undisturbed areas are applicable to this application. For this reason, the NHRA is not applicable to this project.

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

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

The establishment or reclamation of a Mine Residue Deposit forms part of activities for which a Waste Management Licence (WML) is required.

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

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

The project requires approval in terms of Section 21 of the NWA, specifically relating to the Khulu TSF and associated infrastructure. However, various of the activities are located within the regulated NWA 500m buffer from the Dwarsrivier Riparian Zone.

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

Table 10: Listed Activities

NAME OF ACTIVITY	Aerial extent of the Activity (Ha or m²)	LISTED ACTIVITY	APPLICABLE LISTING NOTICE (*GNR 983, GNR 984 or GNR 985*) *Note that Listing Notice 3 is applicable in this event as the activities was at the time of the assessment located in a CBA and still located within a Threatened Ecosystem.*	WASTE MANAGEMENT AUTHORISATION	WATER USES
Project 1					
Construction and operation of the new Khulu TSF	Option B: 22.5ha	x	<u>Listing Notice 2, Activity 15</u>: The clearance of an area of 20 hectares or more of indigenous vegetation, excluding where such clearance of indigenous vegetation is required for— the undertaking of a linear activity. <u>Listing Notice 3, Activity 12</u>: The clearance of an area of 300 square metres or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a Maintenance management plan. (Presence of endangered ecosystem within portions of the footprint) <u>Listing Notice 3, Activity 10</u>: The development and related operation of facilities or infrastructure for the storage, or storage and handling of a dangerous good where such storage occurs in containers with a combined capacity of 30 but not exceeding 80 cubic metres (if required during construction and maintenance).	<u>Regulation 921, as amended by Regulation 633 dated 24 July 2015:</u> <u>Waste Management Activity, Category B, Activity 11</u>: The establishment or reclamation of a residue stockpile or residue deposit resulting from activities which require a mining right, exploration right or production right in terms of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002).	Section 21(g) water uses
Construction and operation of associated infrastructure – Pollution Control Dam (PCD)	This facility will form part of the overall TSF footprint as presented above – and will be finalised once the preferred site has been selected, but could be in the region of 2ha.	x	<u>Listing Notice 1, Activity 13</u>: The development of facilities or infrastructure for the off-stream storage of water, including dams and reservoirs, with a combined capacity of 50 000 cubic meters or more (depending on the Return Water Dam requirements). <u>Listing Notice 2, Activity 6</u>: The development of facilities or infrastructure for any process or activity which requires a permit or license or an amended permit or license in terms of national or provincial legislation governing the generation or release of emissions, pollution or effluent. – this activity is triggered as the proposed dam would require approval in terms of a new Water Use (Section 21g) in terms of the National Water Act, 1998 (Act No. 36 of 1998) (NWA). <u>Listing Notice 3, Activity 12</u>: The clearance of an area of 300 square metres or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a Maintenance management plan. (Presence of endangered ecosystem within the footprint)	-	Section 21(g) water uses
Construction and operation of pipelines	Pipeline from Plant to Filter Press: 350m in length	x	<u>Listing Notice 1, Activity 10</u>: The development and related operation of infrastructure exceeding 1 000 metres in length for the bulk transportation of sewage, effluent, process water, waste water, return water, industrial discharge or slimes – (i) with an internal diameter of	-	-

NAME OF ACTIVITY	Aerial extent of the Activity (Ha or m²)	LISTED ACTIVITY	APPLICABLE LISTING NOTICE (*GNR 983, GNR 984 or GNR 985)* *Note that Listing Notice 3 is applicable in this event as the activities was at the time of the assessment located in a CBA and still located within a Threatened Ecosystem.*	WASTE MANAGEMENT AUTHORISATION	WATER USES
	Pipeline from PCD to Lower Return Water Dam (RWD): 2.1km (350mm diameter, steel, above ground)		0,36 metres or more; or (ii) with a peak throughput of 120 litres per second or more. <u>Listing Notice 3, Activity 12</u>: The clearance of an area of 300 square metres or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a maintenance management plan. (Presence of endangered ecosystem within portions of the footprint)		
Establishment of laydown areas and temporary offices	This will be a temporary site, within the footprint of the TSF demarcated area.	x	<u>Listing Notice 3, Activity 10</u>: The development and related operation of facilities or infrastructure for the storage, or storage and handling of a dangerous good where such storage occurs in containers with a combined capacity of 30 but not exceeding 80 cubic metres (if required). It is not foreseen that any reservoirs in excess of 250m^3 will be constructed for the purposes of any of the activities. <u>Note that the clearance activity is included within the overall TSF footprint clearance</u>.	-	-
Construction of roads	PCD Access and Service Road: 250m; 6m in width. Pipeline service road will not be wider than 4m with a length of about 2.1km. Haul road between mine and existing Plant roads: 1km; 5m in width (two 90m bypass sections) TSF Service Road: Around the TSF (about 2km), 5m wide	x	<u>Listing Notice 1, Activity 24</u>: The development of a road with a reserve wider than 13,5 meters, or where no reserve exists where the road is wider than 8 metres; but excluding a road — which is 1 kilometre or shorter. <u>Listing Notice 3, Activity 4</u>: The development of a road wider than 4 metres with a reserve less than 13,5 metres. (Within 10km of a protected area) <u>Listing Notice 3, Activity 12</u>: The clearance of an area of 300 square metres or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a maintenance management plan. (presence of engendered ecosystem within portions of the footprints)	-	-
Construction of a Topsoil Stockpile	10ha (limited clearance required – approved footprint for clearance in terms of EA, 2019)	x	Clearance is not applicable, as this has already been approved as part of the Discard Dump Extension Environmental Authorisation, 2018.	-	-
Project 2: Diesel and Emulsion Batching					
Dispatching of diesel and emulsion to the underground via pipelines.	• 80m and 55m access roads of about 6m in width. • Diesel Batching: two (2) aboveground	x	<u>Listing Notice 1, Activity 14:</u> The development and related operation of facilities or infrastructure, for the storage, or for the storage and handling, of a dangerous good, where such storage occurs in containers with a combined capacity of 80 cubic metres or more but not exceeding 500 cubic metres. (combined capacity of both facilities).	-	-

NAME OF ACTIVITY	Aerial extent of the Activity (Ha or m²)	LISTED ACTIVITY	APPLICABLE LISTING NOTICE (*GNR 983, GNR 984 or GNR 985)* *Note that Listing Notice 3 is applicable in this event as the activities was at the time of the assessment located in a CBA and still located within a Threatened Ecosystem.*	WASTE MANAGEMENT AUTHORISATION	WATER USES
	diesel tanks of $33m^3$ each (as well as a possible $22m^3$ tank), a $40m^3$ API self-bunded tank (Isotainer) for hydraulic oil and a $20m^3$ API self-bunded tank for lube oil. A total combined storage of $148m^3$ is required. - Emulsion Batching: 60 tons (similarly $60m^3$) of Emulsion product stored underground, with no surface storage or pipeline inventory required. - Feed into pipelines for underground use at both areas. - Parking and offloading areas around the batching areas. Clearance of indigenous vegetation will be required in the order of approximately 5ha.		<u>Listing Notice 1: Activity 27</u>: The clearance of an area of 1 hectare or more, but less than 20 hectares of indigenous vegetation (combined clearance). <u>Listing Notice 3, Activity 4</u>: The development of a road wider than 4 metres with a reserve less than 13,5 metres (due to presence of protected area within 5km). (Within 10km of a protected area) <u>Listing Notice 3, Activity 10</u>: The development and related operation of facilities or infrastructure for the storage, or storage and handling of a dangerous good where such storage occurs in containers with a combined capacity of 30 but not exceeding 80 cubic metres (Diesel Batching Area). <u>Listing Notice 3, Activity 12</u>: The clearance of an area of 300 square metres or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a maintenance management plan (Diesel Batching Area). (presence of engendered ecosystem within the footprints)		
Project 3: Main Parking Extension					
Extension of existing Main Parking Area by 4 $900m^2$ within close proximately (20m) to the Springkaanspruit. No additional specific roads will be required; traffic will be managed within the overall parking bay layout.	Less than 1ha	x	<u>Listing Notice 1: Activity 12</u>: The development of- (ii) infrastructure or structures with a physical footprint of 100 square metres or more; where such development occurs- (a) within a watercourse; (b) in front of a development setback; or (c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse. <u>Listing Notice 1: Activity 48</u>: The expansion of infrastructure or structures where the physical footprint is expanded by more than	-	Section 21(c) & (i) water uses

NAME OF ACTIVITY	Aerial extent of the Activity (Ha or m²)	LISTED ACTIVITY	APPLICABLE LISTING NOTICE (*GNR 983, GNR 984 or GNR 985*) *Note that Listing Notice 3 is applicable in this event as the activities was at the time of the assessment located in a CBA and still located within a Threatened Ecosystem.*	WASTE MANAGEMENT AUTHORISATION	WATER USES
			100m2 or more, where such expansion occurs within a watercourse or within 32m of a watercourse. Listing Notice 3, Activity 12: The clearance of an area of 300 square metres or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a maintenance management plan. (presence of engendered ecosystem within the footprints) Listing Notice 3, Activity 14: The development of— (xii) infrastructure or structures with a physical footprint of 10 square metres or more; where such development occurs— (a) within a watercourse; (c) if no development setback has been adopted, within 32 metres of a watercourse, measured from the edge of a watercourse.		
Project 4: Widening of Access Road between South Shaft/Main Offices and Plant					
An existing road provides access between the Main Office Buildings and the Plant. The current width of the road ranges between 5m and 6m. The mine is planning on increasing a section of 700m of this road to a width of 16m to allow for two-way traffic. Clearance of indigenous vegetation will be required in the order of approximately 0.3ha.	Less than 1ha	x	Listing Notice 1: Activity 48: The expansion of infrastructure or structures where the physical footprint is expanded by more than $100m^2$ or more, where such expansion occurs within a watercourse or within 32m of a watercourse. (This is a potential activity, as the expansion will commence after the existing road crossing over the Springkaanspruit.) Listing Notice 3, Activity 12: The clearance of an area of 300 square metres or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a maintenance management plan. Listing Notice 3: Activity 18: The widening of road by more than 4m, or the lengthening of a road by more than 1km. (within 100m from a watercourse; within 5km from a protected area)	-	Section 21(c) & (i) water uses
Project 5: Access Crossing between Plant and North Mine (Subway Crossing)					
The mine is planning on constructing a road under the regional road bridge to allow for access between the two areas. Clearance of indigenous vegetation will be required in the order of approximately 0.2ha.	Less than 1ha	x	Listing Notice 3, Activity 4: The development of a road wider than 4 metres with a reserve less than 13,5 metres. (within and CBA, 100m from a watercourse; within 5km from a protected area) Listing Notice 3, Activity 12: The clearance of an area of 300 square metres or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a maintenance management plan. (within an CBA and small portion within Endangered Ecosystem)	-	Section 21(c) & (i) water uses

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

1.d.ii.1 Project 1: Khulu TSF

Dwarsrivier Mine is currently depositing tailings at the existing North TSF, east of the Beneficiation Plant, on Portion RE of the Farm Dwarsrivier 372KT. The North TSF was designed to contain production tonnages for 23 years, with 29 000 tonnes for the first two (2) years of operation and the remaining twenty one (21) years at a deposition rate of 17 280 tonnes per month. It is anticipated that the existing North TSF will reach its full capacity within the next three (3) to five (5) years.

The Khulu TSF is required for the storage of tailings produced from the processing of ore. The Khulu TSF will be developed by depositing tailings dewatered by means of a filter press plant. The dewatered tailings will then be transported by trucks, placed and compacted on the TSF. The design of the filtration plant and associated infrastructure will be undertaken by others. The tailings that will be stored in the Khulu TSF was previously classified by nettZero1 as a Type 3 waste. Based on this classification the TSF and the associated pollution control dam (PCD) have been designed with Class C barrier systems.

The mine initially identified seven (7) potential TSF sites, which have since been reduced to three (3) site alternatives (Sites B, C and D), with Site B being the most favourable for the mine and being applied for as part of this project (please refer to the figure overleaf).

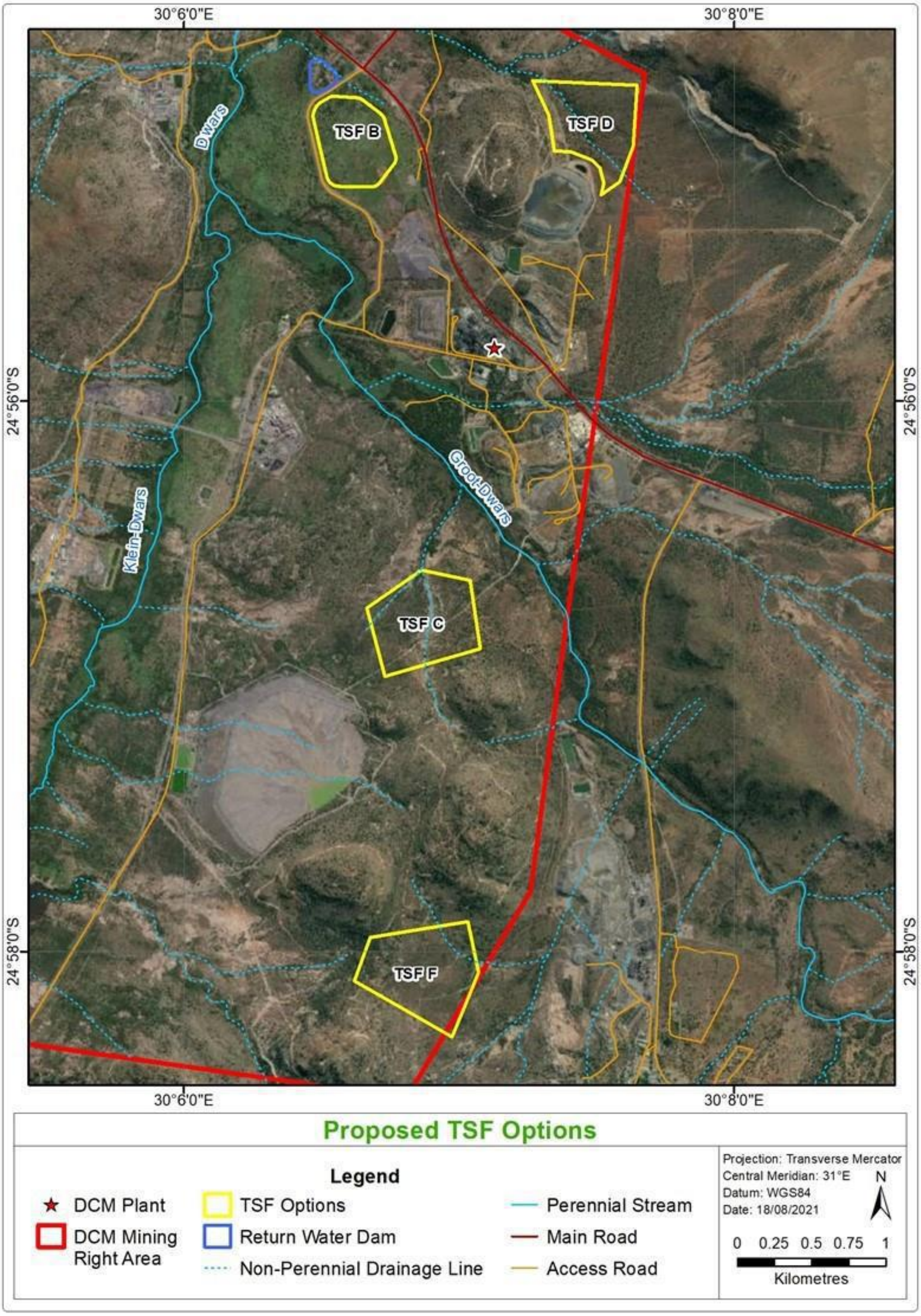


Figure 4: Sites (TSF Options) subjected to initial site selection by the applicant

1.d.ii.1.a Location

The proposed Khulu TSF and related infrastructure will be located approximately 1.5 km north of the mine Plant (please refer to Figure 6). The TSF will be located between the existing D1261 public road (Richmond road) and existing Eskom powerline servitudes.

The following photograph indicates the view of the proposed site, taken from the southern side of Site B (from the top of the existing Discard Dump).

Photo 1: Site B (photo from the Discard Dump viewing the existing disturbed area for the Discard Dump Expansion, and the Eskom Substation on the north-eastern corner of the photo)

The Richmond Road will constrain the development of the TSF to the north and to the west. Existing powerlines are a constraint to the east and to the south. The Richmond Road, existing powerlines and mine property boundary are a constraint for the PCD associated with the Khulu TSF.

The proposed TSF footprint area is not mined through or undermined, but the current Dwarsrivier Mine Life of Mine plan indicates that the proposed TSF footprint could be undermined in future. The depth to the underground resource under the proposed TSF footprint varies from 100m on the eastern side of the TSF to 200m on the western side. The impact of the TSF on the future mining was not raised as a concern by the applicant, and will be taken into account with the design of the future mining activities under the TSF.

The Pollution Control Dam (PCD) associated with the TSF will be located north of the TSF, across the Richmond Road. The PCD will be located close to the property boundary between Dwarsrivier Mine and Two Rivers Platinum mine (TRP mine), but within Dwarsrivier Mine’s surface rights. The northern portion of the PCD is located on an area which was previously undermined (mining rights belong to Tweefontein Mine). Permission to locate the PCD over the undermining will be obtained by Dwarsrivier Mine from the mining rights owner and the authorities.

An existing buried Lebalelo water pipeline is aligned along the northern side of the Richmond Road near the PCD site. There is an existing powerline that crosses the PCD site which will need to be diverted.

The site generally slopes to the Dwars River which runs along the western side of the site some 350m distance away.

A geological fault runs in a north-south direction under the TSF and near its eastern toe. There are exploration boreholes within the infrastructure footprint area that will be sealed prior to constructing the infrastructure.

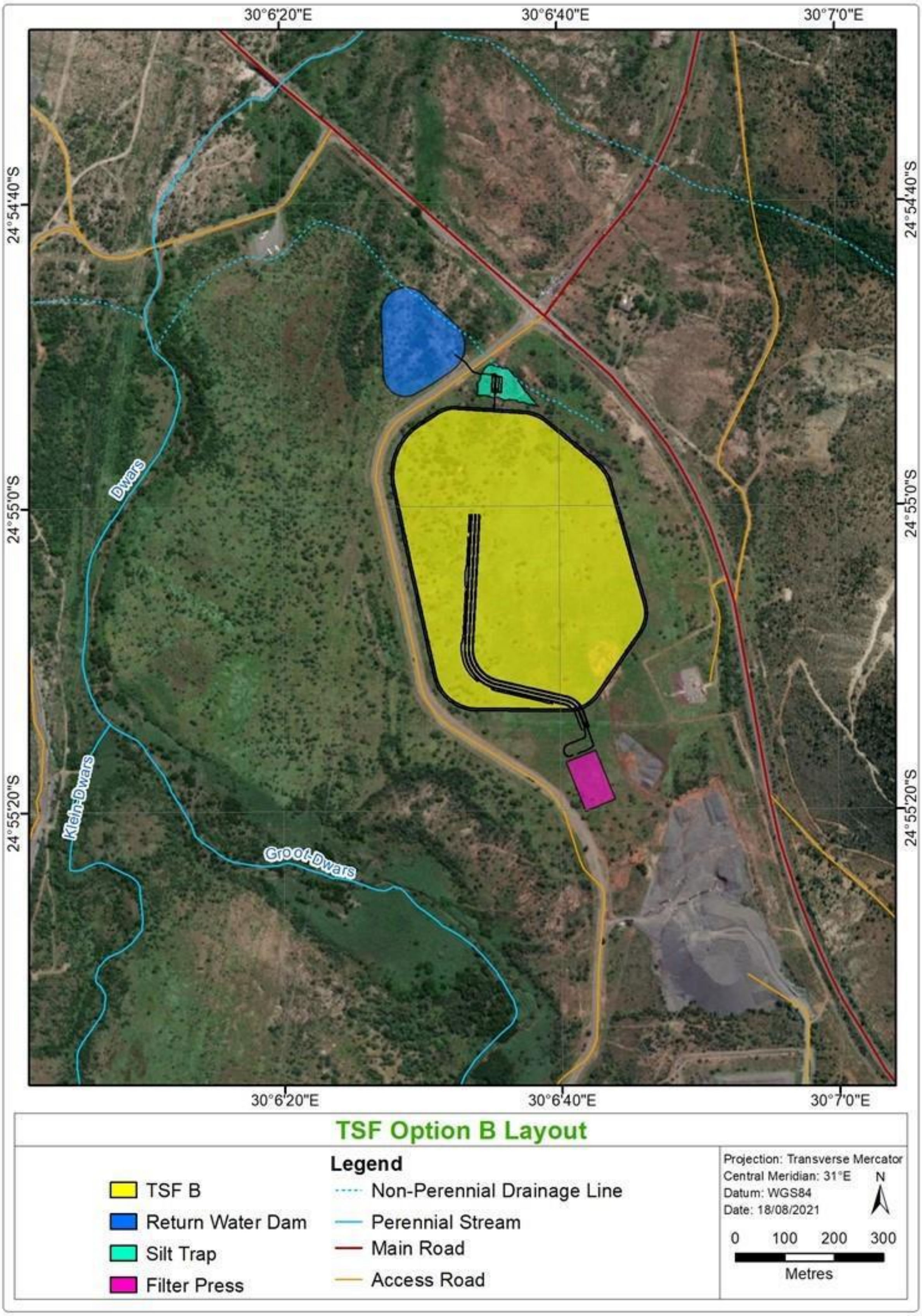


Figure 5: Site B (in yellow) in relation with to Discard Dump Expansion and proposed new PCD location)

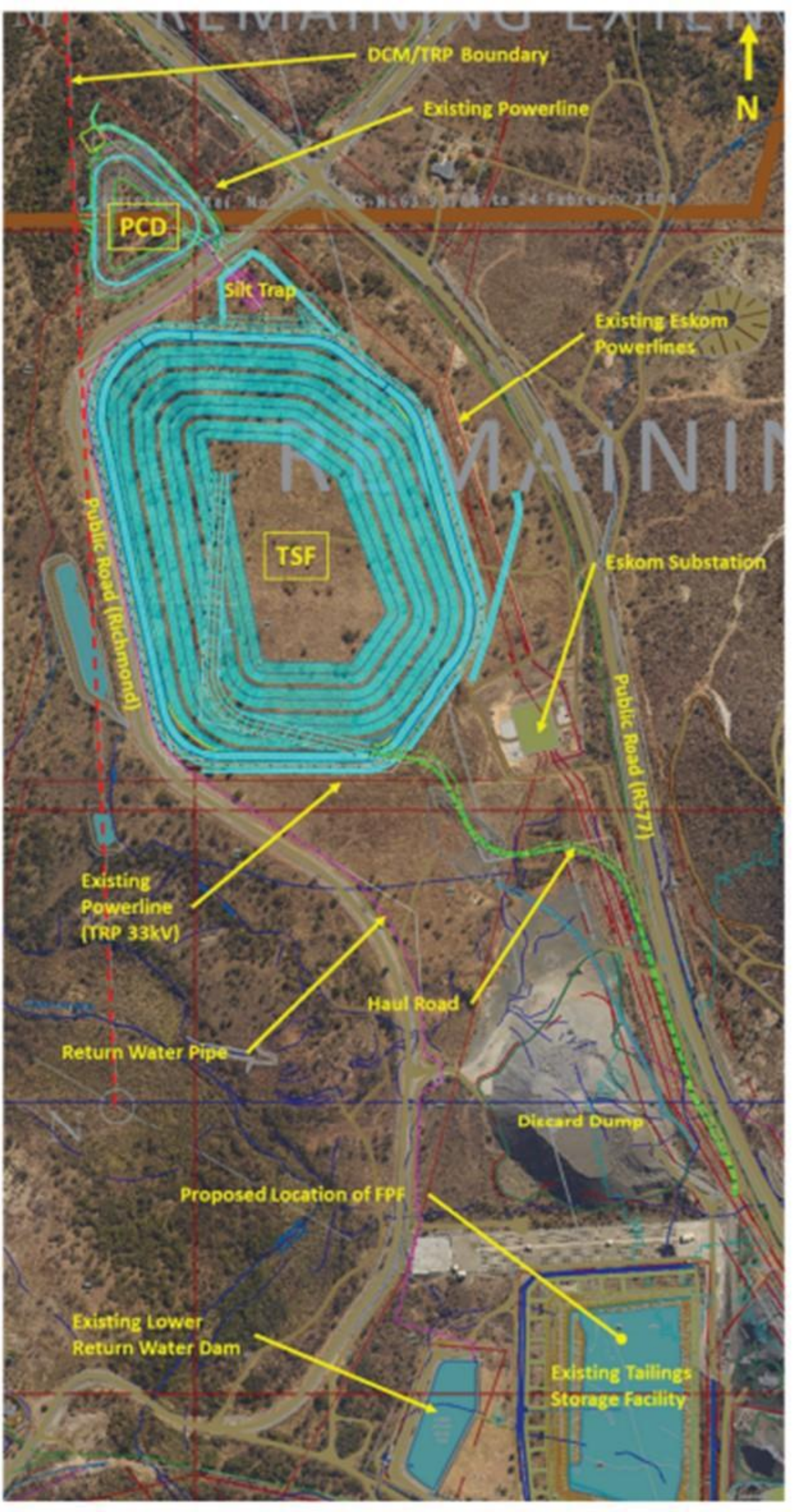


Figure 6: General Layout of the proposed TSF (Site B) and related infrastructure

1.d.ii.1.b Infrastructure Description associated with the Khulu TSF

The infrastructure that forms part of the proposed project and for which designs were completed include the following:

- Class C lined TSF system and associated above and below liner drains.
- Infrastructure required for the management of dirty stormwater runoff generated from the TSF will include the following:
  - Dirty water canal around the TSF.
  - Silt trap for settling and reducing the silt that will report to the PCD.
  - Culvert required to convey dirty water across the existing Richmond road from the silt trap to the PCD.
- The Class C lined PCD, which will include a spillway, the Class C liner system and associated drainage, as well as other associated infrastructure such as a pump station platform and the access road to the platform.
- The pumping system required to pump water stored in the PCD and convey it to the existing Lower Return Water Dam (Lower RWD).
- The clean water diversion canals and berms required to divert clean stormwater runoff around the TSF and the PCD areas.
- The service road around the TSF.
- Pipeline route from Lower RWD to the new PCD.
- The haul road that will be used to transport tailings from the filter press facility to the TSF.

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

Table 11: Khulu TSF and associated infrastructure

Description	Footprint Size	Dimensions	Coordinates	Listed Activities triggered
TSF Site B				
TSF	22.5ha	Height: 42m Storage: 4.4Mm^3	24°55'3.57"S 30° 6'38.21"E	Listing Notice 2, Activity 15: The clearance of an area of 20 hectares or more of indigenous vegetation, excluding where such clearance of indigenous vegetation is required for— the undertaking of a linear activity. Listing Notice 3, Activity 12: The clearance of an area of 300 square metres or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a Maintenance management plan. (Presence of endangered ecosystem within portions of the footprint) Listing Notice 3, Activity 10: The development and related operation of facilities or infrastructure for the storage, or storage and handling of a dangerous good where such storage occurs in containers with a combined capacity of 30 but not exceeding 80 cubic metres (if required during construction and maintenance). **Regulation 921, as amended by Regulation 633 dated 24 July 2015: Waste Management Activity, Category B, Activity 11**: The establishment or reclamation of a residue stockpile or residue deposit resulting from activities which require a mining right, exploration right or production right in terms of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002). **National Water Act, 1998:** Section 21(g) water use
PCD	3ha (49 900m^3)	49 00m^3	24°54'48.59"S 30° 6'30.94"E	Listing Notice 1, Activity 13: The development of facilities or infrastructure for the off-stream storage of water, including dams and reservoirs, with a combined capacity of 50 000 cubic meters or more (depending on the Return Water Dam requirements). Listing Notice 2, Activity 6: The development of facilities or infrastructure for any process or activity which requires a permit or license or an amended permit or license in terms of national or provincial legislation governing the generation or release of emissions, pollution or effluent. – this activity is triggered as the

Description	Footprint Size	Dimensions	Coordinates	Listed Activities triggered
				proposed dam would require approval in terms of a new Water Use (Section 21g) in terms of the National Water Act, 1998 (Act No. 36 of 1998) (NWA). Listing Notice 3, Activity 12: The clearance of an area of 300 square metres or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a Maintenance management plan. (Presence of endangered ecosystem within the footprint) **National Water Act, 1998:** Section 21(g) water use
Establishment of laydown areas and temporary offices	This will be a temporary site, within the footprint of the TSF demarcated area.	-	On TSF footprint	Listing Notice 3, Activity 10: The development and related operation of facilities or infrastructure for the storage, or storage and handling of a dangerous good where such storage occurs in containers with a combined capacity of 30 but not exceeding 80 cubic metres (if required). It is not foreseen that any reservoirs in excess of 250m^3 will be constructed for the purposes of any of the activities. Note that the clearance activity is included within the overall TSF footprint clearance.
Roads	1.5ha	PCD Access and Service Road: 250m; 6m in width. Pipeline service road will not be wider than 4m. Haul road between mine and existing Plant roads: 1km, 5m in width (two 90m bypass sections) TSF Service Road: Around the TSF (about 2km), 5m wide	24°54'49.49"S 30° 6'34.64"E 24°55'13.59"S 30° 6'42.12"E	**Listing Notice 1, Activity 24**: The development of a road with a reserve wider than 13,5 meters, or where no reserve exists where the road is wider than 8 metres; but excluding a road — which is 1 kilometre or shorter. **Listing Notice 3, Activity 4**: The development of a road wider than 4 metres with a reserve less than 13,5 metres. **Listing Notice 3, Activity 12**: The clearance of an area of 300 square metres or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a Maintenance management plan.
Pipeline	0.3ha	Pipeline from Plant to Filter Press: 350m in length Pipeline from PCD to Lower RWD: 2.1km (350mm diameter, steel, above ground)	24°55'38.01"S 30° 6'54.79"E 24°55'33.49"S 30° 6'43.23"E	Listing Notice 1, Activity 10: The development and related operation of infrastructure exceeding 1 000 metres in length for the bulk transportation of sewage, effluent, process water, waste water, return water, industrial discharge or slimes – (i) with an internal diameter of 0,36 metres or more; or (ii) with a peak throughput of 120 litres per second or more. Listing Notice 3, Activity 12: The clearance of an area of 300 square metres or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a maintenance management plan. (Presence of endangered ecosystem within portions of the footprint) **National Water Act, 1998:** S21(c&i) – within 100m riparian buffer.
Topsoil Stockpile	10ha – will be placed in area previously approved for clearance around the Discard Dump, as well as buffers around the	No higher than 5m. Where higher is required – erosion designs will be implemented.	24°55'15.64"S 30° 6'43.33"E	Clearance is not applicable, as this has already been approved as part of the Discard Dump Extension Environmental Authorisation, 2018.

Description	Footprint Size	Dimensions	Coordinates	Listed Activities triggered
	proposed TSF. Less than 1ha clearance will be required			

Please refer to the following figure for a schematic illustration of the activities listed above:

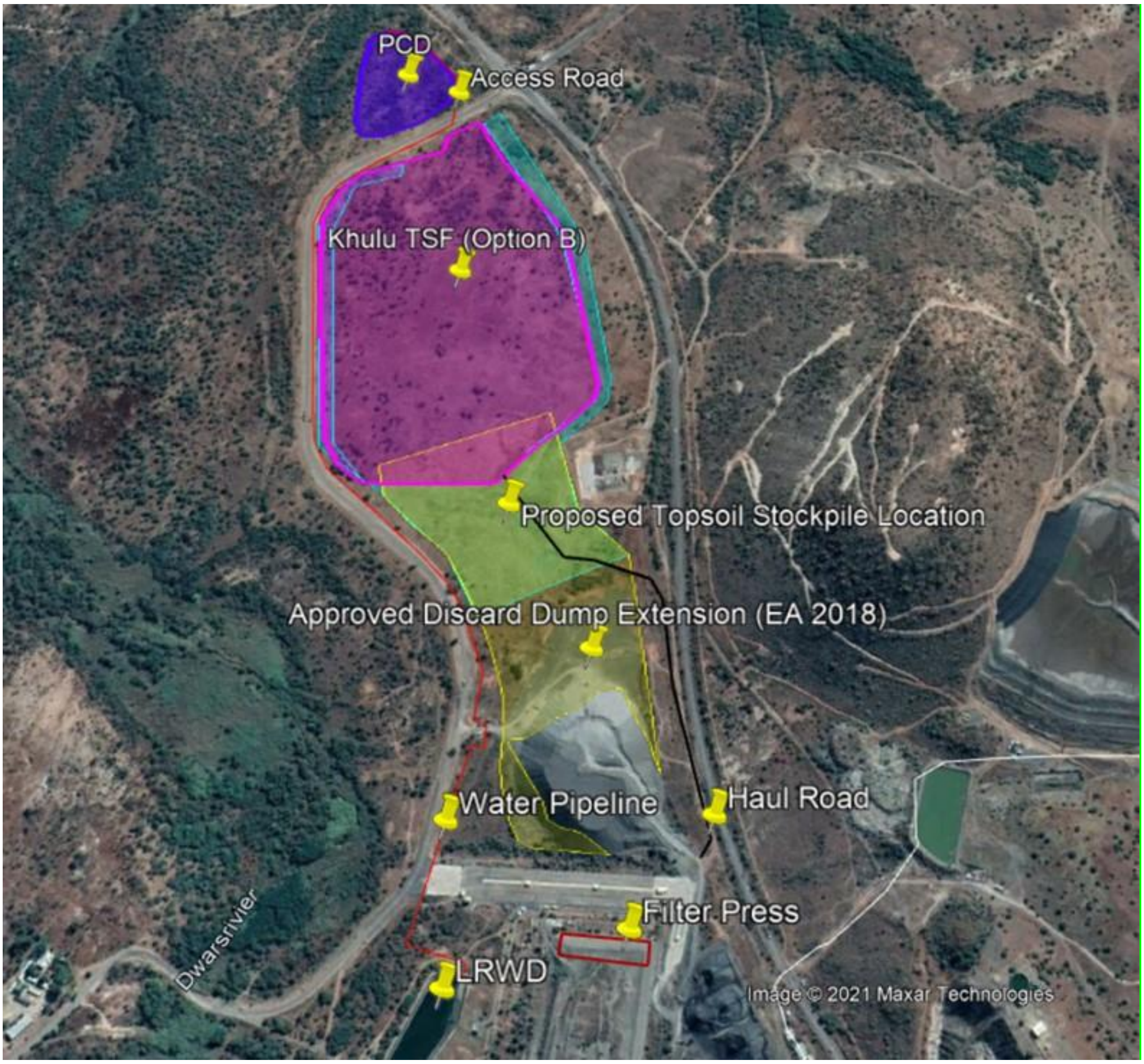


Figure 7: Schematic layout of activities (Khulu TSF)

1.d.ii.1.c TSF Operational Considerations

The new Khulu TSF is required to store the tailings produced by the Plant for a period of 25 years. Based on input provided by Dwarsrivier Mine, tailings will be generated at an average rate of approximately 34 000 tons per month. Tailings will be pumped as slurry with a density of 1.3 t/m^3 from the Plant to a Filter Press where the tailings will be dewatered. The dewatered tailings will be transported from the Filter Press to the TSF using trucks. The tailings will be placed and compacted on the TSF at a final dry density of approximately 2.03 t/m^3 .

The following tailings properties were used in the preliminary design of the infrastructure:

- Final placement dry density – 2.03 t/m^3
- Specific gravity – 3.53 t/m^3
- Angle of repose – 26.9°
- Cohesion – 0 kPa

- Friction angle - 36°
- Tailings permeability – 1.3 x 10-6 m/s

1.d.ii.1.d TSF Design Specifications

Undermining of the TSF

The depth to the underground resource under the proposed TSF footprint varies from 100m on the eastern side of the TSF to 200m on the western side. The impact of the TSF on the future mining was not raised as a concern, and will be taken into account with the design of the future mining activities under the TSF.

Life of Facility and Deposition Requirements

The life of the TSF was estimated to be approximately 21 years based on the placement dry density of 2.03 t/m3 and average tailings production / deposition rate of 34 000 tons per month.

Height and Slope

The height of the TSF was limited to allow sufficient space for operational plant to safely manoeuvre at the top of the facility. A safety berm will be provided along the crest to provide a physical demarcation of the edge of the TSF and to direct stormwater runoff to the down chutes. The TSF was modelled with a side slope of 1V:3H with 5 m wide benches provided at 10m height intervals. The resulting average slope of the TSF is 1V:3.5H.

The maximum height of the TSF is approximately 42m.

Footprint Area

The footprint of the TSF (excluding surrounding infrastructure) will be approximately 22.5ha .

Basin Preparation and Storm Water Management

The basin will be prepared by removing 300mm of topsoil, and compaction of the i*n situ* material to 90% of modified AASHTO maximum density at Optimum Moisture Content (OMC). The TSF footprint in the northeast of the site is eroded and will be filled to level the basin using selected granular material compacted to 93% of modified AASHTO maximum density at OMC. A berm will also be constructed along the toe of the TSF. The berm will serve as a boundary for placing the tailings during operation. An anchor trench will be excavated on top of the berm to anchor the high-density polyethylene (HDPE) geomembrane.

In addition, a system of berms will be constructed with the tailings within the basin. The purpose to these berms will be to create paddocks for the collection of stormwater in order not to damage the lining system as a result of erosion.

Liner Specifications

The liner design caters for collecting seepage in dedicated drains above and below the TSF and PCD liners. Provision is made to capture all seepage in these drains and to transfer the seepage to the PCD. Thus, while the liners are functional, no significant seepage to the aquifers is anticipated.

The facility will be constructed with a Class C lining system. The liner comprises of the following:

- 2 x 150 mm thick clay layers compacted to 98% Proctor Density at OMC
- 1.5 mm thick HDPE geomembrane
- 150mm thick sandy protection layer (tailings) The protection layer protects the geomembrane from damage during construction and initial deposition of tailings.

The service life of the geomembrane is highly dependent on the service temperature that the geomembrane is exposed to. Based on Koerner *et al.*,the geomembrane goes through 3 stages of deterioration (deemed stages A, B and C). The total service life of the geomembrane exposed to a particular service temperature is then calculated by adding the individual service life for each stage. The service life of a geomembrane exposed to temperatures of up to 40°C (degrees Celsius) is around 69 years. However for temperatures of around 20°C the service life of a geomembrane increases to around 446 years . Estimating the service life of a geomembrane that is exposed to different temperatures over its life is not straightforward.

If the entire basin is developed initially a relatively large portion of the geomembrane will be left relatively exposed (only covered by the protection layer) during the initial period (roughly 1 to 2 years assuming a 1m layer is filled initially over the TSF area of 225,000m^2). For the period when the geomembrane is only covered by the protection layer the service temperatures could reach around 40°C. However once covered by the tailings the service temperature on the geomembrane can be expected to be below 20°C. Assuming that the geomembrane life will be determined by the 40°C for stage A (This is probably underestimated as the geomembrane is only expected to be exposed for not more than 2 years) and then by temperatures of 20°C or less for stages B and C the life of the geomembrane can be estimated to be at least 280 years.

Table 12: Liner Specification

TSF Liner type	**Class C (Type 3 waste):** 2 x 150mm thick clay layers compacted to 98% Proctor Density at OMC 1.5mm thick HDPE geomembrane 150mm thick sandy protection layer (tailings) Above and below liner drainage and toe drains Possible seepage rate through liner: 24 – 2685 litres/ha/day Life of geomembrane: 69 years if exposed; 280 years if covered
Pollution Control Dam (PCD) design	Max volume: 24 000m^3 to a maximum of 49 900m^3 Maximum excavation depth: 8.6m Maximum dam depth: 6m **Class C liner:** 1.5mm HDPE geomembrane 2 x 150mm compacted clay layers Below liner drainage spaced 30m apart Possible seepage rate through liner: 467 litre/ha/day Life of geomembrane: 69 years

Basin Drains

Above Drains and Toe Drains

The basin is provided with above liner drains, to prevent the build-up of pore pressures on the liner, and below liner drains to collect any possible seepage through the liner as a result of defects in the lining system.

The above liner drains and toe drain are provided to prevent the build-up of pore pressure on the TSF lining system. Water collecting on the liner will report to the drains and ultimate will report as seepage from the drains into the concrete lined stormwater canal around the perimeter of the facility. Details of the above liner drains are provided on Drawing No. I031- 10-002. The TSF will be developed by depositing dewatered tailings from the Filter Press where most of the water will be removed. It was indicated by Enprotec (consultant responsible for the design of the Filter Press) that the dewatered tailings will be produced with a moisture content of around 12% which is close to OMC. Based on laboratory test results the OMC was measured to be between 11% and 13%. Assuming no significant moisture losses the tailings will be placed and compacted on the TSF at OMC. The tailings will therefore be placed with a saturation of roughly 60%. It is therefore anticipated that the moisture in the tailings will stay as interstitial water or will evaporate after the material has been placed and compacted, with virtually no seepage water reporting to the invert of the TSF and collected by the above liner drainage system. A proportion of the rain falling on the TSF will result in surface run-off that will report directly to the dirty water canal provided around the TSF. The remaining proportion will either evaporate or infiltrate the TSF. Due to the relatively low permeability of the tailings, and the fact that the tailings is not saturated, it is anticipated that most of the infiltrating stormwater will not report to the invert of the TSF and will therefore also not report as seepage from the facility. A small proportion of the infiltrating stormwater may report to the above liver drains as seepage. The above liner drains are spaced at approximately 120 m and will consist of the following in order of placement above the Class C liner waste protection layer (refer to Drawing No. I031-10-002):

- Class 1 non-woven separation geotextile to GRI GT13(a).
- 160mm diameter perforated HDPE pipe (PE100 PN25) surrounded by 19 mm stone (outlet section consist of a solid pipe).
- 125mm thick pea gravel layer.
- 150mm thick filter sand layer.

- 200mm thick tailings protection layer.

The grading of the various materials from part of the drainage system is based on the criteria for a natural drain so that the finer material does not wash into the adjacent coarse material which could end up clogging the drainage pipe. The filter design was undertaken based on Legge (1995) and Nortje (1997). A layer of coarse tailings will be placed over the drains to ensure that during construction and during the initial stages of deposition, the drains do not wash away during storms. The above liner drains will follow the natural topography with slopes typically varying between 0.3% and 3.5%. The above liner drains and the toe drain will discharge into the concrete lined stormwater canal that will be provided around the perimeter of the TSF (refer to Drawing No. I031-10-001). The outlet sections of the drainage pipes will consist of solid HDPE that will connect to the perforated pipe near the toe and will convey any seepage from the TSF basin to the dirty water canal (refer to on Drawing No. I031-10-002). A toe drain is provided around the toe of the TSF to ensure that no pore pressures build up along the toe of the TSF side slope that could negatively impact the stability of the facility (refer to Drawing No. I031-10-001). The composition of the toe drain is the same as that of the above liner drains. The outlets of both the above liner drains and the toe drains must be monitored for seepage during operation.

Below Liner Drains

During the geotechnical investigation (refer to Section 1.g.v.3.c) no seepage or water table was encountered in any of the test pits. Boreholes drilled on site by others recorded a water table at depths of just over 10m. It is however not clear whether the water table has been affected by the mining operations near the site. Indications are that no ground water will be collected in the below liner drains. The purpose of the below liner drains is therefore to collect any leakage (seepage) through the lining system.

The below liner drains will comprise of the following in order of placement up to the clay layers at the bottom of the lining system as shown on Drawing No. I031-10-002:

- Class 1 non-woven separation geotextile to GRI GT13(a).
- 110 mm diameter perforated HDPE pipe (PE100 PN25) surrounded by a 250 mm thick layer of 19 mm stone.
- 150 mm thick layer of pea gravel.
- 100 mm thick layer of filter sand.

Similar to the above liner drains, the below liner drains were positioned across the basin to allow for them to slope and drain towards the dirty water canal provided on the outer perimeter of the TSF. The below liner drains were positioned at roughly the same spacing but halfway between the location of the above liner drains (refer to Drawing No. I031-10- 001). The below liner drains will also drain directly into the concrete lined stormwater canal. The outlets will need to be monitored for both seepage rates and water quality. Flow from the outlets will provide an indication of possible leakage through the liner system or ground water pressure build up below. The drains will have separate outlets to identify the area with a possible defect in the lining system.

Seepage Rate

Based on a good construction the seepage through the liner was estimated to be 24 litres per hectare per day (l/ha/d). However the leakage rate could increase to a value of 2,685l/ha/d if proper quality control is not implemented and the liner system is constructed poorly. This highlights the importance of implementing good quality control and quality assurance systems during construction.

<u>Access Ramp</u>

An access ramp will be provided for the trucks transporting the tailings to the TSF. The access ramp is incorporated on the side of the TSF and will form part of the final TSF geometry as shown on Drawing No I031-10-001. The design haul vehicle is a 30 t articulated dump truck (ADT) which has an overall width of 3.34m. The access ramp has an overall width of 22 m and incorporates two 6 m wide lanes, safety berms and stormwater side drains. The ramp has a maximum slope of 1V:10H and is a continuation of the haul road, starting at the southeast corner of the TSF.

The following table presents the typical considerations in the operational setting of the proposed facility.

Table 13: Operational Setting for each site alternative

Discussion	Site B
Height of TSF (m)	42
Area (ha)	22.5
Clean water diversions	5 000m^3 excavation 1 000m concrete lining
PCD	3ha at 49 000m^3
Return water pipeline & pumping	2 100m length, 18m static head
Deposition rate (t/month)	34 100
Methodology	Tailings piping to Filter Press and from there the dry material will be deposited onto the new TSF. Overall dimension of the filter press planned at 65m x 100m (including temporary stockpile). The temporary stockpile will be a capacity of 3 600t (three days' supply). Return water pipeline will be in place from Filter press to the Plant or to the proposed PCD.
Final Side Slope	1:3
Duration to required capacity	21 years
Liner	Class C liner – Type 3 Waste

1.d.ii.1.e Pollution Control Dam Specifications

A PCD is provided to collect dirty runoff and any seepage from the TSF. The PCD will be located on the northern side of the TSF, on the other side of the existing Richmond road. The dam location is constrained by various infrastructure and a property boundary. The mine property boundary with TRP Mine constrains the PCD to the west. Existing Eskom powerlines constrain the PCD along the east and on the south the PCD is constrained by the Richmond road. An existing distribution powerline stretches across the proposed footprint of the PCD and must be diverted for the construction of the dam.

A dam with a capacity to store approximately 24,000m^3 was found to be adequate for managing stormwater generated from the TSF provided the water level in the dam is managed by pumping to another facility on the mine.

Two pumps, one operational and one standby, will be provided to pump the water from the PCD. Each of the pumps will be capable of pumping about 100 l/s to manage the water level in the dam to ensure that the probability of spillage does not exceed 2%. The operational pump will begin pumping when the water level in the dam reaches a level that corresponds to 75% of 24,000m^3. The pumping will continue until the water level reaches a volume that corresponds with 10 % of the stored volume (2,400m^3). The second pump is not required for managing the water level and will only be provided as a standby for use when the operational pump breaks. The water balance was undertake based on the assumption that the pumps will operate (start and stop) automatically. For improved water management on site additional storage over and above the capacity (24,000m^3) has been allowed for to manage the stormwater from the TSF. The PCD has therefore been designed with a capacity to store approximately 49,900m^3 . The additional 25,900m^3 is available to be used for other mine operational requirements.

A new service road will provide access from the existing Richmond road to the PCD and the pump station.

The natural ground at the location of the PCD slopes relatively steeply to the north. Due to this, the PCD is in cut on the southern side with a dam wall required on the northern side. The maximum wall height, measured from the crest to the toe on the downstream slope is approximately 6.4m high. The maximum excavation depth on the southern side is approximately 8.6m. The PCD wall crest is 3m wide and slopes to the outside at a 1% fall. The embankment has an upstream slope of 1V:4H and a downstream slope of 1V:3H. The maximum depth inside the dam measured from the lowest basin invert level to the full supply level (FSL) is approximately 6m. The dam storage capacity at FSL is 49,900m^3 . The non-overspill crest is 900mm above the FSL.

<u>Dam Safety Outcomes</u>

Section 117(c)(i) of the NWA provides the criteria that must be met for a dam to be classified as a 'dam with a safety risk' as follows:

1) A volume of more than 50 000m^3 ;

2) A wall height of more than 5m measured as the vertical distance from the lowest downstream ground elevation to the non-overspill crest (NOC) of the dam wall.

The first criteria is not met by the proposed PCD and based on that the dam does not meet the requirements to be classified as a dam with a safety risk. The freeboard assessment for this dam was however conducted based on the requirements for a Category I dam.

Liner System

The PCD is designed with a Class C barrier, which consists of a single composite liner consisting of a1.5 mm HDPE geomembrane overlying 2 x 150mm compacted clay layers and a leakage detection system. A HDPE geomembrane that complies with SANS 1526 Edition 3 of 2015 and GRI GM13 of 2016 will be installed according to SANS 10409 Edition 1 of 2005. The service life of the geomembrane is highly dependent on the service temperature. Because the geomembrane will be covered with a ballast, the estimated lifetime of the liner was estimated to be 69 years, assuming the service temperature is 40°C 11 . The estimated life was found to be adequate, particularly because the geomembrane that will be installed on the PCD will be fairly accessible throughout the life of the dam and can be replaced if required. A ballast layer, consisting of 75 mm geocells filled with soilcrete will be constructed on top of the HDPE geomembrane to ensure intimate contact between the geomembrane and the clay layer below, and to prevent the geomembrane from floating. The ballast layer will also function as a protection layer against the sun and will protect the geomembrane from mechanical damage. A Class 800 non-woven protection geotextile that complies with GRI GT12(a) will be installed between the geomembrane and the geocells ballast layer (refer to Drawing No. I031-20-001). At both the inlet to the dam and at the spillway section the geocells will be filled with 15 MPa concrete to provide additional protection against erosion from inflows and outflows respectively (refer to Drawing No. I031-20-001).

Below Liner Drainage

A drainage system will be installed below the liner to collect seepage should the liner system be compromised and also to relieve possible pressure build-up under the liner. Water collected in the drainage system will drain to a leakage detection manhole that will be provided next to the dam. The manhole should be regularly monitored for seepage rate and water quality, which could be an indication that the liner is leaking or that there is a pressure build-up from ground water. Water in the manhole will be pumped back into the PCD. The drainage system consists of a perimeter drain along the toe of the embankment and cut slope and herringbone drains draining toward the middle of the basin

Leakage Rate

It is reasonable to assume that there will be good contact between the geomembrane and the clay layer below due to the presence of a ballast layer. The expected leakage rate was estimated to be 467 l/ha/day.

Inlet into the PCD

Stormwater generated from the TSF will be collected in a dirty water canal provided around the TSF. The canal drains to a silt trap to allow suspended solids to settle out. Flow from the silt trap drains to the PCD via an inlet channel that crosses the Richmond road by means of a culvert. The inlet canal and associated culvert have been designed to pass the peak discharge of $8.63m^3/s$ that will be generated during a 1 in 50 year storm event. The inlet canal section between the culvert and the PCD is trapezoidal in shape and has an invert width of 8 m and 1V:4H side slopes.

Pumping System

A pumping system is provided at the PCD to manage the water that will collect in the dam. The level in the PCD will be managed by pumping water to the existing Lower Return Dam (Lower RWD). The alignment of the pipeline between the PCD and the Lower RWD is shown on Drawing No. I031-00-001. The HDPE pipeline between the PCD and the Lower RWD is 2.1km long. A 350mm diameter steel intake pipe will be installed between the pump station and the concrete inlet structure in the dam. A 20m x 20m platform is provided north of the PCD for the installation of the pumps and a sump that will collect any flow from the below liner drainage system. Access to the pump station terrace will be via a new access road that will be provided to join to the existing Richmond road. The pumpstation terrace will be slightly below natural ground. An outlet channel will be constructed to drain the pumpstation terrace. For details of the PCD, the pumpstation terrace and the associated drain outlet channel refer to Drawing No. I031-20- 001. A DN355 PN10 HDPE pipe was found to be sufficient to convey water from the PCD to the Lower RWD. The pipeline alignment starts at the pumps and is aligned along the PCD service road. The pipeline crosses the Richmond road at the location of the new culvert that will be constructed across the Richmond road. The route then turns to the southern side and is aligned on the western side of the TSF. Past the TSF the pipeline is then placed next to but outside the Richmond road servitude. The pipeline then crosses the entrance to the discard dump and the entrance to the truck park before turning east to the discharge point at the north-eastern corner of the Lower RWD. The pipeline will be installed above ground except at road crossings where the pipe will be installed either through a sleeve of buried. For the alignment of the pipeline refer to Drawing No. I031-20-001.

1.d.ii.1.f Roads

Haul road

A 1km haul road will be provided between the TSF and existing mine roads for the hauling of tailings from the new Filter Press (refer to Drawing No. I031-00-001 - Annexure 4). The haul road will be operated clean, and run-off generated from the haul road will be allowed to drain into the clean environment. The road will be 5m wide to allow access for one-way 30 ADT traffic. Two bypass sections of at least 90m in length are provided to allow for passing opportunity along the road alignment. A number of stormwater culverts will be provided across the haul road where required to allow stormwater drainage from the upstream eastern side to drain across the haul road.

Service road

A 5 m wide gravel road- will be provided around the perimeter of the TSF for light delivery vehicle (LDV) access. However, the service road will occasionally be used by an ADT to access the silt trap platform. A layout of the access road around the TSF is shown on Drawing No. I031-10-001.

1.d.ii.2 Project 2: Diesel and Emulsion Batching

The mine currently has an approved allocation for the storage of 386m^3 of dangerous goods (diesels and other hydrocarbons). Storage is currently approved in the following areas:

- Farm Dwarsrivier 372KT RE: North Shaft Fuel and Oil Storage.
- Farm Dwarsrivier 372KT RE: North Shaft Underground Fuel Supply.
- Farm Dwarsrivier 372KT Portion 1: South Mine Bulk Fuel and Oil Storage.
- Farm Dwarsrivier 372KT Portion 1: South Mine Main Stores Fuel and Oil Storage.
- Farm Dwarsrivier 372KT Portion 1: Plant Workshop.

As the underground mining progresses in line with the approved Mining Works Programme, it is required that the surface infrastructure be adapted to suit the development of the mining operations. The surface developments are undertaken to provide efficient and safe operation from a life safety, environmental safety and cost effective operation perspective. Given the current area of operation at South Shaft and considering the following five (5) year mining plan, the need to consider additional off-loading and bulk Storage of Emulsion and Diesel closer to the immediate work area to a surface position over current strikes at the South Shaft decline have arose. The mine therefore identified the need to erect two (2) batching areas, for diesel and emulsion batching, respectively, to supply diesel and emulsion to the underground mining operations. The location of the diesel and emulsion batching areas are to the north-east of the old Two Rivers Platinum Mine (TRP) Tailings Storage Facility, with the Diesel Batching area just south of the new TRP Tailings Pipeline and the Emulsion Batching area just north of the pipeline. The project will include:

- Diesel Batching Area:
    - Construction of an access road, approximately 55m in length and 6m in width, to the Diesel Batching Area;
    - Due to the imposed limitations of the Mine Health and Safety Act (Act No. 29 of 1996) that limits the storage of hydrocarbons to three (3) days of operation, the majority of the diesel, hydraulic oil and lube oil required will be stored at surface in a purpose designed and constructed terminal that provides the necessary life safety and environmental safety required. The project will involve the storage of two (2) horizontal, aboveground diesel tanks of 33m^3 each (as well as a possible future 22m^3 tank), a 40m^3 API self-bunded tank (Isotainer) for Hydraulic Oil and a 20m^3 API self-bunded tank for Lube Oil. A total combined storage of 148m^3 is therefore required.
    - The product description is:
        - Diesel – Fuel component for compression ignition powered automotive applications with UN number 1202 and CAS-No 68334-30-5. It is combustible and releases very low volumes of vapours.

- Hydraulic Fluid – as a lubricant or additive and also for use in hydraulic systems with CAS-No. 64742-54-7 .
- Lube Oil – is a hydrocarbon used for purposes of lubrication of moving parts with CAS-No. 68784-26-9.

- Emulsion Batching Area:
  - Construction of an access road, approximately 80m in length and 6m in width, to the Emulsion Batching Area.
  - No emulsion will be stored at the surface location and all product decanted will be stored underground at a purpose built depot located at Strike N15G/ N17A. The surface location will be used for the express purpose of transferring emulsion from a designated road tanker, via the off-loading pipeline to the underground storage tanks.
  - The product is an Ammonium Nitrate emulsion intermediate fluid that is used for preparing blasting explosives. The trade name is DDSTM Emulsion provided by SASOL/ Enaex with UN number 3375 and an average specific gravity of 1.35. It is an oxidant classified as class 5.1 and is stored away from combustible materials.
  - The mine intends storing a total of sixty (60) tons (similarly 60m^3) of Emulsion product underground, with no surface storage being done and, no pipeline inventory required.
- General:
  - Parking and offloading areas, with security offices at both areas (no dangerous good storage is planned to take place at any time);
  - Other internal roads will be required to access the various pipelines.

- The Diesel and Emulsion Batching Areas will feed into pipelines for underground use at both areas.
- Clearance of indigenous vegetation will be required in the order of approximately 5ha (including Diesel and Emulsion Batching and the access road).

Figure 8: Diesel and Emulsion Batching Areas

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

Table 14: Project 2: Diesel and Emulsion Batching

Description	Footprint Size	Dimensions	Coordinates	Listed Activities triggered
Batching of diesel and emulsion to the underground via pipelines	5ha	• 80m and 50m access roads of about 6m in width. • Diesel Batching: aboveground diesel tanks of $33m^3$ each (as well as a possible $22m^3$ tank), a $40m^3$ API self-bunded tank (Isotainer) for Hydraulic Oil and a $20m^3$ API self-bunded tank for Lube Oil. A total combined storage of $148m^3$. • Emulsion Batching: 60 tons (similarly $60m^3$) of Emulsion product underground, with no surface storage being done and, no pipeline inventory required. • Feed into pipeline for underground use at both areas. Clearance of indigenous vegetation will be required in the order of approximately 5ha.	Diesel Batching: 24°56'54.50"S 30° 6'28.96"E Emulsion Batching: 24°56'44.16"S 30° 6'33.50"E	facilities or infrastructure, for the storage, or for the storage and handling, of a dangerous good, where such storage occurs in containers with a combined capacity of 80 cubic metres or more but not exceeding 500 cubic metres. (combined capacity of both facilities). <u>Listing Notice 1: Activity 27</u>: The clearance of an area of 1 hectare or more, but less than 20 hectares of indigenous vegetation (combined clearance). <u>Listing Notice 3, Activity 4</u>: The development of a road wider than 4 metres with a reserve less than 13,5 metres (due to presence of protected area within 5km). (Within 10km of a protected area) <u>Listing Notice 3, Activity 10</u>: The development and related operation of facilities or infrastructure for the storage, or storage and handling of a dangerous good where such storage occurs in containers with a combined capacity of 30 but not exceeding 80 cubic metres (Diesel Batching Area). <u>Listing Notice 3, Activity 12</u>: The clearance of an area of 300 square metres or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a maintenance management plan (Diesel Batching Area). (presence of engendered ecosystem within the footprints)

1.d.ii.3 Project 3: Main Parking Extension

The mine requires the expansion of the existing parking area at the Main Offices. The current parking area is about 0.8ha with the parking bays not sufficient to cater for the number of vehicles. The current parking bay comprises of a paved surface area and steel roof parking bays. The same principle will be applied at the expanded area. No new entrances will be required. The planned parking bay expansion will be located about 20m from the Springkaanspruit.

Clearance of indigenous vegetation will be required in the order of approximately 0.5ha.

Figure 9: Parking Bay Extension

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

Table 15: Project 3: Parking Bay Extension

Description	Footprint Size	Dimensions	Coordinates	Listed Activities triggered
Extension of existing Main Parking Area by 4 900m^2 within close proximately (20m) of the Springkaanspruit. No additional specific roads will be required, traffic will be managed within the overall parking bay layout.	0.5ha	The planned parking bay expansion will be located about 20m from the Springkaanspruit. Clearance of indigenous vegetation will be required in the order of approximately 0.5ha.	24°56'2.34"S 30° 7'22.70"E	<u>Listing Notice 1: Activity 12</u>: The development of- (ii) infrastructure or structures with a physical footprint of 100 square metres or more; where such development occurs- (a) within a watercourse; (b) in front of a development setback; or (c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse. <u>Listing Notice 1: Activity 48</u>: The expansion of infrastructure or structures where the physical footprint is expanded by more than 100m2 or more, where such expansion occurs within a watercourse or within 32m of a watercourse. <u>Listing Notice 3, Activity 12</u>: The clearance of an area of 300 square metres or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a maintenance management plan. (presence of engendered ecosystem within the footprints) <u>Listing Notice 3, Activity 14</u>: The development of— (xii) infrastructure or structures with a physical footprint of 10 square metres or more; where such development occurs— (a) within a watercourse; (c) if no development setback has been adopted, within 32 metres of a watercourse, measured from the edge of a watercourse. <u>National Water Act, 1998:</u> Section 21(c) & (i) water use

1.d.ii.4 Project 4: Widening of Access Road between South Shaft/Main Offices and Plant

An existing road provides access between the Main Office Buildings and the Plant. This road crosses the non-perennial Springkaanspruit. The crossing is approved in terms of the 2011 WUL issued by the DWS to the mine. No changes to the river crossing will be required as part of this project.

The current width of the road ranges between 5m and 6m. The mine is planning on increasing a section of 700m of this road to a width of 16m to allow for two-way traffic. The purpose is to improve the safe operation of traffic on this road.

Clearance of indigenous vegetation will be required in the order of approximately 0.3ha.

Figure 10: Widening of Access Road

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

Table 16: Widening of existing road

Description	Footprint Size	Dimensions	Coordinates	Listed Activities triggered
An existing road provides access between the Main Office Buildings and the Plant. The current width of the road ranges between 5m and 6m. The mine is planning on increasing a section of 700m of this road to a width of 16m to allow for two-way traffic. Clearance of indigenous vegetation will be	0.3ha	The mine is planning on increasing a section of 700m of this road to a width of 16m to allow for two-way traffic.	Start 24°55'51.77"S 30° 6'58.99"E End 24°55'59.12"S 30° 7'17.29"E	<u>Listing Notice 1: Activity 48</u>**:** The expansion of infrastructure or structures where the physical footprint is expanded by more than 100m^2 or more, where such expansion occurs within a watercourse or within 32m of a watercourse. (This is a potential activity, as the expansion will commence after the existing road crossing over the Springkaanspruit.) <u>Listing Notice 3, Activity 12</u>: The clearance of an area of 300 square metres or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a maintenance management plan. <u>Listing Notice 3: Activity 18</u>: The widening of road by more than 4m, or the lengthening of a road by more than 1km. (within 100m from a watercourse; within 5km from a protected area)

Description	Footprint Size	Dimensions	Coordinates	Listed Activities triggered
required in the order of approximately 3 311m^2.				

1.d.ii.5 Project 5: Access Crossing between Plant and North Mine (Subway Crossing)

To ensure more optimal logistical management of traffic between the South Mine, where the Plant is located, and the North Mine, and to reduce the number of vehicles on the regional road, the mine is planning on constructing a road under regional road bridge to allow for access between the two areas.

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

Table 17: Project 5: Access Crossing between Plant and North Mine

Description	Footprint Size	Dimensions	Coordinates	Listed Activities triggered
The mine is planning on constructing a road under the regional road bridge to allow for access between the two areas. Clearance of indigenous vegetation will be required in the order of approximately 0.2ha.	0.2ha	Length of about 120m underneath existing regional road. Width not to exceed 12m.	24°55'56.30"S 30° 7'22.34"E	<u>Listing Notice 3, Activity 4</u>: The development of a road wider than 4 metres with a reserve less than 13,5 metres. (within and CBA, 100m from a watercourse; within 5km from a protected area) <u>Listing Notice 3, Activity 12</u>: The clearance of an area of 300 square metres or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a maintenance management plan. (within an CBA and small portion within Endangered Ecosystem) <u>National Water Act, 1998:</u> Section 21(c) & (i) water use

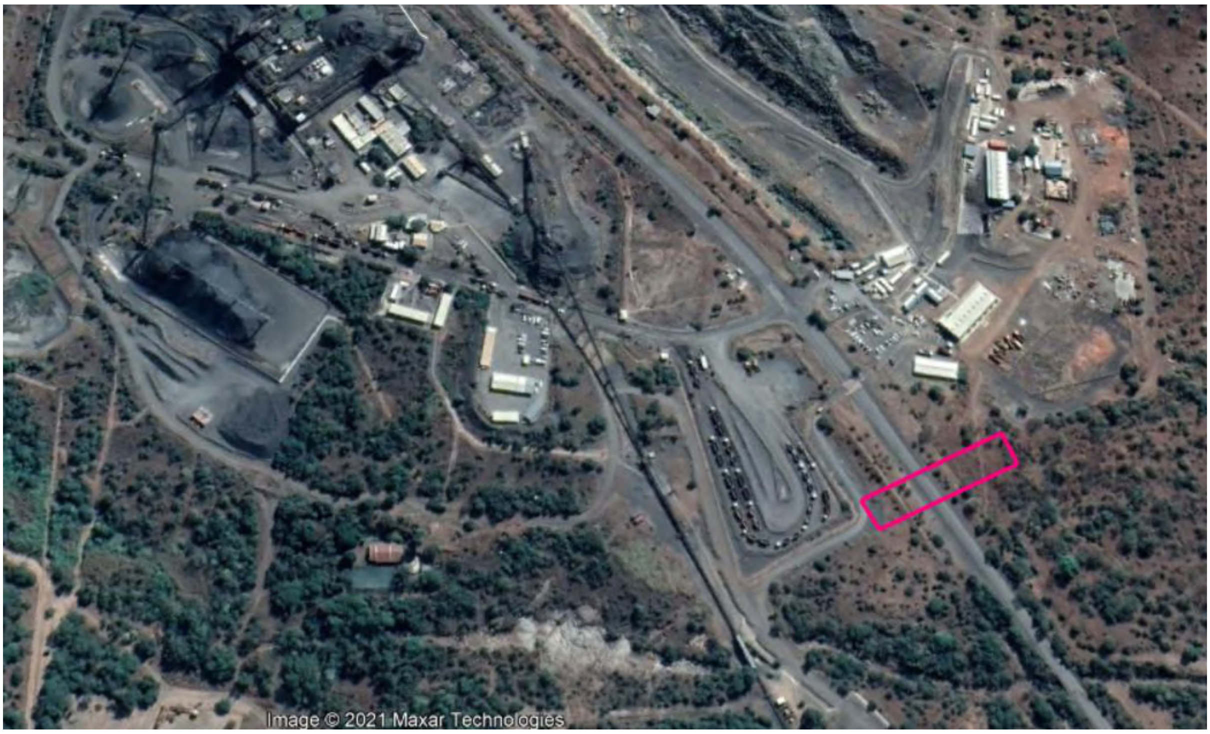


Figure 11: Subway Crossing layout

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

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

- Planning Phase:
  - Ensure the implementation of Legal Requirements (Environmental Permits and Authorisations)
- Construction Phase:
  - Demarcation and identification of protected species
  - Land and footprint clearance
  - Topsoil stripping and stockpiling
  - Establishment of surface infrastructure
  - Waste management
- Operational Phase:
  - Operation of TSF and associated PCD
  - Operation of road and parking infrastructure
  - Operation and use of Diesel and Emulsion Storage and Supply
  - Transportation (roads)
  - Operation of infrastructure and roads
  - Water management
  - Dust suppression
  - Waste management
- Closure Phase:
  - Ensure the implementation of Legal Requirements (Environmental Permits)
  - Rehabilitation of TSF and associated PCD
  - Dismantling of pipelines and associated soil remediation where required
  - Dismantling and decommissioning of infrastructure and buildings, including product stockpiles
  - Earth moving, shaping and ripping of soils
  - Cessation of Labour Contracts
  - Waste Management

1.e Policy and Legislative Context

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

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

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

Table 18: Policy and Legislative Context

Applicable Legislation and Guidelines Used To Compile The Report	Reference Where Applied	How Does This Development Comply With And Respond To The Legislation And Policy Context
The Constitution of South Africa (Act No. 108 of 1996)	Sustainable development is relevant to all projects.	The Constitution reigns supreme and the advancement of human rights is one of the foundations of South Africa's democracy. Furthermore, the Bill of Rights plays a central role in the democratic regime because it embodies a set of fundamental values which should be promoted at all times. An environmental right is contained in Section 24 and is, arguably, the cornerstone for environmental governance in South Africa, which includes the mining industry. Section 24(a) proclaims the right of everyone "to an environment that is not harmful to their health or well-being". Mining companies are thus duty-bound to constitutional, legislative, and other measures to prevent pollution and ecological degradation, promote conservation and to develop in a sustainable manner. The Constitution cannot manage environmental resources as a stand-alone piece of legislation, hence additional legislation has been promulgated in order to manage the various spheres of both the social and natural environment. Each promulgated Act and associated Regulations is designed to focus on various industries or components of the environment to ensure that the objectives of the Constitution are effectively implemented and upheld on an on-going basis throughout the country. In terms of Section 7, a positive obligation is placed on the State to give effect to the environmental rights.
National Legislation		
National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA)	This Draft EIA & the EMPr	In respect of the Listed Activities in terms NEMA, Section 24F(1)(a) of NEMA stipulates the following: ***"no person may- commence an activity listed or specified in terms of section 24(2)(a) or (b) unless the competent authority or the Minister of Minerals and Energy, as the case may be, has granted an environmental authorisation for the activity..."*** Section 24F is clear in its prohibition that only those "***listed or specified***" activities may not commence without prior Environmental Authorisation. Consequently, the activities to be conducted by the Mine will only trigger Environmental Authorisation requirements when these said activities trigger a listed or specified activity referred to in Section 24F. Furthermore, note that the law is clear in that NEMA and its Regulations ***do not have retrospective working***. Accordingly, in terms of the various Listing Notices promulgated since 1997, it is paramount to link the commencement date of the specific activities with the corresponding Listed Activities. There are currently five sets of EIA Regulations which govern potential Listed Activities. The focus should be on if ***and when*** a Listed Activity was commenced with in terms of the specific Regulations; i.e.: - Environmental Conservation Act, 1989 (ECA) Listed Activities, promulgated in terms of the ECA (effective between 08 September 1997 and end of day 09 May 2002); - ECA Listed Activities, promulgated in terms of the ECA (effective between 10 May 2002 and before end of day 02 July 2006); - The 2006 EIA Regulations, 2006 Listing Notice 1 and 2006 Listing Notice 2 (effective between 03 July 2006 and end of day 01 August 2010); - The 2010 EIA Regulations, 2010 Listing Notice 1, 2010 Listing Notice 2 and 2010 Listing Notice 3 (effective between 02 August 2010 and end of day 07 December 2014.); and - The 2014 EIA Regulations, 2014 Listing Notice 1, 2014 Listing Notice 2 and 2014 Listing Notice 3 (commencement date 08 December 2014, as amended in April 2017). Accordingly, an activity must be assessed in terms of the specific Regulations applicable at the time of commencement of the specific activity.

Applicable Legislation and Guidelines Used To Compile The Report	Reference Where Applied	How Does This Development Comply With And Respond To The Legislation And Policy Context
		EnviroGistics undertook a detailed review of the listed activities according to the proposed project description to assess the listed activities that are considered applicable. The assessment was undertaken in line with the 2017 EIA Listed Activities. An integrated Environmental Authorisation in terms of the NEMA and NEMWA is required. The EIA Application fee of R15 000 was paid to the DMRE on 8 July 2021. An Application for Environmental Authorisation was couriered to the DMRE on 12 July 2021. The DMRE acknowledged the application on 11 August 2021. (Refer to Annexure 1). *Under the One Environmental System (December 201), the Minister of Mineral Resources will issue environmental authorisations in terms of the NEMA for mining activities related to the primary extraction and/or primary processing of ore material. The Minister of Environmental Affairs will form the appeal authority.*
Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 1998) (MPRDA)	Existing Mining Right, amendments to activities and addition to infrastructure and activities on site.	Since 2004, the MPRDA has been the principal piece of legislation that regulates the South African mineral and petroleum sector. The MPRDA was enacted with the objectives of promoting local and rural development, ensuring equal access to minerals, and eradicating discriminatory practices in the industry, while still guaranteeing security of tenure to participants in the industry and increasing the industry's international competitiveness. Recent amendments to NEMA and the MPRDA have been published with the objective to align NEMA and the MPRDA authorisation processes as well as to provide for cooperative governance between the DMRE and the Department of Environmental Affairs (DEA) (now the Department of Forestry, Fisheries and Environment (DFFE)). The governing provisions in respect of EMPr's were removed from the MPRDA and incorporated into Sections 24N, 24O, 24P, 24Q, 24R and 24S of NEMA. The project does not entail any additional authorisation for mining rights in terms of the MPRDA. The surface infrastructure will be located within the approved mining area within Dwarsrivier Chrome Mine. No changes to the Mining Works Programme are required at this time, as Project 1 of this application will present information feeding into the need to potentially amend the Mining Works Programme.
National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) (NEMWA)	The NEMWA waste activities are not being triggered as part of this project. However, this legislation is considered in the development of waste management measures and assessing potential impacts.	The NEMWA fundamentally reformed the law regulating waste management, and for the first time provides a coherent and integrated legislative framework addressing all the steps in the waste management hierarchy. The objectives of the NEMWA are to protect health, well-being and the environment by providing reasonable measures for, *inter alia*, remediating land where contamination presents, or may present, a significant risk of harm to health or the environment. The objectives of the NEMWA are structured around the steps in the waste management hierarchy, which is the overall approach that informs waste management in South Africa. The waste management hierarchy consists of options for waste management during the lifecycle of waste, arranged in descending order of priority; i.e.: waste avoidance, reduction, re-use, recycling, recovery, treatment, and safe disposal as a last resort. NEMA, as previously mentioned, introduced a number of additional guiding principles into South African environmental legislation, including the life-cycle approach to waste management, producer responsibility, the precautionary principle and the polluter pays principle (i.e. the sustainability principles as contained in Section 2 of NEMA). Section 5(2) of the NEMWA stipulates that the Act should be interpreted and guided in accordance with these sustainability principles.

<table>
<tr><th>Applicable Legislation and Guidelines Used To Compile The Report</th><th>Reference Where Applied</th><th>How Does This Development Comply With And Respond To The Legislation And Policy Context</th></tr>
<tr><td></td><td></td><td>The NEMWA, furthermore, echoes the duty of care provision in terms of Section 28 of NEMA, by obliging holders of waste to take reasonable measures to implement the waste management hierarchy. Section 16(1) of the NEMWA provides that:

"A holder of waste must, within the holder's power, take all reasonable measures to –

a) avoid the generation of waste and where such generation cannot be avoided, to minimise the toxicity and amounts of waste that are generated;
b) reduce, re-use, recycle and recover waste;
c) where waste must be disposed of, ensure that the waste is treated and disposed of in an environmentally sound manner;
d) manage the waste in such a manner that it does not endanger health or the environment or cause a nuisance through noise, odour or visual impacts;
e) prevent any employee or any person under his or her supervision from contravening this Act; and
f) prevent the waste from being used for an unauthorised purpose."

When considering whether a "substance" is considered a "waste" or not, the definition of the NEMWA must be considered. The NEMWA defines "waste" as:

"Any substance, material or object, that is unwanted, rejected, abandoned, discarded or disposed of, or that is intended or required to be discarded or disposed of, by the holder of that substance, material or object, whether or not such substance, material or object can be re-used, recycled or recovered and includes all wastes as defined in Schedule 3 of this Act; or

Any other substance, material or object that is not included in Schedule 3 that may be defined as a waste by the Minister by notice in the Gazette."

This project will involve an Integrated Environmental Authorisations to apply for approval from both the NEMA and NEMWA.</td></tr>
<tr><td>The Hazardous Substances Act, 1973 (Act No. 15 of 1973) (HSA)</td><td>Management of Chemicals</td><td>All chemicals transported to and stored on site will be handled in accordance with the HSA and the applicable materials safety data sheets. A chemical log will be kept and all the necessary signage erected on site.</td></tr>
<tr><td>National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA)</td><td>Potential presence of heritage sites during construction and excavation activities.</td><td>Section 34 and 38 of the NHRA details specific activities that require an approved Heritage Impact Assessment by SAHRA.

A heritage permit will be required as a new road exceeding 300m in length will be constructed. In addition, more than 5 000m^2 of land will be cleared for the new mining operations, including the re-use of historic mines.

A heritage assessment was undertaken to comply with Regulation 38 of the NHRA. The SAHRA forms part of the Interested and Affected Parties (I&APs), and the draft EIA and EMPr will be made available for comment. According to the paleontological sensitivity of the study area indicated as insignificant and low on the SAHRA Paleontological map and no further studies are required in this regard.</td></tr>
<tr><td>National Water Act, 1998 (Act No. 36 of 1998) (NWA)</td><td>Establishment of facilities containing waste or water containing waste.</td><td>One of the main and ever-continuing concerns in South Africa is the sustainability of water management, and the costs associated with the prevention and remediation of pollution. The NWA is one of the government's answers to some of these challenges and functions as sectoral legislation within the framework of NEMA.

Section 19 of the NWA echoes the duty of care envisaged in Section 28 of NEMA and addresses the prevention and remediation of the effects of pollution. The NWA provides for a broad duty of care in that:

"(1) an owner of land, a person in control of land or a person who occupies or uses the land on which-</td></tr>
</table>

Applicable Legislation and Guidelines Used To Compile The Report	Reference Where Applied	How Does This Development Comply With And Respond To The Legislation And Policy Context
		a) any activity or process is or was performed or undertaken; or *b) Any other situation exists, which causes, has caused or is likely to cause pollution of a water resource must take all reasonable measures to prevent any such pollution from occurring, continuing or recurring."* The words "likely to cause pollution" broadens the scope of the duty, which enables an activity, or situation that is land-based, to trigger the application of the duty. The "reasonable measures" are not prescribed, but may include measures intended to: *"Cease, modify or control any act or process causing the pollution; comply with any prescribed waste standard or management practice; contain or prevent the movement of pollutants; eliminate any source of pollution; remedy the effects of pollution; and remedy the effects of any disturbance to the bed and banks of a watercourse."* The NWA, furthermore, provides for water use authorisations which a mine will have to apply for, before commencing with its primary activity of mining. Water uses that need to be licensed under Section 21 of the NWA include: a) Taking water from a water resource; b) Storing water; c) Impeding or diverting the flow of water in a watercourse; d) Engaging in a stream flow reduction activity; e) Engaging in a controlled activity; f) Discharging waste or water containing waste into a water resource through a pipe, canal, sewer, sea outfall or other conduit; g) Disposing of waste in a manner which may detrimentally impact on a water resource; h) Disposing in any manner of waste which contains waste from, or which has been heated in , any industrial or power generation process; i) Altering the bed, banks, course or characteristics of a watercourse; j) Removing, discharging or disposing of water found underground if it is necessary for the efficient continuation of an activity or for the safety of people; and k) Using water for recreational purposes. A new WUL process will be undertaken for the proposed activities, as well as all other existing activities for which technical amendments are require or which have bee approved in previous Environmental Authorisations, but not as yet in WULs. This project will involve the requirement for Section 21(c) & (i) and Section 21(g) water uses. No dam safety requirements will be triggered for the PCD.
National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) (NEMBA)	Relevant to protected tree removals, as well as to development within the CBA and threatened ecosystem areas.	The NEMBA addresses a number of issues related to biodiversity and how it should be protected and managed in undertaking development activities. The purpose of the NEMBA is to provide for the management and conservation of South Africa's biodiversity within the framework of the NEMA and the protection of species and ecosystems that warrant national protection. As part of its implementation strategy, the National Spatial Biodiversity Assessment (updated in 201 as the National Biodiversity Assessment) was developed. The operation has an approved permit to authorise actions and activities affecting Protected Trees (Ref: LP-SDM-2017-06-06-B). The Permit was valid up until 26 June 2018. For this project an ecological assessment has been undertaken to determine the sensitivity of the ecological setting. The necessary tree/ plant removal permits will be applied for. The DFFE is included as an I&AP and will also receive and opportunity to comment on the draft EIA and EMPr (comments were received on the draft Scoping Report). According to the Fetakgomo Tubatse Municipality Integrated Development Plan (IDP) 2016-2021, the largest proportion of land in the area (probably in excess of 80%) is natural environment. The mines, agriculture and urban development have barely encroached on these wilderness areas. The

Applicable Legislation and Guidelines Used To Compile The Report	Reference Where Applied	How Does This Development Comply With And Respond To The Legislation And Policy Context
		wilderness generally comprises of bushveld and sparse grassland in limited parts of the municipality. It is important to preserve the wilderness for posterity and harvest plant and animal species in a manner that preserve this habitat. For this reason, the IDP states that an investigation on the occurrence of Red Data Listed (RDL) species (Species of Conservation Concern (SCC)) in the area should be undertaken to identify any hotspots for conservation, as information on this aspect is lacking for the local municipality.
Municipal Plans		
Integrated Development Plan (IDP) (Final IDP/Budget 2020/2021 Consolidated IDP for the Fetakgomo Tubatse Local Municipality	Economic Development IDP Vision 2030: "A developed platinum city for the benefit of all"	The IDP states that in the medium to long term it is intended to create a more prosperous Fetakgomo Tubatse Local Municipality through provision of services, social cohesion and nation building, local economy and job creation, help to adapt to the changing climatic conditions, integrated communities, public participation and accountability, education, health, fighting against fraud and corruption. The IDP lists a number of statements, which includes: • Develop and Strengthen Local Economies for Job Creation • Improving Health in Rural Communities • Education • Building Spatially Integrated Communities • Improving Public Participation and Accountability The Municipal Mission Statements are: • Accountable through active community participation • Economic enhancement to fight poverty and unemployment • Render accessible, sustainable and affordable service • Municipal transformation and institutional development • Sustainable livelihoods through environmental management The IDP states that amongst others, opportunities offered by the local municipality include: (a) mining investment opportunity; (b) land availability opportunity; (c) tourism opportunity; (d) funding source opportunity from private sector; and (e) job creation opportunity from infrastructure investment. The IDP states clearly that with the exception of the creativity of people, mining still presents the largest opportunity in the area to a sustainable economic base whereby the local economy and the area is growing at a higher pace. Mining is regarded as an opportunity offered by the municipality, with the IDP stating that the mining activities and natural resources available in the area have created a definite potential to develop tourism and thereby to diversify the economic base of the municipality. The municipality will be able to develop sector plans, policies and by-laws which will be utilised for the planning of the area and regulate both the internal and external affairs.
Land Claims	According to the IDP	The following land claims exist on Dwarsrivier 372KT RE and Portion 1 of the RE: • Masha LA-Masha Lengwai community (KRP 12317) • Leshaba LB – Galeshaba Community (KRP 798) • Mashigwana KJ (4270) • Mashegoane M S (KRP 4270)

Applicable Legislation and Guidelines Used To Compile The Report	Reference Where Applied	How Does This Development Comply With And Respond To The Legislation And Policy Context
National Development Plan (NDP)	Local Municipality within the National and Provincial Planning Context	The IDP/ Budget proposes to argue that South Africa displays what could be seen or described as a "top-down, and, at the same time, bottom-up" process of development planning. The NDP is a plan for the country to encourage long term planning i.e. up to 2030. The municipality incorporates the long term visioning as espoused in the NDP. The following six pillars have widespread merits for strategic planning: - Unite all South Africans around a common programme to fight poverty and inequality and promote social cohesion; - Have South Africans be active citizens in their community and in the development of the country; - A growing and inclusive economy with higher investment, better skills, rising savings and greater levels of competitiveness; - Building capabilities of the people and the state; - A developmental state capable of correcting historical inequalities and creating opportunities for more people while being professional, competent and responsive to the needs of all citizens; and - South African leaders putting aside narrow sectarian interests in favour of national interest and putting the country first.
Limpopo Development Plan (LDP) 2015 - 2019	Support to the IDP	The strategy outline of the IDP draws linkages with reference to the Limpopo development objectives. As a corollary, the LDP (2015-2019) identifies the municipality under the platinum cluster due to its considerable potential and competitive advantage for economic cluster development. The municipality is also identified as a provincial growth point. Specifically, this Fetakgomo Tubatse Local Municipality and Musina Local Municipality were identified as Special Economic Zones. The entire planning outline of the IDP/ Budget is designed on the floor plan of the provincial and national contexts.

1.f Need and Desirability of the Proposed Activities

Currently Dwarsrivier Mine is serviced by approximately 1,200 permanent and 800 contractor employees. The majority of the employees are locals drawn from Lydenburg and villages around the mine, including Steelpoort Park, Kalkfontein and Buffelshoek.

As discussed in the previous section, and with specific reference to the Fetakgomo Tubatse Local Municipality IDP, mining is regarded as an opportunity offered by the municipality, with the IDP stating that the mining activities and natural resources available in the area have created a definite potential to develop tourism and thereby to diversify the economic base of the municipality. When one further considers the importance of chrome in the global market it should be noted that according to an article by S&P Global Plats, 6 March 2017 (https://www.platts.com/latest-news/metals/tokyo/strong-chrome-demand-to-hold-but-views-divided-26678512), "strong demand for chromite feedstock of ferrochrome will continue to hold on the back of robust Chinese stainless steel output, but views are divided on whether global supply will move into deficit due to constraints of South African production to meet that demand, industry sources told S&P Global Platts Monday". According to the article, "sources said there are two possible scenarios arising from South Africa trying to meet Chinese demand amid stagnated output: the market will be short on chrome ore supply as other global suppliers will not be able to fully meet China's demand, or China will reduce dependency on South African chromite supply and diversify to other resources." According to the Mining Weekly Online (http://m.miningweekly.com/article/strong-outlook-for-recovering-ferrochrome-industry-merafe-2017-03-08/rep_id:3861): "The Chinese economy, on which the ferrochrome and chrome ore markets are heavily dependent, grew by 6.7% year-on-year, underpinning pleasing growth in stainless steel production. Ferrochrome-using stainless steel production is projected to grow by 3.5% in 2017 and by 3.8% in 2018, which should be followed by increased ferrochrome demand."

In consideration of the above, the overall aim of the proposed activities is to improve the logistics on site, ensure a suitable supply of chrome for markets.

1.f.i Project 1: Khulu TSF

1.f.i.1 Operational Requirements

In consideration of the above, the overall aim of the proposed activities is to ensure that a well-designed tailings disposal system is operated on site to allow for the production requirements on site. The existing North TSF was designed to contain production tonnages for 23 years, with 29 000 tonnes for the first two (2) years of operation and the remaining twenty one (21) years at a deposition rate of 17 280 tonnes per month. It is anticipated that the existing North TSF will reach its full capacity within the next three (3) to five (5) years and therefore the need has arisen for a new TSF facility.

It is important to note that the proposed PCD was previously considered to be located on Portion 6 of the Farm Dwarsrivier, but its location has since be revised to fall on Portion 0 (RE) of the farm Dwarsrivier. This ensures that all infrastructure is located on the surface rights owned by the applicant.

The mine is further planning on changing the TSF technology of deposition to a filter press system. The filter press methods involve equipment used in liquid/solid separation. The filter press separates liquids and solids utilising pressure filtration. A slurry/slimes is pumped into the filter press and is dewatered under pressure. The filter cake will be deposited via trucks or a conveyor system onto the TSF, and water will be recirculated to the Plant or proposed PCD. The filter press will be designed based on the volume and type of slurry that needs to be dewatered.

This is currently considered the preferred technology, due to the reduction in water to be stored on the proposed TSF, and also the opportunity to recycle water through the Plant.

1.f.i.2 Economic Benefit

Regulation 23 of the MPRDA states in Section 1(a), that subject to subsection 4, the Minister must grant a mining right if the mineral can be mined optimally in accordance with the mining work programme. The mine has been awarded a Mining Right by the Department of Mineral Resources (DMR; now DMRE) and therefore has an obligation to give effect to the following:

- The ongoing development and improvement of the Mining Work Programme which details the planned mining activities to be followed in order to mine the mineral resource optimally; and
- Optimal mining of minerals must be undertaken, as the Minerals and Petroleum Board may recommend to the Minister to direct the holder of a mining right to take corrective measures if the Board establishes that the minerals are not being mined optimally in accordance with the Mining Work Programme. The Minister may, on the recommendation of the Board, suspend or cancel a mining right if the Minister is convinced that any act or omission by the holder justifies the suspension or cancellation of the right.

Dwarsrivier Mine is actively investigating opportunities for the continued and sustainable mining of chrome and other Platinum Group Metals (PGM) reserves and for the purposes of this project, the mine is also applying to remove dried tailings from the definition of a waste in terms of GNR 715, 18 July 2018. This will ensure further beneficiation on site and also as discussed below, reducing waste disposal on site.

1.f.i.3 Giving effect to Waste Reduction

Dwarsrivier Mine is authorised in terms of its EMPr, 2010 to rework/reprocess tailings.

The NEMWA lists in the Preamble to the Act the key principles underpinning the Act and these include:

"*and whereas sustainable development requires that the generation of waste is avoided, or where it cannot be avoided, that it is **reduced, re-used, recycled or recovered** and only as a last resort treated and safely disposed of;*

*and whereas the **minimisation of pollution and the use of natural resources** through vigorous control, cleaner technologies, cleaner production and consumption practices, and waste minimisation are key to ensuring that the environment is protected from the impact of waste;*

*and whereas waste under certain circumstances **is a resource and offers economic opportunities**;"*

It can clearly be seen in the highlighted phrases that the re-use and the placement of economic value on a waste which has the added benefit of diverting waste from landfill will be viewed favorably in terms of the aims of the Act. In addition to this, the 2020 National Waste Management Strategy (NWMS) is a legislative requirement of the NEMWA and gives effect to the objects of the Act. Organs of state and affected persons are obliged to give effect to the NWMS.

The Waste Management Hierarchy in the NWMS consists of options for waste management during the lifecycle of waste, arranged in **descending order of priority** and is summarised as follows:

- Waste avoidance and reduction;
- Re-use;
- Recycling;
- Recovery; and
- Treatment and disposal.

The foundation of the hierarchy, and the first choice of measures in waste management, is avoidance and reduction. This step aims for goods to be designed in a manner that minimises their waste components. Also, the reduction of the quantity and toxicity of waste generated during the production process is important.

The next stage of the hierarchy is re-using waste. Re-using an article removes it from the waste stream for use in a similar or different purpose without changing its form or properties.

After re-use comes the recycling of waste, which involves separating articles from the waste stream and processing them as products or raw materials.

These first four stages of the waste management hierarchy are the foundation of cradle-to-cradle waste management. This approach seeks to re-use or recycle a product when it reaches the end of its life span. In this way, it becomes input for new products and materials. This cycle repeats itself until as small a portion as possible of the original product eventually enters the next level of the waste management hierarchy: recovery.

As a last resort, waste enters the lowest level of the hierarchy to be treated and/or disposed of, depending on the safest manner for its final disposal.

The current 2020 NWMS takes the above strategy further by also focussing on the Circular Economy.

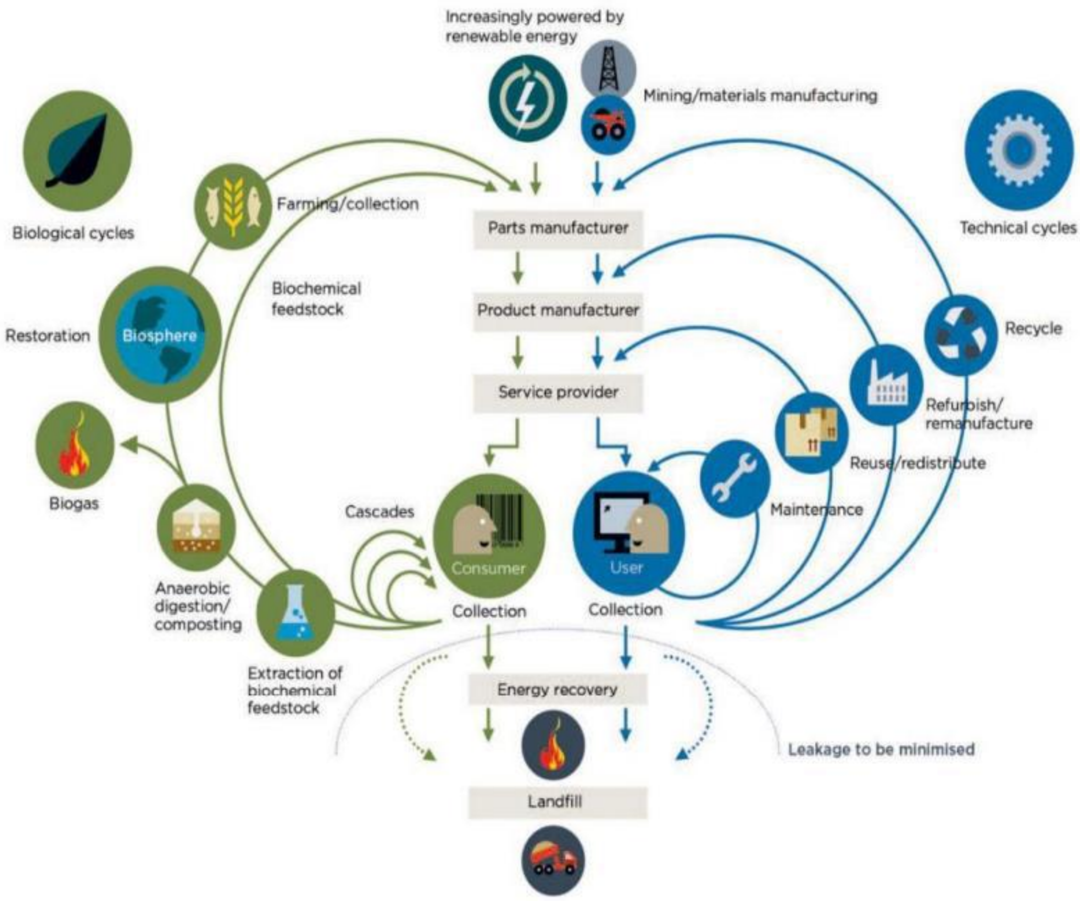


Figure 12: Butterfly Diagram on Circular Economy (NWMS, 2020)

A circular economy redefines economic growth by moving away from a take-make-waste industrial model to one that decouples economic activity from the environment and supports a just transition to renewable energy sources. The three key principles of a circular economy are: design out waste and pollution, keep products and materials in use and regenerate natural systems. The two (2) strategic entry points of the waste sector into waste minimisation and the circular economy is waste prevention and waste as a resource, as briefly explained below.

- Waste Prevention (as highlighted in the 2011 National Waste Management Strategy) – this emphasises avoiding and reducing waste before substances, materials and products are discarded.
- Waste as a Resource (key focus in the Strategy) – this focuses on stimulating a secondary resources economy based on recycling and recovery of materials and energy from waste i.e. interventions that take place after a product or material has become waste. Circularity can deliver substantial material savings throughout value chains and production processes, generate extra value, transformation of industry towards climate-neutrality, long-term competitiveness and unlock economic opportunities. In terms of the waste management hierarchy practices, recycling of waste for reuse and recovery of materials is prioritised over recovery of energy from waste. The main economic driver lies in exploiting the full potential value of waste (drawing the three earlier mentioned principles of the NEMWA close).

The NWMS, 2020 specifically states that waste prevention is a priority in relation to hazardous waste, both in terms of amount and toxicity of waste that is disposed of to landfill. The NWMS 2020 is predicated on the insight that while waste is an environmental concern, it is also an important industry in which technology and innovation have a crucial role to play in creating a secondary resources economy.

The mining and metal extraction industries can be integrated to form a circular economy model that promotes zero waste through the re-use and recycling of these waste materials (ProEarth, 2020). According to an article published in March 2018 (Matinde, Simate and Ndlovu, 2018), the mining and metal extraction industries can be integrated to form a circular economy model that promotes zero waste through the recycling and re-use of these waste materials. In other words, the different waste streams can in fact be considered as secondary sources of valuable metals. .

The NWMS is structured around a framework of eight (8) goals, which are to:

- ***'promote waste minimisation, re-use, recycling and recovery of waste***
- *ensure the effective and efficient delivery of waste services*
- ***grow the contribution of the waste sector to the green economy***
- *ensure that people are aware of the impact of waste on their health, well-being and the environment*
- ***achieve integrated waste management planning***
- *ensure sound budgeting and financial management for waste services*
- *provide measures to remediate contaminated land*
- *establish effective compliance with and enforcement of the Waste Act*.'

The intent of the mine is to beneficiation tailings streams (specifically dried tailings) for:

1. Mineral Extraction – specifically for Platinum Group Metals (PGM); and
2. Selling to Mines and Industry for further processing.

The dried tailings are defined as "Tailings derived from the Chrome Beneficiation Process and Filter Press Processes."

It should further be noted that the DCM is investigating the option of reprocessing or selling tailings dependent on whether the mine will obtain approval to exclude tailings from the definition of a waste in terms of GNR 715 of the NEMWA (18 July 2018). This is in an attempt to further improve economic benefits from the facility, but also to reduce the volumes of waste to be disposed to give effect to the National Waste Management Hierarchy.

1.f.ii Project 2: Diesel and Emulsion Batching

The placement of the Diesel and Emulsion Batching Areas is developed in line with the underground mining operations. The placement will ensure the opportunity to directly pipe diesel and emulsion to the underground workings without excessive surface pipeline systems, which could lead to spills.

1.f.iii Project 3: Main Parking Extension

This project is purely for logistical purposes. The current parking area is about 0.8ha with the parking bays not sufficient to cater for the number of vehicles. The current parking bay comprises of a paved surface area and steel roof parking bays. The same principle will be applied at the expanded area. No new entrances will be required.

1.f.iv Project 4: Widening of Access Road between South Shaft/Main Offices and Plant

This project is purely for safety and logistical purposes. The purpose is to improve the safe operation of traffic on this road.

1.f.v Project 5: Access Crossing between Plant and North Mine (Subway Crossing)

This project is purely for logistical purposes. To ensure more optimal logistical management of traffic between the South Mine and the North Mine, and to reduce the number of vehicles on the Sekhukhune regional road, the mine is planning on construction a road under the regional road bridge to allow for access between the two areas.

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

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

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

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

The projects presented are located within the existing Dwarsrivier Mine Mining Right Area (MRA).

The mine initially identified seven (7) potential TSF sites, which have since been reduced to three (3) site alternatives (Sites B, C and D), with Site B being the most favourable based on the findings of the various specialist studies undertaken as part of the project. The extent and the current anticipated heights of the proposed TSF to be accommodated by each site alternative under consideration are as follows:

- Site (TSF Option) B: 22.5ha, 42m;
- Site (TSF Option) C: 28ha, 29m high; and
- Site (TSF Option) D: 21ha, 49m high.

The heights initially anticipated for each of the TSF Options are 37m, 29m, and 49m, respectively. The project will not involve typical tailings deposition techniques, but will involve the piping of tailings to a filter press facility from where the filter cake will be trucked to the new TSF. The following figure illustrates the initial four (4) sites which were subjected to a site selection process, and were since reduced to three (3) options namely Site C, B and D.

All the selected TSF site alternatives, with the exception of Site B, are located in hilly mountainous terrain. Due to the general classification of the tailing material in terms of NEMWA lining requirements, there is a high potential for similar requirement to be imposed on the selected TSF site and final TSF design. Subsequent to the initial site selection, the facility will be designed with a Class C liner. In terms of construction of the TSF, the potential risks considered included:

- Steep side-slopes for equipment and machinery;
- An avalanche of large boulders due to construction induced vibrations and adjacent mining activities;
- A requirement for extensive pre-work preparations including access roads, barricades, and related protection and construction-related establishment, as well as rehabilitation after completion of construction;
- Geology and stability;
- Graves and other cultural sites;
- The presence of water crossings; and
- Construction preparedness requirements including permits and restrictions that can potentially delay or extend the duration of construction.

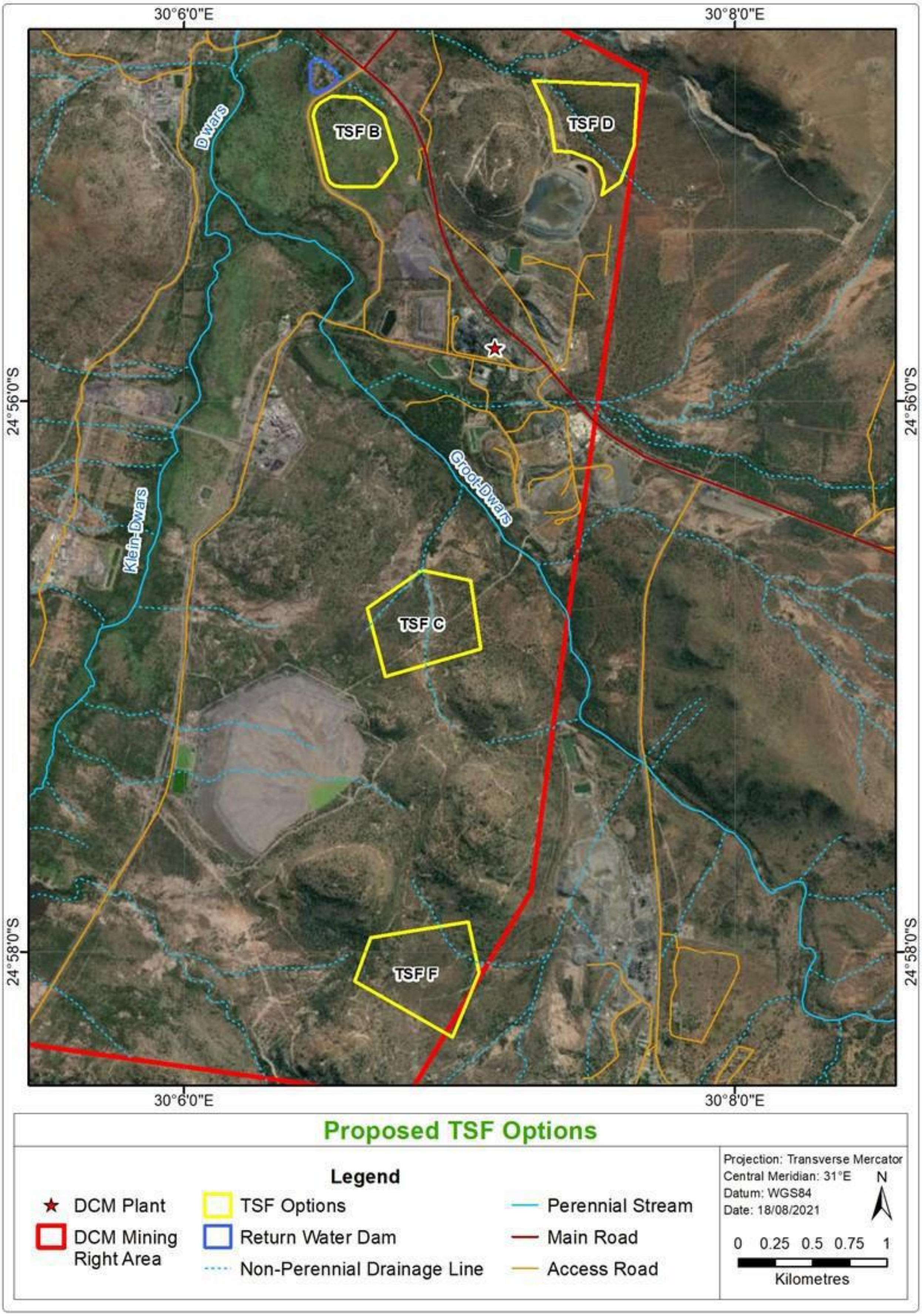


Figure 13: Sites (TSF Options) subjected to initial site selection by the applicant

1.g.i.2 Site B (TSF Option B – Preferred Option)

Site B resulted in the preferred site alternative due to its proximity to the Plant and other services located around 1.3km south of Site B, as well as the outcomes of the environmental and engineering studies. The footprint of this site is planned at about 22.5ha. The footprint area is located on areas previously characterised by agricultural activities and therefore it is unlikely that any protected species would be present in this area.

The site is also located 18m below the Plant in terms of elevation which provides for more effective transportation of tailings. The area in question does not require any relocation of infrastructure and will further also not require any river crossings. The constructability of the site also allows for the least cut and fill requirements from the three (3) options.

This site will require a PCD initially planned at about 58 000m^3 (currently 49 000m^3). Initially the PCD was located across the public road on Portion 6 of the Farm Dwarsrivier, which would have resulted in the facility being within 100m of the 1:100yr flood line of the Dwars River. With the final placement remaining on the Dwarsrivier Mine surface area, the site is no longer within the floodline or within the 100m buffer. The south-western boundary of the TSF however is located within the 500m riparian buffer of the Dwars River.

As per the other two options, this option will include a filter press, which will be located on the existing Discard Dump footprint.

This site will provide an operating life of about 20 years.

The conditions of Site B are as follows:

- Site B is located about 1.3km to the north of the Beneficiation Plant on relatively flat topography. The site slopes towards the west, and is also readily accessible from this direction;
- The direct access for piping between Site B and the Beneficiation Plant navigates alongside an existing tarred road and electrical power line south of the Plant;
- The site is located approximately 300m from the 1:100-year flood line of the Dwars River towards the west;
- A model of the site was developed to assess the capacity of the potential TSF within the available area. This allowed a high level cost assessment of the TSF;
- Site B will require stormwater diversion infrastructure of approximately 1,000m in length at the eastern upstream flank of the proposed TSF; and
- The PCD will have to be positioned downstream of the access road at the northern flank of the potential TSF.

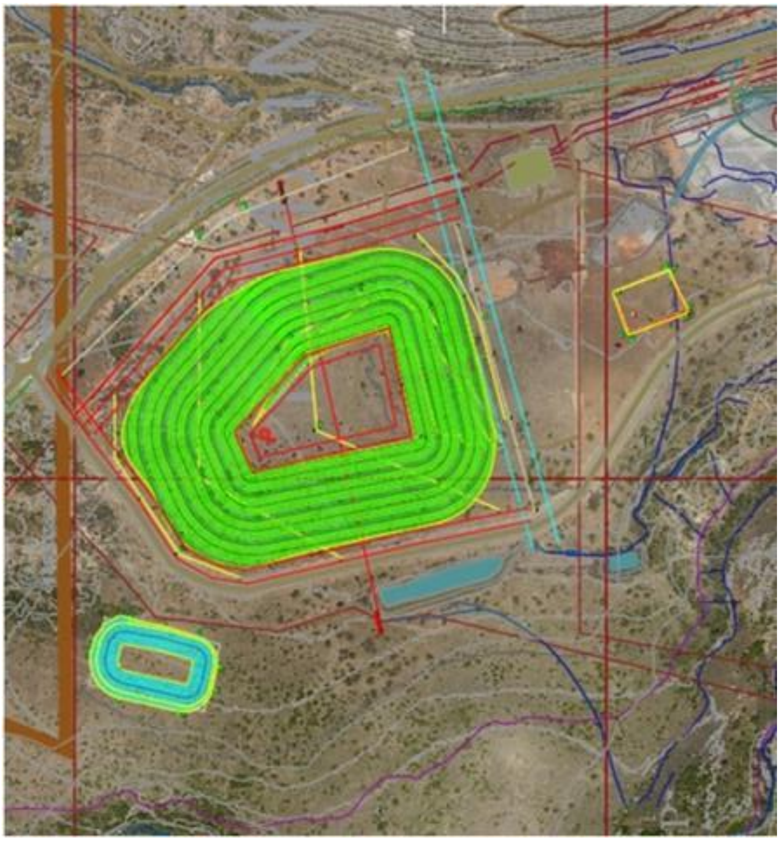


Figure 14: Site B Preliminary Layout with PCD located on Portion 6 of the farm Dwarsrivier 372KT (initial layout)

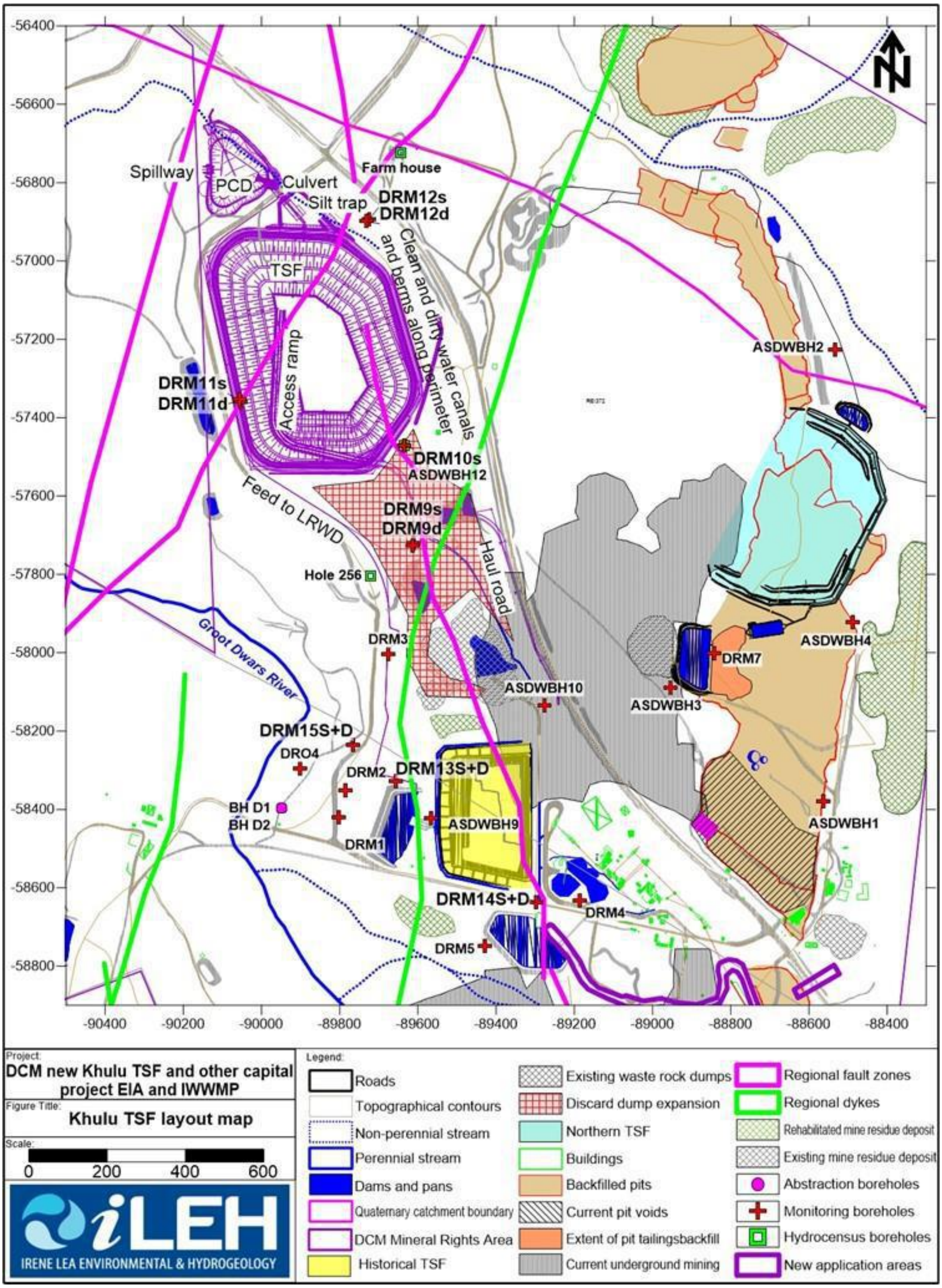


Figure 15: Site B Preliminary Layout with PCD located on Prtion RE of the farm Dwarsrivier 372KT (preferred option)

Engineering constraints identified for Site B include:

- Proximity of public road;
- Eskom powerline servitudes – haulage under powerline;
- Tweefontein underground mining; and
- Possible future underground mining.

1.g.i.3 Site C (TSF Option C)

Site C is located about 2.3km from the Plant and other services. The footprint of this site is planned at about 28ha, the largest in extent of the three (3) TSF Options. The area is characterised by a fairly steep topography. The vegetation comprises of grass and trees, with protected species present. Another component which is considered in this area is the presence of graves which will require potential removal permits if approved. The logistical arrangement of this site will necessitate pipeline and road crossings of the Dwars River from the proposed TSF to the Plant.

The site is also located 5.5m above the Plant in terms of elevation and will require use of the road and pipeline crossings of the Dwarsrivier Mine. The area in question will also necessitate the relocation of low voltage powerlines.

The site is undermined, but considered stable for the purposes of the TSF design at this time.

This site will require a PCD of about 64 000m^3. The PCD will be constructed in a valley and well-designed storm water diversions will be required.

The conditions of Site C are as follows:

- Site C is located towards the south of the Beneficiation Plant. The site slopes towards the north and is readily accessible from the west;
- The site has a large surface area available for siting of a TSF;
- The site is located approximately 400m from the 1:100-year flood line of the Groot Dwars River towards the northern side;
- The installation of slurry delivery pipelines and return water pipelines will be required across a river between the site and the Beneficiation Plant;
- In terms of the conceptual layout for the site (refer to figure below), the resultant starter wall will have an expected height of approximately 7m located at the north flank, with a length of 610m;
- Stormwater diversion trenches and bunds with a combined length of approximately 1,732m will be required at the southern upstream flank; and
- Extension of Site C to the west is constricted by an existing TSF owned by another mine, towards the north and south by steep hills and mountain rock outcrops, and towards the west by a flood line of a down-gradient river.

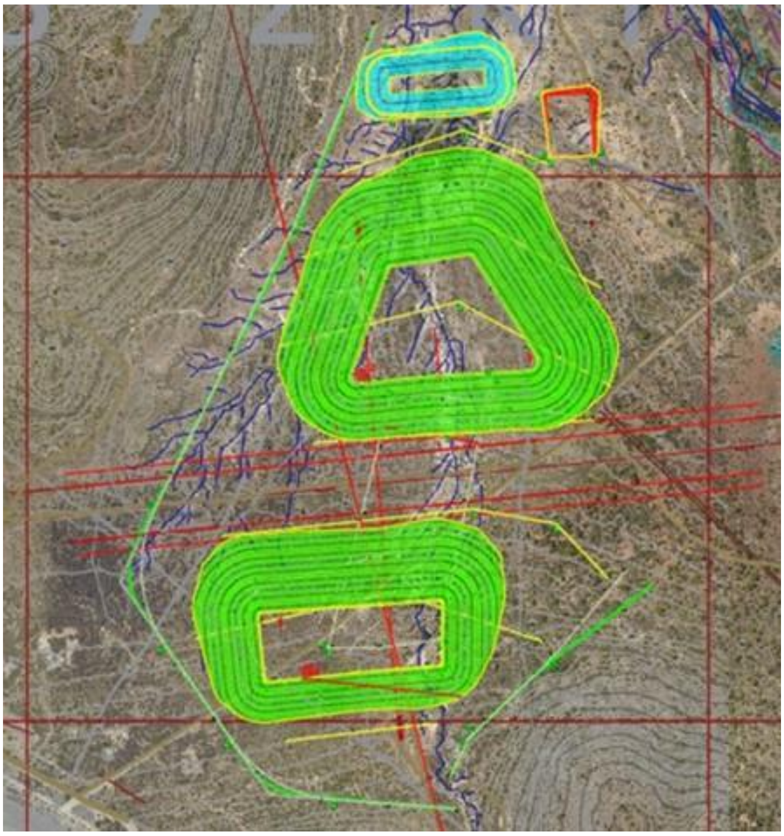


Figure 16: Site C Layout

Engineering constraints identified includes:

- Eskom servitude and TRP pipeline (this will split the site into two compartments);
- Underground mining is present (limit to 100m depth);
- Smaller powerlines will require removal; and
- Ruins/ graves are present.

1.g.i.4 Site D (TSF Option D)

This location is traversed by a non-perennial drainage channel, which is an unnamed tributary of the Dwars River. The site is located 1.4km (pipeline route 1.8km) up-gradient to the east of the Plant, near the existing North TSF. The vegetation comprises of grass and trees, with protected species present.

The site is 29m above the Plant, which provides the most constraints in terms of elevation of the three (3) options.

This site will require a PCD of about 66 000m^3. The current engineering considerations identify the location of the PCD as not being ideal due to the proximity of the non-perennial channel and the challenge of construction of storm water management berms.

The conditions of Site D are as follows:

- Site D is located to the north of the Beneficiation Plant. The site is adjacent to the existing North TSF and partially hidden behind the mountain 'koppie';
- The site has a surface area available for siting a TSF within a valley between mountains;
- The site is located approximately 1 500m from the 1:100-year flood line of a non-perennial unnamed tributary of the Dwars River towards the west of the site, but within a non-perennial drainage channel;
- A portion of the identified area will be located over backfilled areas (on the western side);
- There are mining activities up-gradient and to the east and northeast of the site.

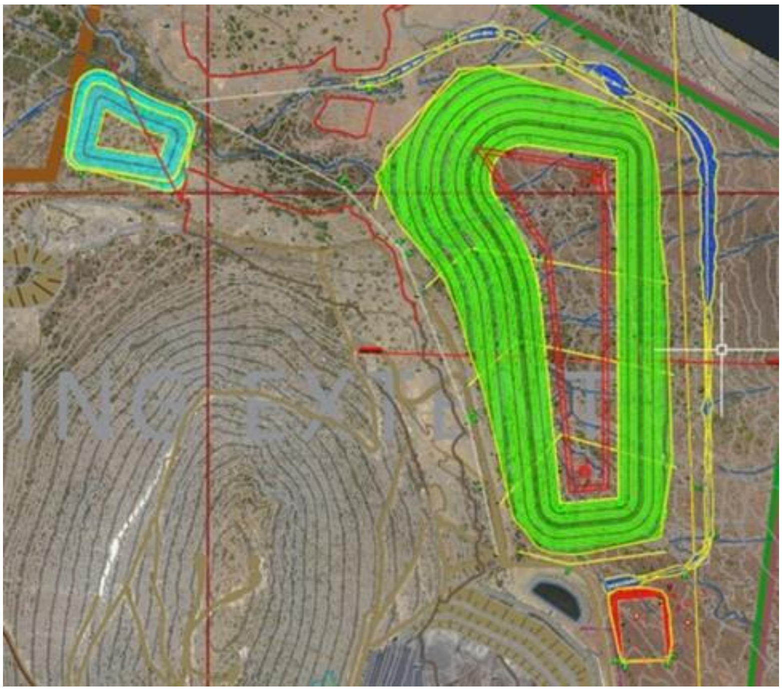


Figure 17: Site D Layout

Engineering constraints identified includes:

- Diversion of non-perennial stream;
- Lion ropeway (Glencore Mining Operations) currently planned in this area;
- Hillside; and
- Backfilled opencast pits.

1.g.i.5 Outcomes of the Site Selection

For the detailed Site Selection Report, please refer to Annexure 5.

The outcomes of the Site Selection are presented in the table below.

Table 19: Site Selection Matrix (1 preferred, 3 least preferred)

Discussion	Site B	Site C	Site D
Engineering			
Engineering considerations, including topography	1	3	2
Engineering Outcomes	**1**	**3**	**2**
Environmental			
Soils, Land Use and Land Capability	2	3	1
Terrestrial Ecology	1	3	2
Hydrology/ Surface Water	1	3	2
Hydrogeology	2	3	1
Freshwater Resources (wetlands)	1	3	2
Visual Character	3	2	1
Air Quality	2	3	1
Heritage	1	2	3*
Socio-Economic	1	1	1
Ranking	14	23	14
Environmental Outcomes	**1**	**3**	**1**
Combined	1	3	2

**Subsequent to the site selection and with ongoing consultation with the land claimants, a grave was identified in the footprint of Site D, rendering this site least preferred in terms of heritage considerations, where previously it was considered preferred in terms of this context.*

The following concluding statements were received from the specialist reports:

Soils, Land Use and Land Capability: From a soil, land use and land capability perspective, Site D is recommended as the preferred site for TSF development, in comparison to the other two (2) TSF alternatives, given the proximity to existing mining infrastructure, thus eliminating the need for significant further disturbance of undisturbed soils in other areas within the mining area.

However, considering the location of Site B and the fact that this is also located in close proximately to the mining activities, it is the view of the EAP that either Site B or D would be suitable options. As a result, Site B is also highlighted for consideration.

Terrestrial Ecology: From a long-term ecological maintenance perspective Site B is deemed to be the preferred option, as this site is already disturbed, is located adjacent to the current mine operations and will not lead to the loss of habitat connectivity. This option does however pose a potential risk to the Groot Dwars River, which needs to be investigated in terms of mitigatory and management requirements.

Hydrology/ Surface Water: The site selection assessment indicated that the most preferred option from a surface water perspective is Site B, followed by Site D and C, respectively, as Site B has no direct impact on watercourse (not located with 1:100 year flood lines).

Hydrogeology: Site B scored similar to Site D and could therefore also be considered as a preferred alternative, provided that the risks identified are managed to avoid or minimise negative impacts on groundwater. The risks associated with Site B include the presence of the alluvial aquifer under or near the TSF footprint, the presence of potential preferential flow paths to groundwater and shallow groundwater level conditions.

Freshwater Resources: The construction of the proposed TSF within Site C or Site D has the potential to have an unacceptably high impact on the watercourse within each respective site. Such impacts may also potentially affect downstream systems. From a freshwater ecological perspective therefore, Site B is the preferred option, as no direct impacts arising from the construction and operation of the TSF within that location to the receiving freshwater environment are anticipated. Nevertheless, indirect impacts, including potential failure of the TSF, could occur and may potentially be detrimental to the Dwars River specifically, if suitable mitigation measures are not strictly implemented throughout all phases.

Visual Character: Site C has the smallest visible area and least number of visual receptors impacted, and is therefore ranked most favourable, followed by Site B and then Site D.

Although Site C is the most favourable in terms of the criteria used to assess the TSF site alternatives, it must be noted that all alternatives fall within an area dominated by mining activities and infrastructure. Due to the visual aesthetics and sense of place of the area being previously altered from rural bushveld to mining, it is unlikely that the implementation of any of the TSF options would result in a significant visual impact.

Air Quality: This study comprises an environmentally conservative/'worst-case' air quality impact assessment and did not find predicted pollutant concentrations to exceed regulated ambient air quality standards. Further, impacts predicted at Site D were anticipated to be the lowest and as such, it is recommended that the proposed TSF be located at Site D.

Heritage and Palaeontology: Initially in terms of the site selection report, Site D was the preferred site from a heritage point of view, but Site B was also considered as this was previously agricultural land. Both Sites B and D have previously been disturbed. For Site D, no heritage resources were identified inside the footprint area of this proposed TSF site alternative. *Subsequent to the site selection and with ongoing consultation with the land claimants, a grave was identified in the footprint of Site D, rendering this site least preferred in terms of heritage considerations, where previously it was considered preferred in terms of this context.* At Site B, the stone wall foundations of a ruin and a possible Early Iron Age site were recorded. The Site B study area is however disturbed, possibly by previous cultivation reducing the significance of the recorded finds. It should be noted that a cemetery occurs on the periphery of Site C, and this area should be demarcated and avoided. From a heritage point of view the heritage sensitivity associated with Site C is considered to be high due to the high number of sites in the impact area and this alternative is not recommended for the proposed development.

Socio-Economic: It is concluded that either Site B, Site C or Site D would be most preferred from a socio-economic perspective.

Conclusion:

As mentioned before, the demand for chrome has increased globally due to the increase in China Markets. Not allowing the development of the proposed Khulu TSF to take place will result in production capabilities of the mine being hampered, as space for tailing material would be severely restricted. With the current TSF reaching its life of mine, a new facility is required to ensure ongoing mining and processing practices. Based on the site selection and taking all environmental aspects assessed and discussed above into consideration, **Site B** is the preferred site from an engineering perspective. Site D and Site B are very similar in rating and both could be considered as preferred options. However, when considered both the environmental, heritage and engineering components, Site B remains the preferred site. The PCD on Portion RE of the farm Dwarsrivier, as opposed to Portion 6 which surface rights belong to TRP, is preferred due to Portion RE's surface rights being owned by the applicant.

This Site B is located in close proximity to the existing Discard Dump. One key area for consideration based on the outcomes of the initial specialist studies are the management of groundwater should Site B be chosen. The underlying lithology at this site is potentially alluvium associated with the Dwars and Groot Dwars Rivers, which creates a major regional aquifer (this will be confirmed during the EIA phase of the project). Dwarsrivier Mine currently abstracts groundwater from this aquifer from BH D1 and D2, situated 725m southwest from Site B. Site B is not currently undermined, but future underground mining is planned for this area. Site B is furthermore underlain by both a fault and a dyke. These structures may act as preferential flow paths to groundwater. Dwarsrivier Mine is in the process of drilling and testing monitoring boreholes that target the dyke and fault present in order to quantify the extent to which these structures could act as preferential flow paths. The results of the drilling and testing programme are not yet available, but will be considered as part of a detailed geohydrological impact assessment to be completed for the project. The site is potentially situated within an existing watercourse (considering the alluvial aquifer), which suggests that shallow groundwater conditions may occur during the wet season. The site is also situated on or near the alluvial aquifer associated with the Klein and Groot Dwars Rivers. Groundwater in this area has already been impacted by the historical TSF, the Plant and the discard dump. The Total Dissolved Solid (TDS) and nitrate (NO_3) concentrations in the nearest borehole (DRM3) confirm the poorest groundwater quality conditions for the four sites evaluated. The depth to groundwater at this site is the shallowest of all the sites evaluated, which means that the barrier between the TSF and the aquifer is the smallest for all four sites. It is not thought that groundwater levels would rise to surface and thus into the liner system. Groundwater is not used in the immediate vicinity of Site B other than being monitored.

With the correct management measures, impacts identified could be addressed.

1.g.ii The type, design and/or technology/operational considerations of activity to be undertaken

The material parameters of the tailings to be deposited at the existing TSF allowed a cyclone method of deposition; however there are other deposition methods available for consideration where it may be rendered impractical to utilise the cyclone method. The available generally utilised tailings disposal methods include:

1.g.ii.1 Impoundment disposal facility

The method involves a containment wall constructed from foreign material, where the tailings material is deposited safely into the containment. This includes in-pit disposal methods where open pits or underground shafts are utilised to dispose the tailings material. This method has advantages including less emphasis on rate of rise, generally pore pressure dissipation complications are less critical. The greatest disadvantage with the method is however high costs of progressively and continuously raising the impoundment walls. The impoundment disposal method is relatively simplified in terms of deposition, where generally open-ended deposition is adequate.

1.g.ii.2 Spigot disposal facility

The spigot disposal method is generally in popular use, however there are limitations with regards to the rate of rise (i.e. approximately 2.5m/yr.). The method generally results in self-raising the tailings storage facility with the tailings material. The operations must ensure freeboard availability as required in GN 704 of the NWA. Since the tailings material is generally deposited hydraulically cycles must be imposed to deposition to allow the tailings material to consolidate. The spigot disposal method requires specific infrastructure and operating conditions for success.

1.g.ii.3 Cyclone disposal facility

The cyclone method of deposition comprises separation of a total tailings stream into fine grained tailings (overflow) and coarse-grained tailings (underflow). Similar to the cyclone wall development, the method involves utilising the tailings material for side wall building. The operator of the TSF must maintain freeboard similar to the spigot deposition method. The advantage with the method is high allowable rates of rise. The methods generally result in stable TSF due to the outer coarse material. The method requires specific infrastructure and operating condition for success.

1.g.ii.4 Filter press method (preferred method)

The filter press methods involve equipment used in liquid/solid separation. The filter press separates liquids and solids utilising pressure filtration. A slurry/slimes is pumped into the filter press and is dewatered under pressure. The filter cake will be deposited via trucks or a conveyor system onto the TSF, and water will be recirculated to the plant or proposed PCD. The filter press will be designed based on the volume and type of slurry that needs to be dewatered.

This is currently considered the preferred technology, due to the reduction in water to be stored on the proposed TSF, and also the opportunity to recycle water through the plant.

1.g.iii The option of not implementing the activity

Should the project not be approved (No Go Option) the following implications may arise:

The demand for chrome has increased globally due to the increase in China Markets. With the current TSF reaching its operational capacity, a new facility is required to ensure ongoing mining and processing practices. Without this facility, the mine will not be able to continue with beneficiation processes and the primary mining activities. This will result in a severe loss of the beneficiation of chrome and optimal mining of chrome in terms of the approved Mining Work Programme, loss of income to the local municipality, loss of employment opportunities, and loss of opportunities in terms of the Social and Labour Plan contributions the mine is making into the Local Municipality.

The other Capital Projects are required for the safe and logistically efficient operation of the mining operations.

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

Public participation is understood to be a series of inclusive and culturally appropriate interactions aimed at providing stakeholders with opportunities to express their views, so that these can be considered and incorporated into the Scoping and Environmental Impact Reporting (S&EIR) process. Effective public participation requires the prior disclosure of relevant and adequate project information to enable Stakeholders to understand the risks, impacts, and opportunities of the proposed project.

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

- Identify relevant individuals, organisations and communities who may be interested in or affected by the proposed project;
- Clearly outline the scope of the proposed project, including the scale and nature of the existing and proposed activities;
- Identify viable proposed project alternatives that will assist the relevant authorities in making an informed decision;
- Identify shortcomings and gaps in existing information;
- Identify key concerns, raised by Stakeholders that should be addressed in the subsequent specialist studies;
- Highlight the potential for environmental impacts, whether positive or negative; and
- To inform and provide the public with information and an understanding of the proposed project, issues and solutions.

This section includes the comments received during the Public Participation Process undertaken to date. The Comments and Responses Section has the following objectives:

1. To provide a formal and integrated record of all the issues raised by Interested and Affected Parties (I&APs) to date, and the responses provided by the EAP;
2. To provide a mechanism that allows all parties participating in the process (including the Competent Authorities) to verify whether the issues raised have been considered and where appropriate, adequately addressed by the EAP.

Issues raised throughout the consultation process will be recorded through a variety of mechanisms. These include:

- Comments sheets received by fax, and/or e-mail;
- Comments sent to the public participation office via e-mails;
- Comments received telephonically; and
- Comments received during the announcement phase when interested Communities were met on site.

1.g.iv.1 Stakeholder Identification

The Public Participation Process must include consultation with (1) the Competent Authority, (2) every State Department that administers a law relating to the matter, (3) all organs of state that have jurisdiction in respect of the activity to which the application relates, (4) all potential, or, where relevant, registered I&APs. In order to satisfy this requirement, the following consultations were undertaken:

- Competent Authority - The DMRE is the Competent Authority related to this application. The EAP undertakes to engage in on-going communications with the DMRE (preferably directly with the allocated case officer).
- Departments that administer a law relating to the matter – The DWS has been directly informed of the proposed projects via email and telephonic conversations. DWS will be the Competent Authority for the WULA that needs to be submitted for the proposed project.
- All organs of state which have jurisdiction in respect of the activity to which the application relates:
    - National Level: The Department of Forestry, Fisheries and Environment (DFFE) - Under the “One Environmental System” rolled out by Government on 8 December 2014, licensing processes for mining, environmental authorisations and water use have been streamlined. Under the One Environmental System, The Minister of Mineral Resources will issue environmental authorisations and Waste Management Licences (WMLs) in terms of the NEMA, and the NEMWA, respectively, for mining and related activities. However, note that under the One Environmental system, the Minister of Forestry, Fisheries and Environment will

be the appeal authority for these authorisations to ensure complete independency to the competent authority.
  - Provincial Level: Given that the activity is located within the Limpopo Province, the Department of Economic Development Environment and Tourism, Limpopo Province (LEDET) will form a primary commenting authority during the process. The provincial Heritage Resource authority has been informed about the proposed project.
  - District Level: The proposed project area falls within the jurisdiction of the Sekhukhune District Municipality. The Sekhukhune District Municipality was informed about the project as part of on-going spatial development planning and land use updates.
  - Local Level: The Dwarsrivier Mine is located within the Fetakgomo Tubatse Local Municipality. The Municipality is responsible for managing the various wards associated with the Dwarsrivier Mine and surrounds. The affected ward is Ward 27, and associated wards include Wards 2, 6, 28, and 30. The ward councillors will be a primary target for the proposed project in an effort to communicate the project to as greater stakeholder database as possible, especially considering the locals will be the most affected stakeholder grouping.
- All potentially registered I&APs - The existing Dwarsrivier Mine stakeholder database was used as a base starting point. The database was updated following any stakeholder request to be registered. The use of site notices, Notification Letters, Short Messaging Systems (SMS), and e-mail was used as methods in which to reach potentially interested and affected parties.
- Affected Adjacent Landowners – As far as possible, all affected adjacent property owners were contacted and informed of the proposed new project at Dwarsrivier Mine. This includes Tweefontein Mine (this mine has previously undermined the preferred location of the PCD) and Two Rivers Mine (constructing a pipeline to their TSF in close proximity to where the Diesel and Emulsion Bathing areas are planned).
- Land Claimants on the farm Dwarsrivier 372 KT.
- Property Owners: Dwarsrivier Mine currently holds the mining rights over Portion 1 (RE), Portion 0 (RE) and Portions 6 and 7 of the farm Dwarsrivier. Surface rights of the mine extends onto Portion 1 (RE), Portion 0 (RE), and Portion 4 (a portion of Portion 3) of the farm De Grooteboom 373KT. The surface rights of Portions 6 and 7 of the farm Dwarsrivier 372KT are owned by TRP.

The latest stakeholder database is included within this report as Annexure 6.

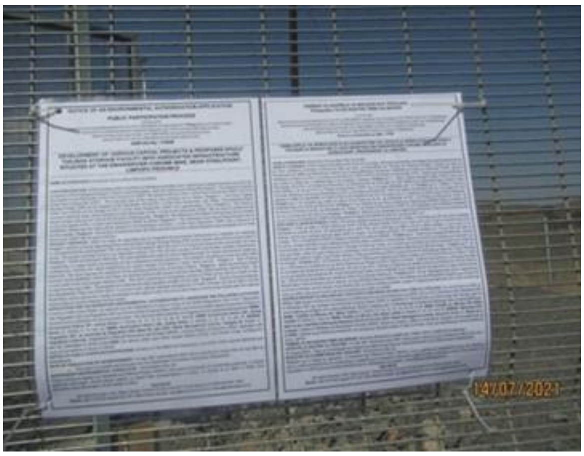
All registered I&APs, are directly or indirectly impacted/ affected by the proposed project, have the right to lodge a comment/question on the project (until such time that the appeals process comes to a close).

1.g.iv.2 Stakeholder Identification and Notification

Please refer to Annexure 6 for copies of these notifications. Proof of email submissions can be requested from the EAP.

1.g.iv.3 Site Notices

In accordance with GNR 982 Section 41(2)(a-b), a site notice was developed (see below, proof of placement) and placed at various visible locations close to the site on 15 July 2021, in order to inform surrounding communities and adjacent landowners of the proposed projects. Site Notices were placed at the following locations:



Fetakgomo Tubatse Local Municipality

Site B Option Entrance (Project 1)

Main Entrance (Project 3)

Site C Option & Emulsion and Diesel Batching Entrance (Projects 1 and 2)

North Mine Entrance (Project 5)

Plant Entrance (Project 4 and 5)

1.g.iv.4 Background Information Documents

Key stakeholders, who included the following sectors, were directly informed of the proposed development by e-mail through the distribution of the Background Information Document (BID) and Registration Sheet:

- Authorities;
- Municipalities;
- Residential Associations;
- Non-governmental organisations;
- General Public;
- Parastatals / Service providers, and
- Adjacent Landowners.

Please refer to Annexure 6 for a copy of the BID.

1.g.iv.5 Advertisements

In accordance with GNR 982 41(2)(c) of Chapter 6 an advert was placed in

- The Steelburger Newspaper on 15 July 2021.

There are many local languages spoken in the area, of which Sepedi is the most prevalent. English is considered a universal language; therefore, the newspaper advert was placed in English only. The site notices were however translated into Sepedi. The proof of advert is attached Annexure 6.

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

In addition to the minimum requirements outlined in GNR 982, the EAP has undertaken the following:

- Distribution of notification letters to Dwarsrivier Mine stakeholders via email and fax (where contact details are available).

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

Please refer to Annexure 6 for a copy of these adverts.

1.g.iv.6 Document Review

The Draft ESR was distributed for public review for a period of 30 days from 23 July 2021 to 23 August 2021. An additional review period was provided to the Dwarsrivier Land Claimants from Thursday 21 October 2021 until Monday 22 November 2021. Printed copies were available at:

- Dwarsrivier Mine (Pieter Schoeman).
- Bakoni Ba Masha Land Claimants (Dwarsrivier Claimants Community).

Electronic Copies were available from:

- Public Participation Office via Dropbox link.

and

- Batho Earth could be contacted to request an electronic copy.

Hard copies of the Draft ESR were couriered to the following authorities:

- DMRE: Ms Patricia Mukhuvele
- DWS (Limpopo): Ms Portia Munyai
- DFFE (Limpopo): Ms NA Mudau
- LEDET: Ms Mokgadi Mogashoa
- SAHRA: Online submission.
- Fetakgomo Tubatse Local Municipality: Mr. N. Mokgotho
- The BID was also mailed to the Department of Commission on Restitution of Land Rights: Mr Mmakolobe Mononyane.

The draft EIA and EMPr is issued in the same manner as above for review from 28 February 2022 to 30 March 2022.

1.g.iv.7 Stakeholder Meetings

Consultation meetings, which included a site visit to the various projects, were held with Interested and Affected Parties such as land claimants and with Regulatory and Competent Authorities, including the Municipal Ward Councillor, on 15-16 February 2022 respectively. Minutes of meetings are provided in Annexure 6.

1.g.iv.8 Summary of Comments raised by the I&APs

The Comments and Responses Register includes the comments received during the Stakeholder Consultation Process undertaken for the proposed projects. This includes responses to the advertisements, response sheets, individual discussions with key stakeholders, and any other comments received during the project timeframe up to 30 March 2022.

Comments reported within this Comments and Response Register were updated during the project. This document can therefore be considered as an active document up until the final reports are submitted. To date the following comments have been received.

Table 20: Stakeholder Comments received

NO.	THEME: GENERAL COMMENTS / ISSUES			
	ISSUE RAISED	**DATE AND HOW ISSUE WAS RAISED**	**COMMENTATOR**	**RESPONSE**

1	The Department is the custodian of the National Forestry Act, 1996, which among others provide special measures for the protection of forests and trees. If the project is going to affect a Natural Forest, it is required you apply for a licence. A specific application form listing all the indigenous tress that are going to be directly affected by the project should be indicated. Recommendations made:
	- Identification of protected trees in terms of the National Forest Act, 1998;
	- All identified trees must be marked;
	- Relocation/transplanting of protected trees is highly recommended (as opposed to cutting and destroying of trees);
	- Application for all activities affecting protected trees and natural forest must be made to the DFFE;
	- Mitigation plan in place and implemented.
	Furthermore:
	- Fire management plan must be put in place;
	- The mine should adhere to preventative measures below:
	    o Construction of fire belts around the boundaries of the mine;
	    o Adherence to the daily fire danger ratings; and
	    o Must have equipment, protecting clothing and trained personnel for extinguishing fires.
	- The mine should do everything in their power to stop the spread of veld fires in their land.
		Letter dated 3 August 2021	Department of Forestry, Fisheries and Environment (DFFE)	The recommendations issued by the DFFE have been included into the EMPr of this report. Please refer to Table 89 to Table 92.

2	Main area of interest: Haulage/ Installation and maintenance of HDPE pipes. Supply of haulage equipment. Strategic partner for haulage and HDPE installation and maintenance.	16 July 2021: Registration sheet submitted	Mr. Totolo Makola: Morwakola Construction	Dwarsrivier Mine has internal and external procurement processes. For more information with regards to the governance process and procurement processes we can refer you to the Dwarsrivier Mine's supplier portal. Please refer to Table 89 to Table 92.
3	My main interest is to be part of the construction and civil engineering companies that will be appointed to build up the infrastructure.	16 July 2021: Registration sheet submitted	Mr. Lancelot Masha: Masha Lancelot Supply Development	
4	I am in full support and confident that this project will create new job opportunities to our surrounding communities and help to combat poverty and many other socio-economic challenges which will lead to economic development.	16 July 2021: Registration sheet submitted	Mr. Lancelot Masha: Masha Lancelot Supply Development	The socio-economic impact referred to is noted. Please refer to Table 89 to Table 92.
5	More information is required on the construction entities, civil and engineering firms to be appointed.	16 July 2021: Registration sheet submitted	Mr. Lancelot Masha: Masha Lancelot Supply Development	The interest is noted. Dwarsrivier Mine has internal and external procurement processes. For more information with regards to the governance process and procurement processes we can refer you to the Dwarsrivier Mine's supplier portal. Please refer to Table 89 to Table 92.
6	What exactly will be involved in the capital project and lastly when will infant prospective small organisations be summoned for development.	16 July 2021: Registration sheet submitted	Mr. Lancelot Masha: Masha Lancelot Supply Development	
7	Main area of interest: Environmental Pollution and/or contamination. Although it would have positive spin-offs there is a concern that of impeding or diverting the water course. The prevention of waste and all spillage – is there any plan in place to control and manage waste?	19 August 2021: Registration sheet submitted	Mr. Lawrence Magolego: Naswana NPO: Chairman	Please refer to Table 89 to Table 92 for the measures included in terms of clean and dirty water management. Management of water runoff has also been incorporated into the TSF design, please refer to Section 1.d.ii.1. In addition to this, no concerns have been noted by the Hydrological or Freshwater Resources Studies should the required management measures be included. Please refer to Annexure 9 and Annexure 10. A detailed waste management plan will be included as part of the EMPr. Please refer to Table 89 to Table 92.
8	Project 1: Khulu Tailings Storage Facility: Option B: 20 Ha Location: Very close to the road and tributary. Areas of concern for the site: Impact on water resources due to the proximity of the activities located near drainage lines Project 1: Khulu Tailings Storage Facility: A portion of the suggested area is under TRP area and currently there is no agreement between Dwarsrivier Mine and Two Rivers Platinum Mine for this area Project 1: Khulu Tailings Storage Facility: Option C: 28 Ha Location: Very close to TRP current pipeline – seems to be on top of current constructed pipeline Areas of concern for the site: Disturbance on the pipeline Project 2: Diesel and emulsion batching: No comment for these two activities as long as it does not impact on the current TRP Pipeline.	23 August 2021: Comments submitted via e-mail	Tintswalo Kanyongolo: Environmental Manager: Two Rivers Platinum Mine	The area of concern in terms of the PCD placed on Two Rivers Platinum surface rights have been reconsidered. The PCD will be located on surface rights owned by Dwarsrivier Mine. Please refer to Figure 6 and Figure 7. The TSF and PCD will be located outside of the Dwars River floodlines and 100m buffer. Please refer to Annexure 10. Please refer to Table 89 to Table 92 for the measures included in terms of clean and dirty water management. Management of water runoff has also been incorporated into the TSF design; please refer to Section 1.d.ii.1. In addition to this, no concerns have been noted by the Hydrological or Freshwater Resources Studies with the required management measures included. Please refer to Annexure 9 and Annexure 10.

NO.	THEME: GENERAL COMMENTS / ISSUES			
	ISSUE RAISED	**DATE AND HOW ISSUE WAS RAISED**	**COMMENTATOR**	**RESPONSE**
				The proposed Diesel and Emulsion Batching Areas are located on Dwarsrivier Mine owned property, however, with the two facilities located on either side of the pipeline route and associated access route of the TRP TSF Pipeline. Construction of the two facilities may impact on the pipeline route if not suitably planned. For this reason, the EMPr recommends that the mine should consult with TRP in terms of the construction plan and schedule to ensure that the activities and associated access requirements do not impact on either of the two mines' activities.
9	Any water uses related activities associated with this project that are not permissible as indicated on Section 22(1) of the NWA shall have to be authorised by the DWS prior to such water uses taking place.	13 December 2021: Letter submitted via e-mail	Patheka Mfinyezi (DWS)	The purpose of the current Water Use Licence Application (WULA) is to make technical amendments to the existing authorised water uses and include new water uses associated with the proposed new activities. The following amendment to the existing water uses and new water uses will be captured: • Section 21(a) – taking water from a water resource (amendment and replacement of boreholes – the mine is currently approved to abstract water from the Dwars River itself, and wishes to augment this with abstraction from alluvial aquifer boreholes). • Section 21(b) – storing water in tanks – no Section 21(b) water tanks are currently authorised. Most of the existing water tanks on site are Generally Authorised, however for the purposes of the WULA these existing tanks, as well as the existing fire water tank and fissure water tank will be applied for. • Section 21(c) & (i) – impeding or diverting the flow of water in a watercourse; altering the bed, banks, course or characteristics of a watercourse. (The mine is located in close proximity to the Groot Dwars River, as well as the Springkaanspruit. The Groot Dwars River water system is characterised by a riparian zone, which results in the 100m and 500m buffer being triggered for most of the mining activities. • Section 21(g) – disposal of waste in a manner which may detrimentally impact in a water resource (inclusion of the proposed Khulu TSF – dry system, and associated PCD). The online Water Use Licence Application and Authorisation System (EWULAAS) process has been initiated on 15 January 2022.
10	The applicant is requested to liaise with the DWS for guidance on the requirements for water use authorisation applications for the water use activities associated with the proposed project.			
11	Pollution of underground and surface water: this shall be avoided by the implementing of proper water and management during the entire life of the operation.			Please refer to Table 89 to Table 92 for the measures included in terms of clean and dirty water management. Management of water runoff has also been incorporated into the TSF design; please refer to Section 1.d.ii.1. In addition to this, no concerns have been noted by the Hydrological or Freshwater Resources Studies with the required management measures included. Please refer to Annexure 9 and Annexure 10.
12	Water and soil contamination: this shall be avoided by implementing proper storm water management during the entire life of the operation. The applicant must ensure that storm water is diverted away from all the working areas. The storm water leaving the construction area must not be contaminated by any substance, whether that substance is a solid, liquid, vapour or any combination thereof. The soil must be stablished in order to prevent resulting washdown into any water resource.			Please refer to Table 89 to Table 92 for the measures included in terms of clean and dirty water management. Management of water runoff has also been incorporated into the TSF design; please refer to Section 1.d.ii.1. In addition to this, no concerns have been noted by the Hydrological or Freshwater Resources Studies with the required management measures included. Please refer to Annexure 9 and Annexure 10.

NO.	THEME: GENERAL COMMENTS / ISSUES			
	ISSUE RAISED	**DATE AND HOW ISSUE WAS RAISED**	**COMMENTATOR**	**RESPONSE**
13	Construction and operation of the new Khulu TSF and associated infrastructure (Return Water Dam – now the PCD): the applicant shall note that the construction and operation of the TSF and PCD are water use activities in terms of Section 21(g) of the NWA and requires authorisation by the DWS. The applicant shall provide DWS with details on how the waste will be disposed or utilised within the activity.			The purpose of the current WULA is to make technical amendments to the existing authorised water uses and include new water uses associated with the expansion activities. The EWULAAS process has been initiated on 15 January 2021.
14	Wetland and stream: It is indicated on Page 32 of the Scoping Report that the extension of the main parking for the proposed site is within the regulated area of the Springkaanspruit river, as well as construction of roads and pipelines, therefore the applicant should also note that any destruction of watercourse requires water use authorisation in terms of the Section 21(c) and (i) of the NWA.			
15	Storage Facilities: it is indicated that the diesel and emulsion batching areas will be on site. The applicant shall ensure that the diesel is stored and handled properly in a concrete or cement lined surface with berm walls to avoid any seepage into the groundwater resources and also ensure that the design of the storage area is such that any leakages or spillages can be contained. The applicant also need to adhere to the Mines health and Safety Act.			Please refer to Table 89 to Table 92. Storage facilities will be suitably designed to containe 110% of hazardous or dangerous goods stored.
16	Waste management: it should be noted that disposal or discard of unwanted waste must be collected and disposed of at a licenced waste disposal site. A signed copy of service agreement shall be submitted to the DWS to demonstrate that provision will be made to render such service.			A detailed waste management plan has been included as part of the EMPr. Please refer to Table 89 to Table 92. The mine is registered with South African Waste Information System (SAWIS) for the following: - D11951-01 (05 February 2018) - Disposal of waste to landfill (Dwarsrivier Mine Discard Area). - D11951-02 (05 February 2018) - Disposal of waste to land (Dwarsrivier Mine Tailings). - D11951-03 (09 April 2018) - Hazardous Waste Generator. Waste is removed to the Salvage Yards, from where it is then sorted. The management of waste is undertaken in line with procedure ENV-OP-03. A detailed record of all wastes produced on site is kept on an electronic spreadsheet, which provides the monthly generation figures in comparison to the previous month. The mine uses the following contractors to dispose of waste: - Oils - Used oils are removed by Oilkol (Pty) Ltd for reworking. - Hazardous waste - Hazardous waste is removed by Waste Legends (Pty) Ltd and disposed of at Holfontein landfill site. - General waste - General Waste is removed by Waste Legends (Pty) Ltd and disposed of at the Roossenekal Landfill Site (Elias Motsoaledi Local Municipality). - Sewage - Sludge is removed by LaFancy (Pty) Ltd and taken to Lydenburg Sewage Treatment Works. In addition to the aforementioned, Interwaste (Pty) Ltd assists with sewage sludge removal when required. The sewage sludge is disposed at the Interwaste (Pty) Ltd Klinkerstene Landfill Site. - Water Treatment Plant (WTP) Sludge - Sludge is collected by Interwaste (Pty) Ltd and is disposed at the Interwaste (Pty) Ltd Klinkerstene landfill site. - Medical waste – Averda South Africa (Pty) Ltd and Compass Waste Services (Pty) Ltd manage the mine's medical waste.
17	The applicant should consult with the biodiversity and heritage department for removal of indigenous vegetation for roads and comments be made available to the DWS.			Consultation with DFFE and the South African Heritage Resources Agency (SAHRA) has been initiated and comments received, please refer to this table, as well as Annexure 6.
18	The applicant shall note that in terms of section 19(1) of the NWA it is stated that: An owner of land, a person in control of land or a person who occupies or uses the land on which a) any activities or process is or was			The Applicant is aware of this responsibility. Reporting of incidents are also included into the EMPr. Please refer to Table 89 to Table 92.

NO.	THEME: GENERAL COMMENTS / ISSUES			
	ISSUE RAISED	**DATE AND HOW ISSUE WAS RAISED**	**COMMENTATOR**	**RESPONSE**
	performed or undertaken or b) any other situation exists, which causes, has cause or is likely to cause water pollution of a water resource must take all reasonable measures to prevent any such pollution from occurring, continuing or recuring. Any pollution incident(s) originating from the proposed project shall be reported to the Provincial Head of the DWS within 24 hours.			

19	The SAHRA Archaeology, Palaeontology and Meteorites (APM) accepts the HIA report and its proposed recommendations. Furthermore, we grant the development from undertaking an assessment of impacts to palaeontological resources as it is located in a very low palaeo sensitivity zone according to the SAHRIS Palaeomap. The SAHRA has no objection to the development going ahead on the following conditions: If the mine is unable to conserve the identified archaeological sites in situ then the sites must be mitigated by a suitably qualified archaeologist. A permit issued under s35 of the NHRA will be required to conduct such work. On completion of the mitigation work the developer can apply for a destruction permit with the backing of the mitigation report. If fossil remains or trace fossils are discovered during any phase of construction, either on the surface or exposed by excavations the Environmental Officer (EO) in charge of these developments must be informed. These discoveries ought to be protected and the ECO must report to SAHRA. In the event that fossils are uncovered during construction then construction must cease within the immediate vicinity, a buffer of 30 m must be established, and a palaeontologist called in to inspect the finds. The palaeontologist must obtain a section 35(4) permit in terms of NHRA and Chapter IV NHRA Regulations, before any fossils are collected. If there are any new heritages resources are discovered during construction and operation phases of the proposed development, then a professional archaeologist or palaeontologist, depending on the nature of the finds, must be contracted as soon as possible to inspect the findings at the expense of the developer. If the newly discovered heritage resources prove to be of archaeological or palaeontological significance, a Phase 2 rescue operation may be required at the expense of the developer. Mitigation will only be carried out after the archaeologist or palaeontologist obtains a permit in terms of section 35 of the NHRA (Act 25 of 1999). You may contact SAHRA APM Unit for further details: (Nokukhanya Khumalo/Phillip Hine 021 202 8654). The Burial Grounds and Graves (BGG) Unit accepts the recommendations provided in the HIA report. If a TSF alternative D is chosen then a 100m buffer zone must be adhered to in order to conserve the cemetery against any potential damage during construction. A social consultation process in terms of Chapter XI of the NHRA Regulations, must be carried out to identify the descendants of the burials and to obtain permission to fence in the identified cemetery. If the mine is unable to retain the grave in situ the permission must be obtained from the families of the deceased, if they agree to the relocation of their graves then a section 36 of the NHRA permit application must be logged on SAHRIS. If any unmarked human burials are uncovered and the archaeologist called in to inspect the finds and/or the police find them to be heritage graves, then mitigation may be necessary and the SAHRA Burial Grounds and Graves (BGG) Unit must be contacted for processes to follow (Thingahangwi Tshivase/Mimi Seetelo 012 320 8490). The Final EIA and its appendices must be submitted to the case and once a Record of Decision from the competent authority is issued, it must also be submitted to the case. Should you have any further queries, please contact the designated official using the case number quoted above in the case header.	23 December 2021: Letter submitted via e-mail	Nokukhanya Khumalo	A detailed Heritage Impact Assessment (HIA) was conducted, as well as a Paleontological Desktop Assessment. Please refer to Annexure 12.
				
				Please take note of Table 89 to Table 92 for further management measures stipulated in the EMPr.
				
				Note that Site D is no longer considered as an alternative location for the TSF, with Site B being the preferred alternative.
				
				Further recommendations regarding the conservation of heritage features made in the EMPr include:
				- The mine should conduct an overall heritage assessment in consultation with the land claimants to determine the presence of any other graves not currently known of.
				- The stone cairn of unknown purpose at Feature 1 (west of proposed PCD) should be avoided with a 30m buffer. If this is not possible, it should be confirmed whether this is a grave through stakeholder consultation/ Ground Penetrating Radar/ Test Excavations and if confirmed to be a grave, it should be relocated as per all the relevant legal requirements. Should this be determined a grave, two options will be considered:
				  o Excavation permits will be applied for; or
				  o A 30m buffer zone (as recommended by the HIA report as no blasting or invasive activities are planned during construction the proposed TSF) must be adhered to in order to conserve the grave against any potential damage during construction. A social consultation process in terms of Chapter XI of the National Heritage Resources Act (Act No. 25 of 1999) (NHRA) Regulations must be carried out to identify the descendants of the burials and to obtain permission to fence in the identified grave. If the mine is unable to retain the grave *in situ*, permission to relocate the grave must be obtained from the families of the deceased. If they agree to the relocation of the graves, then a Section 36 of the NHRA permit application must be logged on the South African Heritage Resources Information System (SAHRIS).
				- Features 2 and 3 (both at the Emulsion and Diesel Batching Areas) and Feature 5 (south of proposed TSF) should be shovel pit tested (with the required mitigation measures and permit in place) to determine the presence of subsurface deposit after which a destruction permit can be applied for.
				- The lack of graves at Feature 4 (Emulsion and Diesel Batching) and Feature 6 (proposed TSF) should be confirmed prior to construction by the social team and monitored during construction.

20	As CPA, they have a concern with regards to the consultation processes followed. The Ba-Mmadi CPA was consulted as part of the renewal license application for DCM. DCM, through the consultants, is just engaging the CPA during public participation processes for the required EIA's. There are no other direct consultation and since the last renewal process there has been no engagement with the CPA's.	15 February 2022: Comments made during meeting	Mr Jim Mosotho: Bakoni Ba-Mmadi CPA	The challenge in this regard refer to two processes that have to be undertaken by DCM. The meeting was part of the EIA application and is regulated by government who mandates these types of meetings

NO.	THEME: GENERAL COMMENTS / ISSUES			
	ISSUE RAISED	**DATE AND HOW ISSUE WAS RAISED**	**COMMENTATOR**	**RESPONSE**
	As CPA, they are unwilling to agree to DCM renewing their license without proper consultation. They will not approve the submission, until they have been properly consulted			
21	The frustration of the Bakoni Ba-Mmadi CPA relates to the socio-economic aspects of projects and thus links to the social commitments of DCM	15 February 2022: Comments made during meeting	Mr Jim Mosotho: Bakoni Ba-Mmadi CPA	The concern raised will be duly considered and will be further discussed with the relevant sections of DCM to determine how best these concerns can be address and what the way forward will entail. These concerns specifically relate to the mandate of the economic division of the mine. The representatives of DCM at the meeting are only involved with the environmental aspects and the EIA application. In terms of the regulations of the EIA process, various Interested and Affected parties (I&APs) and stakeholders are consulted with. As part of the EIA process, the consultants also attend to these types of comments and aim to resolve these as part of the EIA process, where possible. The Dwarsrivier Heritage Management Plan is not seen in isolation, and hence the involvement of the CPA together with their representatives as part of a group discussion.
22	He agreed with the concerns raised by Mr. Mosotho with regards to consultation. DCM is now engaging them, but prior to these EIA meetings, they were not consulted as the Dwarsrivier Claimants Committee (DCC).	15 February 2022: Comments made during meeting	Mr. Caswell Pokwane: Dwarsrivier Claimants Committee	In terms of the regulations of the EIA process, various Interested and Affected parties (I&APs) and stakeholders are consulted with. As part of the EIA process, the consultants also attend to these types of comments and aim to resolve these as part of the EIA process, where possible.
23	The DCC will respond to the graves assessed and identified during the presentation, as part of the site visit that will follow the meeting.	15 February 2022: Comments made during meeting	Mr. Caswell Pokwane: Dwarsrivier Claimants Committee	The Dwarsrivier Heritage Management Plan is not seen in isolation, and hence the involvement of the CPA together with their representatives as part of a group discussion.
24	It is important for the mine to incorporate grey water management principles as part of its design. This is to ensure the sustainability of the project. The mine also needs to ensure that water and energy efficiency is assessed. The mine should not only investigate one element but build on to more elements that can form part of sustainable design elements.	15 February 2022: Comments made during meeting	Mr. Caswell Pokwane: Dwarsrivier Claimants Committee	Noted.
25	Will the project result in dust and/or dust pollution?	15 February 2022: Comments made during meeting	Mr. Caswell Pokwane: Dwarsrivier Claimants Committee	There are no dust pollution linked to the Khulu application. The following impacts were considered in the EIA and assessed by the Air Quality Specialist: • Sensitive receptors are identified as areas that may be impacted negatively due to emissions from the proposed TSF. Four receptors (villages and dwellings) were identified in the area surrounding the proposed project area, within a 10 km radius, and were used for this assessment. PM10 • Highest predicted 24-hour average off-site concentrations during Scenario 2 are non-compliant with the relevant 24-hour standard, due to the close proximity of the new TSF road to the boundary of the mine. However, the highest predicted annual average concentrations remain compliant with the standard; and • However, despite the non-compliance predicted for the 24-hour PM10 off-site concentrations (Scenario 2), all concentrations predicted at neighbouring sensitive receptors remain compliant with their relevant standard, as noted previously. PM2.5 • Predicted concentrations at all receptors remain well below the standards during Scenario 2; and • Highest predicted 24-hour average and annual average off-site concentrations remain compliant with the relevant standards for both scenarios. Dust Fallout • Overall levels of dust fallout anticipated to occur as a result of the proposed TSF are below the respective National Dust Control Regulations.

NO.	THEME: GENERAL COMMENTS / ISSUES			
	ISSUE RAISED	**DATE AND HOW ISSUE WAS RAISED**	**COMMENTATOR**	**RESPONSE**
				The DCM tailings have a very course material / particulate compared to other mines. Platinum tailings also differ from chrome tailings.
26	He acknowledges that a Heritage Impacts Assessment was done for the Khulu project. He is satisfied that DCM is undertaking a Heritage Management Plan for the entire Dwarsrivier area. Their concerns raised at the previous meeting seem to be attended to, and this is a step in the right direction. However, the DCC is not a CPA, but are the claimants. DCC is still waiting for their CPA structure to be finalised. They are thus attending this meeting as the Dwarsrivier Claimants Committee (DCC), as they are family representatives	15 February 2022: Comments made during meeting	Mr. Caswell Pokwane: Dwarsrivier Claimants Committee	The Dwarsrivier Heritage Management Plan is not seen in isolation, and hence the involvement of the CPA together with their representatives as part of a group discussion.
27	As CPA they are satisfied that they are consulted with. They understand that the EIA is a separate process and that this meeting forms part of the EIA application. However, what they highlight is the need for DCM to engage with them as the Bakoni Ba-Mmadi Communal Property Association (CPA). Since 2018, DCM have not engaged with them. They requested that DCM meet with the Bakoni Ba-Mmadi CPA within 7days from the date of this meeting. This will not be their first request for additional meetings with DCM outside of the EIA processes. They will not commit to this process as the application will not benefit them.	15 February 2022: Comments made during meeting	Mr Jim Mosotho: Bakoni Ba-Mmadi CPA	Noted. Batho Earth was informed after the meeting that DCM did meet with the CPA Bakoni Ba-Mmadi at the beginning of February 2022. DCM will continue to meet with all the relevant stakeholders as part of their internal processes, these matter fall outside the scope of the EIA.
28	They are satisfied with t the EIA process and that they were invited to this meeting, but they are not satisfied with DCM and therefore provides DCM with 7 days to respond to their request.			Noted. Batho Earth was informed after the meeting that DCM did meet with the CPA Bakoni Ba-Mmadi at the beginning of February 2022. DCM will continue to meet with all the relevant stakeholders as part of their internal processes, these matter fall outside the scope of the EIA.
29	What is the objective of the meeting, and will it be achieved? The DMRE is the decision-making authority, and can only observe. The DMRE still need to make a decision on the said application. There are other parties that also need to be involved in the process.	16 February 2022: Comments made during meeting	Mr Nicholas Chavalala (NC):DMRE:	The objectives of the meeting will be reached and achieved. All relevant authorities were invited to the meeting. The Department of Water and Sanitation (Limpopo) did provide an apology indicating that they could not attend the meeting. A separate meeting was held with the Land Claimants affected by the proposed project on 15 Feb 2022. The presentation also provides a summary of the stakeholder engagement process followed to date. Key stakeholders, that included the following sectors, were directly informed of the proposed development through the distribution of the Background Information Document and Registration Sheet: • Authorities; • Municipalities; • Residential Associations; • Non-governmental organisations; • General Public; • Parastatals / Service providers, and • Adjacent Landowners. The Draft Environmental Scoping Report (ESR) was made available to all registered stakeholders from 23 July 2021 to 23 August 2021. Comments were received from DFFE, SAHRA, DWS, surrounding mines and stakeholders. It is proposed that the draft EIA report will be made available at the end of February 2022. The different interest groups were grouped, as part of the consultation process, and separate meetings were held for each interest group. The aim of the meeting is to provide feedback on the project and the results of the specialists' studies.
30	Have you received proof from the land claimant that they are the actual land claimant of the site. It must be ensured that the correct stakeholders are involved as land claimants. As FTLM, they are also assessing the information with regards to the Land Claimants.	16 February 2022: Comments made during meeting	Councillor Mabowa: Ward 27 Fetakgomo Tubatse Local Municipality (FTLM)	A meeting was held with two land claimant groupings on 15 Feb 2022. The consultants have also consulted with the Commission of Restitution of Land Rights/Land Claims Commissioner to determine the status of the land claims on the affected farm portions and the stakeholders involved in the land claims.
31	It is critical that the correct information is used and that the legitimate land claimants are involved.	16 February 2022: Comments made during meeting	Councillor Mabowa: Ward 27 Fetakgomo Tubatse Local Municipality (FTLM)	Batho Earth will also consult with the FTLM in terms of information obtained and sharing of the information already received with regards to the issue of land claimants.

NO.	THEME: GENERAL COMMENTS / ISSUES			
	ISSUE RAISED	DATE AND HOW ISSUE WAS RAISED	COMMENTATOR	RESPONSE
32	How many protective species will be removed as part of the diesel and emulsion batching area? Do we have the quantity (number) of trees available that will require removal?	16 February 2022: Comments made during meeting	Tshifhiwa Mathase: Department of Forestry, Fisheries and the Environment (DFFE): Limpopo	No quantity/numbers are yet available. It is proposed that a walk-over is done before construction commence. The information obtained during this walk-over will be submitted to the department as part of the permitting process.
33	What is the size of the project area, thus how much land will be cleared as part of the diesel and emulsion project?	16 February 2022: Comments made during meeting	Tshifhiwa Mathase: Department of Forestry, Fisheries and the Environment (DFFE): Limpopo	It is planned to clear approximately 5ha of land for both sites, which is the Diesel area and the Emulsion area.
34	Are all the protected trees within the same study area? Will we be attending to these trees as part of the site visit?	16 February 2022: Comments made during meeting	Tshifhiwa Mathase: Department of Forestry, Fisheries and the Environment (DFFE): Limpopo	The entire study area and the affected areas that form part of the various capital projects and the location of the Tailings facility will be visited and investigated as part of the site visit that took place after the meeting
35	Have you already applied for these tree permits?	16 February 2022: Comments made during meeting	Patricia Makhuvele: DMRE	The permitting process can only be undertaken once the mine has received approval in terms of the EIA process. This permitting process takes approximately 12 months and one cannot apply in advance. The process can only commence after approvals from the DMRE. SAS Environmental Group of Companies will be appointed to undertake the required permitting process. They have substantial knowledge of the area and the process required.
36	In terms of the Emulsion and Diesel project, will the project be underground or above ground?	16 February 2022: Comments made during meeting	Patricia Makhuvele: DMRE	The infrastructure (tanks) associated with the Diesel plant will be above ground, but the diesel will not be "used" above ground, but will connect to the underground mining operations, to supply diesel to these areas. The Emulsion plant will also be above ground in terms of infrastructure, but for usage as part of the underground mining operations. No emulsion will be stored at the surface location and all product decanted will be stored underground at a purpose-built depot located at Strike N15G / N17A. The surface location will be used for the express purpose of transferring emulsion from a designated road tanker, via the off-loading pipeline to the underground storage tanks. The mine intends storing a total of 60 (Sixty) tons (similarly 60m^3) of Emulsion product underground, with no surface storage being done and, no pipeline inventory.
37	It is important to remember that although the area to be cleared only refer to the construction site, it is also important for the mine to highlight the areas surrounding the "site clearance". The surrounding areas are also affected, not only the construction area. These areas are normally not regarded as protected, especially the protected trees outside the construction footprint. It is suggested that as part of your onsite training that you also demarcate an additional buffer around the construction site. It is also important to include as part of the training manual a description (a picture of all the trees that were identified) of all the protected trees located in the area	16 February 2022: Comments made during meeting	Tshifhiwa Mathase: Department of Forestry, Fisheries and the Environment (DFFE): Limpopo	The proposed application makes provision for this to be included into the EMPr. The consultant will ensure that this is included into the document
38	Before construction can commence, a site visit needs to be undertaken by representatives of the DFFE to ensure that the mitigation measures are in place	16 February 2022: Comments made during meeting		The EMPr requires that an Environmental Control Officer (ECO) is appointed to oversee all the construction activities. The ECO as per the regulation needs to be independent. The ECO will thus ensure that all the mitigation measures are implemented. The inclusion of an Ecologist as part of the construction phase is also seen as a possible management measure to ensure that the wider area is protected, and not only the construction site
39	The EIA also needs to ensure that a proper Fire management plan is implemented. The EMPr should include measures, that no protected trees may be used for harvesting of firewood. Again, this needs to be included as part of the general induction training.	16 February 2022: Comments made during meeting	Tshifhiwa Mathase: Department of Forestry, Fisheries and the Environment (DFFE): Limpopo	There is an induction training manual in place for Dwarsrivier Chrome Mine (DCM), which includes the protection of trees, including that trees are not allowed to be used for firewood.
40	The issue of veldfires in the area is of great concern. There need to be strict measures in place to ensure that veldfires are minimized. No smoking must be allowed other than at the dedicated smoking areas. No open fires must be allowed for cooking purposes.	16 February 2022: Comments made during meeting	Tshifhiwa Mathase: Department of Forestry, Fisheries and the Environment (DFFE): Limpopo	All the comments received are included into the EIA report. The said report also has a separate table with all the listed conditions. This then also gets documented in the EMPr for use on site. The consultant can also provide the separate list of conditions to the departments.

NO.	THEME: GENERAL COMMENTS / ISSUES			
	ISSUE RAISED	**DATE AND HOW ISSUE WAS RAISED**	**COMMENTATOR**	**RESPONSE**
41	As part of the final EIA, all the comments received need to be incorporate into the report such as the comments from the Land Claimant and SAHRA. The Ecology report also needs to form part of the submission as we would like to avoid any appeals. A full public participation process needs to be incorporated.	16 February 2022: Comments made during meeting	Patricia Makhuvele: DMRE	All specialist studies will be included into the draft EIA report. The report will also provide a summary of all the findings. The inclusion of a detailed public participation report is noted and will be included.
42	We would like to place on record that Eskom has knowledge of the proposals as per your report and that several discussions and meetings took place between Eskom and Dwarsrivier Chrome Mine (DCM) to determine the impact on Eskom's network and plant. It was agreed between Eskom and DCM that, before execution of the final project/s by DCM, Eskom will either enter upon a Co-Use agreement with DCM, or DCM will, at their cost, relocate Eskom network and/or plant components.	21 February 2022 Formal comments submitted via letter	Xander Neethling: Eskom: Supervisor: Land and Rights	Noted.

Please refer to the following table for the comments raised by the DMRE:

Table 21: Comments received from the DMRE on the final ESR

#	Comment	Response
1	Please ensure that all relevant stakeholders are consulted, and comments are submitted to the Department with the Environmental Impact Assessment Report. This includes but is not limited to the Provincial Heritage Resources Authority, Provincial Environmental Department, Department of Agriculture, Forestry and Fisheries (DAFF), Department of Water and Sanitation (DWS), Eskom and the Local Municipality. Proof of correspondence with the various stakeholders must be included into the EIA. Should you be unable to obtain comments, proof of attempts that were made to obtain comments should be submitted to the Department.	Please refer to Section 1.g.iv for details of the Stakeholder consultation process. Also refer to Annexure 6.
2	In addition, the following amendments and additional information are required for the EIA and EMPr: Details of the future land use for the site and infrastructure after decommissioning in 20-30 years. The total footprint of the proposed development should be indicated. Possible impacts and effects of the development on the vegetation ecology with regards to low land-highland interface in the locality should be indicated. Possible impacts and effects of the development on the surrounding industrial area. Information on services required on the site, e.g. sewage, refuse removal, water and electricity. Who will supply these services and has an agreement and confirmation of capacity been obtained? A construction and operational phase EMPr to include mitigation and monitoring measures. Should blasting be required, appropriate mitigation measures should be provided.	The current financial rehabilitation plan makes provision for the end land use of the mine to be Wilderness land. Please refer to Section 1.s of the EIA and Section 1.e of the EMPr for the outcomes of the Financial Provision. Please refer to Table 10 for a summary of each of the activities. In addition to this, please refer to Section 1.d.ii for detailed descriptions of each of the projects and lastly Table 82 for the financial provision quantity. Please refer to Annexure 8 and Annexure 9 for the findings of the ecological and Freshwater Resources studies. No low-land/ high-land interface has been identified. Various different ecological habitats requiring management have been demarcated with management of these presented in Table 89 to Table 92. The mine is an existing operation, and no additional services are required. Existing services will be utilised for the proposed projects. Please refer to Table 89 to Table 92. No blasting is required for the purposes of this project.
3	The applicant is hereby reminded to comply with the requirements of regulation 3 of the EIA Regulations, 2014 with regards to the time period allowed for complying with the requirements of the Regulations.	Noted.
4	Please ensure that the Report includes A3 size locality maps of the area and illustrates the exact location of the proposed development. The maps must be of acceptable quality and as a minimum, have the following attributes (maps are relatable to one another; coordinates legible legends; indicate alternatives; scale and vegetation types of the study area).	Please refer to Annexure 16.
5	Further, it must be reiterated that, should an application for Environmental Authorisation be subjected to any permits or authorisations in terms of the provision of any Specific Environmental Management Acts (SEMAs), proof of such application will be required.	The purpose of the current WULA is to make technical amendments to the existing authorised water uses and include new water uses associated with the expansion activities. The EWULAAS process has been initiated on 15 January 2022.

#	Comment	Response
6	Your attention is brought to Section 24F of the NEMA which stipulates that no activity may commence prior to an Environmental Authorisation being granted by the Competent Authority.	The Applicant is aware of this responsibility. Reporting of incidents are also included into the EMPr.
7	Ensure that financial provision quantum form part of the EIAr and it caters for the proposed additional listed activities.	Please refer to Section 1.s of the EIA and Section 1.e of the EMPr for the outcomes of the Financial Provision.
8	You are requested to consult with relevant state departments that adjudicate mining activities and submit three hard copies of the report and at least one electronic copy (CD/DVD) of the complete EIA/EMPr to this Regional Office.	Noted.

The draft EIA and EMP Report is made available to all Commenting Authorities and Registered Stakeholders.

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

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

1.g.v.1 Climate

WSP Consulting was appointed to undertake the Air Quality Assessment and Hydrospatial to undertake the Hydrological Assessment. The climatic information was sourced from these reports, as well as available information on site.

1.g.v.1.a Temperature

The mine is situated in the Highveld Climate Region of South Africa. The average daily maximum temperature for summer (January) is 27 degrees Celsius (°C) and for winter 17°C. The average daily minimum temperatures vary between 13°C in January and 0°C in July. In terms of the 2019 Air Quality Site Selection Report, the highest monthly average temperature for 2015, 2016 and 2017 was 22.46, 21.84 and 21.65°C, respectively, recorded during summer. The lowest monthly average temperature for 2015, 2016 and 2017 was 12.36, 12.77 and 13.09°C, respectively, recorded during winter.

1.g.v.1.b Rainfall

The Mean Annual Precipitation (MAP) on the project area is estimated to range around 650mm per annum; while the small portion of the study area ranges from 601 to 800mm. The mine receives most of its rainfall during the summer months.

1.g.v.1.c Humidity

According to the 2019 Air Quality Site Selection Report, the humidity in the region is moderate to high, with the annual average for 2015, 2016 and 2017 being 65.13, 66.94 and 63.13 %, respectively.

1.g.v.1.c.1 Evaporation

The table below provides the evaporation figures for the project area.

Table 22: Evaporation Summary

Type	Amount (mm)
Mean Annual Evaporation	1677

The MAP is less than the Mean Annual Evaporation (MAE) and therefore the project area is classified as a water deficit site.

1.g.v.1.d Wind

Wind can play an important factor in the potential distribution of fugitive dust resulting from the site. As the mine is situated in the Dwarsrivier valley, this factor gives rise to winds that are variable in terms of both speed and direction.

Wind roses (see the following figure) summarize wind speed and directional frequency at a location. Each directional branch on a wind rose represents wind originating from that direction. Each directional branch is divided into segments of colour, representative of different wind speeds.

Typical wind fields are analysed for the full period (January 2018 – December 2020)); diurnally for day (06h00–18h00) and night (18h00–06h00); and seasonally for summer (December, January and February), autumn (March, April and May), winter (June, July and August) and spring (September, October and November).

- Calm conditions occurred 4.76% of the time;
- Moderate winds from the east-southeast prevailed in the region with notable south-easterly, easterly and north-north-easterly components;

- Wind speeds were predominately light to moderate during the period, with a few winds exceeding 8m/s at times, particularly from the southeast; – North-north-easterly trajectories prevailed during the day while east-south-easterly trajectories prevailed at night;
- Diurnal wind speeds were predominately light to gentle during morning hours with an average wind speed of 3.8m/s observed;
- Minimal seasonal variability in seen in the wind profile with east-south-easterly and east-north-easterly winds dominating during the summer and spring months, while south-easterly winds prevailed in winter and autumn; and
- Average seasonal wind speeds for the region were highest during the spring and summer months with an average wind speed of 3.7m/s and 3.5m/s observed respectively.

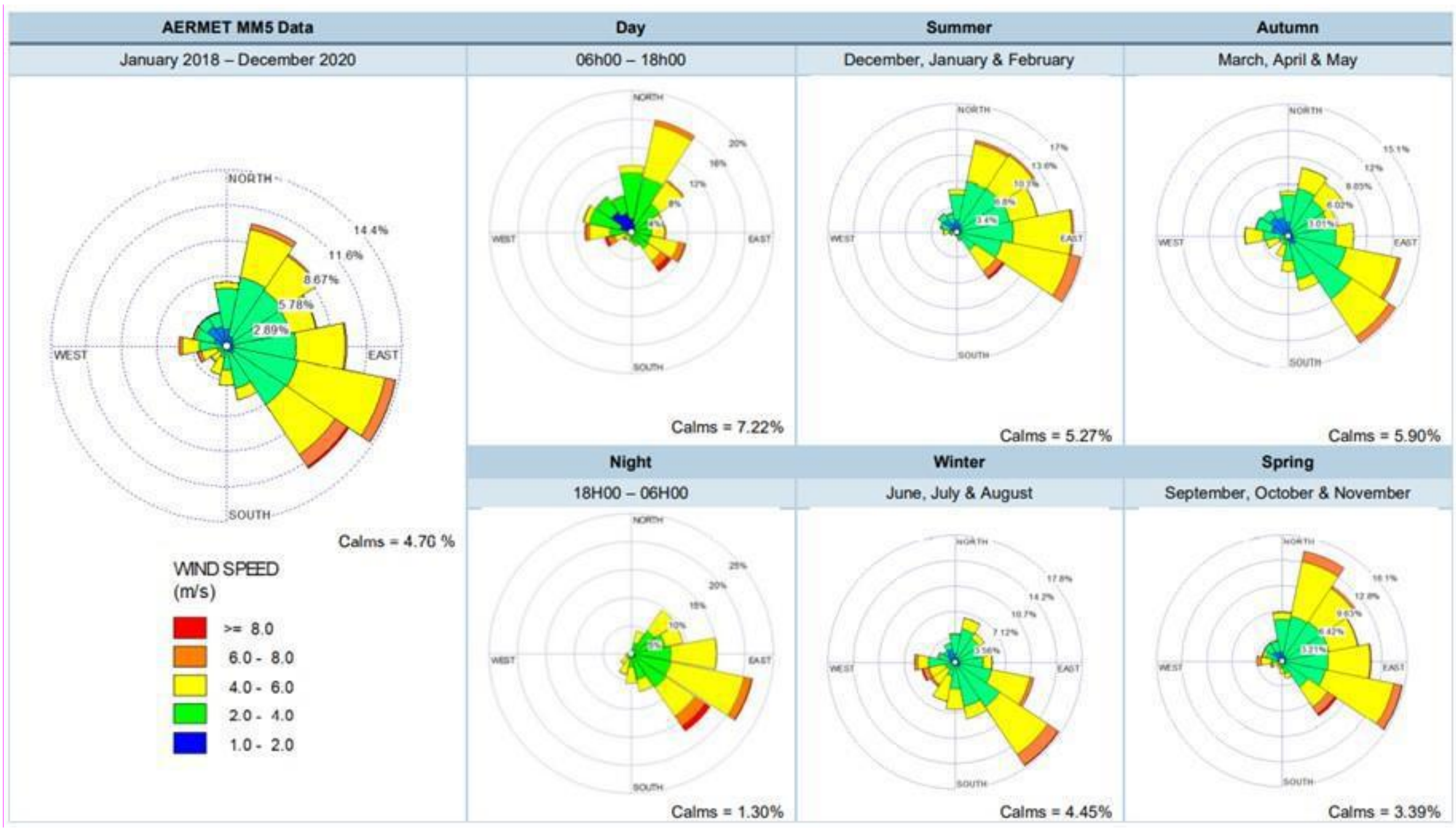


Figure 18: Wind data.

1.g.v.1.e Extreme Weather Conditions

The incidents of extreme weather conditions for this area are included in the following table.

Table 23: Extreme Weather Conditions.

# of Days With	Jan	Feb	March	Apr	May	un	Jul	Aug	Sep	Oct	Nov	Dec	Days Per Yr.
Thunder	6.	4.4	3.7	2.7	0.9	0.5	0.4	1.1	1.4	4.1	7.1	5.1	37.6
Hail	0.3	0.1	0.2	0.1	0.0	0.1	0.1	0.1	0.1	0.1	0.5	0.2	1.9
Fog	1.9	1.3	1.1	0.9	0.4	1.1	0.8	1.1	0.8	2.6	1.6	1.6	15.2
Snow	0.0	0.0	0.0	0.1	0.0	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.6

1.g.v.2 Topography

Hydrospatial was appointed to undertake the Hydrological and Visual Assessments. The topographic information was sourced from these reports, as well as available information on site.

The farm Dwarsrivier 372KT, on which the mine is located, is traversed by the Groot Dwars River and the Klein Dwars River. The confluence of these rivers is also located on the property. The eastern portion of the property, where the chrome reserves outcrop, generally slopes in a westerly to south westerly direction, towards the Dwars River. Adjacent to the river, slopes are gentle, in the order of 3°. Further upslope from the river, slope angles increase to as much as 40°.

The regional topography can be described as undulating with numerous mountain ridges and valleys (refer to the following figure). A mountain ridge runs along the western boundary of the Dwarsrivier Mine MRA, where a maximum elevation of approximately 1 630 metres above mean sea level (mamsl) is reached. From this ridge, the elevation drops off to approximately 900 mamsl near the confluence of the Klein and Groot Dwars Rivers. A number of koppies and hills are located along the central eastern part of the study area.

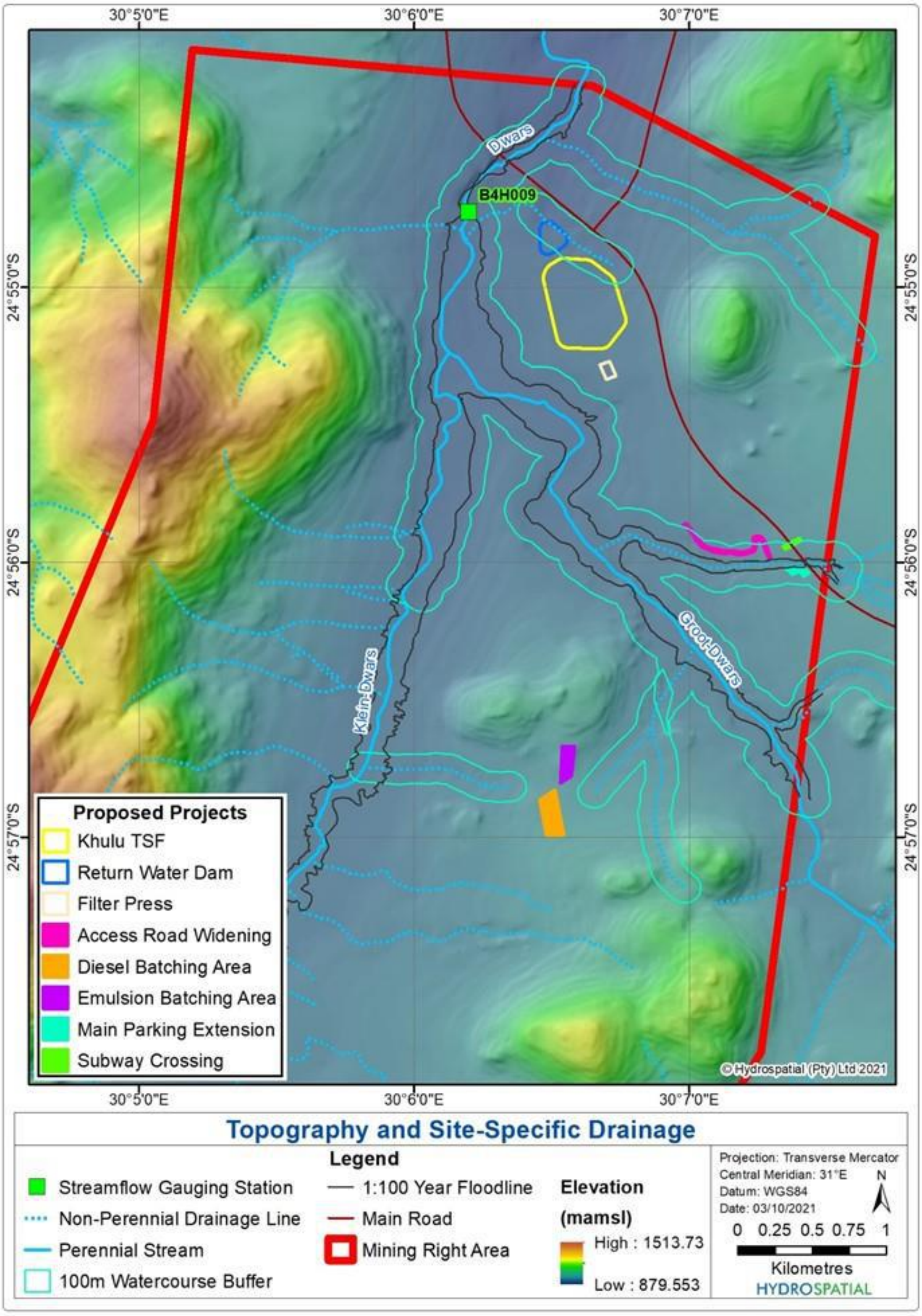


Figure 19: Topography (HydroSpatial, 2021)

1.g.v.3 Geology

iLEH was appointed to undertake the Hydrogeological Assessment The geological information was sourced from these reports, as well as available information on site.

1.g.v.3.a Regional Geology

Dwarsrivier Mine is situated in the Eastern Limb of the Bushveld Igneous Complex and the chrome deposits form part of the Critical Zone. The Dwarsrivier ore body represents an open-ended structural synform with a north-south orientated axis that plunges gently to the south (iLEH, 2015). The Steelpoort Chromite Seam (SCS) seam is mined. The geology overlying the chromite comprises norite, pyroxenite and anorthosite, as indicated on Figure 20. Along the eastern, western and southern boundaries of the sub-catchment in which the project is situated, Critical and Marginal Zone anorthosites, pyroxenites and norites outcrop. These have a general northerly strike and a dip of 7 – 10° west (Gap Geophysics, 2018). The igneous rocks form steep sloping mountain land and hills. From east to west, the Dwarsrivier Mine mineral rights area hosts Lower (LG) and Middle Group (MG) chromitite seams and higher up the stratigraphic sequence, the UG2 and Merensky Reefs. The LG6 (or Steelpoort) seam is the economic ore body mined by Dwarsrivier Mine. Differential weathering rates of the igneous rocks give rise to the topography:

- The peaks of the Dwarsrivier mountain appear to be marked by outcropping dykes and replacement pegmatoids, both of which area weathering resistant.
- The slopes, their directions and the breaks in their curvature are controlled by the presence or lack of faults and shear zones. Where discrete fault zones exist, weathering channels are apparent.

Large-scale alluvial aquifers occur in the floodplains of the Groot and Klein Dwars Rivers in the central part of the project area. These aquifers are exploited for groundwater supply to the mining operations.

1.g.v.3.b Local Geology

The mining operations are situated approximately 10km southeast of the Steelpoort lineament that affects the general area of Kennedy's Vale. Splays from this regionally dominant feature include the Dwarsrivier Fault, which defines the flow of the Klein Dwars River. This fault resulted in increased joint densities and associated alteration and therefore increased weathering rates.

Numerous fault zones are known and intersected in the Dwarsrivier Mine underground workings, as indicated on figure overleaf. The positions of these faults were confirmed through a study completed by Gap Geophysics (2018) as well as information provided by Dwarsrivier Mine. It is thought that these major regional fault lines are associated with enhanced aquifer conditions and would therefore act as preferential flow paths to groundwater. It is known that faults intersected in the underground workings in South Mine yield groundwater that is captured for reuse in the mine water balance. This water is pumped from underground to a dedicated tank (Fissure Water Tank) on surface for redistribution.

A number of north-northeast striking dolerite dykes are present in the area, as indicated on Figure 20. These dykes are associated with the Dwarsrivier Fault and are of late-Bushveld age. The strike orientation of these dykes are the result of the regional stress tensional system. For this reason, significant faults are aligned along or in close proximity to individual dykes. It is estimated that regionally approximately 10% of dykes infill faults. Cross-cut west-northwest trending dykes also seem to correlate with faulting (Gap Geophysics, 2018). Based on the close relationship between faults and dykes, it is likely that the dykes would also be associated with enhanced aquifer conditions and hence act as preferential flow paths to groundwater.

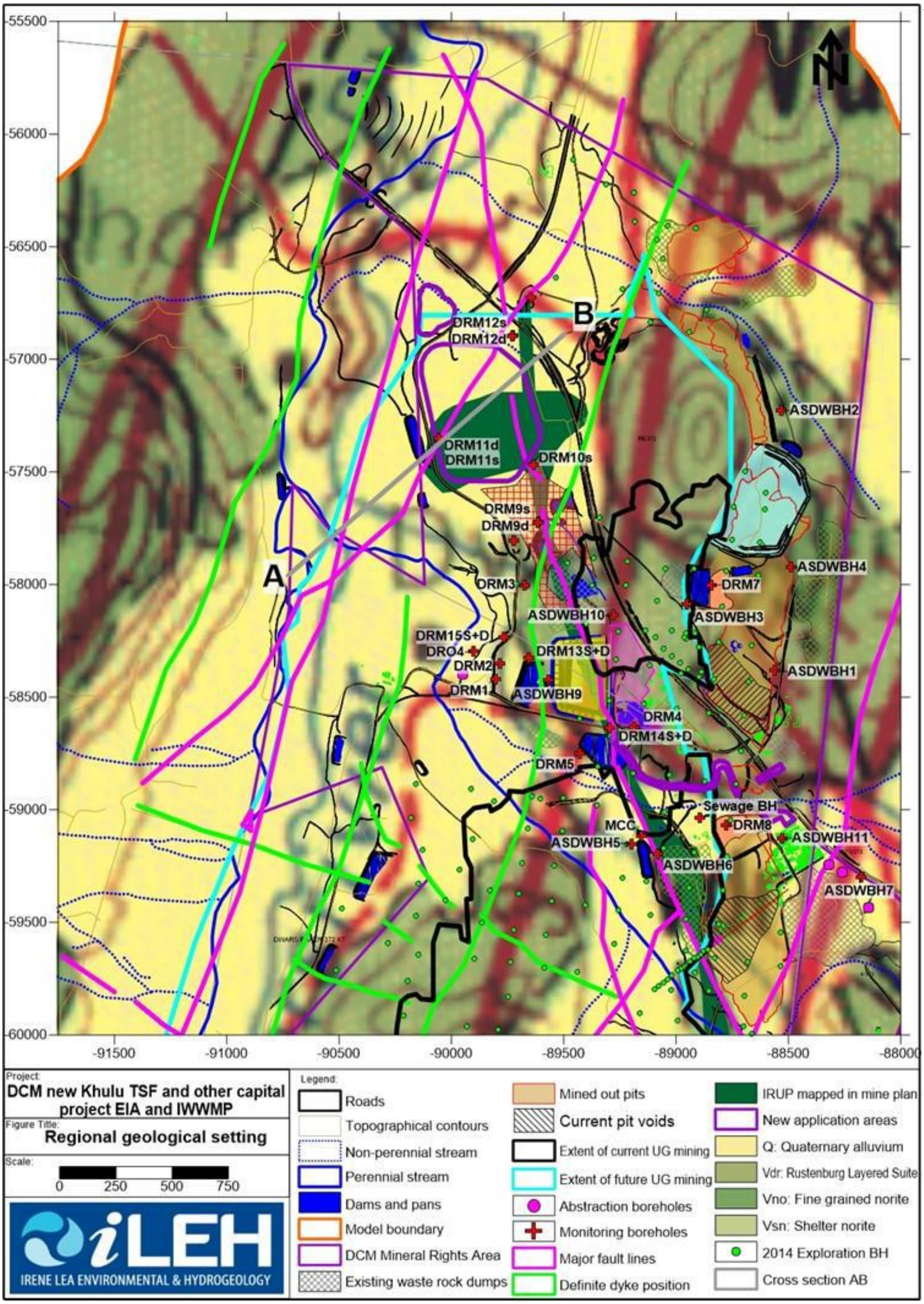


Figure 20: Geological setting

1.g.v.3.c Geological Conditions at the proposed Khulu TSF

Jones & Wagener (Design Engineers of the TSF) conducted a geotechnical investigation within the proposed infrastructure footprint areas to investigate the prevailing *in-situ* soil conditions and to take soil samples for testing.

A geological fault runs through the site from north to south near the eastern edge of the proposed TSF footprint as also presented in the preceding section (refer to Drawing No. I031-00- 001 in Annexure 4 and Figure 20 before).

Considerable surface erosion was noted on the northern side of the proposed Khulu TSF footprint and within the footprint of the PCD. On the western side of the fault the soil profile comprises of approximately 1m thick top layer of black clayey hillwash (black clay). The hillwash is underlain by fine sandy residual Norite that extends to depths of up to 6 m. A highly weathered soft rock Norite was encountered at greater depths (±6m) underlying the residual Norite layer.

On the eastern side of the fault the soil profile consists of approximately 1m thick top layer of black clayey hillwash closer to the fault. The thickness of the top layer reduces towards the east and away from the fault. The area towards the northeast side is eroded and the top layer is poorly developed. Closer to the fault the top layer is underlain by between 2m to 3m thick layer of brown clay. The brown clay is underlain by a residual norite sand which overly a norite rock. The thickness of the brown clay layer also reduces to the east and away from the fault. On the far eastern side of the site, the brown clay layer was poorly developed or absent. The brown clay can potentially be borrowed and used for the construction of the clay layers forming part of the liner system, however the quantity is limited.

The footprint of the PCD is highly eroded in areas. The footprint areas that are less eroded are overlain by a thick layer of sandy hillwash of up to 0.9m. The thickness of the hillwash layer reduces to about 0.1m over eroded areas. The rest of the profile under the hillwash layer is similar to that observed on the western side of the fault under the TSF footprint.

No seepage or water table was encountered in any of the test pits.

Analysis of Dwarsrivier Mine exploration borehole data suggests that the majority of fractures and faults are found in the upper 60m of the geological succession. Water strikes associated with the fault zones occur between 15 and 32m below surface. Please refer to the following figure for an illustration of the fault areas, as well as the table thereafter for a detailed explanation.

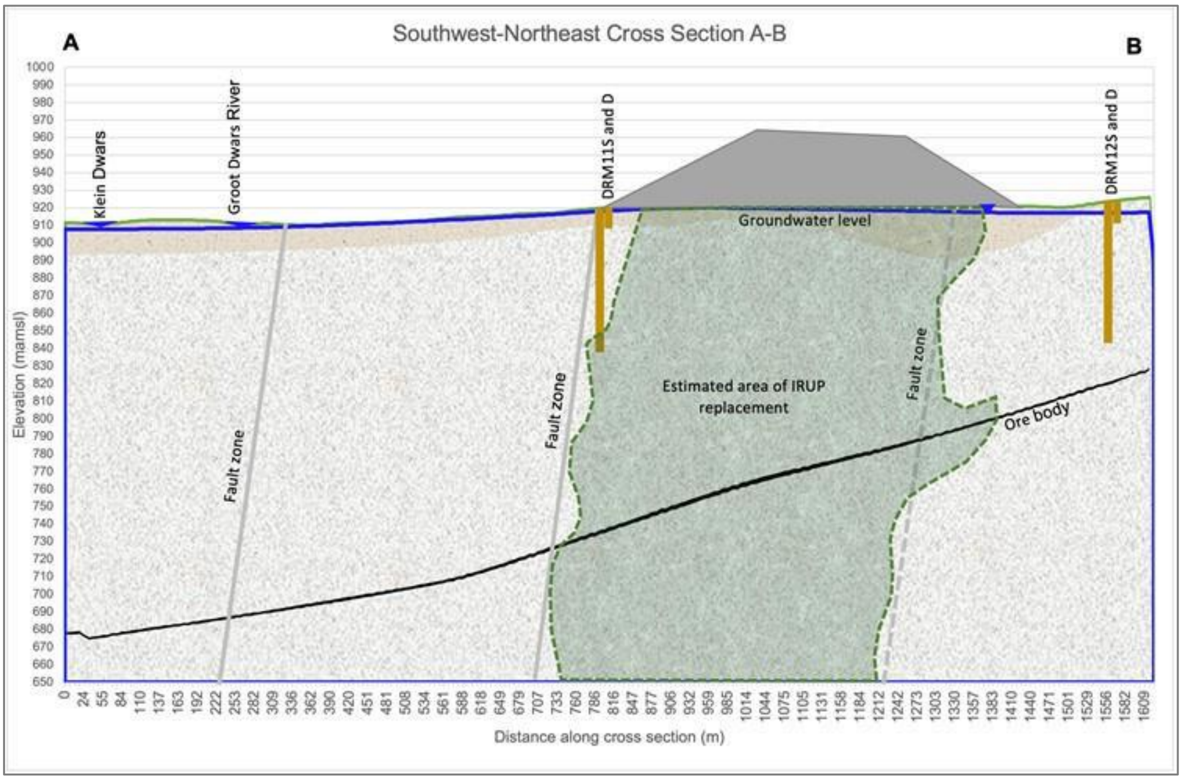


Figure 21: Cross section through the project area

Table 24: Aquifer conditions associated with fault zones

Fault Zone	Relevant Boreholes and/or Structures	Aquifer Conditions
A regional southwest-northeast trending fault line transects the Khulu TSF footprint area. The position of this fault is indicated on Figure 20.	Monitoring boreholes DRM11S and D and DRM12S and D targets the southwest-northeast trending fault zone. The Farm House borehole included in the hydrocensus is also situated on this fault zone.	DRM11S and D, situated down gradient of the Khulu TSF was dry at the time of drilling. Groundwater levels recovered in the deep borehole to around 14m, which is comparable to regional trends. This information could indicate that the rock matrix (unfractured pyroxenite) is tight and is not expected to transmit significant volumes of groundwater. It is further likely that the southwest-northeast trending fault is not associated with a strong aquifer, based on data from DRM11D.
	The iron rich ultramafic pegmatoid replacement (IRUP) bodies and marker horizons identified within the mining area are stratigraphic of nature. The Khulu TSF footprint area is partially underlain by an IRUP, which is associated with the N-S striking fault present in the mining area. The replacement body is aligned with the N-S striking fault mapped along the eastern side of the Khulu TSF. It was logged in borehole DRM11D at a depth of 70m.	It is noted that ASDWBH12, an existing monitoring borehole identified during the hydrocensus is also located along the N-S striking fault at the position where the pipe balloons (see Figure 20). This borehole yields groundwater at an estimated rate of 19 l/s and has a transmissivity of 189m2/d, suggesting that the IRUP in combination with the N-S striking fault forms a strong aquifer. Further north, aquifer conditions measured in DRM12D could indicate that the fault zone can transmit groundwater. It is however acknowledged that DRM12D is located at the intersection between two fault zones and that the data from the borehole is characteristic of the north-south trending fault (see further information in the row below).
A second north-south striking fault line transects the eastern section of the Khulu TSF footprint area, if regional mapped faults are extrapolated.	Monitoring boreholes DRM9S and D, DRM10S (and ASDWBH12) and DRM12S and D targets this fault line. It is noted that monitoring borehole DRM14S and D drilled recently by Dwarsrivier Mine for a separate drilling and pump testing project targets the north-south trending fault in the vicinity of the plant (nettZero, 2021).	The information suggests that the north-south trending fault forms a stronger aquifer with higher borehole yields in DRM9D, DRM12D and ASDWBH12. The transmissivity of this structure varies between 6 and 189m^2/d. Information from borehole DRM14D indicates water strikes between 13 and 43m in the north-south striking fault zone. Aquifer conditions in this borehole are well developed with a high transmissivity of 328m^2/d with a moderate borehole yield (nettZero, 2021).
In addition to the fault zones, sub-parallel southwest-northeast trending dykes are present in the vicinity of the Khulu TSF footprint area (Figure 20).	Boreholes DRM3, DRM13S and D and ASDWBH9 likely target this dyke. Borehole DRM9S and D was also used to target the dyke.	Aquifer tests were completed on DRM3, DRM13D and ASDWBH9 by nettZero (2021). Aquifer characteristics for these boreholes are presented in Table 39. It is shown that the transmissivity for the dyke is lower compared to the fault zones discussed above, varying between 0.3 and 17.5m^2/d. Borehole yields are also lower ranging between 0.1 and 1.6 l/s.

Based on the information evaluated, it is concluded that the north-south trending fault is a strong aquifer with high permeabilities. It is therefore identified as a preferential flow path to groundwater and therefore also for potential contamination associated with the Khulu TSF.

The southwest-northeast trending fault also exhibits enhanced aquifer conditions, which are variable along its strike. It is significant that borehole DRM11D situated down gradient of the Khulu TSF on this fault was dry at the time of drilling. This structure may therefore also be considered as a preferential flow path to groundwater, but with less significance compared to the north-south trending fault.

In the contact zone of the dyke situated east of the Khulu TSF could act as a preferential flow path to groundwater, especially around ASDWBH9. In the vicinity of the Khulu TSF, the significance of the preferential flow along the dyke contact is considered less.

1.g.v.4 Soils and Land Capability

Zimpande was appointed to undertake a Soils, Land Use and Land Capability Assessment to provide input in terms of the soil characteristics on site (please refer to Annexure 7).

1.g.v.4.a Land Use

The local climate can be broadly classified as somewhat favourable for good yield for selective adapted crops. The Mean Annual Rainfall (MAR) Associated with the MRA is estimated to range around 650mm per annum. Under these climatic conditions some crops may require irrigation to supplement water shortages to prevent permanent wilting which might ultimately affect the crop yield.

None of the footprint areas earmarked for the various projects are currently under cultivation and none have previously been utilised for agricultural purposes except for the proposed TSF area which has previously been cultivated for subsistence purposes but has since been laid fallow. Scrutiny of the satellite imagery indicated that the dominant land uses in the surrounding areas are mining and wilderness, with very few residential areas northeast of the MRA. No cultivated agricultural land was observed within the immediate vicinity of the MRA.

Figure 22: Map depicting the current Land uses associated with the proposed development

1.g.v.4.b Dominant Soil Forms

The dominant soil form occurring within the TSF footprint area is the Bonheim soil form which is considered ideal for agricultural cultivation due to:

- Deep, well-drained soil characteristics;
- Texture and structure allowing for effective rooting depth;
- Good water holding/storage capacity; and
- Good nutrient holding capacity.

The remaining footprint areas are characterised by soils by which are not considered suitable for cultivation, with these soil forms including Mispah, Outcrops, Mayo, Glenrosa, Etosha and Gamoep. These soils have a limitation in terms of the effective depth and water holding or storage capacity which render these unsuitable for most cultivated crops.

The Witbank (Anthrosols) soil form associated with the widening of access roads has been subjected to physical disturbance because of mining and related activities. As a result, these soils are not ideal for agricultural cultivation. The figure below presents the soil forms identified within the footprint areas.

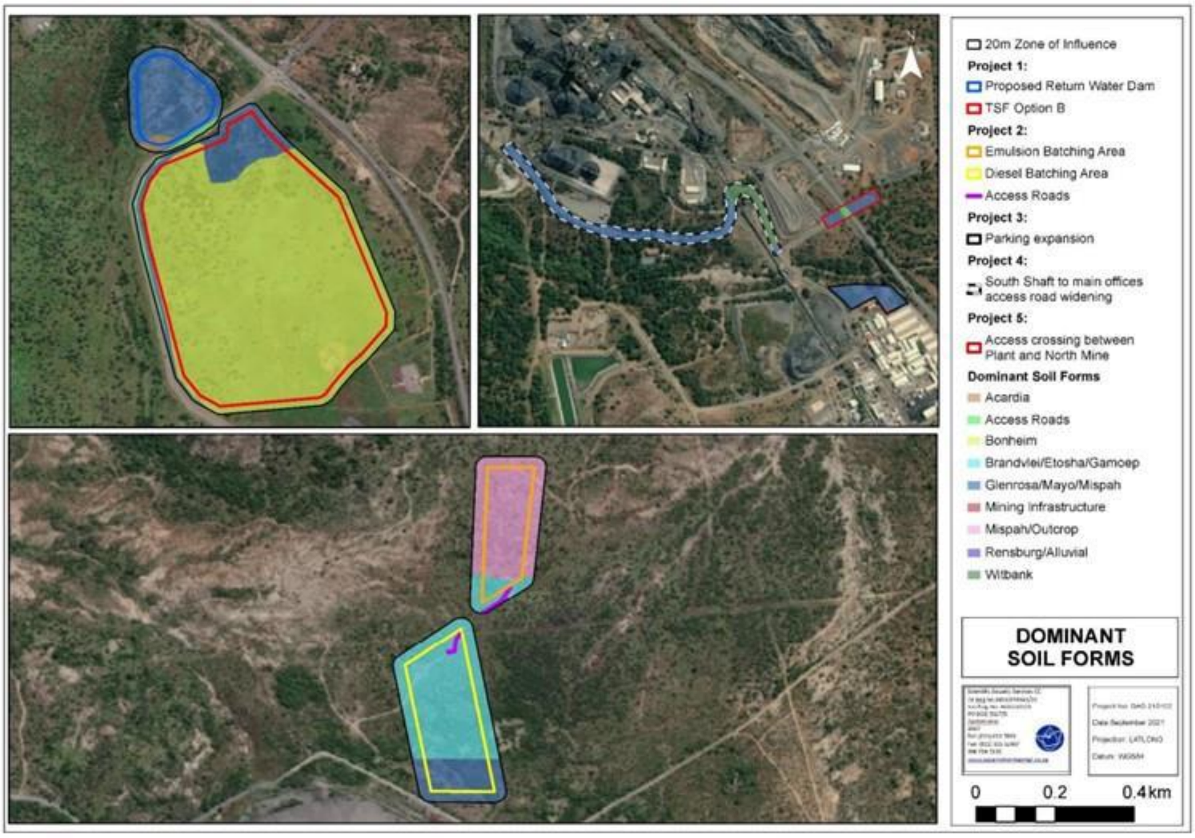


Figure 23: Map depicting the dominant soil forms associated with the proposed projects

1.g.v.4.c Land Capability Classification

The MRA falls into Climate Capability Class 5, with a moderately restricted growing season due to low temperatures, frost and/or moisture stress. Suitable crops may be grown at risk of some yield loss.

The identified soils were classified into land capability and land potential classes using the Camp et al., and Guy and Smith Classification system (Camp et al., 1987; Guy and Smith, 1998), as presented in Figure 24. The identified land capability limitations for the identified soils are discussed in comprehensive “dashboard style” summary tables presented in tables below. The dashboard reports aim to present all the pertinent information in a concise and visually appealing manner.

Table 25: Identified soil forms within the project area and their respective land capability.

Soil Form	Land capability	Area (ha)	Land Potential	Percentage
Bonheim	Arable (Class III)	28.73 ha	L4: Moderate Potential	65.5
Arcadia	Grazing (Class V)	0.24 ha	L5: Restricted potential	0.5
Mispah Mispah/Outcrop Etosha Gamoep	Grazing (Class VI)	13.98ha		30.8
Witbank	Wilderness (Class VIII)	2.47ha	L8: Very low potential	5.4
Total Enclosed Area		**45.42***		**100***

***infrastructure accounts for 0.9*ha of the investigated footprint area**

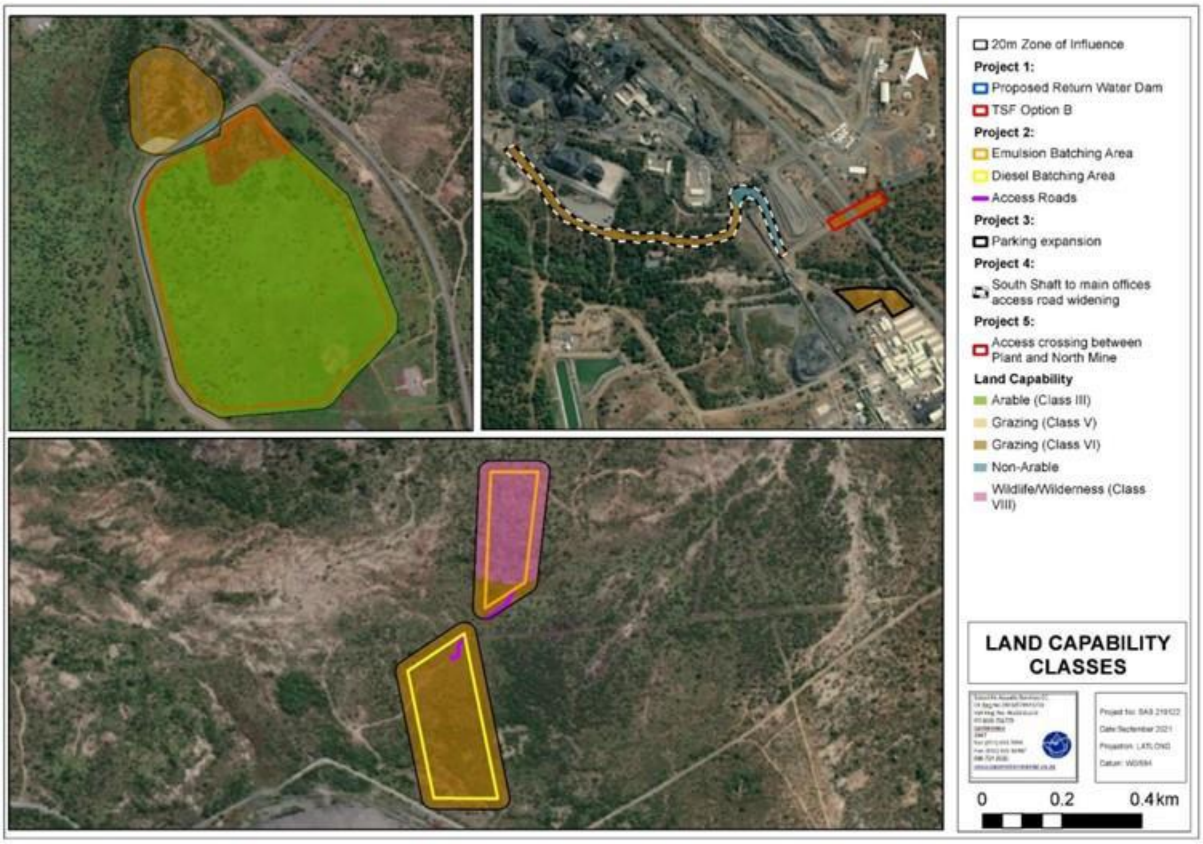


Figure 24: Map depicting the land capability classes of the soils associated with the proposed projects

Table 26: Soil and Land Capability Discussion

	Arable (Class III) land capability class (High potential with moderate limitations)	**Grazing (Class V) land capability class**	**Grazing (Class VI) land capability class**	**Wildlife/Wilderness (Class VIII) land capability class**
Terrain Morphological Unit (TMU)	<0.3% (Relatively flat)	Gently sloping terrain and valley bottom landscapes of < 1% slope gradient	Gently landscapes of < 0.5% slope gradient	These soils are largely dominant in the crest to the medium gradient mountains
Photograph				
Soil Form(s)	Bonheim	Arcadia (Ar)	Immerpan/Mispah	Mispah/Outcrop
Diagnostic Horizon Sequence	-	0-22 cm: Vertic A ≥ 22 cm: Unspecified	-	0-35 cm: Orthic A/exposed rock ≥ 35 cm: Miscellaneous hard rocky material
Area Extent	28.73 ha (65.5%)	0.24 ha (0.5%)	13.98ha (30.8%)	2.47ha (5.4)
Physical Limitations	The occurrence of an impermeable layer at somewhat shallow depth is the primary land capability limitation of the Bonheim soil form as this horizon cannot be cut with a spade even when wet.	Vertic soils inherently have some very significant management constraints attributed to excessive stickiness when wet and hardening when dry due to high smectitic (expandable) clay minerals and high plasticity index values.	Effective rooting depth is the primary limitation of the land capability of the Mispah soil form, due to the occurrence of a rocky layer at relatively shallow depth. Arcadia soils inherently have serious management constraints attributed to excessive stickiness when wet and hardening when dry due to high smectitic (expandable) clay minerals and high plasticity index values. Immerpan soils were found to be highly weathered and have a high erosion hazard, particularly the topsoil layer. All identified soil forms are, at best, suited for grazing and/or wilderness practices.	No soil and shallow depth of these soils hinders penetration of plant roots.
Land Potential	L3 ((Good potential): Infrequent and/or moderate limitations due to soil, slope, temperatures or rainfall. Appropriate contour	L5 (Restricted potential): Regular and/or moderate to severe limitations due to soil, slope, temperature, or rainfall.	L5 (Restricted potential): Regular and/or moderate to severe limitations due to soil, slope, temperature, or rainfall.	L5 (Restricted potential): Regular and/or moderate to severe limitations due to soil, slope, temperature, or rainfall.

	Arable (Class III) land capability class (High potential with moderate limitations)	**Grazing (Class V) land capability class**	**Grazing (Class VI) land capability class**	**Wildlife/Wilderness (Class VIII) land capability class**
	protection must be implemented and inspected.			
Land Capability and Land Potential	The identified soil forms are of moderate (Class III) land capability, and suitable for arable agricultural land use with restrictions. Therefore, these soils are considered to make a moderate contribution to agricultural productivity on a regional and national scale.	The identified Arcadia soil form is considered a poor (class V) land capability soil, which is generally not considered suitable to arable agricultural land use. The inherently high natural fertility of these soils is considered of significant value for grazing purposes. Traditionally these soils are ploughed for subsistence farming for shallow rooted arable crops like vegetables under resource-poor circumstances, due to their limiting factors such as high clay content which tightly holds soil water such that it is not readily available for plant uptake.	The Lithic soils (Glenrosa/Mispah) are also considered to be of poor (Class VI) land capability and are not suitable for arable agriculture. These soils are therefore considered to have restricted land potential.	The identified Mispah/Outcrop soil forms are of poor (class VIII) land capability and are not suitable for arable agricultural land use. Theses soils are, at best, suitable for wildlife and wilderness. Therefore, these soils are not considered to contribute to agricultural production.
Overall impact significance prior to mitigation	MH The identified Bonheim soil forms are considered somewhat suitable for cultivation (class III). Therefore, these soils are considered to have the potential contribute to reginal and provincial agricultural production grid if managed properly, and are essentially also well-suited for other less intensive land uses such as grazing, forestry, etc. However, emphasis is directed to their agricultural crop productivity due to the scarcity of such soil resources on a national scale and food security concerns. The anticipated impacts on the land capability of the soils is Moderate High (MH) without management measures and Moderately Low (ML) with management measures.	ML The overall impact of the proposed mining and related activities on the land capability of these soils is anticipated to be moderate (M). While these soils are not considered prime agricultural soils, historical cultivation activities have occurred as well as livestock grazing which has therefore qualified these soils for cultivation under intensive management. With mitigation measure the impact will effectively be reduced to a low level, so as to ensure that the local and regional food production supply is not disrupted.	ML The identified soils are generally not considered to be of significant agricultural productivity. These soils, at best are suited for grazing. The proposed mining development is viable on these soils due to their low agricultural potential although their importance in terms of biodiversity support must be considered. Mitigation measures should this put in place to minimise further disruption of other adjacent soils which can potentially be used for grazing.	L The overall impact of the proposed mining activities on the land capability of these soils is anticipated to be Low (L) due to the limited potential grazing opportunities. These soils are however not ideal for cultivated agriculture due to their low yield contribution to regional and provincial agricultural production. With management measures in place the impacts can be reduced to Very Low (VL).
Overall impact significance post mitigation	ML	L	L	VL
Business case, Conclusion and Mitigation Requirements:	These soils are regarded ideal for cultivated agriculture of selective crops, however the viability of agricultural crop cultivation of these soils in area is low due to land fragmentation by current mining and associated activities in the surrounding areas.	The susceptibility of these soils to shrink under dry conditions and expand under moist conditions should also be considered and avoided where possible as this may cause undesired damage on the structural integrity of the surface infrastructure. Furthermore, these soils are	The identified soils are generally not considered to be of significant agricultural productivity. These soils, at best are suited for grazing. The proposed mining development is viable on these soils due to their low agricultural potential although their importance in terms of biodiversity support must be considered. Mitigation measures should this put in place to	These soils are, at best, suited for wildlife/wilderness practices. This is due to the exposed bedrock/ and/or relatively shallow parent rock material. The impact of the proposed mining and related activities on the land capability of these soils is anticipated to be low after mitigation. As much as these soils are not considered ideal for agriculture,

	Arable (Class III) land capability class (High potential with moderate limitations)	Grazing (Class V) land capability class	Grazing (Class VI) land capability class	Wildlife/Wilderness (Class VIII) land capability class
	In addition, these soils also cover a small area which is not sufficient for commercial agricultural production However, mitigation measures should be implemented accordingly. The impact of the proposed TSF development on the land capability of these soils is anticipated to be within acceptable levels, given the lack of high potential agricultural soils as well as the limiting climatic conditions (MAP less than 600 mm). Although the identified soils are not considered as prime agricultural soils, these soils may be important for potential small-scale grazing opportunities.	highly sensitive and can be severely impacted by longterm stockpiling and their structural integrity is anticipated to deteriorate during stockpiling while awaiting rehabilitation.	minimise further disruption of other adjacent soils which can potentially be used for grazing	these soils are important for potential light grazing opportunities and biodiversity support. Therefore, implementation of rehabilitation and the proposed integrated mitigation measures is recommended to reinstate the natural topography of the area post mining.

1.g.v.4.c.1 Khulu TSF

The TSF and PCD area is largely dominated by arable soils which have been historically subjected to cultivation but have since been laid fallow. It is evident that these soils are capable of supporting agriculture. It should however be noted that the extent of these soils is too small to support commercial scale cultivated agriculture. The best suited farming scale in this instance is subsistence farming or grazing. The overall impact of Project 1 on a local, regional, provincial and national scale is anticipated to be limited given that the soils occur in a small patch and is not actively being used for agriculture.

1.g.v.4.c.2 Diesel and Emulsion Batching Areas

The Diesel and Emulsion Batching Areas are located within shallow soils which were classified as Glenrosa/Mispah soil forms. These soils are of poor (Class VII) land capability and are not suitable for arable agricultural land use. At best, these soils are suitable as natural pastures for light grazing.

The proposed Project 2 will most likely result in the clearance of vegetation as part of the construction phase which will lead to loss of soil through erosion and subsequent loss of land capability. Given the small footprint of this project, the loss of land capability is not anticipated to be significant, provided that the project occurs within the demarcated areas and mitigation measures are implemented during all phases of development. The extent of the access road required for this project will be limited since this project is located adjacent the current TRP Mine's new TSF pipeline and service road. The TSF maintenance road will serve as the main access road and as such the impact of the access road will be negligibly low.

1.g.v.4.c.3 Main Parking Extension, Widening of Access Road between South Shaft/Main Offices and Plant, and Access Crossing between Plant and North Mine (Subway Crossing)

The proposed projects are located within the existing mine operational footprint where soils have already been subjected to significant disturbance associated with mining and related infrastructure. The extension of the existing infrastructure will not lead to a significant losses of land capability given the disturbance that has occurred on the surrounding soils. Impacts such as soil erosion, compaction and soil contamination will likely occur during the construction phase which will lead to further degradation of the surrounding soils and the subsequent loss of land capability. However, the overall impact significance of these proposed projects will be negligibly low, after mitigation measures have been put in place during all phases of development.

1.g.v.5 Ecological Footprint

Scientific Terrestrial Services (SAS) was appointed to undertake an Ecological Assessment for the proposed projects. The ecological information was sourced from this report, as well as available information on site.

The Dwarsrivier Mine is located in the Savanna Biome, within the Central Bushveld Bioregion. Ecological aspects relating to the vegetation of the area indicate that the majority of the Dwarsrivier Mine is located within the Sekhukhune Mountainlands listed threatened ecosystem (Figure 25 and Figure 26), which is considered to be Endangered, and within the Sekhukhune Mountain Bushveld vegetation type which is considered Least Threatened. Portions of Project 1 and Projects 2 to 5 fall within an area considered to form part of the remaining extent of the Endangered Sekhukhune Mountainlands. According to the description in GNR 1002, the Sekhukhune Mountainlands falls under Criterion F, which are priority areas for meeting explicit biodiversity targets as defined in a systemic biodiversity plan. These areas have a very high irreplaceability and are of medium threat. Endangered ecosystems have undergone degradation of ecological structure, function or composition as a result of human intervention, although they are not critically endangered ecosystems. For this purpose, habitat is considered severely degraded if it would be unable to recover to a natural or near-natural state following the removal of the cause of the degradation (e.g., invasive aliens, over-grazing), even after very long time periods.

The vegetation and landscape features are considered as dry, open to closed microphyllous and broad-leaved savanna on hills and mountain slopes that form concentric belts parallel to the north-eastern escarpment. Open bushveld, often associated with ultramafic soils, which often provide habitat for a high diversity of edaphic specialists, is present on southern aspects. Bushveld located on mountain slopes is generally taller than in the valleys, with a well-developed herbaceous layer. Bushveld located within valleys and dry northern aspects is usually dense, like thicket, with an herb layer comprising many short-lived perennials. Dry habitats contain a number of species with xerophytic adaptations, such as succulence and underground storage organs. Both man-made and natural erosion dongas occur on the foot slopes of clay soils rich in heavy metals.

The Dwarsrivier Mine falls within an area that is currently not protected (Figure 27). According to the National Biodiversity Assessment (NBA), 2018, the majority of the of the portions of the five proposed (about 25% of the proposed TSF project; full extent of the diesel and emulsion batching area and parking extension, and portions of the road widening project) projects currently fall within the remaining extent of the least concerned Sekhukhune Mountain Bushveld, that is currently poorly protected. Ecosystem types are categorised as "not protected", "poorly protected", "moderately protected" and "well protected" based on the proportion of each ecosystem type that occurs within a protected area recognised in the National Environmental Management: Protected Areas Act, 2003 (Act No. 57 of 2003), and compared with the biodiversity target for that ecosystem type.

Initially, the Projects 1, 2 3 and 5 and the majority of Project 4 fell within areas defined as a Category 1 CBA. These are "Irreplaceable" areas, which are required to meet biodiversity pattern and/or ecological processes targets; and with no alternative sites available to meet targets. A small portion of Project 4 falls within an area defined as a Category 2 ESA. These are areas where no natural habitat remains, but that are still important for meeting ecological processes (Figure 28). Project 2 (Diesels and Emulsion Dispatching Area) is located about 2km from the Mpumalanga Mesic Grasslands (NPAES 2009 protected area).

NOTE: Important to note that Subsequent to the specialist assessments, the CBAs for the Sekhukhune District Municipality were updated to align these with the Sekhukhune District Bioregional Plan, and the current mining area, including the proposed project footprint areas, no longer falls within a CBA, but still in a listed threatened ecosystem. This report therefore still refers to CBAs, as it has minimal impact on the assessment. It should also be noted that based on current available information, the Sekhukhune Mountainlands threatened ecosystem is proposed to fall away once the Draft Revised Threatened Ecosystem Regulations of 2021 are promulgated. The Sekhukhune Mountainlands threatened ecosystem is however still in place, in line with the undertaking of the current specialist studies.

With the change in the CBAs delineation, only the Subway Crossing Project (Project 5) is located within an area delineated as CBA 1. The remainder of the projects are located in mostly what is defined as Ecological Support Areas 1 (ESA 1).

(for the purposes of this project, the activities identified under Listing Notice 3 is retained, but indicated where not required after the amendment of the CBA delineation.

According to the South African Protected Areas Database (SAPAD; 2020), the TSF is located approximately 6km south-east of the De Hoop Dam Protected Environment. The National Protected Areas Expansion Strategy (NPAES;2009) database and South African Conservation Areas Database (SACAD; 2020) do not indicate any formally or informally protected areas or conservation areas to be situated within 10km of the five proposed projects.

The five proposed projects are not situated within 10km of an Important Bird and Biodiversity Area (IBA).

In terms of the Mining and Biodiversity Guidelines (2013) (Figure 30), the five proposed projects fall within an area considered to be of Highest Biodiversity Importance. Highest Biodiversity Importance areas include areas where mining is not legally prohibited, but where there is a very high risk that due to their potential biodiversity significance and importance to ecosystem services (e.g. water flow regulation and water provisioning) that mining projects will be significantly constrained or may not receive the necessary authorisations.

For the terrestrial biodiversity theme identified by the EIA Screening tool, the five proposed projects are considered to have an overall sensitivity of Very High. The triggered sensitivity features include CBA Category 1 and ESA Category 1, Freshwater Ecosystem Priority Area (FEPA catchment), an endangered ecosystem and focus areas for land based protected area environment.

For the animal species theme, the five proposed projects are considered to have an overall sensitivity of Medium. Species identified by the EIA Screening tool include: *Chrysospalax villous* (Rough-haired golden mole, Vulnerable (VU)), *Crocidura maquassiensis* (Makwassie Musk Shrew, Least Concern (LC)), *Dasymys robertsii* (Robert's shaggy rat, Data Deficient (DD)) and *Sagittarius serpentarius* (Secretary bird, Endangered (EN)).

For the plant species theme, the five proposed projects are considered to have a Medium sensitivity. Species identified by the EIA Screening tool include *Asparagus fourei* (VU), *Polygala sekhukhuniensis* (VU), Se*arsia batophylla* (VU), *S. sekhukhuniensis* (Rare) and *Combretum petrophilum* (Rare).

The five proposed projects area are not within 10km of a Strategic Water Source Area.

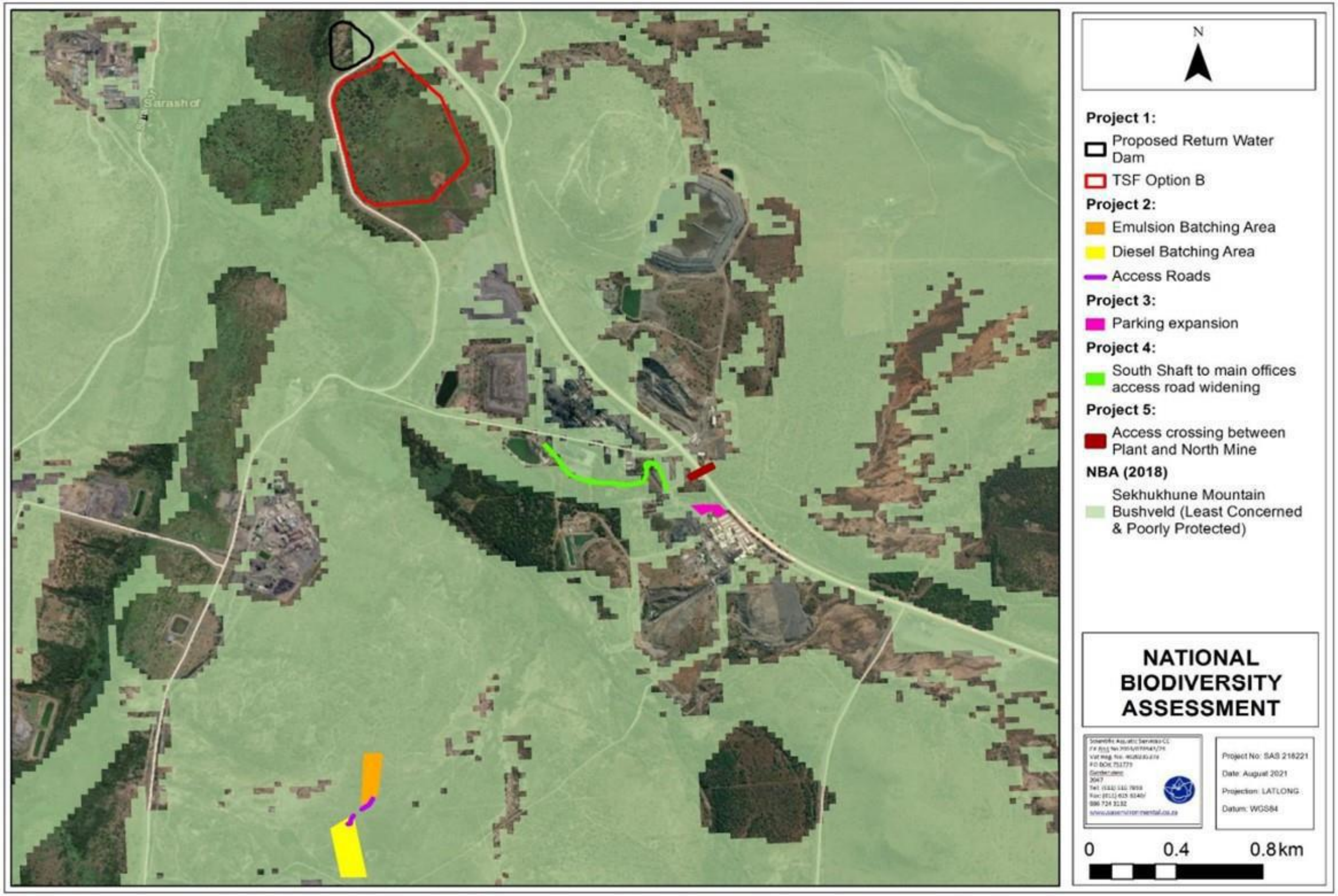


Figure 25: The remaining extent of the Sekhukhune Mountain Bushveld associated with the five proposed projects according to the National Biodiversity Assessment (NBA, 2018)

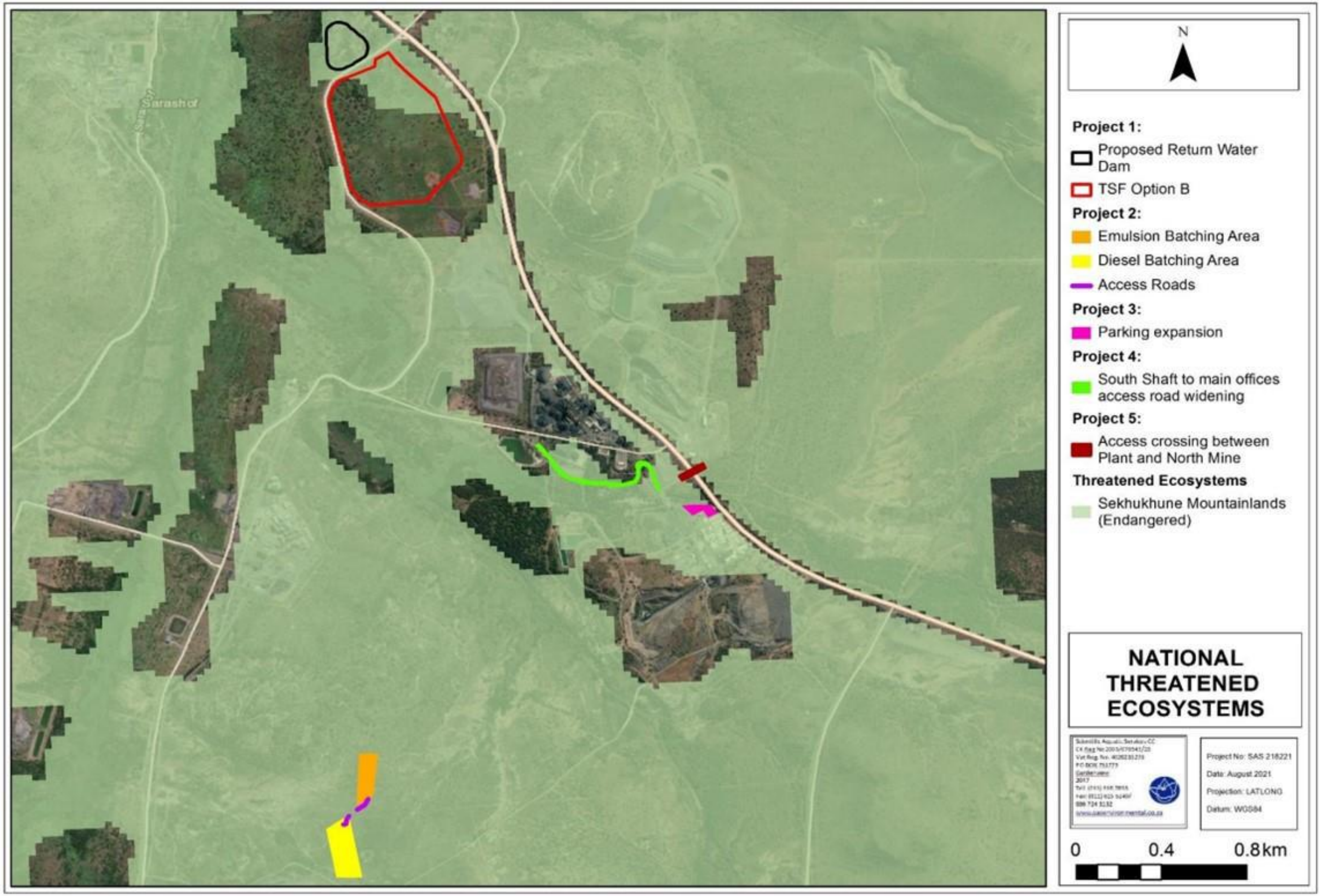


Figure 26: The Endangered Sekhukhune Mountainlands ecosystem associated with the mine and TSF site alternatives (National Threatened Ecosystems, 2011)

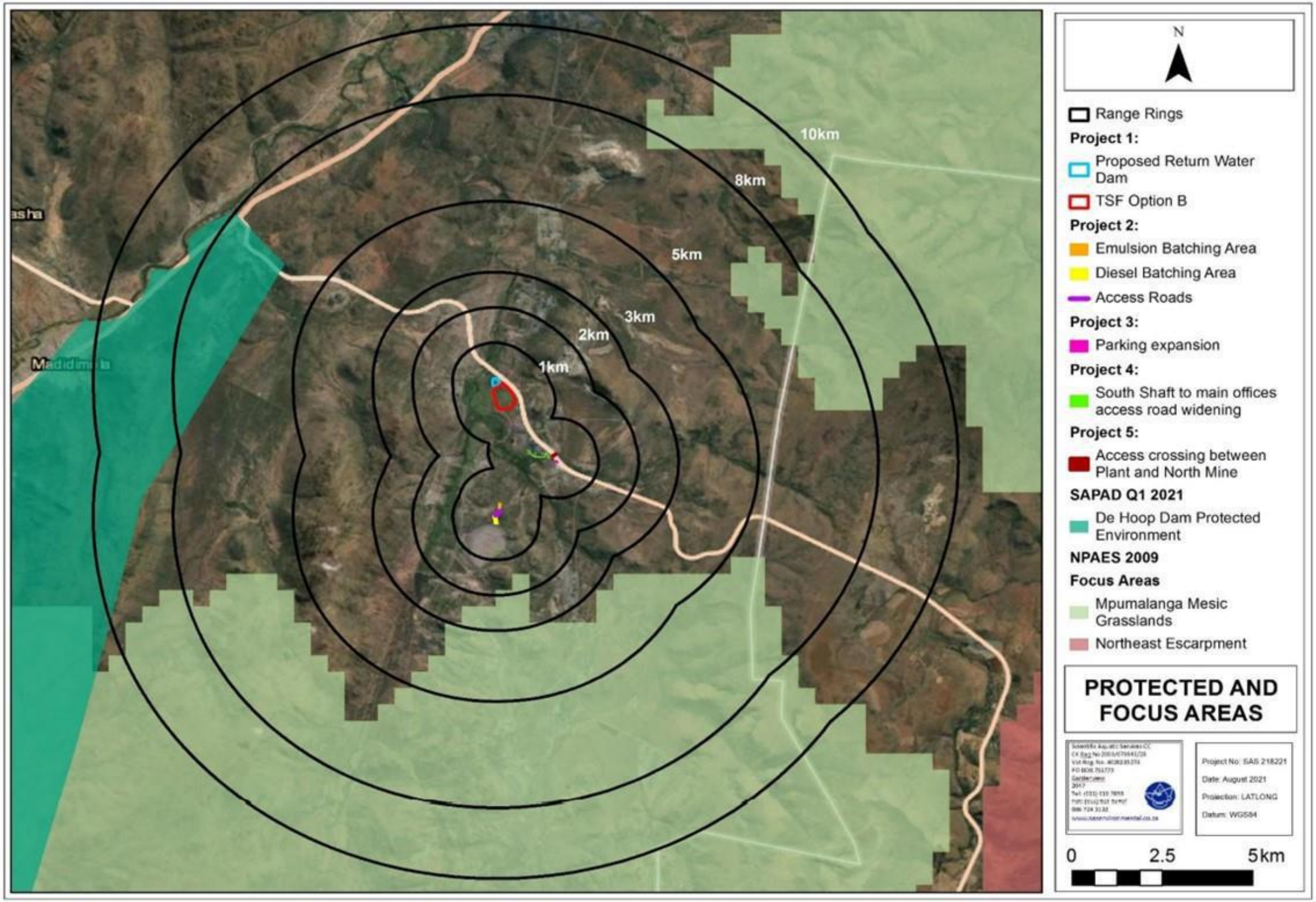


Figure 27: The protected area and focus area associated with the five proposed projects (SAPAD, 2020 and NPAES, 2009)

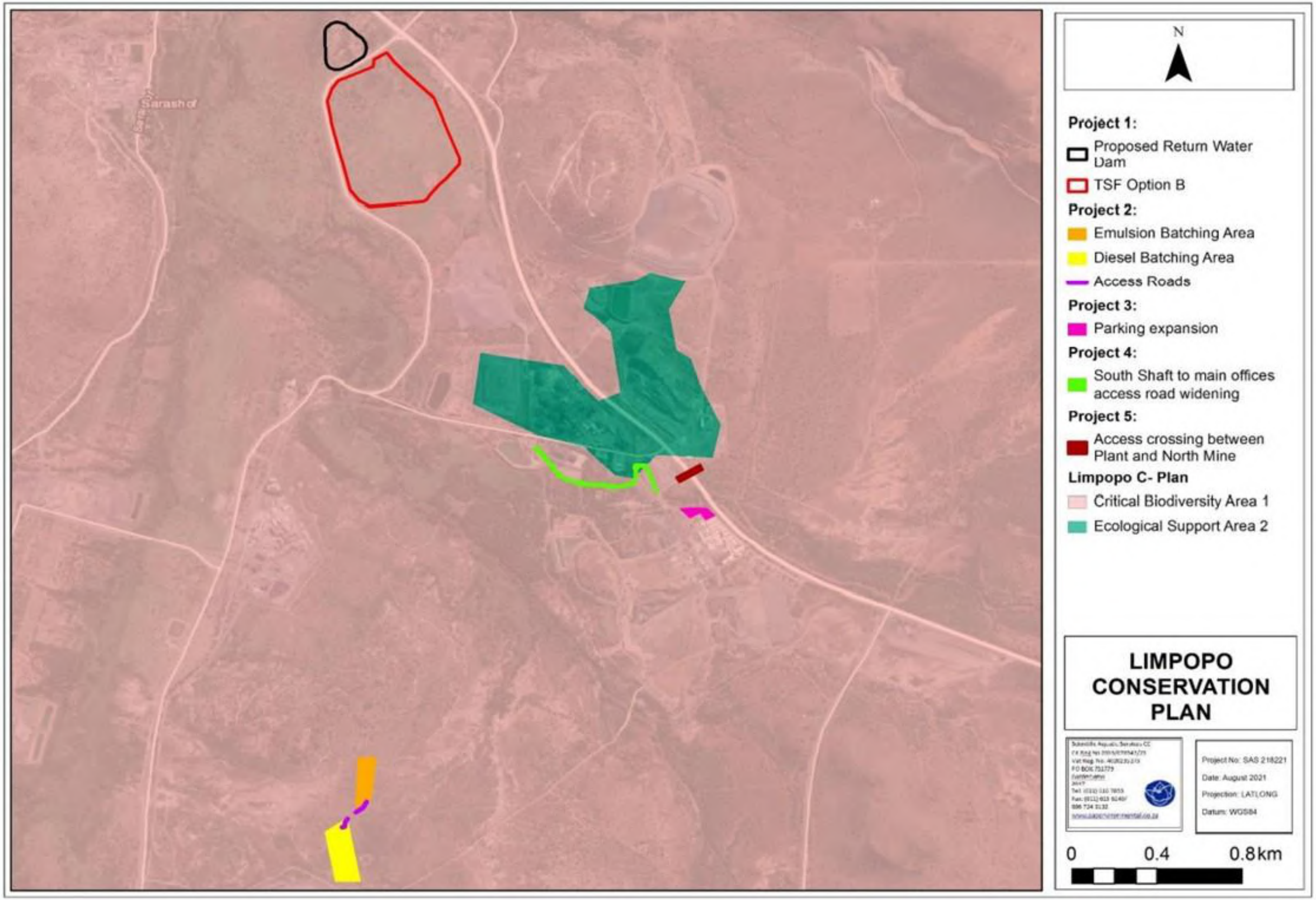


Figure 28a: Initial Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs) associated with the project areas according to the Limpopo Conservation Plan database (2013)

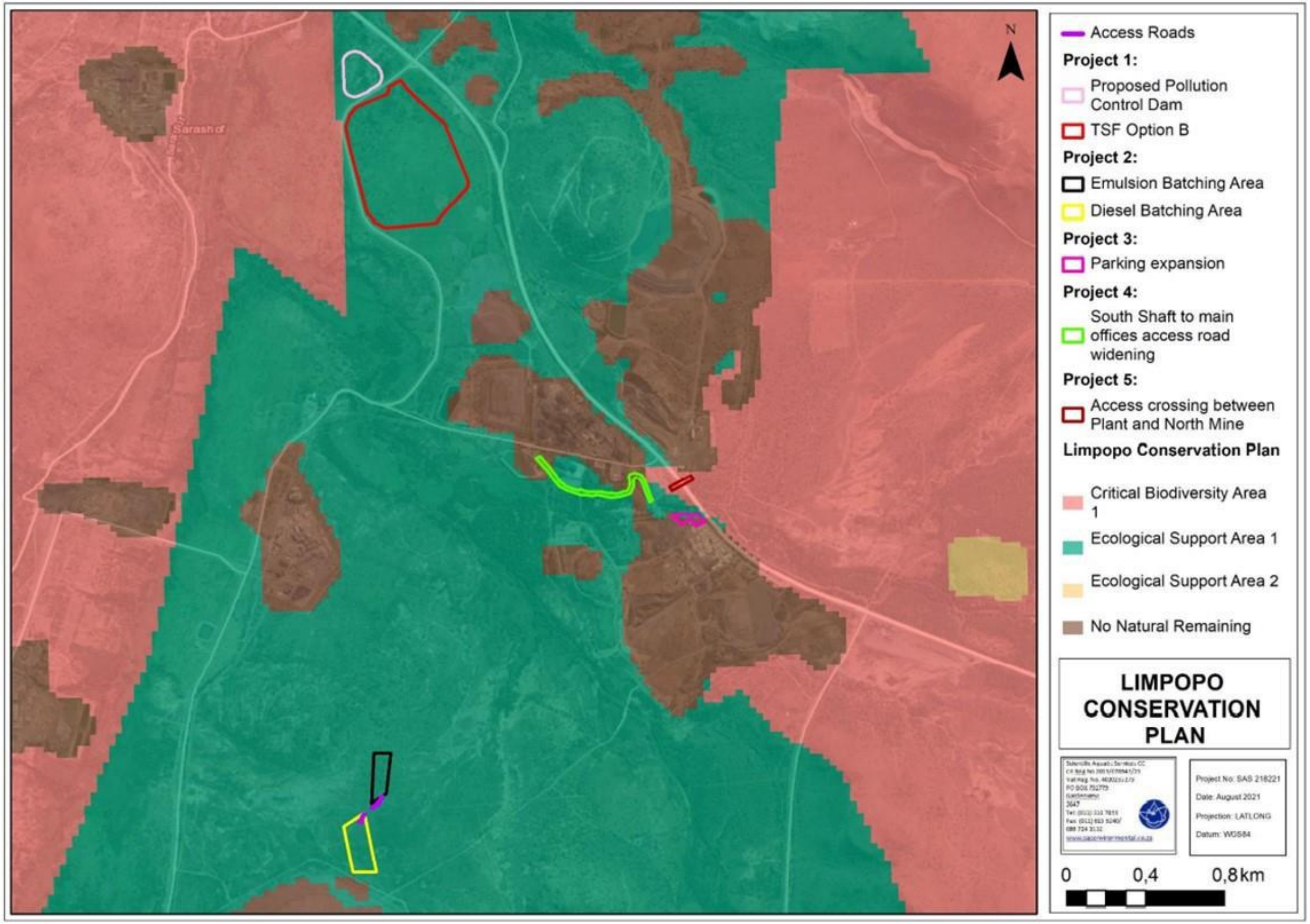


Figure 29b: The Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs) associated with the project areas according to the Limpopo Conservation Plan database (2018, and adopted 2022)

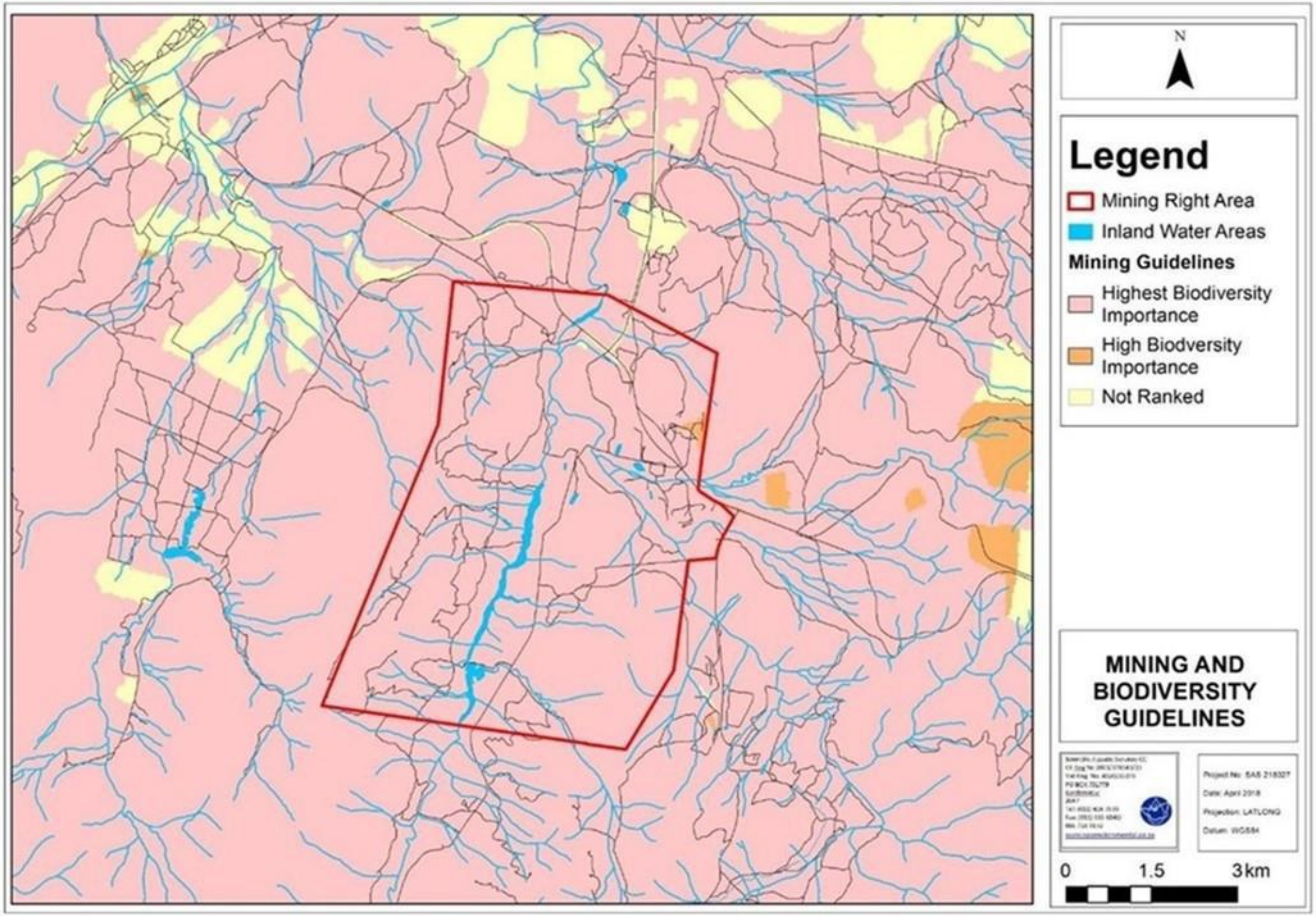


Figure 30: Importance of the MRA according to the Mining and Biodiversity Guidelines (2013)

1.g.v.5.a Habitat Units

The various proposed projects are all located within the existing and approved Dwarsrivier Mine MRA. The various projects are located within areas ranging from total transformation with no natural habitat remaining to areas which are still considered natural, comprising of indigenous vegetation. The proect areas are located within the Sekhukhune Mountain Bushveld vegetation type, according to Mucina & Rutherford (2006).

During the field assessment three broad habitat units were identified namely:

1. The Sekhukhune Mountain Bushveld,

2. The Secondary Bushveld; and

3. The Transformed areas.

The Transformed areas include existing gravel roads and the active mining area and comprise of little to no remaining vegetation. This habitat unit is no longer representative of the associated vegetation type and does not provide sufficient habitat for faunal species. The existing impacts on the biodiversity associated with the various project areas include:

- Historic transformation of mining areas, including the road network;
- Edge effects from the mining activities including trimming of vegetation along the road networks;
- Growth of Alien Invasive Plants (AIPs) in the disturbed areas, notably in the transformed areas; and
- Active mining leading to dust and noise pollution, impacting on the biodiversity in the adjacent areas.

Figure 31: Habitat units associated with Project 1

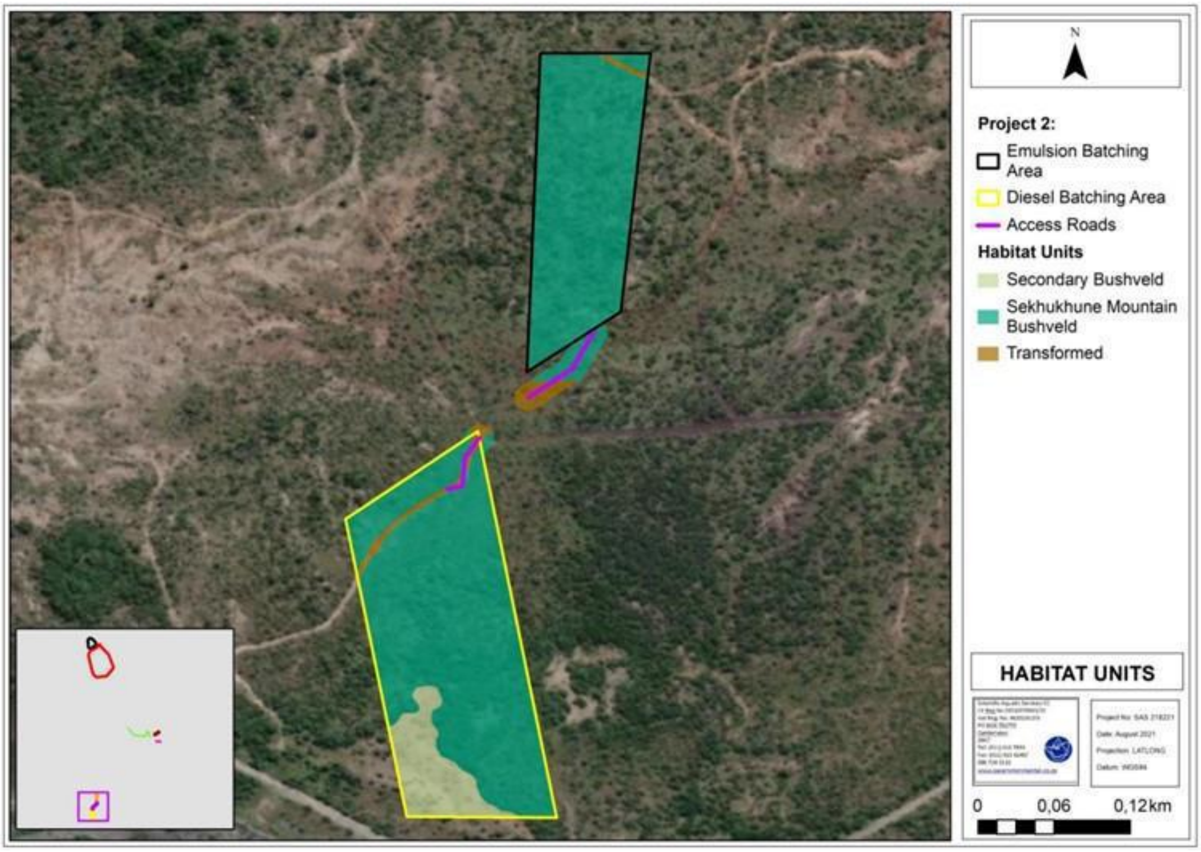


Figure 32: Habitat units associated with Project 2

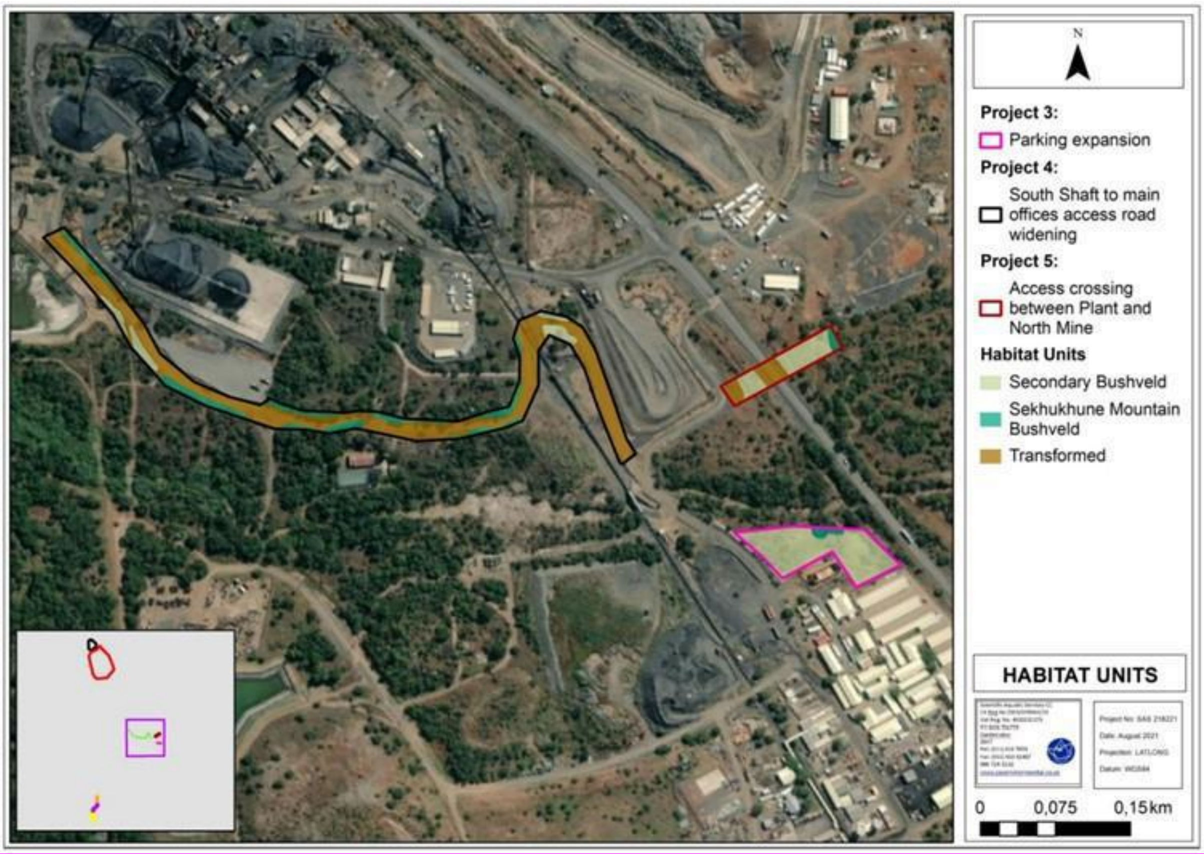


Figure 33: Habitat units associated with Projects 3-5

Table 27: Floral Habitat Description

	Sekhukhune Mountain Bushveld	**Secondary Bushveld**	**Faunal Assessment**
Reference photos			 Left to right: *Argiope lobata* (Black-lobed garden orb-web), *Idolomorpha dentifrpns* (Cone-headed Mantid), *Hystrix africaeaustralis* (Porcupine) spoor, *Plocepasser mahali* (White-browed sparrowweaver) nests, *Platysaurus orientalis* (Sekhukhune Flat Lizard) and *Harpactirella overdijki* (Lesser baboon spider)
Habitat Overview	This habitat unit has been exposed to some degree of impact stemming from mining related edge effects but more notably from historic farming (cattle grazing) activities, and the alteration / exclusion of ecological functions such as fire and heavy large grazers / broswers. This habitat unit, although potentially more encroached than what it would have been historically, is still considered representative of the reference vegetation type as described by Mucina and Rutherford (2006). Vegetation structure: Medium to tall woody species interspersed with grasses and forbs indicative of the Sekhukhune Mountain Bushveld habitat.	This habitat unit varies with areas where the graminoid layer is limited with bare patches of soil evident to areas of dense grass species with limited herbaceous species evident. The woody component is more open with woody density notably lower than that of the Sekhukhune Mountain Bushveld. This habitat unit is not considered representative of the reference vegetation type as described by Mucina and Rutherford (2006). Vegetation structure: Open bushveld with scattered woody species, dominated by herbaceous species indicative vegetation that is in the primary and secondary phases of succession.	The Sekhukhune Mountain Bushveld habitat with its well-developed woody and herbaceous layer provides habitat to a diversity of generalist and specialist species, as well as endemics (generalist and specialist species, as well as endemics such as Pycna sylvia (cicada)). The varying vegetation and abiotic structures within the habitat further add to habitat complexity and the habitats' ability to support a diversity of species. Habitat structure is known to be an important driver for avifaunal diversity, whilst insect species also benefit from such. The rocky patches provide suitable areas of refuge for small mammals, reptiles and invertebrates, whilst the avifaunal species were observed throughout the habitat. The Sekhukhune Mountain Bushveld habitat will likely support a healthy insect population, considered of increased importance as insects serve an important ecological role in the environment. Insects not only help cycle nutrients and detrital material but also serve as important food resource for many species on higher trophic levels. Additionally, herbivorous insects are often able to feed upon plant material that is high in lignin and otherwise unpalatable to other herbivores, whilst also transporting dead plant material sub-surface (termites), helping to maintain the nutrient cycle. Although a high diversity of species is likely to occur, abundance levels therein are expected to be limited due to

	Sekhukhune Mountain Bushveld	Secondary Bushveld	Faunal Assessment
			several factors. The relatively nutrient poor sand soil substrate result in the vegetation growth being that of plant species of decreased palatability, meaning species less tolerant to low plant palatability will need to forage over greater distances to obtain the required nutrition intake. Additionally, the current land use activities adjacent to the remaining Sekhukhune Mountain Bushveld habitat (mining and small-scale cattle farming) as well as fencing off of areas, has resulted in a loss of large mammals in the area. The loss of large herbivores (with the exception of a small number of Kudus which roam through the whole valley) and an altered fire regime has led to a change in ecological processes, impacting vegetation structure and influencing faunal species presence, overall diversity and abundances. The Secondary Bushveld habitat comprises areas that were disturbed as a result of farming (crops) and/or construction activities and that resulted in the clearance of the indigenous vegetation. These areas have subsequently been left to revegetate over time, however, with the exclusion / limited input of key ecological processes, the overall vegetation composition and structure does not resemble that of the Sekhukhune Mountain Bushveld reference state. As such, faunal species diversity is not as rich in this habitat unit, food resources are notably lower and AIP proliferation higher. The Secondary Bushveld habitat supports predominantly common faunal species, notably common insects and avifaunal species, which show greater tolerance to disturbed areas and those which select for more open grassland areas, notably ground foraging avifauna such as Francolins and Guineafowls. The open grassland structure may favour predatory snakes; however, limited signs of small mammal activity was observed and such, food resources for these snakes is likely a limiting factor herein. The large homogenous stands of low palatability grasses in this habitat unit limit habitat structure and as such, species diversity. Additionally, areas of refuge for small mammals, invertebrates and reptiles are limited, increasing the risk of predation and as such, it is likely these species will select for areas of more suitable habitat. The Secondary Bushveld provides no unique or important niche habitat for faunal species in the region, with species abundances notably lower and species observations more infrequent, indicating that the majority of fauna are seemingly avoiding this habitat and, understandably, showing preference for the intact Sekhukhune Mountain Bushveld habitat in the adjacent areas. The Transformed areas are largely devoid of vegetation and therefore food resources and shelter. Some hardier species such as small skinks, common avifauna and individuals of the *Order Orthoptera* (Grasshoppers and crickets) were observe. Skinks and smaller avifauna are often found in developed areas, as they are able to adapt to such areas more readily,

	Sekhukhune Mountain Bushveld	Secondary Bushveld	Faunal Assessment
			utilise buildings for shelter and obtain food resources from insects attracted to the night lights and scraps of food left by people. Overall, the transformed areas are not considered important for faunal species nor do the transformed areas provide important ecological services or functions for fauna. During the site assessment the majority of faunal species were observed within the Sekhukhune Mountain Bushveld (associated with Project 2). Species observed include *Raphicerus campestris* (Steenbok), *Tragelaphus strepsiceros* (Kudu), *Lepus capensis* (Cape Hare), Hystrix africaeaustralis (Porcupine), *Idolomorpha dentifrpns* (Cone-headed Mantid), Di*crurus adsimilis* (Fork-tailed Drongo), *Agama aculeata distanti* (Distant's Ground Agama), *Trachylepis margaritifer* (Rainbow Skink) and *Prinia subflava* (Tawny-flanked Prinia) amongst others. Within the Secondary Bushveld species or signs there of observed include *Lepus capensis* (Cape Hare), *Plocepasser mahali* (White-browed Sparrow-weaver), *Streptopelia capicola* (Cape Turtle Dove), *Numida meleagris* (Helmeted Guineafowl) and *Pternistis swainsonii* (Swainson's Spurfowl) amongst others. For a full list of observed species please refer to Appendix I (presented as Annexure 8 of this report).
Species Overview	Dominant Indigenous Vegetation: - Trees and Shrubs: *Vitex obovata* subsp. *wilmsii, Combretum* spp, *Pappea capensis, Euclea crispa* subsp. *crispa* and *Dichrostachys cinerea*; - Herbs and Forbs: *Rhoicissus sekhukhuniensis, Ledebouria marginata, sansevieria hyacinthoides* and Blepharis subvolubilis; and - Graminoids: *Heteropogon contortus, Panicum maximum, Cymbopogon pospischilii, Themeda triandra* and *Aristida* spp. Refer to Appendix F of the Ecological Report (presented as Annexure 8 of this report) for a complete list of species recorded on site. Dominant Alien Vegetation: *Solanum lichtensteinii* and *Bidens pilosa*. Refer to the section hereafter for further information pertaining to Alien Invasive Plant (AIP) species.	Dominant Indigenous Vegetation: - Trees and Shrubs: *Vachellia karroo, Vachellia tortilis, Dichrostachys cinerea, Searsia pyroides, Peltophorum africanum* and *Euclea crispa* subsp. *crispa*; - Herbs and Forbs: *Pterodiscus ngamicus*; - Graminoids: *Heteropogon contortus, Eragrostis* spp, *Aristida* spp. Refer to Appendix F of the Ecological Report (presented as Annexure 8 of this report) for a complete list of species recorded on site. Dominant Alien Vegetation: *Tagetes minuta, Datura ferox, Solanum* sp and *Bidens pilosa.* Refer to the section hereafter for further information pertaining to AIP species.	-
Presence of Unique Landscapes	The habitat units are both located within the Sekhukhuneland Centre of Plant Endemism, with the Sekhukhune Mountain Bushveld habitat being representative of the expected vegetation type. This vegetation type is diminishing in the region due to development and exploitation for wood and material resources, as such, the intact nature of the habitat observed is considered to be unique, even if it is still widespread in the MRA currently. The Secondary Bushveld and Transformed areas are not considered unique.		-

<table>
<tr><th></th><th>Sekhukhune Mountain Bushveld</th><th>Secondary Bushveld</th><th>Faunal Assessment</th></tr>
<tr><td>Species of Conservation Concern</td><td colspan="2">The following floral species of conservation importance as per the national and provincial protected species regulations were observed within the assessment zone:

National Forests Act (Act No. 84 of 1998) (NFA):

- Sclerocarya birrea subsp. caffra.

The protected species S. birrea subsp. caffra is not considered threatened according to the Red List of South African Plants. Additionally, the following floral SCC are considered to have an increased probability of occurring within the assessment zone:

- Boscia foetida (NFA, Limpopo Environmental Management Act (Act No. 7 of 2003) (LEMA);
- Lydenburgia cassinoides (NFA);
- Aloe castanea (LEMA);
- Chlorophytum cf. cyperaceum (Anthericum cyperaceum) (LEMA); and
- Euphorbia spp (LEMA).

Prior to any vegetation clearing activities, permits must be obtained from the Department of Forestry, Fisheries and the Environment (DFFE) and the Limpopo Department of Economic Development, Environment and Tourism (LEDET) for the removal or destruction of any protected listed species. Refer to Appendix G (presented as Annexure 8 of this report) for the list of Species of Conservtion Concern (SCC) considered as part of this assessment</td><td>One endemic insect was observed in the vicinity of Project 2, namely Pycna sylvia (Cicada) whilst Python natalensis (African Python, VU) has also been recorded in the adjacent habitat. Of importance is that Pycna sylvia (cicada) appears to be largely endemic to the Dwars River Valley and is most commonly associated with the tree species Vitex obovata subsp. wilmsii and as such habitat loss and consequently the loss of individuals in the area may have a significant knock-on impact to the overall population of this species in the valley. Additionally, there is the increased probability that species such as Panthera pardus (Leopard, Vulnerable, TOPS Listed), Parahyaena brunnea (Brown hyaena, NT, TOPS Listed), Sagittarius serpentarius (Secretary bird, VU), Polemaetus bellicosus (Martial Eagle, VU) and Neotis denhami (Denham's Bustard, NT) are likely to utilise the Sekhukhune Mountain Bushveld habitat unit. Although Project 2 which occurs in this habitat is small in extent, the development of such will still lead to a decrease in habitat, foraging grounds and may hinder SCC movement for terrestrial species.</td></tr>
<tr><td>Important considerations:</td><td colspan="2">The Sekhukhune Mountain Bushveld habitat unit is considered important from an ecological perspective, is of increased species diversity whilst there is the potential that several floral SCC may occur in this habitat. The Secondary Bushveld habitat is considered less important as this habitat is currently in a state of ecological succession and has limited species diversity and no recorded floral SCC. Important considerations:

- The Sekhukhune Mountain Bushveld habitat units is considered to be representative of the reference vegetation type, i.e., the Sekhukhune Mountain Bushveld;
- Whilst only a single floral SCC was observed on site, it is likely that several more may occur, notably in the Sekhukhune Mountain Bushveld habitat;
- No AIP's were observed in the Sekhukhune Mountain Bushveld habitat, however several species were observed in the Secondary Bushveld habitat. As such, the areas must be monitored for AIPs and when such are found, they are to be removed / controlled as per an AIP control plan;
- According to the Limpopo C-Plan (V2, 2013) database, Projects 1, 2, 3 and 5 and the majority of Project 4 falls within areas is defined as a Category 1 CBA whilst a small portion of Project 4 falls within an area classified as a Category 2 ESA;
- The majority of the proposed TSF (Project 1) is located in the Secondary Bushveld which does not align with that of the CBA 1 classification. Similarly, Projects 3, 4 and 5 are also predominantly located in the Secondary Bushveld and Transformed areas and are not representative of the CBA 1 listing as per the background data; and
- The Screening Tool output for the area indicated a medium sensitivity for the project areas. Following the field verification, it can be concluded that the Secondary Bushveld may, to a degree, align with the screening tool output, however, the Sekhukhune Mountain Bushveld should be considered of higher sensitivity, whilst the Transformed areas can be considered to be of lower sensitivity.</td><td>The Sekhukhune Mountain Bushveld is considered of greater importance for faunal species in terms of habitat provision, breeding opportunities and food resources when compared to the Secondary Bushveld habitat, however, the small footprint area of Project 2 is unlikely to have a significant impact on the overall faunal species diversity and abundance levels in the region. Due to the small footprints of the projects affecting the Sekhukhune Mountain Bushveld, impacts on faunal species herein are not expected to be high. Additionally, TRP mine has recently constructed a new TSF pipeline which intersects the 2 footprint areas of Project 2. This pipeline will likely be more of an impact to habitat connectivity than that of Project 2 itself. Projects 3 – 5 are located inside the active mining area, which is surrounded by fences and as such, these projects are unlikely to impact species movement patterns or habitat connectivity. The PCD and the TSF associated with Project 1 are located in the far corners of fenced off areas and currently are not considered vital or important for faunal movement, nor do they serve important habitat connection functions. As such, although habitat loss will occur, there is likely to be limited impact on species movement, habitat availability and habitat utilisation in these areas as well as the adjacent areas. Important considerations:

- Habitat loss is inevitable as ground clearing and vegetation removal is unavoidable within the footprint areas. This will lead to habitat loss and species displacement herein;
- It is important that disturbed areas are rehabilitated and natural vegetation reinstated where possible to limit</td></tr>
</table>

	Sekhukhune Mountain Bushveld	Secondary Bushveld	Faunal Assessment
			additional habitat loss through erosive actions and AIP proliferation; • The Screening Tool indicated the site sensitivity as medium for animals. Following the site assessment, the Sekhukhune Mountain bushveld is considered to be of higher sensitivity than the screening tool listed (refer to Section 5), whilst the Secondary Bushveld is considered to be similar in terms of the screening tool. The Transformed areas however do not coincide with the sensitivity as presented by the screening tool; • The Screening Tool indicated the following species as potentially occurring in the assessment areas: *Chrysospalax villous* (Rough-haired golden mole, VU), *Crocidura maquassiensis* (Makwassie Musk Shrew, LC) and *Dasymys robertsii* (Robert's shaggy rat, DD). Following the site assessment, it is considered unlikely that these species will utilise the various project sites and as such, the proposed activities pose no threat to the ongoing conservation of these species; and • From a faunal ecological perspective, although the proposed activities will lead to habitat loss, this loss is not expected to have a significant impact on the current faunal populations in the region, provided strict site management is undertaken and all mitigation measures implemented.

1.g.v.5.b Alien and Invasive Plant Species

During the site assessment, a number of AIPs were observed, predominantly in the Secondary Bushveld and the Transformed Areas, but also in the small pockets of Sekhukhune Mountain Bushveld habitat associated with Project 1 and Projects 3 - 5. The Sekhukhune Mountain Bushveld habitat associated with Project 2 did not appear, at the time of assessment, to be associated with AIP growth, however, if left uncontrolled this may change over time.

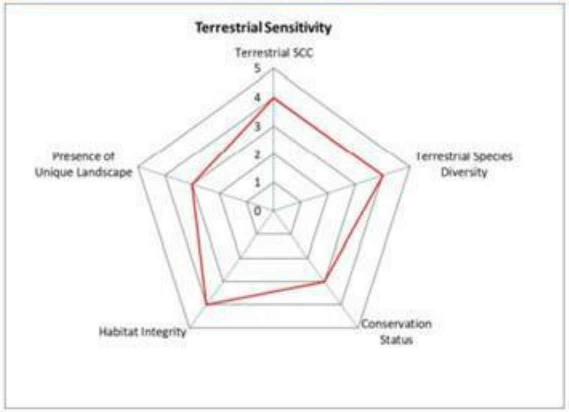
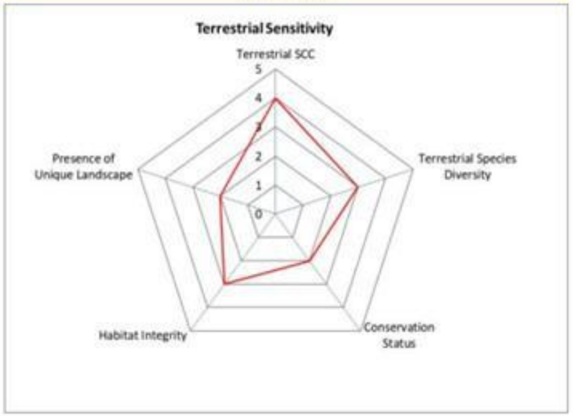
Table 28: Dominant alien vegetation species identified during the field assessment.

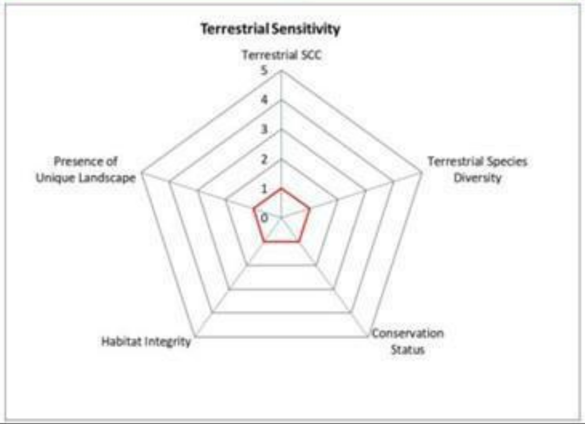
Species	English name	NEMBA Category
	Succulents	
Agave sisalana	Sisal	2
Cereus jamacara	Queen of The Night	1b
Opuntia ficus-indica	Prickly Pear	1b
	Trees/ shrubs	
Melia azedarach	Syringa	1b
	Grasses	
Arundo donax	Spanish Reed	1b
Pennisetum setaceum	Fountain Grass	1b
	Forbs	
Argemone ochroleuca	White-flowered Mexican Poppy	1b
Datura ferox	Large Thorn Apple	1b
Datura stramonium	Common Thorn Apple	1b
Solanum elaeagnifolium	Silverleaf bitter apple	1b
Solanum sisymbriifolium	Dense-thorned Bitter Apple	1b
Verbena bonariensis	Wild Verbena	1b
	Plant species not listed in NEMBA	
Alternanthera pungens	Khakiweed	-
Amaranthus hybridus	Pigweed	-
Bidens pilosa	Common Black Jack	-
Tagetes minuta	Tall Khaki Weed	-
Zinnia peruviana	Redstar Zinnia	-

1.g.v.5.c Habitat Sensitivity

The following figures conceptually illustrate the areas of ecological sensitivity – depicting the sensitivity for flora and fauna, respectively. The proposed projects are depicted according to their sensitivity in terms of the presence or potential for SCC, habitat integrity and levels of disturbance, threat status of the habitat type, the presence of unique landscapes and overall levels of diversity.

Table 29: Habitat Sensitivity

Habitat Sensitivity	Conservation objective	Habitat Unit	Key habitat characteristics
Moderately High 	Preserve and enhance the biodiversity of the habitat unit, limit development and disturbance.	Sekhukhune Mountain Bushveld – Project 1 and 2	- Intact habitat and vegetation structure representative of the reference vegetation type; - High diversity of faunal and floral species of which some are endemic to the region; and - Floral and faunal SCC observed in the habitat whilst increased probability that several more may occur in the habitat unit.
Intermediate 	Preserve and enhance biodiversity of the habitat unit and surrounds while optimising development potential.	Sekhukhune Mountain Bushveld – Project 3-5 Secondary Bushveld	- Representative of vegetation currently in a secondary state of succession resulting from habitat clearance / disturbance from past agriculture and mining activities; - Not representative of the vegetation type; - Dominated by common floral and faunal species, however, lacks species that are unique / dominant to the Sekhukhune Centre of Endemism; and - No floral or faunal SCC observed with a decreased probability for of their occurrence herein; and - Vegetation representative of the CBA 1 listing (Project 5 only)

Habitat Sensitivity	Conservation objective	Habitat Unit	Key habitat characteristics
Low 	Optimise development potential.	Transformed Areas	• This habitat has been largely transformed from the reference vegetation type due to the development of the mine and roads; • Little to no native vegetation remains; and • No floral or faunal SCC were observed or expected to occur

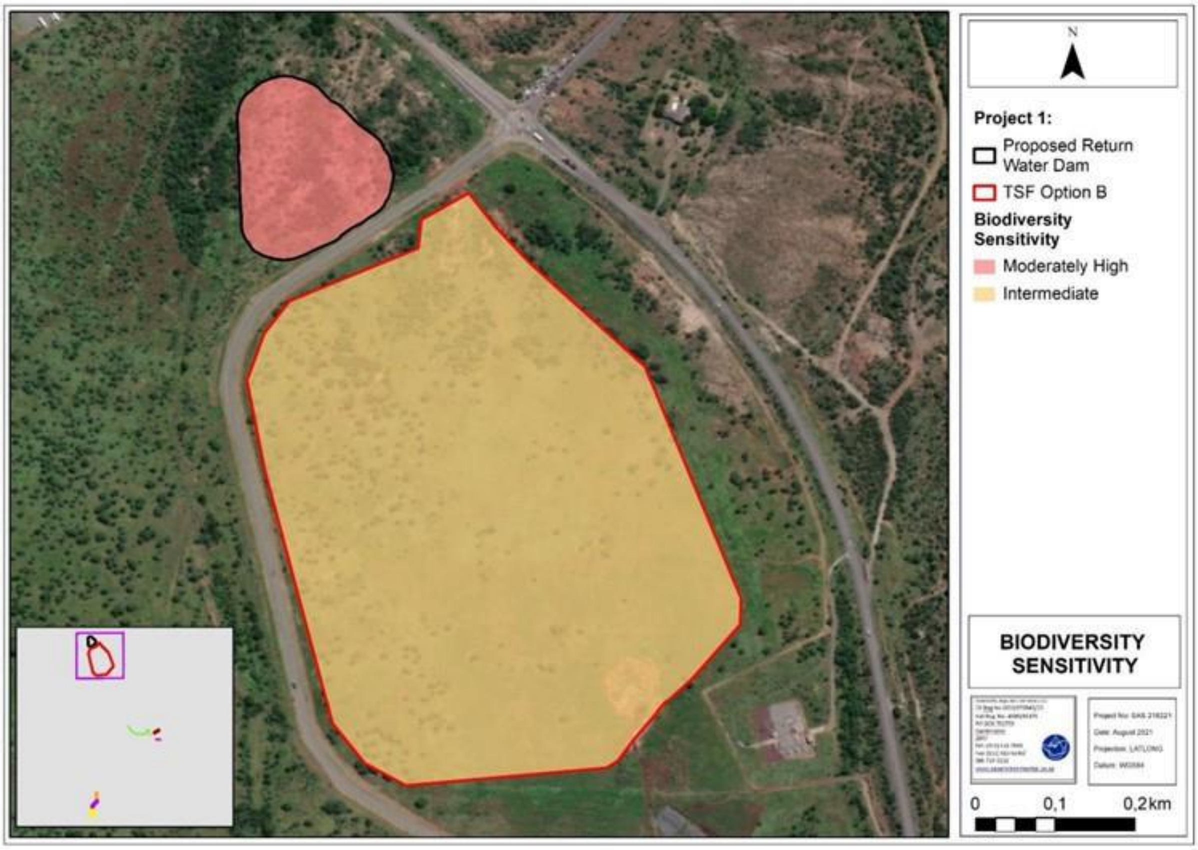


Figure 34: Habitat Sensitivity Project 1

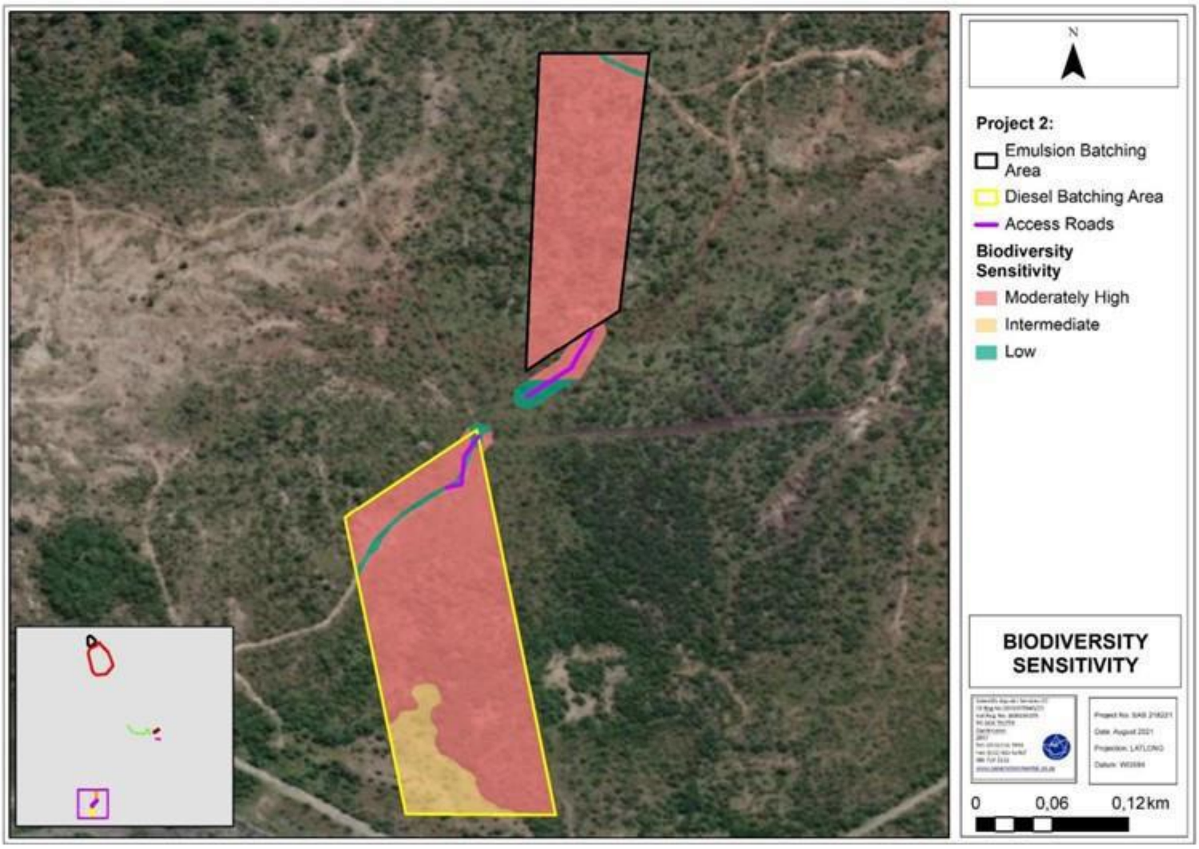


Figure 35: Habitat Sensitivity Project 2

Figure 36: Habitat Sensitivity Project 3-5

1.g.v.6 Freshwater Ecosystems

Scientific Aquatic Services (SAS) was appointed to undertake the Freshwater Assessment. The wetland and aquatic habitat setting information was sourced from this report, as well as information available on site.

The project areas are located within the Olifants North Catchment, with the Steelpoort subWMA. Projects 2 to 5 and the majority of the Khulu TSF fall within quaternary catchment B41G, with the remaining northern portion of TSF within B41H. These areas are located in the Eastern Bankenveld quatic Ecoregion (Figure 37).

The five proposed projects fall within the Central Bushveld Group 1 Wetland Vegetation Type considered Critically Endangered (CR) (Mbona et al, 2015).

The five proposed projects fall within an area considered to be of Highest Biodiversity Importance in terms of the Mining and Biodiversity Guidelines (2013). Highest Biodiversity Importance areas include areas where mining is not legally prohibited, but where there is a very high risk that due to their potential biodiversity significance and importance to ecosystem services (e.g. water flow regulation and water provisioning) that mining projects will be significantly constrained or may not receive the necessary authorisations.

Projects 2 to 5 and the majority of TSF Site B fall within an area defined as a Freshwater Ecosystem Priority Area (FEPA) catchment, with the remaining northern portion of TSF Site B located within an area considered a Fish Support Area (FSA). River FEPAs achieve biodiversity targets for river ecosystems and threatened fish species and were identified in rivers that are currently in a good condition (A or B ecological category). Although the FEPA status applies to the actual river reach, the surrounding land and smaller stream network needs to be managed in a way that maintains the good condition of the river reach. Remaining fish sanctuaries in lower than an A or B ecological condition were identified as Fish Support Areas. Furthermore, the Fish Support Areas include sub-quaternary catchments important for migration of threatened fish species (Figure 38).

In terms of the National Freshwater Ecosystem Priority Area (NFEPA) Wetlands:

- No watercourses were identified directly within TSF Site B, the proposed Diesel and Emulsion Batching Areas, Main Parking Extension, Widening of the Access Road proposed to be widened or the new Subway Crossing proposed between North Mine and the Plant, although watercourses were identified within 500m of each project. Although no watercourses are directly associated with the remaining projects (i.e. not situated directly within the proposed project areas), the proposed batching areas are located upgradient of watercourses, and the proposed Extension of the Main Parking area will encroach marginally on the delineated riparian zone of the Springkaanspruit.

- No wetlands or rivers are indicated by the NFEPA database within any of the five proposed projects (Figure 38, Figure 40 and Figure 41).
- The database indicates three small artificial unchanneled valley bottom wetlands located within the investigation area of the proposed Project 4. These wetlands are considered to be heavily to critically modified (Class Z3). Analysis of digital satellite imagery indicates that these are various mine process water dams.
- The Dwars River is located within the western portion of TSF Site B's investigation area. The river is a designated FSA and is currently in a moderately modified ecological condition (Class C).
- The Groot Dwars River traverses the south-western portion of Site B's investigation area (within 500m buffer). This river is considered largely natural (Class B) and is a designated FEPA River (Figure 38).

According to the NBA (2018): South African Inventory of Inland Aquatic Ecosystems (SAIIAE) the artificial features identified by the NFEPA Database (2011) to be located within the investigation area, are classified as dams. The Dwars River and Groot Dwars River are largely modified according to the NBA 2018 dataset. The Ecosystem Protection Level (EPL) of the rivers are poorly protected and the rivers are indicated to be Critically Endangered (Ecosystem Threat Status (ETS)).

For the aquatic biodiversity theme, the five proposed projects, with the exception of a portion of the Khulu TSF, are considered to have an overall aquatic sensitivity of Very High, due to the area being classified as a FEPA catchment (NFEPA, 2011). The remaining northern portion of the TSF has a low aquatic sensitivity.

Table 30: Ecological Status (DWS, 2014)

Sub-quaternary reach	B41G – 00674 (Groot Dwars River)	B41H – 00640 (Dwars River)
Assessed by expert?	Yes	Yes
PES Category Median	Class D (Largely Modified)	
Stream Order	2	2
Mean Ecological Importance (EI) Class	High	High
Mean Ecological Sensitivity (ES) Class	Very High	Very High
Default Ecological Class (based on median PES and highest EI or ES mean)	Class A (Very High)	Class B (High)

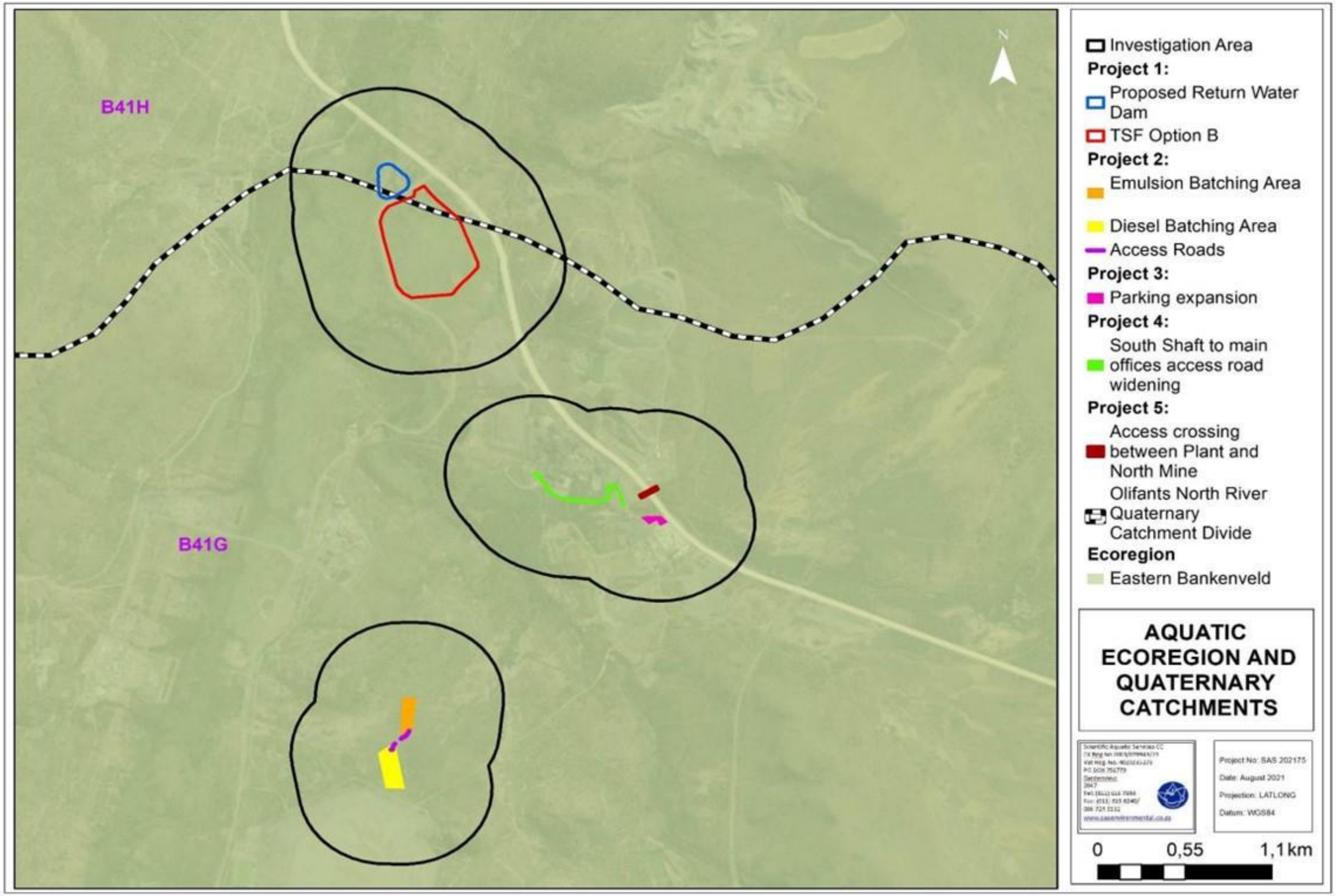


Figure 37: The aquatic ecoregion and quaternary catchments associated with the proposed five projects

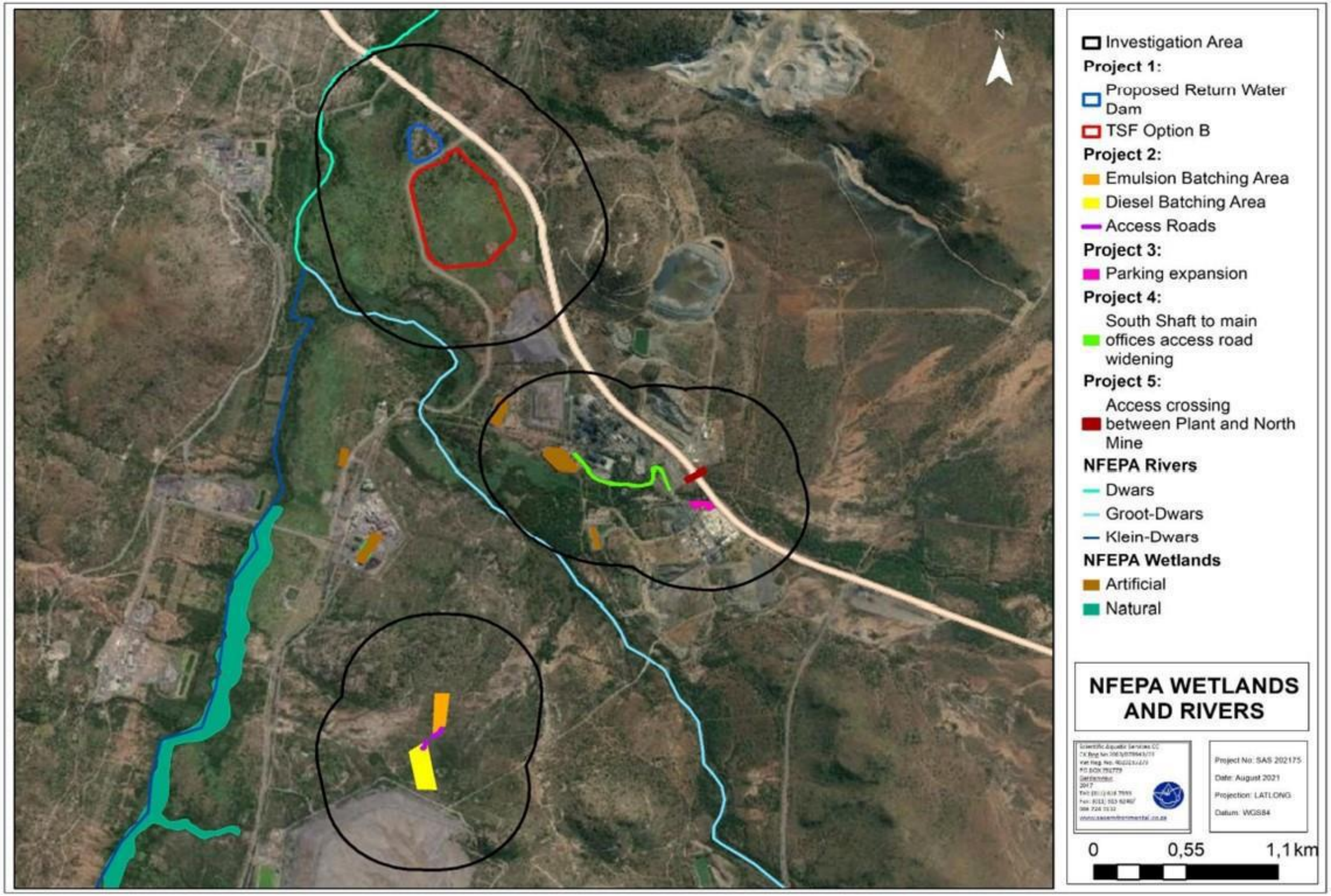


Figure 38: The natural and artificial wetland features, and rivers associated with the five proposed projects according to the NFEPA Database (2011)

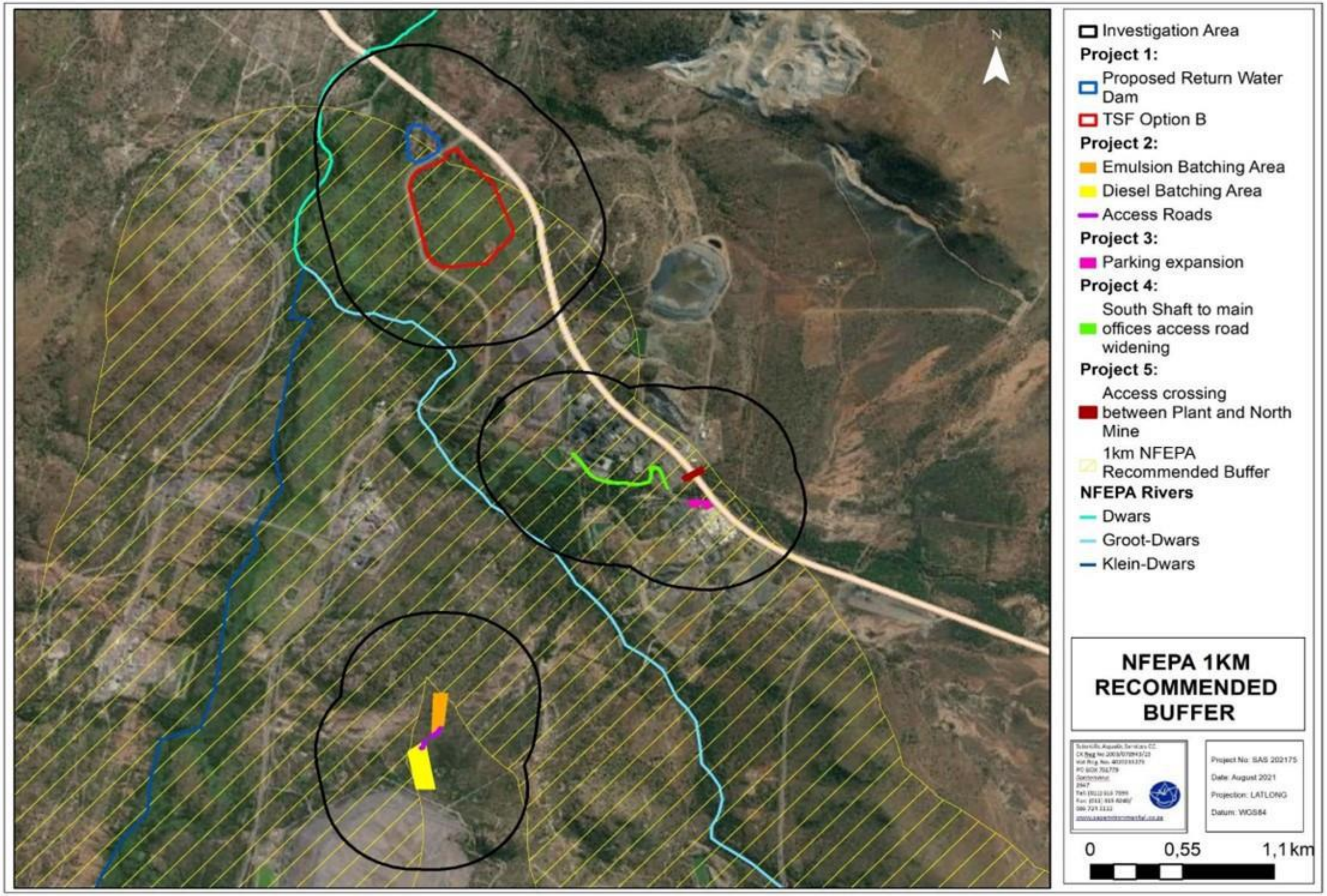


Figure 39: The 1 km recommended buffer around the FEPA Rivers, according to the NFEPA Database (2011)

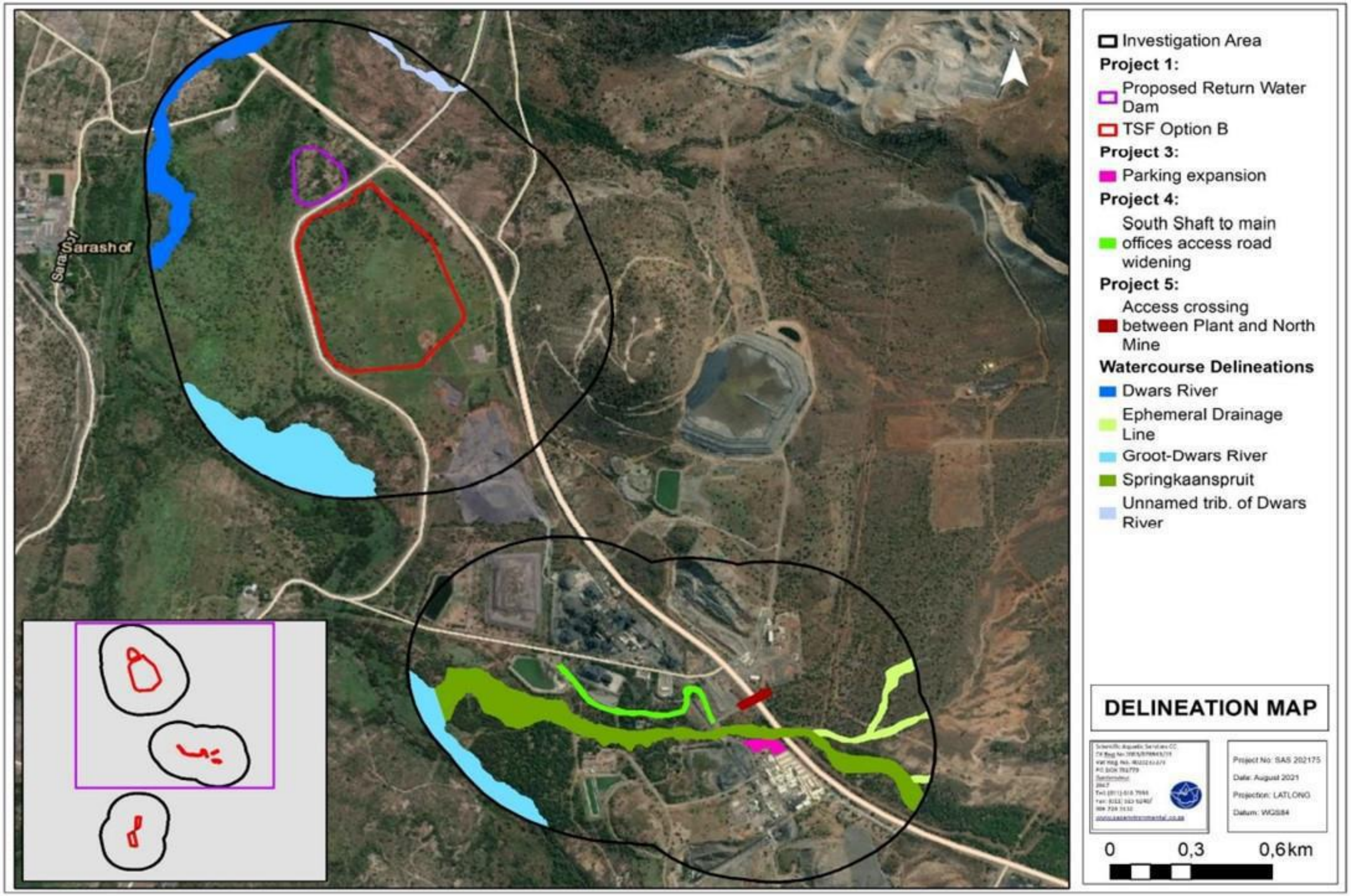


Figure 40: Identified watercourses within the vicinity of Projects 1,3, 4 and 5.

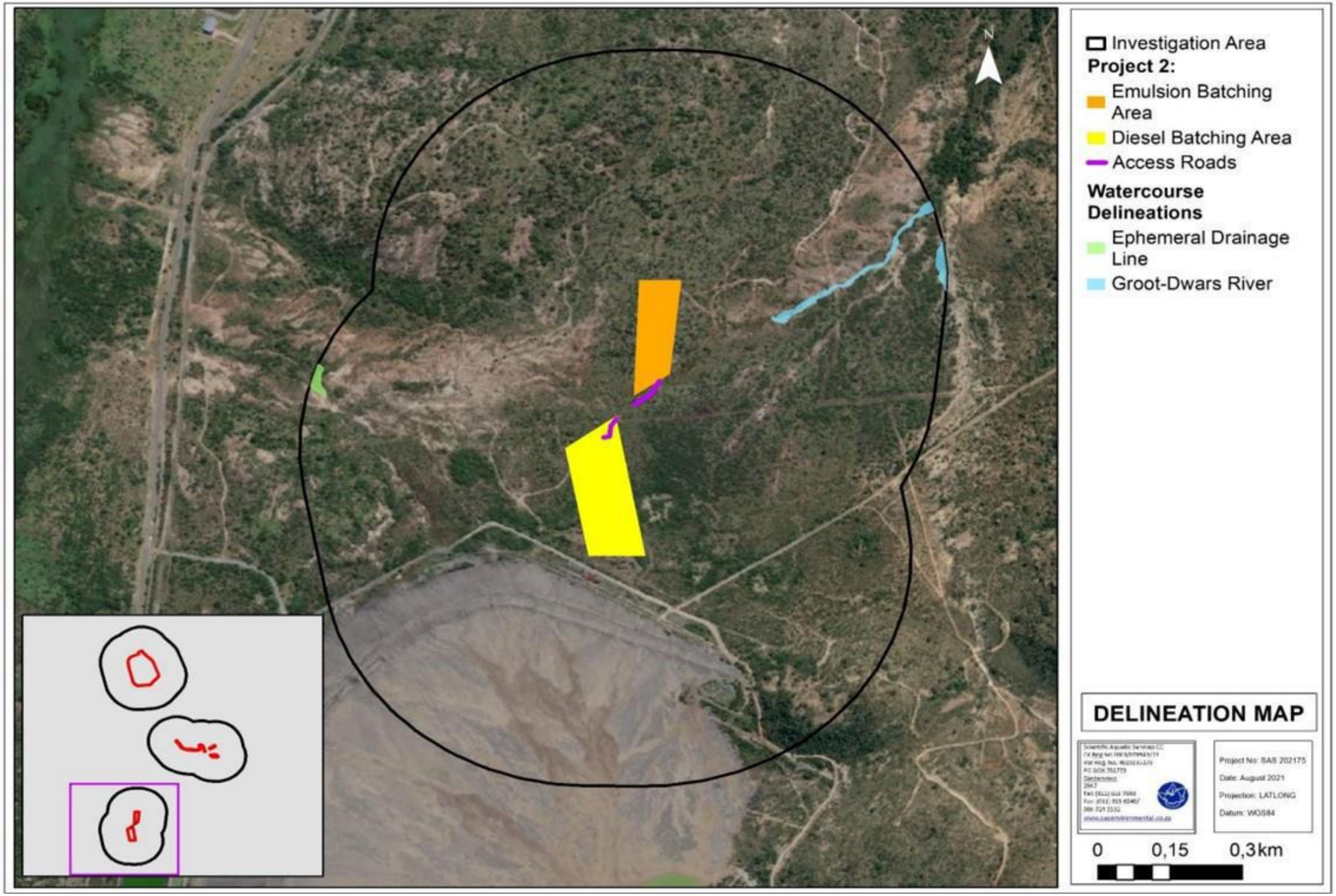


Figure 41: Identified watercourses within the vicinity of Projects 1 and 2

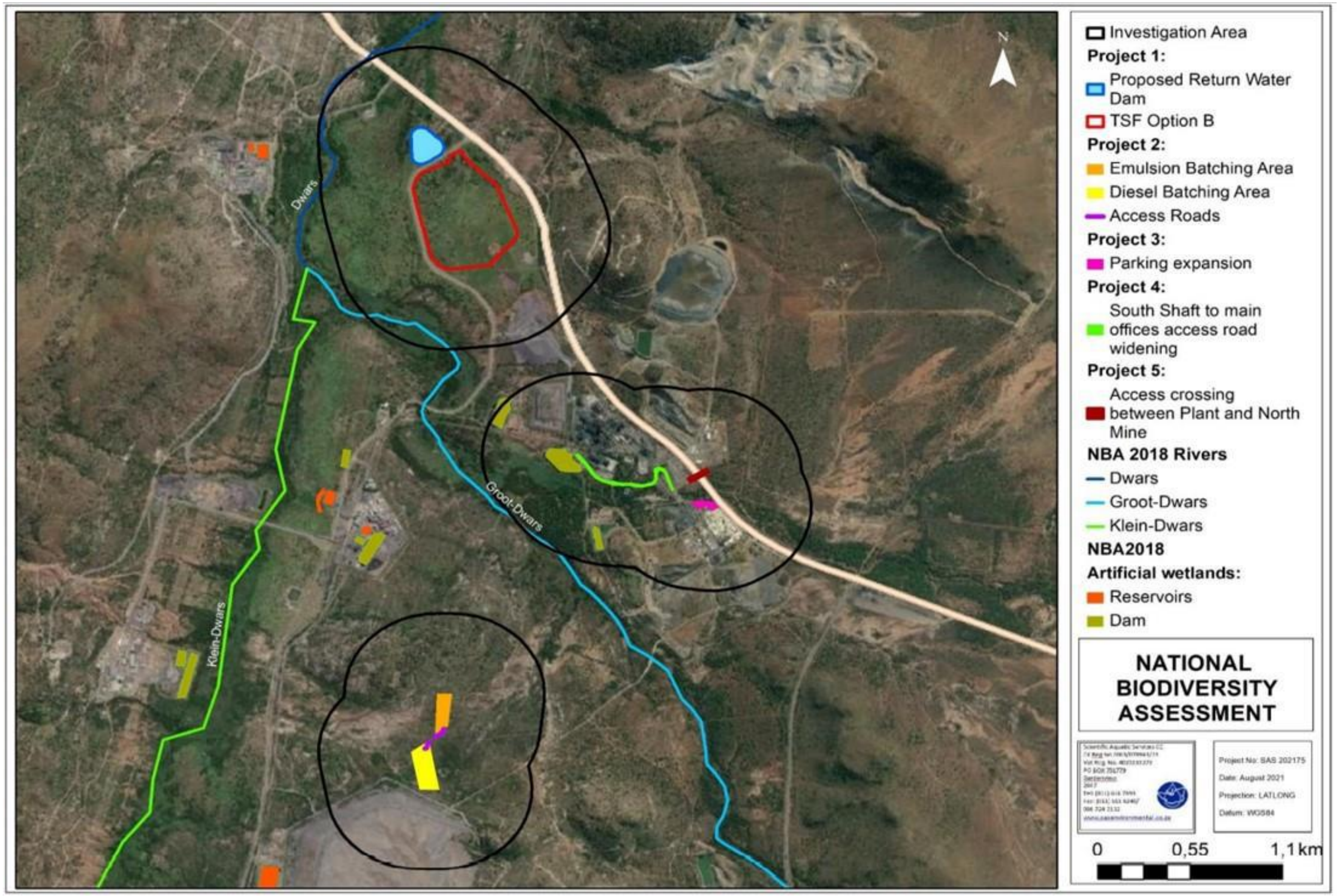


Figure 42: Artificial wetlands associated with the five proposed projects according to the National Biodiversity Assessment (NBA) (2018)

1.g.v.6.a Freshwater Ecological Assessment Results

1.g.v.6.a.1 Khulu TSF (Site B)

During the field assessments undertaken in May 2021, TSF Site B was assessed in terms of location, freshwater and aquatic habitat availability, ecological importance and sensitivity and any potential impacts on freshwater resources within each site which may occur as a result of the proposed activity. Previous studies conducted by SAS (2018) in the area as well as the relevant desktop data was used to provide input into the suitability and constraints of each alternative. Figure 41 above indicates the locality of identified watercourses associated with the proposed TSF. Although the topographic map (Figure 2 of Annexure 9: Freshwater Ecosystem) indicates an ephemeral drainage line within TSF Site B, no watercourses were identified directly therein. The site is however located 230m east and upgradient of the Dwars River, which flows south to north, confluencing with the Steelpoort River approximately 14.5km downstream of Site B. Additionally, TSF Site B B is located approximately 385m south, and down-gradient of an ephemeral, unnamed tributary of the Dwars River. As the proposed TSF is located down-gradient of the unnamed tributary of the Dwars River, that drainage system was not assessed. SAS (2018) assessed the reach of the Dwars River associated with the Dwarsrivier Mine MRA (and therefore the proposed TSF) and found that the riparian zone was moderately modified, and instream habitat was largely natural, and that the ecological importance and sensitivity correlated with the ‘very high’ category assigned by the various databases.

1.g.v.6.a.2 Diesel and Emulsion Batching

Although the sites proposed for the Diesel and Emulsion Batching Areas have not been specifically ground-truthed, field-verified data obtained in March 2020 for three alternative sites located between 30m and 100m south and southwest of the two proposed batching sites, along with available historical data for watercourses within 500m thereof and relevant desktop data was used to provide input into the freshwater ecological character of the batching sites.

It is important to note that no watercourses were identified directly within either the proposed batching areas; however, the headwaters of small ephemeral drainage lines were identified within 500m thereof (Figure 40). During the March 2020 site assessment, an area of increased moisture was identified was identified approximately 240m to the west of the proposed Diesel Batching Area. Although graminoid species which are tolerant of increased soil moisture were identified within this area of increased moisture, numerous species which are typically associated with non-wet areas were present. Furthermore, the soil profile was extremely shallow (no more than 10cm to 15cm), did not indicate any characteristics associated with a fluctuating water table (such as mottling) and was notably disturbed, containing sediments not found in the immediately adjacent areas. Additionally, surface water, which was present appeared to be contaminated, based on a visual assessment. Based on the observations made during the site assessment and the analysis of 5m contours of the site, historical aerial photographs and digital satellite imagery, it was concluded that this feature has formed as a result of seepage from the existing TRP TSF and is not a naturally occurring feature.

1.g.v.6.a.3 Main Parking Extension, Widening of Access Road between South Shaft/Main Offices and Plant, and Access Crossing between Plant and North Mine respectively

The extension of the parking facility at the Main Offices (Project 3) encroaches marginally on the delineated riparian zone of the Springkaanspruit, a small tributary of the Groot Dwars River, although the active channel of the Springkaanspruit is approximately 20m from the proposed extension area. The proposed parking extension is also outside the 1:100 year floodline.

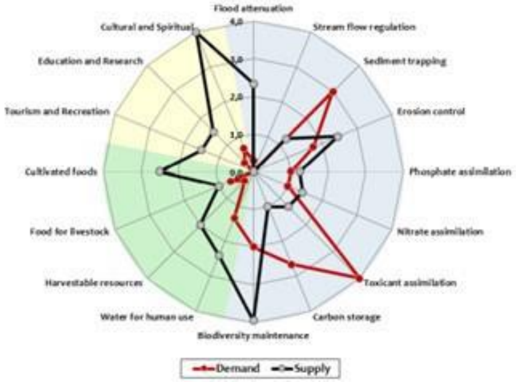
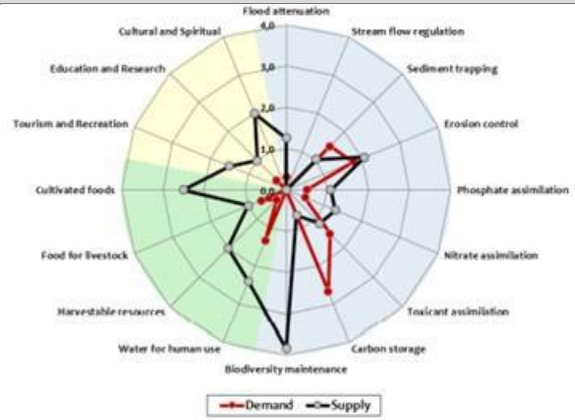
The access road between the South Shaft and the Main Offices which will be widened (Project 4) is currently located approximately 50m from the Springkaanspruit, and the widening of this road will bring it to within 45m of the Springkaanspruit.

The proposed access crossing between the Plant and North Mine (Project 5) will be approximately 122m from the Springkaanspruit and may result in a reduction of traffic over the Springkaanspruit, as some vehicles will no longer need to traverse the Springkaanspruit to access the Plant and North Mine.

The Springkaanspruit was not ground-truthed for the purposes of this investigation; however, the results of studies undertaken by SAS (2017; 2018) were utilised.

Refer to the following table providing a summary of the outcomes of the freshwater assessment.

Table 31: Summary of Freshwater Assessment

	Khulu TSF	**Diesel and emulsion batching areas**	**Main Parking Extension, Widening of Access Road between South Shaft/Main Offices and Plant, and Access Crossing between Plant and North Mine respectively**
Ecological & socio-cultural service provision graph		No watercourses were identified within the proposed Diesel and Emulsion Batching Areas.	
Photograph	 Representative photographs of the less disturbed upper reaches of the Dwars River (left) depicting a relatively natural floral composition, and a section of the river approximately 1.2km downstream of TRP Mine, in the far north of the MRA, depicting floral encroachment (right).	 An erosion gully situated approximately 100m west of the proposed emulsion batching area (left and centre); and (right) the wet feature identified approximately 240 m west of the Diesel Batching Area. The TRP TSF is visible in the background.	 Representative photographs of the Springkaanspruit in 2018 (left) and 2017 (right)
PES discussion	**PES Category: Instream Index of Habitat Integrity (IHI) PES Category B, Riparian IHI PES Category C** The portion of the Dwars River within the MRA remains in a largely natural condition, with few modifiers to the system. However, impacts such as weirs and bridge crossings are likely to have had an effect on flow patterns, whilst the riparian zone associated with the reach of the river in the far north of the MRA has been impacted by removal of vegetation, grazing by livestock and encroachment of both indigenous and AIPs.	-	**PES Category: Instream IHI PES Category B/C, Riparian IHI PES Category C** The lower reaches of the Springkaanspruit, which enters the MRA in the north-east, confluencing with the Groot Dwars River in the vicinity of the mine's Return Water Dams (RWDs) have been impacted by road and conveyor crossings, increased sedimentation due to mining activities and altered vegetation communities. However, the upper reaches located outside of the MRA are unlikely to have been significantly impacted since few disturbances occur in that vicinity.
Ecoservice provision	**Moderately High to Low (indicator dependent)** Ecological service provision by the Dwars River includes flood attenuation, streamflow regulation, assimilation of excess nutrients and toxicants, and sediment trapping. These functions are considered particularly importance in the context of increased development within	-	**Moderately High to Very Low (indicator dependent)** The Springkaanspruit is considered to provide intermediate levels of ecological service provision. It is considered important in terms of benefits such as flood attenuation, streamflow regulation, and assimilation of nutrients and toxicants. Whilst the Dwarsrivier Mine

	Khulu TSF	Diesel and emulsion batching areas	Main Parking Extension, Widening of Access Road between South Shaft/Main Offices and Plant, and Access Crossing between Plant and North Mine respectively
	the river's catchment, and downstream of the MRA. Such ecological services will provide indirect benefits to downstream users and as such, should be maintained as much as feasible. As with the other systems assessed, potential to provide socio-cultural services is limited by accessibility. However, as noted in the discussion on geomorphology, community utilisation of the northern portion of the system in the MRA is apparent. Additionally, tourism and educational/research potential exists, particularly due to the Dwars River Geological Occurrence Heritage Site (declared as such in 1965).		MRA, and other mining properties adjacent to the MRA, are largely restricted access areas, when assessing socio-cultural benefits provided by these systems, consideration was given to portions of the river which are accessible to local communities.
Watercourse characteristics (hydraulic regime, water quality, geomorphology and sediment balance and habitat and biota)	Instream modifiers in the portion of the Dwars River within the MRA include bridge crossings and a large weir, approximately 900m downstream of the confluence between the Klein and Groot Dwars Rivers. Flow patterns, particularly during low flow periods, are altered as a result, potentially impacting on flow-sensitive biota. The catchment area for this portion of the river has not been extensively developed however, and therefore significantly increased water inputs are not anticipated at this time. A basic water quality assessment was undertaken at a single point on the Dwars River, downstream of the Two Rivers Platinum Mine. The results of this assessment indicate that the basic water quality parameters are in line with the OREWRA (2001) guidelines, as well as being consistent with results obtained from the Groot Dwars and Klein Dwars assessment points. The results were as follows: temperature = 17°C; pH = 7.3; EC = 49mS/m. Geomorphological processes have not been significantly altered; at the time of the assessment, very little bank incision or erosion which could alter channel competency could be discerned. However, increased sediment inputs are anticipated, primarily transported from upstream areas, but also as a result of vegetation removal (either for firewood or due to grazing of livestock) in the far north of the MRA, around the river. The proliferation of P. australis within the active channel (depicted in the photograph above right) is indicative of excess sediment (and possibly excess nutrients) entering the system. Nevertheless, this proliferation of reeds is also likely to aid in trapping sediment, preventing it from reaching downstream areas of the river outside of the MRA. Habitat is varied in terms of ecological integrity thereof. The portion of the Dwars River closest to Two Rivers Platinum Mine remains largely intact in terms of floral community structure and composition, with few invasive species observed. However, downstream of this area, it is apparent that anthropogenic activity increases, as indicated by noticeable vegetation removal, grazing by livestock and increased incidence of alien invasive species. Nevertheless, the Dwars River and its associated riparian zone is considered to provide an important faunal migratory corridor, providing as it does, connectivity to less disturbed and more natural areas to the north and north-west of the MRA. The relatively recent discovery of a previously unidentified fish species (*Enteromius* sp. nov 'south africa';	No watercourses were identified within the proposed diesel of emulsion batching sites. An ephemeral drainage line is located approximately 470 m west of the proposed diesel batching site, and another is located approximately 200 m east of the proposed emulsion batching site. Neither watercourse was assessed as the proposed infrastructure is not deemed to pose a significant quantum of risk to either watercourse. Nevertheless, the strict implementation of mitigation measures is strongly recommended to prevent any possible edge effects, particularly to the ephemeral drainage line located to the east of the proposed emulsion batching site.	Watercourse characteristics: a) Hydraulic regime Instream infrastructure such as bridge and fence crossings and weirs are present in the lower reaches of the Springkaanspruit, thus impacting on instream connectivity and flow patterns. In addition, due to the increase in impermeable surfaces in the vicinity of the lower reaches of the system, increased water inputs are anticipated. b) Water quality According to SAS (2017), water quality within the Springkaanspruit was within the parameters stated in the in the Olifants River Ecological Water Requirements Assessment (OREWRA) (2007) for a stream in this section of the Olifants River catchment at the time of assessment. During the assessment undertaken in 2018, surface water was absent and therefore parameters could not be determined. It is anticipated that due to the proximity of mining activities, water quality is likely to be impaired with specific mention of elevated salt concentrations and potential for contamination by specific pollutants. c) Geomorphology and sediment balance a. The Springkaanspruit has been impacted by increased sediment loads entering the system, and this increase is attributed to mining activities. SAS (2017) noted severe sedimentation at the downstream site where the stream exits the DRCM complex, leading to a "complete transformation of the bed substrate". Increased sedimentation of the system further has the potential to lead to smothering of biota, habitat alterations and bank incision, which is already evidenced by monotypic stands of Phragmites australis in the lower reaches of the system. In addition, erosion within the active channel is evident,

	Khulu TSF	Diesel and emulsion batching areas	Main Parking Extension, Widening of Access Road between South Shaft/Main Offices and Plant, and Access Crossing between Plant and North Mine respectively
	common name southern Sidespot barb) within the drainage system of which the Dwars River forms part, highlights the ecological importance of the river.		although it is more severe around infrastructure placed within the active channel, such as support structure for the conveyor traversing the Springkaanspruit b. Habitat and biota. The vegetation associated with the Springkaanspruit has undergone a greater degree of modification when compared with, for example, the Groot Dwars River. Monotypic stands of reeds and alien invasive species are apparent along the Springkaanspruit, however it provides suitable breeding and foraging habitat for a variety of fauna, as well as providing essential connectivity with other natural areas, and is therefore considered an important faunal migratory corridor including for fish.
REC, RMO & BAS Category	**Recommended Ecological Category (REC): B/C** **Best Attainable Stat (BAS): B/C (Maintain)** **Recommended Management Objective (RMO): B/C (Maintain)** The Dwars River, being relatively ecologically intact, of high ecological importance and sensitivity, and increased cultural/scientific value, should not be permitted to be further degraded as a result of the proposed mining activities. It is imperative that appropriate mitigation measures are implemented to ensure that edge effects relating to the construction and operation of the proposed TSF do not contribute to reduced ecological integrity of the river.	-	**REC Category: B/C** **BAS: B/C (Maintain)** **RMO: B/C (Maintain)** The Springkaanspruit too, should be managed and maintained appropriately, i.e. no further impacts should be permitted, and efforts should be made to rehabilitate those areas which have been affected by current mining operations.
EIS discussion	**EIS Category: Very High** The Dwars River system is considered to be of very high ecological importance due to the relatively intact ecology of the system and connectivity to surrounding natural areas, thus increasing the likelihood of the occurrence of threatened floral and faunal species. Additionally, the system provides important hydraulic functions, such as flood attenuation and sediment trapping.	-	**EIS Category: High** The Springkaanspruit, although having undergone a degree of modification, is nevertheless considered important in terms of service provision to downstream systems, as well as from a biodiversity maintenance perspective.
Extent of modification anticipated	None. No modification of the reach of the Dwars River associated with the proposed TSF and PCD is anticipated as a result of the construction and day to day operation of the infrastructure. The consequences in the event of a spill could be devastating however, and therefore very strict mitigation measures will be required throughout the life of the proposed TSF and PCD to ensure that failure does not occur.	None. Neither proposed batching site encroaches on any watercourses, and therefore no modification to freshwater ecosystems is expected due to the construction and operation of the diesel or emulsion batching sites.	The perceived risks associated with the widening of the existing access road between South Shaft and the Main Offices/Plant, and the construction of the access crossing between the Plant and North Mine are not anticipated to have a direct impact on the Springkaanspruit, due to the distance of the proposed activities from the river.

	Khulu TSF	Diesel and emulsion batching areas	Main Parking Extension, Widening of Access Road between South Shaft/Main Offices and Plant, and Access Crossing between Plant and North Mine respectively
Possible significant impacts, business case, conclusion and mitigation requirements:	The proposed TSF is located between 380m and 630m from the Dwars River, and the associated PCD is located approximately 440 m from the river; however both are located upgradient of the river and therefore although no direct impacts are expected, appropriate mitigation measures are necessary to ensure that possible edge effects do not contribute to lowered ecological integrity of the system. A key mitigation measure in this regard is in ensuring that the design and operation of the proposed TSF and PCD do not lead to seepages or failure of either, as a spill, particularly from the TSF, could have devastating consequences on the Ecostatus of the river. The results of the risk assessment are presented in Section 7 of this report and indicate a 'low' risk significance although this is largely attributed to the distance of the TSF and PCD from the river. Key mitigation measures include, but are not limited to: • The approved construction footprint of the TSF and PCD must be adhered to, to ensure that there is no encroachment on the watercourse; • The design of the TSF and the PCD must ensure that no dirty water runoff must be permitted to reach the watercourse in line with GN704 as it relates to the NWA and appropriate clean and dirty water separation and stormwater management controls must be developed as the first part of the construction activities; • The TSF and PCD must be designed to contain a minimum storm event of a 24 hour 1 in 50 year flood event, and must be appropriately lined with HDPE liners to prevent seepage; • As much as practically possible, limiting clearing and construction activities to the dry season to minimise the risk of sediment-laden runoff entering the river; • The construction of sediment traps around the downgradient boundary of the construction area is strongly recommended to minimise the volume of sediment transported in runoff from the construction site; • The TSF and RW PCD D must be managed throughout the life of both facilities in such a way to ensure that storage and surge capacity is available if a rainfall event occurs; and • An Emergency Response Plan must be compiled. Furthermore, it is imperative that mitigation measures are implemented to reduce the long-term risk of latent and cumulative impacts as well as contributing to reduced closure liability. Identified cumulative risks include altered sediment balance and changes to the physico-chemical characteristics, in particular salt concentrations, of the Dwars River due to the increased mining activity in the catchment	No direct impacts to the watercourses are anticipated, given the distances of the batching sites from the watercourses. Nevertheless, general 'best practice' mitigation measures are strongly recommended, including but not limited to: ➢ Development of an Emergency Response Plan prior to construction to provide a protocol in the event of a spill. ➢ Retention of as much natural vegetation as possible around the sites to provide stormwater and sediment trapping capacity. ➢ As the soil in the area is susceptible to erosion, it is strongly recommended that regular monitoring for erosion takes place. Should any preferential flow paths or erosion gullies form, these must be immediately managed in accordance with the mine's existing soil management protocols.	The perceived risks associated with the widening of the existing access road between South Shaft and the Main Offices/Plant, and the construction of the access crossing between the Plant and North Mine are not anticipated to have a direct impact on the Springkaanspruit, due to the distance of the proposed activities from the river. The expansion of the existing parking facility at the Main Offices will encroach marginally on the delineated riparian zone but will remain outside of the floodline. As the parking facility is pre-existing the expansion thereof is expected to pose a 'low' risk to the ecological integrity of the system. Nevertheless, strict implementation of mitigation measures will be required during construction in particular, including but not limited to: • As much as practically feasible, limit site preparation and construction activities to the dry season to minimise the volume of contaminated runoff potentially entering the watercourse; • Sediment traps must be erected around the construction site prior to commencement of construction activities to minimise the risk of sediment entering the downgradient watercourses; • Limit the footprint of vegetation clearing to what is absolutely essential and focus on retention of indigenous vegetation, rather clearing alien vegetation where possible; • Rehabilitation and revegetation of disturbed areas (as a result of construction) must take place immediately after construction, including replanting of indigenous tree species such as *Combretum erythrophyllum* and *Vachellia karroo*), in line with the existing Biodiversity Action Plan (SAS, 2018); and • Appropriate control methods for alien vegetation in line with existing and approved alien vegetation control within the mine must be implemented.

1.g.v.7 Hydrological Setting

Hydrospatial was appointed to undertake the Hydrological Assessment. The water setting information was sourced from this report, as well as available information on site.

The proposed Khulu TSF and Capital Projects are located in quaternary catchment B41G which is situated within the Olifants Water Management Area (WMA) (see Figure overleaf). A number of non-perennial drainage lines drain the mountain ridges and hills within of the MRA. These non-perennial drainage lines are ephemeral in nature (only flowing for short periods of time in response to high rainfall) and drain into the Klein and Groot Dwars Rivers. The Klein Dwars River flows through the centre of the MRA in a north-easterly direction, whilst the Groot Dwars River flows in a north-westerly direction. These two rivers form a confluence near the north of the MRA, forming the Dwars River, which flows into the Steelpoort River 8.5km north-west of the MRA. The Steelpoort River flows into the Olifants River, 40km north-east of the town of Steelpoort. The Olifants River is a tributary of the Limpopo River, which flows into the Indian Ocean near the town of Xai-Xai in Mozambique.

The topography of the MRA can be described as undulating with numerous mountain ridges and valleys (Figure 44). A mountain ridge runs along the western boundary of the MRA, where a maximum elevation of approximately 1 630 metres above mean sea level (mamsl) is reached. From this ridge, the elevation drops off to approximately 900 mamsl near the confluence of the Klein and Groot Dwars Rivers. A number of hills are located along the eastern portion of the MRA.

The proposed access road widening, subway crossing and main parking extension, are located within a 100m horizontal distance of the non-perennial Springkaanspruit, which is a tributary of the Klein Dwars River (Figure 44). The proposed emulsion batching area drains both east and west, whilst the diesel batching area drains west towards the Klein Dwars River. Both the emulsion batching area and the diesel batching area are located outside of the 100 m watercourse buffer.

The Khulu TSF site is located on fairly flat topography, dipping gradually in a north-westerly direction towards the Dwars River. According to the 1:50 000 topographical map 2430CC Kennedy's Vale, a non-perennial drainage line runs along the north-eastern boundary of the PCD and TSF site (Figure 44). During the site visit this area was assessed, and it was noted to be highly disturbed by what appeared to be old stockpiles and borrow pits, possibly from previous road construction in the area (see photo below).

Photo 2: Disturbed area along the north-eastern section of the proposed Khulu TSF site and PCD

As a result, water is likely to pond in this area and it is therefore highly unlikely that this area functions as a drainage line. Furthermore, the Freshwater Ecological Assessment (SAS, 2021) did not identify this area as a potential watercourse.

1.g.v.7.a Surface Water Runoff

The non-perennial drainage lines within the MRA are ephemeral, and runoff will only be generated when sufficient rainfall is received. The Groot Dwars and Klein Dwars Rivers are perennial rivers and will generally flow throughout year, barring dry years, when they may potentially stop flowing.

Monthly flows for river gauging station B4H009 was downloaded from the DWS hydrological services website for the period October 1966 to January 2019. B4H009 is located on the Dwars River below the confluence of the Klein and Groot Dwars Rivers, near the northern boundary of the MRA (Figure 44). The highest flows occur over the months of December to March, whilst the low flows occur over the months of June to October. According to the WR2012 study, quaternary catchment B41G has a Mean Annual Runoff (MAR) of 25.46 million cubic metres (mcm).

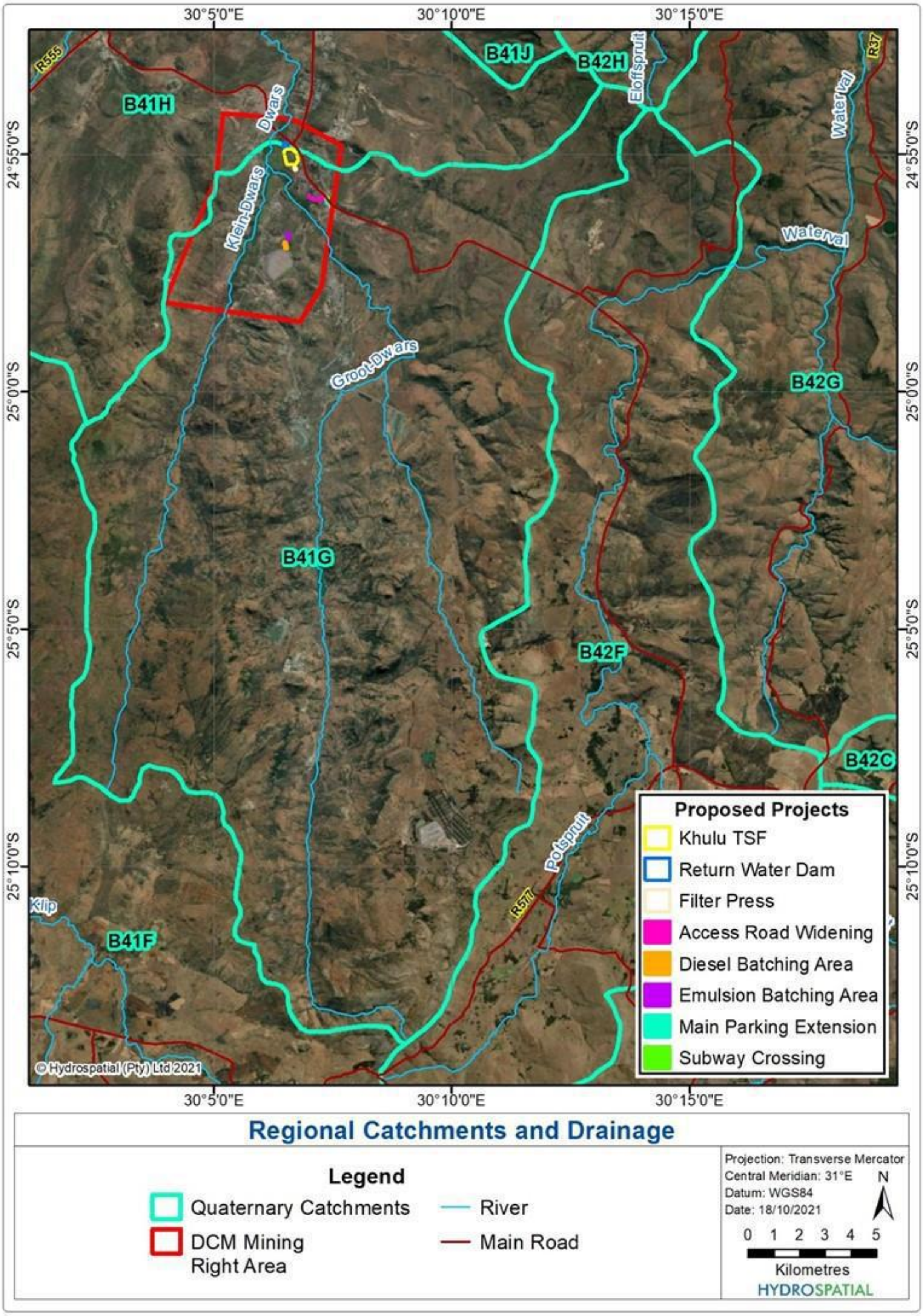


Figure 43: Quaternary Catchments

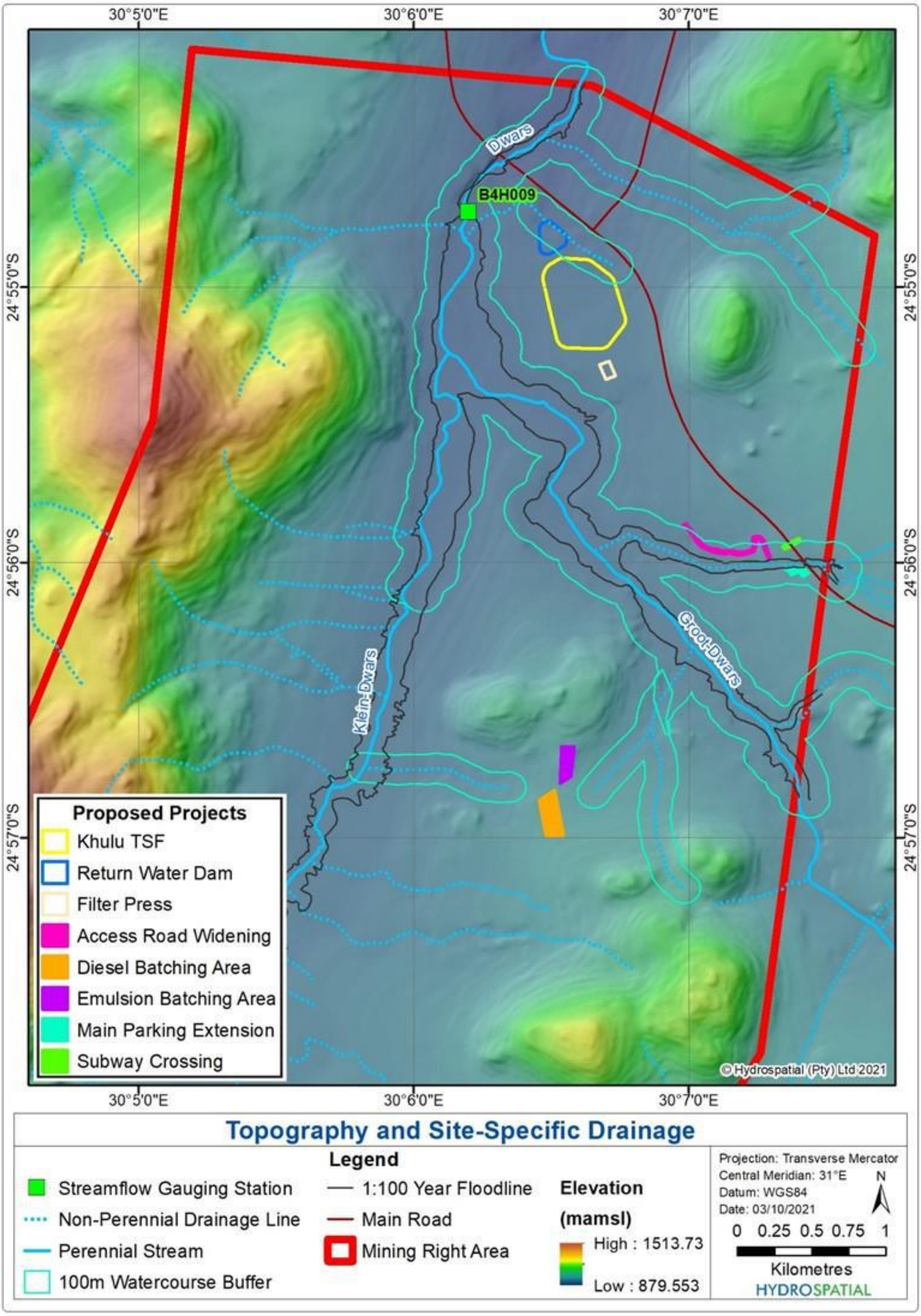


Figure 44: Site Specific Drainage

1.g.v.7.b Surface Water Quality

Surface water quality data was obtained from the Dwarsrivier Mine Quarterly Environmental Water Quality Report for the period January 2021 – March 2021 (Aquatico, 2021). The instream monitoring points were used to describe the surface water quality status of the receiving environment. Monitoring is undertaken on a monthly basis. Details of the monitoring points are summarised in the table below and their locations are shown on the figure overleaf.

Table 32: Instream surface water quality monitoring points

Monitoring Point	Location Description	Latitude	Longitude	Monitoring Frequency
S1	Groot Dwars River upstream of operations	-24.94224	30.12034	Monthly
S2	Klein Dwars River (Helipad Bridge north of Landing Strip)	-24.92921	30.10105	Monthly
S3	Groot Dwars River before confluence with Groot Dwars River and Springkaanspruit (Clinic Bridge)	-24.92833	30.1084	Monthly
S4	After confluence of Groot Dwars and Klein Dwars (Main Public Road Bridge)	-24.91199	30.10325	Monthly
S5	First stream next to DRM6 (Klein Dwars)	-24.94315	30.12238	Monthly
SP1	Bridge crossing Springkaanspruit (Upstream of Operation)	-24.93336	30.12379	Monthly
SP2	Springkaanspruit on mine premises (Close to Main Sewage Plant)	-24.93351	30.11982	Monthly
SP3	Springkaanspruit on mine premises (Downstream at mine perimeter)	-24.93299	30.11686	Monthly
SP4	Klein Dwarsriver (Downstream of Truck Parking Area)	-24.94138	30.12976	Monthly
SP5	Groot Dwarsrivier (Bridge to Thorncliffe Mine)	-24.9553	30.12781	Monthly

The average monthly water quality between January 2021 and March 2021 is indicated in Table 33. Monthly trends in pH, Total Dissolved solids (TDS), sulphate and nitrate are indicated in the graphs thereafter. The water quality was compared to the following limits:

- Assessment 1: Dwarsrivier Mine 2008 Water Use License (WUL) limits (Licence No. 24053346, Ref. 16/2/7/B400/C83); and
- Assessment 2: General Authorisation Special limit for non-listed water resources (as per DWS published in Government Gazette No 36820, GNR665, dated 6 September 2013).

It is important to note that the water quality limits as stipulated in the original WULs were removed by the DWS in the amended WULs of 2021.

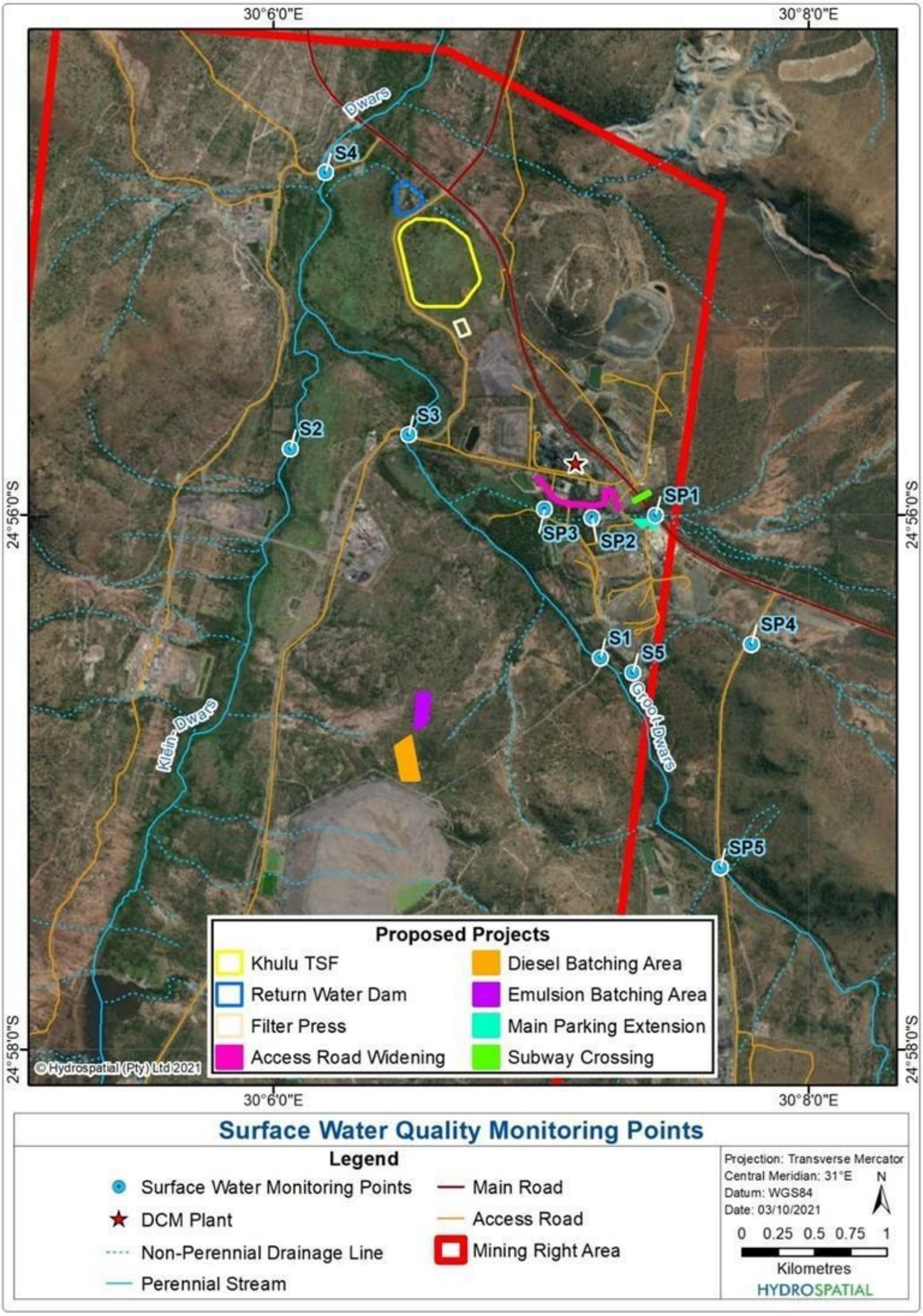


Figure 45: Surface water quality monitoring points

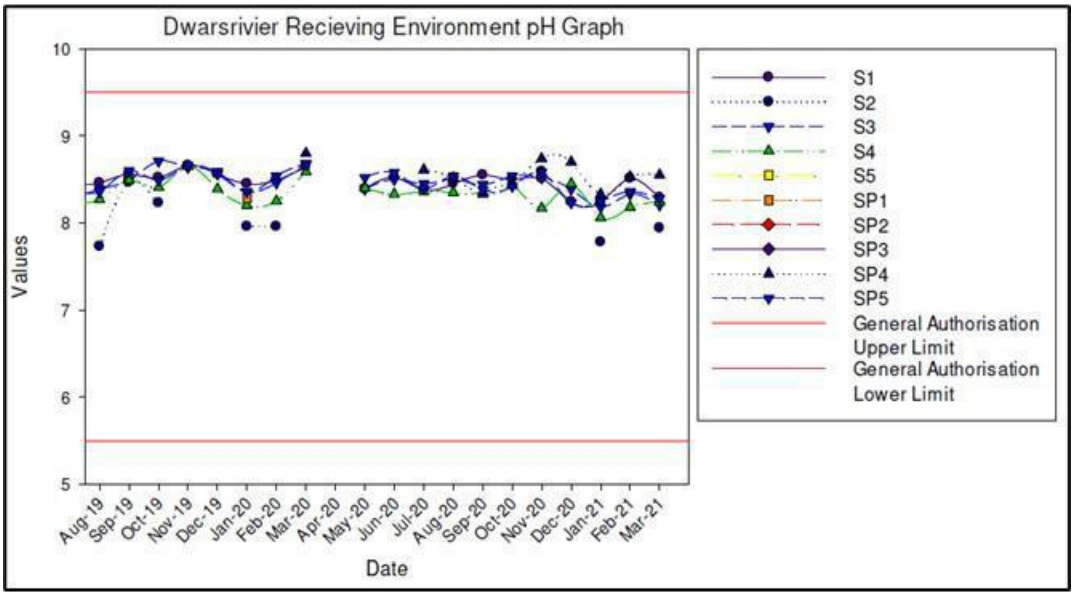
The following provides a summary of the water quality of the instream receiving environment:

- The pH has been alkaline (> 7) and within limits at all monitoring points;

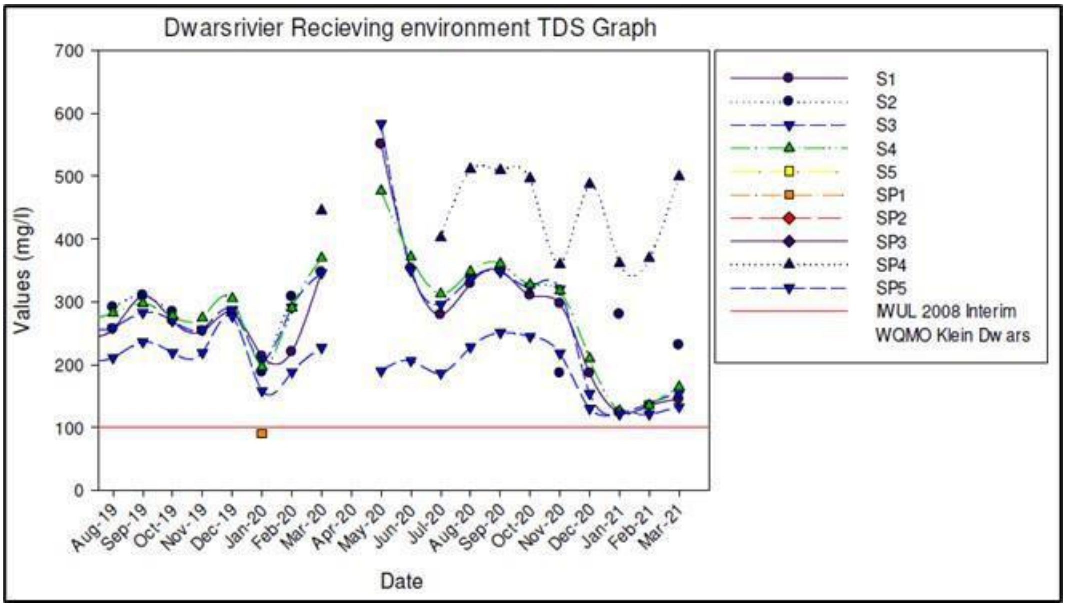
- Total Dissolved Solids (TDS) exceeded the WUL limit at all monitoring points and has been particularly elevated at SP4, S2 and S4. The elevated TDS at S2 is most likely from the upstream activities from the other mines in the Klein Dwars River catchment;
- Sulphate has been within the WUL limit at all monitoring points except on one occasion at S2 in February 2020;
- Nitrate exceeded the WUL limit at S1 – S4 between January 2021 and March 2021. Nitrate has regularly exceeded the limit in the past at S1, S3 and S4, however, between December 2020 and March 2021 levels significantly declined; and
- The water quality for all other variables monitored were within the WUL limits.

Table 33: Average monthly water quality between January 2021 – March 2021 (Aquatico, 2021)

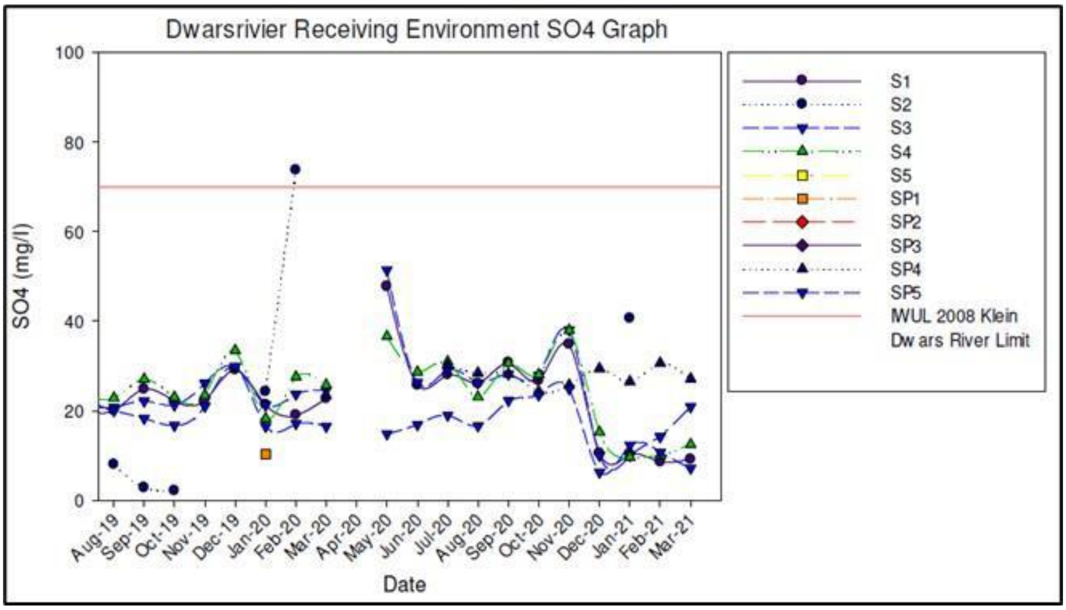
AVERAGE DATA TABLE:														
PROJECT NAME				Dwarsrivier Chrome Mine										
ASSESSMENT SET 1				Dwarsrivier IWUL (2008) Interim WQMO for Klein Dwars River										
ASSESSMENT SET 2				General Authorisation Limit, Section 21f and h, 2013										
				Value exceeds the assessment set 1										
VARIABLE	UNITS	ASSESSMENT 1	ASSESSMENT 2	MONITORING LOCALITIES										
				S1	S2	S3	S4	S5	SP1	SP2	SP3	SP4	SP5
pH @ 25°C	pH	-	5.5/9.5	8.34	7.86	8.24	8.16					8.47	8.29
Electrical conductivity (EC) @ 25°C	mS/m	-	150	21.7	41.3	22.8	23.6					63.8	20.2
Total Dissolved solids @ 180°C	mg/l	100	-	156	283	151	168					421	150
Calcium (Ca)	mg/l	-	-	20.7	37.5	19.1	20.1					35.4	17.3
Magnesium (Mg)	mg/l	-	-	13	19.9	13.3	14.1					71.8	13
Sodium (Na)	mg/l	-	-	5.8	17.5	6.37	6.4					7.09	5.68
Potassium (K)	mg/l	-	-	1.22	2.8	1.35	1.48					2	1.22
Total alkalinity	mg CaCO3/l	-	-	95.8	176	92.5	105					371	98.3
Chloride (Cl)	mg/l	62	-	4.35	19.7	5.17	5.27					6.16	5.01
Sulphate (SO_4)	mg/l	70	-	9.3	20.3	15	10.7					28.1	10.1
Fluoride (F)	mg/l	1.485	1	0.132	0.132	0.132	0.132					0.132	0.132
Nitrite (NO_2) as N	mg/l	-	-	0.081	0.127	0.087	0.088	Dry	Dry	Dry	Dry	0.08	0.083
Nitrate (NO_3) as N	mg/l	-	15	3.13	2.06	2.97	2.34					0.358	1.15
Nitrate as NO_3	mg/l	6	-	13.8	9.11	13.2	10.4					1.59	5.1
Ammonia (NH_3) as N	mg/l	-	-	0.009	0.007	0.013	0.014					0.03	0.019
Ammonium (NH_4) as N	mg/l	-	6	0.094	0.237	0.169	0.212					0.25	0.22
Hexavalent chromium (Cr^{6+})	mg/l	0.014	0.05	0.001	0.001	0.001	0.001					0.001	0.001
Cadmium (Cd)	mg/l	-	0.005	0.001	0.001	0.001	0.001					0.001	0.001
Chromium (Cr)	mg/l	-	-	0.002	0.002	0.002	0.002					0.002	0.002
Copper (Cu)	mg/l	0.005	0.01	0.001	0.001	0.001	0.001					0.001	0.001
Manganese (Mn)	mg/l	0.3663	0.1	0.001	0.001	0.001	0.001					0.011	0.001
Total suspended solids (TSS)	mg/l	0.0891	25	38	33	46	76					51	42



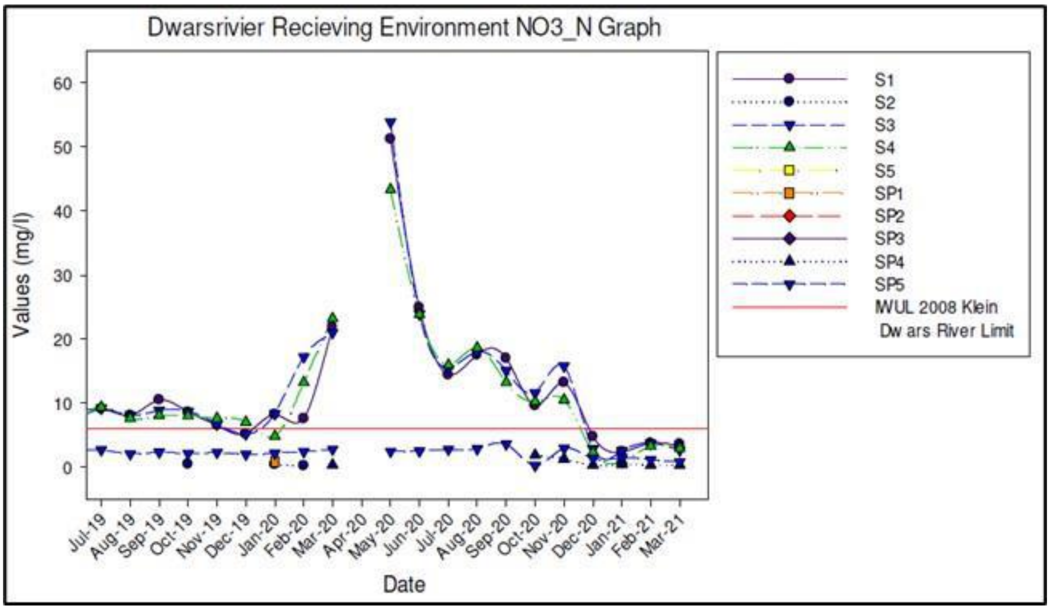
Graph 1: Trends in monthly pH between August 2019 and March 2021 (Aquatico, 2021)



Graph 2: Trends in monthly TDS between July 2019 and March 2021 (Aquatico, 2021)



Graph 3: Trends in monthly sulphate between August 2019 and March 2021 (Aquatico, 2021)



Graph 4: Trends in monthly nitrate between July 2019 and March 2021 (Aquatico, 2021)

1.g.v.8 Reserve Determination

1.g.v.8.a Quality

The then Department of Water Affairs (DWA; now DWS) published a reserve for the Dwars River in quaternary catchment B41H in 2010 (Ref. 26/8/3/3/310, 550/7). The reserve was prepared for the Richmond Dam, which is situated upstream of Dwarsrivier Mine. The study entailed an intermediate surface water and a rapid groundwater (quantity) reserve determination. The outcome of the assessment indicates that the present ecological state of the Dwars River is rates B/C. The Ecological Importance and Sensitivity (EIS) were rated as high and the Recommended Ecological Category was rated as B/C.

The groundwater reserve, defined as the amount of groundwater that is required to contribute to the surface water requirements of a water resource in order to achieve the recommended ecological category (baseflow contribution), was calculated as part of this study. The catchment wide of rate recharge of rain water to the aquifers present in the Dwars River catchment is estimated to be 3% of MAP. Thirty eight percent of this recharge volume was determined as the required contribution to baseflow necessary to achieve the recommended ecological category of B/C. Groundwater is therefore thought to contribute significantly to surface water requirements in the catchment. The groundwater component of baseflow over the 442km^2 area of the catchment, was calculated to be 4,67 million m^3/a.

Surface water quality specifications (quality ecospecs) for the intermediate reserve for the Dwars River, as published in the reserve determination, is presented in the following table.

Table 34: Dwars River Reserve Water Quality Specifications

Parameter	**Ecological Requirements**	**Basic Human Needs Requirement**	**Reserve requirement: water quality**
$MgSO_4$ (mg/l)	<16	N/A	<16
Na_2SO_4 (mg/l)	<20	N/A	<20
$MgCl_2$ (mg/l)	<15	N/A	<15
$CaCl_2$ (mg/l)	<21	N/A	<21
NaCl (mg/l)	<45	N/A	<45
$CaSO_4$ (mg/l)	<351	N/A	<351
Na (mg/l)	N/A	<200	<200
Mg (mg/l)	N/A	<100	<100
Cl (mg/l)	N/A	<200	<200
Ca (mg/l)	N/A	<80	<80

Parameter	Ecological Requirements	Basic Human Needs Requirement	Reserve requirement: water quality
SO_4 (mg/l)	N/A	<400	<400
PO_4 (mg/l)	<0,02	N/A	<0,02
T Nitrogen (mg/l)	<4	N/A	<4
pH	6,5 – 8,8	5 – 9,5	6,5 – 8,8
Dissolved Oxygen (mg/l)	>7	N/A	>7
Electrical Conductivity (mS/m)	<55	0 - 70	<55

1.g.v.8.b Present Ecological State

An Intermediate Reserve Determination for catchment B41G (including 18 % of B41H – the Steelpoort River Quaternary Catchment) was done in 2008 just below the confluence of the two Dwars Rivers. The Present Ecological Status (PES) of the catchment is included in Table 35.

Table 35: Present Ecological Status of the Dwars River (Source: Intermediate Reserve Determination, 2008)

COMPONENT	PRESENT ECOLOGICAL STATE (PES)	MOTIVATION FOR PES	ECOLOGICAL IMPORTANCE AND SENSITIVITY
Riparian Vegetation	C	Presence of weed and modification through agriculture	High
Habitat Integrity - Instream	C	The present ecological state of this system is in virtually a near natural state, with only exotic weed infestation and some herbaceous layer reduction the major drivers of change. These have reduced the integrity of the area to some degree. On the upper left bank in the area transitional between the riparian and terrestrial zone there has been a significant loss of riparian species due to the cultivation of wheat in the fields adjacent to the river.	
Habitat Integrity - Riparian	A		
Fish	C	Most of the expected fish species are still present, although the frequency of occurrence (FROC) of some species has been reduced. These include especially the rheophilic species *Amphilius uranoscopus*, as well as other species such as *Barbus paludinosus* and *Anguilla mossambica*. The decreased FROC of *B. paludinosus* is expected to be related to loss in overhanging vegetation, while *A. mossambica* have been affected by downstream migration barriers. One highly intolerant fish species, namely *Opsaridium peringueyi* have been lost from the area. It absence is related to altered flows and water quality.	
Invertebrates	B/C	A slight loss of expected taxa, not present, mostly related to limited vegetation (Species of concern include Naucoridae, Corixidae, Pleidae, Atyidae and Dytiscidae), which is not completely unnatural and related to sensitivity to lowered water quality (not lowered flow).	
Hydrology	C	Good gauging station, but limit exceeded for very high flows. Uncertainty about possible water losses between gauge and EWR site.	
Fluvial Geomorphology	B	Small increases in the fine component of the sediment supply and decreased flows.	
Water Quality (Integrated)	B/C	Biotic indicators also suggest moderate water quality. Although water quality status appears to be stable, there are potential causes for concern due to spillage from slimes dams during "upset" conditions.	
Ecostatus (overall, integrated score)	**B/C**	Various human activities have already impacted on the biotic conditions of the Dwars River.	
Confidence - Medium			

The findings form the Reserve Determination indicated that the B41G Dwars River sub-catchment is in a near to pristine state. The system supports species that are sensitive to pollution, also indicative of the natural status of the water resource.

1.g.v.8.c Receiving Water Quality Objectives and the Reserve

The reserve for B41G drainage was determined and recommended by the DWA (now DWS) on 22 January 2010. The following table shows the receiving water quality objectives of Dwars River as stated in the reserve determination.

Table 36: Receiving Water Quality Objectives or Reserve Requirements

PARAMETER	RESERVE REQUIREMENT: WATER QUALITY
$MgSO_4$ (mg/l)	<16
$NaSO_4$ (mg/l)	<20
$MgCl_2$ (mg/l)	<15
$CaCl_2$ (mg/l)	<21
$NaCl_2$ (mg/l)	<45
$CaSO_4$ (mg/l)	<351
Sodium (mg/l)	<200
Magnesium (mg/l)	<100
Chloride(mg/l)	<200
Calcium(mg/l)	<80
Sulphate(mg/l)	<400
Phosphate(mg/l)	<0.021
Total Inorganic Nitrogen(mg N/l)	<4.0
pH 5th Percentile pH 95th Percentile	65 8.8

1.g.v.8.d Resource Class and River Health

DWS has identified Drainage Region B41 as being:

- High in its EIS; and
- Largely Natural, Class B in its PES.

Determining future management class of the reserve

The visioning process is part of the Resource Management Strategy, which is currently being developed. Future Management Classes for quaternaries are therefore not available at present.

Determining sensitivity of the water resource in the vicinity of the mine

In the short term, with the future Management Classes not defined, the precautionary principle will apply, and the vision for the catchment will be based on ecological criteria, as tabulated in Table 37.

Management measures in the short term have been evaluated as improving the PES of the river to Class A/B.

Table 37: Management Measures in the Short Term

			ECOLOGICAL IMPORTANCE AND SENSITIVITY (EIS			
			VH	H	M	L
PRESENT ECOLOGICAL STATE (PES)	A	Pristine	A Maintain	A Maintain	A Maintain	A Maintain
	B	Natural	A Improve	A/B Improve B41G	B Maintain	B Maintain
	C	Good	B Improve	B/C Improve	C Maintain	C Maintain
	D	Fair	C Improve	C/D Improve	D Maintain	D Maintain
	E/F	Poor	D Improve	D/E/F Improve	E/F Maintain	E/F Maintain

VH = Very High H = High M = Moderate L = Low

In the longer term, the catchment vision will be based on the current assessment and the future Management Class, as tabulated in Table 38. Management measures in the longer term have been evaluated as sustainable use with a vision of a retaining Class III for drainage region B41G.

Table 38: Management Measures in the Long Term

			ECOLOGICAL IMPORTANCE AND SENSITIVITY (EIS)			
			I Special Protected	II Protected	III Good Quality	IV Acceptable Quality
PRESENT ECOLOGICAL STATE (PES)	A	Pristine	Maintain	Maintain	N/A	N/A
	B	Natural	Maintain	Maintain	Sustainable use	Sustainable use
	C	Good	Improve	Improve	Maintain	Sustainable use
	D	Fair	Improve	Improve	Improve	Maintain
	E/F	Poor	Improve	Improve	Improve	Improve

1.g.v.9 Hydrogeological Setting

iLEH was appointed to undertake the Hydrogeological Assessment The hydrogeological information was sourced from these reports, as well as available information on site.

1.g.v.9.a Monitoring Boreholes

Up to 2021, Dwarsrivier Mine monitored 19 boreholes. During 2021, additional monitoring boreholes were drilled to quantify the aquifers associated with the Khulu TSF, which is discussed in this report. In addition, six monitoring boreholes were drilled as part of a separate project (nettZero, 2021), pertinent details of which are presented in this report. The locations of all monitoring boreholes are indicated in the figure hereafter.

1.g.v.9.b Unsaturated Zone

Information regarding the soils present was sourced from EScience (2010). The results of a soil study completed on a 200 – 300m grid at the time indicates that the indicates the predominant soil include Glenrosa and Mispah Forms with small pockets of Hutton soil forms. On lower slopes associated with the streams, the soil forms include Hutton, Clovely, Augrabies and Katspruit. Valsrivier soils were found exposed in erosion gullies.

The Glenrosa and Mispah soil forms are generally present to depths of 0.3 – 0.6m and showed no signs of wetness. The Clovely and Hutton forms have a marked increase in clay content with depth and extend to depths of more than 0.6m and in places as deep as 1,5m. The Katspruit and Valsrivier form soils associated with the streams indicate signs of prolonged saturation.

The alluvial material associated with the rivers and streams is unconsolidated sand, possibly with lenses of clay, slit or calcrete.

Additional information regarding soil conditions underlying the Khulu TSF is discussed in Section 1.g.v.3.c before. This information was sourced from JAW (2021).

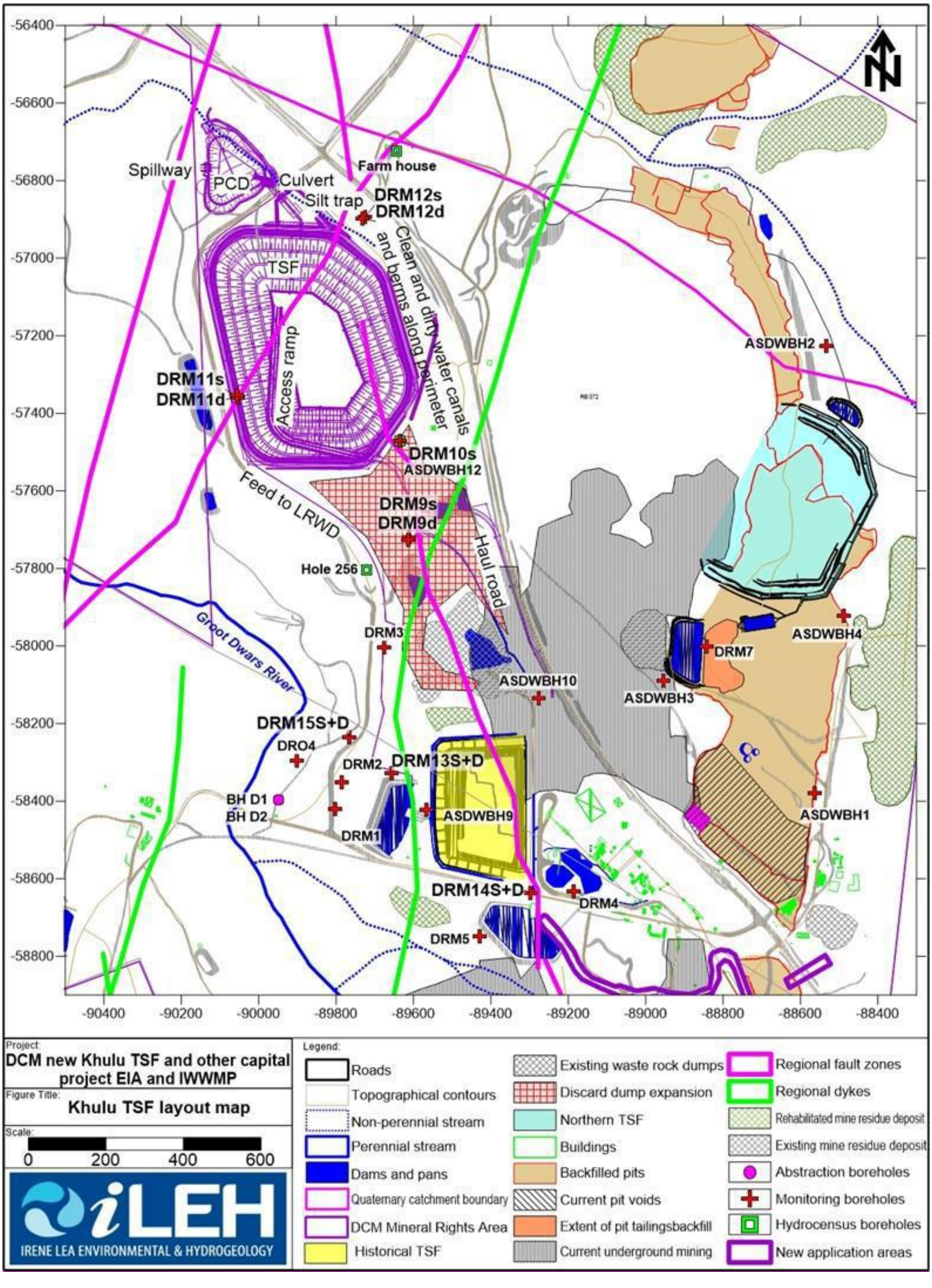


Figure 46: Location of Boreholes

1.g.v.9.c Saturated Zone

There are three (3) main aquifers found in the area (iLEH, 2020). These include:

1. An alluvial aquifer present in the floodplains of the Groot and Klein Dwars Rivers. In this aquifer, the lithology varies from large boulders to fine silty material. Monitoring boreholes drilled into this aquifer suggests that it is 15m thick on average in the vicinity of the Khulu TSF. This thickness was correlated with the depth of weathering. This aquifer is replenished through the recharge of rainwater.
2. A shallow weathered aquifer present in the upper 15m of the geological succession. The alluvial and weathered aquifers are hydraulically connected, as there is no information available that suggests the presence of an impermeable barrier between the two aquifers. The vertical extent of this aquifer is defined by the limit of weathering.
3. A lower semi-confined fractured rock aquifer consisting of fractured pyroxenites, anorthosites and norites. The depth to weathering in this aquifer varies from 0 – 32m, but is on average 15m below surface in the vicinity of the Khulu TSF. Pockets of deeper weathering are associated with faulting and/or jointing. The intersection of fractures in exploration boreholes suggests that the majority of fractures occur within the upper 60m of the geological succession. Deeper fracturing is however found to a depth of 200m. Information from monitoring boreholes suggests that water-bearing fractures typically occur to a depth of 40m. The localised fractured aquifers in the rocks are thought to be restricted to contact zones between intrusions and the host rock as well as with joints, faults and fractures. Groundwater in the fractured aquifer system is drained from storage in the overlying weathered aquifer as well as through recharge of rainwater and from watercourses. Two regional fault lines are present in the project area, as discussed earlier (See Section 1.g.v.3.c). Based on field data, it is concluded that both fault lines will act as preferential flow paths to groundwater. The north-south striking fault specifically has significantly enhanced aquifer conditions. In addition, a regional north-south striking dyke is located east of the Khulu TSF. The contact zone of this dyke is also thought to be a preferential flow path to groundwater. This dyke does however not transect the Khulu TSF footprint. The unfractured rock matrix is tight and unlikely to transmit groundwater flow to any significant extent. Groundwater flow is expected mainly along the faults, fractures and dyke contact zones present. The fractured rock aquifer is also hydraulically connected to the alluvial and weathered aquifers and will be recharged with rainwater from the two upper aquifers. The vertical movement of groundwater between the two aquifers is however expected to be at least and order of magnitude lower compared to horizontal flow rates.

1.g.v.9.d Aquifer Transmissivity

The available information for the aquifers identified from the geological setting of the project is summarised in the following table. The table indicates the range of transmissivities for the aquifers as well as an average value calculated from the available dataset. The calculation of average transmissivities considered the heterogeneity of the aquifers present. The following is concluded from the average transmissivities for each aquifer:

- The N-S striking fault zone has the highest average transmissivity and will be considered a preferential flow path to groundwater.
- The alluvial aquifer also has a comparatively high transmissivity and is therefore also considered a preferential flow path. The information gained from recent aquifer test data could be used to obtain a better understanding of the nature of the alluvial aquifer. The transmissivity of this aquifer is lower than previously thought. This is supported by the borehole logs, which does not indicate unconsolidated material, but clay-rich to sandy deposits.
- The dolerite dyke contact zone has a moderately low average transmissivity. It is likely to act as a preferential flow path to groundwater, but to a lesser extent compared to the N-S striking fault.
- The aquifer associated with the SW-NE trending fault is also not as well developed as the N-S striking fault. Boreholes DRM11S and D, situated down gradient of the Khulu TSF were dry at the time of drilling. Seepage did however subsequently collect in DRM11D, suggesting low groundwater seepage conditions in this position. The transmissivity of DRM12D, situated along this fault up gradient of the Khulu TSF, is however significantly higher. This suggests that the fault could act as a preferential flow path to groundwater.
- The transmissivities of the shallow weathered aquifer are generally low with dry aquifer conditions at the time of drilling. In places this aquifer could have transmissivities above 5 m2/d, as shown.
- The fractured rock matrix has a very low transmissivity. Groundwater flow is not expected to take place at any significant extent in unfractured rock.

Table 39: Aquifer transmissivity analysis: Khulu TSF footprint area

Aquifer	Boreholes with data	Transmissivity range (m^2/d)	Average Transmissivity (m^2/d)
Alluvial	DRM1, DRM2	2.87 - 9.21	5,14
Shallow weathered	DRM9S, DRM10S, DRM11S, DRM12S, DRM13S, DRM15S	Dry - 5,46	0,16
Fractured rock: matrix	DRM15D, ASDWBH10, DRM4	0.04 - 0.07	0,06
Fractured rock: SW-NE fault	DRM11D, DRM12D, Farm Borehole	Dry - 96	13,78
Fractured rock: N-S fault	DRM9D, ASDWBH12, DRM12D, DRM14D	6 - 328	77,08
Fractured rock: Dyke	DRM9D, DRM13D, DRM3(?), ASDWBH9	0.25 - 17.5	2,36

1.g.v.9.e Interaction between shallow and deep aquifers

Monitoring in shallow boreholes was undertaken during aquifer tests completed during 2021 in order to gain information on how the shallow weathered aquifer interacts with the deeper underlying fractured rock aquifer.

Results from the aquifer tests completed as part of this study suggests that there is limited interaction between the shallow and deep aquifers during constant discharge aquifer tests on the deep monitoring boreholes at each location (see the table below). It is noted that borehole DRM10 and 11S were dry at the time of the tests. The information suggests that the shallow weathered aquifer does not carry water and does not significantly contribute to the rate of recovery in the deep monitoring boreholes.

Table 40: Aquifer test programme summary

	Borehole ID	DRM 9d	DRM 12d	ASDW BH12
Aquifer Test Data	Available Drawdown (m)	67.63	68.20	31.60
	Step 1 (L/s) / Drawdown (m)	0,5 / 0.76	0.5 / 0.11	0.5 / 0.04
	Step 2 (L/s) / Drawdown (m)	1 / 2.97	1.5 / 0.49	1.5 / 0.19
	Step 3 (L/s) / Drawdown (m)	2 / 7.09	4 / 1,59	4 / 0.54
	Step 4 (L/s) / Drawdown (m)	5 / 67.63	6.5 / 2.88	6.3 / 0.99
	Step Recovery - % vs time	90% (7 min)	90% (15 min)	75% (8 min)
	Constant Discharge (L/s)	3.0	6.0	6.0
	Duration (min)	720	720	720
	Max Drawdown (m)	47.63	3.07	1.50
	Constant Recovery - % vs time	90% (50 min)	90% (70 min)	82% (12 min)
	Obs Bhs	BH 12m deep - water level 11.04 m. BH emptied at start of Step 2 and never recovered	BH 8m deep - water level 7.15 m. Level dropped by 25cm at end of Step test and remained there. Did not recover	BH 12m deep - dry
	FC Method			
	T - m^2/day	6	95	189
	Borehole yield	1.6 L/s	12.0 L/s	19.5 L/s

NettZero (2021) installed an automatic level recorder in borehole DRM9 to determine if there is a hydraulic connection when boreholes DRM13 – 15 were pumped. Although groundwater level fluctuations were observed in borehole DRM9, it was concluded form the study that the observed fluctuations are rather due to daily atmospheric changes than impacts associated with the constant discharge tests in boreholes DRM13 – 15. Limited drawdown was also observed in boreholes close to each of the pump tested boreholes.

Based on this information, it is concluded that there is limited vertical movement between the shallow weathered and the deeper fractured rock aquifer. The exception is at DRM14S and D (at the current Beneficiation Plant), where high transmissivities were recorded in both shallow and deep boreholes by nettZero (2021). This borehole is located on the IRUP body mapped in the underground workings as well as on the N-S striking fault. The information suggests that vertical infiltration of contamination in this area is likely, which is furthermore supported by monitoring data in boreholes along this fault line.

1.g.v.9.f Groundwater Levels

The groundwater flow contours are presented in the following two figures for measurements in the shallow and deep boreholes respectively.

The contours indicate that groundwater flow in both aquifers is in a westerly direction towards the Klein Dwars River. The average flow gradient over the Khulu TSF footprint area in the shallow aquifer is 0.017 (1:58) and 0.02 (1:50) in the deeper fractured aquifer. Flow patterns are very similar in the two aquifers.

The average depth to groundwater in the shallow monitoring boreholes in the area is 10m. This is close to the average depth in deep monitoring boreholes which is 12m. Borehole logs suggest there is no geological barrier between the two aquifers. The limit of the weathered aquifer is defined by the depth of weathering and for this reason is hydraulically connected to the fractured aquifer.

There is a slight cone of depression around boreholes DRM1 and 2 in both aquifers. This is probably attributed to the impact of groundwater abstraction from boreholes D1 and D2, which is situated in this area near the Groot Dwars River (see Figure 46).

In contrast, a mound in groundwater levels has developed around the Upper RWD. This is indicative of shallow groundwater conditions in this area and could reflect seepage from the dam. A detailed assessment of the Upper RWD falls outside the scope of this report. It is however important to investigate groundwater flow at the Upper RWD in order to develop measures to minimise contamination associated with the Dwarsrivier Mine operations.

Groundwater level measurements along the N-S fault, the SW-NE fault and the dyke were used to trace preferential flow along these structures (see the figure overleaf). This information indicates that there is a well-developed preferential flow path along the N-S striking fault. In this structure, flow is from the plant area in a northerly direction and not westerly as regional flow patterns suggest. Less pronounced preferential flow takes place along the SW-NE striking fault and the N-S striking dyke, as shown.

A comparison between topographical elevation and groundwater elevation in the shallow and deep monitoring boreholes is included in the following two (2) figures. A strong correlation between these two parameters suggest that groundwater flow takes place mainly under the force of gravity from high-lying areas towards the rivers and streams. In the shallow boreholes, a 92% correlation exists. In the deeper boreholes, the correlation is 83%. This suggest that other factors could control groundwater flow, including pressure along the fault lines and dyke contact zones as well as the impact of mine dewatering.

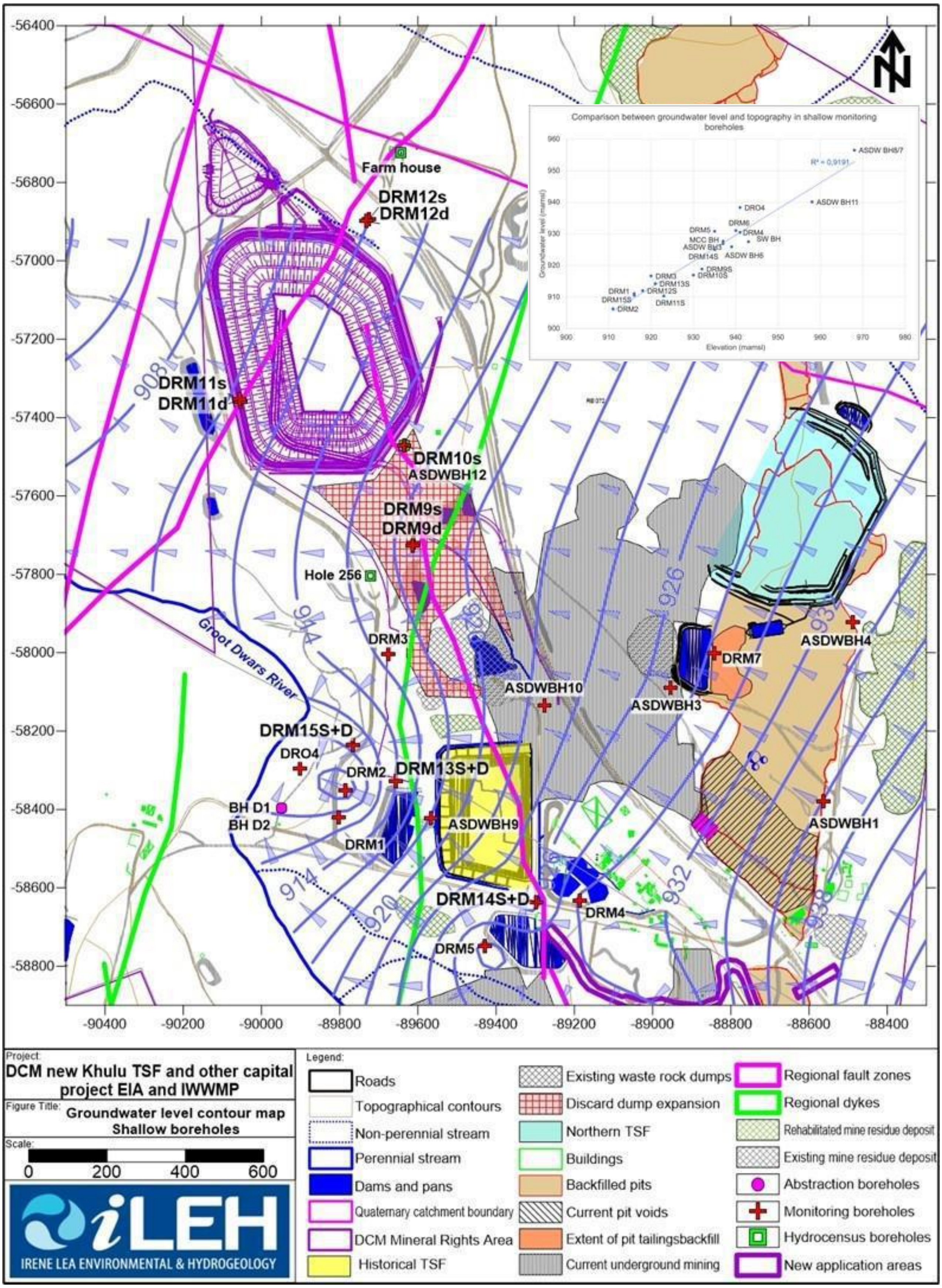


Figure 47: Groundwater flow contours in shallow boreholes

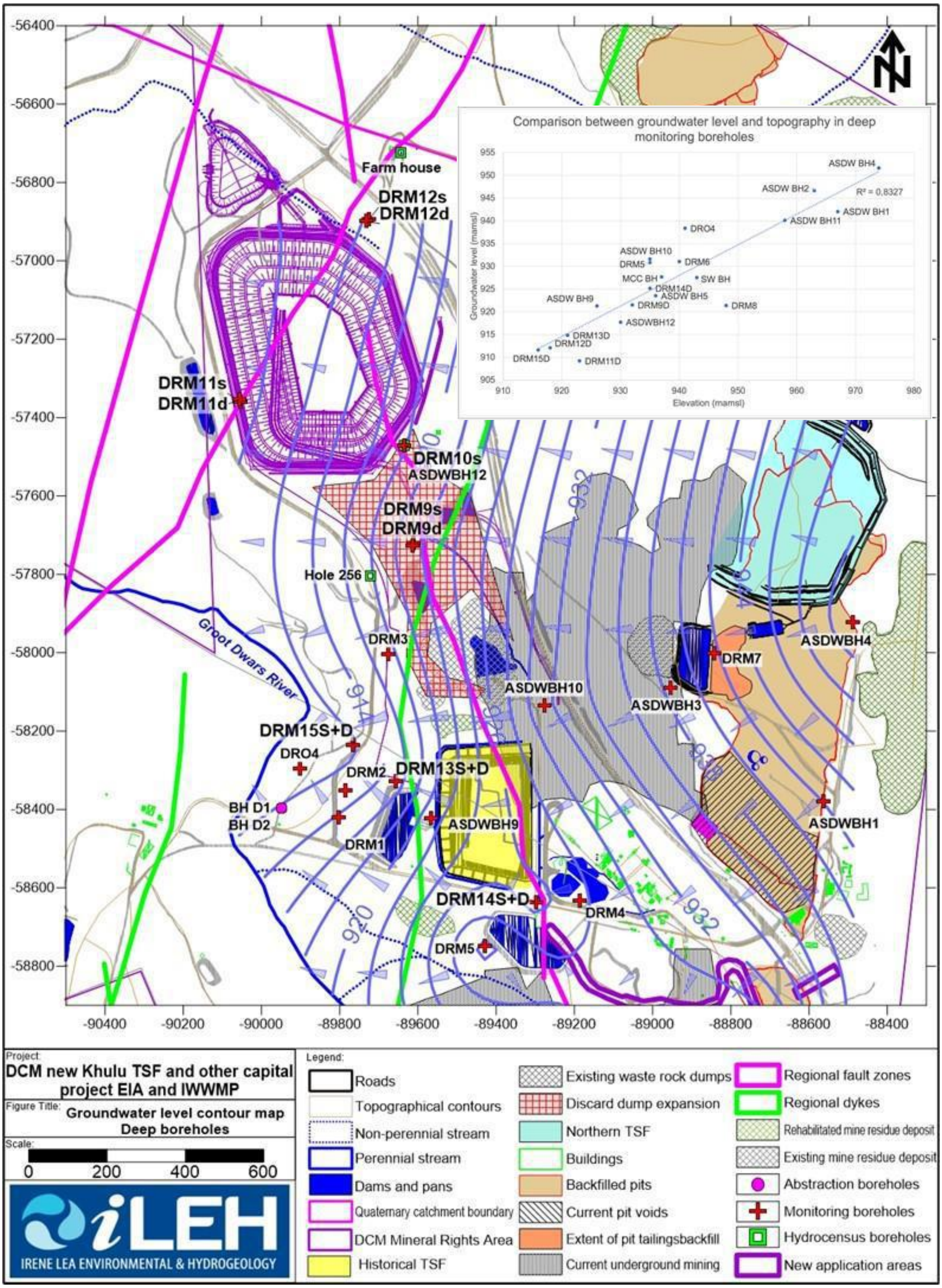


Figure 48: Groundwater flow contours in deep boreholes

1.g.v.9.g Groundwater potential contaminants

The water quality in the Lower RWD was used to identify the potential groundwater contaminants associated with mining area as it is thought to be representative of the overall Dwarsrivier Mine dirty water circuit. Water from the Upper RWD as well as feed from the North TSF and its return water dam is currently discharged to the Lower RWD for re-use.

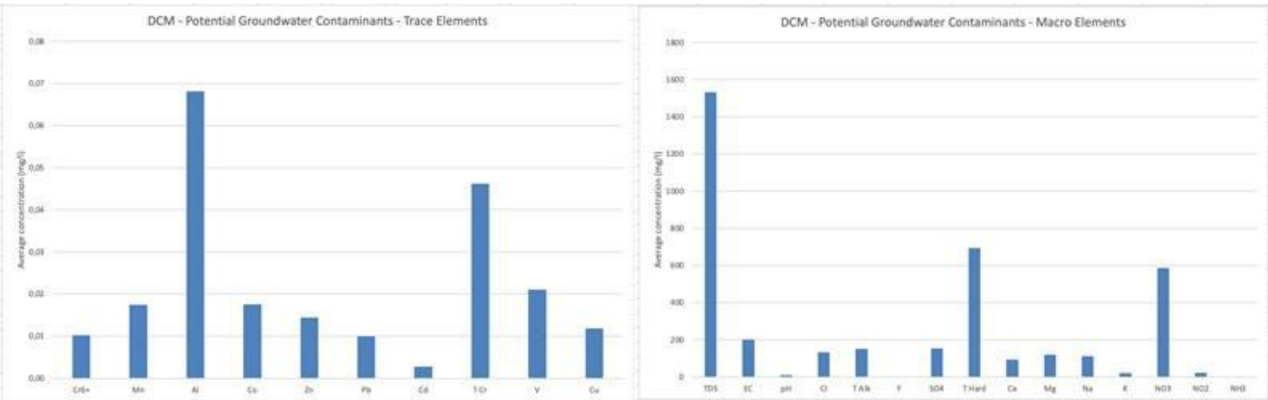
In future, water from the Lower RWD will be entrained in the tailings slurry that will be pumped to the Filter Press prior to the discharge of filter cakes on the Khulu TSF.

As such, the long-term average concentrations for macro and trace elements provide an indication of the indicator elements for the mining operations as a whole, but also for the Khulu TSF. These are presented graphically in the following graph.

The information presented in the following graph indicates that the water has elevated Total Dissolved Solids (TDS), total hardness (T Hard) and nitrate (NO_3). The average 2021 nitrate concentration for the Lower RWD is 1,167mg/l, which indicates that nitrate concentrations are increasing in this dam.

In terms of trace metals, the average concentrations are all below 0.07 mg/l. It is noted that aluminium (Al) and total chromium (T Cr) have the highest average concentrations of the metals included in the monitoring database.

Nitrate was previously identified as the indicator element for the operations (Future Flow, 2015 and iLEH, 2017). The averaged macro and trace element qualities assessed confirm this finding and NO_3 will therefore be used to complete the impact assessment presented in this report.



Graph 5: Average macro and trace element concentrations for the Lower RWD

1.g.v.9.h Groundwater Quality

1.g.v.9.h.1 Khulu TSF pre-construction groundwater quality

Groundwater samples were taken from the six boreholes at the proposed Khulu TSF footprint as part of this study. These include three hydrocensus borehole samples (Farm House, ASDWBH12 and Boreholes D1+D2) as well as groundwater monitoring boreholes that contained groundwater at the time of the aquifer testing.

Samples were taken using single valve, decontaminated bailers or from pump discharge lines, or water supply taps in the case of boreholes which were equipped and in use. Sterilised 1 litre (L) sample bottles were used and filled to the top. Samples were stored in a cooler box during the site surveys.

The samples were submitted to Waterlab, a South African National Accreditation System (SANAS) accredited laboratory for analysis. The water samples were analysed for basic inorganic parameters and the results were compared against the SANS 241:2015 Drinking Water Standards. The laboratory certificates are attached in Appendix D of Annexure 11.

Three of the boreholes sampled had elevated electrical conductivity levels (and TDS concentrations). These elements provide an indication of total salt content. The groundwater from all boreholes is considered very hard.

Significantly elevated nitrate concentrations were recorded in all but one of the boreholes. This is indicative of the impact of the Dwarsrivier Mine mining activities on water quality. It is noted that the receiving water quality in the Groot Dwars River upstream of Dwarsrivier Mine also exhibits elevated nitrate concentrations, which suggest that surrounding mining activities also impacts on groundwater and surface water quality in this area.

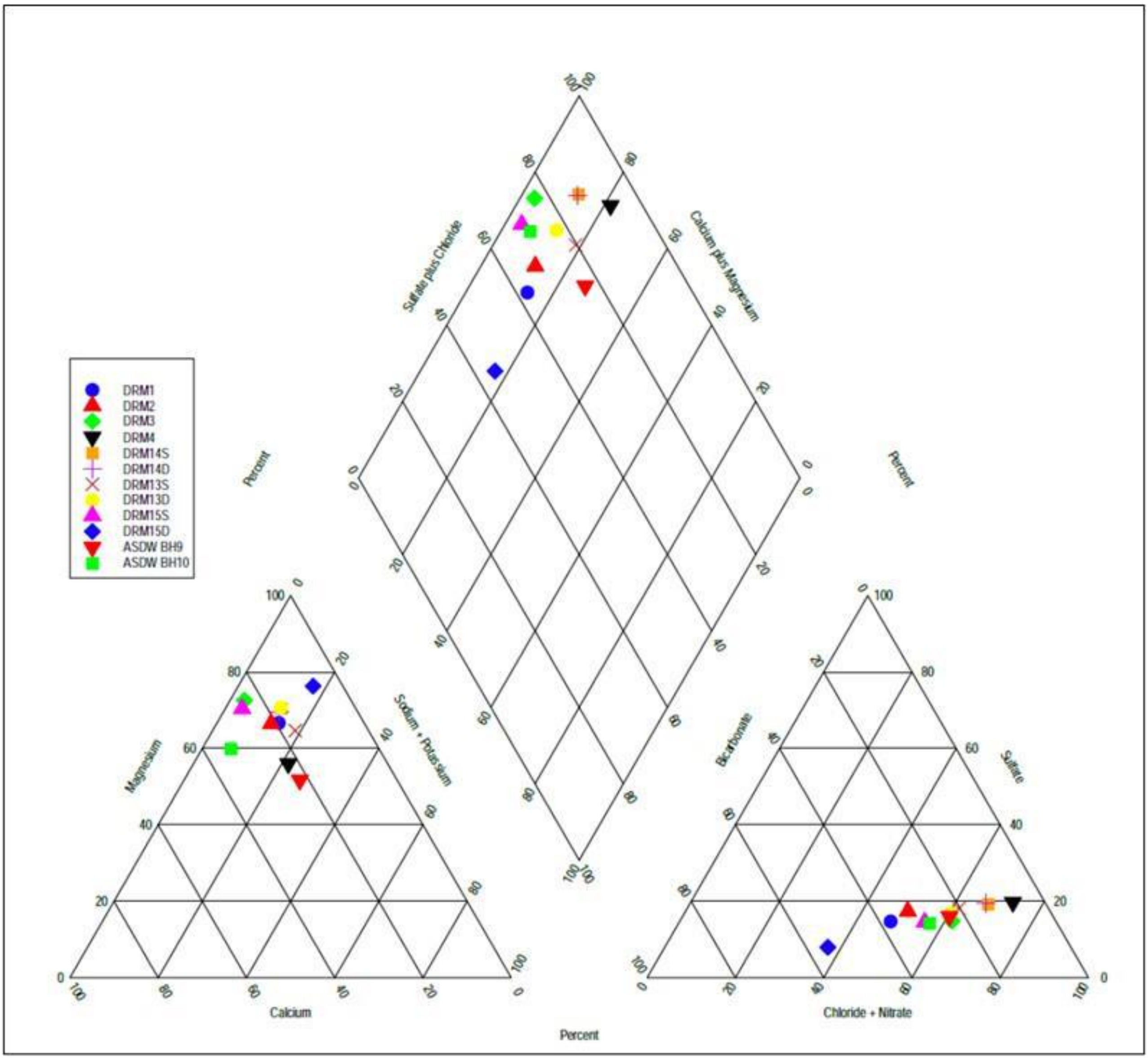
Borehole D1+D2, situated at the Clinic and used to supply drinking water to the mine, had low nitrate concentrations and this water is suitable for domestic use. This borehole did however have an elevated manganese concentration, which could be indicative of old pipes. Borehole DRM9D showed elevated chloride concentrations, significantly higher than ambient trends. It is not known what the source of the elevated chloride in this borehole is. All other metal concentrations were low with trace elements mostly below the laboratory detection limits. This is expected with neutral to alkaline pH conditions reported for the groundwater samples taken.

The following conclusions were drawn in terms of the groundwater quality:

- Nitrate: At the concentrations reported methaemoglobinaemia may occur in infants. No effects on adults are expected.
- Manganese: Manganese tends to precipitate out of solution to form a black hydrated oxide which is responsible for staining. At the concentration reported, no health effects are expected.
- Chloride: at the concentration reported, the water is expected to have a distinct salty taste, but no health effects are expected. The water may also result in a noticeable increase in corrosion in domestic appliances.
- Total Hardness: The groundwater from all boreholes is considered very hard. These concentrations of calcium and magnesium could lead to scaling on heat exchange surfaces. For this reason, descaling of the water is recommended.

Table 41: Groundwater quality (July 2021)

All concentrations in mg/L unless noted otherwise	SANS241:2015 Drinking Water Standard Limits		D1+D2 (Clinic BH)	Farm House	ASDW BH12	ASDW BH12	DRM 9D	DRM 12D
	Aesthetic effects	Chronic health effects						
pH	≥5 to ≤9.7		8.0	7.9	7.6	7.4	7.4	7.6
Electrical Conductivity (mS/m)	Aesthetic ≤170		61.1	114	184	196	251	122
TDS	Aesthetic ≤1200		348	694	1158	1394	2116	790
Total Alkalinity			304	440	252	304	308	400
Bicarbonate	Not specified		371	536	307	371	375	488
P Alkalinity			<5	<5	<5	<5	<5	<5
Total Hardness	150–200mg/l, moderately hard; 200–300mg/l, hard; >300mg/l, very hard		311	613	885	938	1225	601
Aluminium	Operational ≤ 0,30		<0.1	0.113	0.118	0.108	0.128	<0.1
Calcium			46	62	150	161	154	52
Copper		Chronic health ≤2	<0.01	0.032	<0.01	0.016	0.019	0.014
Total Iron	Aesthetic ≤0,3	Chronic health ≤2	<0.025	<0.025	<0.025	<0.025	0.026	<0.025
Magnesium			48	112	124	130	204	115
Manganese	Aesthetic ≤0,1	Chronic health ≤0,4	0.304	<0.025	<0.025	<0.025	<0.025	<0.025
Potassium			0.8	1.1	0.8	0.5	0.6	1.5
Sodium	Aesthetic ≤200		14	13	27	26	26	27
Chloride	Aesthetic ≤300		11	14	178	200	313	31
Fluoride		Chronic health ≤1,5	<0.2	<0.2	<0.2	0.2	0.2	0.2
Free & Saline Ammonia	Aesthetic ≤1,5		<0.1	0.1	<0.1	0.3	0.7	0.5
Nitrate		Acute health ≤11	3.3	46	89	82	106	49
Nitrite		Acute health ≤0,9	<0.05	<0.05	0.07	<0.05	<0.05	<0.05
Ortho Phosphate as P			<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total Nitrogen as N			3.9	46	89	82	107	50
Kjeldahl Nitrogen			0.6	<0.5	<0.5	<0.5	1.1	1.1
Sulphate	Aesthetic ≤250	Acute health ≤500	27	45	124	135	185	64
Cadmium		Chronic health ≤0.003	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Lead		Chronic health ≤0.01	<0.001	0.001	<0.001	0.002	0.001	0.001
Total Chrome		Chronic health ≤0,05	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Hexavalent Chromium			<0.01	<0.01	<0.01	0.012	<0.01	<0.01
Barium		Chronic health ≤0.7	0.039	0.058	0.045	0.049	0.063	0.069
Boron		Chronic health ≤2.4	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Nickel		Chronic health ≤0.07	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Molybdenum			<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Cobalt			<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Silver			<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Vanadium			<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Zinc	Aesthetic ≤5		<0.025	0.091	<0.025	<0.025	<0.025	<0.025



Graph 6: Piper Diagram

Groundwater samples taken from the 12 additional boreholes drilled around the plant area (nettZero, 2021) show similar trends to that discussed above. All the groundwater samples exceeded Electrical Conductivity (EC) levels, as well as TDS, calcium (Ca), magnesium (Mg), chlorine (Cl), nitrate (NO_3) and nitrogen (N). Sulphate (SO_2) concentrations were furthermore exceeded in some of these boreholes. Elevated fluoride (F), sodium (Na) and manganese Mn) were also reported. The groundwater samples indicated a clear impact from the Dwarsrivier Mine mining activities.

The general water quality is shown in the Piper Diagram in the graph above. The diagram indicates that the groundwater is mainly Mg-HCO_3-NO_3-N dominant.

1.g.v.9.h.2 Nitrate concentration trends

An overview of nitrate concentrations in groundwater is presented in this section. Nitrate is an indicator element for the operations and a sound understanding of the impacts of mining and mineral processing activities on groundwater quality is therefore important to conceptualise the project.

Nitrate concentrations for the latest available sampling period are presented for the groundwater around the Khulu TSF footprint, as well as for process water that may affect tailings deposition in future. These include the Lower RWD and URWD, from which water is supplied to the plant for mineral processing. Also indicated is tailings return water quality from the North TSF, which is currently operational. The North TSF water qualities provide an indication of the expected water qualities for the Khulu TSF. It is shown that the nitrate concentration in the URWD, the Lower RWD and the N RWD is comparable. Also included is the last available concentration for seepage from the Old TSF, which dates from 2017.

The information presented in the table below was used to generate a nitrate diagnostic map to show the spatial distribution of nitrate concentrations for the project. This map is shown in Figure 49.

Table 42: Nitrate concentrations at monitoring points around the Khulu TSF

Sample position	Latest NO_3 concentration (mg/l)
Upper RWD	1508
Lower RWD	1497
North TSF RWD (North RWD)	1191
North TSF PCD (North PCD)	811
Old TSF seepage	730
DRM4	299
DRM14D	259
DRM14S	259
Clarifier 1	223
DRM13S	164
DRM13D	161
ASDW BH9	152
ASDW BH10	130
DRM9D	118
DRM1	112
DRM2	100
DRM3	96
DRM15S	88
DRM10D (ASDWBH12)	79
Dam 26	70
DRM12D	49
Farm House	46
DRM9S	31
DRM11D	23
DRM15D	20
DRM12S	4
Borehole D1+D2	3

The following is concluded from the information presented:

- Groundwater in the fractured rock aquifer already exhibits elevated nitrate concentrations at the Khulu TSF footprint. Nitrate concentrations in this aquifer vary between 20 and 100mg/l, which exceeds the WUL condition of 6mg/l.
- Only one water sample is available from the shallow weathered aquifer, DRM12S. Nitrate concentrations in this borehole are below 6mg/l and complies with the WUL conditions.
- This information suggests that the existing groundwater contamination is moving preferentially in the fractured rock aquifer along the identified preferential flow paths. These include the two fault zones and the dyke.
- A nitrate concentration time series graph for the Lower RWD, Northern RWD and Old TSF seepage is presented in Graph 7. The information indicates a steady increase in nitrate from around 200 – 400mg/l in 2009 to above 1,200mg/l at present. This suggests concentration of nitrates in the dirty water circuit, which is operated in a closed loop. Evaporation and chemical reactions in the open dams could also contribute to the increased nitrate salt load.
- The source of the elevated nitrate concentrations is the plant as well as the Upper RWD and the Lower RWD. Nitrate concentrations in the two dams are currently around 1,500mg/l. In the Plant, nitrate concentrations vary between 250 and 300mg/l. In the past, nitrate concentrations measured in DRM4, the borehole located in the plant area were significantly elevated. This is demonstrated in Graph 8.

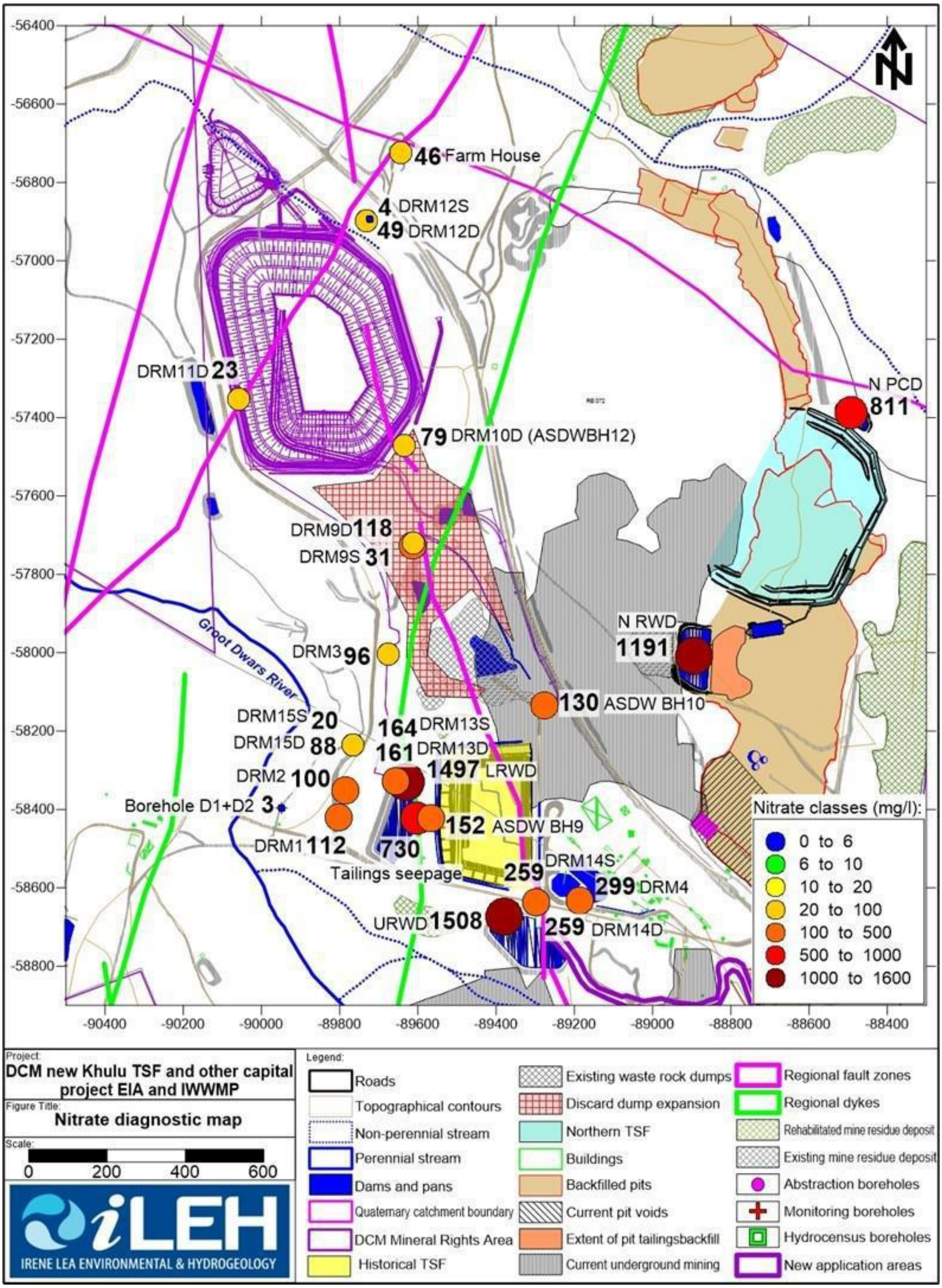
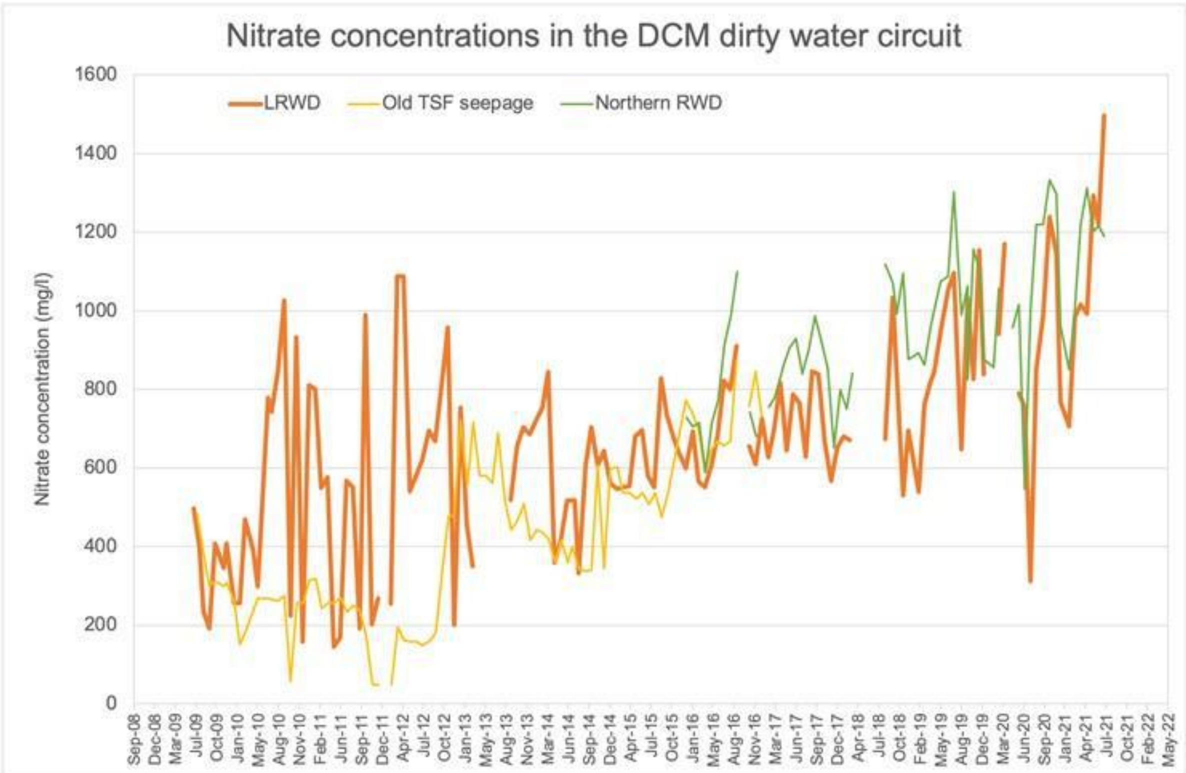


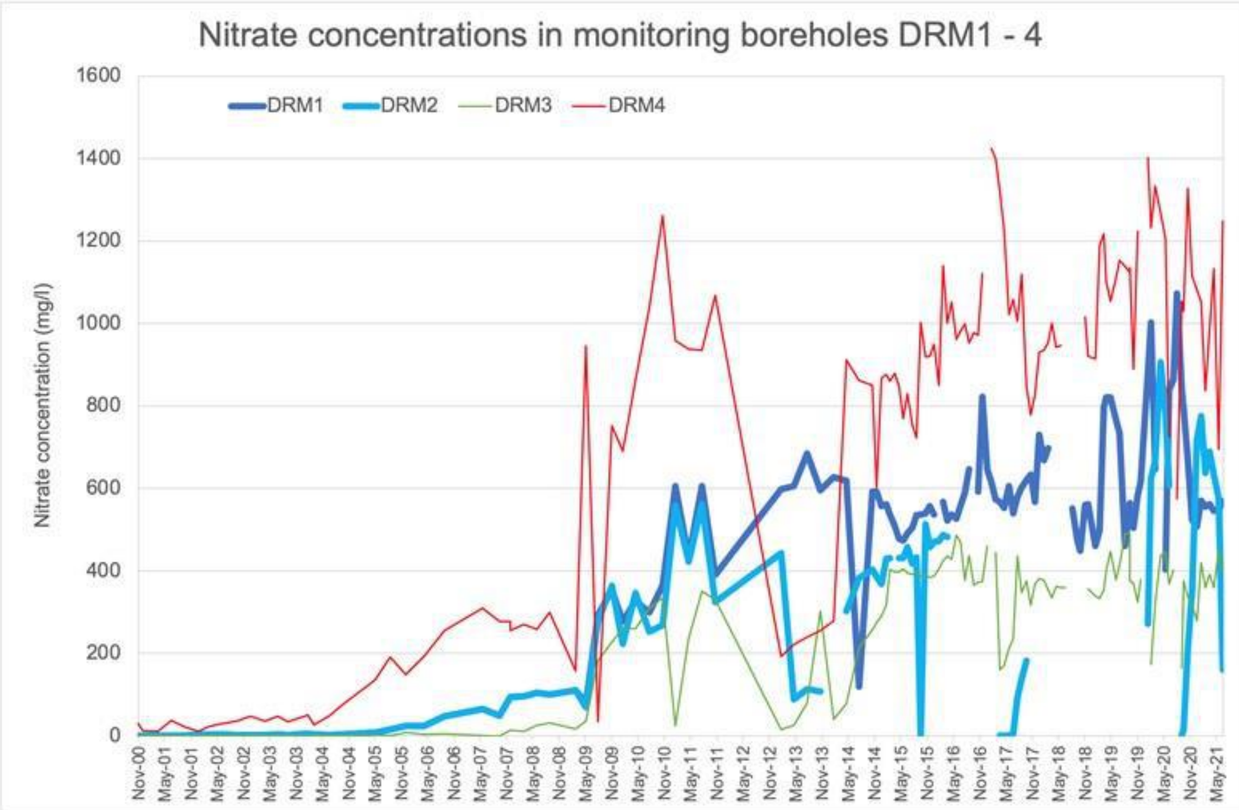
Figure 49: Diagnostic map: Latest nitrate concentrations

- The elevated nitrates in the new deep monitoring boreholes at the Khulu TSF decreases along the N-S fault line in a northerly direction. Borehole DRM14S, situated on this fault in the plant area has a nitrate concentration of 259mg/l. DRM9D, approximately 900m north of the source area has a nitrate concentration of 118mg/l. This decreases to 79 mg/l in ASDWBH12 (DRM10D) another 300m along the fault and to 49mg/l in DRM12D situated another 550m along the fault line. This suggests that a plume is migrating along the N-S fault line from the plant area to the Khulu TSF and possibly beyond.

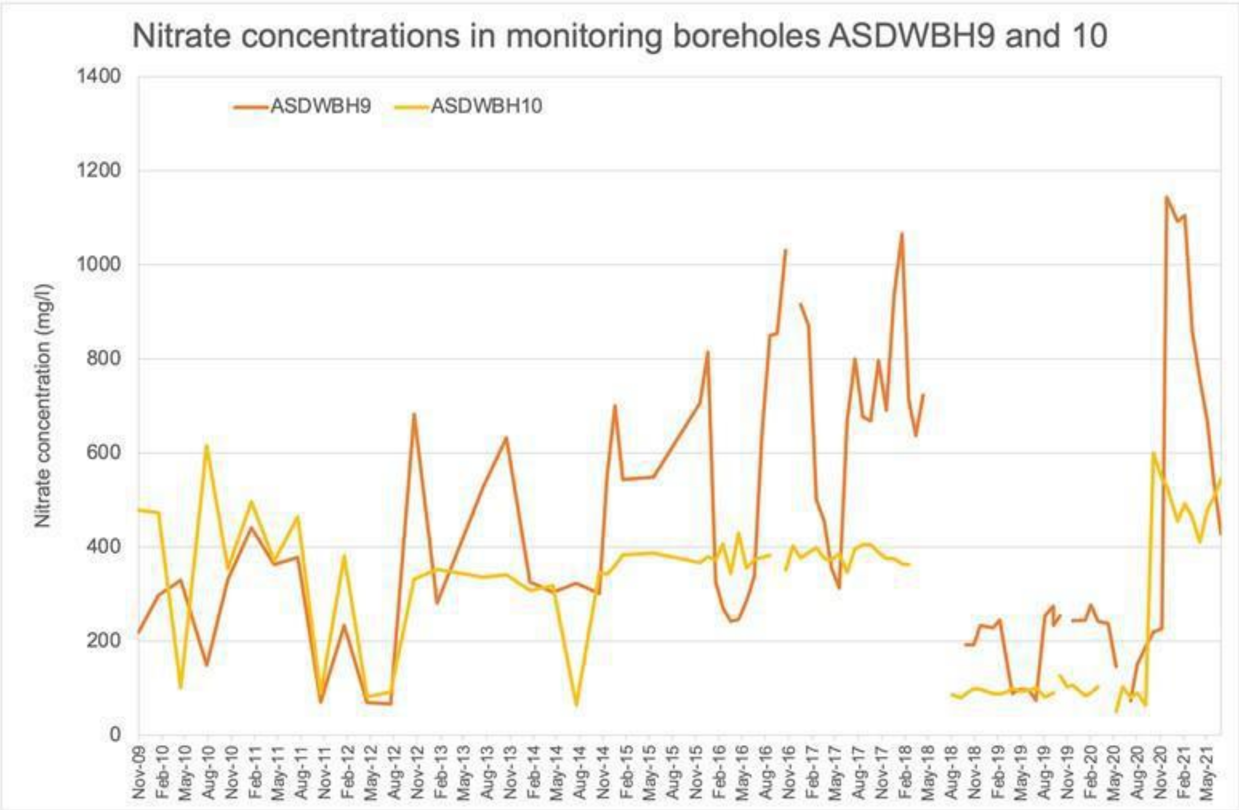
- Similarly, contamination is moving preferentially along the dyke contact zone. The dyke transects the base of the Lower RWD. Borehole DRM13D, drilled immediately north of the Lower RWD on the dyke has a nitrate concentration of 161 mg/l. Nitrate concentrations decrease to 96 mg/l at DRM3, situated 300m north of the source area along the dyke. Borehole DRM9D is located at the intersection between the fault line and the dyke and could therefore provide an indication of plume migration along both structures. Nitrate concentrations in DRM9D is 118 mg/l a further 250m north along the dyke. It is however more likely that nitrate concentrations at DRM9D reflects plume movement along the N-S striking fault line.
- Nitrate concentrations have steadily increased in borehole DRM3 since 2007, as indicated in Graph 8. This probably demonstrates the point at which contamination from the source areas reach this borehole along the dyke contact zone. Mining commenced in 1999. If it is assumed that the Lower RWD was constructed by the end of 1999, the information in DRM3 suggests that pollution along the dyke contact zone moves at a rate of approximately 35m/a. By using the flow gradient along the dyke and an assumed porosity for the dyke contact zone of 0,035 (based on S-value calculations presented in nettZero (2021)), the permeability of the contact zone is calculated as 0.34m/d using Darcy's Law and the migration time along the structure. This translates to a transmissivity of 7,9m^2/d over the saturated thickness of DRM3. This falls within the range of transmissivities reported for the dyke in Table 39 and is slightly higher compared to the average T-value calculated from the aquifer test data.
- Long-term nitrate concentrations in boreholes ASDWBH9 and 10 are presented in Graph 9. The information indicates a steady increase in nitrate concentrations in ASDWBH9 up to May 2018 when the monitoring contractor was changed at the mine. ASDWBH9 is located along the N-S striking dyke and monitors contamination originating from the Old TSF as well as from the Lower RWD. Monitoring in this borehole commenced in 2009 and can therefore not be used to accurately calculate plume migration rates. Nitrate concentrations in ASDWBH10 has remained constant over the monitoring period. This borehole is not located on any of the preferential flow paths identified. It does however contain elevated nitrate concentrations that probably originate from the old opencast pits, tailings backfill to North Pit and possibly from the N RWD.
- It is interesting that elevated nitrate concentrations are also recorded in the SW-NE-striking fault in boreholes DRM11D and the Farm House borehole. This could be attributed to two scenarios. The first is that contamination moving along the N-S striking fault line intersects the SW-NE striking fault at DRM12D. This could result in contamination moving along the SW-NE striking fault under the influence of pressure in the fractured rock aquifer along the fault lines. Groundwater flow is regionally in a westerly direction towards the Groot Dwars River. This probably also plays a role in plume migration along the SW-NE striking fault.



Graph 7: Nitrate concentration trends in the Lower RWD, the Northern RWD and Old TSF



Graph 8: Nitrate concentration in boreholes DRM1 - 4



Graph 9: Nitrate concentrations in boreholes ASDWBH9 and 10

- The nitrate timeseries for DRM1 and 2 can be used to calculate the estimated permeability of the alluvium using Darcy's Law. Monitoring information suggests that nitrate concentrations start to increase significantly by May 2005 in these boreholes (see Graph 8). Depending on the source of the contamination in DRM1 and DRM2 and an assumed porosity of 6%, the calculated permeability of the alluvium is equivalent to a transmissivity of between 0.99 and 2.27m^2/d. This is lower than the transmissivities calculated from aquifer testing data presented in Table 39. It could be that aquifer conditions in and the boreholes are enhanced compared to the flow paths through the alluvium from the sources of contamination used to complete this calculation.

NettZero (2018) reports that supernatant compounds associated with blasting and materials handling that cling to the solid matter (ore, waste rock, tailings, etc) accounts for the high nitrate concentrations in the Dwarsrivier Mine water circuit. Leach tests proven that nitrogen does not form part of the mineralogy or minerals internal structures. The explosives (ammonium nitrate) that is present on the surface of materials handled on the mine are readily available for dissolution with rain and pore water and is therefore considered the most likely source of nitrate contamination on the mine. NettZero further reports that the possibility further exists that nitrates will remain supernatant in the mine water circuit for the foreseeable future and will therefore continue to leach out into surface and groundwater.

With the presence of ammonium nitrate in the mine water circuit, the possibility of oxidation of ammonia to nitrite and nitrate should also be considered. This typically happens in the presence of ammonia and/or nitrite oxidising bacteria, which could occur naturally or be introduced through the re-use of treated sewage effluent in the mine water circuit.

1.g.v.10 Visual Character

Hydrospatial was appointed to undertake the Visual Assessment. The visual setting information was sourced from this report.

The Mine is situated approximately 60km northwest of Lydenburg, 25km south of Steelpoort and 63km north-east of Roossenekal in the Limpopo Province.

The regional topography can be described as undulating with numerous mountain ridges and valleys. A mountain ridge runs along the western boundary of the Mining Right Area (MRA), where a maximum elevation of approximately 1 630 metres above mean sea level (mamsl) is reached. From this ridge, the elevation drops off to approximately 900 mamsl near the confluence of the Klein and Groot Dwars Rivers. A number of koppies and hills are located along the central eastern part of the study area.

Due to the mountainous topography and bushveld vegetation of the region, the study area was defined as a 5 km radius around the proposed Khulu TSF (Site B). Beyond a km radius, it is highly unlikely that the Khulu TSF will exert any visual exposure.

The landscape of the study area can be broadly divided into two main categories:

- Natural areas – consisting of natural bushveld areas; and
- Mining areas – consisting of mine dumps, bare areas and mine infrastructure.

Sense of place is the unique value that is allocated to a specific place or area through the cognitive experience of the user or viewer. According to Lynch (1992), sense of place is "the extent to which a person can recognise or recall a place as being distinct from other places – as having a vivid, unique, or at least particular, character of its own".

Mining activities within the study area, primarily from the Dwarsrivier Chrome Mine, Two Rivers Mine, De Grooteboom Mine, Samancor Tweefontein Mine and Thorncliffe Mine, characterise the landscape. The natural bushveld sense of place has largely been converted into a mining landscape. Existing TSFs in the area include:

- Dwarsrivier Mine North TSF (20m high);
- Dwarsrivier Mine Old TSF (15m high);
- TRP Mine Old TSF (50m high);
- TRP Mine new TSF (80m high);
- Samancor Tweefontein Mine TSF (10m high); and
- Thorncliffe Mine TSF (15m high).

According to HCAC (2021), the cultural landscape of the region is characterised by a rural area that is extensively disturbed by mining activities and in the past by agricultural activities. From the archaeological database of the general area archaeological settlements 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 cited in this plateau environment.

The following visual receptors have been identified within the study area and are indicated on Figure 50 and Figure 52:

- Houses;
- Lodges; and

- Motorists travelling on roads within the study area.

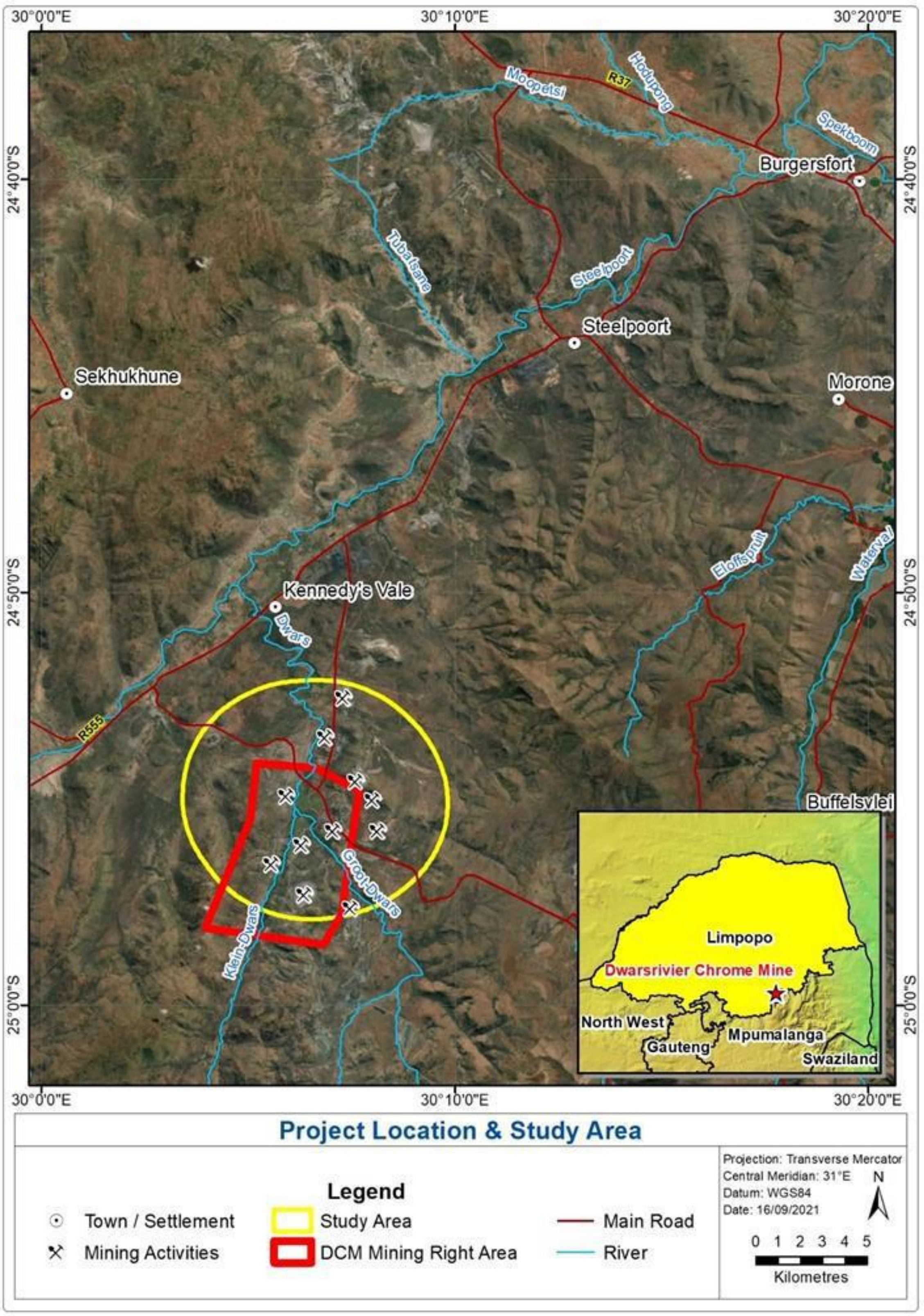


Figure 50: Location of Dwarsrivier Mine in relation to various mining activities

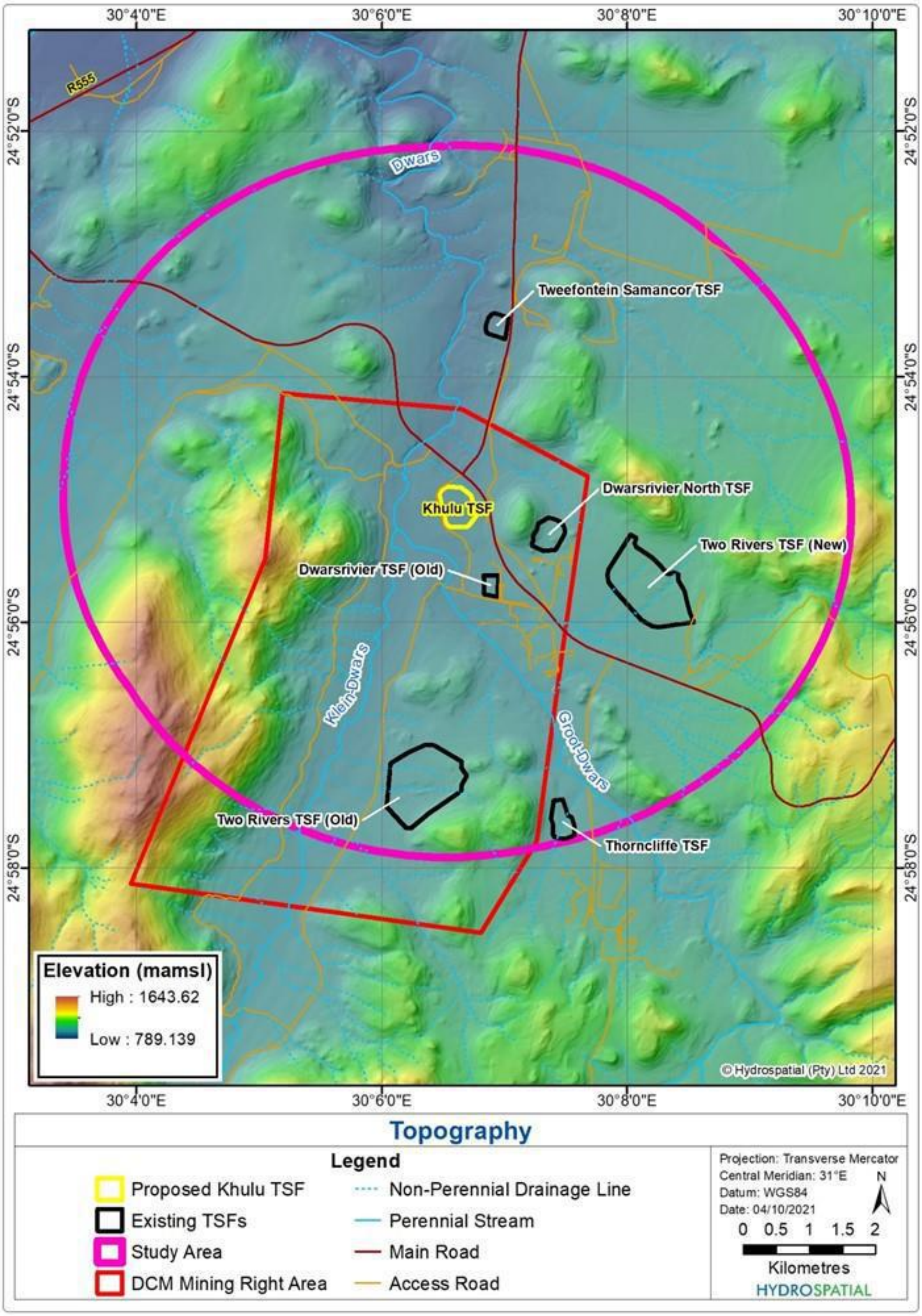


Figure 51: Topography of the study area

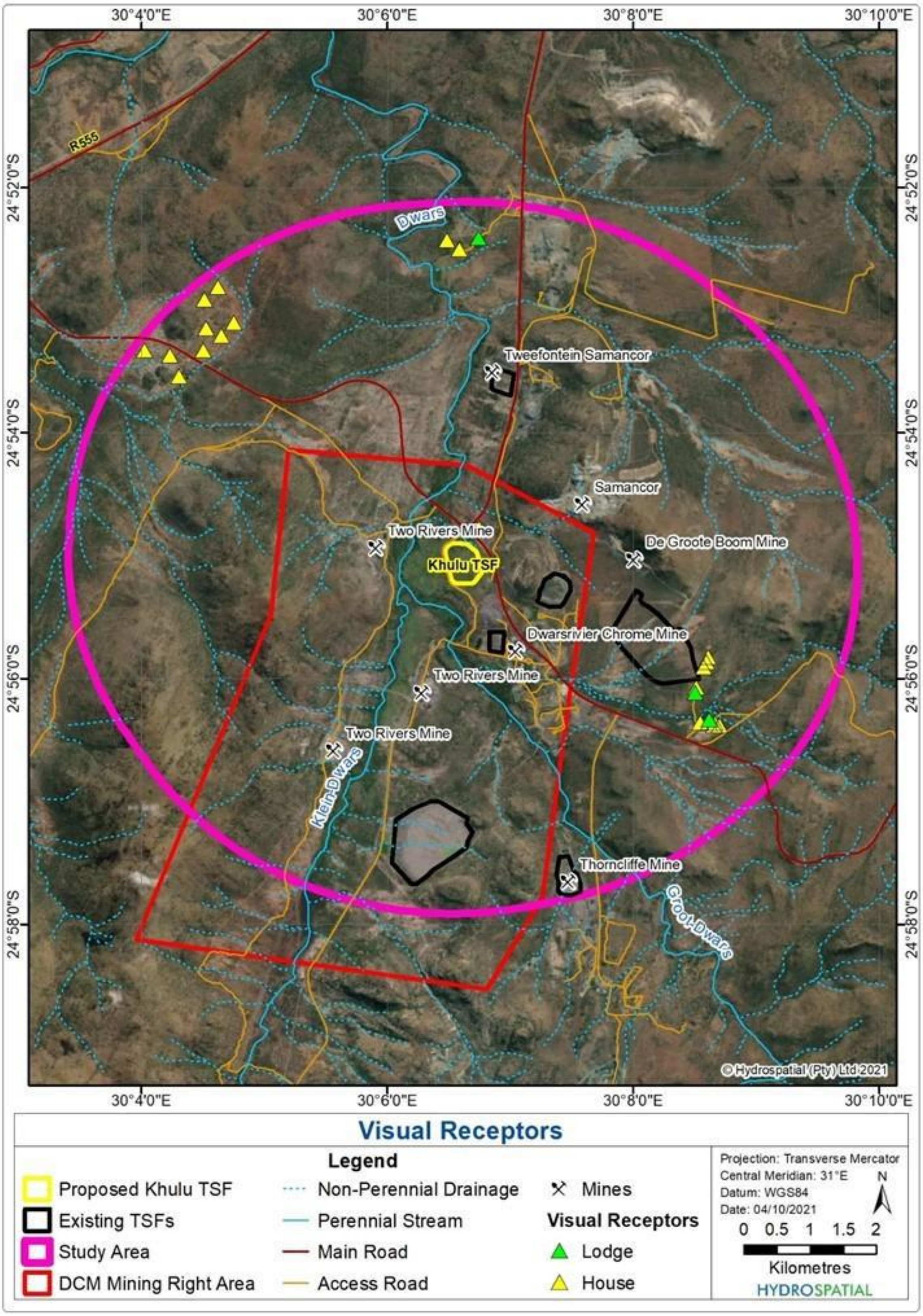


Figure 52: Visual receptors within the study area

1.g.v.11 Air Quality

WSP Consulting was appointed to undertake the Air Quality Impact Assessment (AQIA). The air quality setting information was sourced from this report, as well as information available on site.

The R577 roadway that connects to the R555 (Lydenburg-Roossenekal road), is situated to the north of the Plant and mine offices. The overall area is characterised by intensive mining development. Various servitudes traversing the site are present, which include gravel roads, telephone lines and electricity lines.

Several neighbouring farms, namely Tweefontein 380JT, Thorncliffe 374KT, De Grooteboom 373KT and Dwarsrivier 372KT are owned by mining houses with existing and operational chrome and platinum mines. On the remainder of the neighbouring farms, agricultural activities take place, in the form of stock grazing and the growing of vegetables, lucerne and cotton.

Figure 53: Surrounding Communities

1.g.v.11.a Sensitive Receptors

Sensitive receptors, as defined by the United State Environmental Protection Agency (USEPA; 1995) include, but are not limited to, hospitals, schools, day-care facilities, elderly housing and convalescent facilities. These are areas where the occupants are more susceptible to the adverse effects of exposure to toxic chemicals, pesticides and other pollutants. Extra care must be considered when dealing with pollutants in proximity to areas recognised as sensitive receptors. Based on this definition the residential, educational and recreational land uses in the surrounding area are considered sensitive receptors.

Sensitive receptors are identified as areas that may be impacted negatively due to emissions from the proposed TSF. Four receptors (villages and dwellings) were identified in the area surrounding the proposed project area, within a 10km radius, and were used for this assessment.

Table 43: Sensitive Receptors

ID	Receptor Name	Distance from proposed TSF (km)	Latitude	Longitude
1	SR1 (Villages)	6.01	24°58'25.29"S	30° 7'39.31"E
2	SR2 (Villages)	5.06	24°52'8.82"S	30° 7'9.83"E
3	SR3 (Dwelling)	9.19	24°56'54.46"S	30° 4'58.96"E
4	SR4 (Dwelling)	9.70	24°55'44.27"S	30°12'11.79"E

Figure 54: Location of sensitive receptors surrounding the Dwarsrivier Mine

1.g.v.11.b Sources of Dust and Local Dust Fall Out Monitoring

A qualitative discussion of identified emission sources in the vicinity of the study site is provided below. Key emission sources in the region are mining and agricultural emissions. These emission sources contribute towards the air quality status quo within the region, with PM and DFO being of particular concern in this regard.

Mining

Mining is the predominant land use within the surrounding area, with existing and operational chrome and platinum mines in the surrounding area. Expected fugitive emissions from mining activities include, but are not limited to:

- Vehicle entrainment on paved and unpaved roads;
- Crushing and screening activities;
- Drilling and blasting;
- Wind erosion of exposed stockpiles, waste dumps and TSFs;
- Stripping of overburden; and
- Materials handling operations.

Fugitive emissions are noted to be highest during the loading of fresh ore onto stockpiles as fine particulates are easily broken down and dispersed to the atmosphere.

Agricultural Activities

Agriculture is also one of the lands uses within the surrounding area, comprising mostly in the form of stock grazing and the production of vegetables, lucerne and cotton.

Emissions from agricultural activities are difficult to control due to the seasonality of emissions and the large surface area producing emissions (USEPA, 1995). Expected emissions resulting from agricultural activities include particulates associated with wind erosion, ploughing and burning of crop residue, chemicals associated with crop spraying and odiferous emissions resulting from manure, fertilizer and crop residue.

Dust associated with agricultural practices may contain seeds, pollen and plant tissue, as well as agrochemicals, such as pesticides. The application of pesticides during temperature inversions increases the drift of the spray and the area of impact. Dust entrainment from vehicles travelling on gravel roads may also cause increased particulates in an area. Dust from traffic on gravel roads increases with higher vehicle speeds, more vehicles and lower moisture conditions.

These are the most likely contributors of fugitive emissions from agricultural activities. However, it is noted that fugitive emissions from agricultural activities generally have confined impacts near to the source, limiting the regional impacts.

Five monitoring points are assessed for dust fallout by the mine. These are indicated in the following table:

Table 44: Dust Monitoring Points

Sample Point	Sample Point Name	Classification
DWR 001	School	Residential
DWR 002	Far North Point	Non-Residential
DWR 003	Parking Lot South Shaft	Far North Point
DWR 004	Discard Dump South Shaft	Far North Point
DWR 005	North Shaft	Far North Point

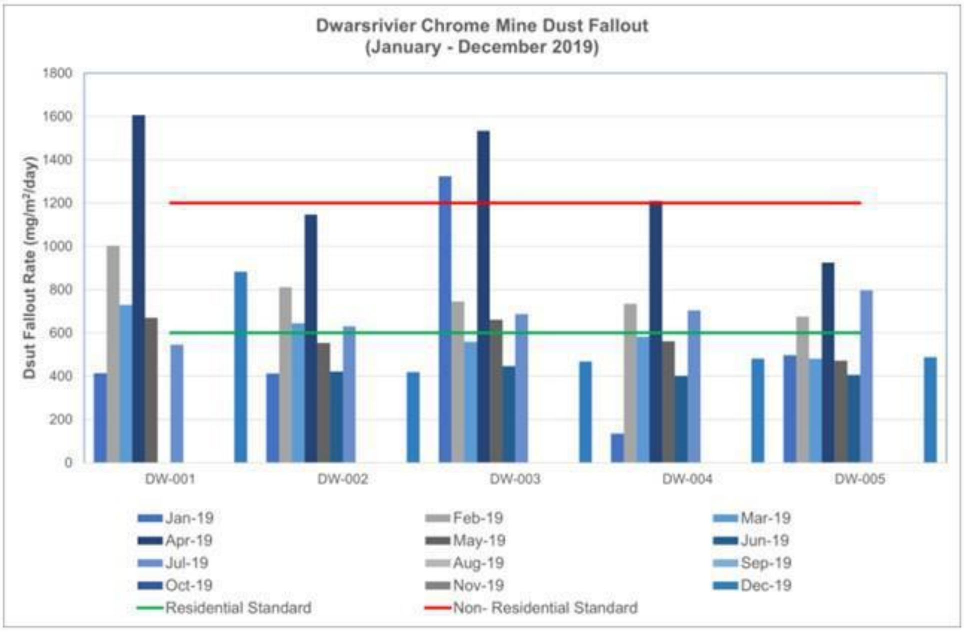
The following figure illustrates the location of these.

Figure 55: Dust Monitoring Locations

The fall-out dust standards from National Dust Control Regulations, 2013.

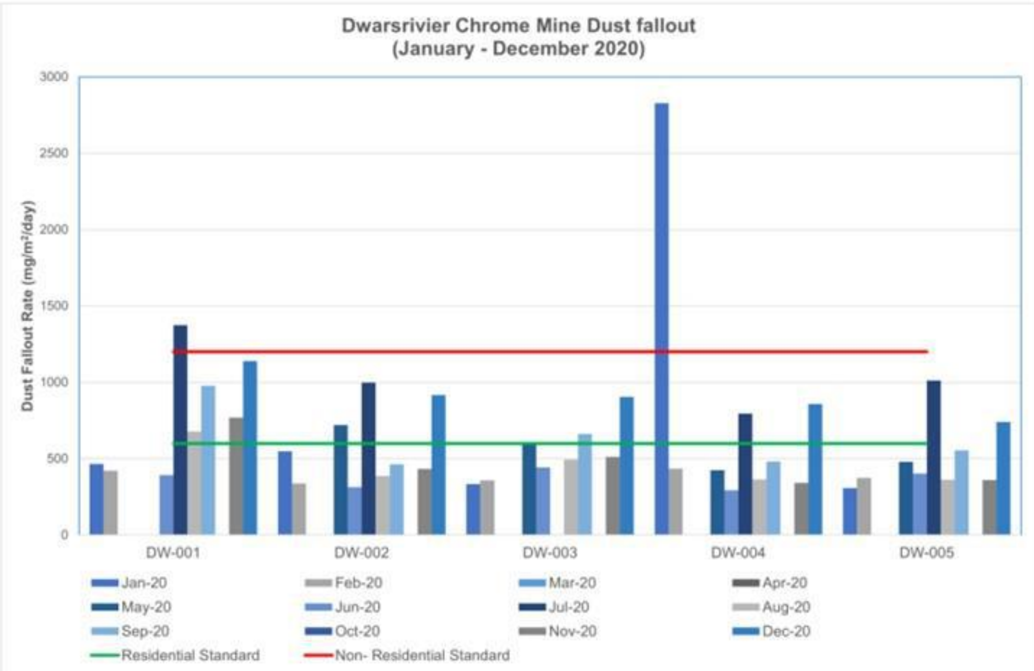
Dust fallout results for the 2019 to 2021 monitoring period are presented below. For comparative purposes only; the dust fallout rates are compared to the National Dust Control Regulations standards.

The graph hereafter shows dust fallout rates during the 2019 monitoring period. No data was available during September – November 2019. DW001 exceeded the residential standard four times during 2019 (February, March, April and December), resulting in non-compliance with the Dust Control Regulations. Such regulations allow for two non-sequential exceedances over a rolling twelve-month period. Exceedances of the non-residential standard were recorded at DW003 (January and April) and DW004 (April). These monitoring locations, however, remained compliant with the Dust Control Regulations.



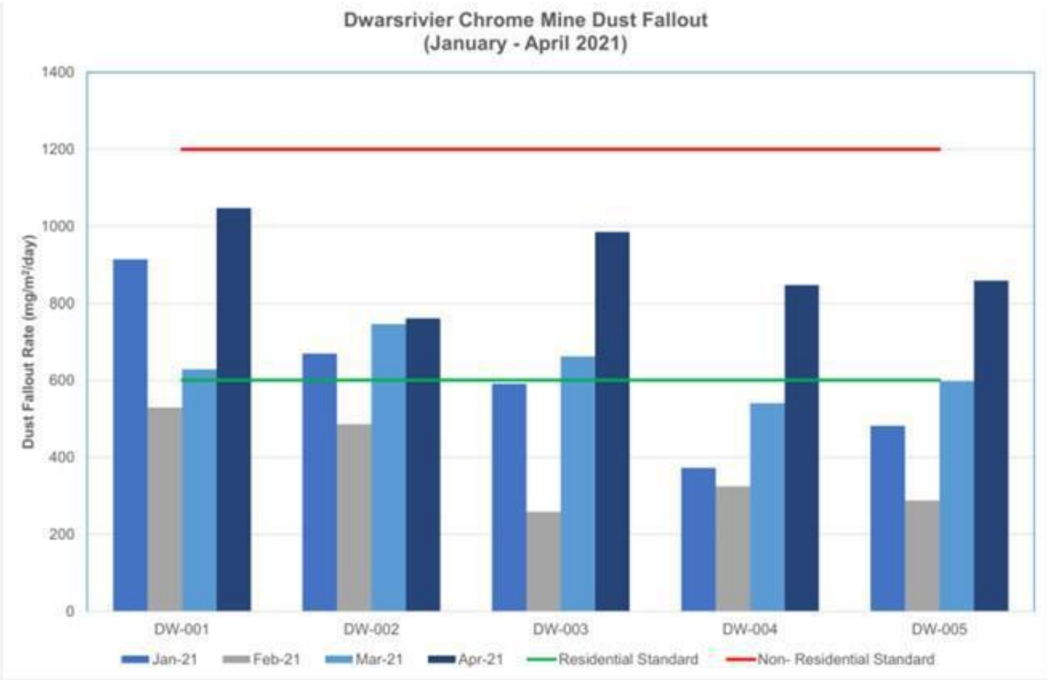
Graph 10: Onsite dust fallout results for 2019

The following figure illustrates the dust fallout monitoring results for 2020. There are no monitoring results for the months of March and April 2020, due to COVID-19 lockdown restrictions. As such, the May results represent exposure over the March to May period. Six exceedances of the residential standard were recorded at DW001 in 2020 (July, August, September, October, November and December), resulting in non-compliance with the Dust Control Regulations. The non-residential standard was exceeded once at DW004 during January, however, remaining compliant with the National Dust Control Regulations.



Graph 11: Onsite dust fallout results for 2020

The following graph illustrates the monitoring results for January to April 2021. In comparison to the National Dust Control Regulation residential standard, DW001 was non-compliant as it recorded three exceedances (January, March and April). All other monitoring sites were compliant.



Graph 12: Onsite dust fallout results for 2021

1.g.v.12 Noise

The following sources of noise along the boundaries of the mine:

- traffic noise – both light motor vehicles and heavy-duty trucks;
- distant mine noise;
- mine activity noise;
- industrial noise; and
- ventilation noise.

No additional noise assessment was undertaken for the current application as the activities in question are located within the existing mining footprint and will be a pure expansion of existing facilities.

Of particular significance is the presence of the R577 regional road from Sekhukhuneland to Lydenburg that transects the mine property and is adjacent to the main mining activities on Dwarsrivier Mine, most importantly the processing plant, conveyor and workshops. Also important is the presence of four other mining operations in the vicinity of Dwarsrivier Mine.

These contribute noise directly to the ambient noise levels, but also indirectly through the presence of heavy duty and other traffic on the R577 and minor access roads to the mines. The area cannot be classified as rural according to Table 2 of SANS 10103 due to the above factors.

The following conclusions were drawn from the results of the noise impact assessment:

- The prevailing ambient noise levels along the boundary of the mining area are lower than the recommended noise level for an industrial area;
- The prevailing ambient noise levels are largely caused by emissions from a combination of noise sources;
- The significance of the noise impact from the activities at the proposed mine on the existing immediate environment will be medium according to the standardised risk matrix; and
- According to Table 5 of SANS 10103 of 2008, the community response to the industrial type noise will be medium due to the higher prevailing ambient noise levels already experienced in this area from other mining activities.

1.g.v.13 Cultural and Heritage Setting

1.g.v.13.a Heritage

Heritage Contracts and Archaeological Consulting (HCAC) was appointed to undertake the Heritage and Paleontological Assessment The information was sourced from these reports, as well as available information on site.

This brief background study indicates that the general area under investigation has a wealth of heritage sites and a cultural layering dating to the following periods:

- Stone age sites;
- Iron Age sites and;
- Graves can be expected anywhere on the landscape.

Stone Age

South Africa has a long and complex Stone Age sequence of more than 2 million years. The broad sequence includes the Later Stone Age (LSA), the Middle Stone Age (MSA) and the Earlier Stone Age (ESA). Each of these phases contains sub-phases or industrial complexes, and within these we can expect regional variation regarding characteristics and time ranges. For Cultural Resources Management purposes it is often only expected/ possible to identify the presence of the three main phases.

Yet sometimes the recognition of cultural groups, affinities or trends in technology and/or subsistence practices, as represented by the sub-phases or industrial complexes, is achievable (Lombard 2012). The three main phases can be divided as follows:

- Later Stone Age: associated with Khoi and San societies and their immediate predecessors. Recently to ~30 thousand years ago
- Middle Stone Age: associated with Homo sapiens and archaic modern humans. 30-300 thousand years ago.
- Earlier Stone Age: associated with early Homo groups such as Homo habilis and Homo erectus. 400 000-> 2 million years ago. 7.2.1.2 The Iron Age

Very few Early Stone Age sites are on record for Mpumalanga and no in situ sites dating to this period are expected for the study area. An example in Mpumalanga is Maleoskop on the farm Rietkloof where ESA tools have been found. This is one of only a handful of such sites in Mpumalanga.

Middle Stone Age isolated artefacts are known to occur in the general area. Finds typically include radial cores, triangular points and flakes. These artefacts are usually scattered too sparsely to be of any significance (Van der Walt 2016). Evidence of this period has been excavated at Bushman Rock Shelter, a well-known site on the farm Klipfonteinhoek in the Ohrigstad district located about 70 km from the project area. This cave was excavated twice in the 1960s by Louw and later by Eloff. The MSA layers show that the cave was repeatedly visited over a long period. Lower layers have been dated to over 40 000 BP (Before Present) while the top layers date to approximately 27 000 BP (Esterhuizen & Smith in Delius, 2007; Bergh, 1998). At Bushman Rock Shelter the MSA is also represented and starts at around 12 000 BP but only lasted for some 3 000 years.

The LSA is of importance in geological terms as it marks the transition from the Pleistocene to the Holocene which was accompanied by a gradual shift from cooler to warmer temperatures. This change had its greatest influence on the higher lying areas of South Africa. Both Bushman Rock Shelter and another site, Heuningneskrans, have revealed a greater use in plant foods and fruit during this period (Esterhuizen & Smith in Delius, 2007; Bergh, 1998). Faunal evidence suggests that LSA hunter-gatherers trapped and hunted zebra, warthog and bovids of various sizes. They also diversified their protein diet by gathering tortoises and land snails (Achatina) in large quantities.

Ostrich eggshell beads were found in most of the levels at these two sites. It appears that there is a gap of approximately 4 000 years in the Mpumalanga LSA record between 9 000 BP and 5 000 BP. This may be a result of generally little Stone Age research being conducted in the province. It is, however, also a period known for rapid warming and major climate fluctuation which may have led people to seek out protected environments in this area. The Mpumalanga Stone Age sequence is visible again during the mid-Holocene at the farm Honingklip near Badplaas in the Carolina district (Esterhuizen & Smith in Delius, 2007; Bergh, 1998).

The LSA period is also associated with rock engravings and rock paintings. Approximately 400 rock art sites are distributed throughout Mpumalanga and can be divided into San rock art, herder or Khoe Khoe (Khoi Khoi) paintings (thin scattering from the Limpopo Valley) through the Lydenburg district into the Nelspruit area) and localised late white farmer paintings. Farmer paintings can be divided into Sotho-Tswana finger paintings and Nguni engravings (Only 20 engravings occur at Boomplaats, north-west of Lydenburg). Farmer paintings are more localised than San or herder paintings and were mainly used by the painters for instructional purposes (Smith & Zubieta 2007).

A rock engraving which date from the more recent past were recorded against the eastern slope of the Groot Dwars River Valley (Huffman & Schoeman 2001, 2002[a], 2002[b] & 2002[c]) and it is possible that more engravings may exist in this valley.

The Iron Age

The Iron Age as a whole represents the spread of Bantu speaking people and includes both the pre-Historic and Historic periods. It can be divided into three distinct periods:

- The Early Iron Age: Most of the first millennium AD.
- The Middle Iron Age: 10th to 13th centuries AD
- The Late Iron Age: 14th century to colonial period.

The Iron Age is characterised by the ability of these early people to manipulate and work Iron ore into implements that assisted them in creating a favourable environment to make a better living. Most of the decorated pottery found in the study area belongs to the stylistic facies known as Eiland. This style dates to between 1550 AD and 1750 AD and was made by Sotho-Tswana people (Huffman 2007: 186-189). These Middle Iron Age Sites do not have any stone walling associated with them and is found close to cultivatable soil. Some stylistic Marateng pottery were also recorded presumably in association with Late Iron Age stone walled settlements. Marateng pottery dates to between 1650 AD and 1840 AD (Huffman 2007: 207).

Historical Information of the area

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 study area. In particular, a number of settlements located around high meadows probably date from 1860 to 1880, when tensions were high but before major European occupation of local farms.

Anglo-Boer War

The Anglo-Boer War was the greatest conflict that had taken place in South Africa up to date. No sites relating to the war are known to occur in the study area.

Cultural Landscape

The cultural landscape of the region is characterised by a rural area that is extensively disturbed by mining activities and in the past by agricultural activities. From the archaeological database of the general area archaeological settlements 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 cited in this plateau environment.

Graves and Burial Sites

No known graves are indicated on databases consulted but graves and cemeteries are widely distributed across the landscape and can be expected anywhere.

Findings of the Survey

The study area is characterised by high grass cover as well as impenetrable bush in the Diesel and Emulsion Batching Areas. Previous disturbances relating to mining activities are evident, but even so the survey recorded two areas with historical/recent residential elements (Feature 4 and 6), the remains of an Iron Age site marked by a scatter of ceramics and ephemeral stone walling (Features 2, 3, and 5) and a stone cairn (Feature 1) in the proposed PCD of unknown purpose that could possibly indicate a grave. The recorded features are indicated in the figure hereafter and discussed further in this chapter within the different impact areas namely TSFand PCD as well as the Diesel and Emulsion Batching Areas.

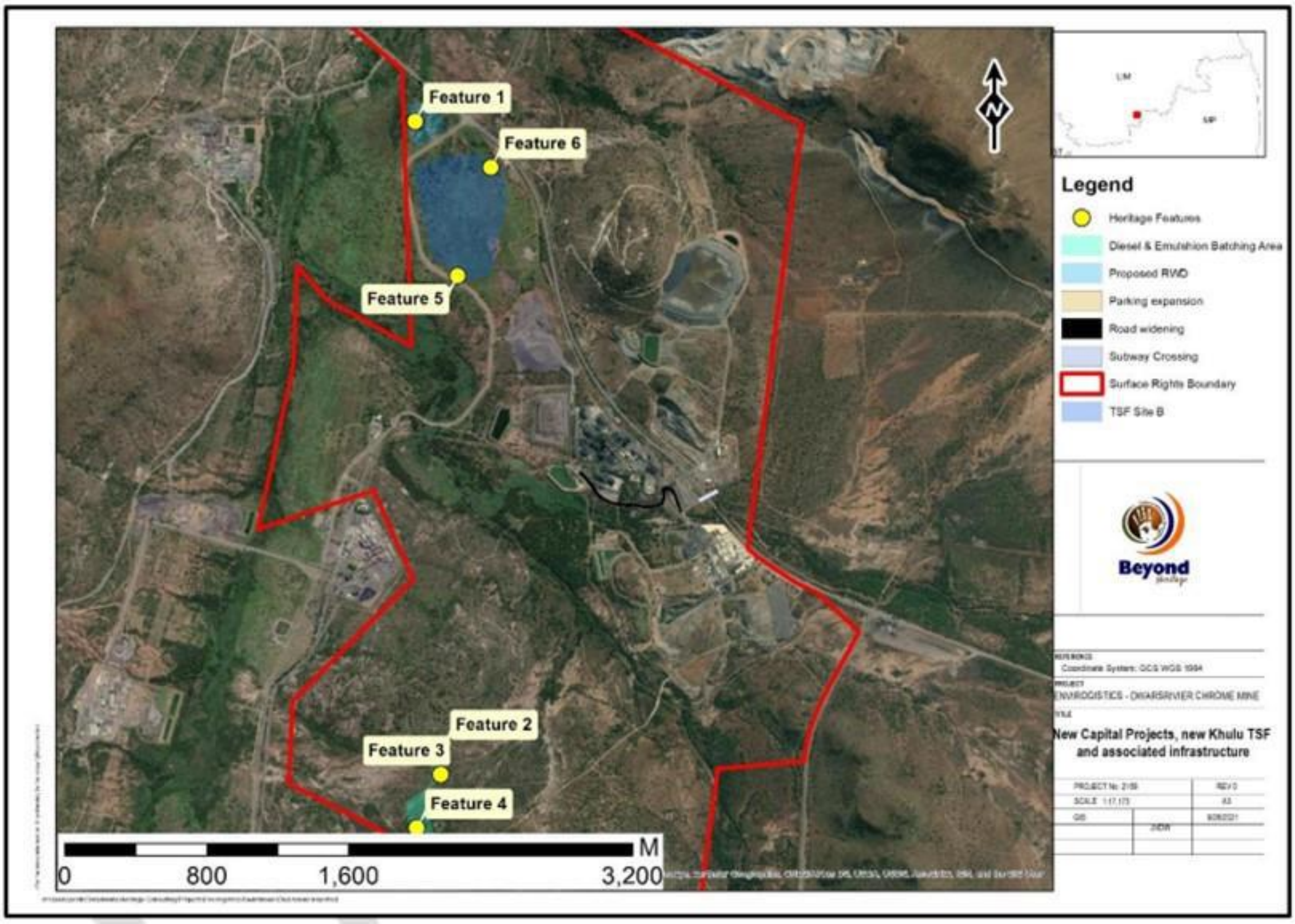


Figure 56: Known sites in relation to the study area.

1.g.v.13.a.1 Khulu TSF and PCD

Three features were identified within the impact areas of the TSF and PCD and are described in the table hereafter. The features were plotted in relation to the proposed impact areas on historical topographic maps and to contextualise the study area and identified features in relation to development over the years (Figure 57 to Figure 59) and recorded feature are indicated in Photo 3 to Photo 7.

Based on historical topographic maps Feature 1 and 6 are indicated to be located within an excavated area from the 1960's until 1976 (Figure 57 to Figure 59). By 2002 Feature 1 is still indicated within an excavated area and Features 6 and 7 are indicated to be located within previously cultivated area (Figure 59), now fallow land. Due to the extensive disturbance of the excavation and cultivation activities the sites would have been disturbed and the context of the sites would have been impacted on, but the presence of subsurface deposit cannot be excluded.

Table 45: Findings of the survey within the impact areas of the TSF and PCD

Label	Longitude	Latitude	Description	Significance	Mitigation	Impact area
Feature 1	30° 06' 29.0132" E	24° 54' 47.7510" S	Stone cairn next to survey beacon, the purpose of the feature is unknown, but the feature is located in a sandy area where stones do not occur naturally and were carried in. The feature should be regarded as a possible grave.	High social significance and GP A.	Graves should be avoided with a 30 m buffer or relocated as per all the relevant legal requirements.	RWD and TSF
Feature 5	30° 06' 36.7524" E	24° 55' 15.8592" S	Large area with scattered ceramics. Possible EIA site.	Generally Protected B (GP. B) - Medium significance	Recording before destruction, monitoring during construction.	RWD and TSF
Feature 6	30° 06' 42.7789" E	24° 54' 56.1167" S	Square stone packed foundations of a structure measuring approximately 4x4 meters, possibly farm labourer dwelling.	Low significance GP C Unless graves are present, then High social significance and GP A.	The presence of graves or lack thereof should be confirmed prior to construction by the social team. The site should be monitored during construction	RWD and TSF

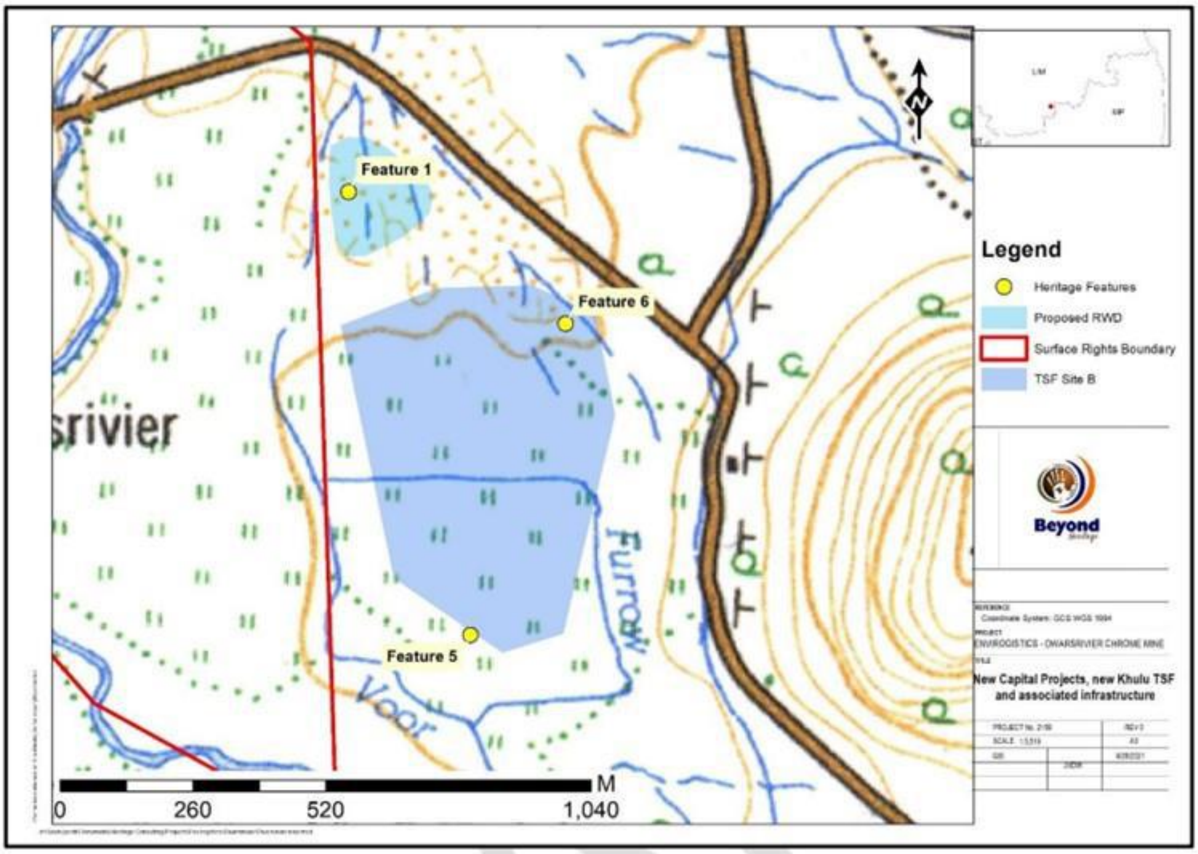


Figure 57: 1963 Topographic map of the TSF and PCD areas indicating the location of features recorded in this survey in relation to project components. Feature 1 is indicated within an excavation and Feature 5 in a cultivated area.

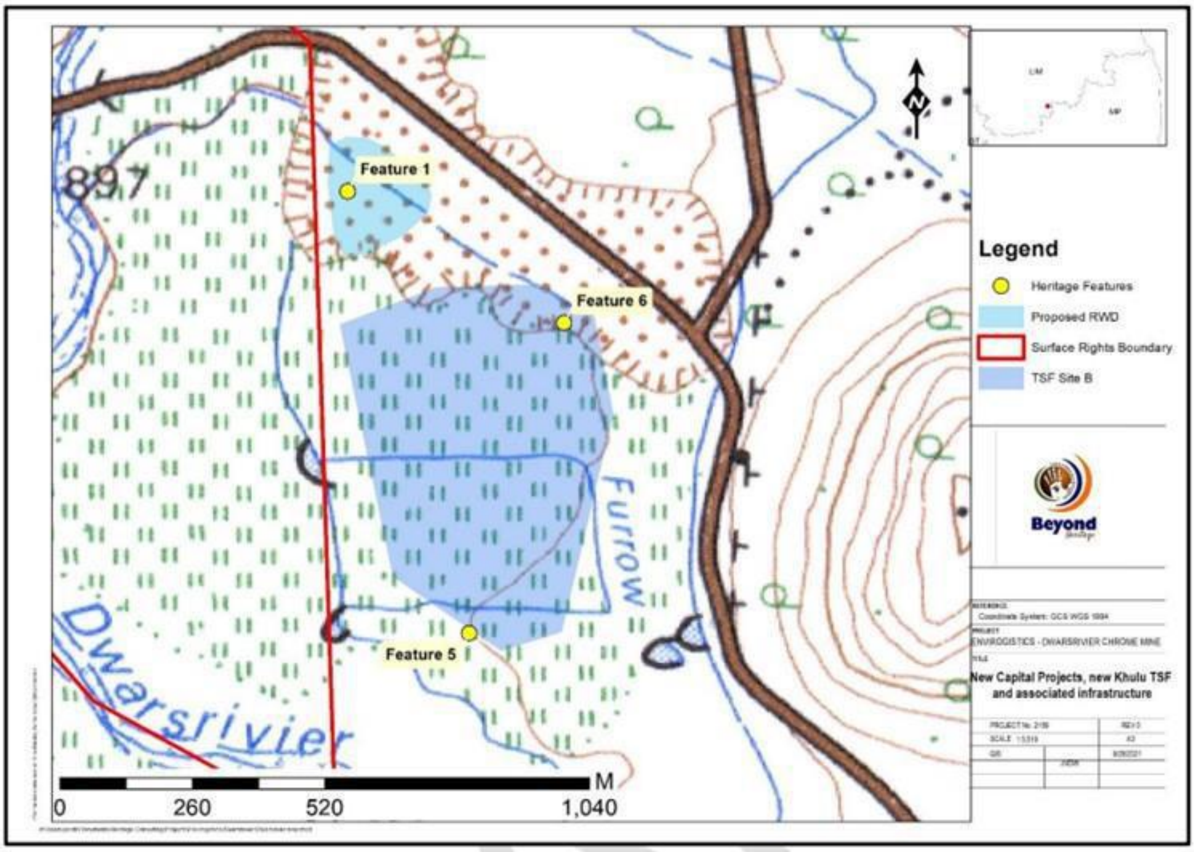


Figure 58: 1976 Topographic map indicating the area of the TSF and PCD. Excavations are indicated where Features 1 and 6 are located. Feature 5 is located within an area with intensive cultivation.

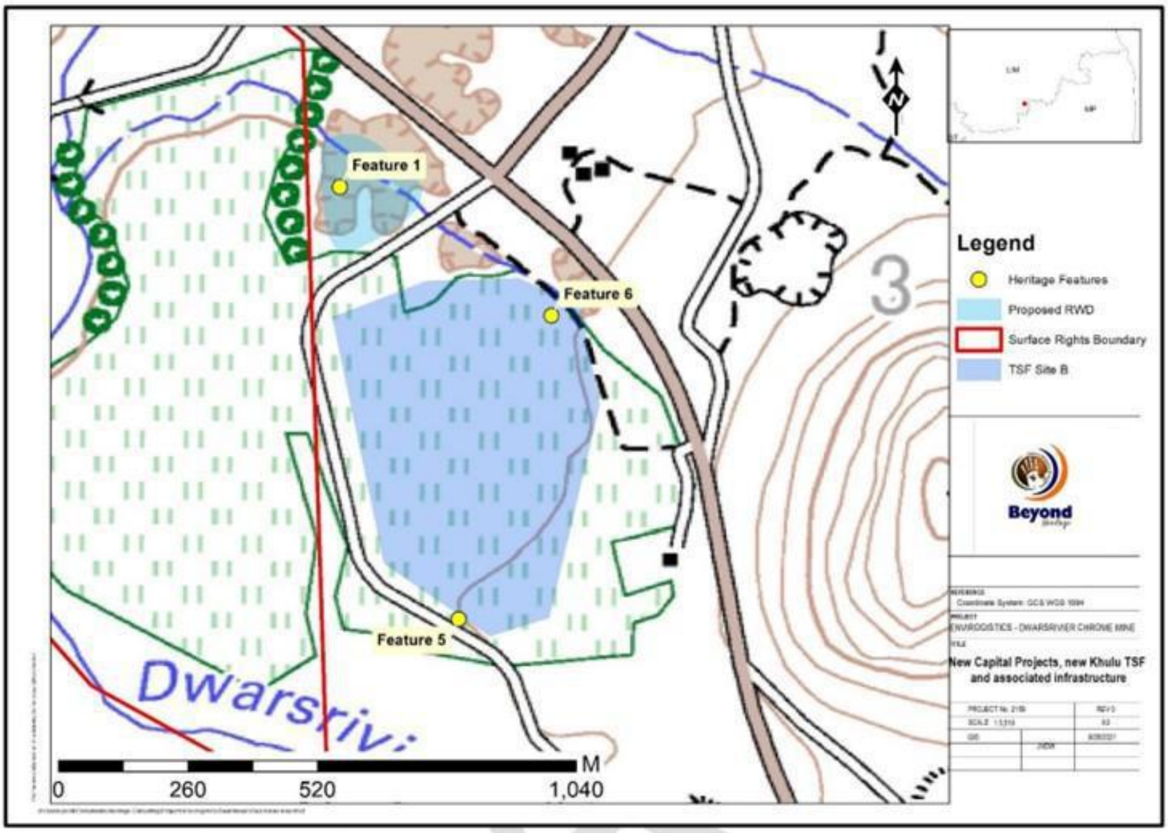


Figure 59: 2002 Topographic map indicating the impact areas of the TSF and PCD. Feature 1 is indicated within an excavated area and Feature 5 and 6 in areas that are cultivated.

Photo 3: Stone cairn next to survey beacon at Feature 1

Photo 4: Ceramics at Feature 5

Photo 5: General site conditions at Feature 5.

Photo 6: Site conditions at Feature 6.

Photo 7: Site conditions at Feature 6.

1.g.v.13.a.2 Diesel and Emulsion Batching Area

The findings in the Diesel and Emulsion Batching Area include Iron Age features and the remains of a structure as described in Table 46. The area has been for the most part undeveloped (Figure 60 to Figure 62) except for huts and kraals indicated on the 1976 topographic map around Feature 4 (Figure 61). The feature is probably related to these structures, but not older than 60 years, and therefore not protected by the NHRA. It should be noted that features such as these are often associated with graves, and the lack of graves in these areas should be confirmed through the stakeholder process. By 2002 no structures are indicated (Figure 62). Identified features are illustrated in Photo 8 to Photo 12.

Table 46: Findings of the survey within the Diesel and Emulsion batching area.

Label	Longitude	Latitude	Description	Significance	Mitigation	Impact area
Feature 2	30° 06' 33.8436" E	24° 56' 42.0144" S	Low density scatter of ceramics. No other features are present. Decorated ceramics are typological like the Eiland *facies* dating to 1000 – 1300 AD (Huffman 2007)	Generally Protected B (GP. B) - Medium significance	Recording before destruction, monitoring during construction.	Diesel and Emulsion Batching area
Feature 3	30° 06' 33.6492" E	24° 56' 46.6945" S	Decorated Eiland Ceramics next to small hill. Some evidence of ephemeral walling also present but is too overgrown to be sure.	Generally Protected B (GP. B) - Medium significance	Recording before destruction, monitoring during construction.	Diesel and Emulsion Batching area
Feature 4	30° 06' 29.2679" E	24° 56' 56.4612" S	Glass, Metal, Wire in an open area in the vegetation. Could have been old labourer housing. Potentially graves in the area	Low significance GP C Unless graves are present, then High social significance and GP A.	The presence of graves or lack thereof should be confirmed prior to construction by the social team. The site should be monitored during construction.	Diesel and Emulsion Batching area.

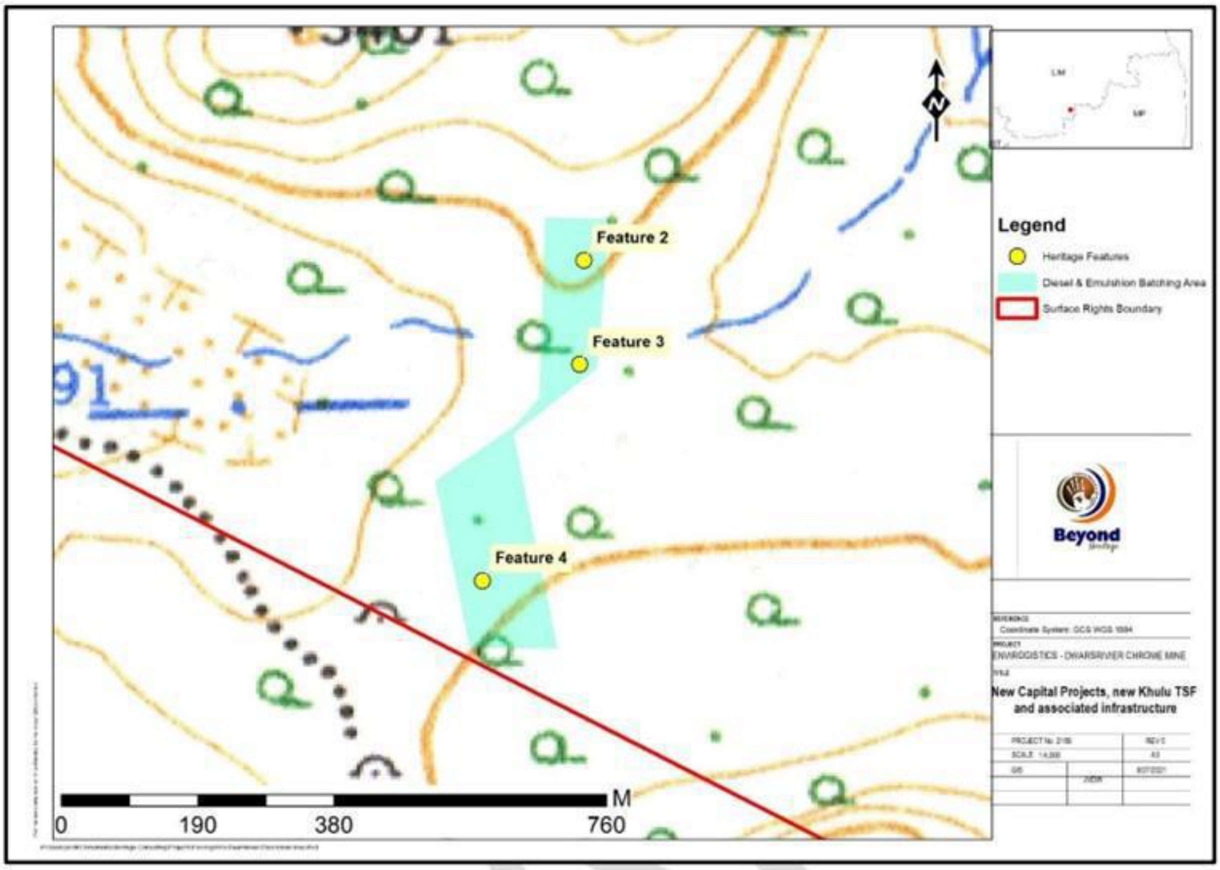


Figure 60: 1963 Topographic map of the Batching area indicating the location of features recorded in this survey in relation to project components. No features are visible on the map

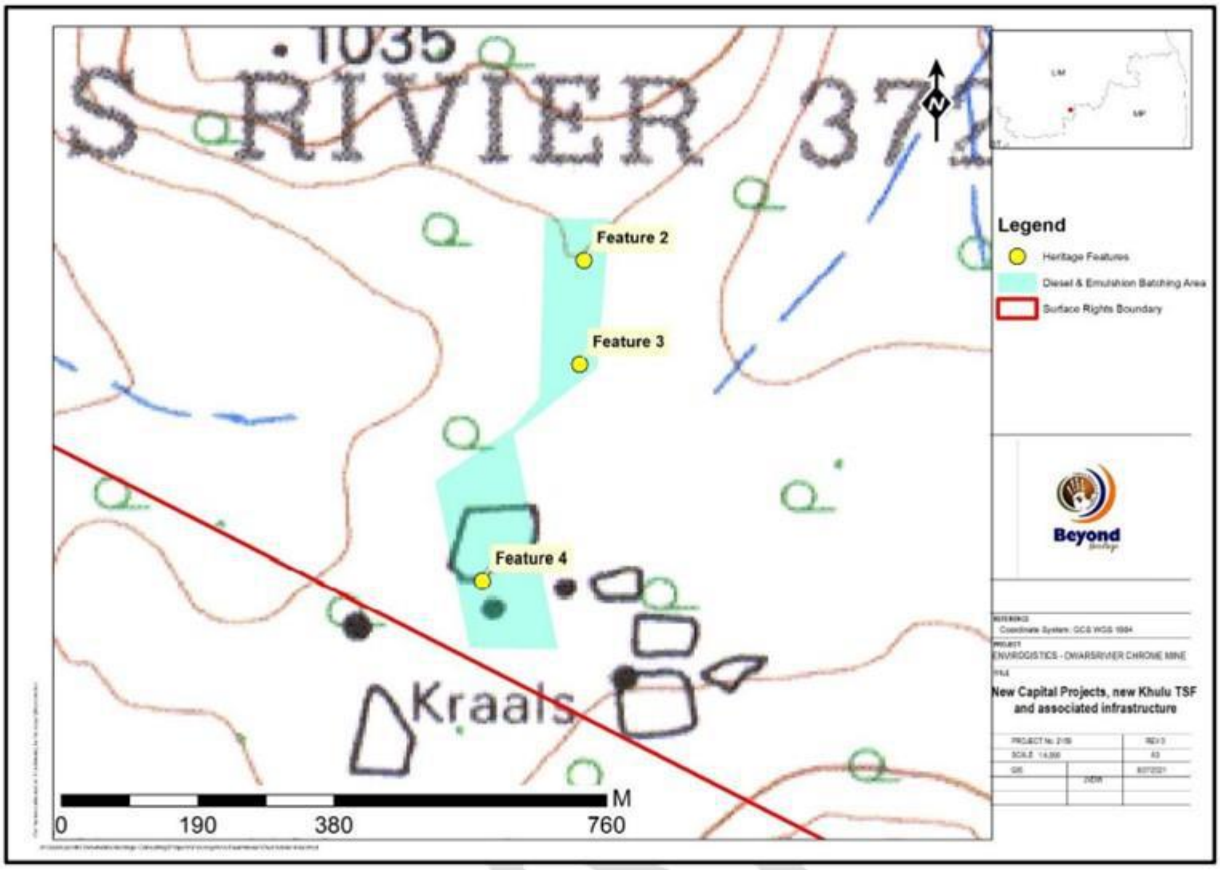


Figure 61: 1976 Topographic map of the Batching area. Kraals and huts are indicated in the same location as Feature 4

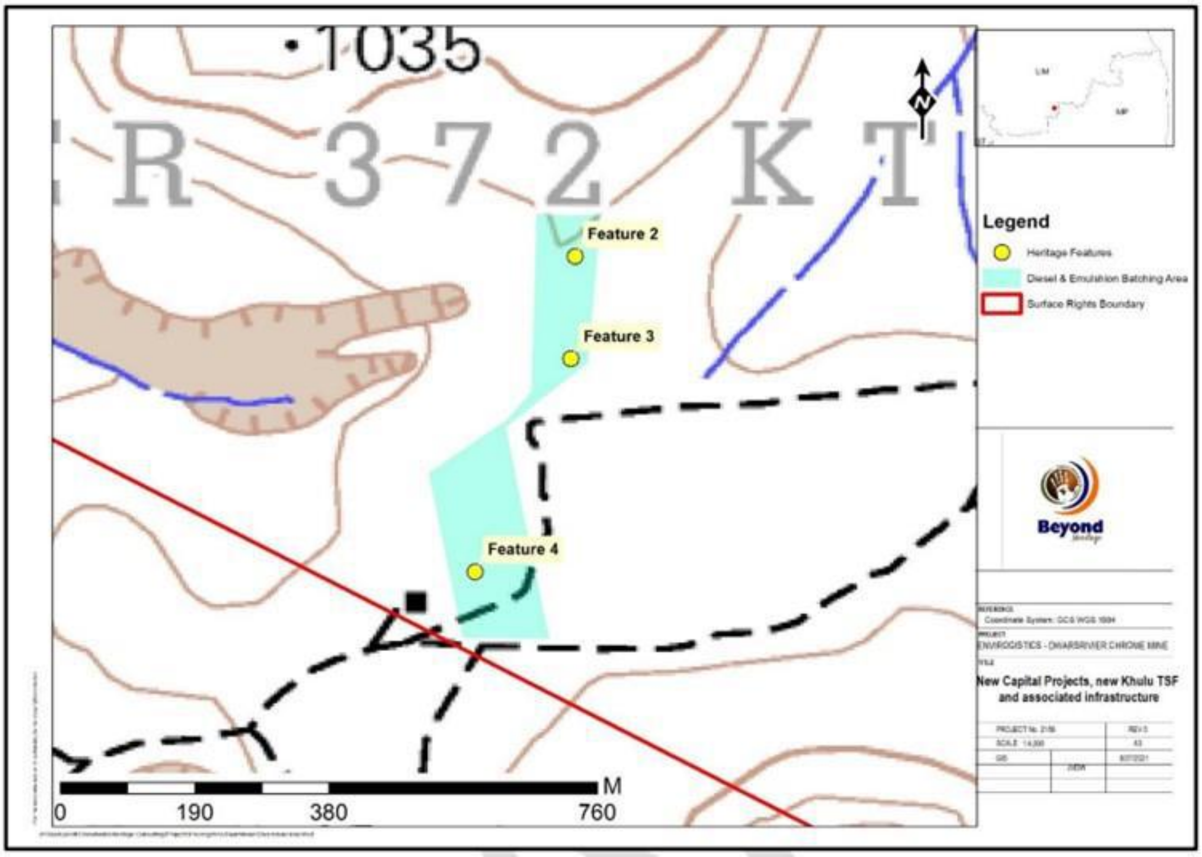


Figure 62: 2002 Topographic map indicating the batching area. A road and structure are indicated close to Feature 4

Photo 8: Rubbing stone at Feature 2

Photo 9: General site conditions at Feature 2 and 3.

Photo 10: Ceramics at Feature 2 and 3

Photo 11: General site conditions at Feature 4

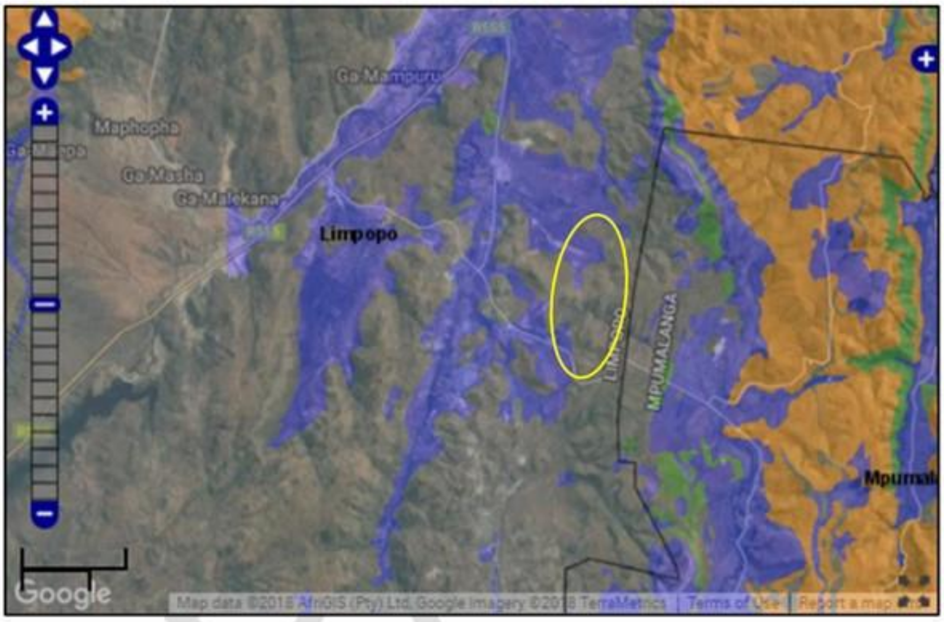
Photo 12: Metal implements at Feature 4.

1.g.v.13.a.3 Extension of Main Parking Area, Widening of Access Road and Subway Crossing

No features were identified in these areas.

1.g.v.13.b Paleontological Sensitivities

According to the paleontological sensitivity of the study area indicated as insignificant and low on the SAHRA Paleontological map (Figure 8.18) and no further studies are required in this regard (see the following figure).



Colour	Sensitivity	Required Action
RED	VERY HIGH	Field assessment and protocol for finds is required
ORANGE/YELLOW	HIGH	Desktop study is required and based on the outcome of the desktop study, a field assessment is likely
GREEN	MODERATE	Desktop study is required
BLUE	LOW	No palaeontological studies are required however a protocol for finds is required
GREY	INSIGNIFICANT/ZERO	No palaeontological studies are required
WHITE/CLEAR	UNKNOWN	These areas will require a minimum of a desktop study. As more information comes to light, SAHRA will continue to populate the map

Figure 63: Paleontological Sensitivity

1.g.v.14 Socio-Economic Setting

BathoEarth was appointed to undertake the Socio-Economic Assessment. The socio-economic setting information was sourced from these reports, as well as those of the available information on site.

1.g.v.14.a Sekhukhune District

The Sekhukhune District Municipality was established in December 2000. It consists of four Local Municipalities, namely Elias Motsoaledi, Ephraim Mogale, Fetakgomo/Tubatse, and Makhuduthamaga Local Municipalities. The district is situated in the Limpopo province, to the northwest of Mpumalanga and within the southern section of the Limpopo Province. The Sekhukhune District Municipality covers an area of approximately 13 264 m^2. Most of the area is typical rural as only 5% of Sekhukhune population lives in urban areas.

The main urban centres are Groblersdal, Marble Hall, Burgersfort, Jane Furse, Ohrigstad, Steelpoort and Driekop. Outside these major towns, one finds almost 605 villages which are generally sparsely populated and dispersed throughout the district[2].

1.g.v.14.b Study area

The Dwarsrivier Chrome Mine (Dwarsrivier Mine) is situated on Portion 1 (Remaining Extent) and Portion 0 (Remaining Extent) of the farm Dwarsrivier 372 KT and Portion 4 (a Portion of Portion 3) of the Farm De Grootteboom 373 KT, approximately 25 km south of the town of Steelpoort in the Limpopo Province. DM is 60km northwest of Lydenburg, and 63km northeast of Roossenekal. The Dwarsrivier Mine is accessed from the R577. The area falls under the jurisdiction of the Sekhukhune District and the Fetakgomo Tubatse Local Municipality (Fetakgomo Tubatse Local Municipality).

According to the recent official demographic survey results (2016), the Fetakgomo Tubatse Local Municipality has a total population of 490 381 people (Statistics South Africa Community Survey, 2016).

There is overwhelming strong statistical evidence that the population is growing at an exponential rate. There are more females 251 923 (51%) than males 238 458 (49%) in the population pyramid. Of the total population within the Fetakgomo Tubatse Local Municipality, 223 214 are young people. The youth thus represent 46% of the total population figure[3].

The Dwarsrivier Mine falls within Ward 27 of the Fetakgomo Tubatse Local Municipality and has a population of 12 527 (Statistics from 2011)[4]. Ward 27 has the following villages: Moshate, Tsakane, Kalkontein, Mabelane, Makakatela, Kutullo A&B, Shushumela & Matepe, Kutullo C&D, Dithamaga and Madibeng[5].

The main economic sectors within Fetakgomo Tubatse Local Municipality include agriculture, mining and quarrying, trade, tourism, manufacturing, general government, community, social and personal services, catering and accommodation[6].

1.g.v.14.c Social Profile

1.g.v.14.c.1 Population Figures

The following table provides an outline of the population figures in the affected ward and how it compares to those of the municipality, district and province.

*Table 47: **Population figures**[7]*

Ward	*Population*	*People per km²*	*Number of Households*	*% Under 20 Years Age Group*
Ward 27	12 527	18.9 km^2	2 727	48%
Fetakgomo Tubatse Local Municipality	489 902	85.9 km^2	125 363	42%
Sekhukhune District Municipality	1 169 762	85.7 km^2	290 526	45%

[2] www.sekhukhunedistrict.gov.za
[3] www.fgtm.gov.za
[4] www.wazimap.co.za
[5] Draft 2018/19 IDP/Budget for Fetakgomo Tubatse Local Municipality
[6] Fetakgomo Tubatse Local Municipality: Draft 2018/19 IDP/Budget for Fetakgomo Tubatse Local Municipality
[7] www.wazimap.co.za (Census 2011)

Limpopo Province	5 799 990	46.1 km^2	1 601 083	44%

The population figures indicate a study area which is not densely populated compared to the rest of the Fetakgomo Tubatse Local Municipality. The percentage of youth under the age of 20 years comprises approximately half of the population sector within Ward 27. The Fetakgomo Tubatse Local Municipality has a lower percentage of people within the under 20 years age category, but this figure still remains high. Employment creation within the municipality and especially within the ward, over the long term, is thus critical.

Ward 27 constitutes 1% of the total Fetakgomo Tubatse Local Municipality population[8].

1.g.v.14.c.2 Education Levels

Based on information received, the percentage within Ward 27 that achieved Grade 12 compares much lower to the levels of the Fetakgomo Tubatse Local Municipality. The levels of higher education achieved in the study area are also lower than those of the Fetakgomo Tubatse Local Municipality, the district and province.

Table 48: Education Levels[9]

MUNICIPALITY / WARD	***NO SCHOOLING***	***GRADE 12***	***HIGHER EDUCATION***
Ward 27	16%	19%	1%
Fetakgomo Tubatse Local Municipality	16%	26%	4%
Sekhukhune District Municipality	16%	26%	4%
Limpopo Province	14%	28%	6%

1.g.v.14.c.3 Employment and Income Levels

The table below shows relatively higher average income levels in the Ward and Fetakgomo Tubatse Local Municipality compared to the Sekhukhune District Municipality. This could be due to the various mining activities in the area responsible for various employment opportunities.

Table 49: Employment and Income Levels

WARD	***Employed***	***Other not economically active***	***Average Annual household income***
Ward 27	22.1%	43%	R29 400
Fetakgomo Tubatse Local Municipality	23%	47%	R57 500
Sekhukhune District Municipality	20.9%	50%	R14 600
Limpopo Province	27.4%	49%	R30 000

1.g.v.14.c.4 Skill levels of the labour force

According to the Fetakgomo Tubatse Local Municipality Integrted Development Plan (IDP), there is a shortage of relevant skills among locals which results in a situation where skills for the mining industry are sourced from outside the province. This hampers the municipality's job creation efforts[10]. Skills shortages are thus a challenge that needs to be overcome.

1.g.v.14.c.5 Infrastructure

The majority of residents within the Fetakgomo Tubatse Local Municipality live in formal dwellings (76%), which is approximately the same as within the Sekhukhune District. The area where the proposed development is situated (Ward 27), however has only 67% living within formal dwellings and 22.5% of the residents that live within informal dwellings. The latter is almost double the figure of those within the Fetakgomo Tubatse Local Municipality and the Sekhukhune District[11].

[8] Draft IDP/Budget 2021/22-2023/26 for Fetakgomo Tubatse Local Municipality
[9] www.wazimap.co.za (Community Survey 2016)
[10] Draft 2018/19 IDP/Budget for Fetakgomo Tubatse Local Municipality
[11] www.wazimap.co.za

Fetakgomo Tubatse Local Municipality can be seen as a water stressed municipality. According to the community survey of 2016, 58 255 households have access to piped water and 67 208 households have no access to piped water. Of the 39 wards in the Fetakgomo Tubatse Local Municipality, almost all the villages source water from boreholes, rivers, dams and tanks. The main reasons for this situation is illegal water connections, limited communal and aging infrastructure, drought, lack of financial resources, the topography of the area, as well as the number of informal and scattered settlements through the municipal area.[12]

Within Ward 27, 62% of the households obtain their water from the river, but 19.5% of the households do receive their water from a regional or local water service provider. The majority of households (72.4%) also use pit latrines[13].

Villages within Ward 27 all have access to electricity services, although there are some households that still need to be connected. The area however experiences frequent power outages[14].

1.g.v.14.d Economic activities

The Fetakgomo Tubatse Local Municipality has the following investment opportunities:

- mining investment;
- land availability;
- tourism;
- funding source from private sector; and
- job creation from infrastructure investment.

Mining still presents the largest opportunity in the area and the mining activities and natural resources available in the area have created a definite potential to develop tourism and thereby to diversify the economic base of the municipality[15].

The mining industry is furthermore the municipality's leading job creator and key economic growth driver. With all major mining houses fully represented in the municipality, locals pin their hopes for jobs and income security in this sector. The mining sector accounts for 34% of the Municipality's total Gross Value Added (GVA) and 54% of the total labour force in the formal sector. The job absorption patterns during a 12-year review period in the sector shows that year 2012 witnessed the highest number of jobs (1833) created.

The agriculture sector in the Fetakgomo Tubatse Local Municipality is still emerging and heavily under-invested. Lack of mechanisation makes smallholder farming one of the smallest contributors to the municipality's economic growth.

The manufacturing sector covers the manufacturing of goods, products and beverages. It also comprises the production, processing and preservation of meat, fish, fruit, vegetables, oils and dairy products; grain mill, starches and tobacco products; textile products; spinning, weaving; and petroleum products and nuclear fuel. This sector has a vast potential as job creator but is still in its infancy.

With regards to the tourism sector, it was noted that the unique selling benefits of local heritage sites and other tourism facilities in the municipality are not effectively profiled and marketed. The tourism sector is further being overshadowed by mining to the extent that more strategic focus is unevenly invested in the latter at its expense.

The area surrounding the mining site is characterised by mining activities of other chrome and platinum mines. Some of the neighbouring farms in the area are further used for livestock grazing and the production of vegetables, lucerne and cotton.

1.g.v.15 Type of Environment Affected by the Proposed Activity

Please refer to the preceding section detailing the environmental setting in which the mine is located. The following settings are the key areas which requires management during the development and operation of the proposed project.

Landownership

The proposed projects are located within the approved Mining Rights and Surface Rights are of Dwarsrivier Mine. The overall area is highly characterised by mining operations.

In terms of land claims and grave ownership, the Bakone Ba Masha are the owners of various graves located within the vicinity of Dwarsrivier Mine, specifically in terms of the two (2) farm portions in question and was identified as an I&AP.

[12] Draft 2018/19 IDP/Budget for Fetakgomo Tubatse Local Municipality
[13] www.wazimap.co.za
[14] Draft 2018/19 IDP/Budget for Fetakgomo Tubatse Local Municipality
[15] Draft 2018/19 IDP/Budget for Fetakgomo Tubatse Local Municipality

<u>Heritage Significance</u>

The study area is characterised by extensive mining activities. The heritage survey recorded two areas with historical/recent residential elements, the remains of Iron Age sites marked by a scatter of ceramics, and a stone cairn of unknown purpose that although unlikely could possibly indicate a grave site. Based on the high significance of burial sites the impact will be high if it is confirmed to be a grave. If the feature is not a grave it is of no heritage significance.

The study area is of insignificant and low paleontological sensitivity and no further studies are required for this aspect.

<u>Ecological Significance</u>

The Dwarsrivier Mine is located in the Savanna Biome, within the Central Bushveld Bioregion. Ecological aspects relating to the vegetation of the area indicate that the majority of the Dwarsrivier Mine is located within the Sekhukhune Mountainlands listed <u>threatened ecosystem</u>, which is considered to be <u>Endangered</u>, and within the Sekhukhune Mountain Bushveld vegetation type which is considered Least Threatened. Portions of Project 1 and Projects 2 to 5 fall within an area considered to form part of the remaining extent of the Endangered Sekhukhune Mountainlands ecosystem. According to the description in GNR 1002, the Sekhukhune Mountainlands falls under Criterion F, which are <u>priority areas for meeting explicit biodiversity targets as defined in a systemic biodiversity plan</u>. These areas have a very high irreplaceability and are under medium threat. Endangered ecosystems have undergone degradation of ecological structure, function or composition as a result of human intervention, although they are not critically endangered ecosystems. For this purpose, habitat is considered severely degraded if it would be unable to recover to a natural or near-natural state following the removal of the cause of the degradation (e.g., AIPs, over-grazing), even after very long time periods.

The Dwarsrivier Mine falls within an area that is currently not protected (Figure 27). According to the National Biodiversity Assessment (NBA), 2018, the majority of the of the portions of the five proposed (about 25% of the proposed TSF project; full extent of the diesel and emulsion batching area and parking extension, and portions of the road widening project) projects currently fall within the remaining extent of the least concerned Sekhukhune Mountain Bushveld, that is currently poorly protected. Ecosystem types are categorised as “not protected”, “poorly protected”, “moderately protected” and “well protected” based on the proportion of each ecosystem type that occurs within a protected area recognised in the National Environmental Management: Protected Areas Act, 2003 (Act No. 57 of 2003), and compared with the biodiversity target for that ecosystem type.

Initially, the Projects 1, 2 3 and 5 and the majority of Project 4 fell within areas defined as a Category 1 CBA. These are “Irreplaceable” areas, which are required to meet biodiversity pattern and/or ecological processes targets; and with no alternative sites available to meet targets. A small portion of Project 4 falls within an area defined as a Category 2 ESA. These are areas where no natural habitat remains, but that are still important for meeting ecological processes (Figure 28). Project 2 (Diesels and Emulsion Dispatching Area) is located about 2km from the Mpumalanga Mesic Grasslands (NPAES 2009 protected area).

NOTE: Important to note that Subsequent to the specialist assessments, the CBAs for the Sekhukhune District Municipality were updated to align these with the Sekhukhune District Bioregional Plan, and the current mining area, including the proposed project footprint areas, no longer falls within a CBA, but still in a listed threatened ecosystem. This report therefore still refers to CBAs, as it has minimal impact on the assessment. It should also be noted that based on current available information, the Sekhukhune Mountainlands threatened ecosystem is proposed to fall away once the Draft Revised Threatened Ecosystem Regulations of 2021 are promulgated. The Sekhukhune Mountainlands threatened ecosystem is however still in place, in line with the undertaking of the current specialist studies.

With the change in the CBAs delineation, only the Subway Crossing Project (Project 5) is located within an area delineated as CBA 1. The remainder of the projects are located in mostly what is defined as Ecological Support Areas 1 (ESA 1).

(for the purposes of this project, the activities identified under Listing Notice 3 is retained, but indicated where not required after the amendment of the CBA delineation.

According to the SAPAD (2020), the proposed TSF (Site B) is located approximately 6km south-east of the De Hoop Dam Protected Environment. The SACAD (2020) databases does however not indicate any formally or informally protected areas or conservation areas to be situated within 10km of the five proposed project.

<u>Hydrological and Freshwater Aquatic Significance</u>

Two primary freshwater ecosystems were identified in association with the aforementioned project areas: the Dwars River, and the Springkaanspruit (a tributary of the Groot Dwars River). Both rivers have been subjected to various impacts relating to ongoing mining activities within the MRA and the greater catchment and are considered moderately modified (PES Category C). The Dwars River is deemed of Very High EIS whilst the Springkaanspruit is of High EIS.

No freshwater ecosystems were identified directly within the proposed footprint areas of the Diesel and Emulsion Batching Areas, although the headwaters of two small ephemeral drainage systems are located within 500m thereof. These ephemeral drainage systems were not deemed at risk from the proposed project and were therefore not assessed in detail, although it is strongly recommended that mitigation measures be implemented throughout all phases of the proposed batching areas to ensure that no risks or impacts are posed by edge effects. No freshwater ecosystems were identified within any of the other projects.

Groundwater Significance

Three aquifers are typically present in the region. These include an alluvial aquifer associated with the floodplains of the Groot and Klein Dwars Rivers; a shallow weathered aquifer present in the upper 15m of the geological succession; and a deeper fractured rock aquifer in the pyroxenites, anorthosites and norites.

The only private borehole is located 230m northeast of the TSF. This is a borehole utilised by security offices – but also owned by Dwarsrivier Mine (Security Accommodation).

Groundwater levels are at an average depth of 10m in the shallow boreholes and 12m in the deep boreholes. Excavations during construction will not intercept groundwater.

A geophysical survey was completed to confirm the locations of perceived faults and dykes that are present near the TSF. A total of seven new monitoring boreholes were drilled on the geophysical targets, including three sets of shallow and deep monitoring boreholes to target the aquifers present and one shallow borehole adjacent to an existing old deep monitoring borehole identified during the hydrocensus. Aquifer tests were completed in the deep monitoring boreholes, while observations were made in the shallow boreholes. The drilling programme and aquifer tests were used to obtain information to characterise the aquifers present.

Based on the information evaluated, a north-south trending fault, associated with a replacement pegmatoid body mapped in the underground mine plan, is identified as a preferential flow path to groundwater and therefore also for potential contamination associated with the Khulu TSF. This fault intersects the eastern edge of the TSF. A second southwest-northeast trending fault was also identified and characterised. This fault transects the Khulu TSF footprint and also exhibits enhanced aquifer conditions, which are variable along its strike. A borehole situated down gradient of the Khulu TSF on this fault line was dry at the time of drilling. Groundwater seepage was recorded afterwards in the borehole. This structure may therefore also be considered as a preferential flow path to groundwater, but with less significance compared to the north-south trending fault. A dyke situated east of the Khulu TSF could act as a preferential flow path to groundwater, south of the TSF footprint. In the vicinity of the Khulu TSF, the significance of the preferential flow along the dyke contact is considered less prominent as it does not intersect the footprint area.

Evaluation of monitoring data obtained during aquifer tests suggest that there is limited vertical movement between the shallow weathered and deeper fractured aquifers at the Khulu TSF footprint. Further south in the plant area, high transmissivities were recorded for the N-S striking fault in shallow and deep boreholes. It is thought that contamination from surface enters the fractured rock aquifer in this area.

Groundwater flow patterns confirm preferential flow along the N-S striking fault and to a lesser extent along the SW-NW striking fault and the dyke. Groundwater levels measured in shallow boreholes indicate that groundwater follows the topography in the weathered aquifer and discharges towards rivers and streams. Groundwater flow in the underlying fractured rock aquifer is only partially governed by the topography. Preferential flow along geological structures and the impact of mine dewatering also affects the fractured rock aquifer.

An assessment of process water quality and rock leach tests completed indicates that the risk of acid mine drainage associated with the operations is low.

Even without construction of the Khulu TSF and PCD, the existing Dwarsrivier Mine mining and mineral processing activities will continue to impact on groundwater quality in the long-term. Dwarsrivier Mine is in the process of developing and implementing a Groundwater Remediation Strategy that will be designed to reduce nitrate concentrations in groundwater. This strategy will be developed as part of a separate study.

Liner failure under good installation conditions is expected to result in an increase in nitrate concentrations of between 20 and 80mg/l in the long-term. The outcome of Scenario 1 (Good liner installation for the Khulu TSF and PCD. Exposure to the atmosphere is managed and limited to a minimum, resulting in a life of liner of 280 years) resulted in the least significant impacts on groundwater and the receiving water quality.

If the liners are poorly installed and managed, negative impacts are expected on the receiving water bodies (the Klein and Groot Dwars Rivers) as well as on groundwater quality. Groundwater baseflow to the rivers at the concentrations reported will most likely result in an increase in nitrate concentrations in the rivers. The increased nitrate concentrations in groundwater will result in an unacceptable long-term impact.

Based on the outcome of the assessment, the preferred option in terms of liner design for the Khulu TSF and PCD is Scenario 1. For this scenario, good liner installation will be implemented and the liner will not be exposed to the atmosphere excessively. If this is achieved, the life of the liner is estimated to be 280 years. Simulations indicate that even if the liner fails, long-term impacts on the receiving water bodies are not expected to be significant.

Socio-Economic Significance

The main economic sectors within Fetakgomo Tubatse Local Municipality include agriculture, mining and quarrying, trade, tourism, manufacturing, general government, community, social and personal services, catering and accommodation. The positive impacts associated with the proposed project include the continuation of employment during the operational phase and some employment creation as part of the various construction activities. This could also have potential positive impacts on the adjacent local area. Dwarsrivier Mine will further continue with local procurement, capacity building and the overall socio-economic development within the area. Targets for the procurement of capital goods, consumer goods and services should be set and Dwarsrivier Mine can develop an action plan to meet these targets.

1.g.v.16 Description of the Current Land Uses

The current land use for the area is for mining operations, with the TRP and Glencore Thorncliffe Mines operating in the adjacent farm portions.

Dwarsrivier Mine has been mining chromite ore from the LG6 seam since 1999. Between 1999 and 2005, ore was mined using opencast methods. The six pits have subsequently been mined out and backfilled with the exception of the South and North Pit portals from which access is gained to the underground workings. The current mine plan extends the life of the operations to the year 2042 (24 years). Dwarsrivier Mine indicated that the mine plan has not changed since the 2015 numerical modelling was undertaken (iLEH, 2015).

The abstraction of groundwater for potable use was included in the assessment presented in this report. Six boreholes are applied for in terms of the WUL (Borehole C is not in use currently) are used for groundwater abstraction, namely BHA, B, C, D1, D2 and E.

All opencast mining has ceased and the pits have been backfilled and partially rehabilitated. These areas were delineated as part of the annual rehabilitation plan, completed by GCS in 2016. Access to the underground workings is gained from both North and South Pits. The two decline shafts are constructed in the high walls of the pits.

Tailings material was backfilled into both North and South Pits. The majority of the tailings material was backfilled into North Pit while the construction of the North TSF was completed. A RWD was constructed in the north-western part of North Pit during this period. The RWD was excavated into backfilled tailings and lined with HDPE.

The old TSF situated west of the Plant is partially reprocessed. Tailings are currently deposited in the North TSF, which was commissioned in 2012. The remaining life of the North TSF is estimated to be around 12 years.

Several dams are used on site to contain and transfer dirty water around the operations. These include two pollution control dams, the Upper RWD and the Lower RWD, situated adjacent to the old TSF. Both dams are lined with HDPE. Extraneous water is pumped from the underground workings to the Clarifier. From here, water is transferred to Dam 26. Approximately half of the extraneous water is pumped back underground for reuse.

Several waste rock dumps (WRDs) are situated around the operations. Some of these dumps have been rehabilitated. The operational WRDs are situated to the north of the old TSF (the northern Discard Dump).

Pre-Mining Land Use

Prior to the sale of the land for mining purposes, a portion of the property was used for agriculture under irrigation, the dominant crops being maize, lucerne, cotton and vegetables. The remainder of the property was used for grazing and wilderness land. The valley lines and wetland areas were left uncultivated.

Historical Potential

The estimated dryland production potential of the area is 4 tons per hectare (t/ha). The grazing capacity is approximately seven large stock units per hectare. The irrigated land potential is in the order of 6 - 10 t/ha for maize.

Evidence of Misuse

The only evidence of misuse is erosion gullies in some areas and the presence of borrow pits where the soils and underlying soft rock materials have been removed.

Current Land Use

All of the footprint areas earmarked for the various projects are not under current cultivation, and have never been utilised for agricultural purposes except for the TSF area which has previously been cultivated (for subsistence purposes) but has since been laid to fallow. Scrutiny of the satellite imagery was made, and it was evident that the dominant land uses in the surrounding areas are mining and wilderness, with very few residential areas northeast of the MRA. No cultivated agriculture was observed within the immediate vicinity of the MRA.

The photos below present images of some of the land uses within the project area.

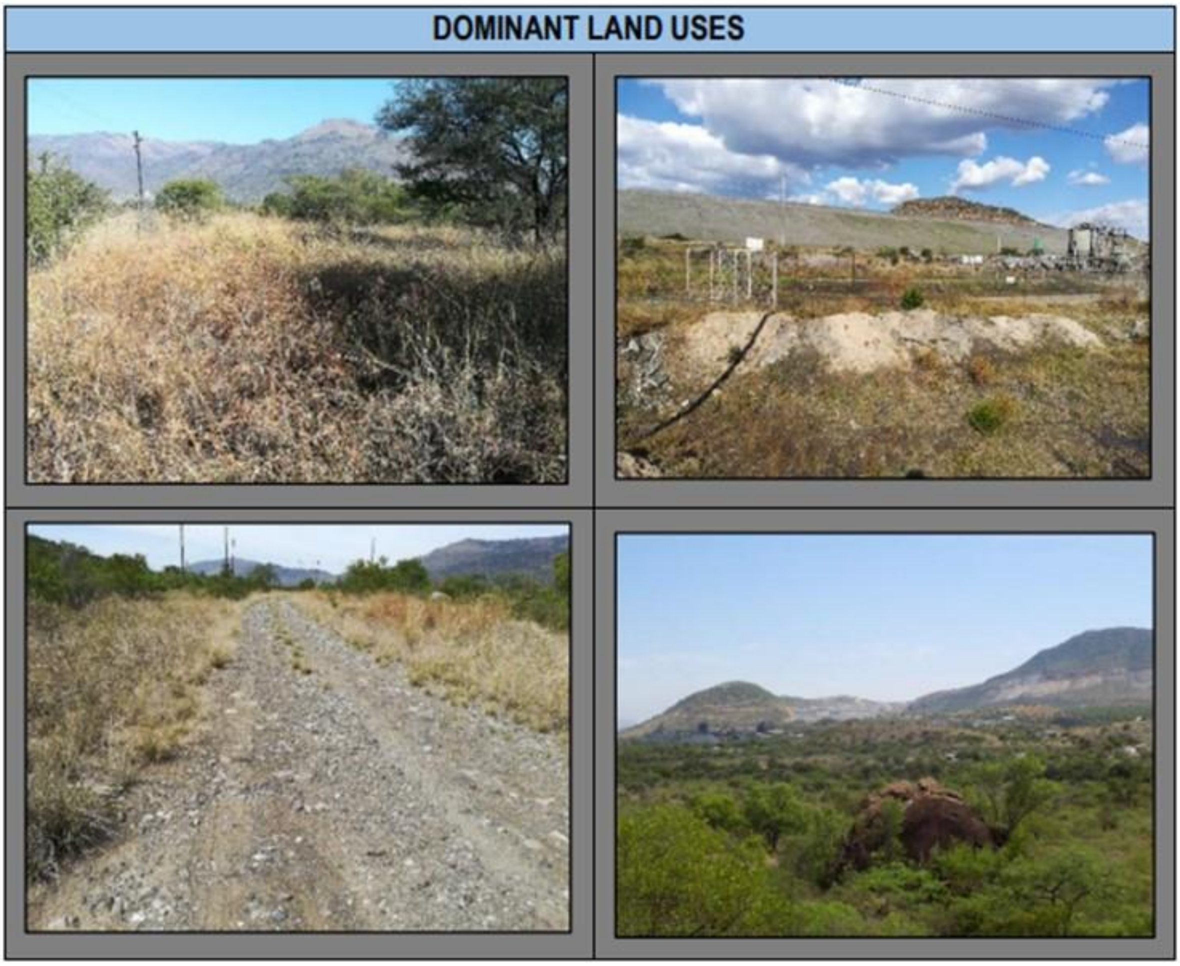


Photo 13: images depicting current land uses

1.g.v.17 Description of Specific Environmental Features and Infrastructure on Site & Specific Zones of Regulation

A 100m zone of regulation in line with GN 704 of the NWA is applicable to the watercourses identified within the proposed TSF, as well as a 32 m zone of regulation in line with NEMA for non-mining specific infrastructure (e.g. roads or pipelines). Additionally, in terms of GNR 509 of the NWA, a 100m zone of regulation is applicable to any riparian area, in the absence of a determined 1:100 year floodline. These zones of regulation must be taken into consideration during the site selection and planning process, in line with the mitigation hierarchy as advocated by the the Department of Environmental Affairs (DEA, now DFFE), 2013, and should they be encroached upon then the relevant authorisations will need to be obtained prior to the commencement of any construction activities. The respective zones of regulation in terms of Regulations GNR 509 and GN 704 of the NWA and the NEMA are depicted in the following figures.

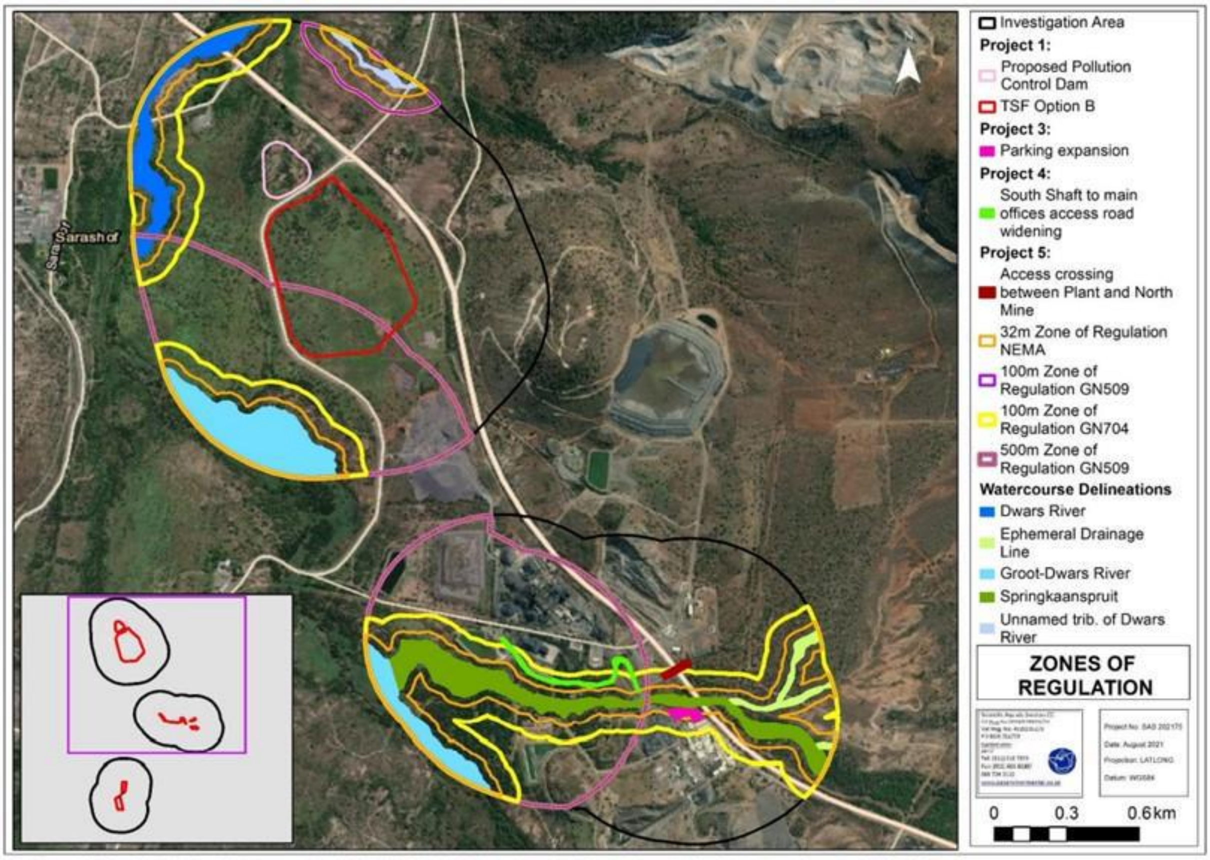


Figure 64: The relevant zones of regulation applicable to the watercourses associated with the various projects, in line with Regulations GN704 and GN509, and NEMA

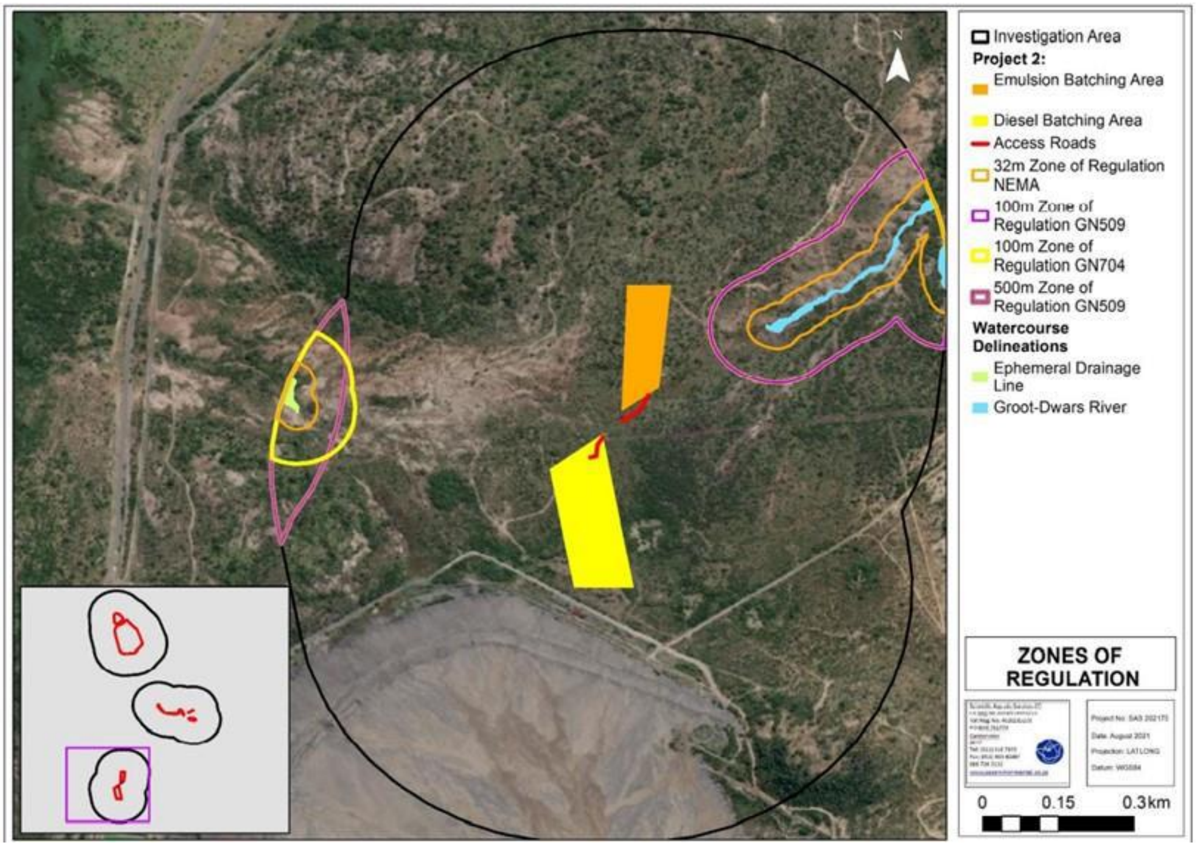


Figure 65: The relevant zones of regulation applicable to the watercourses associated with the fuel storage area alternatives, in line with Regulations GN 704 and GNR 509, and NEMA

The following specific environmental features are present on site:

- The Heritage Impact Assessment identified a heritage feature (cairn) in the location of the proposed PCD, which could be a grave. Should this be proven to be a grave, this will be considered as a high significance impact and will require mitigation;
- The site is located in a threatened ecosystem, as well as CBA and ESA areas. These areas have been assessed and the required tree removal permits have already been obtained.
- The Dwars River is considered a Flagship River in terms of the NFEPA, and therefore all activities will be located outside of the 1:100 year flood line.
- Preferential flow paths in terms of the alluvial aquifer, N/S strike fault, SW-NE fault, SW-NE fault and N-S dyke (see Figure 20 and Figure 21).
- Undermining of TSF at about 100m, which is not considered a risk by the design team (see Annexure 4).

1.g.v.18 Environmental and Current Land Use Map

The landscape of the study area can be broadly divided into two main categories:

- Natural areas – consisting of natural bushveld areas; and
- Mining areas – consisting of mine dumps, bare areas and mine infrastructure.

Please refer to Figure 66.

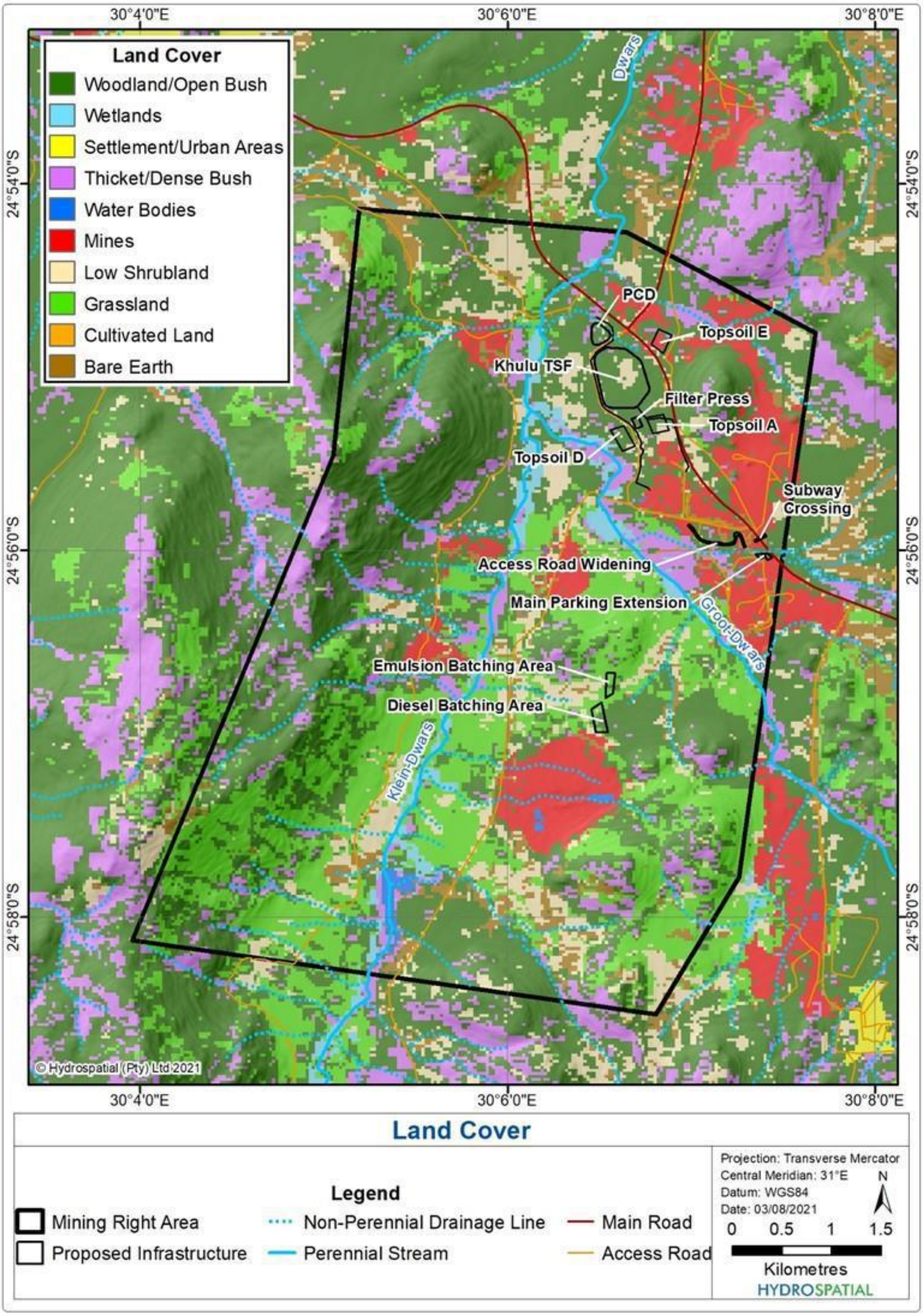


Figure 66: Land use map

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

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

Before the impact assessment can be done, the different activities must be identified, mapped and understood. The activities directly related to this impact assessment are listed in Table 10 presented in the first section of the report. Each of these activities were assessed in detail as part of the specialist investigations.

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

- Planning Phase:
    - Ensure the implementation of Legal Requirements (Environmental Permits and Authorisations)
- Construction Phase:
    - Demarcation and identification of protected species
    - Land and footprint clearance
    - Topsoil stripping and stockpiling
    - Establishment of surface infrastructure
    - Waste management
- Operational Phase:
    - Operation of TSF and associated PCD
    - Operation of road and parking infrastructure
    - Operation and use of Diesel and Emulsion Storage and Supply
    - Transportation (roads)
    - Operation of infrastructure and roads
    - Water management
    - Dust suppression
    - Waste management
- Closure Phase:
    - Ensure the implementation of Legal Requirements (Environmental Permits)
    - Rehabilitation of TSF and associated PCD
    - Dismantling of pipelines and associated soil remediation where required
    - Dismantling and decommissioning of infrastructure and buildings, including product stockpiles
    - Earth moving, shaping and ripping of soils
    - Cessation of Labour Contracts
    - Waste Management

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

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

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

The EIA aims to achieve the following:

- Provide an overall assessment of the social and biophysical environments affected by the proposed project;
- Assess the study area in terms of environmental criteria;

- Identify and recommend appropriate mitigation measures for potentially significant environmental impacts;
- Successfully analyse all public issues raised to date in order to recommend appropriate mitigation measures for all social and environmental related concerns; and
- Impacts and benefits are assessed before and after the application of mitigation measures.

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

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

The evaluation of impacts is conducted in terms of the criteria detailed in Table 50 to Table 55. The various environmental impacts and benefits of this project are discussed in terms of impact status, extent, duration, probability, and intensity. Impact significance is regarded as the sum of the impact extent, duration, probability and intensity and a numerical rating system has been applied to evaluate impact significance. Therefore, an impact magnitude and significance rating is applied to rate each identified impact in terms of its overall magnitude and significance (Table 55).

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

1.g.vi.2.b Impact Status

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

Table 50: Status of Impact

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

1.g.vi.2.c Impact Extent

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

Table 51: Extent of Impact

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

1.g.vi.2.d Impact Duration

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

Table 52: Duration of Impact

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

1.g.vi.2.e Impact Probability

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

Table 53: Probability of Impact

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

1.g.vi.2.f Impact Intensity

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

Table 54: Intensity of Impact

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

1.g.vi.2.g Impact Significance

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

Table 55: Impact Magnitude and Significance Rating

Impact	Rating	Description	Quantitative rating
Positive	High	Of the highest positive order possible within the bounds of impacts that could occur.	+ 12 – 17
	Medium	Impact is real, but not substantial in relation to other impacts that might take effect within the bounds of those that could occur. Other means of achieving this benefit are approximately equal in time, cost and effort.	+ 6 – 11
	Low	Impacts is of a low order and therefore likely to have a limited effect. Alternative means of achieving this benefit are likely to be easier, cheaper, more effective and less time-consuming.	+ 1 – 5
No Impact	No Impact	Zero impact.	0
Negative	Low	Impact is of a low order and therefore likely to have little real effect. In the case of adverse impacts, mitigation is either easily achieved or little will be required, or both. Social, cultural, and economic activities of communities can continue unchanged.	- 1 – 5
	Medium	Impact is real, but not substantial in relation to other impacts that might take effect within the bounds of those that could occur. In the case of adverse impacts, mitigation is both feasible and fairly possible. Social cultural and economic activities of communities are	- 6 – 11

Impact	Rating	Description	Quantitative rating
		changed but can be continued (albeit in a different form). Modification of the project design or alternative action may be required.	
	High	Of the highest order possible within the bounds of impacts that could occur. In the case of adverse impacts, there is no possible mitigation that could offset the impact, or mitigation is difficult, expensive, time-consuming or a combination of these. Social, cultural and economic activities of communities are disrupted to such an extent that these come to a halt.	- 12 - 17

1.g.vi.3 Impacts and Risks identified

1.g.vi.3.a The Positive and Negative Impacts that the Proposed Activity (in terms of the Initial Site Layout) and Alternatives will have on the Environment and the Community that may be affected

1.g.vi.3.a.1 Soil and Land Capability

Soil Erosion

The MRA is characterised by steep and gradual slopes, consisting of shallow and moderately deep soils respectively. The areas where the infrastructure is proposed are mostly gradual, however the exploration activities will be located among the mountainous setting and this is where erosion is considered moderately high. The natural and undisturbed soils will become more vulnerable to erosion once the vegetation is cleared for construction activities, and the soils will inevitably be exposed to wind and some surface runoff during intensive rainfall events. The significance of this impact is anticipated to be moderate and will be reduced to moderately low impact if mitigation measures outlined in this document are adhered to.

Soil Compaction

Heavy equipment traffic during construction and exploration activities is anticipated to cause soil compaction. The severity of this impact is anticipated to be medium-high for Acardia soils due to clayey texture. Whereas soils with a relatively shallow bedrock and lithocutanic character (partly weathered rock material) such as the Glenrosa/Mispah soil forms are anticipated to be less impaired due to the resistance offered by the underlying bedrock.

Soil Contamination

All the identified soils are considered equally predisposed to potential contamination (i.e. hydrocarbons), as contamination sources are generally unpredictable and often occur as incidental spills or leak for construction developments. The significance of soil contamination is medium-high for all identified soils, largely depending on the nature, volume and/or concentration of the contaminant of concern. Therefore, strict waste management protocols and activity specific EMPr guidelines should be adhered to during the construction activities.

Loss of Agricultural Land Capability

The land capability loss is anticipated to range between medium low for Bonheim due to the limited areal extent of these soils, and low for Mispah and Glenrosa as these soils are not considered ideal for cultivation, attributable to their shallow nature and high erosion hazard. From a land capability perspective, Witbank (Anthrosols) soils have no bearing on agricultural production, and as such the impacts on these soils is anticipated to be low.

1.g.vi.3.a.2 Ecology

The impact assessment was undertaken on all aspects of floral ecology deemed likely to be affected by the proposed five projects.

Direct impacts on floral habitat and species diversity will be greatest during the construction phase, with secondary impacts from poorly managed edge effects (e.g., AIP proliferation, disturbed areas left unrehabilitated and erosion) to be most significant during the operational and maintenance phases.

The impacts will be limited in their extent and the perceived effects on floral ecology can be kept to a local scale with sufficiently implemented mitigation measures. The decommissioning and closure phase pose the opportunity for positive impacts if vegetation is adequately reinstated in these areas. Impacts on protected floral species will be higher during the construction phase when vegetation clearance activities take place. Prior to clearance activities, permits for the relocation/ destruction of any floral species of conservation importance must be obtained from the relevant authorities. Relocation of geophytes and succulent species of conservation importance on site will likely be successful, with woody species more likely requiring destruction, unless individuals are small and can be relocated. It is important that if a species is destroyed, the same species is currently being grown in the Dwarsrivier nursery and that these species are reinstated as part of rehabilitation activities. Impacts during the operational phase can be reduced to lower impact significance provided edge effects are managed and that all mitigation measures are implemented.

<u>Impact on Floral Habitat and Diversity</u>

The impact assessment was undertaken on all aspects of floral ecology deemed likely to be affected by the proposed five projects. The proposed five projects will result in the clearance of vegetation that is of intermediate to moderately high sensitivity. Prior to mitigation measures implemented, impact significance on floral habitat and diversity varies between Medium-Low and Very Low. With mitigation measures implemented, the direct and indirect impacts on the floral habitat and diversity can mostly be reduced to Low and Very low significances. The most significant impacts to the floral habitat integrity and species diversity resulting from the proposed five projects during the construction phase include, but are not limited to, the following:

- Clearance of floral species within the proposed footprint areas as well as nationally and provincially protected floral species;
- Habitat fragmented and reduced dispersal opportunities for plant species as the disturbed / impacted areas will be less attractive to faunal species who are important mechanisms for seed dispersal;
- Increase risk of erosion and poor stormwater management - resulting in loss of soils, the down-slope sedimentation of habitat and the consequent loss of habitat beyond the planned footprint; and
- AIP proliferation and woody encroachment into natural vegetation, displacing indigenous flora and altering favourable habitat conditions for the establishment of indigenous species.

<u>Impacts on Floral SCC</u>

The proposed five projects are associated with floral species of conservation importance, which will likely be directly impacted by the proposed activities. Such species recorded on site (*Sclerocarya birrea* subsp. *caffra*) is protected under the NFA. Additionally, there is an increased chance that several other NFA and LEMA listed floral species of conservation importance may occur within the footprint areas.

Without mitigation implemented, the anticipated impact significance on floral species of conservation importance communities varies between Medium Low and Very Low. The impacts on species of conservation importancev are deemed to be mitigatable and thus with mitigation measures implemented, the impact significance can be reduced to Low and Very low significance levels.

The proposed five projects are not anticipated to have a high impact on floral species of conservation importance and with mitigation measures implemented the impacts can remain localised in extent. Succulents and geophytes are good candidates for rescue and relocation to suitable sites outside of the proposed footprints, either to surrounding natural habitat or to the Dwarsrivier nursery. Woody species are less likely to be successfully relocated, especially larger individuals. Where woody SCC species are to be cleared and not relocated, it must be ensured that the same species are currently being propagated in the nursery. If this is not the case, seeds can be harvested from the surrounding areas and/or from the individuals that will be cleared as part of vegetation clearing activities to be propagated off-site and reinstated as part of rehabilitation activities.

Activities which are likely to negatively affect the flora of conservation concern within and around the proposed five projects include, but are not limited to, the following:

- Disturbance, fragmentation and alteration of floral species of conservation importance habitat;
- Destruction, removal or harvesting of floral species of conservation importance during construction and operational activities; and
- Potentially poorly implemented and monitored rescue and relocation of species of conservation importance or not ensuring that the same species are being propagated in the Dwarsrivier nursery.

<u>Impact on CBAs, ESAs, Threatened Vegetation and Protected Areas</u>

According to the desktop database, the proposed five projects will impact on a CBA 1 and the Sekhukhune Mountainlands threatened ecosystem, however, following the site assessment this is more accurately only applicable to the PCD of Project 1 and the footprint areas of Project 2. The remaining areas associated with the TSF (Project 1) and Projects 3-5 have all been impacted on and are associated with the active mining footprint.

According to the desktop database, a small portion of Project 4 will impact on an ESA however, this section of the ESA has been degraded in terms of habitat integrity and is located within the active mining area.

NOTE: Important to note that Subsequent to the specialist assessments, the CBAs for the Sekhukhune District Municipality were updated to align these with the Sekhukhune District Bioregional Plan, and the current mining area, including the proposed project footprint areas, no longer falls within a CBA, but still in a listed threatened ecosystem. This report therefore still refers to CBAs, as it has minimal impact on the assessment. It should also be noted that based on current available information, the Sekhukhune Mountainlands threatened ecosystem is proposed to fall away once the Draft Revised Threatened Ecosystem Regulations of 2021 are promulgated. The Sekhukhune Mountainlands threatened ecosystem is however still in place, in line with the undertaking of the current specialist studies.

<u>Probable Residual Impacts</u>

Even with extensive mitigation, residual impacts on the receiving floral ecological environment are deemed likely. The following points highlight the key latent impacts that have been identified:

- Fragmentation of ecologically intact habitat resulting in altered ecological functioning of habitat beyond the authorised projects, notably Project 2;
- Potential further loss of and altered floral species diversity outside of the footprint areas, including loss of favourable habitat for species of conservation importance if effects from AIP proliferation and the intensification of woody encroachment are not managed; and
- Loss of NFA protected tree species as a result of vegetation clearing and/or potential harvesting in the region.

<u>Cumulative Impacts</u>

A significant threat for the floral ecology associated with the five projects is the potential proliferation of AIP species and particularly a potential for indigenous bush encroachment, resulting in the overall loss of native floral communities within the local area.

1.g.vi.3.a.3 Faunal Impacts

Direct impacts on faunal habitat and species diversity will be greatest during the construction phase with secondary impacts stemming from poorly managed edge effects and potential hunting/snaring of species during this phase. During the operational phase, these impacts will decrease as there will be less people on site and less vehicles movement, however habitat fragmentation, noise and dust pollution leading to reduced faunal movement and habitat availability/utilisation is considered the greatest impact. The impacts will be limited in their extent and the perceived effects on faunal ecology can be kept to a local scale with sufficiently implemented mitigation measures.

Potential impacts on protected faunal species are expected to be higher during the construction phase during which vegetation is being cleared and earth moving activities are being undertaken. Impacts during the construction phase can be reduced to lower impact significance on faunal SCC provided a walk down is undertaken and all construction teams are monitored to ensure no snare or traps are set and that no species are collected for the pet/ traditional medicine trade either. Due to the limited extent of the various proposed projects impacts to faunal SCC are not anticipated to be high, provided mitigation measures are adequately implemented.

<u>Impact on Faunal Habitat and Diversity</u>

The impact assessment was undertaken on all aspects of faunal ecology deemed likely to be affected by the five proposed projects. The five proposed projects will result in the clearance of vegetation that varies from low to moderately high sensitivity. The loss of habitat will have a negative impact of faunal species diversity within the five footprint areas, however it is unlikely that such habitat loss will impact upon the overall species diversity and abundance levels of the region, due to the small extents of the footprints. Impacts to the low and intermediate sensitivity habitats are considered to be Very low to Low in significance. Impacts to areas of increased sensitivity can also be maintained at low impact significances, provided all mitigation measures are implemented and the overall extent of the five proposed projects remains within, or smaller than, the proposed footprint areas.

Most significant impacts that will affect faunal habitat and species diversity as a result of the five proposed projects during the construction phase include, but are not limited to, the following:

- Clearance of habitat leading to the displacement of faunal species;

- Habitat fragmented and resulting in reduced movement of species and potentially reduced dispersal opportunities;
- Increased risk of trapping / snaring and the potential collection for the pet / traditional medicine trade; and
- AIP proliferation and woody encroachment into natural vegetation, displacing indigenous vegetation and altering favourable habitat conditions for faunal species.

Impacts on Faunal SCC

The five proposed projects are associated with habitats that are known to host faunal SCC, notably the Sekhukhune Mountain Bushveld habitat. The remaining habitats may serve as intermediary or transitionary habitats for such species, but not permanent habitat. One SCC was recorded on site, namely *Pycna sylvia* (Cicada) whilst *Python natalensis* (African Python, VU) has also been recorded in the adjacent areas. Panthera pardus (Leopard, Vulnerable, TOPS Listed), *Parahyaena brunnea* (Brown hyaena, NT, TOPS Listed), *Sagittarius serpentarius* (Secretary bird, VU), *Polemaetus bellicosus* (Martial Eagle, VU) and *Neotis denhami* (Denham's Bustard, NT) are also considered to have a medium probability of occurring, however such occurrences are likely to be transitionary and not permanent, as the footprint areas are not sufficient in extent to permanently host these species nor are there sufficient food resources within the five proposed project footprint areas alone to support these species. Mammalian, avifaunal and some reptilian SCC are likely to maintain large home ranges that will far exceed the extent of the five proposed project footprint areas. Due to the small project footprint extents and ability of many of the SCC to relocate ahead of construction activities, impacts stemming from the proposed projects are not expected to pose a significant risk to these species.

Without mitigation implemented, the anticipated impact significance on faunal SCC varies between Very-Low to Medium Low. The impacts on SCC are deemed to be mitigatable and thus with mitigation measures implemented, the impact significance can be reduced to Low to Very low levels.

Probable Residual Impacts

Even with extensive mitigation, residual impacts on the receiving faunal ecological environment are likely. The following points highlight the key residual impacts that have been identified:

- Loss of / altered faunal species diversity in the footprint areas and the areas adjacent to the proposed projects;
- Edge effects such as habitat fragmentation, AIP proliferation and bush encroachment limiting faunal species habitat utilisation
- Potential further loss of SCC/protected faunal species and suitable habitat for such species; and
- It is unlikely that disturbed areas will be rehabilitated to an ecologically functioning state resulting in significant loss of habitat and species diversity, with reinstatement to pre-mining levels being unlikely.

Cumulative Impacts

The Dwars Valley and notably the Sekhukhune Mountain Bushveld vegetation habitat has, over the years, been exposed to significant impacts in terms of vegetation clearance for mining development. This has led to a notable decrease in species diversity and abundance levels in the region. The remaining intact areas are as such becoming of increased importance for the remaining species. The five proposed projects will result in the loss of habitat, pushing species within those areas into the adjacent remaining habitats. This may result in increased competition for space and food resources, potentially leading to further loss of species. It is important to note that the TRP mine has recently constructed a new TSF pipeline between the two proposed footprints of Project 2, further adding to the cumulative loss of habitat and species displacement in that area. Projects 1 and 3 - 5 are all located adjacent to the current Dwarsrivier active mining footprint and as such, these projects will further add to the cumulative loss of habitat in this area, although much of this habitat has already been somewhat disturbed. Such additional impacts will, however add to potential long term impacts and rehabilitation efforts during mine closure.

1.g.vi.3.a.4 Freshwater Ecosystems

There are four key ecological impacts on the watercourses that are anticipated to occur namely:

Loss of habitat and ecological structure

- Decreased ecoservice provision; and
- Further proliferation of alien vegetation or increased bush encroachment as a result of disturbances.
- Potential loss of biodiversity, aquatic taxa, riparian habitat.

Changes to the sociocultural and service provision

- Altered vegetation community structure and diversity due to moisture stress and changes to goods and service provision;
- Decreased ecoservice provision and biodiversity maintenance capacity
- Reduction in volume of water entering the watercourse, leading to loss of recharge of the watercourse;

Impacts on the hydrology and sediment balance

- Exposure of soil, leading to increased runoff, erosion and stream incision, and thus potentially increased sedimentation of the Dwars River;
- Potential of backfill material to enter the downgradient watercourse, increasing the sediment load of the watercourse
- Increased flood peaks into the watercourse as a result of formalisation and concentration of surface runoff

Impacts on water quality

- Increased sedimentation of the watercourse may lead to smothering of flora and benthic biota and potentially further alter surface water quality;
- Potential impacts on the water quality of runoff which may potentially enter the downgradient watercourse and contamination of soils
- Potential impacts on water quality due to leaks and spills from construction machinery and increased sediment availability.

1.g.vi.3.a.5 Hydrology

The following impacts which will require management have been identified:

- Erosion of exposed soils leading to siltation and sedimentation of downslope drainage channels.
- Potential hydrocarbon spillages washed into downslope drainage channels.
- Due to the small size of the TSF and Capital Projects, the loss of contributing area will be negligible (less than 0.5 %) in comparison to the runoff area of quaternary catchment B41G.
- According to the 1:50 000 topographical map 2430CC Kennedy's Vale, a non-perennial drainage line runs along the north-eastern boundary of the Khulu TSF site. This area was assessed on the site visit and it was noted that the area was highly disturbed by what appeared to be old stockpiles and borrow pits, most likely from previous road construction in the area. Water is likely to pond in this area as a result of the disturbance, and therefore it is highly unlikely that this area functions as a drainage line.

1.g.vi.3.a.6 Hydrogeology

The study considered the following:

- Potential leakage through liners;
- Pathway and receptors.

Three scenarios will be evaluated to test the impact of liner failure on the aquifers:

- Scenario 1: Good liner installation for the Khulu TSF and PCD. Exposure to the atmosphere is managed and limited to a minimum, resulting in a life of liner of 280 years. During this time, it is assumed that seepage will be collected above and below the TSF and PCD liner and that this water will be transferred to the PCD. No seepage is therefore expected to infiltrate to the underlying aquifers. This is considered the best case scenario.
- Scenario 2: Good liner installation for the Khulu TSF and PCD. Exposure to the atmosphere cannot be managed, resulting in a life of liner of 69 years. After 69 years, the liner starts seeping into the aquifers according to the rates presented in Table 56.
- Scenario 3: Poor liner installation for the Khulu TSF and PCD. Exposure to the atmosphere cannot be managed, resulting in a life of liner of 69 years. After 69 years, the liner starts seeping into the aquifers at the maximum rate. This is considered the worst case scenario.

In addition to the three scenarios listed above, a no project option was also evaluated. During this simulation, it was assumed that the Khulu TSF and PCD will not be constructed.

In order to integrate the impact of other activities that may impact on groundwater quality during simulations, the 2020 Annual Rehabilitation Plan (Digby Wells, 2020) was used to assess rehabilitation measures that will be considered as part of simulations. Please refer to Section 11.3 and 11.4 of the Numerical Model for further information in this regard (Annexure 11).

1.g.vi.3.a.6.1 Potential Leakage Through Liners

The potential seepage rate through the liner system was calculated by JAW (2021f). The seepage rate was estimated based on the method developed by Rowe (2012). Parameters used for the calculation of the expected leakage rate is presented in Table 57. A description of the liner designs is presented in Section 1.d.ii.1.d and 1.d.ii.1.e, as well as Table 12.

Table 56: Parameters assumed for leakage rate calculations (JAW, 2021)

Parameter	Assumed value	Unit
Hydraulic conductivity of clay layer	1E-09 (0.000000001)	m/s
Hydraulic conductivity of attenuation later	1E-04 (0.0001)	m/s
Wrinkle width	0.1	m
Length of connected wrinkle	20	m
Wrinkles per hectare	3	

Based on a good liner installation, the estimated seepage through the liner to be installed underneath the Khulu TSF is 2.4E-2m^3/d per ha (0.024m^3/ha). If proper quality control is not implemented and the liner system is constructed poorly, this seepage rate may increase to 2.7m^3/d per ha. The Khulu TSF design includes a below liner drainage system designed to collect seepage through the liner and the relieve possible pressure build up under the liner. The below liner drainage system is designed to remove the seepage volumes calculated.

Similar calculations were made for the Khulu TSF PCD. The results indicate that the seepage rate through the PCD liner is around 4.7E-1m^3/d per ha (0.47m^3/ha). The below liner drainage system is however designed to remove 23 times more seepage than the estimated volume. With good installation, no seepage should escape the liner system and therefore no seepage is expected to reach the underlying aquifers.

JAW (2021) estimate that the life of the Khulu TSF liner is 69 years, which could be extended to 280 years if the HDPE liner is covered with tailings and not exposed to excessive ambient temperatures. The life of the Khulu TSF PCD is also estimated to be 69 years.

The leakage rates for the Khulu TSF are summarised in the following table

Table 57: Estimated leakage rates through liners

Lined facility	Measured area (ha)	Seepage through liner (m^3/d per ha)	Seepage as % of MAP	Seepage as recharge rate (m/d)
Khulu TSF (good installation)	22,5	2.4E-2 (0.024)	4%	7.48E-5 (0.0000748)
Khulu TSF (poor installation)	22,5	2.7	395%	7.39E-3 (0.00739)
Khulu TSF PCD	2,5	4.7E-1 (0.47)	69%	1.29E-4 (0.000129)

1.g.vi.3.a.6.2 Pathways and receptors

Based on the available dataset, the following aquifer pathways are identified for the project (see figure overleaf):

- Preferential flow along the alluvial aquifer, due slightly elevated permeability. This aquifer is associated with the floodplains of the rivers and streams. The Khulu TSF and PCD footprint areas are located on the alluvium. It is however noted that the designs for the facilities take the interception of seepage above and below the liners into consideration.
- Vertical flow through the soil horizon from surface sources of contamination to the underlying aquifers. The rate at which the vertical flow can take place is governed by the vertical permeability of the soils and the weathered aquifer, which was assumed to be 1/10th of the horizontal permeabilities.
- Lateral flow through the weathered and alluvial aquifers to the receiving water bodies, which are the rivers and streams down gradient of the mining area. At the Khulu TSF and PCD, the receiving water body is the Groot Dwars River.
- Vertical flow from the weathered and alluvial aquifers to the underlying fractured rock aquifer. There is no geological evidence that these two aquifers are separated by an impermeable layer. For this

reason, it is assumed that the two aquifers are interconnected (however, not a strong interconnection according to the fieldwork – see Section 1.g.v.9.e).

- Once the possible contamination reaches the fractured rock aquifer, the preferential flow paths include the N-S and SW-NE striking faults and the contact zone with the N-S striking dyke. The locations of dykes and faults were inferred from Gap Geophysics (2018) and are discussed above. Aquifer testing data from monitoring boreholes that intersect these structures confirm enhanced aquifer conditions.
- Groundwater will also flow through the rock matrix, but at much lower rates compared to the preferential pathways listed above. Flow in the rock matrix is considered insignificant in the context of this study.

The following receptors were identified:

- Watercourses associated with the rivers and streams, including the Groot and Klein Dwars Rivers.
- The Farm House borehole identified during the hydrocensus is located up gradient of the Khulu TSF and as such will not be affected by any impacts from the operation and management of tailings deposition in this area. No other private boreholes are located between the Khulu TSF and the Groot Dwars River.

The following figure presents the various source terms and sensitive receptors.

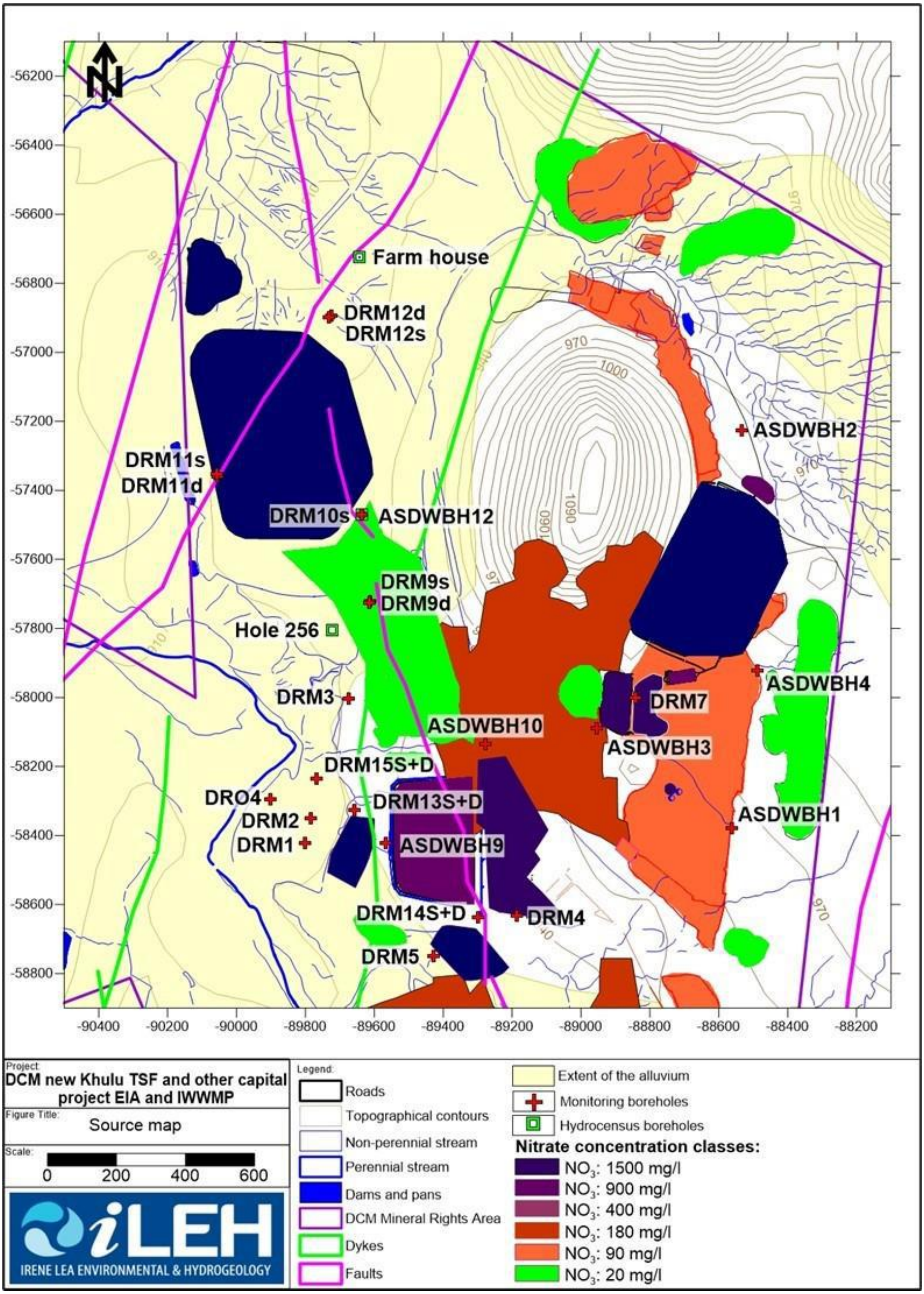


Figure 67: Source map indicating pathways and sensitive receptors

1.g.vi.3.a.6.3 Plume Delineation

The modelling results are presented as estimated nitrate concentrations in the weathered as well as the fractured rock aquifers for each scenario tested. In order to define the nitrate concentration that will be used to delineate the plumes, an assessment of the effects of nitrate on human health as well as nitrate concentrations in the receiving surface water in the Groot Dwars River was undertaken.

The effects of nitrate on human health, as described by DWAF (1997) is presented in the table below. The ranges are slightly different to that prescribed by SANS241:2015, but the information provides an indication of the expected effects with increasing concentrations of nitrate.

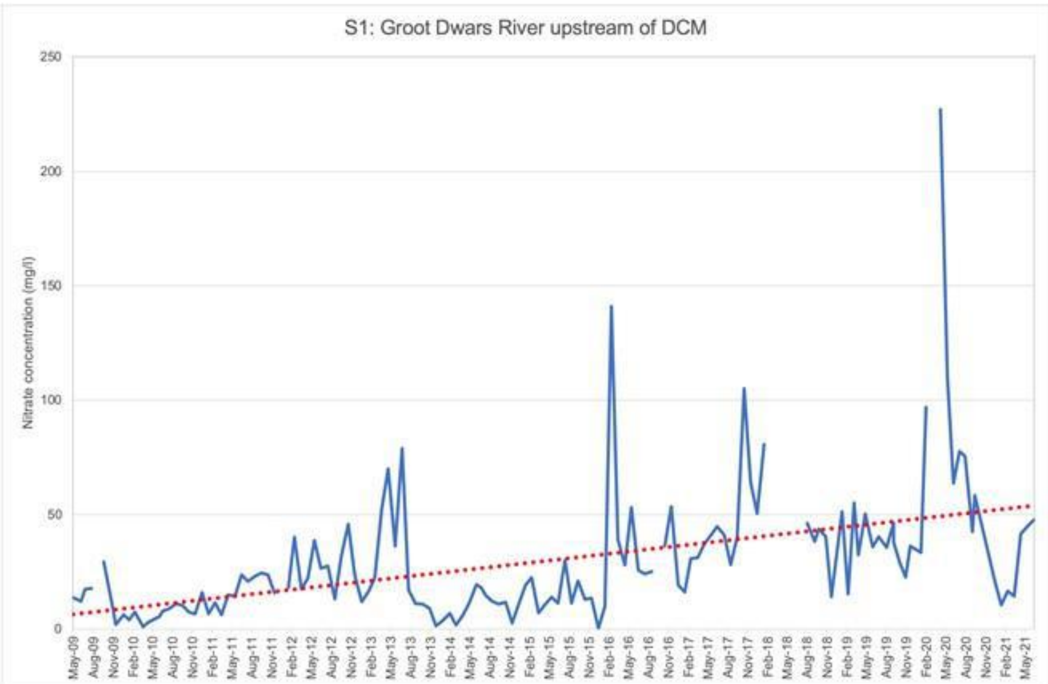
Table 58: Effects of nitrate on human health

Aluminium range (mg/l)	Effects
0 – 6	No adverse health effects
6 - 10	Rare instances of methemoglobinemia in infants, no effects in adults. Concentrations in this range is generally well tolerated. The SANS241:2015 standard is 11 mg/l.
10 - 20	Methemoglobinemia may occur in infants. No effects in adults
>20	Methemoglobinemia occurs in infants. Occurrence of mucous membrane irritation in adults

The 11mg/l nitrate concentration contour will also be indicated as reference on the delineated plumes discussed below. This is the SANS241:2015 standard for nitrate for domestic use.

Dwarsrivier Mine monitoring information indicates that the receiving water quality in the Groot Dwars River already exhibits elevated nitrate concentrations, as shown in the graph below. Since monitoring commenced in 2009, nitrate concentrations increased from below 6 mg/l on average to above 50mg/l at present. The average long-term nitrate concentration for this upstream sampling position is 30mg/l, which exceeds the highest concentration to assess human health presented in the table before.

It is likely that upstream impacts also affect groundwater quality in the Dwarsrivier Mine mining area. In order to consider this impact, not associated with the Dwarsrivier Mine operations, the 30mg/l nitrate concentration contour line will be used to delineate the plumes associated with the operations.



Graph 13: Nitrate concentrations in the receiving water quality

The shape of the plume is defined by aquifer conditions as described above. The alluvium associated with the watercourses is assumed to be a preferential flow path due to a higher anticipated permeabilities compared to for example fresh rock matrix. Flow in this aquifer will be controlled by the elevation of water in the Klein Dwars River and its tributaries. This elevation was inferred from the Digital Terrain Model (DTM) generated for the project area.

In the fractured rock aquifer the N-S and SW-NE striking faults and the N-S striking dyke are preferential flow paths and were included in the model according to the discussion above. Available information suggests that these regional geological structures do not extend to surface and will therefore not impact on groundwater flow in the weathered aquifer. The exception of this is in the plant area, where elevated transmissivities were calculated for both the shallow weathered and deeper fractured rock aquifer for DRM14S and D. This borehole is situated on the IRUP structure and the N-S striking fault (in the current plant area). Infiltration of contaminated water in this area is expected to flow in a northerly direction along the N-S striking fault.

Flow in unfractured rock matrix is expected to be very slow due to low permeabilities/transmissivities.

The following general observations are made, based on the outcome of simulations:

- The shape of the plumes are delineated by the presence of preferential flow paths, as well as the permeabilities of the rock formations in the weathered and fractured rock aquifers. The effect of this difference in permeability is that potential contamination will move further in the fractured rock aquifer with time. However, dilution from throughflow of clean groundwater is also expected to play a more significant role compared to that in the weathered aquifer.
- In the weathered aquifer, the flow is largely controlled by the position and the interpolated water level elevation in the Klein Dwars River.
- The simulated extent of the nitrate plume is presented separately for the weathered and fractured rock aquifers in the discussion below.
- At the sources of groundwater contamination on surface, the most significant impact of the project is on the shallow weathered aquifer, including weathered pyroxenite and alluvium. Due to the perceived low rate at which groundwater moves vertically from the weathered to the fractured rock aquifer, the impact on the underlying fractured rock aquifer is less pronounced.

Long-term simulations were run for a period of 300 years after mine closure in order to assess the long-term impact of liner failure on groundwater quality. If the liners are well installed and not exposed to the atmosphere for excessive periods of time, the life of the liner is expected to be 280 years (JAW, 2021).

1.g.vi.3.a.6.4 Anticipated Impacts at the end of the Operational Phase

The model was used to assess the impact on groundwater quality at the end of the operational phase. This was assumed to coincide with the end of life of the Khulu TSF, which is indicated as 21 years.

During the operational phase, it is assumed that the liner at the TSF and the PCD will remain intact and that seepage from the tailings material will be collected above and below the drains to installed. As such, no significant seepage from the Khulu TSF to the underlying aquifers is expected.

Impacts associated with other sources of contamination to groundwater, including the plant, the historical TSF (before it is reworked), the dirty water dams, pit backfill areas and the underground workings are assumed to continue to impact over the life of the operations. It is noted that Dwarsrivier Mine is in the process of developing a groundwater remediation strategy to reduce nitrate concentrations in groundwater in the plant area. This project will be evaluated in a separate study.

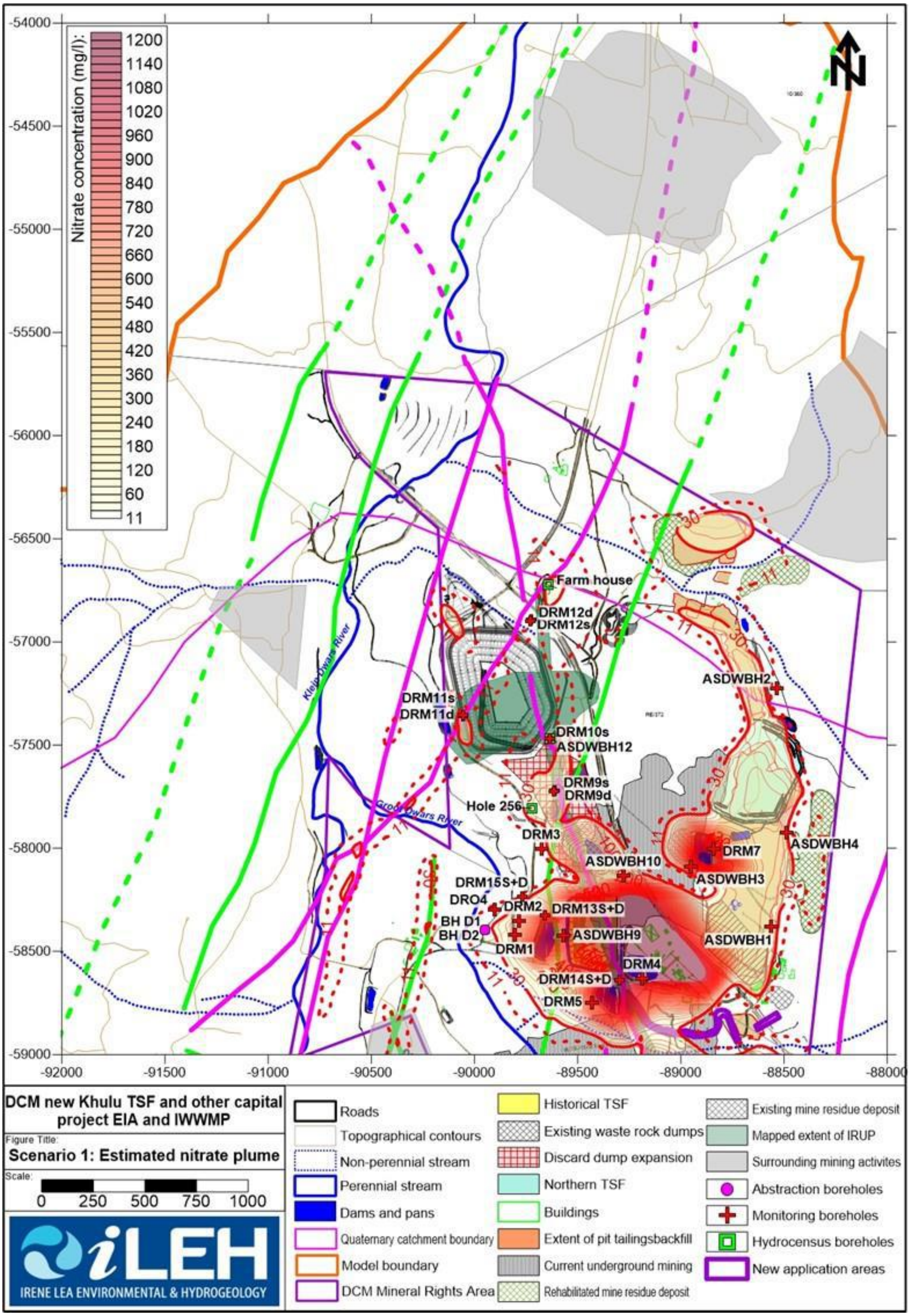


Figure 68: Simulated NO_3 plume at the end of the operational phase in the weathered aquifer

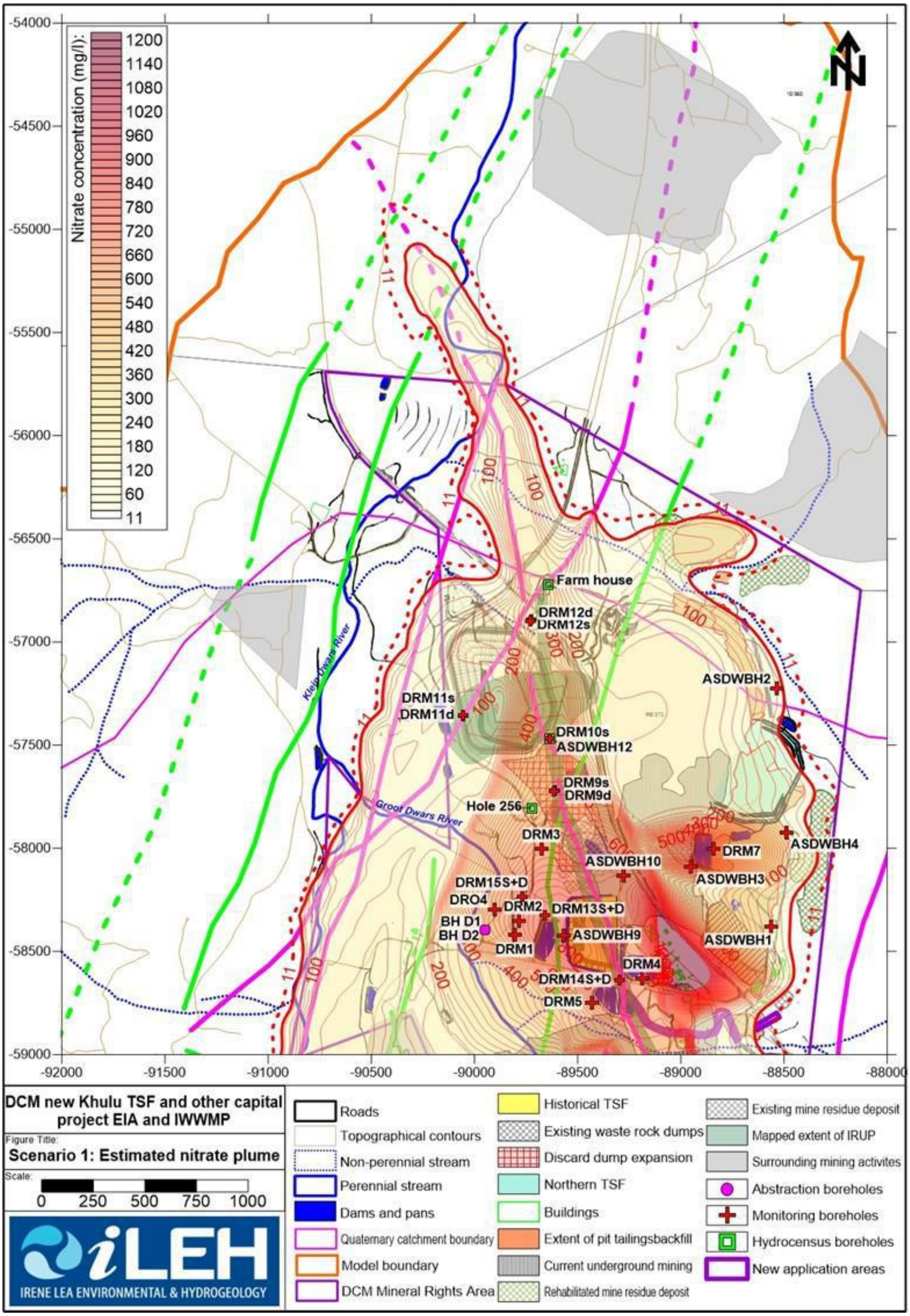


Figure 69: Simulated NO_3 plume at the end of the operational phase in the fractured aquifer

The results of the simulations to estimate the impact at the end of the operational phase, as presented in Figure 68 and Figure 69, indicate the following:

- Nitrate contamination in the weathered aquifer will be contained to the plant and opencast mining areas, as indicated in Figure 68. Based on the current characterisation of the alluvial aquifer, it is unlikely that nitrate concentrations in the weathered aquifer would exceed 11mg/l in the vicinity of the Groot Dwars River.
- No significant impact is expected on the shallow weathered and alluvial aquifers during the operational phase. Nitrate concentrations in these aquifers at the Khulu TSF footprint are expected to remain below 11 mg/l in general.
- No impact on groundwater quality is expected in the vicinity of the Klein Dwars River west and northwest of the Khulu TSF and PCD at the end of the operational phase.
- Based on the conceptualisation of preferential groundwater flow in the fractured rock aquifer, the nitrate plume is expected to migrate in a northerly direction along the N-S striking fault. This contamination originates from the plant, historical TSF, dirty water dams, open cast and underground mining areas and not from the Khulu TSF and PCD.
- At the Khulu TSF footprint, nitrate concentrations may increase to above 400mg/l along the fault line. It is likely that the plume may migrate more than 500m north of the Dwarsrivier Mine mineral rights boundary by the end of the operational phase. The extent to which contamination may migrate from existing mining and mineral processing activities will depend on the manner in which the sources to groundwater are managed, as well as the permeability and porosity of the preferential flow path.
- As noted above, Dwarsrivier Mine is in the process of developing a groundwater remediation strategy to address existing nitrate contamination. This strategy will be addressed in a separate study, but it will be designed to reduce the impact on the fractured rock aquifer in the long-term.
- Nitrate concentrations in the Farm House borehole may increase to around 200mg/l by the end of the operational phase. At present, the nitrate concentration in this borehole is 46mg/l.

1.g.vi.3.a.6.5 Long Term Impacts

1.g.vi.3.a.6.5.1 No project option

A modelling scenario was run to estimate the long-term impact on groundwater quality if the Khulu TSF project does not go ahead. The estimated extent of the nitrate plumes 300 years after mine closure in the weathered and fractured rock aquifers are presented in Figure 70 and Figure 71. The following is concluded from the simulations presented:

- The simulations indicate that the nitrate plume will recede in the long-term in the weathered aquifer. Nitrate concentrations are expected to reduce to below 60 mg/l in the plant area if all sources of contamination are removed at mine closure as part of the rehabilitation programme.
- At the Khulu TSF, nitrate concentrations are not expected to significantly exceed 11mg/l in the long-term for this scenario.
- The impact on the Groot and Klein Dwars Rivers is expected to reduce significantly in the long-term for this scenario. Nitrate concentrations in groundwater reaching these rivers in the weathered and alluvial aquifers are not expected to exceed 11mg/l.
- Long-term impacts associated with leakage through the North TSF and the associated dirty water dams liners are however expected to impact on groundwater quality in the long-term. A detailed discussion of this impact falls outside the scope of this report.
- The plume in the fractured aquifer is expected to continue to migrate along the preferential flow paths and to a lesser extent in unfractured rock matrix in the long-term. Nitrate concentrations are however expected to reduce inside the affected area as a result of plume dilution from recharge of fresh rain water and groundwater throughflow. Over the footprint area of the Khulu TSF, nitrate concentrations are expected to reduce to below 160 mg/l on average.

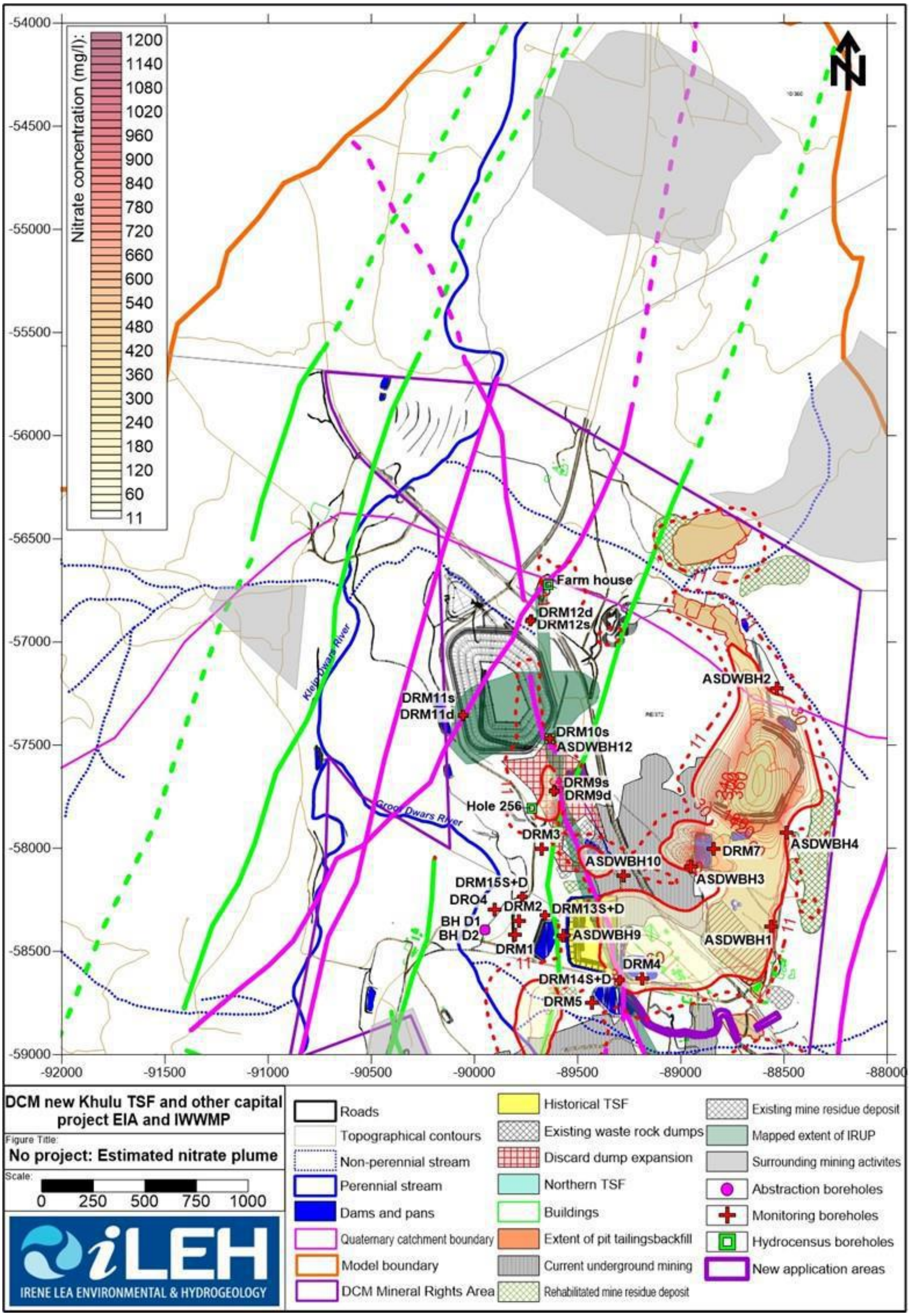


Figure 70: No project: Simulated NO_3 plume 300 years after mine closure - weathered aquifer

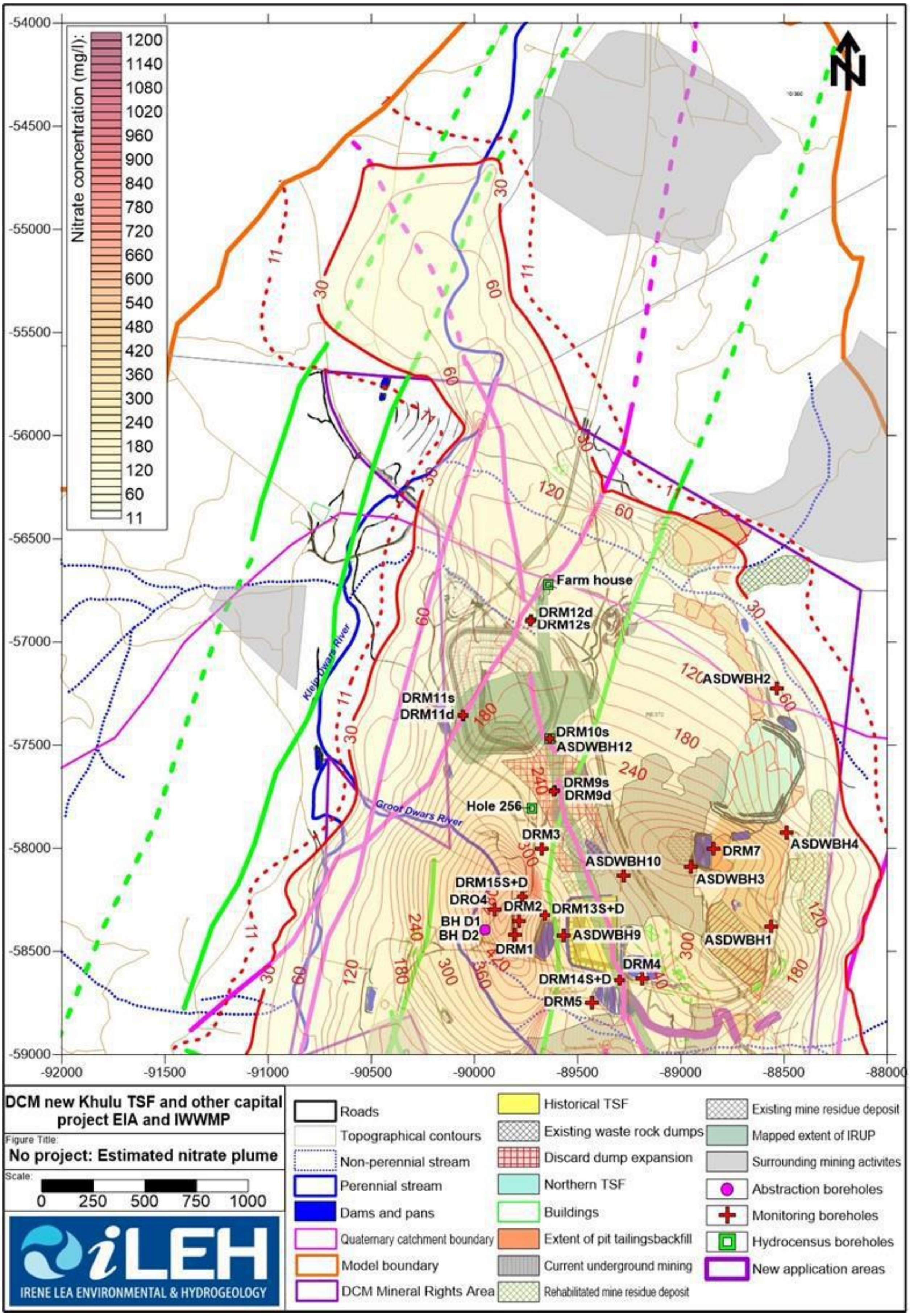


Figure 71: No project: Simulated NO_3 plume 300 years after mine closure - fractured aquifer

1.g.vi.3.a.6.5.2 Scenario 1: Good liner installation and limited exposure to the atmosphere

The long-term impacts on groundwater associated with the Khulu TSF and PCD for Scenario 1 are presented in Figure 72 and Figure 73.

This scenario assumes that the TSF and PCD liners will fail after 280 years. In this event, seepage from the TSF and PCD may reach the underlying aquifers at a rate of 0.024m^3/d per ha.

The following is concluded from the results of the simulations:

- Seepage through the TSF and PCD liners are expected to increase nitrate concentrations in the weathered aquifer underneath the footprint areas. Nitrate concentrations may increase to above 600mg/l over the footprint areas in the weathered and alluvial aquifers in the long-term.
- The nitrate plume is expected to migrate in a north-westerly direction towards the Klein Dwars River in the weathered and alluvial aquifers. At 300 years after mine closure, simulations suggest that it is unlikely that groundwater with nitrate concentrations exceeding 11mg/l would reach the Klein Dwars River from the Khulu TSF and PCD to any significant extent.
- The effect of liner failure at the Khulu TSF and PCD on the fractured rock aquifer is not expected to add significantly to the pollution load associated with other Dwarsrivier Mine mining and mineral processing activities.
- Nitrate concentrations may increase to above 180 mg/l in the fractured rock aquifer as a result of infiltration over the Khulu TSF and PCD footprint areas. This is an estimated 20mg/l increase in concentration compared to the no project option discussed above.
- The nitrate plumes originating from the Khulu TSF and PCD are expected to migrate in a northerly direction along the preferential flow paths identified. Contamination along these geological structures are however expected to be dominated by Dwarsrivier Mine mining and mineral processing activities and not significantly as a result of seepage from the Khulu TSF and PCD.
- In the long-term, nitrate concentrations in the Farm House borehole could reduce to below 100mg/l from the anticipated 200mg/l at the end of the operational phase. This borehole is located along a preferential groundwater flow path, which means that long-term plume migration will result in elevated nitrate in this borehole under the rehabilitation measures implemented.
- The nitrate plume is expected to migrate more than 900m north outside the Dwarsrivier Mine mineral rights boundary along the N-S striking in the long-term for this scenario.
- Additional measures to reduce nitrate concentrations associated with the plant and historical TSF areas will be investigated and developed as part of the Dwarsrivier Mine Groundwater Remediation Strategy, which will be undertaken in a separate study. These measures will be focussed on the preferential flow paths identified and will be geared at reducing long-term contamination.

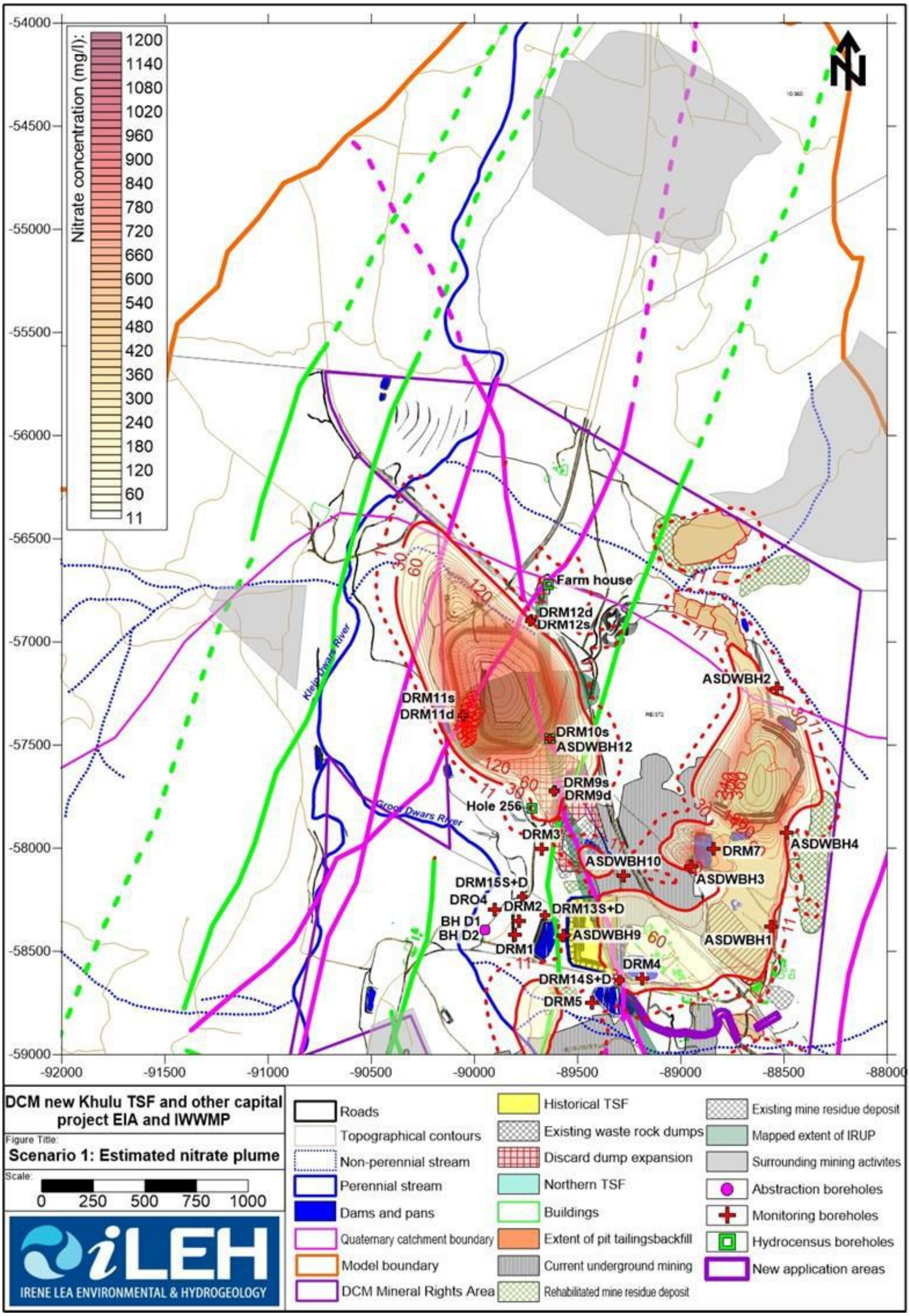


Figure 72: Scenario 1: Simulated NO_3 plume 300 years after mine closure - weathered aquifer

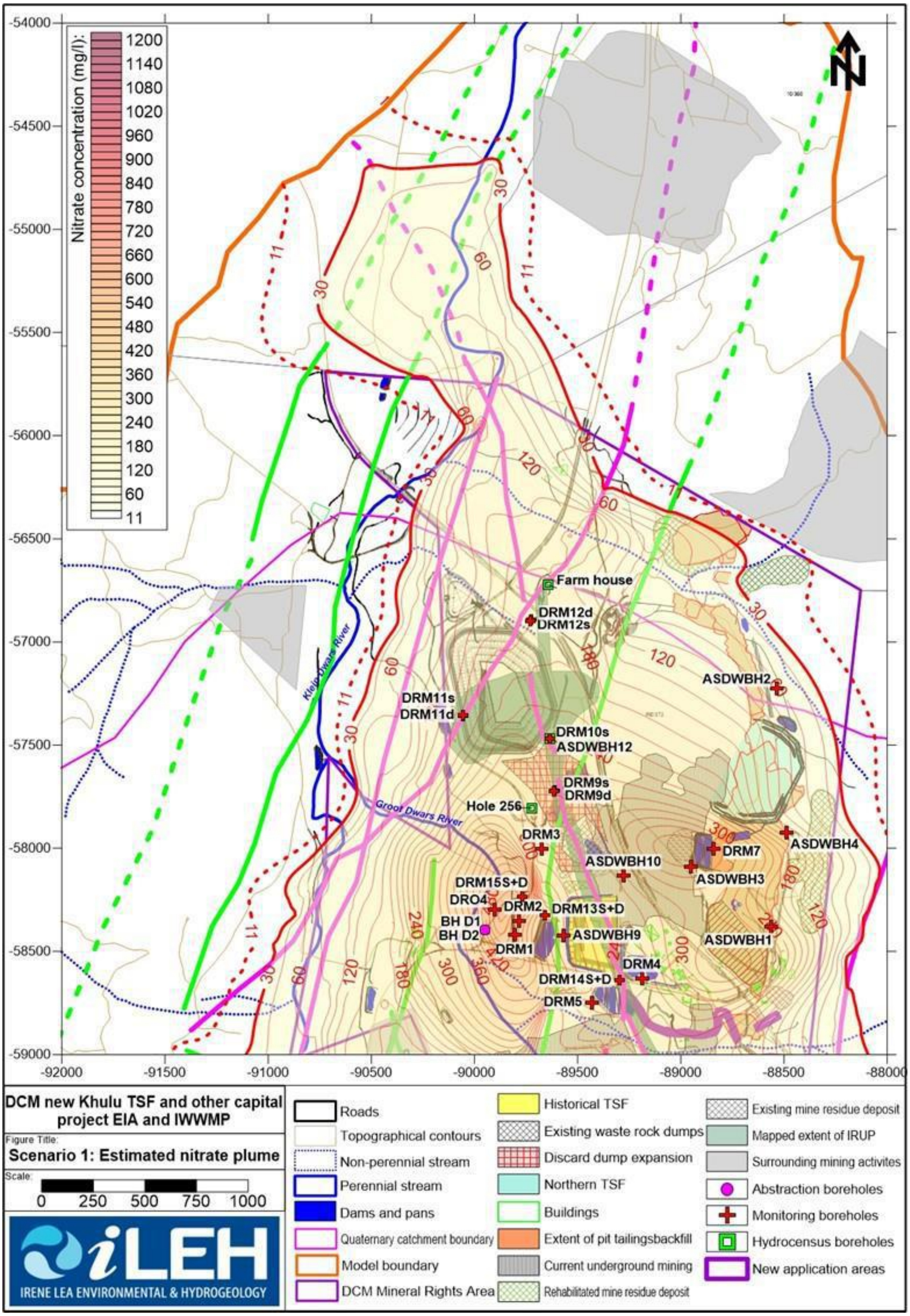


Figure 73: Scenario 1: Simulated NO_3 plume 300 years after mine closure - weathered aquifer

1.g.vi.3.a.6.5.3 Scenario 2: Good liner installation with exposure to atmosphere

Scenario 2 evaluates the long-term impact if exposure to the atmosphere results in a reduced liner life of 69 years. At this time, it is assumed that the liner would leak at a rate of 0.024 m^3/d per ha if the liner installation is good.

The results of the long-term simulations are presented in Figure 74 and Figure 75. These figures indicate the anticipated extent of the nitrate plumes 300 years after mine closure in order to ensure comparison with the output of other scenarios tested.

The following is concluded from the simulations presented:

- The extent of the impact on groundwater quality for this scenario is similar to that reported for Scenario 1. The extent of the plume is driven by aquifer parameters like permeability and porosity and to a lesser extent by the concentration gradient for Scenarios 1 and 2. This is due to the fact that the rate of seepage from the Khulu TSF liner for good installation is reported to be comparatively low, which means the concentration gradient from the source to the aquifer is low.
- Nitrate concentrations inside the delineated plumes are however expected to increase for this scenario compared to Scenario 1, as the seepage will take place for a longer period of time. The liner failure occurs after 69 years for this scenario, compared to after 280 years for Scenario 1.
- In the weathered and alluvial aquifers, nitrate concentrations may increase to above 800 mg/l in the long-term for this scenario. This is an increase of 200 mg/l compared to Scenario 1.
- The contamination is expected to migrate in a north-westerly direction towards the Klein Dwars River in the long-term. Nitrate concentrations are however not expected to significantly exceed 11mg/l in groundwater reaching the Klein Dwars River in this time.
- The nitrate plume in the fractured rock aquifer will migrate preferentially along the N-S striking fault and the other preferential flow paths identified. As reported for Scenario 1, the nitrate plume may migrate more than 900m north along the N-S striking fault outside the Dwarsrivier Mine mineral rights boundary in the long-term.
- Nitrate concentrations in the fractured rock aquifer immediately underneath the Khulu TSF and PCD may increase to above 240mg/l for this scenario. This is an increase of 60 mg/l in nitrate concentration compared to Scenario 1.
- Nitrate concentrations in at the Farm House borehole may decrease to around 170mg/l in the long-term compared to the 200mg/l expected at the end of the operational phase. This is however an increase of around 70mg/l compared to the results of Scenario 1.
- Plume movement in unfractured rock matrix is expected to be low. Nitrate concentrations in the fractured rock aquifer immediately down gradient of the Khulu TSF and PCD are not likely to exceed 11mg/l near the Klein Dwars River in the long-term.

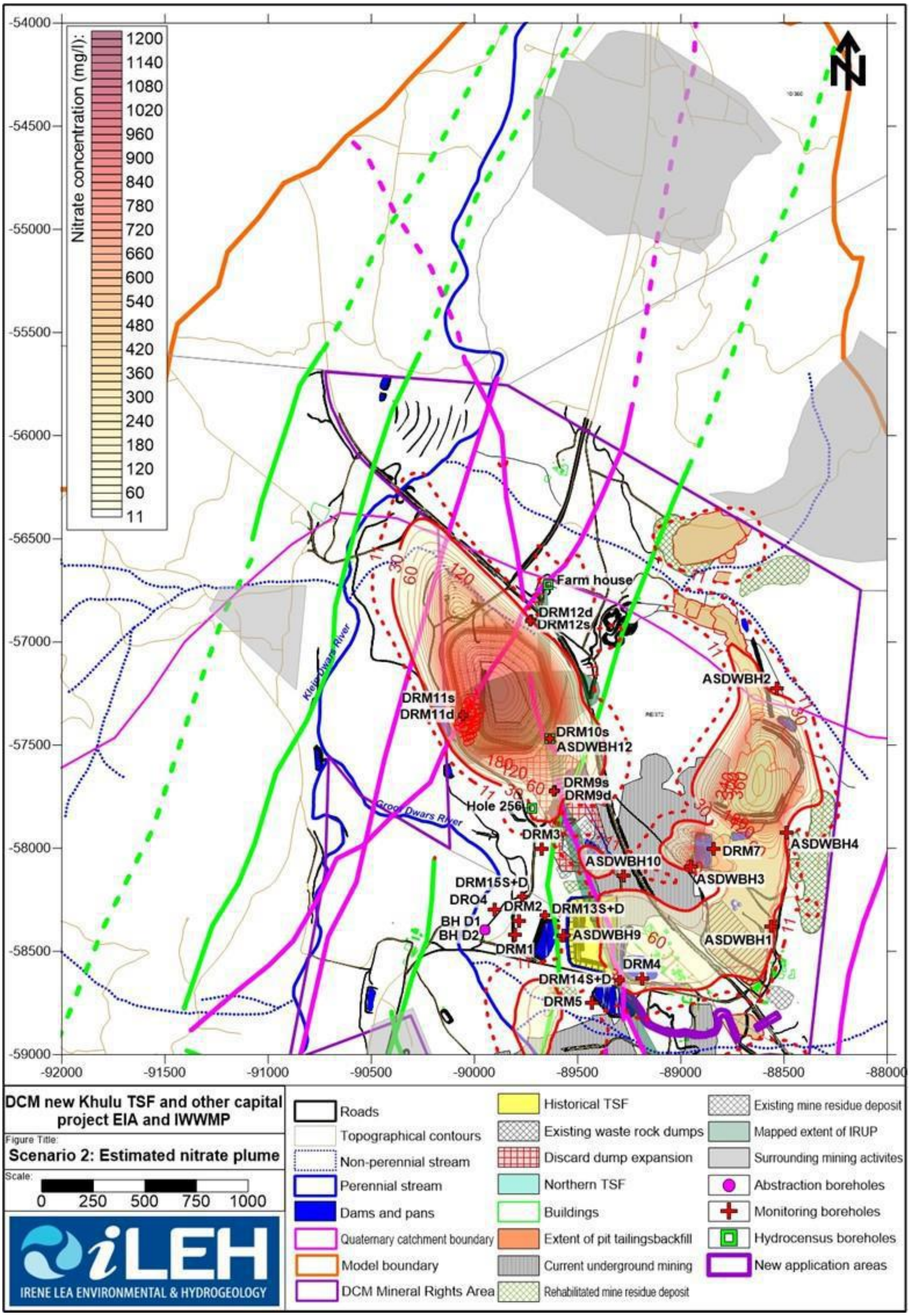


Figure 74: Scenario 2: Simulated NO_3 plume 300 years after mine closure - weathered aquifer

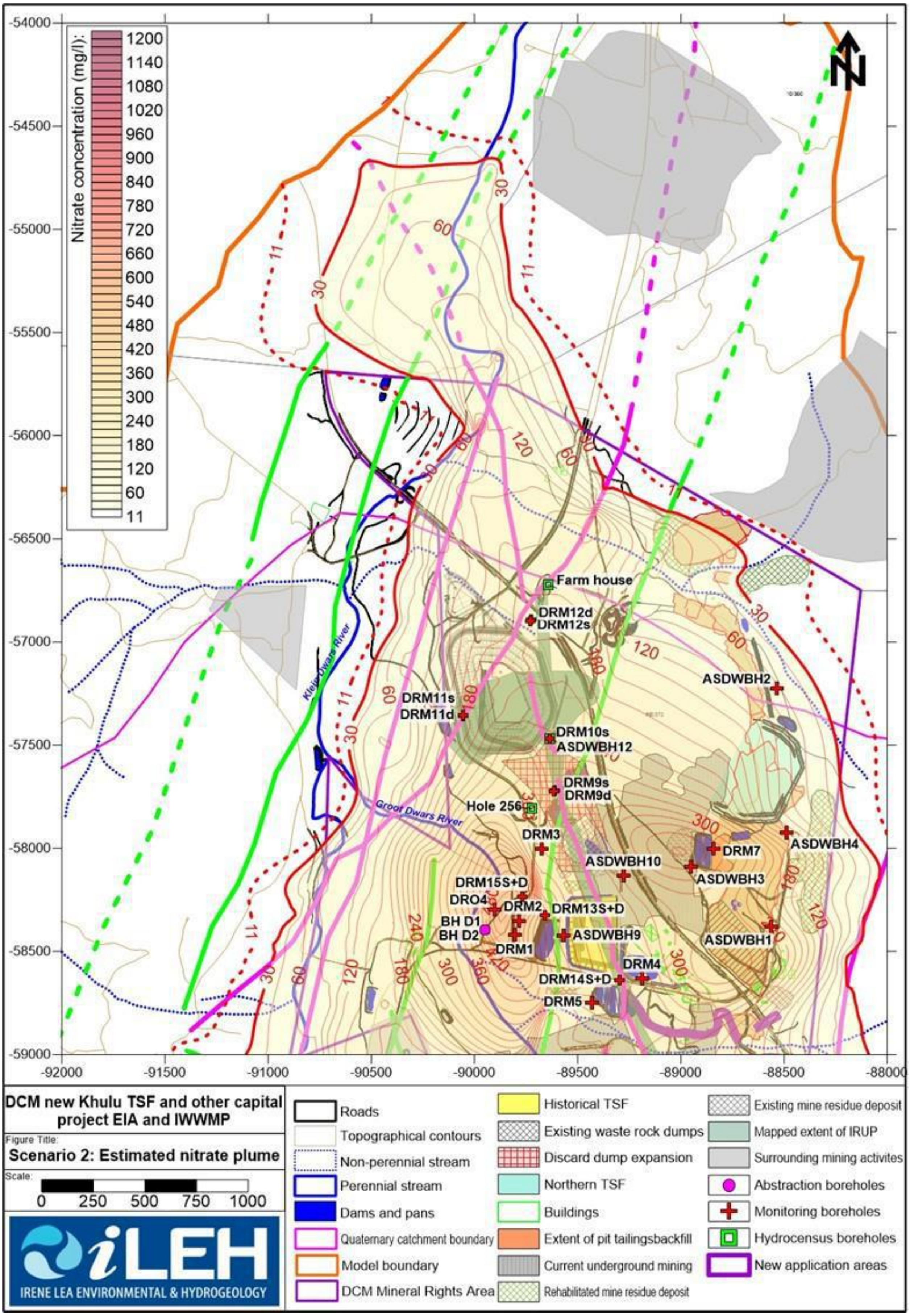


Figure 75: Scenario 2: Simulated NO_3 plume 300 years after mine closure - fractured aquifer

1.g.vi.3.a.6.5.4 Scenario 3: Poor liner installation

This scenario tests the effect if the Khulu TSF and PCD liners are poorly installed and exposed to the atmosphere. Under these conditions, the life of the liner is 69 years. At this stage, the maximum volume of seepage could infiltrate to the underlying aquifers at a reported rate of 2.2m^3/d per ha. This is the maximum volume of seepage calculated by the engineers.

The results of the simulations for Scenario 3 are presented in Figure 76 and Figure 77.

The following is concluded from the simulation results:

- Liner failure and maximum seepage rates to the underlying aquifers for this scenario is expected to result in a significant negative impact on groundwater quality. With the increased seepage rate, the concentration gradient at the Khulu TSF and PCD footprint will increase significantly, resulting in an accelerated spread of contamination in the long-term. The plume is also expected to migrate radially away from the Khulu TSF footprint area due to the high infiltration rates. A mound in groundwater levels is expected around the footprint in this case. It is noted that the rate of infiltration is significantly high and is most probably not a reality.
- The extent of the impact on the weathered and alluvial aquifers is expected to significantly increase for this scenario. Over the footprint area, nitrate concentrations may increase to 1,500 mg/l in the long-term.
- The plume is expected to migrate in a north-westerly and westerly direction towards the Klein Dwars River. Nitrate concentrations in groundwater reaching the Klein Dwars River are expected to increase to above 30 mg/l over a length of 250m along the river. In places, nitrate concentrations in groundwater reaching the Klein Dwars River in the weathered and alluvial aquifers could exceed 200mg/l for this scenario. This is expected to result in a noticeable impact on surface quality in the long-term.
- The plume is also likely to reach the Groot Dwars River southwest of the Khulu TSF due to the anticipated radial flow from the footprint area. Groundwater reaching the Groot Dwars River may have nitrate concentrations exceeding 30 mg/l over a stretch of around 200m along the river. In places, nitrate concentrations in groundwater may increase to above 150mg/l at the river. This is also expected to result in a noticeable impact on surface water quality in the long-term.
- The high seepage rates from the Khulu TSF and PCD are also expected to result in significant vertical flow to the underlying fractured rock aquifer. This is different to the outcome of Scenarios 1 and 2, where the concentration gradient under lower seepage rates did not result in significant impacts on the fractured rock aquifer.
- Once the nitrate concentrations reach the fractured rock aquifer, preferential flow is expected along the N-S and the SW-NE striking fault lines.
- Over the Khulu TSF and PCD footprint areas, nitrate concentrations may increase to above 1200 mg/l in the fractured rock aquifer for this scenario, which is a significant increase from the impacts associated with Scenarios 1 and 2.
- Along the N-S striking fault, nitrate concentrations may exceed 700mg/l in the long-term. This plume is also expected to migrate more than 1300m north and outside the Dwarsrivier Mine MRA, as indicated.
- Nitrate concentrations in the SW-NE striking fault may increase to above 1,000mg/l in the long-term. In addition, a nitrate plume is expected to migrate along this structure in a south westerly direction towards the Groot Dwars River. In the long-term, nitrate concentrations may increase to around 450mg/l in the fault line at the intersection with the Groot Dwars River.
- The groundwater mound that will develop underneath the Khulu TSF and PCD footprint areas is also expected to drive migration of the nitrate plume in the unfractured rock matrix towards the Klein Dwars River west of the site. On the long-term, this could result in an increase in nitrate concentrations in the fractured rock aquifer at the river of more than 30 mg/l, possibly as high as 50mg/l.

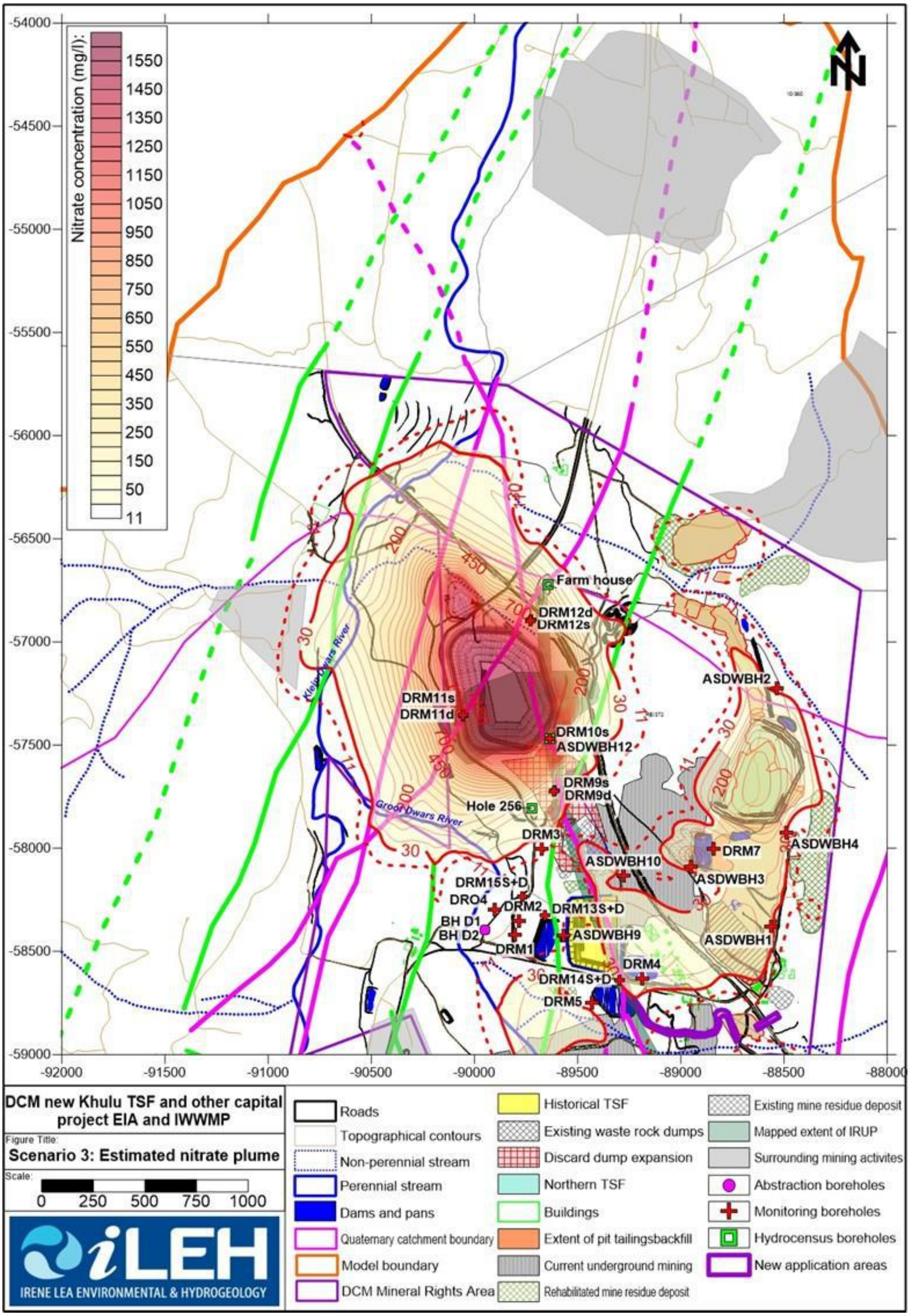


Figure 76: Scenario 3: Simulated NO_3 plume 300 years after mine closure - weathered aquifer

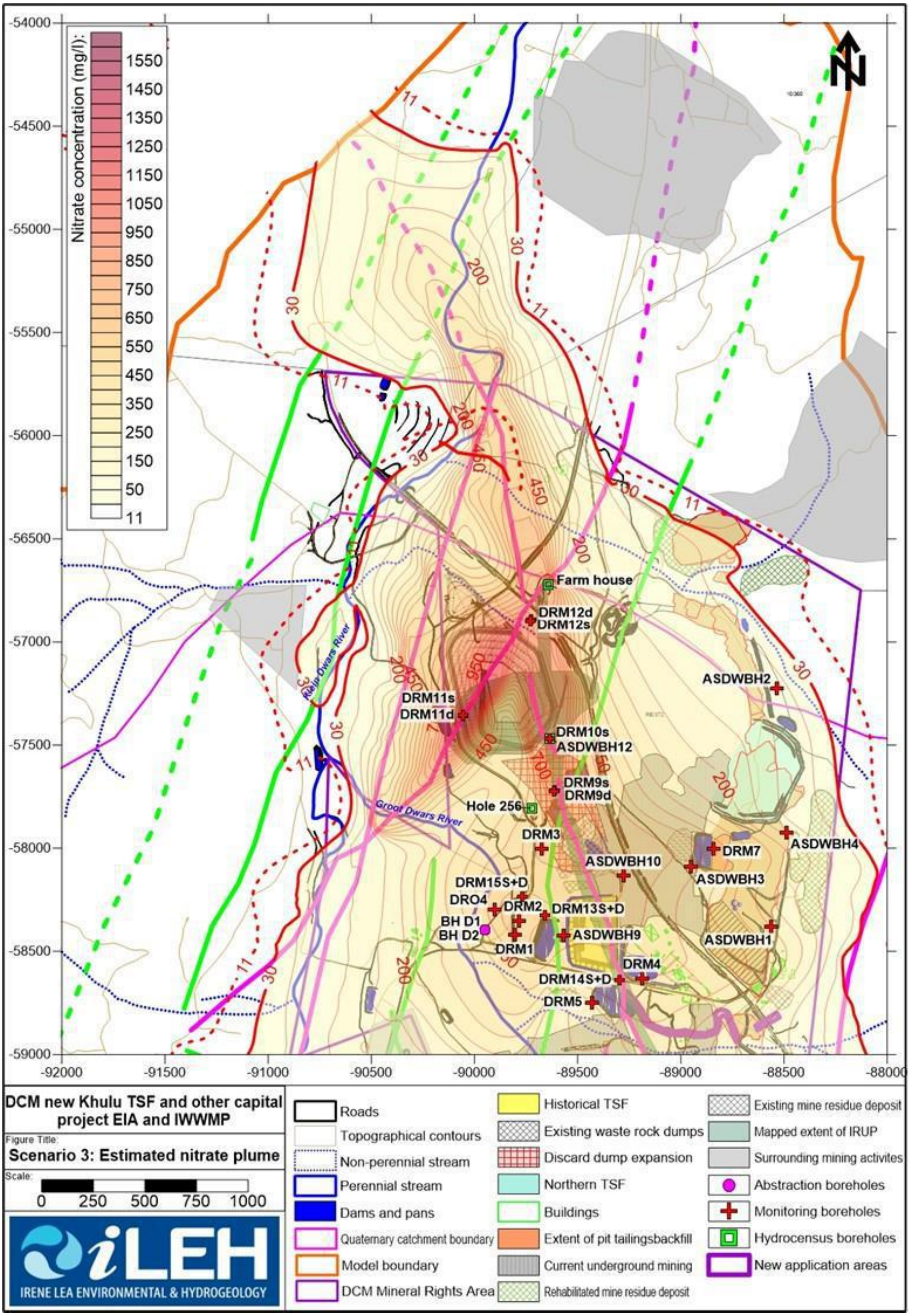


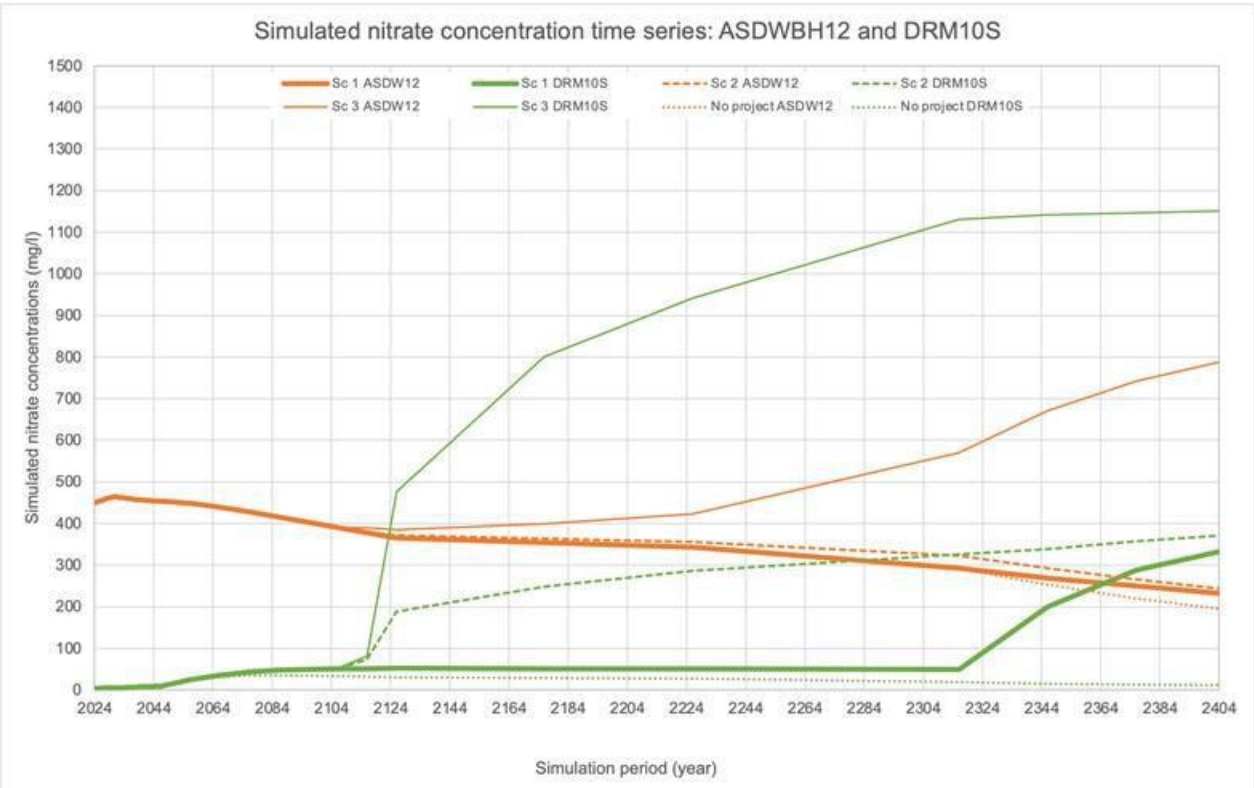
Figure 77: Scenario 3: Simulated NO_3 plume 300 years after mine closure - fractured aquifer

1.g.vi.3.a.6.6 Simulated nitrate concentration time-series evaluation

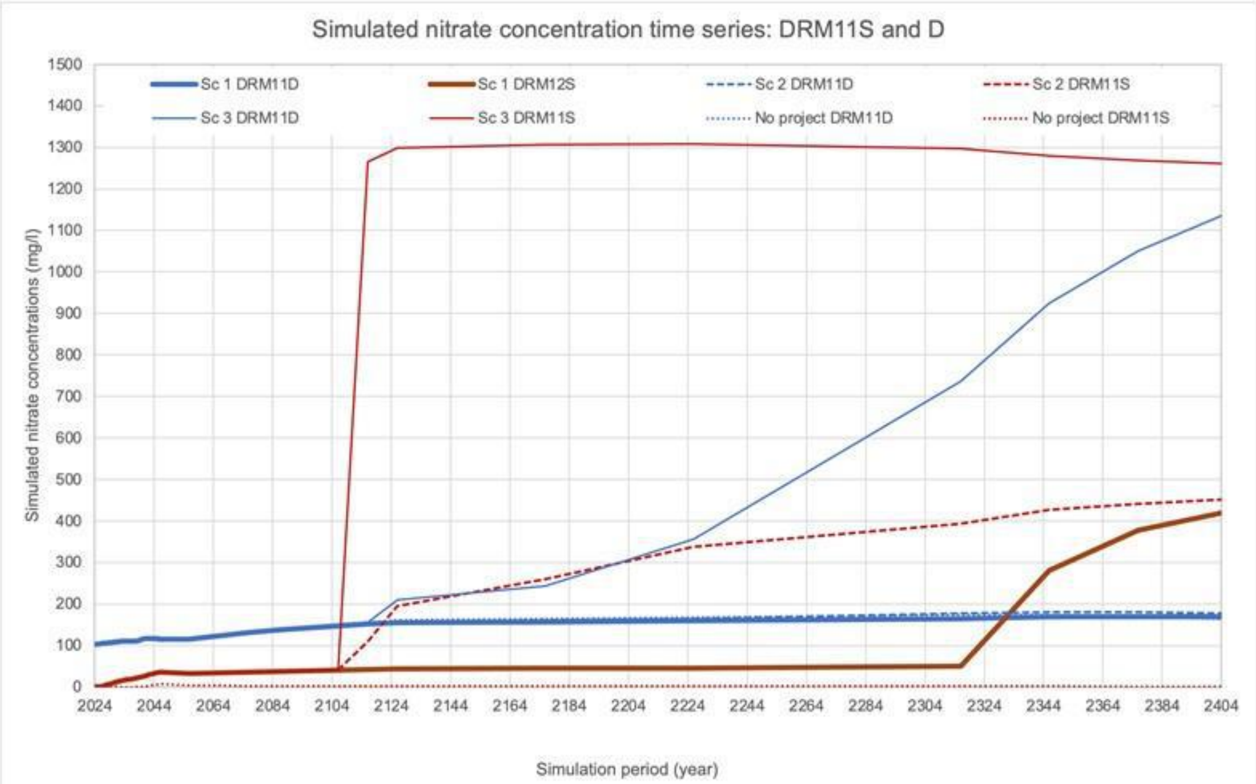
The simulated nitrate concentration time series for the three clusters of monitoring boreholes closest to the Khulu TSF footprint area are presented in the following three graphs. These graphs indicate the simulated nitrate concentrations with time for the no project option in comparison with the outcome of simulations for Scenarios 1 to 3.

The information presented confirms the following outcome:

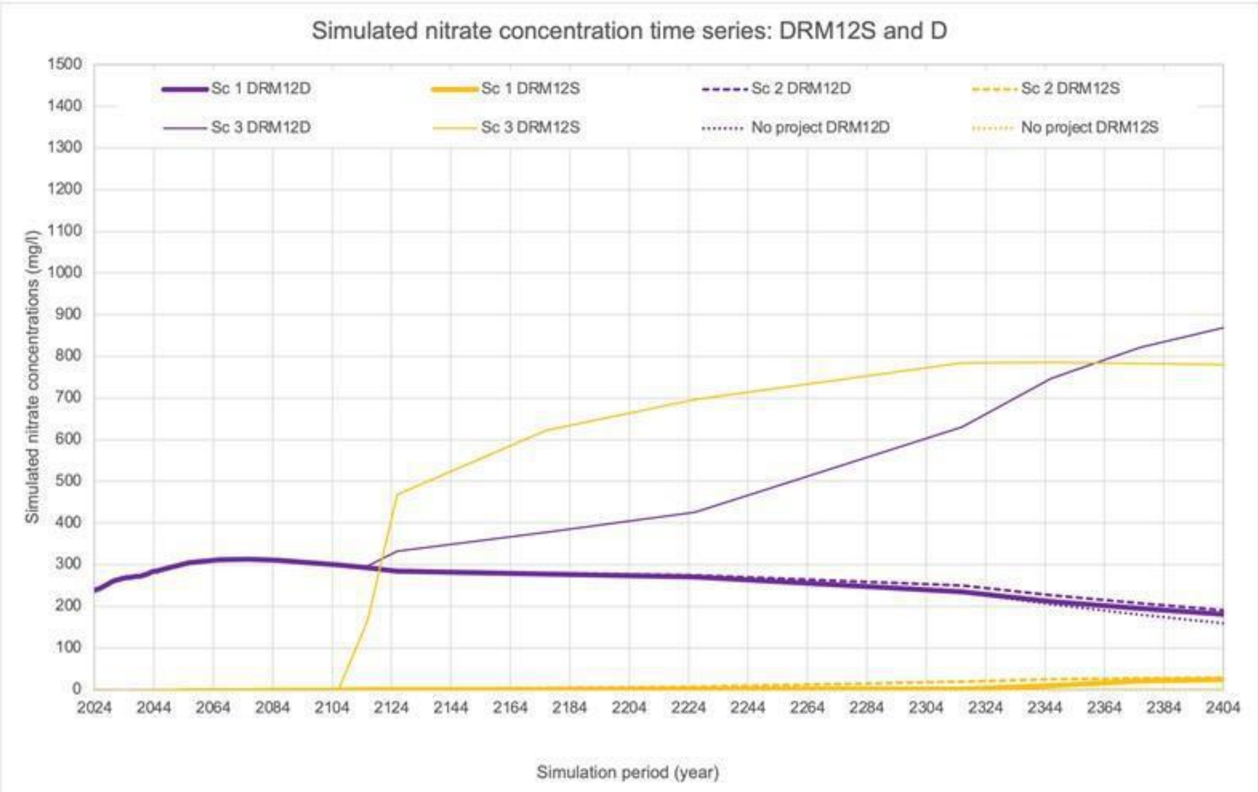
- The residual long-term impact on groundwater associated with other Dwarsrivier Mine mining and mineral processing activities will continue to impact on groundwater quality in the long-term, especially in the fractured rock aquifer. Even if the Khulu TSF and PCD is not constructed, nitrate concentrations are expected to be elevated above the average receiving surface water concentration of 30 mg/l in this aquifer.
- With the implementation of rehabilitation measures at mine closure aimed at source reduction, the long-term nitrate concentrations in the fractured rock aquifer are expected to reduce by between 100 and 200mg/l in the long-term for no project option and Scenarios 1 and 2.
- Similar trends are observed for the weathered aquifer, but at lower concentrations compared to the fractured rock aquifer. This is as a result of preferential groundwater flow associated with the regional faults and dykes targeted in the fractured rock aquifer as part of this study.
- Liner failure for Scenario 1 will only impact on groundwater quality 280 years after liner installation, as discussed above. The increased nitrate concentrations in monitoring boreholes around the Khulu TSF footprint as a result of increased seepage rate after liner failure is expected manifest over a period of 40 – 60 years, after which concentrations are expected to plateau at 300 – 400mg/l in the weathered aquifer.
- Liner failure for Scenario 2 will impact on groundwater quality 69 years after installation. At this point, nitrate concentrations are expected to increase to 300 – 400mg/l over a period of 40 – 80 years and start to plateau at concentrations of between 300 – 400mg/l.
- The significant impact of liner failure under Scenario 3 is evident from the graphs. It is shown that nitrate concentrations will increase significantly in both the shallow weathered and deeper fractured rock aquifers over a period of 10 – 20 years. In the weathered aquifer, nitrate concentrations may increase to above 1,200mg/l during this period. After the initial rapid increase in concentration, nitrate is expected to plateau at between 800 and 1300 mg/l in the weathered aquifer over a period of 100 years or longer.



Graph 14: Simulated nitrate concentration time series: ASDWBH12 and DRM10S



Graph 15: Simulated nitrate concentration time series: DRM11S and D



Graph 16: Simulated nitrate concentration time series: DRM12 S and D

1.g.vi.3.a.6.7 Summarised impact on groundwater quality and the receiving water body

The results of the impact prediction simulations discussed above are summarised in Table 59 in terms of each impact on groundwater quality and the receiving water body.

As discussed above, even without construction of the Khulu TSF and PCD, the existing Dwarsrivier Mine mining and mineral processing activities will continue to impact on groundwater quality in the long-term. Dwarsrivier

Mine is in the process of developing and implementing a Groundwater Remediation Strategy that will be designed to reduce nitrate concentrations in groundwater. This strategy will be developed as part of a separate study.

Liner failure under good installation conditions is expected to result in an increase in nitrate concentrations of between 20 and 80mg/l in the long-term. The outcome of Scenario 1 resulted in the least significant impacts on groundwater and the receiving water quality.

If the liners are poorly installed and managed, negative impacts are expected on the receiving water bodies (the Klein and Groot Dwars Rivers) as well as on groundwater quality. Groundwater baseflow to the rivers at the concentrations listed in the table below will most likely result in an increase in nitrate concentrations in the rivers. The increased nitrate concentrations in groundwater will result in an unacceptable long-term impact.

Table 59: Summary of groundwater impact prediction simulations

Scenario	**Description**	**NO_3 in groundwater: Khulu TSF footprint (mg/l)**	**NO_3 in groundwater: Farm House BH**	**NO_3 in groundwater: Klein Dwars River**	**NO_3 in groundwater: Groot Dwars River**
End operational Phase	No liner failure, evaluating other Dwarsrivier Mine mining and mineral processing activities	Weathered aquifer: <11 Fractured aquifer: > 400	<200	<11	<11
No project	Khulu TSF and PCD not built 300 years after mine closure	Weathered aquifer: <11 Fractured aquifer: <160	<100	<11	<11
1	Good liner installation, limited exposure to atmosphere 300 years after mine closure	Weathered aquifer: >600 Fractured aquifer: >180	<100	<11	<11
2	Good liner installation, exposure to atmosphere 300 years after mine closure	Weathered aquifer: >800 Fractured aquifer: >240	<170	<11	<11
3	Poor liner installation, exposure to atmosphere 300 years after mine closure	Weathered aquifer: >1500 Fractured aquifer: >1200	>750	30 - 200	30 - 150

Based on the outcome of the assessment, the preferred option in terms of liner design for the Khulu TSF and PCD is Scenario 1. For this scenario, good liner installation will be implemented and the liner will not be exposed to the atmosphere excessively. If this is achieved, the life of the liner is estimated to be 280 years. Simulations indicate that even if the liner fails, long-term impacts on the receiving water bodies are not expected to be significant.

1.g.vi.3.a.6.8 Risk of decant

No risk of decant was identified for the Khulu TSF and PCD. Seepage will be collected and managed with above and below liner drains until liner failure. The impact of liner failure is an increased rate of infiltration to the underlying aquifers, as discussed above.

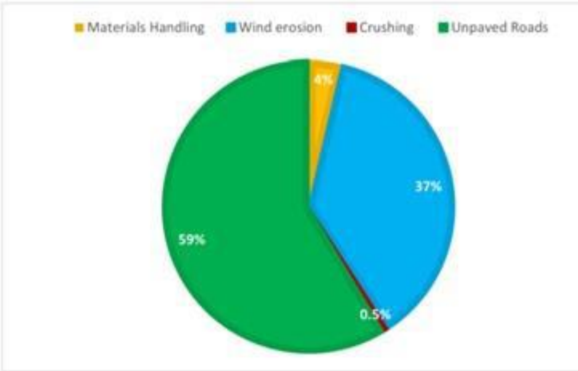
1.g.vi.3.a.7 Air Quality

Emissions Estimations were developed considering:

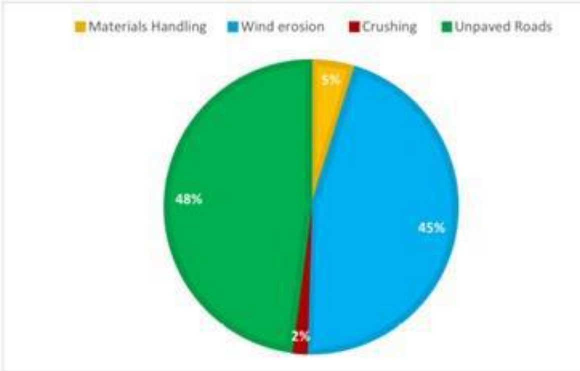
- Crushing;
- Materials Handling;
- Vehicle entrainment on unpaved roads; and
- Wind erosion.

The following graph illustrate the contribution of individual sources to the overall PM10, PM2.5 and TSP concentrations anticipated to occur as a result of the proposed TSF.

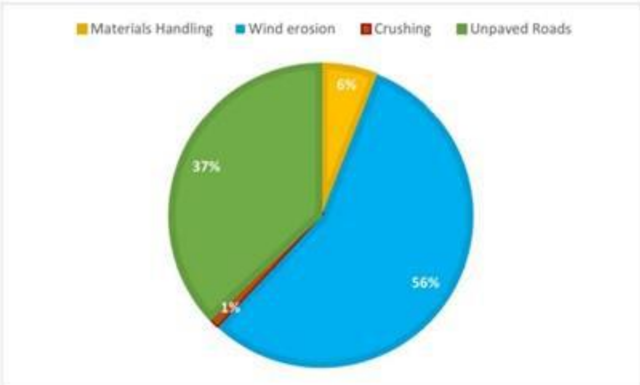
The largest source of PM10 is attributed to unpaved roads (59%), followed by wind erosion (37%). For PM2.5 the largest source is attributed to unpaved roads (48%), followed by wind erosion (45%). The largest source of TSP is attributed to wind erosion (56%), followed by unpaved roads (37%) and materials handling and crushing constituting 6% and 1% respectively.



PM10 source apportionment



PM2.5 source apportionment



TSP source apportionment

Graph 17: Source Apportionment

Sensitive receptors are identified as areas that may be impacted negatively due to emissions from the proposed TSF. Four receptors (villages and dwellings) were identified in the area surrounding the proposed project area, within a 10 km radius, and were used for this assessment.

For the purposes of this study, two dispersion modelling simulations was undertaken (Current operations and current operations with the proposed TSF) for the Dwarsrivier Mine.

The following sources were included in each modelling scenario:

- Scenario 1 – Current Operations
  - Primary crushing activities; − Wind erosion from waste rock dump (north and south), pit backfill (north and south), discard dump and existing TSF;
  - Existing roads – haulage road one and haulage road two; and
  - Loading and offloading activities.
- Scenario 2 – Current Operations with Proposed TSF
  - All current sources including wind erosion from Site B; and
  - Proposed TSF road.

Long-term (annual) and short-term (24-hour average) concentrations for the pollutants of concern were compared with the South African National Ambient Air Quality Standards (NAAQS) and dust fallout rates with the National Dust Control Regulations (NDCR) standards.

The outcomes of the study are discussed in the following sections:

1.g.vi.3.a.7.1 PM10 Concentrations

<u>Scenario 1:</u>

Ambient 24-hour (P99) and annual average PM10 concentrations are predicted to be compliant at all sensitive receptors (Table 60). No exceedances were predicted at sensitive receptors with predicted concentrations remaining well below the standard.

Figure 78 and Figure 79 present graphical outputs of the 24-hour average and annual average modelled results respectively. Highest predicted 24-hour and annual average off-site concentrations are compliant with the respective 24-hour and annual average PM10 standard (Table 61). Highest concentrations are predicted on the north-western portion of the mine, predominately around the areas of existing haulage roads.

Scenario 2:

Ambient 24-hour (P99) and annual average PM10 concentrations are predicted to be compliant at all sensitive receptors (Table 62). No exceedances were predicted at sensitive receptors with predicted concentrations well below the standard. Figure 80 and Figure 81 present graphical outputs of the 24-hour average and annual average modelled results respectively. Maximum predicted 24-hour off-site concentrations are non-compliant with the relevant standard due to the close proximity of the new TSF road to the boundary of the mine. Maximum predicted annual average off-site concentrations (Table 63) remain compliant with the annual standard. However, despite the non-compliance predicted for the 24-hour off-site concentrations, all concentrations predicted at neighbouring sensitive receptors remain complaint with their relevant standard, as noted previously.

Table 60: Predicted PM10 concentrations at neighbouring sensitive receptors for Scenario 1

ID	Sensitive Receptor	24-Hour Average PM_{10} Standard (µg/m³)	Predicted 24-Hour Average Concentration (µg/m³)	Annual Average PM_{10} Standard (µg/m³)	Predicted Annual Average Concentration (µg/m³)
SR01	Village	**75**	0.99	**40**	0.08
SR02	Village	**75**	2.26	**40**	0.19
SR03	Dwelling	**75**	0.19	**40**	0.02
SR04	Dwelling	**75**	0.18	**40**	0.01

Table 61: Maximum predicted offsite PM10 concentrations

X (m) (UTM 35S)	Y (m) (UTM 35S)	Predicted concentration (µg/m³)	Elevation (m)	Grid resolution (m)	Averaging period	Date	Hour
207849.79	7240364.74	26.50	920.79	100	24-hr (P99)	2020/05/07	24:00
207849.79	7240364.74	6.78	920.79	100	Annual	N/A	N/A

Figure 78: 24 -hour average PM10 concentrations (µg/m 3) for Scenario 1

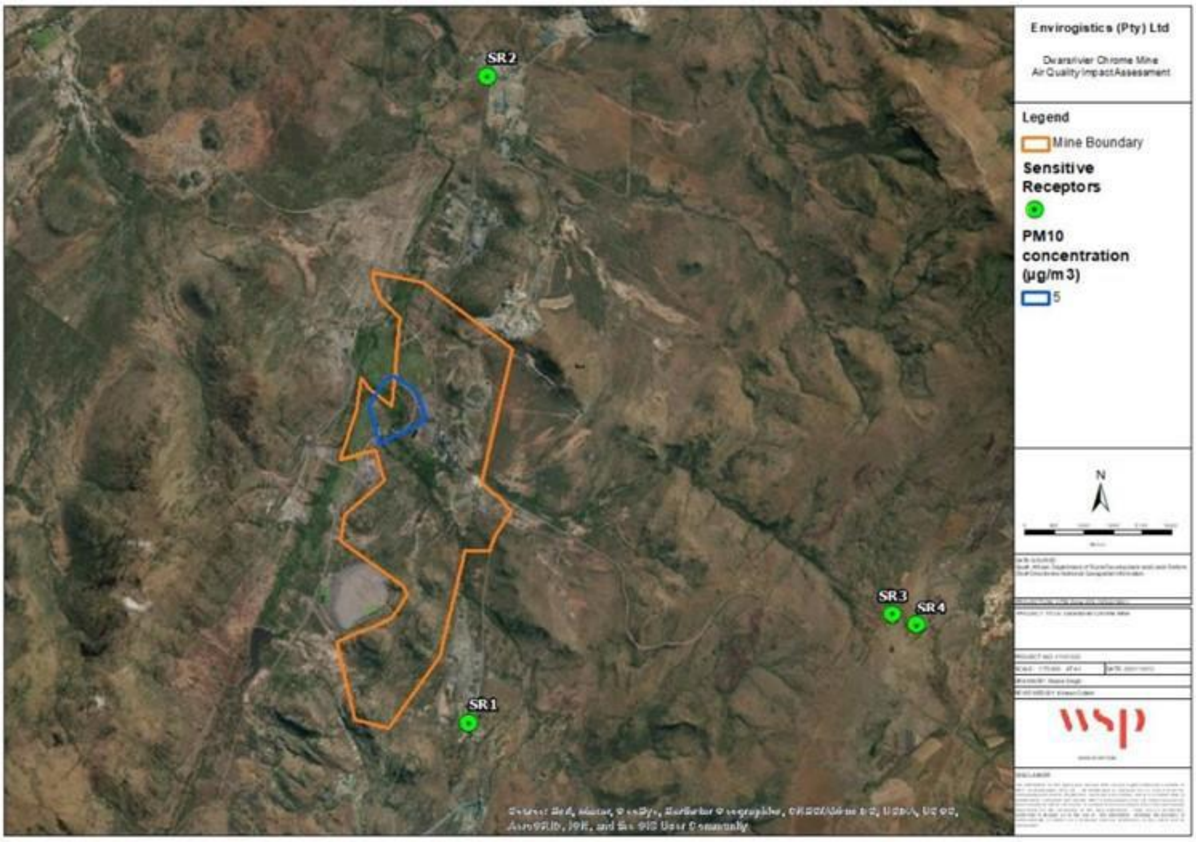


Figure 79: Annual average PM10 concentrations (µg/m³) for Scenario 1

Table 62: Predicted PM10 concentrations at neighbouring sensitive receptors

ID	Sensitive Receptor	24-Hour Average PM_{10} Standard (µg/m³)	Predicted 24-Hour Average Concentration (µg/m³)	Annual Average PM_{10} Standard (µg/m³)	Predicted Annual Average Concentration (µg/m³)
SR01	Village	**75**	1.53	**40**	0.14
SR02	Village	**75**	5.54	**40**	0.51
SR03	Dwelling	**75**	0.37	**40**	0.04
SR04	Dwelling	**75**	0.36	**40**	0.04

Table 63: Maximum predicted offsite PM10 concentrations

X (m) (UTM 35S)	Y (m) (UTM 35S)	Predicted concentration (µg/m³)	Elevation (m)	Grid resolution (m)	Averaging period	Date	Hour
207849.79	7240364.74	113.60	910.97	100	24-hr (P99)	2018/03/01	24:00
207849.79	7240364.74	36.80	910.97	100	Annual	N/A	N/A

' Concentrations highlighted in red indicate non-compliance

Figure 80: P99 24-hour average PM10 concentrations (µg/m3) for Scenario 2

Figure 81: Annual average PM10 concentrations (µg/m³) for Scenario 1

PM10 Assessment Outcomes

- For Scenario 1 (current mining operations) and Scenario 2 (current with proposed TSF) ambient 24-hour (P99) and annual average PM10 concentrations are predicted to be compliant at all sensitive receptors;
- Changes in predicted PM10 concentrations between Scenario 1 and Scenario 2 are substantial, with a 66% average increase in the 24-hour (P99) concentrations and a 69% average increase in annual average concentrations across all sensitive receptors. However, despite the increase, predicted concentrations at all receptors remain well below the standards during Scenario 2;
- Highest predicted 24-hour and annual average off-site concentrations are compliant with the respective standards for Scenario 1. Highest concentrations are predicted on the north-western portion of the mine, predominately around the areas of existing haulage roads;
- Highest predicted 24-hour average off-site concentrations during Scenario 2 are non-compliant with the relevant 24-hour standard, due to the close proximity of the new TSF road to the boundary of the mine. However, highest predicted annual average concentrations remain compliant with the standard; and
- However, despite the non-compliance predicted for the 24-hour PM10 off-site concentrations (Scenario 2), all concentrations predicted at neighbouring sensitive receptors remain complaint with their relevant standard, as noted previously.

1.g.vi.3.a.7.2 PM2.5 Concentrations

Scenario 1

Ambient 24-hour (P99) and annual average PM2.5 concentrations are predicted to be compliant at all sensitive receptors (Table 64). No exceedances were predicted at sensitive receptors with concentrations remaining well below the respective standards. Figure 82 and Figure 83 present graphical outputs of the 24-hour average and annual average modelled results respectively. Highest predicted 24-hour and annual average offsite concentrations are compliant with the respective 24-hour and annual average PM2.5 standard across the boundary (Table 65). Highest concentration is predicted on the north-western portion of the mine, predominately around the areas of existing haulage roads.

Scenario 2

Ambient 24-hour (P99) and annual average PM2.5 concentrations are predicted to be compliant at all sensitive receptors with the proposed TSF activities (Table 66). No exceedances were predicted at sensitive receptors, with concentrations remaining below the respective standards. Figure 84 and Figure 85 present graphical outputs of the 24-hour average and annual average modelled results respectively. Highest predicted 24-hour and annual average off-site concentrations (Table 67) are compliant with the 24-hour and annual average standard respectively. Highest concentrations are predicted on the north-western portion of the mine, predominately around the areas of the new TSF and TSF road.

Table 64: Predicted PM2.5 concentrations at neighbouring sensitive receptors for Scenario 1

ID	Sensitive Receptor	24-Hour Average $PM_{2.5}$ Standard (µg/m³)	Predicted 24-Hour Average Concentration (µg/m³)	Annual Average $PM_{2.5}$ Standard (µg/m³)	Predicted Annual Average Concentration (µg/m³)
SR01	Village	**40**	0.12	**20**	0.01
SR02	Village	**40**	0.26	**20**	0.02
SR03	Dwelling	**40**	0.02	**20**	2.00E-03
SR04	Dwelling	**40**	0.02	**20**	2.30E-03

Table 65: Maximum predicted offsite PM2.5 concentrations

X (m) (UTM 35S)	Y (m) (UTM 35S)	Predicted concentration (µg/m³)	Elevation (m)	Grid resolution (m)	Averaging period	Date	Hour
207849.79	7240364.74	3.06	920.79	100	24-hr (P99)	2020/05/07	24:00
207849.79	7240364.74	0.82	920.79	100	Annual	N/A	N/A

Figure 82: 24 -hour average PM2.5 concentrations (µg/m 3) for Scenario 1

Figure 83: Annual average PM2.5 concentrations (µg/m³) for Scenario 1

Table 66: Predicted PM2.5 concentrations at neighbouring sensitive receptors for Scenario 2

ID	Sensitive Receptor	24-Hour Average $PM_{2.5}$ Standard (µg/m³)	Predicted 24-Hour Average Concentration (µg/m³)	Annual Average $PM_{2.5}$ Standard (µg/m³)	Predicted Annual Average Concentration (µg/m³)
SR01	Village	**40**	0.17	**20**	0.01
SR02	Village	**40**	0.65	**20**	0.06
SR03	Dwelling	**40**	0.18	**20**	0.01
SR04	Dwelling	**40**	0.04	**20**	0.01

Table 67: Maximum predicted offsite PM2.5 concentrations

X (m) (UTM 35S)	Y (m) (UTM 35S)	Predicted concentration (µg/m³)	Elevation (m)	Grid resolution (m)	Averaging period	Date	Hour
207849.79	7240364.74	11.50	910.97	100	24-hr (P99)	2018/03/01	24:00
207849.79	7240364.74	3.77	910.97	100	Annual	N/A	N/A

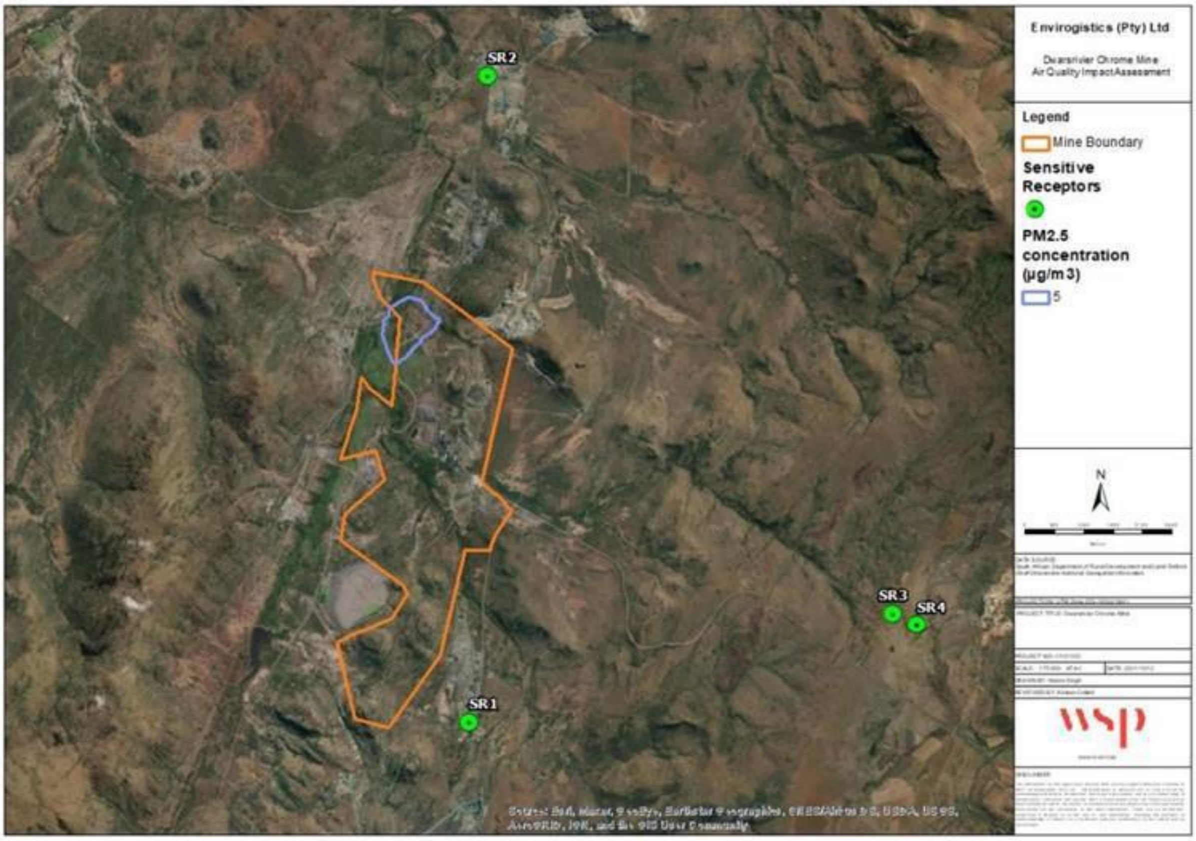


Figure 84: 24-hour average PM2.5 concentrations (µg/m3) for Scenario 2

Figure 85: Annual average PM2.5 concentrations (µg/m³) for Scenario 2

PM2.5 Assessment Outcomes

- For Scenario 1 (current mining operations) and Scenario 2 (current with proposed TSF), ambient 24-hour (P99) and annual average PM2.5 concentrations are predicted to be compliant at all sensitive receptors;
- Changes in predicted PM2.5 concentrations between Scenario 1 and Scenario 2 are substantial, with a 72% average increase in the 24-hour (P99) concentrations and a 68% average increase in annual average concentrations across all sensitive receptors. However, despite the increase, predicted concentrations at all receptors remain well below the standards during Scenario 2; and
- Highest predicted 24-hour average and annual average off-site concentrations remain compliant with the relevant standards for both scenarios.

1.g.vi.3.a.7.3 Dust Fallout

Scenario 1

Maximum daily dust deposition rates as a result of current mining activities were within the NDCR residential and non-residential standards at all sensitive receptors (Table 68). There were no predicted exceedances of the residential standard. Figure 86 present graphical outputs of the daily average modelled dust fallout rates.

Highest predicted daily average off-site dust fallout rates are compliant with the respective non-residential standard across the boundary.

Scenario 2

Maximum daily dust deposition rates as a result of mining and TSF activities were well within the NDCR residential and non-residential standards at all sensitive receptors (Table 69). Figure 87 present graphical outputs of the daily average modelled dust fallout rates. Highest predicted daily average off-site dust fallout rates remain compliant with the non-residential standard. Highest predicted dust fallout rates are along the new TSF road close to the boundary of the mine.

Table 68: Predicted dust fallout rates at neighbouring sensitive receptors for Scenario 1

ID	Sensitive Receptor	Residential standard ($mg/m^2/day$)	Predicted 24-hour dust fallout rates ($mg/m^2/day$)
SR01	Village	**600**	4.13
SR02	Village	**600**	4.38
SR03	Dwelling	**600**	1.94
SR04	Dwelling	**600**	1.84
Maximum offsite Concentration		**1,200**	121.60

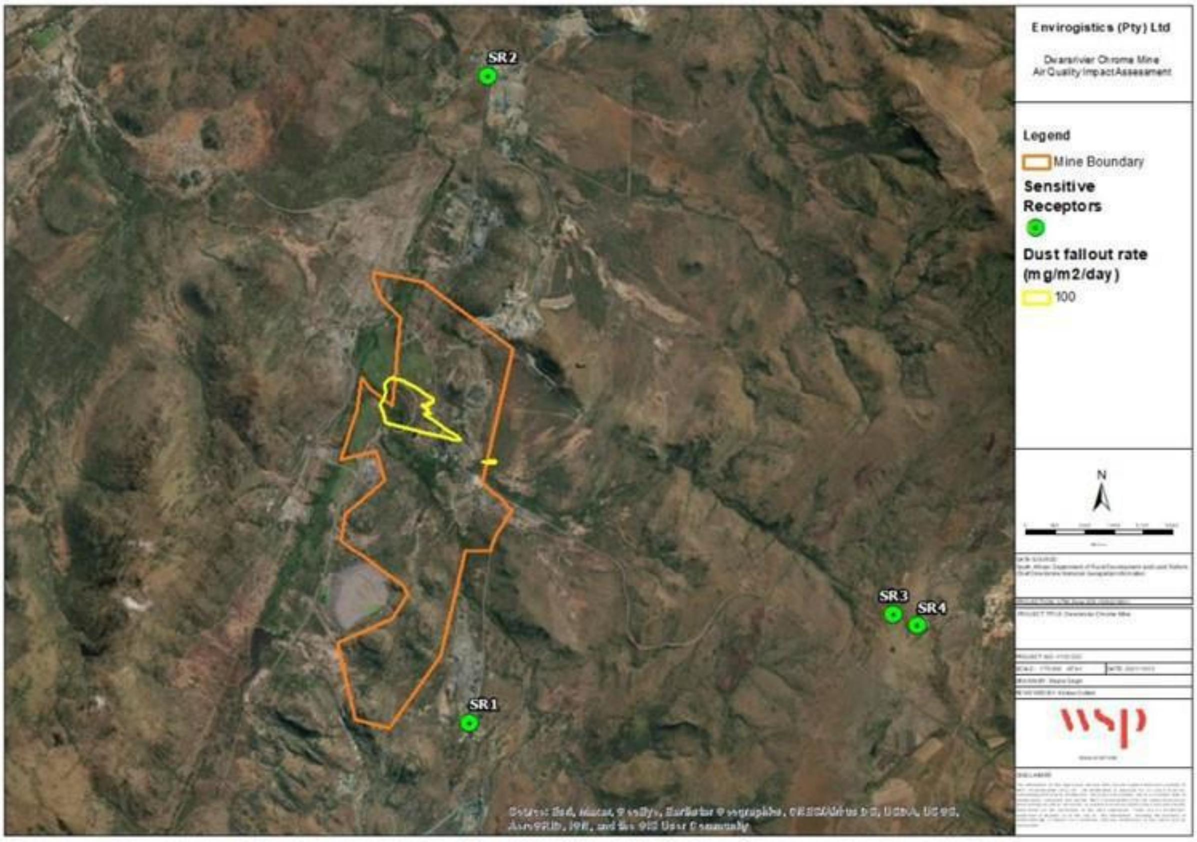


Figure 86: Dust fallout rate s (mg/m 2 /day) for Scenario 1

Table 69: Predicted dust fallout rates at neighbouring sensitive receptors for Scenario 2

ID	Sensitive Receptor	Residential standard (mg/m²/day)	Predicted 24-hour dust fallout rates (mg/m²/day)
SR01	Village	**600**	6.95
SR02	Village	**600**	12.92
SR03	Dwelling	**600**	3.61
SR04	Dwelling	**600**	3.40
Maximum off-site Concentration		**1,200**	631.93

Figure 87: Dust fallout rates (mg/m 2 /day) for Scenario 2

<u>Dust Fallout Assessment Outcomes</u>

- For both scenarios, no exceedances of the dust fallout residential standard are predicted at any of the neighbouring sensitive receptors;
- Scenario 1 and Scenario 2 highest predicted off-site dust fallout rates remain compliant with the non-residential standard; and
- Overall levels of dust fallout anticipated to occur as a result of the proposed TSF are below the respective National Dust Control Regulations.

1.g.vi.3.a.7.4 Cumulative Assessment

To determine the cumulative impact of the proposed Site B TSF on current operations, predicted annual average and maximum 24-hour concentrations from Scenario 1 have been added to Scenario 2. Daily maximum and annual average results are presented in Table 70 and Table 71 respectively.

The following is noted:

- During both scenarios, the cumulative concentrations are <u>below</u> the respective 24-hour and annual average standard for PM10 and PM2.5;
- Changes in predicted PM10 concentrations between Scenario 1 and Scenario 2 are substantial, with a 24-hour average increase of 66% and annual average increase of 69% across all sensitive receptors; and
- Changes in predicted PM2.5 concentrations between Scenario 1 and Scenario 2 are substantial, with a 24-hour average increase of 72% and annual average increase of 68% across all sensitive receptors.

Table 70: 24-Hour predicted cumulative assessment for Dwarsrivier

Receptor	24-Hour Ambient Standard (µg/m³)	Predicted Scenario 1 24-Hour Average (µg/m³)	Predicted Scenario 2 24-Hour Average (µg/m³)	Cumulative Concentrations (µg/m³)	Percentage Contribution of Predicted Concentrations to Cumulative Concentrations (%)
PM_{10}					
SR1	75	0.99	1.53	2.52	60
SR2		2.26	5.54	7.80	71
SR3		0.19	0.37	0.56	66
SR4		0.18	0.36	0.56	66
$PM_{2.5}$					
SR1	40	0.12	0.17	0.29	59
SR2		0.26	0.65	0.91	71
SR3		0.02	0.18	0.20	90
SR4		0.02	0.04	0.06	67

Table 71: Annual predicted cumulative assessment for Dwarsrivier

Receptor	Annual Ambient Standard (µg/m³)	Predicted Scenario 1 Annual Average (µg/m³)	Predicted Scenario 2 Annual Average (µg/m³)	Cumulative Concentrations (µg/m³)	Percentage Contribution of Predicted Concentrations to Cumulative Concentrations (%)
PM_{10}					
SR1	40	0.08	0.14	0.2247	63
SR2		0.19	0.51	0.717	72
SR3		0.02	0.04	0.064	70
SR4		0.01	0.04	0.061	70
$PM_{2.5}$					
SR1	20	0.01	0.01	0.027	62
SR2		0.02	0.06	0.085	70
SR3		2.00E-03	0.01	0.007	71
SR4		2.30E-03	0.01	0.0073	68

1.g.vi.3.a.8 Visual

<u>Viewshed</u>

The Khulu TSF viewshed and affected visual receptors is indicated on Figure 88 and Figure 89. The viewshed indicated that the proposed TSF will mostly be visible along the valleys of the rivers, with views from the western and eastern parts of the study area blocked by mountain ridges. The visible area of the Khulu TSF covers much of the same area as the existing TSFs. The same visual receptors that are already impacted by the existing TSFs will be impacted by the Khulu TSF. The lodges within the visible area, namely the Escal Lodge and Chrome Valley Lodge, primarily provide accommodation for contractors and consultants working on the mines in the area. The same main roads affected by the existing TSFs will also be impacted by the Khulu TSF. Mining activities are the main land use within the high and medium exposure areas.

The following table shows the visible areas within the study area, number of affected visual receptors, and the length of main road within the visible area for both the existing TSFs and Khulu TSF. The existing TSFs have a larger visible area in comparison to the Khulu TSF. Both viewsheds affect the same visual receptors, whilst the Khulu TSF will impact on a slightly longer length of main road.

Table 72: Visible areas, visual receptors and length of main road affected by the viewsheds

Viewshed	Total Visible Area within the Study Area (km^2)	No. of Visual Receptors in the Visible Area	Length of Main Road in the Visible Area (km)
Existing TSF viewshed	55.1	15	11
Khulu TSF viewshed	40.6	15	12.5

The visual quality of the area prior to any mining activities would have been high, with the bushveld and mountainous landscape that would have fully characterised the area. However, much of this has been converted and the dominant land use in the area is now mining. The remaining bushveld and mountainous backdrops still provides scenic views, and for this reason, a medium scenic quality has been assigned to the study area.

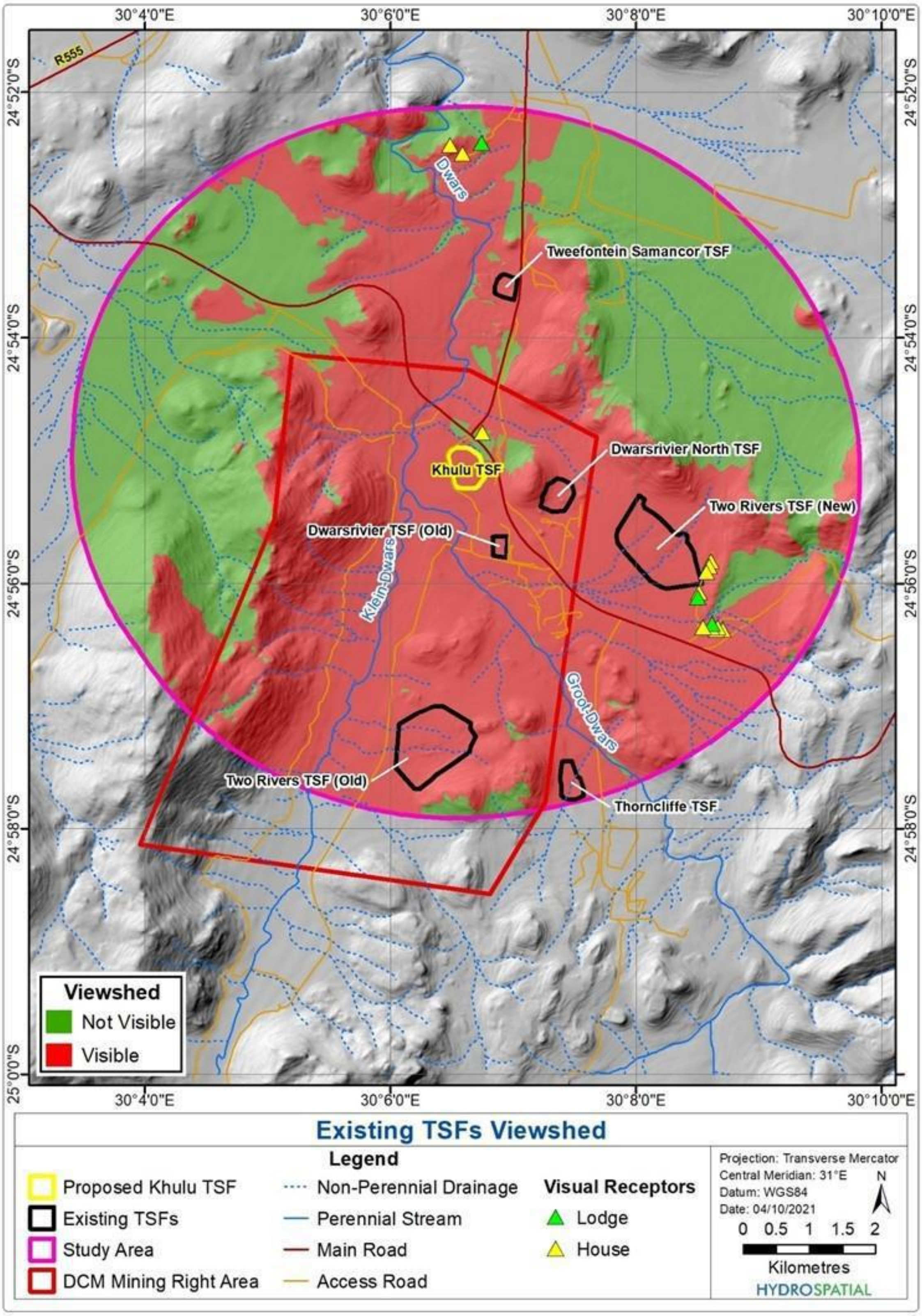


Figure 88: Existing TSF viewshed

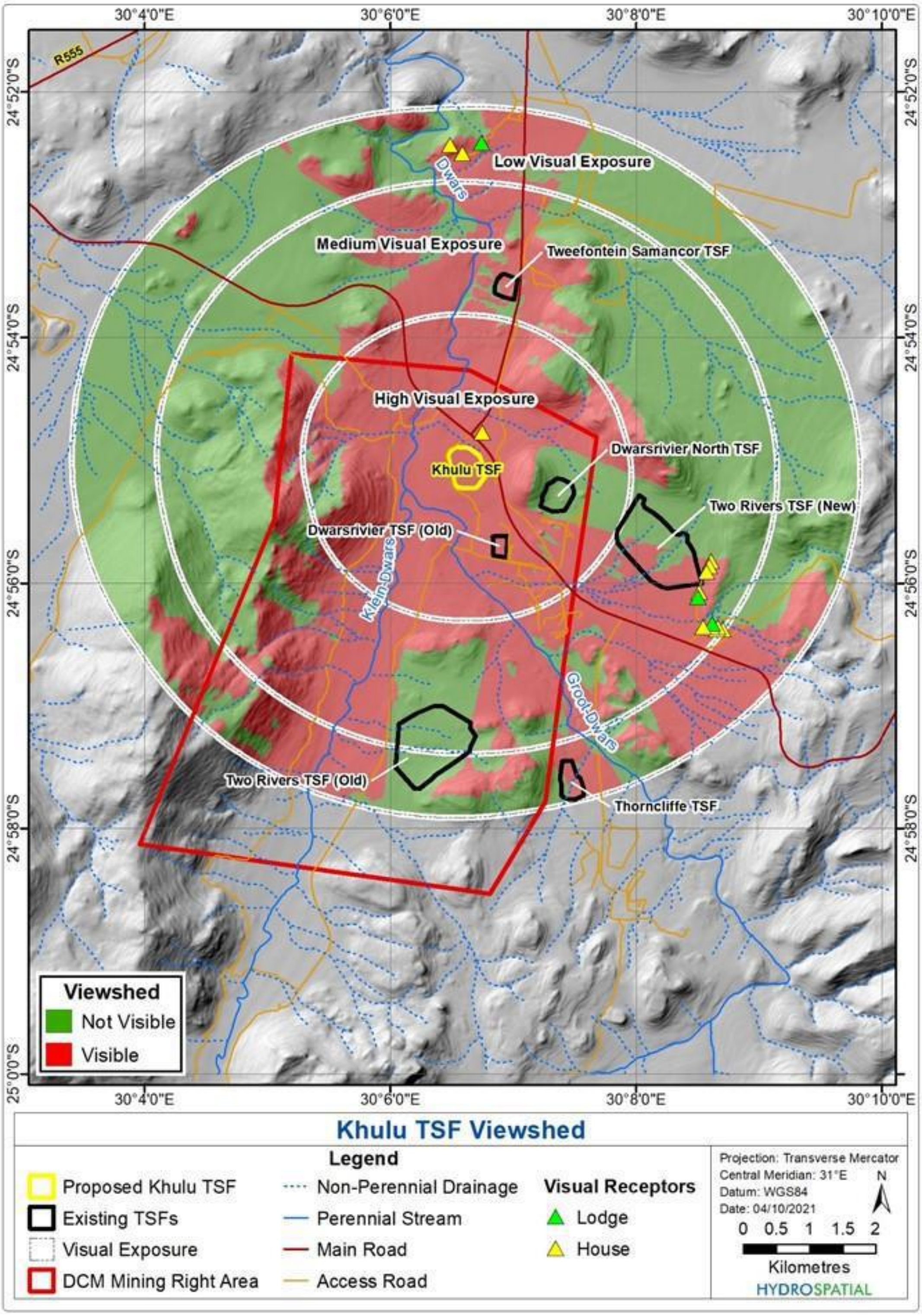


Figure 89: Khulu TSF viewshed

<u>Visual Absorption Capacity</u>

The Visual Absorption Capacity (VAC) is the potential of the landscape to conceal the proposed development as a result of topography, vegetation or synthetic features (Oberholzer, 2005). The mountainous terrain on either side of the Dwars River conceals views of the Khulu TSF to within the valley. The vegetation immediately surrounding the Khulu TSF site is fairly open, as this area was previously used for agriculture, and therefore, the vegetation will provide very little cover to conceal the proposed TSF (see photo below). Further away from the TSF, particularly along the rivers, thicker vegetation occurs, which will conceal views of the TSF. Taking into account the general vegetation and topography of the study area, the VAC was determined to be moderate.

Photo 14: Westerly view from the main road over the proposed Khulu TSF site

Visual Intrusion

Due to a number of existing TSFs in the area, as well as other mine infrastructure, the proposed project is in line with the current land use of the area, and will have a low visual intrusion.

Viewer Sensitivity

The viewer sensitivity is summarised in the following table.

Table 73: Summary of the viewer sensitivity of the Project

Visual Receptor	Comment	Rating
Houses and farmsteads	People living in the houses in the rural areas will be accustomed to mining in the area. However, views of mine dumps and mining activities is unlikely to be favourable.	Moderate
Motorists on roads	Views of existing TSFs and mining activities are evident along the main roads within the study area.	Low
Lodges	The lodges within the study area provide accommodation for people working on the mines and are therefore largely dependent on the mines.	Low

Cumulative Impact

Cumulative impacts result from the incremental impact of proposed activities on a common resource when added to the impacts of other past, present or reasonably foreseeable future activities. Cumulative impacts can occur from the collective impacts of individual minor actions over a period of time and can include both direct and indirect impacts.

The proposed project will cumulatively add to the historical and active mining in the area. Since the landscape has already been transformed by mining activities, it is not foreseen that the visual quality of the area would be further significantly reduced. The visual quality, will however, be improved once rehabilitation has been successfully implemented.

1.g.vi.3.a.9 Heritage and Palaeontology

Impacts to heritage resources are permanent and irreversible.

Based on the high significance of burial sites (Feature 1) the impact will be high if it is confirmed to be a grave. If the feature is not a grave it is of no heritage significance.

Feature 4 and 6 (possible labourer dwelling and structural remains) is of low heritage significance (unless proven that there are graves) and the impact will be low, unless the presence of graves is confirmed, if this is the case the graves will be of high social significance.

Feature 2, 3 and 5 is of medium significance and with no mitigation measures the impact will be medium to high. With the implementation of the correct mitigation measures at each feature the impact can be mitigated to an acceptable level.

It is assumed that the pre-construction phase involves the removal of topsoil and vegetation as well as the establishment of infrastructure. These activities can have a negative and irreversible impact on heritage features if any occur. Impacts include destruction or partial destruction of non-renewable heritage resources.

During this phase, the impacts and effects are similar in nature but more extensive than the pre-construction phase. Potential impacts include destruction or partial destruction of non-renewable heritage resources.

No impacts are expected after the construction phase.

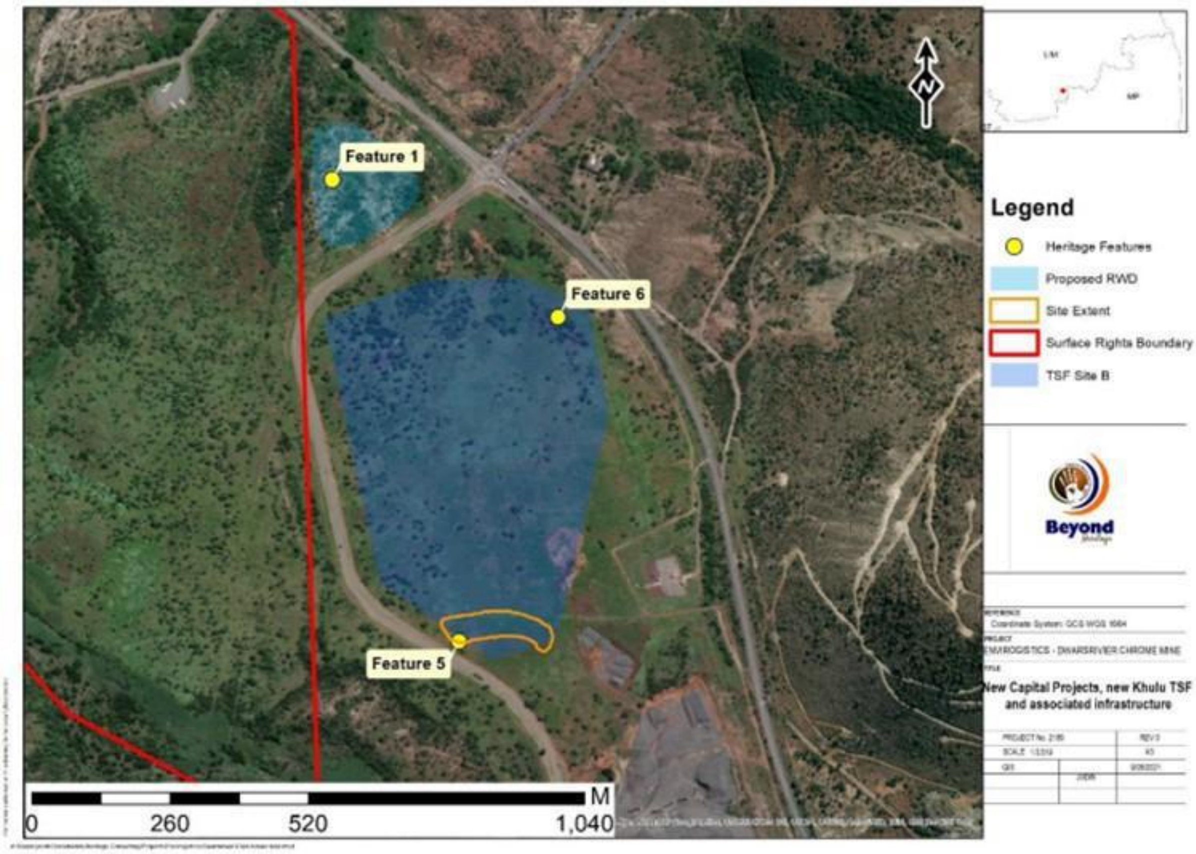


Figure 90: Features 1, 5 and 6 in relation to the TSF and PCD

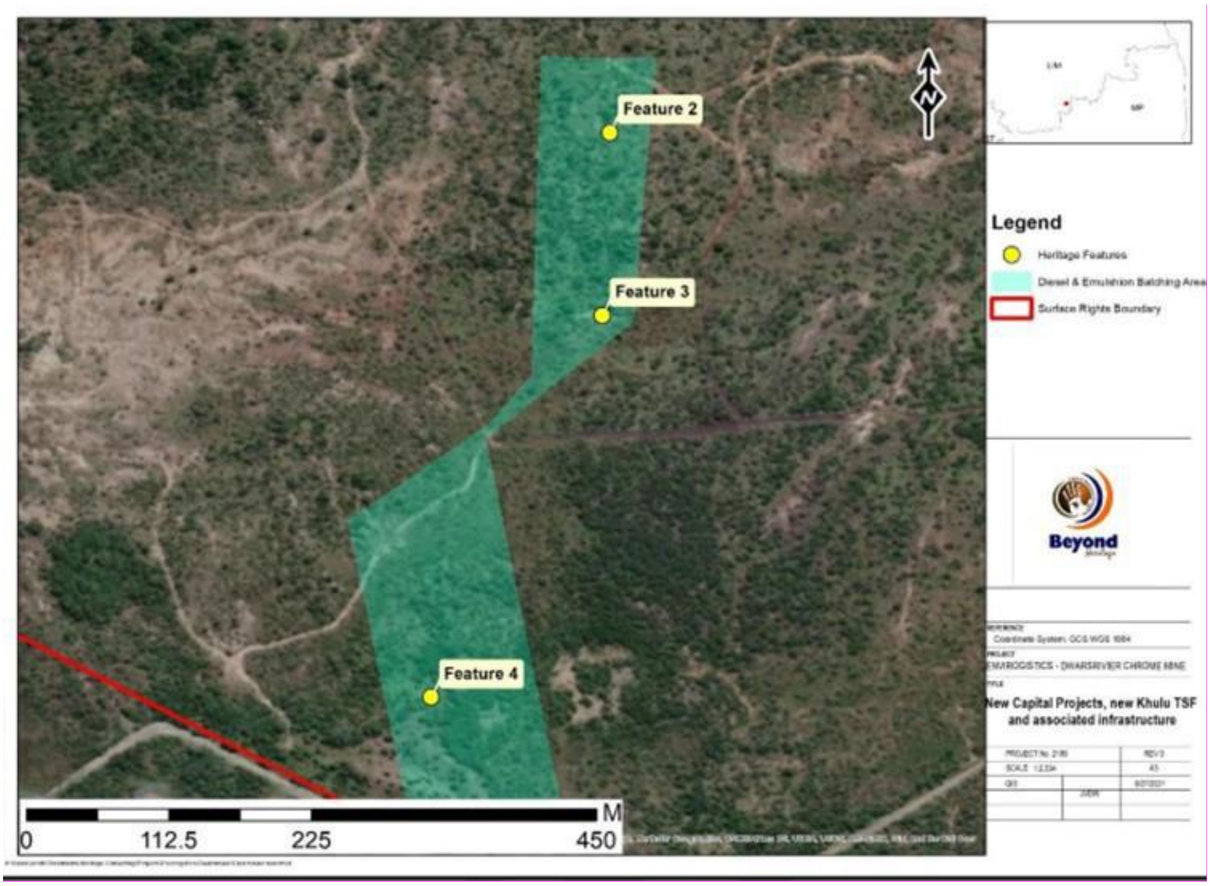


Figure 91: Features 2, 3 and 4 in relation to the impact area of the Diesel and Emulsion Batching Areas

1.g.vi.3.a.10 Socio-Economic

The following section provides a description of the social impacts anticipated to occur during the construction or build-up period of the proposed Khulu TSF and capital projects. The timeframe for the build-up period for the various projects is of a short duration and construction activities associated with the different projects will overlap.

The construction of the TSF will last 20 months (e.g. Q1 of 2022 until Q1 of 2023) and will be constructed as the first phase of the project. Project 2 (Diesel and emulsion batching area), Project 3 (Main parking extension) and Project 4 (Widening of the access road between South Shaft/Main Offices and Plant) will commence (e.g. all to be undertaken from Q2 2022 until 2022 Q3). These three projects will be completed in approximately eight months. Project 5 (Access crossing between South and North Mine) will be undertaken within an eighteen month period from e.g. 2022 Q2 until 2022 Q4.

The construction phase will include land and footprint clearances, topsoil stripping and stockpiling, and the establishment of the surface infrastructure.

<u>Employment and income opportunities during build-up phase</u>

For the construction of the Khulu TSF, a total of 64 construction workers would be employed for the whole duration. Forty (40) of these would be contractors. From the total employees required, twelve (1)2 would be medium skilled (workers with technical qualifications up to Grade 12) and sixteen (16) would be low skilled (Grade 10 and lower).

Furthermore, some outside contractors will be involved with specific projects such as the construction of the Diesel and Emulsion Batching Areas (five (5) individuals on a part-time basis); Main Parking Extension (five (5) individuals on a part-time basis), widening of the existing access road (ten (10) full time contractors) and new access crossing (sixteen (16) full time contractors).

A section of the workforce would consist of low skilled workers (e.g. general construction labourers), as well as medium skilled site operators and skilled supervisors.

As existing mining is taking place at Dwarsrivier Mine, some of the above employment opportunities will be filled by existing employees. It is anticipated that a total of 36 new employment positions will be created which will result in positive economic impacts. Dwarsrivier Mine is further committed to source all the individuals falling within the medium and lower skilled categories from the local labour pool, and as many as possible falling within the high skilled category. To enhance the benefit to the local communities, it is recommended that local labour (from within the local municipal area) be procured as far as possible for all levels of skills.

Herewith a summarised table indicating the anticipated employment profile during the construction phase:

Table 74: Employment Profile during construction phase

Employment	**PROJECT 1: KHULU TSF**	**PROJECT 2: BATCHING AREAS**	**PROJECT 3: PARKING EXTENSION**	**PROJECT 4: WIDENING OF ACCESS RD**	**PROJECT 5: ACCESS CROSSING**
Permanent full-time	24	0	0	0	0
Contract full time	40	0	0	10	16
Seasonal/part-time	0	5	5	0	0
Total	***64***	***5***	***5***	***10***	***16***
High skilled (*Workers with academic qualifications*)	12	0	0	0	1
Medium skilled (*Workers with technical qualifications up to grade 12*)	12	5	5	3	5
Low skilled (*Grade 10 and lower*)	16	0	0	7	10

The socio-economic benefit of the build-up area can have limited short-term positive impacts and would possibly be similar to what is currently being experienced with the existing mining operation. It is not anticipated that the build-up period associated with the Khulu TSF and capital projects would necessarily create significant business opportunities within the local economy.

The population in the municipal area consists of a large proportion of youth. It is thus likely that some of these young jobseekers living in the various settlements in close proximity to Dwarsrivier Mine can move closer to, or gather at the mining site, should they become aware of new construction related activities being undertaken.

Due to the relative short timeframe and extent of the build-up period, as well as the expected number of workers involved, it is however highly unlikely that the project would result in large numbers of in-migration of jobseekers and workers to the local area. Therefore, no population change is anticipated as a direct result of the proposed Khulu TSF and capital projects.

The total spending (excluding salaries and wages) during the construction can total approximately R450 million. The majority of this spending will be procured from the local municipal area (80%) and from BEE suppliers (80%). Only 10% or less would be spend on foreign imports. The local benefits and economic spin-offs opportunities are thus substantial.

Community Safety and Security

During the construction phase, community safety can be at risk, mainly due the movement of construction vehicles and construction activities (e.g. blasting) affecting the R577 due to the construction of the access crossing underneath the R577 to allow ease of access between the South and the North Mine. Safety hazards to mine personnel would also occur during the construction activities forming part of the extension of the main parking area and widening of the access road between the plant and North Mine, due to the continued movement of mining vehicles on this section of road. These impacts are anticipated to be mitigated by implementing construction related precautionary measures and warning signs/notifications.

The development of the Khulu TSF and batching areas can furthermore create possible safety hazards. On site, mining activities pose safety risks which must be managed according to the relevant Health and Safety Plans of the mine to ensure the safety of workers and adjacent communities. These anticipated impacts will further respond to the environmental monitoring and management measures to be implemented. In terms of the different sites for the Khulu TSF, the following should be noted:

- It is considered that the movement of workers to and from Sites B and D, as well as the movement of equipment during the construction and operational phases would result in limited negative impacts due to the sites' proximity to the existing plant and available roads. Safety and security issues associated with the movement of the personnel can be dealt with by the existing measures put in place by Dwarsrivier Mine should the internal gravel roads be used. Additional measures might be required if the R577 would be used or where the R577 would be crossed.

- It is considered that the movement of workers to and from Site C, as well as the movement of equipment during the construction would result in limited negative impacts as there is an existing access road to the site. Safety and security issues can be dealt with, but additional measures might be required due to the distance from the existing plant and the access road might have to be upgraded.

The number of construction vehicles, driver conduct, location of the worker accommodation facilities, as well as the actual number of outside construction workers would influence the intensity of the impact.

Visual impact and sense of place

Land-uses in the area include mining, natural veld and farming activities which is mainly grazing of livestock. Scattered settlements are also found in the larger study area, but not in close proximity to the mine. The nearest settlements e.g. Ga-Malekana, Madidimola and Ga-Mampuru are approximately 10 km from Dwarsrivier Mine.

Various mining related infrastructure, roads, telecommunication infrastructure and so forth is present. The area is not pristine and various disturbances to the natural area characterise the study area.

The main visual impact associated with the construction phase would be the actual construction sites, possible storage of equipment and construction vehicles (laydown area), as well as the disruption of the soil and vegetation. Construction activities associated with the access crossing and the Khulu TSF will be visible to the road users.

These temporary impacts do not necessarily bring new negative impacts to the already disturbed area. There are no sensitive receptors in close proximity to the site, and due to the existing characteristics, the temporary visual impact is rated as low.

Traffic Movement

Construction activities will mainly include clearing of vegetation and preparation of the different sites, the widening of the access road, the construction of the new access crossing, construction of the infrastructure associated with the diesel and emulsion batching areas and the development of the TSF.

These activities will result in the movement of heavy machinery and vehicles within the boundaries of the site and with some movement of construction vehicles on the provincial road R577. The number of vehicles involved in the process and equipment details are unknown. The increased noise and dust created by these vehicles, vehicle emissions and increased risk of accidents as well as possible impact on the road surfaces create additional intrusions. These impacts, however, will be intermittent and of a short duration.

Employment Opportunities during Operational Phase

The proposed Khulu TSF and capital projects forms part of the Dwarsrivier Mine's overall objective to ensure continued mining and sufficient supply of their product to chrome markets. The proposed projects will thus assist in achieving this objective as it will improve logistics on site and ensure a proper disposal system for the production requirements.

The draft Scoping Report indicated that there is approximately 1200 permanent and 800 contractor employees in service at Dwarsrivier Mine. This employment profile will be sustained as the proposed project would allow the operation to meet the existing production capacity. Approximately 24 employees will be directly involved with the operations related to the TSF. No new employment positions will be created as these employees are already employed at Dwarsrivier Mine.

However, the existing socio-economic benefits created through Dwarsrivier Mine being a key employer in the area would continue. The social services support as part of the Social and Labour Plan (SLP) requirements will also continue to be implemented.

As no additional workers are anticipated, the inflow of jobseekers is also anticipated to be of limited significance.

Local Procurement

Existing employees would continue to be responsible for the overall mining activities. Limited additional temporary workers could over time be required for specific tasks associated with the proposed Khulu TSF and capital projects. When that occurs, new mining activities can then be allocated to appointed specialist contractors.

Even if limited procurement is foreseen, this variable is still regarded as positive, due to the indirect impacts of Dwarsrivier Mine's mining activity on the local economy through the creation of possible business opportunities (e.g. local service industry) and local procurement of material, services and equipment.

<u>Socio-Economic Development</u>

The socio-economic impact of the proposed projects would be based on the mine's continued contribution to the Gross Geographical Product (GGP) and the number of direct (continued employment at the mine) and indirect jobs that would be created. Therefore, except for ongoing direct employment, that would generate income and increase local spending, people living in the vicinity of the study area is also expected to benefit by the earnings of those employed by the mine and the local buying power in the area.

Through employment and income generation during the mining processes, some economic benefits to the region and local communities therefore accrue. The mine would continue to contribute to the local economy through its employee wages, procurement of local contractors and services, purchasing of water and electricity and through payment of taxes to the Fetakgomo Tubatse Local Municipality.

Dwarsrivier Mine, through their mining activities, is involved in various Local Economic Development Initiatives linked to the IDP of the Fetakgomo Tubatse Local Municipality, as well as other government initiatives. These activities would thus continue, and the constant positive socio-economic impacts thereof would remain to benefit of the local communities.

<u>Capacity Building</u>

Although education and training are mainly the responsibility of government, there is increased pressure on the business sector in South Africa to increase the development and skills of their workforce.

Dwarsrivier Mine is involved in capacity building and training. Further to these focus areas, the company also concentrate on local employment creation and poverty alleviation, as well as environmental management, rural development and the provision of infrastructure.

The above-mentioned inputs would continue if Dwarsrivier Mine is successful in sustaining their mining operations in the area. Dwarsrivier Mine has thus played an important role in the area in this regard and commits to continue with these efforts which would benefit the local communities within the Fetakgomo Tubatse Local Municipality area.

<u>Safety and Security Related Impacts</u>

The production capacity associated with the proposed Khulu TSF project and the capital projects would remain approximately similar to the current situation and it is therefore *not* anticipated that the transportation of material or products would escalate. However, the continuous movement of mining related vehicles transporting goods and materials on the local roads can still continue to create safety and security risks.

Construction of the access crossing between the plant and North Mine, as well as the widening of the access road between the South Shaft/Main Offices and Plant would reduce these risks and create a positive impact in this regard. The negative impact prior to mitigation can thus be changed to a medium positive impact.

The method to be used at the Khulu TSF involves dry stacking by means of the filter cake which is of a solid content. This method minimises the risk of tailings dam failures and can lessen possible seepage significantly. From a socio-economic perspective this method will thus limit safety and security risks, as well as health risks.

<u>Health Related Risks</u>

During the operational phase dust impacts are anticipated due to general mining activities and vehicles travelling on the access and haul roads. The dust concentrations as a result of this movement are not anticipated to reach residential areas and the impact would possibly be localised on site.

Fugitive dust from stockpile areas and waste rock dumps are also of concern. Windblown dust from these facilities will vary according to the season, with possible higher levels and frequency during the windy months. The probability and intensity of these possible impacts would further depend on the wind directions and the proximity of sensitive receptors. The nearest residential area is approximately 10 km to the north and east of the mining area.

Should there be a possible increase in the air pollution (dust), these sensitivities should be adequately dealt with and be taken into account in the monitoring processes stipulated as part of the EMPr.

In the event that sensitive receptors are affected (worst case scenario), based on dust fallout rates, the necessary mitigation measures as stipulated through the Air Quality specialist study must be implemented. The rating below is based on the general air quality impacts usually experienced with mining projects and the proximity of sensitive receptors in the study area.

Emissions would include vehicle emissions (carbon monoxide and nitrogen oxide) and emissions from large construction equipment.

Industrial, solid and hazardous waste would be created during the mining operations. As is currently the case, these different types of waste should continue to be responsibly disposed of to avoid any health-related impacts in this regard. Storing of diesel and emulsion can create health related risks. As mitigation, the emulsion will be stored in underground tankers. The majority of the pipelines will further be underground to limit risks in this regard and possible spills.

The Khulu TSF, as indicated above would include dry stacking. This method can minimise health risks usually associated with conventional tailings facilities. Surface water runoff and possible seepage are still possible and can contaminate water resources. The designs should avoid such pollution in order to avoid public health impacts due to the potential impact on the water quality. It should also again be noted that the nearest residential settlement is approximately 10 km away from the mining activities.

In mining areas there are further concerns relating to migrant employees bringing health risks, and nowadays the threat of Covid-19 infection, to mining areas or small towns. The Fetakgomo Tubatse Local MunicipalitY area is already characterised by vulnerable households and inadequate public health services that cannot always effectively deal with the health risks associated with the pandemic. It will remain the responsibility of Dwarsrivier Mine to continue their support to their employees and surrounding communities to reduce vulnerability and to implement the required Covid-19 Protocol.

<u>Impact on Daily Living and Movement Patterns</u>

The proposed capital projects and the new Khulu TSF are within the existing mining right boundary. Intrusions on the daily living and movement patterns are thus not anticipated to directly impact on residential areas and/or towns as it will be confined to general mining practices within the mining area, such as the limited movement of workers and equipment to and from the diesel and emulsion batching sites during the operational phase.

The filter cake will be trucked to the new TSF. With regards to the vehicular movement to the different sites investigated for the Khulu TSF, the following should be noted:

- Access to the TSF can be obtained from within the mining area and the R577. It is anticipated that the site would be accessed from the existing mining area (probably to the west of the R577) and that the R577 would not be used as main access point. No impacts on the traffic flow to and from Two Rivers Platinum mine, on through-flow traffic and main access to Dwarsrivier Chrome Mine are anticipated. Access to the PCD to the west of the R577 however must still be obtained.
- The power lines and servitude to the east of Site B must be also considered in the detailed design.

The impact on the social environment could thus increase for a period of time, but as these activities would be within the existing mining right boundary, the long-term impacts on the daily living and movement patterns are deemed similar to the existing impacts. In this regard, the impacts on the social environment would thus remain constant.

Decommissioning refers to the actual closure of the mine, the dismantling of the infrastructure (e.g. pipelines, conveyors), the rehabilitation of the TSF and PCD. Decommissioning can also include the replacement of the infrastructure with newer technology.

At this stage, the life of mine is anticipated to be 25 which can be extended by the implementation of the projects. Possible social impacts to be experienced during decommissioning (closure of the mine) could include the following:

- Job losses due to mine closure;
- Decline in the sustainability of the local economy as a result of the loss of employment, household income and capital investments;
- Reduced economic activities within the area with subsequent negative impacts on smaller businesses;
- A decline in the local economy would also have a direct impact on the financial status of the affected local municipalities. This, and the fact that one of the key role players, such as the mine, falls away, would seriously impede the municipality in exercising its functions in terms of strengthening the Local Economic Development (LED) process;
- Negative impact on the revenue base of the local municipalities;
- Population changes and ‘outflux’ of people from the area;

- Negative impact on the social fabric and social networks;
- A new class of jobseekers targeting other mines in the area;
- Inflow of illegal miners creating social, safety, economic and legal problems and risks;
- Decrease in the quality of life of the surrounding communities due to the discontinuation of social development support and local economic development programmes;
- Possible relocation of families;
- Negative impacts on the local schools;
- Skilled workers moving out of the area in search of employment elsewhere;
- Negative impact on infrastructure development and maintenance;
- A change in community infrastructure;
- A change in the industrial focus of the area;
- Disruptions and nuisance factors associated with the actual decommissioning such as noise, visual and traffic related impacts;
- Increased safety risks associated with the decommissioning of the infrastructure;
- Possible negative impact on the crime levels due to increased unemployment rate;
- Possibility of additional temporary job creation during the decommissioning phase;
- Remnants of possible environmental impacts; and
- Remaining visual impact as a result of mining.

As decommissioning or the replacement of the infrastructure is likely to only take place within approximately 25 years, it is recommended that a detailed Social Impact Assessment be undertaken then to determine the actual impacts on the changing social environment at that stage.

Possible social impacts to be experienced during the replacement of infrastructure with newer technology options would be similar to the impacts described as part of the construction process although more limited.

<u>No Go Alternative</u>

Should the proposed project not proceed, the status quo in terms of the existing social impacts in the area would therefore remain. The Life of Mine would then not be indirectly extended and the mine would cease to operate over a shorter period of time.

The most significant social impact with regards to the no-go alternative relates to the loss in employment opportunities and the overall direct and indirect economic impacts for the region.

As the mine is involved in various corporate social investment programmes these would not be further implemented and no impacts on poverty alleviation would occur as a result of such programmes. The potential loss in terms of employment and economic benefits to the local communities is considered as a critical negative impact.

The ‘no-go alternative’ should thus not be considered from a social point of view as the negative social impacts anticipated with the expansion project are deemed low. The negative impacts would further respond to mitigation as proposed. The proposed activities further fall within the mining rights area and the area is already characterised by and surrounded by various mining infrastructure.

1.g.vi.4 The possible mitigation measures that could be applied and the level of risk

1.g.vi.4.a.1 Soil and Land Capability:

<u>Soil Erosion and Dust Emission Management</u>

- The footprint areas should be clearly demarcated to restrict vegetation clearing activities within the infrastructure footprint as far as practically possible;
- Bare soils can be regularly dampened with water to suppress dust, especially when strong wind conditions are predicted according to the local weather forecast; and
- All disturbed areas adjacent to the footprint areas can be re-vegetated with an indigenous grass mix, if necessary, to re-establish a protective cover, to minimise soil erosion and dust emission.

<u>Soil Compaction management</u>

- All vehicular traffic should be restricted to the existing service roads and the selected road servitude as far as practically possible; and
- Compacted soils adjacent to the mining blocks and associated infrastructure footprint can be lightly ripped to at least 25cm below ground surface to alleviate compaction prior to re-vegetation.

Soil Contamination Management

- Contamination prevention measures should be addressed in the EMPr for the proposed development, and this should be implemented and made available, and accessible always to the contractors and construction crew conducting the works on site for reference;
- A spill prevention and emergency spill response plan, as well as dust suppression, and fire prevention plans should also be compiled to guide the construction works;
- An emergency response contingency plan should be put in place to address clean-up measures should a spill and/or a leak occur, as well as preventative measures to prevent ingress; and
- Burying of any waste including rubble, domestic waste, empty containers on the site should be strictly prohibited and all construction rubble waste must be removed to an approved disposal site.

Loss of Natural Topography and Drainage Pattern Management

- Footprint areas should be accessed through existing road network, where feasible to avoid unnecessary excavation;
- Excavation and long-term stockpiling of soil should be limited within the demarcated areas as far as practically possible; and
- Restrict the amount of mechanical handling, as each handling event increases that compaction level and the changes to the soil structure. Wherever possible, the 'cut and cover' technique (where the stripped soils is immediately placed in an area already prepared for rehabilitation, thus avoiding stockpiling) should be used;

Stockpile Management

- Excavation and long-term stockpiling of soil should be limited within the demarcated areas;
- Ensure all stockpiles (especially topsoil) are clearly and permanently demarcated and located in defined no-go areas;
- Restrict the amount of mechanical handling, as each handling event increases that compaction level and the changes to the soil structure. Wherever possible, the 'cut and cover' technique (where the stripped soils is immediately placed in an area already prepared for rehabilitation, thus avoiding stockpiling) should be used;
- Separate stockpiling of different soil to obtain the highest post-mining land capability;
- Stockpile height should be restricted to that which can deposited without vehicles moving over previously dumped topsoil. Typically this would be a maximum height that can be achieved by the model of vehicles moving and dumping the topsoil. This guideline should be juxtaposed with the impact of an increased topsoil dump footprint created due to reducing the height of the dump and the associated impact on agriculture and/or biodiversity The stockpile should be treated with temporary soil stabilisation methods; such as the application of organic matter to promote soil aggregate formation, leading to increased infiltration rate, thereby reducing soil erosion. Also, the use of lime to stabilise soil pH levels;
- Stockpiled soils should be stored for a maximum of 3-5 years to ensure that the soil quality does not deteriorate. In addition, concurrent rehabilitation must strongly be considered to reduce the duration of stockpile storage to ensure that the quality of stored soil material does not deteriorate excessively; especially with regard to leaching and acidification;
- Soil erosion should be controlled on stockpiles by having control measures to reduce erosion risk such as erosion control blankets, soil binders, revegetation, contours, diversion banks and spillways;
- The topsoil stockpile should be vegetated and while vegetating, measures will be needed to contain erosion of the stockpile during rain events; and
- The recovered soils should be re-used to rehabilitate the mine footprint following mine closure.

Loss of Land Capability Management

- Direct surface disturbance of soils should be avoided where possible;
- The footprint as well as areas affected by edge effect should be ripped to alleviate compaction;
- Stored topsoil should be replaced (if any) and ameliorated according to soil chemical analysis;
- The recovered soils should be re-used to rehabilitate the mine footprint following mine closure.

1.g.vi.4.a.2 Integrated Impact Mitigation (Ecology - Flora and Fauna)

Provided that all management and mitigation measures are implemented, as stipulated in this report, the overall risk to floral and faunal diversity, habitat and SCC can be mitigated and minimised.

Construction Phase

Development footprint Management

- Prior to any vegetation clearance activities taking place a walkdown of the footprint must be undertaken and all floral and faunal SCC and species of conservation importance encountered must be GPS marked and the necessary permits applied for with the relevant national and provincial departments. The site walk down is to be conducted prior to clearance activities and ideally post good rains between November and February when the smaller bulbous plants are growing and visible;
- The construction footprint must be kept as small as possible to minimise impact on the surrounding environment (edge effect management) – Some key considerations should include:
  - For pipelines and haul roads, existing servitudes and roads must be utilised as far as practically possible.
  - Considering that the mine is applying for the discard to be excluded from the definition of a waste the opportunity to utilise portions of that footprint for topsoil stockpiling should be highly considered.
  - The use of discard in backfilling of the opencast pits should these pits be reworked must also commence as soon as practically possible, to further assist in the reduction of the Discard footprint (backfilling with this material is approved in the EMPr, 2010);
- Removal of vegetation must be restricted to what is absolutely necessary and should remain within the approved footprint;
- As far as possible clearing of vegetation should take place in a phased manner moving away from fences and/or barriers. This will allow for any faunal species within the proposed footprints to flee and avoid harm;
- Smaller species such as scorpions and reptiles will not as readily able to move out of an area ahead of ground clearing. As such should any be observed in the construction site during clearing and construction activities, they are to be carefully and safely moved to an area of similar habitat outside of the disturbance footprint. Construction personnel are to be educated about these species and instructed not to kill them. Smaller scorpion species and harmless reptiles (that are likely present within the footprint areas) should be carefully relocated by a suitably nominated construction person. For larger venomous snakes, a suitably trained specialist, or on-site personnel, should be contacted to carry out the relocation of the species, should it not move off on its own;
- Vehicles should be restricted to travelling only on designated roadways to limit the ecological footprint of the construction activities. Additional road construction should be limited to what is absolutely necessary, and the footprint thereof kept to a minimal;
- No hunting or trapping of faunal species is to be allowed by construction personnel;
- Informal fires by construction personnel should be prohibited, and no uncontrolled fires whatsoever should be allowed;
- Care should be taken during the construction of the five proposed projects to limit edge effects to surrounding natural habitat. This can be achieved by: · Demarcating all footprint areas during construction activities; · No dumping of litter, rubble or cleared vegetation on site should be allowed. Rubble / waste should be disposed of at an appropriate registered dump site away from the development footprint. No temporary dump sites should be allowed in areas with natural vegetation. It is advised that waste disposal containers and bins be provided during the construction phase for all construction rubble and general waste;
- Manage the spread of AIP species as per the mines mine's AIP control plan;
- Appropriate sanitary facilities must be provided during the construction of the development and must be removed to an appropriate waste disposal site;
- If any spills occur, they should be immediately cleaned up to avoid soil contamination that can hinder floral rehabilitation later down the line. Spill kits should be kept on-site at all times. In the event of a breakdown, maintenance of vehicles must take place with care, and the recollection of spillage should be practised, preventing the ingress of hydrocarbons into the topsoil; and
- Upon completion of construction activities, it must be ensured that no bare areas remain, and that indigenous species be used to revegetate the disturbed area.

Alien Vegetation Management

- Edge effects arising from the proposed development, such as erosion and alien plant species proliferation, which may affect adjacent natural areas, need to be strictly managed. Specific mention in this regard is made of Category 1b AIP species (as listed in the NEMBA Alien species lists, 2020), in line with the NEMBA Alien and Invasive Species Regulations (2020);
- AIP monitoring and clearing/control should take place throughout the construction phase of the development, and a 30m buffer surrounding the proposed railway loop should be regularly checked for

AIP proliferation and to prevent inward and or/outward spread of AIPs, notably into non infested areas outside of the proposed railway loop or into newly rehabilitated areas; and
- Alien vegetation that is removed must not be allowed to lay on unprotected ground as seeds might disperse upon it. All cleared plant material to be disposed of at a licensed waste facility which complies with legal standards.

Floral and Faunal SCC Management

- Should any floral species of conservation importance be relocated, the relocation success of such species should be monitored during the construction phase to ensure immediate actions can be taken if it becomes evident that relocation is not successful;
- No collection of floral species of conservation importance must be allowed by construction personnel without the relevant permits;
- Edge effect control needs to be implemented to prevent further degradation and potential loss of floral and faunal SCC or species of conservation importance outside of the five proposed project footprint areas; and
- Should the presence of any faunal or floral SCC or species of conservation importance be noted within the development footprint post walkdown and during vegetation clearance / construction activities, a suitably qualified specialist should be consulted on the best way to proceed

Operational and Maintenance Phase

Development footprint Management

- The footprint area must be regularly inspected for sign of erosion, edge effects and any new areas of disturbance which will lead to further habitat loss and/or the proliferation of AIPs; and
- No dumping of litter or waste must be allowed on-site.

Alien Vegetation Management

- AIP proliferation which may affect adjacent natural areas needs to be strictly managed. Specific mention in this regard is made of Category 1b AIP species (as listed in the NEMBA Alien species lists, 2020), in line with the NEM:BA Alien and Invasive Species Regulations (2020);
- Ongoing AIP monitoring and clearing/control should take place throughout the operational phase, and the project perimeters should be regularly checked for AIP establishment to prevent spread into surrounding natural areas; and
- Alien vegetation that is removed must not be allowed to lay on unprotected ground as seeds might disperse upon it. All cleared plant material to be disposed of at a licensed waste facility, which complies with legal standards.

Floral and Faunal SCC Management

- If any relocation of SCC or species of conservation importance took place, monitoring of relocation success should continue for at least three years after the completion of the construction phase, or until it is evident that the species have established self-sustaining populations.

1.g.vi.4.a.3 Freshwater Ecosystems

- The approved construction footprint of the TSF and PCD must be adhered to, to ensure that there is no encroachment on the watercourse;
- As far as practically possible, clearing and construction activities must take place during the dry season to limit potential impacts to the watercourse as a result of clearing and construction activities;
- The construction of sediment traps around the downgradient boundary of the construction area is strongly recommended to minimise the volume of sediment transported in runoff from the construction site;
- Contractor laydown areas, vehicle re-fuelling areas and material storage facilities to remain outside of the delineated watercourse and applicable setback area;
- Construction footprint areas to remain as small as possible and vegetation clearing to be limited to what is absolutely essential;
- Vegetation removal to be kept to a minimum, and preferably only alien floral species to be removed;
- Retain as much indigenous vegetation as possible;
- The design of the TSF and the PCD must ensure that no dirty water runoff must be permitted to reach the watercourse in line with GN 704 as it relates to the NWA and appropriate clean and dirty water

separation and stormwater management controls must be developed as the first part of the construction activities;

- The TSF and PCD must be designed to contain a minimum storm event of a 24 hour 1 in 50 year flood event;
- The TSF and PCD must be appropriately lined with HDPE liners to prevent seepage;
- Clean runoff captured in the clean and dirty water separation system should be returned back into the adjacent watercourse. Dirty water must be managed within the mine's existing water management system;
- The watercourse must be protected against erosion arising from the discharge of diverted clean stormwater. In this regard, energy dissipating structures should be installed to prevent erosion. Water should also be distributed in a diffuse manner to prevent canalisation.
- With regards to concrete mixing on site:
    - No mixed concrete may be deposited outside of the designated construction footprint;
    - Protective equipment should be provided, onto which any mixed concrete can be deposited whilst it awaits placing;
    - Concrete spilled outside of the demarcated area must be promptly removed and taken to a suitably licensed waste disposal site.
- As much as practically feasible, limit site preparation and construction activities to the dry season to minimise the volume of contaminated runoff potentially entering the watercourse;
- Sediment traps must be erected around the construction site prior to commencement of construction activities to minimise the risk of sediment entering the downgradient watercourses;
- Rehabilitation and revegetation of disturbed areas (as a result of construction) must take place immediately after construction;
- Appropriate control methods for AIPs in line with existing and approved alien vegetation control within the mine must be implemented;
- No waste material is permitted to be disposed of within the watercourse;
- The watercourse must be demarcated with an appropriate barrier to prevent unauthorised access to the watercourse;
- As the fuel batching sites are situated more than 200 m from watercourses, the risk posed is considered minimal. Nevertheless general 'best practice' mitigation measures are recommended including:
    - Development of an Emergency Response Plan prior to construction to provide a protocol in the event of a spill.
- As the soil in the area is susceptible to erosion, it is strongly recommended that regular monitoring for erosion takes place. Should any preferential flow paths or erosion gullies form, these must be immediately managed in accordance with the mine's existing soil management protocols.

1.g.vi.4.a.4 Hydrology

The following management measures have been identified:

- Vegetation clearance should be kept to an absolute minimum;
- Temporary erosion measures should be employed at exposed areas;
- Exposed areas should be vegetated as soon as possible;
- Machinery, trucks and vehicles must be well maintained and serviced regularly as per a recommended service guide;
- Refuelling must be undertaken over hard park bunded areas that adequately sized to capture and contain spillages;
- Machinery and vehicles should be parked on appropriately lined areas;
- Drip trays must be employed under stationary machinery;
- Spillages should be reported immediately, and spill kits should be readily available at all times;
- Runoff from dirty areas must be contained according to GN 704 regulations;
- There are no mitigation measures for a loss of contributing catchment area. The loss of catchment area is extremely small and would therefore have a negligible impact on reducing the catchment yield.
- The recommended Storm Water Management Measures as per the Hydrological Study, 2021 for all infrastructure, and specifically the Jones & Wagner (JAW) Engineering Designs should be implemented around the Khulu TSF.
    - Runoff from the Khulu TSF will be captured in a perimeter trench (solution trench) which must be lined and sized appropriately according to GN 704 regulations.
    - Clean water should be diverted around the TSF through the implementation of a diversion trench.

- The TSF silt trap must be regularly inspected and desilted. Desilted material must be placed temporarily on a lined bunded area and disposed of either back on the TSF or at an appropriate facility.
- The PCD must be lined and appropriately sized so as not to spill more than once in 50 years, in accordance with GN704 regulations.
- The freeboard of the PCD must be monitored daily.
- Lined bunded areas that are sized to accommodate 110% of the storage capacity of the diesel tanks must be implemented beneath the tanks and should be operated empty at all times.
- The emulsion transfer area must be lined and sloped towards a sump to capture any potential spills.
- The sump should be inspected and emptied on a regular basis and disposed at an appropriate facility.
- Clean water should be diverted around the diesel and emulsion batching areas to prevent any unnecessary cross contamination.

- If possible, the Khulu TSF should be vegetated as part of rehabilitation activities;
- The topography should be returned to its former state (as far as practically possible);
- Exposed areas should be vegetated as soon as possible; and
- The topsoil stockpiles should be used to fill in areas and to create a suitable substrate to re-vegetate areas.

1.g.vi.4.a.5 Hydrogeology

Several broad over-arching groundwater management measures should be implemented by Dwarsrivier Mine to minimise impacts on groundwater the proposed Khulu TSF project. Most of these form part of good house-keeping measures, as detailed in the following table.

Table 75: General groundwater management measures

Operational Phase
Develop and implement a sound surface runoff management plan for the project. This plan must focus on containing all dirty water that could be generated during the project and preventing clean runoff from entering the footprint area. These measures are considered in the TSF designs developed by JAW (2021a-g).
Ensure that sufficient capacity is available to all contain dirty water within mining area. This management measure must consider the containment of additional dirty water that will be discharged from the Khulu TSF PCD to the Lower RWD. The water balance calculations completed as part of the Khulu TSF WULA suggests that the Lower RWD can accommodate the PCD discharge through use in the Dwarsrivier Mine Plant. If the capacity of the dirty water containment measures are compromised, these structures must managed to free up capacity.
Complete regular inspections of all dirty water management systems, including toe drains, cut off trenches and berms, pollution control dams and stormwater diversion structures, specifically noting incidences of overflow and leakage. If the latter is identified, measures must be taken to rectify non-compliances immediately.
Maintain sound house-keeping measures to prevent spills and leaks. If spills and/or leaks occur, they must be addressed and remediated as a matter of urgency.
Maintain the groundwater monitoring programme in existing and proposed additional monitoring boreholes. Some amendments to the current monitoring programme is proposed. These are detailed below.
Measure and record rainfall daily on site.
Decommissioning and Closure Phase
Complete all rehabilitation to a satisfactory level, focussing specifically on maintaining dirty water and runoff in designated areas. Effective rehabilitation of these areas must aim to reduce the rate of recharge of rainwater as far as possible. No ponding must be allowed over rehabilitated areas. All rehabilitated surfaces must be free draining.
Plan for and budget to continue with the groundwater monitoring period for a minimum of two (2) years after mine closure. The continued need for groundwater monitoring will depend on the outcome of the final mine closure groundwater impact assessment.

The following specific measures are recommended to minimise and/or eliminate the impacts on groundwater quality and the spread of groundwater pollution associated with the Khulu TSF:

- Finalise the implementation plan for the Groundwater Remediation Strategy for the operations, based on the outcome of fieldwork completed during 2021. The most effective groundwater management strategies must be developed and implemented as part of a groundwater impact assessment study to be completed during 2022. Due to the fact that groundwater quality at the Khulu TSF is affected by preferential flow along regional faults and dykes, it is accepted that the Groundwater Remediation Strategy will also improve groundwater quality at the TSF and PCD in the long-term.
- The outcome of the groundwater impact assessment presented in this report indicates that the Scenario 1 liner design is the preferred option to ensure that long-term impacts on groundwater quality are limited. This entails good installation of the liner and limited exposure of the HDPE to the atmosphere. Under these measures, the liner is expected to have a life of 280 years. Once the liner fails, the rate of seepage to the underlying aquifers is minimised with good liner installation.
- The liner design must include the above and below liner capture of seepage. Any seepage collected must be diverted to the PCD for containment.
- The water level in the PCD must be diligently monitored to avoid spills and/or seepage. If excess water collects in the PCD, this water must be pumped to the Lower RWD for reuse in the mine water balance.
- Dwarsrivier Mine must monitor the volumes of water transferred to and from the Khulu TSF and PCD as part of its flow meter monitoring network. Instruments installed to measure flow must be maintained and calibrated to ensure that accurate measurements are made. The data collected from the flow meters must be used to confirm that the assumptions on which this impact assessment are based, remain valid. If significant deviations in terms of water flow volumes are recorded, the impact assessment presented in this report must be re-evaluated, especially in terms of the volume of seepage available for infiltration from the TSF and PCD.
- All newly drilled monitoring boreholes must be surveyed to confirm accurate positions and elevations. The coordinates presented in this report were recorded with a hand-held GPS.
- Groundwater monitoring must be maintained in all boreholes dedicated to the Khulu TSF. Both groundwater quality and groundwater levels must be monitored in the boreholes according to the strategy below. The information from the monitoring programme must be kept in a spreadsheet. Trends must be analysed to ensure that any exceedances are immediately detected.
- In the event of deterioration in groundwater quality, an inspection must be held to identify the source of contamination. Any non-compliances must be rectified immediately to avoid prolonged negative impacts on groundwater.
- If any of the monitoring boreholes are destroyed during construction and/or operation of the TSF, these must be placed as a matter of urgency. Of specific concern is the location of boreholes DRM11S and D, which is located on the edge of the Khulu TSF design. These boreholes target the SW-NE trending fault and must be redrilled on this structure if destroyed to ensure efficient monitoring of groundwater in this position.
- Additional monitoring boreholes, as detailed below, must be drilled prior to the commencement of construction of the Khulu TSF and PCD to ensure that a baseline can be generated.

1.g.vi.4.a.6 Air Quality

Important Mitigation measures to be implemented during mining operations are:

- Use of water sprays at crushing and transfer points;
- Continuous wetting of the access road during vehicle transport;
- Wetting of exposed stockpiles to limit the dispersion of wind-blown dust and particulate emissions;
- Avoid dust generating works during the most windy conditions; and
- Frequent wetting of the access roads.

In addition to the above, the Visual Impact Assessment recommended the planting of trees along the road to mitigate visual intrusion, this could also aid in the mitigation of dust.

1.g.vi.4.a.7 Visual

The following management measures have been identified:

- Vegetation clearance should be kept to an absolute minimum.
- Exposed areas should be vegetated as soon as possible.
- Dust suppression measures should be implemented to limit the generation of dust.

- Trees should be planted along the main roads to conceal the TSF from motorists.
- There are no real mitigation measures as the TSF will increase in height and will be approved for a certain height, however, the TSF should be vegetated as soon as practicably possible and should not exceed the approved height.
- In terms of closure, The TSF should be vegetated to blend into the surrounding area.

1.g.vi.4.a.8 Heritage and Palaeontology

The following management measures have been identified:

- The stone cairn of unknown purpose at Feature 1 should be avoided with a 30 m buffer, if this is not possible it should be confirmed whether this is a grave through stakeholder consultation/ Ground Penetrating Radar/ Test Excavations and if confirmed to be a grave it should be relocated as per all the relevant legal requirements;
- Features 2, 3 and 5 should be shovel pit tested (with the required mitigation permit) to determine the presence of subsurface deposit after which a destruction permit can be applied for.
- The lack of graves at Feature 4 and 6 should be confirmed prior to construction by the social team and monitored during construction;
- Implementation of a chance find procedure for the project.

1.g.vi.4.a.9 Socio-Economic

The following management measures have been identified:

- Employment
    - Prioritise any possible new local labour in the recruitment process as part of the company's own recruitment policy or as part of the contractor management plan and stipulate the procurement of new employees, especially in the medium to lower skilled categories, from the local communities.
    - The procurement of locals should receive preference if there is any need for additional employees. The ideal objective should be to reach 100% recruitment of additional/ new unskilled labour from local communities where skills are locally available.
    - Contractual obligations for contractors (if required) should be introduced to use local labour as far as possible where applicable.
    - Contractors should ensure that workers reside in suitable facilities and not establish informal houses.
    - Targets for the procurement of capital goods, consumer goods and services should be set and Dwarsrivier Mine should develop an action plan to meet these targets.
    - The procurement process should be based on competitive business principles and the quality of services to be rendered, to ensure adherence to standards and to maximise overall welfare.
    - Targets for the procurement of capital goods, consumer goods and services should be set and Dwarsrivier Mine can develop an action plan to meet these targets. These plans could include, but are not limited to, the development of Economic Empowerment (EE) policies, procedures and guidelines, as well as the development of a database of local small businesses (entrepreneurs and Small, Medium and Micro Enterprises (SMME's))
    - The procurement process should be based on competitive business principles and the quality of services to be rendered, must ensure adherence to standards while maximising overall welfare of the local communities.
    - Contract executions by SMMEs should be strictly monitored to determine whether SMMEs require assistance with regards to general business principles, financial management, management of stock, competitive costing (pricing), and marketing of their businesses.
    - Enterprise development is a key enhancement measure in this regard. The proponent should assist small businesses and/or SMME's to develop to a certain level. Such measures recommended could include the following:
        - The establishment of joint ventures between small businesses and established companies with relevant experiences with regards to tender processes can be considered;
        - Flexible payment systems can be considered to assist smaller businesses in terms of expenditure, but such a system must be strictly controlled; and

        - An audit of existing local enterprises that could provide services, goods and material should be undertaken with the assistance of local leaders and community representatives, as well as local business structures

- Safety and Security
    - Construction vehicles must adhere to all mine related safety regulations and drivers must adhere to road regulations.
    - Drivers and operators must have the necessary qualifications to operate the vehicles and equipment they are assigned to.
    - Construction vehicles must be in a good working order. Inspections of vehicles, as well as maintenance must be undertaken on a regular basis.
    - Discussions and approvals with regards to required construction authorisations between Dwarsrivier Mine and Department of Roads and Public Works to be in place.
    - Warning signs with regards to construction activities to be erected to inform public road users of activities and possible dangers.
- Traffic Movement
    - Unauthorised entry onto the mining area must not be allowed. Access control should continue to be implemented.
    - Mining areas must be secured and fenced.
    - All construction vehicles should be in a good condition and adhere to road worthy standards.
    - Construction vehicles must keep to speed limits.
    - Limit construction hours to daylight hours e.g., 6 AM to 6 PM.
    - Road users must be notified if delays would be experienced due to the access road construction.
    - Warning signs with regards to the construction activities need to be erected at strategic places along the R577 and must be clearly visible at night.
    - Road deviations, if required, must be clearly indicated by road signs and must be clearly visible at night.
- Socio-Economic Development
    - Dwarsrivier Mine, through their SLP, must continue to provide skills development opportunities for employees that include functional literacy and numeracy programmes, career progression plans, up-skilling for hard to fill vacancies and management positions, bursary and internships and portable skills training.
    - Develop a database of SMME's for the procurement of goods and services that could potentially be outsourced to the local community.
    - Dwarsrivier Mine to continue to adhere to the Social and Labour Plans as per the Regulation 46 of the Mineral and Petroleum Resources Development Act (Act 28 of 2002) and the Mining Charter (2018).
- Capacity Building
    - Dwarsrivier Mine should continue with a Human Resources Development (HRD) strategy as part of the SLP. The focus should remain of career development programmes, bursaries, learnership programmes, skills development and training.
    - Learnership programmes should preferably focus on individuals from the core and affected areas in close proximity to Dwarsrivier Mine to maximise the long-term employment opportunities of these local community members.
    - Local goods and services should be used as far as possible and therefore contractual requirements for contractors to use local goods and services should be implemented as far as possible
    - Local Economic Development initiatives should continue.

1.g.vi.5 Motivation where no alternatives sites exist

Please refer to Section 1.g of this report for the alternative assessment

1.g.vii Statement motivating the preferred site

Please refer to Section 1.g of this report for the alternative assessment.

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

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

- The stakeholder consultation process is undertaken in a manner to be interactive, providing landowners and identified stakeholders with the opportunity to provide input into the project. This is a key focus, as the local residents have the capability to provide site specific information, which may not be available in desktop research material. Stakeholders are requested (as part of the BID) to provide their views on the project and any potential concerns which they may have. All comments and concerns received to date, have been captured and formulated into the impact assessment.
- Various environmental studies have been undertaken in the past for a number of projects at the mine. These include the MPRDA EMPr, EMPr Amendment, various Environmental Authorisation Processes, etc. on the portions of land applicable to this project. The baseline specialist studies prepared for the 2018 EIA process, which broadly involved resource and reserve drilling, various Capital Projects throughout the MRA, and the establishment of diesel storage tanks, together with the impact findings were considered as part of this process and incorporated into the assessment of impacts and the ranking of these.
- Site Specific specialist studies were conducted for the proposed projects, which included:
    - Engineering investigations;
    - Soils Assessment;
    - Ecological assessments;
    - Freshwater Ecosystem assessments;
    - Hydrological investigations;
    - Groundwater investigations;
    - Visual assessments;
    - Air Quality assessments;
    - Heritage assessments;
    - Socio-Economic assessments; and
- In addition to information obtained from existing specialist studies, a detailed desktop investigation was undertaken to determine the environmental setting in which the project is located. Based on the desktop investigations, various resources were used to determine the significance and sensitivity of the various environmental considerations. The desktop investigation involved the use of:
    - South African National Biodiversity Institute (SANBI) Biodiversity Geographic Database Land Use Decision Support (LUDS) system;
    - Geographic Information System (GIS) base maps;
    - DWS information documents such as the Internal Strategic Perspective (ISP) and Groundwater Vulnerability Reports;
    - Agricultural GIS database;
    - Municipal IDPs; etc.
- The rating of the identified impacts was undertaken in a quantitative manner as provided in Section 1.g.vi.2.a (Impact Ratings). The ratings are undertaken in a manner to calculate the significance of each of the impacts. The EAP also assessed the outcomes of the calculation to determine whether the outcome reflects the perceived and actual views.
- The identification of management measures is done based on the significance of the impacts and measures that have been considered appropriate and successful, specifically as Best Practical and Economical Options.

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

The following tables present the impacts assessed based on the Sections before. Please take note of the following abbreviations when assessing the tables:

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

Table 76: Planning Impact Assessment and Management Measures (Significance before Mitigation –SbM; Significance after Mitigation – SaM; Can be avoided – CbA; R – Reversible; Ir – Irreversible; ST: 1-12 months; MT: 1-5 yrs.; LT: 5 years and more; LOM: Life of Mine)

Name of Activity			Potential Impacts	Rating Prior to Measures						Mitigation Type	Rating Post Measures					Significance	
Activities	Project	Impact Area	Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM	CvA/R/Ir
Legal Requirements (Environmental Permits)	1, 2, 3, 4 &5	Legal Compliance	Unlawful water and waste activities, which could lead to NWA Directives and Section 24G Rectification fines.	N	-4	-3	-2	-5	-14	A legal assessment of all activities and future planned activities must be undertaken annually to ensure that all activities are authorised. All legally appointed personnel responsible or involved in water use activities and activities associated in the Environmental Authorisations on site must receive training on the requirements of the Environmental Authorisations and relevant Environmental Legislation. Biannually (construction) internal and external audits must be undertaken during the construction phase, whereafter Biennial (every second year) audits can be undertaken, on the lawful implementation of the Environmental Authorisation Additional monitoring boreholes, as detailed in the Numerical Model, 2022, must be drilled prior to the commencement of construction of the Khulu TSF and PCD to ensure that a baseline can be generated. In addition to this the following should be undertaken to plan toward groundwater management prior to the construction of the TSF: • Survey newly drilled monitoring boreholes. • Drill three additional monitoring boreholes, two down-gradient of the PCD and one on the north-western corner of the TSF. • Implement the monitoring programme dedicated to the Khulu TSF. • Finalise the Groundwater Remediation Strategy for the Dwarsrivier Mine operations. The objective of the strategy must be to avoid further deterioration of groundwater quality. The study must be based on the field data obtained from newly drilled monitoring boreholes during 2021. • The TSF design should consider the locations of all monitoring boreholes to avoid borehole destruction. • Develop a conceptual rehabilitation plan that takes the outcome of the geohydrological study into consideration. This plan should consider the implementation of concurrent rehabilitation during the operational phase to reduce long-term impacts. A copy of the Water Use Licences (WULs) must be available on site at all times. GN704 exemptions will be applied for, for the following proposed: • Infrastructure located within a 100m horizontal distance of a watercourse: Main Parking Extension; Widening of an Access Road between South Shaft/Main Offices and Plant; and Subway Crossing between the Plant and North Mine The following buffers should be maintained: • No activities within 1:100 year floodline unless approved in terms of the NWA; • No activities of 100m² and more may be undertaken within 32m of the riparian zones unless approved in terms of the NEMA; • Where necessary and recommended as part of the Heritage Impact	P	4	3	5	5	17	CbA

Name of Activity			Potential Impacts	Rating Prior to Measures						Mitigation Type	Rating Post Measures					Significance	
Activities	**Project**	**Impact Area**	**Potential Impacts**	**Status**	**Extent**	**Duration**	**Probability**	**Intensity**	**SbM**	**Mitigation Measures**	**Status**	Extent	Duration	Probability	Intensity	SaM	**CvA/R/Ir**
										Assessment (HIA), buffers around heritage features must remain as stipulated; alternatively the required permits must be obtained from the SAHRA to relocate or destroy these should this be determined necessary.							
										For NFA protected tree species, attempting to relocate mature individuals are often too expensive and/or result in unsuccessful re-establishment due to unavoidable damage to their root systems during their excavation. Where possible, seedlings of affected tree species should be targeted for relocation, and seeds must be harvested prior to vegetation clearance to use in rehabilitation activities. It is important that seedlings and seeds be harvested within a close proximity of an area to be impacted, so as to prevent alteration of population genetics.							
										All efforts must be made to avoid damage or destruction of protected trees.							
										Floral species of conservation importance recorded within the proposed mining footprint included species protected under the NFA and the NEMBA TOPS regulations. A walkdown of the footprint area is required before construction activities commence, where all anticipated floral species of conservation importance /protected species are searched and marked for relocation and/or destruction so that all necessary permits can be obtained from the LEDET and DFFE.							
										A rescue and relocation plan must be drafted and approved by the relevant authorities for all floral species of conservation importance that will potentially be impacted by the proposed mining activities. The Rescue and Relocation Plan must be used in conjunction with an approved Rehabilitation Plan for the Mine to ensure successful translocation and/or reinstatement of floral species of conservation importance and habitat for such species.							
										Where relocation of protected trees and plant species cannot be undertaken the necessary removal permits must also be applied for at the DFFE.							
										The legal register must be updated to indicate all activities associated with Environmental Authorisations.							
Land Claims and associated grave ownership	1, 2, 3, 4 &5	Socio-Economic	There are land claims present on the farm Dwarsrivier and De Grooteboom. No known graves are being impacted upon by the activities in question, although the diesel and emulsion storage project are in close proximity to some of the graves. All known graves are located more than 170m from the proposed activities. The heritage study recorded two areas with historical/recent residential elements (Feature 4 and 6), the remains of Iron Age sites (Feature 2,3, and 5) marked by a scatter of ceramics, and a stone cairn (Feature 1) of unknown purpose that although unlikely could possibly indicate a grave site.	N	-3	-3	-4	-4	-14	The mine should conduct an overall heritage assessment in consultation with the land claimants to determine the presence of any other graves not known off. The stone cairn of unknown purpose at Feature 1 (west of proposed PCD) should be avoided with a 30m buffer, if this is not possible it should be confirmed whether this is a grave through stakeholder consultation/ Ground Penetrating Radar/ Test Excavations and if confirmed to be a grave it should be relocated as per all the relevant legal requirements. Should this be determined a grave two options must will be followed: • Excavation permits will be applied for; or • 30m buffer zone (as recommended by the HIA report as no blasting or invasive activities is planned with the construction the TSF)) must be adhered to in order to conserve the cemetery against any potential damage during construction. A social consultation process in terms of Chapter XI of the NHRA Regulations, must be carried out to identify the descendants of	N	-1	-2	-1	-1	-5	CbA

Name of Activity			**Potential Impacts**	**Rating Prior to Measures**						**Mitigation Type**	**Rating Post Measures**					**Significance**	
Activities	**Project**	**Impact Area**	**Potential Impacts**	**Status**	**Extent**	**Duration**	**Probability**	**Intensity**	**SbM**	**Mitigation Measures**	**Status**	Extent	Duration	Probability	Intensity	SaM	**CvA/R/Ir**
			However, the presence for chance finds should be considered.							the burials and to obtain permission to fence in the identified cemetery. If the mine is unable to retain the grave in situ, the permission must be obtained from the families of the deceased, if they agree to the relocation of their graves then a section 36 of the NHRA permit application must be logged on SAHRIS. Features 2 & 3 (both at the Emulsion and Diesel Storage Areas) and 5 (south of proposed TSF) should be shovel pit tested (with the required mitigation permit) to determine the presence of subsurface deposit after which a destruction permit can be applied for. The lack of graves at Feature 4 (Emulsion and Diesel Storage Areas) and 6 (proposed TSF) should be confirmed prior to construction by the social team and monitored during construction. If risks are manifested (accidental discovery of heritage resources) the chance find procedure should be implemented: Cease all works immediately; • Report incident to the Sustainability Manager; • Contact an archaeologist/ palaeontologist to inspect the site; • Report incident to the competent authority; and • Employ reasonable mitigation measures in accordance with the requirements of the relevant authorities. • Only recommence operations once impacts have been mitigated. The mine should ensure that they are abreast the developments of the land claim assessment and in consultation with the relevant department. If the mine is unable to conserve the identified archaeological sites in situ then the sites must be mitigated by a suitably qualified archaeologist. A permit issued under Section 35 of the NHRA will be required to conduct such work. On completion of the mitigation work the developer can apply for a destruction permit with the backing of the mitigation report. All activities should remain within the approved contracts.							
Location of infrastructure on mining rights areas.	1	Geology and Economic Activities	The PCD associated with the TSF will be located north of the TSF, across the Richmond road. The PCD will be located very close to the property boundary between Dwarsrivier Mine and Two Rivers Platinum mine (TRP mine) but on Dwarsrivier Mine's surface rights. The northern portion of the PCD is located on an area which was previously undermined (mining rights belong to Tweefontein Mine).	N	-3	-3	-2	-5	-13	Permission to locate the PCD over the undermining will be obtained by Dwarsrivier Mine from the mining rights owner and the authorities.	P	1	3	3	5	12	CbA
Location of Diesel and Emulsion Storage Area near TRP TSF Pipeline route.	2	Geology and Economic Activities	The proposed Diesel and Emulsion Storage Area are located on Dwarsrivier Mine owned property, however, with the two facilities located on either side of the pipeline route and associated access route of the TRP TSF Pipeline. Construction of the two facilities may impact on the pipeline route if not suitably planned.	N	-3	-3	-2	-5	-13	The mine should consult with TRP in terms of construction plan and schedule to ensure that the activities and associated access requirements do not impact on either of the two mines activities.	P	1	3	3	5	12	CbA
Protection of Lebolelo Pipeline	1	Water Supply	The Lebolelo Pipeline is located between the TSF and PCD.	N	-3	-3	-2	-5	-13	The mine should ensure that the pipeline is protected from the mining related activities to ensure that there is no impact on water supply.	P	1	3	3	5	12	CbA

Name of Activity			Potential Impacts	Rating Prior to Measures						Mitigation Type	Rating Post Measures					Significance	
Activities	**Project**	**Impact Area**	**Potential Impacts**	**Status**	**Extent**	**Duration**	**Probability**	**Intensity**	**SbM**	**Mitigation Measures**	**Status**	Extent	Duration	Probability	Intensity	SaM	**CvA/R/Ir**
Relocation of Mine owned and State (Eskom) Owned (where possible) Powerline	6	Socio-Economic	The TSF will be located between the existing D1261 public road (Richmond road) and existing Eskom powerline servitudes. The Richmond road will constrain the development of the TSF to the north and to the west. Existing powerlines are a constrain to the east and to the south. The Richmond road, existing powerlines and mine property boundary are a constrain for the PCD associated with the Khulu TSF. An Eskom substation and future extension and servitudes of this substation constrains the site to the south. However, these will not be impacted. There is an existing Eskom powerline that crosses the PCD site which will need to be diverted. The relocation of the powerlines (applicant owned and/or Eskom owned) could temporarily disrupt Economic Activities in the area which the powerline supplies. Consultation with Eskom has been initiated and the relocation of the powerlines will accordingly be managed.	N	-3	-1	-4	-4	-12	The mine should obtain approval from the relevant parties regarding the relocation of the powerlines where this be required. Buffers along the substation and other Eskom Powerline infrastructure should be agreed to between parties. The mine should enter into discussions with affected parties to develop an operating procedure and time line for the removal of the powerlines should this be required. The powerlines may not be removed without the required approvals by the relevant authorities (if applicable).	N	-1	-2	-1	-1	-5	CbA
Location of Eskom Owned Sub Station	1	Socio-Economic	The existing dam break analysis indicates that should an impact occur that the Eskom Sub Station will be in the zone of influence (refer to Annexure 4).	N	-3	-2	-2	-5	-12	The necessary emergency preparedness plans must be developed and implemented in consultation with Eskom to proactively plan and manage an instance should dam break be encountered. The TSF must be designed, constructed and operated in line with the approved designs.	N	-3	-1	-1	-2	-7	CbA

Table 77: Construction Phase Impact Assessment and Management Measures (Significance before Mitigation –SbM; Significance after Mitigation – SaM; Can be avoided – CbA; R – Reversible; Ir - Irreversible)

Name of Activity			**Potential Impacts**	**Rating Prior to Measures**						**Mitigation Type**	**Rating Post Measures**					**Significance**	
Activities	**Project**	**Impact Area**	**Potential Impacts**	**Status**	**Extent**	**Duration**	**Probability**	**Intensity**	**SbM**	**Mitigation Measures**	**Status**	Extent	Duration	Probability	Intensity	SaM	**CvA/R/Ir**
Land and Footprint Clearance **Topsoil Stripping and Stockpiling and Vegetation Removal**	-	Geology	No direct impact expected on geology.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	1, 2 & 3	Topography	Direct impact: Alteration of topography. Removal of vegetation and the associated shaping of the area will lead to change in topographical characteristics of the area. The impact is not considered significant due to the fairly flat nature of the topography and the location of the activities in the immediate vicinity of the existing plant area.	N	-1	-3	-3	-2	-9	The footprint areas of all surface infrastructure must remain as small as possible within the parameters of operational and engineering requirements. Footprint areas should be accessed through existing road network, where feasible to avoid unnecessary excavation. Excavation and long-term stockpiling of soil should be limited within the demarcated areas as far as practically possible Construction areas must be clearly demarcated to control movement of personnel and vehicles, providing clear boundaries for construction sites in order to limit the spread of impacts. Markers and pegs will be erected and maintained along the boundaries of the working areas, access roads, haul roads and paths before commencing any work. If proved insufficient for control, these shall be replaced by fencing. Designs of the facilities (TSF and landscaping) must be undertaken by a registered Engineer. Draw up a procedure clearly reflecting the method and phases of clearance of vegetation only in areas where construction will take place. Removal of vegetation must be undertaken in a phased approach to limit surface exposure. Temporary erosion control measures may be used to protect the disturbed soils during the construction phase until adequate vegetation has established. Clean and dirty water separation must be implemented early in the construction phase, especially down-gradient of construction areas to ensure that the natural runoff patterns are impacted as little as possible. Activities must remain outside of the 1;100 year flood lines, where this is not possible, the required approval must be obtained from the DWS and activities should further be restrained to the dry season. Linear infrastructure must follow for as far as practically possible the natural contours of the area.	N	-1	-1	-2	-1	-5	R
	1, 2, 3, 4 & 5	Soil, Land Use and Land Capability	Direct impact: The removal and stockpiling of topsoil may lead to a loss of soil resource and land capability through erosion of the stockpiles and chemical and physical degradation. This impact is considered important due to the fact that the mine may be operating on a negative topsoil balance and therefore the retaining of suitable topsoil is important for successful rehabilitation.	N	-2	-3	-5	-4	-14	Excavation and long-term stockpiling of soil should be limited within the demarcated areas Adhere to Soil Stripping, Soil Stockpiling and Soil Management Plan as part of the EMPr (where feasible). Prior to construction of the road the soil will be stripped and placed on a soil stockpile. The A-horizon (0-30cm) and B horizon (50-80cm) can be stripped as one horizon since the physical characteristics of both these horizons are	N	-1	-1	-2	-1	-5	Irr

Name of Activity	Project	Impact Area	Potential Impacts	Rating Prior to Measures						Mitigation Type	Rating Post Measures					Significance	
Activities	**Project**	**Impact Area**	**Potential Impacts**	**Status**	**Extent**	**Duration**	**Probability**	**Intensity**	**SbM**	**Mitigation Measures**	**Status**	**Extent**	**Duration**	**Probability**	**Intensity**	**SaM**	**CvA/R/Ir**
			The Project 1 area is largely dominated by arable soils which have been historically subjected to cultivation but have since been laid to fallow. It is evident that these soils are capable of supporting agriculture. It should however be noted that the extent of these soils is small to support commercial scale cultivated agriculture. The best suited farming scale in this instance is subsistence farming or grazing. The overall impact of project 1 on the local, regional, provincial and national scale is anticipated to be limited given that the soils occur in a small patch and that they are not actively being used for agriculture. The proposed Project 2 will most likely result in the clearance of vegetation as part of the construction phase which will lead to loss of soil through erosion and subsequent loss of land capability. Given the small footprint of this project, the loss of land capability is not anticipated to be significant, provided that the project occurs within the demarcated areas and mitigation measures are implemented during all phases of development. The extent of the access road required for this project will be limited since this project is located adjacent the current TRP mine's new TSF pipeline and service road. The TSF maintenance road will serve as the main access road and as such the impact of the access road will be negligibly low. The proposed projects (3,4 & 5) are located within the existing mine operational footprint where soils have already been subjected to significant disturbance associated with mining and related infrastructure. The extension of the existing infrastructure will not lead to a significant losses of land capability given the disturbance that has occurred on the surrounding soils. Impact such as soil erosion, compaction and soil contamination will likely occur during the construction phase which will lead to further degradation of the surrounding soils and the subsequent loss of land capability. However, the overall impact significance of the proposed project will be negligibly low, after mitigation measures have been put in place during all phases of development. The ratings given in the columns on the left is for Project 1 , and Project 2-5.							similar. Both layers are regarded useable as topsoil during closure. This is largely influenced by the fact that these soils have been previously cultivated and thus the tillage practices have mixed the soil to a degree such that both horizons can be utilised as a growth medium. The 2021 Soils report states that the topsoil within the TSF area is available up until 80cm and that this should be stripped if feasible. However, without compromising the stability and integrity of the facility. According to the Engineering Report for the Khulu TSF, a maximum of 30cm must be stripped. Stripping of topsoil should be documented, to determine that the maximum volume of topsoil has been removed.							
										The topsoil associated with the RWD infrastructure should be stripped to 30cm or in manner that does not compromise the design and will not lead to infrastructural damage.							
										Topsoil should be stockpiled on designated topsoil stockpiles, unless around linear infrastructure, where the topsoil could be stockpiled next to the linear structure.							
										Separate stockpiling of different soil to obtain the highest post-mining land capability.							
										Restrict the amount of mechanical handling, as each handling event increases that compaction level and the changes to the soil structure. Wherever possible, the 'cut and cover' technique (where the stripped soils is immediately placed in an area already prepared for rehabilitation, thus avoiding stockpiling) should be used.							
										The management of topsoil stockpiles should be undertaken in terms of the Topsoil Management Plan included into this EMPr to ensure that the topsoil stockpiles maintain its integrity and are not subjected to compaction.							
										Stockpile height should be restricted to that which can deposited without additional traversing by machinery. Stockpiles should be treated with temporary soil stabilisation methods, such as the application of organic matter to promote soil aggregate formation, leading to increased infiltration rate, thereby reducing soil erosion.							
										The use of lime to stabilise soil pH levels will be required in some instances.							
										Restrict the amount of mechanical handling, as each handling event increases that compaction level and the changes to the soil structure. Wherever possible, the 'cut and cover' technique (where the stripped soils is immediately placed in an area already prepared for rehabilitation, thus avoiding stockpiling) should be used.							
				N	-2	-3	-3	-2	-10	Temporary stockpiles must be protected by means of suitable geotextiles such as hessian sheeting, silt curtains, sandbags etc. to prevent contamination of runoff and sedimentation of freshwater resources in the vicinity of the surface infrastructure and should remain outside of the buffer zones.	N	-1	-1	-2	-1	-5	R
										The stockpile should be treated with temporary soil stabilisation methods; such as the application of organic matter to promote soil							

Name of Activity			Potential Impacts	Rating Prior to Measures						Mitigation Type	Rating Post Measures					Significance	
Activities	**Project**	**Impact Area**	**Potential Impacts**	**Status**	**Extent**	**Duration**	**Probability**	**Intensity**	**SbM**	**Mitigation Measures**	**Status**	**Extent**	**Duration**	**Probability**	**Intensity**	**SaM**	**CvA/R/Ir**
										aggregate formation, leading to increased infiltration rate, thereby reducing soil erosion. Also, the use of lime to stabilise soil pH levels.							
										Stockpiled soils should be stored for a maximum of 3-5 years to ensure that the soil quality does not deteriorate. In addition, concurrent rehabilitation must strongly be considered to reduce the duration of stockpile storage to ensure that the quality of stored soil material does not deteriorate excessively; especially with regard to leaching and acidification.							
										Soil erosion should be controlled on stockpiles by having control measures to reduce erosion risk such as erosion control blankets, soil binders, revegetation, contours, diversion banks and spillways.							
										Temporary berms can be installed, around stockpile areas whilst vegetation cover has not established to avoid soil loss through erosion							
										The topsoil stockpile should be vegetated and while vegetating, measures will be needed to contain erosion of the stockpile during rain events.							
										The recovered soils should be re-used to rehabilitate the mine footprint following mine closure.							
			Soil compaction - Heavy equipment traffic during construction and exploration activities is anticipated to cause soil compaction. The severity of this impact is anticipated to be medium-high for Acardia soils due to clayey texture. Whereas soils with a relatively shallow bedrock and lithocutanic character (partly weathered rock material) such as the Glenrosa/Mispah soil forms are anticipated to be less impaired due to the resistance offered by the underlying bedrock. The ratings given in the columns on the left is for Project 1 , Project 2 and Project 3-5.	N	-2	-3	-5	-4	-14	The contractor will ensure that all activities, material and equipment storage and personnel movement take place within the designated area.	N	-1	-1	-2	-1	-5	R
										A site plan must be developed, indicating the following: Location of all approved activities; 1:100 year buffer around all watercourses; Location of the CBA and Endangered Ecosystems and mark these areas where construction is not approved as a no-go zone's All vegetation management zones as per the Biodiversity Action Plan.							
				N	-2	-3	-4	-2	-11	Laydown areas should be located within disturbed soils (anthrosols) to avoid compaction of natural soils.	N	-1	-1	-2	-1	-5	
										All contractors must receive induction. The induction should be updated on site, to make provision for the site plan and a detailed explanation on the purpose of the no-go zones, presence of protected species, presence of the CBA and ESAs and the meeting thereof.							
				N	-2	-3	-4	-2	-11	The management of topsoil stockpiles should be undertaken in terms of the Topsoil Management Plan included into this EMPr to ensure that the topsoil stockpiles maintain its integrity and are not subjected to compaction.	N	-1	-1	-2	-1	-5	
										Restrict the amount of mechanical handling, as each handling event increases that compaction level and the changes to the soil structure. Wherever possible, the 'cut and cover' technique (where the stripped soils is immediately placed in an area already prepared for rehabilitation, thus avoiding stockpiling) should be used.							
										A fine system/disciplinary system must be implemented on site for all significant or recurring environmental non-compliances.							
										Compacted soils adjacent to the mining blocks and associated infrastructure footprint can be lightly ripped to at least 25cm below ground surface to alleviate compaction prior to re-vegetation.							

Name of Activity	Project	Impact Area	Potential Impacts	Rating Prior to Measures						Mitigation Type	Rating Post Measures					Significance	
Activities	Project	Impact Area	Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM	CvA/R/Ir
										Site clearance and activities should be restricted to the approved footprint. Contractors areas should be established on already disturbed footprints. All vehicular traffic should be restricted to the existing service roads and the selected road servitude as far as practically possible							
			Clearing vegetation will result in the exposure of soil, which may in turn lead to soil erosion, in addition to this, stockpiling of topsoil material on sloping areas leading to increased runoff and erosion. The areas where the infrastructure is proposed are mostly gradual, however the exploration activities will be located among the mountainous setting and this is where erosion is considered moderately high. The natural and undisturbed soils will become more vulnerable to erosion once the vegetation is cleared for construction activities, and the soils will inevitably be exposed to wind and some surface runoff during intensive rainfall events. The ratings given in the columns on the left is for Project 1 , Project 2 and Project 3-5.	N	-2	-3	-5	-4	-14	The approved Storm Water Management Plan must be implemented. Clean and dirty water systems must be established prior to construction. Ensure the required erosion protection measures are monitored and corrected where necessary. Bare soils can be regularly dampened with water to suppress dust during the construction phase, especially when strong wind conditions are predicted according to the local weather forecast All disturbed areas adjacent to the footprint areas can be re-vegetated with an indigenous grass mix, if necessary, to re-establish a protective cover, to minimise soil erosion and dust emission. Natural vegetation establishment (self-succession) will be encouraged on cleared areas, and topsoil stockpiles. If natural succession of vegetation is not established within one rainy season, after rehabilitation, the disturbed areas and areas adjacent to the infrastructural areas must be re-vegetated with an indigenous grass mix, if necessary, to re-establish a protective cover, to minimise soil erosion and dust emission.	N	-1	-1	-2	-1	-5	R
				N	-2	-3	-4	-2	-11	The mine will investigate an appropriate seed mix for the rehabilitation purposes should self-succession not establish on rehabilitated sites. If possible, vegetation clearance and commencement of construction activities can be scheduled to coincide with low rainfall conditions when the erosive stormwater and wind are anticipated to be low. The footprint of the proposed areas should be clearly demarcated to restrict vegetation clearing activities within the infrastructure footprint as far as practically possible. No construction or project related activities may be undertaken outside of the demarcated areas.	N	-1	-1	-2	-1	-5	
				N	-2	-3	-4	-2	-11	A fire management plan must be developed for the mine. Fire belts must be constructed around the boundaries of the mine. Daily fire danger ratings must be viewed and addressed where required. The mine must have equipment, protecting clothing and trained personnel for extinguishing fires. No open fires must be allowed.	N	-1	-1	-2	-1	-5	
			Potential of Soil Contamination - All the identified soils are considered equally predisposed to potential contamination (i.e. hydrocarbons), as contamination sources are generally unpredictable and often occur as incidental spills or leak	N	-2	-3	-5	-4	-14	Contamination prevention measures should be addressed in the Environmental Management Programme (EMP) for the proposed development, and this should be implemented and made available, and accessible always to the contractors and construction crew conducting the works on site for reference	N	-1	-1	-2	-1	-5	R

Name of Activity			Potential Impacts	Rating Prior to Measures						Mitigation Type	Rating Post Measures					Significance	
Activities	Project	Impact Area	Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM	CvA/R/Ir
			for construction developments. The significance of soil contamination is medium-high for all identified soils, largely depending on the nature, volume and/or concentration of the contaminant of concern. The ratings given in the columns on the left is for Project 1 , Project 2 and Project 3-5.	N	-2	-3	-4	-2	-11	A spill prevention and emergency spill response plan, as well as dust suppression, and fire prevention plans should also be compiled to guide the construction works An emergency response contingency plan should be put in place to address clean-up measures should a spill and/or a leak occur, as well as preventative measures to prevent ingress	N	-1	-1	-2	-1	-5	
				N	-2	-3	-4	-2	-11	Burying of any waste including rubble, domestic waste, empty containers on the site should be strictly prohibited and all construction rubble waste must be removed to an approved disposal site	N	-1	-1	-2	-1	-5	
			Impact on land use - The footprint areas comprise of relatively small areas where arable soils with a moderate potential for agriculture, whilst the rest of the footprint area is comprised on very shallow soils not considered suitable for agricultural production. The extent of arable Bonheim soils therefore cannot be considered sufficient for viable cultivated small commercial farming. In addition, lack of rainfall (less than 600 mm per annum) further disqualifies the area from being ideal for agricultural production. Furthermore, high temperatures occurring in this area are also likely to cause crop permanent wilting, thus affecting crop yield. Given these constraints the extent of the high productivity soils is not considered sufficient for viable cultivated commercial farming. Based on the above-mentioned limiting factors the proposed project is anticipated to have a relatively low cumulative loss of arable land and medium low cumulative loss of natural grasslands for grazing and/or ecological conservation. Livestock commercial farming is not considered an optimum land use for the footprint areas due to the veld being classified as having a grazing capacity of 6 ha Per Large Animal Unit. This can be attributed to the scarcity of vegetation as well as lack of palatable grasses.	N	-2	-3	-5	-4	-14	Direct surface disturbance of soils should be avoided where possible The footprint as well as areas affected by edge effect should be ripped to alleviate compaction Stored topsoil should be replaced (if any) and ameliorated according to soil chemical analysis The recovered soils should be re-used to rehabilitate the mine footprint following mine closure	N	-1	-1	-2	-1	-5	R
			Impact on Floral Habitat and Diversity due to: 1. Clearance of floral species within the proposed footprint areas as well as nationally and provincially protected floral species; 2. Habitat fragmented and reduced dispersal opportunities for plant species as the disturbed / impacted areas will be less attractive to faunal species who are important mechanisms for seed dispersal; 3. Increase risk of erosion and poor stormwater management - resulting in loss of soils, the down-slope sedimentation of habitat and the consequent loss of habitat beyond the planned footprint; 4. AIP proliferation and woody encroachment into natural vegetation, displacing	-	-	-	-	-	-	Prior to any vegetation clearance activities taking place a walkdown of the footprint must be undertaken and all floral and faunal SCC encountered must be GPS marked and the necessary permits applied for with the relevant national and provincial departments. The site walk down is to be conducted prior to clearance activities and ideally post good rains between November and February when the smaller bulbous plants are growing and visible	-	-	-	-	-	-	R

Name of Activity			Potential Impacts	Rating Prior to Measures						Mitigation Type	Rating Post Measures						Significance
Activities	**Project**	**Impact Area**	**Potential Impacts**	**Status**	**Extent**	**Duration**	**Probability**	**Intensity**	**SbM**	**Mitigation Measures**	Status	Extent	Duration	Probability	Intensity	SaM	**CvA/R/Ir**
			indigenous flora and altering favourable habitat conditions for the establishment of indigenous species. Probable Residual Impacts could occur due to 1. Fragmentation of ecologically intact habitat resulting in altered ecological functioning of habitat beyond the authorised projects, notably Project 2; 2. Potential further loss of and altered floral species diversity outside of the footprint areas, including loss of favourable habitat for SCC if effects from AIP proliferation and the intensification of woody encroachment are not managed; and 3. Loss of NFA protected tree species as a result of vegetation clearing and/or potential harvesting in the region. Cumulative Impacts - A significant threat for the floral ecology associated with the five projects is the potential proliferation of AIP species and particularly a potential for indigenous bush encroachment, resulting in the overall loss of native floral communities within the local area.														
			Sekhukhune Mountain Bushveld - Project 1	N	-1	-2	-4	-4	-11	The construction footprint must be kept as small as possible to minimise impact on the surrounding environment (edge effect management)	N	-1	-1	-2	-2	-6	
			Sekhukhune Mountain Bushveld - Project 2	N	-2	-2	-4	-4	-12	Removal of vegetation must be restricted to what is absolutely necessary and should remain within the approved footprint; In the establishment of fences, erect fences in such a manner as to limit the potential of animals to enter the project areas. This could involve the placement of rocks and materials at on the surface of the fences.	N	-1	-1	-2	-2	-6	
			Sekhukhune Mountain Bushveld - Project 3-5	N	-1	-2	-4	-4	-11	As far as possible clearing of vegetation should take place in a phased manner moving away from fences and/or barriers. This will allow for any faunal species within the proposed footprints to flee and avoid harm;	N	-1	-1	-2	-2	-6	
			Secondary Bushveld - Project 1	N	-1	-2	-4	-4	-11	Smaller species such as scorpions and reptiles will not as readily able to move out of an area ahead of ground clearing. As such should any be observed in the construction site during clearing and construction activities, they are to be carefully and safely moved to an area of similar habitat outside of the disturbance footprint. Construction personnel are to be educated about these species and instructed not to kill them. Smaller scorpion species and harmless reptiles (that are likely present within the footprint areas) should be carefully relocated by a suitably nominated construction person. For larger venomous snakes, a suitably trained specialist, or on-site personnel, should be contacted to carry out the relocation of the species, should it not move off on its own	N	-1	-1	-2	-2	-6	
			Secondary Bushveld - Project 2	N	-1	-2	-4	-4	-11	Vehicles should be restricted to travelling only on designated roadways to limit the ecological footprint of the construction activities. Additional road construction should be limited to what is absolutely necessary, and the footprint thereof kept to a minimal	N	-1	-1	-2	-2	-6	
			Secondary Bushveld - Project 3-5	N	-1	-1	-2	-1	-5	No hunting or trapping of faunal species is to be allowed by construction personnel	N	-1	-1	-2	-1	-5	
			Transformed Habitat	N	-1	-1	-2	-1	-5	Informal fires by construction personnel should be prohibited, and no uncontrolled fires whatsoever should be allowed	N	-1	-1	-2	-1	-5	

Name of Activity	Project	Impact Area	Potential Impacts	Rating Prior to Measures						Mitigation Type	Rating Post Measures						Significance
Activities	Project	Impact Area	Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM	CvA/R/Ir
			Impact on Faunal Habitat and Diversity due to 1. Clearance of habitat leading to the displacement of faunal species; 2. Habitat fragmented and resulting in reduced movement of species and potentially reduced dispersal opportunities; 3. Increased risk of trapping / snaring and the potential collection for the pet / traditional medicine trade; and 4. AIP proliferation and woody encroachment into natural vegetation, displacing indigenous vegetation and altering favourable habitat conditions for faunal species. Probable Residual Impacts on fauna are considered to be: 1. Loss of / altered faunal species diversity in the footprint areas and the areas adjacent to the proposed projects; 2. Edge effects such as habitat fragmentation, AIP proliferation and bush encroachment limiting faunal species habitat utilisation; 3. Potential further loss of SCC/protected faunal species and suitable habitat for such species; and 4. It is unlikely that disturbed areas will be rehabilitated to an ecologically functioning state resulting in significant loss of habitat and species diversity, with reinstatement to premining levels being unlikely.	-	-	-	-	-	-	Care should be taken during the construction of the five proposed projects to limit edge effects to surrounding natural habitat. This can be achieved by: • Demarcating all footprint areas during construction activities; • No dumping of litter, rubble or cleared vegetation on site should be allowed. Rubble / waste should be disposed of at an appropriate registered dump site away from the development footprint. No temporary dump sites should be allowed in areas with natural vegetation. It is advised that waste disposal containers and bins be provided during the construction phase for all construction rubble and general waste; and • Manage the spread of AIP species as per the mines mine's AIP control plan.	-	-	-	-	-	-	CbA
			Sekhukhune Mountain Bushveld - Project 1	N	-1	-2	-4	-4	-11	Appropriate sanitary facilities must be provided during the construction of the development and must be removed to an appropriate waste disposal site.	N	-1	-1	-2	-2	-6	
			Sekhukhune Mountain Bushveld - Project 2	N	-2	-2	-4	-4	-12	If any spills occur, they should be immediately cleaned up to avoid soil contamination that can hinder floral rehabilitation later down the line. Spill kits should be kept on-site at all times. In the event of a breakdown, maintenance of vehicles must take place with care, and the recollection of spillage should be practised, preventing the ingress of hydrocarbons into the topsoil.	N	-1	-1	-2	-2	-6	
			Sekhukhune Mountain Bushveld - Project 3-5	N	-1	-2	-4	-4	-11	Upon completion of construction activities, it must be ensured that no bare areas remain, and that indigenous species be used to revegetate the disturbed area.	N	-1	-1	-2	-2	-6	
			Secondary Bushveld - Project 1	N	-1	-2	-4	-4	-11	Edge effects arising from the proposed development, such as erosion and alien plant species proliferation, which may affect adjacent natural areas, need to be strictly managed. Specific mention in this regard is made of Category 1b AIP species (as listed in the NEMBA Alien species lists, 2020), in line with the NEMBA Alien and Invasive Species Regulations (2020).	N	-1	-1	-2	-2	-6	
			Secondary Bushveld - Project 2	N	-1	-2	-4	-4	-11	The poaching and/or hunting of animals will be strictly forbidden.	N	-1	-1	-2	-2	-6	
			Secondary Bushveld - Project 3-5	N	-1	-1	-2	-1	-5	AIP monitoring and clearing/control should take place throughout the construction phase of the development, and a 30 m buffer surrounding the proposed railway loop should be regularly checked for AIP proliferation and to prevent inward and or/outward spread of AIPs, notably into non infested areas outside of the proposed railway loop or into newly rehabilitated areas	N	-1	-1	-2	-1	-5	

Name of Activity	Project	Impact Area	Potential Impacts	Rating Prior to Measures						Mitigation Type	Rating Post Measures					Significance	
Activities			Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM	CvA/R/Ir
			Transformed Habitat	N	-1	-1	-2	-1	-5	Alien vegetation that is removed must not be allowed to lay on unprotected ground as seeds might disperse upon it. All cleared plant material to be disposed of at a licensed waste facility which complies with legal standards.	N	-1	-1	-2	-1	-5	
			Impact on Floral SCC - The proposed five projects are is associated with floral SCC, which will likely be directly impacted by the proposed activities. The SCC recorded on site (Sclerocarya birrea subsp. caffra) is protected under the NFA. Additionally, there is a an increased chance that several other NFA and LEMA listed floral SCC may occur within the footprint areas. The proposed 5 projects are not anticipated to have a high impact on floral SCC and with mitigation measures implemented the impacts can remain localised in extent. Succulents and geophytes are good candidates for rescue and relocation to suitable sites outside of the proposed footprints, either to surrounding natural habitat or to the Dwarsrivier nursery. Woody species are less likely to be successfully relocated, especially larger individuals. Where woody SCC species are to be cleared and not relocated, it must be ensured that the same species are currently being propagated in the nursery. If this is not the case, seeds can be harvested from the surrounding areas and / or from the individuals that will be cleared as part of vegetation clearing activities to be propagated off-site and reinstated as part of rehabilitation activities. Activities which are likely to negatively affect the flora of conservation concern within and around the proposed five projects include, but are not limited to, the following: 1. Disturbance, fragmentation and alteration of floral SCC habitat; 2. Destruction, removal or harvesting of floral SCC during construction and operational activities; and 3. Potentially poorly implemented and monitored rescue and relocation of SCC or not ensuring that the same species are being propagated in the Dwarsrivier nursery. Impact on CBAs, ESAs, Threatened Vegetation and Protected Areas - According to the desktop database, the proposed five projects will impact on a CBA 1 and the Sekhukhune Mountainlands threatened ecosystem, however, following the site assessment this is more accurately only applicable to the RWD of Project 1 and the footprint areas of Project 2. The remaining areas associated with the TSF (Project 1) and Projects 3-5 have all been impacted on and are associated with the active mining footprint. According to the desktop database, a small portion of Project 4 will impact on an ESA however,	-	-	-	-	-	-	Should any floral SCC or species of conservation importance be relocated, the relocation success of such species should be monitored during the construction phase to ensure immediate actions can be taken if it becomes evident that relocation is not successful.	-	-	-	-	-	-	CbA

Name of Activity	**Project**	**Impact Area**	**Potential Impacts**	**Rating Prior to Measures**						**Mitigation Type**	**Rating Post Measures**					**Significance**	
Activities			**Potential Impacts**	**Status**	**Extent**	**Duration**	**Probability**	**Intensity**	**SbM**	**Mitigation Measures**	**Status**	**Extent**	**Duration**	**Probability**	**Intensity**	**SaM**	**CvA/R/Ir**
			this section of the ESA has been degraded in terms of habitat integrity and is located within the active mining area.														
			Project 1	N	-1	-2	-1	-3	-7		N	-1	-1	-1	-2	-5	
			Project 2	N	-1	-2	-4	-4	-11		N	-1	-1	-1	-2	-5	
			Project 3-5	N	-1	-1	-1	-1	-4		N	-1	-1	-1	-1	-4	
			Impacts on Faunal SCC - The five proposed projects are associated with habitats that are known to host faunal SCC, notably the Sekhukhune Mountain Bushveld habitat. The remaining habitats may serve as intermediary or transitionary habitats for such species, but not permanent habitat. One SCC was recorded on site, namely Pycna sylvia (Cicada) whilst Python natalensis (African Python, VU) has also been recorded in the adjacent areas. Panthera pardus (Leopard, Vulnerable, TOPS Listed), Parahyaena brunnea (Brown hyaena, NT, TOPS Listed), Sagittarius serpentarius (Secretary bird, VU), Polemaetus bellicosus (Martial Eagle, VU) and Neotis denhami (Denham's Bustard, NT) are also considered to have a medium probability of occurring, however such occurrences are likely to be transitionary and not permanent, as the footprint areas are not sufficient in extent to permanently host these species nor are there sufficient food resources within the five proposed project footprint areas alone to support these species. Mammalian, avifaunal and some reptilian SCC are likely to maintain large home ranges that will far exceed the extent of the five proposed project footprint areas. Due to the small project footprint extents and ability of many of the SCC to relocate ahead of construction activities, impacts stemming from the proposed projects are not expected to pose a significant risk to these species.	-	-	-	-	-	-	Edge effect control needs to be implemented to prevent further degradation and potential loss of floral and faunal SCC outside of the five proposed project footprint areas	-	-	-	-	-	-	CbA
			Project 1	N	-1	-2	-1	-3	-7	Should the presence of any faunal or floral SCC be noted within the development footprint post walkdown and during vegetation clearance / construction activities, a suitably qualified specialist should be consulted on the best way to proceed	N	-1	-1	-1	-2	-5	
			Project 2	N	-1	-2	-4	-4	-11	A walk down must be undertaken to determine the presence of any faunal species of concern and all construction teams are monitored to ensure no snare or traps are set.	N	-1	-1	-1	-2	-5	
			Project 3-5	N	-1	-1	-1	-1	-4	No species may be collected for the pet / traditional medicine trade either.	N	-1	-1	-1	-1	-4	
			Habitat degradation due to dust: Increased dust will occur in all areas where vegetation is cleared. Dust will be caused by excavation, and construction. Dust in the area will be greatly increased due to the dry weather	N	-2	-2	-2	-2	-8	Maintain the current air quality monitoring stations that determine fallout and implemented respirable dust (PM10) monitoring that could arise from the mining activities. Dust suppression should be undertaken where and when dust is present.	N	-1	-1	-2	-1	-5	CbA

Name of Activity	Project	Impact Area	Potential Impacts	Rating Prior to Measures						Mitigation Type	Rating Post Measures					Significance	
Activities			Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM	CvA/R/Ir
			conditions and the nature of the soil in the area. Dust settling on plant material can reduce the amount of light reaching the chlorophyll in the leaves, thereby reducing photosynthesis, which in turn reduces plant productivity, growth and recruitment.														
			Accidental death of animals on the roads.	N	-2	-3	-2	-5	-8	Clearly marked signs will be erected along the transportation routes to create awareness of animal crossings. A clearly marked and enforced vehicle speed will be implemented on the internal mine and transportation routes. A detailed induction programme will be in place to ensure that all parties are aware of the rules and regulations on site in terms of the use of roads. Vehicles may only travel on demarcated roads on site.	N	-1	-3	-1	-3	-1	CbA
			Direct Impact: Increased erosion can eventually lead to the loss of vegetation and habitats for further species. Soils in the area are prone to erosion in areas where vegetation is cleared, this is further compounded by the fact that precipitation in the area occurs through heavy rainfall events in in the form of thundershowers in summer. Furthermore large areas will be cleared before construction leaving these areas prone to erosion.	N	-3	-3	-5	-5	-16	Ensure the required erosion protection measures are monitored and corrected where necessary. Storm water management plan should be implemented prior to construction to ensure that runoff does not lead to the formation of erosion gulleys. Where vegetation cannot be established during the life of construction and operations, appropriate measure will be taken to control erosion. These will include grading of surfaces to prevent rapid run-off of storm water and / or the use of energy dissipaters. An erosion monitoring and mitigation plan should be put in place.	N	-1	-1	-2	-2	-6	CbA
	1	Freshwater Ecosystems	TSF: Site preparation prior to construction activities of surface infrastructure, including placement of contractor laydown areas and storage facilities may lead to: •Exposure of soil, leading to increased runoff, erosion and stream incision, and thus potentially increased sedimentation of the Dwars River; •Increased sedimentation of the watercourse may lead to smothering of flora and benthic biota and potentially further alter surface water quality; •Decreased ecoservice provision; and *Further proliferation of alien vegetation or increased bush encroachment as a result of disturbances.	N	-1	-2	-3	-2	-8	The approved construction footprint of the TSF and RWD must be adhered to, to ensure that there is no encroachment on the watercourse; As far as practically possible, clearing and construction activities must take place during the dry season to limit potential impacts to the watercourse as a result of clearing and construction activities The construction of sediment traps around the downgradient boundary of the construction area is strongly recommended to minimise the volume of sediment transported in runoff from the construction site Contractor laydown areas, vehicle re-fuelling areas and material storage facilities to remain outside of the delineated watercourse and applicable setback area Construction footprint areas to remain as small as possible and vegetation clearing to be limited to what is absolutely essential; Vegetation removal to be kept to a minimum, and preferably only alien floral species to be removed; Retain as much indigenous vegetation as possible	N	-1	-1	-1	-2	-5	CbA
	1		TSF: Construction of the proposed TSF and RWD and associated clean and dirty water systems: •Loss of catchment yield resulting from stormwater containment; •Increased flood peaks as a result of formalisation and concentration of surface runoff in clean water diversion	N	-1	-2	-2	-2	-7	The design of the TSF and the RWD must ensure that no dirty water runoff must be permitted to reach the watercourse in line with GN704 as it relates to the NWA and appropriate clean and dirty water separation and stormwater management controls must be developed as the first part of the construction activities; The TSF and RWD must be designed to contain a minimum storm event of a 24 hour 1 in 50 year flood event;	N	-1	-1	-1	-2	-5	CbA

Name of Activity			Potential Impacts	Rating Prior to Measures						Mitigation Type	Rating Post Measures					Significance	
Activities	**Project**	**Impact Area**	**Potential Impacts**	**Status**	**Extent**	**Duration**	**Probability**	**Intensity**	**SbM**	**Mitigation Measures**	**Status**	Extent	Duration	Probability	Intensity	SaM	**CvA/R/Ir**
			structures; •Potential for erosion, leading to sedimentation of the watercourse; •Reduction in volume of water entering the watercourse, leading to loss of recharge of the watercourse; •Altered vegetation community structure and diversity due to moisture stress and changes to goods and service provision; •Disturbances of soil leading to increased alien vegetation proliferation or bush encroachment, and in turn to further alteration of surrounding watercourse and terrestrial habitat, with potential to affect the downgradient watercourse habitat; •Altered runoff patterns, leading to increased erosion and sedimentation of the downgradient watercourse; •Erosion of the exposed areas; •Potential impacts on the water quality of runoff which may potentially enter the downgradient watercourse and contamination of soils due to concrete being cast; and •Potential of backfill material to enter the downgradient watercourse, increasing the sediment load of the watercourse..							The TSF and RWD must be appropriately lined with HDPE liners to prevent seepage Clean runoff captured in the clean and dirty water separation system should be returned back into the adjacent watercourse. Dirty water must be managed within the mine's existing water management system; The watercourse must be protected against erosion arising from the discharge of diverted clean stormwater. In this regard, energy dissipating structures should be installed to prevent erosion. Water should also be distributed in a diffuse manner to prevent canalisation No mixed concrete may be deposited outside of the designated construction footprint; Protective equipment should be provided, onto which any mixed concrete can be deposited whilst it awaits placing Concrete spilled outside of the demarcated area must be promptly removed and taken to a suitably licensed waste disposal site.							
	2		Diesel and Emulsion Batching Areas: Site preparation and construction activities of surface infrastructure, including placement of contractor laydown areas and storage facilities may lead to: •Damage to and loss of vegetation, leading to exposed/compacted soil, in turn leading to potential for increased runoff from exposed areas, erosion of the downgradient watercourses and potential for increased sedimentation of the watercourses; •Increased sedimentation of the watercourses may lead to changes in instream habitat, potentially altered surface water quality particularly in the downstream reaches of the system, and smothering of vegetation and/or altered vegetation composition; •Potential impacts on water quality due to leaks and spills from construction machinery and increased sediment availability; •Decreased ecoservice provision and biodiversity maintenance capacity; and •Proliferation of alien vegetation as a result of disturbances.	N	-1	-2	-2	-2	-7	As far as practically possible, clearing and construction activities must be restricted to the dry season to minimise the risk of sediment-laden runoff entering the downgradient watercourses and reduce the risk of erosion and formation of preferential flow paths. Sediment traps must be constructed around the construction sites line to minimise the risk of sediment entering the downgradient watercourses. Limit the footprint of vegetation clearing to what is absolutely essential. Retain as much indigenous vegetation as possible. Rehabilitation and revegetation of disturbed areas (as a result of construction) must take place immediately after construction. Appropriate control methods for alien vegetation in line with existing and approved alien vegetation control within the mine must be implemented.	N	-1	-1	-1	-2	-5	CbA

Name of Activity			Potential Impacts	Rating Prior to Measures						Mitigation Type	Rating Post Measures					Significance	
Activities	Project	Impact Area	Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM	CvA/R/Ir
	3		Expansion of Parking at Main Offices: Site clearing prior to commencement of construction activities, including vegetation clearing (approximately 280 m of riparian vegetation), removal of topsoil and stockpiling for use in rehabilitation, levelling of ground and placement of contractor laydown areas. Also considering the laying of tar and construction of steel roof parking bays and the potential indiscriminate disposal of wastes within a watercourse; •Damage to marginal and non-marginal vegetation, leading to exposed/compacted soil, in turn leading to potential for increased runoff from exposed areas, erosion of the watercourse and potential for increased sedimentation of the watercourse; •Increased sedimentation of the watercourse may lead to changes in instream habitat, potentially altered surface water quality particularly in the downstream reaches of the system, and smothering of vegetation and/or altered vegetation composition; •Potential impacts on water quality due to leaks and spills from construction machinery; •Decreased ecoservice provision and biodiversity maintenance capacity; and •Proliferation of alien vegetation as a result of disturbances.	N	-2	-2	-2	-3	-9	As much as practically feasible, limit site preparation and construction activities to the dry season to minimise the volume of contaminated runoff potentially entering the watercourse. Sediment traps must be erected around the construction site prior to commencement of construction activities to minimise the risk of sediment entering the downgradient watercourses. Limit the footprint of vegetation clearing to what is absolutely essential. Retain as much indigenous vegetation as possibl. Rehabilitation and revegetation of disturbed areas (as a result of construction) must take place immediately after construction. Appropriate control methods for alien vegetation in line with existing and approved alien vegetation control within the mine must be implemented. No waste material is permitted to be disposed of within the watercourse. The watercourse must be demarcated with an appropriate barrier to prevent unauthorised access to the watercourse.	N	-1	-1	-1	-2	-5	CbA
	4&5		Widening of Existing Access Road between South Shaft/Main Offices and Plant & Access Crossing between Plant and North Mine: Site preparation prior to widening of roadway, including placement of contractor laydown areas and storage facilities: Exposure of soil, leading to increased runoff, erosion and stream incision, and thus increased sedimentation of the watercourse. •Increased sedimentation of already transformed riparian and instream habitat, leading to smothering of flora and benthic biota, alterations to the characteristics of the stream bed and potentially further altering surface water quality; •Decreased ecoservice provision; and •Further proliferation of alien vegetation or Phragmites australis as a result of disturbances. No direct impacts to the watercourse are anticipated due to the distance of the proposed activity from the watercourse (approximately 25 m at the closest point).	N	-1	-1	-1	-2	-5	General 'best practice' mitigation measures are recommended including but not limited to: •Dust suppression during construction; •Placement of sediment control devices along the northern delineated boundary of the Springkaanspruit to minimise transportation of sediment into the watercourse via stormwater; and •Undertake the upgrade activities during the dry season if feasible to minimise the chance of runoff entering the watercourse.	N	-1	-1	-1	-2	-5	CbA
	1, 3, 4 & 5	Hydrology	Removal of vegetation for the Khulu TSF, Capital Projects and associated infrastructure, could lead to the erosion of	N	-2	-1	-2	-2	-7	Vegetation clearance should be kept to an absolute minimum. Temporary erosion measures should be employed at exposed areas.	N	-1	-1	-1	-1	-4	CbA

Name of Activity	Project	Impact Area	Potential Impacts	Rating Prior to Measures						Mitigation Type	Rating Post Measures					Significance	
Activities			Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM	CvA/R/Ir
			exposed soils leading to siltation and sedimentation of downslope drainage channels.							The storm water management plans should be implemented in and around the facilities to ensure that dirty water runoff or water with high sediment loads do not enter the existing watercourses. This must be undertaken in terms of the Storm Water management Plan as approved in this EMPr or subsequently approved. Specific storm water management measures should include: ■ A clean water diversion berm should be constructed upslope of the proposed Khulu TSF Erosion measures such as hessian nets should be employed around working areas when construction is taking place Rehabilitate open areas as soon as practically possible. Self-succession should be encouraged. If natural succession of vegetation is not established within one rainy season, after rehabilitation, the disturbed areas and areas adjacent to the infrastructural areas must be re-vegetated with an indigenous grass mix, if necessary, to re-establish a protective cover, to minimise soil erosion and dust emission.							
			Alteration in the natural topography through the development of the compacted areas and new storm water management systems.	N	-2	-3	-3	-3	-11	Development footprints should be kept to minimum footprint area. The creation of steep slopes should be avoided as far as possible. Culverts should be placed at topographically low positions to allow for suitable drainage.	N	-1	-2	-1	-1	-5	
			Use of heavy machinery, trucks and vehicles for construction purposes, which could lead to potential hydrocarbon spillages washed into downslope drainage channels.	N	-2	-1	-2	-3	-8	The storm water management plans should be implemented in and around the facilities to ensure that dirty water runoff or water with high sediment loads do not enter the existing watercourses. This must be undertaken in terms of the Storm Water management Plan as approved in this EMPr or subsequently approved. Water and soil contamination shall be avoided by implementing proper storm water management during the entire life of the operation. The applicant must ensure that storm water is diverted away from all the working areas. The storm water leaving the construction area must not be contaminated by any substance, whether that substance is a solid, liquid, vapour or any combination thereof Refuelling must be undertaken over hard park bunded areas that adequately sized to capture and contain spillages. Machinery, trucks and vehicles must be well maintained and serviced regularly as per a recommended service guide. Machinery and vehicles should be parked on appropriately lined areas. Drip trays must be employed under stationary machinery. Spillages should be reported immediately, and spill kits should be readily available at all times.	N	-1	-1	-1	-1	-4	
	-	Geohydrology	No direct impact during the construction phase.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	1 & 2	Heritage	The presence for chance finds should be considered.	N	-3	-3	-3	-4	-13	The possibility of the occurrence of subsurface finds cannot be excluded. Therefore, if during construction any possible finds such as stone tool scatters, artefacts or bone and fossil remains are made, the operations must be stopped and a qualified archaeologist must be contacted for an assessment of the find and therefor chance find procedures should be put in place as part of the EMP. A short summary of chance find procedures is discussed below. This procedure applies to the developer's permanent employees, its	N	-1	-1	-2	3	-1	CbA

Name of Activity			Potential Impacts	Rating Prior to Measures						Mitigation Type	Rating Post Measures					Significance	
Activities	Project	Impact Area	Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM	CvA/R/Ir
										subsidiaries, contractors and subcontractors, and service providers. The aim of this procedure is to establish monitoring and reporting procedures to ensure compliance with this policy and its associated procedures. Construction crews must be properly inducted to ensure they are fully aware of the procedures regarding chance finds as discussed below. • If during the pre-construction phase, construction, operations or closure phases of this project, any person employed by the developer, one of its subsidiaries, contractors and subcontractors, or service provider, finds any artefact of cultural significance or heritage site, this person must cease work at the site of the find and report this find to their immediate supervisor, and through their supervisor to the senior on-site manager. • It is the responsibility of the senior on-site Manager to make an initial assessment of the extent of the find, and confirm the extent of the work stoppage in that area. • The senior on-site Manager will inform the ECO of the chance find and its immediate impact on operations. The ECO will then contact a professional archaeologist for an assessment of the finds who will notify the SAHRA The possibility of the occurrence of subsurface finds cannot be excluded. Therefore, if during construction any possible finds such as stone tool scatters, artefacts or bone and fossil remains are made, the operations must be stopped and a qualified archaeologist must be contacted for an assessment of the find and therefor chance find procedures should be put in place as part of the EMP.							
										If fossil remains or trace fossils are discovered during any phase of construction, either on the surface or exposed by excavations the Environmental Officer (EO) in charge of these developments must be informed. These discoveries ought to be protected and the ECO must report to SAHRA. In the event that fossils are uncovered during construction then construction must cease within the immediate vicinity, a buffer of 30 m must be established, and a palaeontologist called in to inspect the finds. The palaeontologist must obtain a section 35(4) permit in terms of NHRA and Chapter IV NHRA Regulations, before any fossils are collected. If there are any new heritages resources are discovered during construction and operation phases of the proposed development, then a professional archaeologist or palaeontologist, depending on the nature of the finds, must be contracted as soon as possible to inspect the findings at the expense of the developer. If the newly discovered heritage resources prove to be of archaeological or palaeontological significance, a Phase 2 rescue operation may be required at the expense of the developer. Mitigation will only be carried out after the archaeologist or palaeontologist obtains a permit in terms of section 35 of the NHRA (Act 25 of 1999).							
										Development of a Heritage Management Plan .							

Name of Activity	Project	Impact Area	Potential Impacts	Rating Prior to Measures						Mitigation Type	Rating Post Measures					Significance	
Activities			Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM	CvA/R/Ir
										The Heritage Management Plan and Chance Find Procedure should form part of the Contractor's Tender Documentation, as well as form part of site specific induction and training processes.							
										Access to graves must be awarded to grave owners.							
										Graves on site must be clearly demarcated and well fenced off.							
										If risks are manifested (accidental discovery of heritage resources) the chance find procedure should be implemented: Cease all works immediately; Report incident to the Sustainability Manager; Contact an archaeologist/ palaeontologist to inspect the site; Report incident to the competent authority; and Employ reasonable mitigation measures in accordance with the requirements of the relevant authorities. Only recommence operations once impacts have been mitigated.							
										In the event that fossils are uncovered during construction then construction must cease within the immediate vicinity, a buffer of 30 m must be established, and a palaeontologist called in to inspect the finds. The palaeontologist must obtain a section 35(4) permit in terms of NHRA and Chapter IV NHRA Regulations, before any fossils are collected.							
										If there are any new heritages resources are discovered during construction and operation phases of the proposed development, then a professional archaeologist or palaeontologist, depending on the nature of the finds, must be contracted as soon as possible to inspect the findings at the expense of the mine.							
										If the newly discovered heritage resources prove to be of archaeological or palaeontological significance, a Phase 2 rescue operation may be required at the expense of the developer. Mitigation will only be carried out							
	1, 2, 3, 4 & 5	Visual	Soil stripping and footprint clearance. The main visual impact associated with the construction phase would be the actual construction sites, possible storage of equipment and construction vehicles (laydown area), as well as the disruption of the soil and vegetation. Construction activities associated with the access crossing and the Khulu TSF will be visible to the road users.	N	-2	-2	-2	-2	-8	Stripping of vegetation and soils should be undertaken within the demarcated areas and be kept to a minimum.	N	-1	-1	-1	-1	-4	R
										Exposed areas should be vegetated as soon as possible. Self succession will be preferred, however if vegetation establishment is not successful after the first rainy season, revegetation practices should be implemented.							
										Dust suppression measures should be implemented to limit the generation of dust.							
			The presence and use of heavy machinery, trucks and vehicles for construction purposes. Due to the existing mining in the area, vehicles and heavy machinery are already present and are not uncommon.	N	-2	-1	-2	-2	-7	Trees should be planted along the main roads to conceal the TSF from motorists.	N	-1	-1	-1	-1	-4	R
										Dust suppression measures should be implemented to limit the generation of dust.							
	1, 2, 3, 4 & 5	Air Quality	Potential increase in dust fall out. Despite the non-compliance predicted for the 24-hour PM10 off-site concentrations, all concentrations predicted at neighbouring sensitive receptors remain complaint with their relevant standard. In terms of PM2.5, the highest predicted 24-hour average and annual average off-site	N	-2	-1	-2	-2	-7	Utilised the existing monitoring network to monitor dust fall out in and around the construction area.	N	-1	-1	-2	-1	-5	CbA
										Strictly enforced speed limits on all roads - not to exceed 40km/hr.							
										All areas, should be rehabilitated once construction has been compiled, and in the case with the drilling pads, once the drilling activities at that pad had been concluded.							

Name of Activity			Potential Impacts	Rating Prior to Measures						Mitigation Type	Rating Post Measures					Significance	
Activities	Project	Impact Area	Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM	CvA/R/Ir
			concentrations remain compliant with the relevant standards for both scenarios. Overall levels of dust fallout anticipated to occur as a result of the proposed TSF are below the respective National Dust Control Regulation. The outcomes of the air quality model stated that the proposed TSF will result in minimal air quality impacts on nearby receptors.							Bare soils can be regularly dampened with water to suppress dust during the construction phase, especially when strong wind conditions are predicted according to the local weather forecast Limit site clearance to designated areas. Dust suppression should be undertaken on all exposed roads, where increased dust fallout is observed. A dust management plan must be strictly implemented. Exposed areas should be vegetated as soon as possible. Self succession will be preferred, however if vegetation establishment is not successful after the first rainy season, revegetation practices should be implemented.							
	All	Noise	The area is located within the mining area. Noise impacts are not considered to be significant but can occur during excavation and construction activities.	N	-2	-1	-2	-2	-7	Equipment will be well maintained to reduce excessive noise creation. The necessary safety warning signs will be clearly visible in and around the sites. The required Professional Protective Equipment (PPE) will be issued to all employees were required. Construction hours must preferably be limited to daylight day hours where possible.	N	-2	-1	-1	-1	-5	CbA
	All	Social	For the construction of the Khulu TSF, a total of 64 construction workers would be employed for the whole duration. Forty of these would be contractors. From the total employees required, 12 would be medium skilled (workers with technical qualifications up to grade 12) and 16 would be low skilled (grade 10 and lower). Furthermore, some outside contractors will be involved with specific projects such as the construction of the diesel and batching areas (5 individuals on a part-time basis); main parking extension (5 individuals on a part-time basis), widening of the existing access road (10 full time contractors) and new access crossing (16 full time contractors). A section of the workforce would consist of low skilled workers (e.g. general construction labourers), as well as medium skilled site operators and skilled supervisors. As existing mining is taking place at Dwarsrivier Mine, some of the above employment opportunities will be filled by existing employees. It is anticipated that a total of 36 new employment positions will be created which will result in positive economic impacts. Dwarsrivier Mine is further committed to source all the individuals falling within the medium and lower skilled categories from the local labour pool, and as many as possible falling within the high skilled category. To enhance the benefit to the local communities, it is recommended that local labour (from within the local municipal area) be procured as far	P	1	2	1	1	5	Prioritise any possible new local labour in the recruitment process as part of the company's own recruitment policy or as part of the contractor management plan and stipulate the procurement of new employees, especially in the medium to lower skilled categories, from the local communities. Where possible involve land claimants in the development of closure objectives and potential economic involvement where practically and legally possible. Contractual obligations for contractors (if required) should be introduced to use local labour as far as possible where applicable. Contractors should ensure that workers reside in suitable facilities and not establish informal houses.	P	3	1	2	3	9	CbA

Name of Activity	Project	Impact Area	Potential Impacts	Rating Prior to Measures						Mitigation Type	Rating Post Measures					Significance	
Activities			Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM	CvA/R/Ir
			as possible for all levels of skills. The socio-economic benefit of the build-up area can have limited short-term positive impacts and would possibly be similar to what is currently being experienced with the existing mining operation. It is not anticipated that the build-up period associated with the Khulu TSF and capital projects would necessarily create significant business opportunities within the local economy. Due to the relative short timeframe and extent of the build-up period, as well as the expected number of workers involved, it is however highly unlikely that the project would result in large numbers of in-migration of jobseekers and workers to the local area. Therefore, no population change is anticipated as a direct result of the proposed Khulu TSF and capital projects.														
			The total spending (excluding salaries and wages) during the construction can total approximately R450 million. The majority of this spending will be procured from the local municipal area (80%) and from BEE suppliers (80%). Only 10% or less would be spend on foreign imports. The local benefits and economic spin-offs opportunities are thus substantial.	P	3	1	1	3	8	Targets for the procurement of capital goods, consumer goods and services should be set and Dwarsrivier Mine should develop an action plan to meet these targets. The procurement process should be based on competitive business principles and the quality of services to be rendered, to ensure adherence to standards and to maximise overall welfare.	P	3	1	2	3	9	CbA
			Community Safety and Security - During the construction phase, community safety can be at risk, mainly due the movement of construction vehicles and construction activities (e.g. blasting) affecting the R577 due to the construction of the access crossing underneath the R577 to allow ease of access between the South and the North Mine. Safety hazards to mine personnel would also occur during the construction activities forming part of the extension of the main parking area and widening of the access road between the plant and North Mine, due to the continued movement of mining vehicles on this section of road. These impacts are anticipated to be mitigated by implementing construction related precautionary measures and warning signs/notifications. The development of the Khulu TSF and batching areas can furthermore create possible safety hazards. On site, mining activities pose safety risks which must be managed according to the relevant Health and Safety Plans of the mine to ensure the safety of workers and adjacent communities. These anticipated impacts will further respond to the environmental monitoring and management measures to be implemented.	N	-2	-1	-3	-3	-9	Maximise the use of local labour and contractors where possible by developing a strategy to involve local labour in the construction process to limit the inflow of outsiders. Construction vehicles must adhere to all mine related safety regulations and drivers must adhere to road regulations. Drivers and operators must have the necessary qualifications to operate the vehicles and equipment they are assigned to. Construction vehicles must be in a good working order. Inspections of vehicles, as well as maintenance must be undertaken on a regular basis. Discussions and approvals with regards to required construction authorisations between Dwarsrivier Mine and Dept. of Roads and Public Works to be in place. Warning signs with regards to construction activities to be erected to inform public road users of activities and possible dangers.	N	-2	-1	-2	-2	-7	CbA

Name of Activity			Potential Impacts	Rating Prior to Measures						Mitigation Type	Rating Post Measures					Significance	
Activities	Project	Impact Area	Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM	CvA/R/Ir
			Traffic Movement - Construction activities will mainly include clearing of vegetation and preparation of the different sites, the widening of the access road, the construction of the new access crossing, construction of the infrastructure associated with the diesel and emulsion batching areas and the development of the TSF. These activities will result in the movement of heavy machinery and vehicles within the boundaries of the site and with some movement of construction vehicles on the provincial road R577. The number of vehicles involved in the process and equipment details are unknown. The increased noise and dust created by these vehicles, vehicle emissions and increased risk of accidents as well as possible impact on the road surfaces create additional intrusions. These impacts, however, will be intermittent and of a short duration.	N	-2	-1	-3	-3	-9	Unauthorised entry onto the mining area must not be allowed. Access control should continue to be implemented. Mining areas must be secured and fenced. All construction vehicles should be in a good condition and adhere to road worthy standards. Construction vehicles must keep to speed limits. Limit construction hours to daylight hours e.g., 6am to 6 pm. Road users must be notified if delays would be experienced due to the access road construction. Warning signs with regards to the construction activities need to be erected at strategic places along the R577 and must be clearly visible at night. Road deviations, if required, must be clearly indicated by road signs and must be clearly visible at night	N	-2	-1	-2	-2	-7	CbA
Establishment of Surface Infrastructure	1	Geology	The TSF footprint area is not mined through or undermined, but the current Dwarsrivier Mine Life of Mine (LoM) plan provided to Jones and Wagner indicate that the TSF footprint could be undermined in future. The depth to the underground resource under the proposed TSF footprint varies from 100m on the eastern side of the TSF to 200 m on the western side. The impact of the TSF on the future mining was not raised as a concern, and will be taken into account with the design of the future mining activities under the TSF.	N	-3	-3	-2	-5	-13	Permission to undermine the TSF should be obtained from the DMRE should this be required in the future.	P	1	3	3	5	12	CbA
	1	Topography	During the site clearance activity, the required storm water management systems and shaping of land would have been completed. The construction of the TSF will have the greatest impact on the topographic setting of the area. With the establishment of infrastructure the topography will be impacted.	N	-1	-3	-3	-2	-9	Activities should be constructed and developed within the approved design concepts. Specifically in terms of the TSF, the design and construction should be undertaken with closure design principles. Linear infrastructure must follow for as far as practically possible the natural contours of the area.	N	-2	-2	-2	-1	-7	R
	2, 3, 4, 5		Alteration in the natural topography through the construction of infrastructure, roads and parking areas.	N	-2	-3	-3	-3	-11	Linear infrastructure must follow for as far as practically possible the natural contours of the area. The creation of steep slopes should be avoided as far as possible. All required storm water management measures should be implemented. The aim in this instance, is to mitigate any potential erosion during the construction phase. Culverts should be placed at topographically low positions to allow for suitable drainage.	N	-1	-2	-1	-1	-5	CbA
	1, 2, 3, 4 &5	Soil, Land Use and Land Capability	Site clearance would have been completed, and storm water management infrastructure will be implemented. However, construction activities with surrounding exposed soil may in turn lead to soil erosion.	N	-2	-2	-4	-4	-12	Ensure that all design drawings include effective erosion control measures and that these are implemented during the establishment of the infrastructure. Areas of construction must be clearly demarcated. No construction or project related activities may be undertaken outside of the demarcated areas.	N	-1	-1	-2	-1	-5	CbA

Name of Activity			Potential Impacts	Rating Prior to Measures						Mitigation Type	Rating Post Measures					Significance	
Activities	Project	Impact Area	Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM	CvA/R/Ir
										Clean and dirty water systems must be established prior to construction and must be maintained throughout the life of mine. Where vegetation cannot be established during the life of construction and operations, appropriate measure will be taken to control erosion. These will include grading of surfaces to prevent rapid run-off of storm water and / or the use of energy dissipaters. Provision should be to protect the soils from hydrocarbon spills/drips by the vehicles and refuelling trucks entering and existing the site (i.e. grid system or permanently manned personnel to treat soils during periods of refuelling). Where erosion gulley is formed, these will be recorded on the IsoMetrix system for immediate action.							
	-	Terrestrial Ecology (Fauna & Flora)	Please refer to site clearance for the required impacts and management measures.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	-	Freshwater Ecosystems	Please refer to site clearance for the required impacts and management measures.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	1	Geohydrology	Impact on the alluvial aquifer due to the presence of the TSF.	-	-3	-3	-3	-3	-12	The TSF and associated infrastructure should be lined according to the identified designs. Additional monitoring boreholes, as detailed below, must be drilled prior to the commencement of construction of the Khulu TSF and PCD to ensure that a baseline can be generated. Develop and implement a sound surface runoff management plan for the project. This plan must focus on containing all dirty water that could be generated during the project and preventing clean runoff from entering the footprint area. These measures are considered in the TSF designs, as well as the EMPr Storm Water Management Plan. The required storm water management measures must be implemented. Finalise the implementation plan for the Groundwater Remediation Strategy for the operations, based on the outcome of fieldwork completed during 2021. The most effective groundwater management strategies must be developed and implemented as part of a groundwater impact assessment study to be completed during 2022. Due to the fact that groundwater quality at the Khulu TSF is affected by preferential flow along regional faults and dykes, it is accepted that the Groundwater Remediation Strategy will also improve groundwater quality at the TSF and PCD in the long-term. The outcome of the groundwater impact assessment presented in this report indicates that the Scenario 1 liner design is the preferred option to ensure that long-term impacts on groundwater quality are limited. This entails good installation of the liner and limited exposure of the HDPE to the atmosphere. Under these measures, the liner is expected to have a life of 280 years. Once the liner fails, the rate of seepage to the underlying aquifers is minimised with good liner installation. The liner design must include the above and below liner capture of seepage. Any seepage collected must be diverted to the PCD for containment.	N	-2	-2	-1	-1	-6	CbA

Name of Activity	**Project**	**Impact Area**	**Potential Impacts**	**Rating Prior to Measures**						**Mitigation Type**	**Rating Post Measures**					**Significance**	
Activities			**Potential Impacts**	**Status**	**Extent**	**Duration**	**Probability**	**Intensity**	**SbM**	**Mitigation Measures**	Status	Extent	Duration	Probability	Intensity	SaM	**CvA/R/Ir**
										All newly drilled monitoring boreholes must be surveyed to confirm accurate positions and elevations. The coordinates presented in this report were recorded with a hand-held GPS. If any of the monitoring boreholes are destroyed during construction and/or operation of the TSF, these must be placed as a matter of urgency. Of specific concern is the location of boreholes DRM11S and D, which is located on the edge of the Khulu TSF design. These boreholes target the SW-NE trending fault and must be redrilled on this structure if destroyed to ensure efficient monitoring of groundwater in this position. Groundwater monitoring must be undertaken in line with the EMPr Groundwater Monitoring Network. Ongoing groundwater monitoring must be undertaken.							
	1, 2, 3, 4, 5		The use of waste rock in the compaction of the roads and surface footprints should not lead to an impact on the groundwater resources as the material is not considered a pollutant, as the material is relatively inert. Results of leach tests indicate that the waste rock material is a Type 4 waste and does not pose a threat to groundwater contamination. Rate of evaporation of water used for dust suppression is high.	-	**-2**	**-3**	**-1**	**-3**	-9	The use of waste rock will only be undertaken when an alternative such as paving proved to be economically flawed. Record the volume of water used for dust suppression Continue with and evaluate groundwater monitoring programme, specifically in newly drilled shallow boreholes at the Plant. Exemption in terms of GN704 (Regulation 5) should be obtained from the DWS for the use of the Waste Rock in the construction of the proposed activities.	-	**-1**	**-2**	**-1**	**-1**	-5	CbA
	-	Heritage	No further impacts are foreseen.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	1, 2, 3, 4, 5	Visual	Impact on the visual character of the site.	N	-2	-2	-4	-3	-11	Activities should be restricted within the approved footprints. Indigenous trees should be planted along the roads where the TSF is planned to be constructed.	N	-2	-1	-2	-2	-7	R
	-	Air Quality	All impacts are assessed under Footprint Clearance.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	-	Noise	All impacts are assessed under Footprint Clearance.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	-	Social	All impacts are assessed under Footprint Clearance.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Waste Management and Handling Hydrocarbon spills within the Mining Area and the management of Domestic and Hazardous Waste	-	Geology	No direct impact.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	-	Topography	No direct impact.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	1, 2, 3, 4 & 5	Soils	Contamination of soil resources due to hydrocarbon spills.	N	-1	-2	-4	-4	-11	Storage of fuels and oils, the refuelling of vehicles and equipment maintenance must be limited to designated, bunded (bunds to be 110% of volume of the materials stored) areas. All contaminated material at the construction activities must be contained in mobile sumps. All fuels and soils must be stored in appropriate containers. Chemicals and hazardous material must be stored in suitable containers, fit for purpose and in line with SDS requirements. Where drip trays are too small, specially prepared, non-pervious bunds with solution trenches must be used to capture spillages Oils and potentially hazardous materials must be disposed of at a licensed facility and waste certificates obtained. A spill kit must be provided to be used in the event of a spill.	N	-1	-2	-1	-1	-5	CbA

Name of Activity	Project	Impact Area	Potential Impacts	Rating Prior to Measures						Mitigation Type	Rating Post Measures					Significance	
Activities			Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM	CvA/R/Ir
										If a spill occurs, the contaminated soil must be removed immediately. Contaminated soil must be stored according to best practices until it can be disposed of at a suitably licensed facility. Safety signage must be used at designated storage areas. All workers must undergo an induction which includes environmental awareness training to make them aware of the environmental incident management procedures as well as the importance of complying with management measures.							
			Contamination of soils as a result of a lack of sanitary services	N	-1	-2	-4	-4	-11	Chemical toilets must be readily available to employees where permanent infrastructure is not available. Licensed companies must be appointed to remove any contaminated material and or wastes to licensed landfill sites.	-	-1	-2	-1	-1	-5	CbA
	1, 2, 3, 4 & 5	Ecology	The unmanaged disposal of waste, could result in the spread of invader species, as well as the influx of opportunistic species.	N	-2	-3	-3	-4	-12	Develop dedicated waste handling areas; prevent access to rodents and opportunistic species; prevent the spread of waste. Develop dedicated waste handling areas, fit for purpose and prevent the spread of waste.	N	-1	-1	-2	-1	-5	CbA
	-	Freshwater Ecosystems	Please refer to site clearance for the required impacts and management measures.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	1, 2, 3, 4 & 5	Surface Water	Handling of Hazardous Waste within workshops and general mine area could contaminate the dirty water storage areas. The water is then reused in the system and could have impacts on the integrity of the storm water system and also the production.	N	-3	-2	-2	-4	-11	Clean and Dirty water separation systems should be incorporated in terms of the 2016 SWMP or any approved update thereafter. A detailed waste management strategy will be established and implemented, which will clearly demarcate the containments for different waste streams. Waste management training must be implemented on site. Clear signs informing staff of waste management practices must be implemented on site. All contaminated material at the Exploration Activities must be contained in mobile sumps. The mobile sumps must maintain a suitable freeboard, to ensure when these are moved/transported, that no spillage will occur. Hazardous waste handling should only take place within bunded and/or lined areas. Hazardous waste should be removed by a licenced removal company and taken to a suitable and licenced landfill site. Clean spills, if occur within 24 hours. Documentation of removal and safe disposal must be available on site. The mine will adopt a cradle-to grave approach to ensure that the waste is removed and disposed of in a legally compliant manner. Notify the relevant regulatory authorities in the event of the occurrence of a reportable incident. Weekly inspections of Storm Water Management Systems must be undertaken. Any blockages or maintenance requirements must be documented and an action plan developed.	N	-1	-1	-2	-2	-6	CbA
			Handling and Storing of Domestic Waste should have no impact on the surface water resources due to the location	N/A	-1	-2	-3	-3	-9	Clean and Dirty water separation systems should be incorporated in terms of the 2016 SWMP or any approved update thereafter.	N	-1	-1	-2	-1	-5	CbA

Name of Activity			Potential Impacts	Rating Prior to Measures						Mitigation Type	Rating Post Measures					Significance	
Activities	**Project**	**Impact Area**	**Potential Impacts**	**Status**	**Extent**	**Duration**	**Probability**	**Intensity**	**SbM**	**Mitigation Measures**	**Status**	**Extent**	**Duration**	**Probability**	**Intensity**	**SaM**	**CvA/R/Ir**
			of the facility. However, incorrect disposal of waste could hamper the integrity of the storm water system.							Waste management training must be implemented on site. Weekly inspections of Storm Water Management Systems must be undertaken. Any blockages or maintenance requirements must be documented and an action plan developed. Clear signs informing staff of waste management practices must be implemented on site. Access control must be strictly enforced. Waste should be disposed of by licensed companies to licenced facilities. Recycling practices must be investigated and implemented on site.							
	1, 2, 3, 4 &5	Groundwater	Large scale hydrocarbon spills could be present at the mining area	N	-3	-1	-4	-4	-12	Clean and Dirty water separation systems should be incorporated in terms of the 2016 SWMP. No activities associated with hydrocarbons and/or chemicals may be undertaken outside of an effectively designed and contained area. All used oils must be removed from site by a licensed company and disposed of at a suitably licensed site. Any spills occurring during the collection process must be cleaned up immediately. Any significant spills must be captured in the incident reports and must be reported to the relevant department (LDEDET, Catchment Management Agency/DWS). All equipment and machinery should be kept in good working order. In the event of a large spill include total petroleum hydrocarbon (TPH) in the next groundwater monitoring cycle. If elevated TPH is recorded, additional measures must be implemented to clean and/or rehabilitate affected areas. Soil samples must be taken after rehabilitation to confirm the presence of hydrocarbons that could pose a threat to groundwater contamination. A clean up procedure (i.e. Works Instruction) must be in place. Clean spills, if occur within 24 hours.	N	-2	-1	-2	-1	-6	CbA
			Handling or Hazardous Waste within workshops and general mine area.	N	-2	-2	-2	-4	-10	Clean and Dirty water separation systems should be incorporated in terms of the 2016 SWMP or any approved update thereafter. The workshop should be designed with the suitable waste containment measures (berms, sumps, oil separators). Waste management training must be implemented on site. Clear signs informing staff of waste management practices must be implemented on site. Hazardous waste handling should only take place within bunded and/or lined areas, with a capacity of at least 110% of the volume stored. Hazardous waste should be removed by a licenced removal company and taken to a suitable and licenced landfill site. Documentation of removal and safe disposal must be available on site.	N	-1	-1	-2	-2	-6	CbA
			Handling and Storing of Domestic Waste	N	-2	-2	-1	-2	-7	Clean and Dirty water separation systems should be incorporated in terms of the 2016 SWMP or any approved update thereafter. Waste management training must be implemented on site. Clear signs informing staff of waste management practices must be implemented on site.	N	-1	-1	-1	-2	-5	CbA

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

Table 78: Operational Phase Impact Assessment and Management Measures (Significance before Mitigation –SbM; Significance after Mitigation – SaM; Can be avoided – CbA; R – Reversible; Ir - Irreversible)

Name of Activity	Project	Impact Area	Potential Impacts	Rating Prior to Measures						Mitigation Type	Rating Post Measures					Significance	
Activities			Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM	CvA/R/Ir
Operation of TSF and associated infrastructure	1	Geology	The TSF footprint area is not mined through or undermined, but the current Dwarsrivier Mine Life of Mine (LoM) plan provided to Jones and Wagner indicate that the TSF footprint could be undermined in future. The depth to the underground resource under the proposed TSF footprint varies from 100m on the eastern side of the TSF to 200 m on the western side. The impact of the TSF on the future mining was not raised as a concern, and will be taken into account with the design of the future mining activities under the TSF.	N	-3	-3	-2	-5	-13	Permission to undermine the TSF should be obtained from the DMRE should this be required in the future.	P	1	3	3	5	12	CbA
		Topography	The ongoing operation of the TSF will have the greatest impact on the topographic setting of the area.	N	-3	-3	-3	-2	-11	The TSF should be operated and designed in terms of the approved designs. The height of the TSF will be limited to allow sufficient space for operational plant to safely operate at the top of the facility. A safety berm will be provided along the crest to provide a physical demarcation of the edge of the TSF and to direct stormwater runoff to the down chutes. The TSF will have a side slope of 1V:3H with 5 m wide benches provided at 10m height intervals. The resulting average slope of the TSF is 1V:3.5H Rehabilitation should be undertaken concurrently with operation as far as practically possible and in line with the approved designs, or those reassessed and approved thereafter.	N	-2	-2	-2	-1	-7	R
		Soils and Land Capability	Soil compaction outside of demarcated areas	N	-2	-3	-5	-4	-14	The mine will ensure that all activities, material and equipment storage and personnel movement take place within the designated area. A site plan must be developed, indicating the following: Location of all approved activities; 1:100 year buffer around all watercourses; Location of the CBA and Endangered Ecosystems and mark these areas where construction is not approved as a no-go zone's All vegetation management zones as per the Biodiversity Action Plan. Laydown areas should be located within disturbed soils (anthrosols) to avoid compaction of natural soils. All contractors must receive induction. The induction should be updated on site, to make provision for the site plan and a detailed explanation on the purpose of the no-go	N	-1	-1	-2	-1	-5	R

Name of Activity	Project	Impact Area	Potential Impacts	Rating Prior to Measures						Mitigation Type	Rating Post Measures					Significance	
Activities			Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM	CvA/R/Ir
										zones, presence of protected species, presence of the CBA and ESAs and the meeting thereof.							
										The management of topsoil stockpiles should be undertaken in terms of the Topsoil Management Plan included into this EMPr to ensure that the topsoil stockpiles maintain its integrity and are not subjected to compaction.							
										Restrict the amount of mechanical handling, as each handling event increases that compaction level and the changes to the soil structure. Wherever possible, the ‘cut and cover’ technique (where the stripped soils is immediately placed in an area already prepared for rehabilitation, thus avoiding stockpiling) should be used.							
										A fine system/disciplinary system must be implemented on site for all significant or recurring environmental non-compliances.							
										Compacted soils adjacent to the mining blocks and associated infrastructure footprint can be lightly ripped to at least 25cm below ground surface to alleviate compaction prior to re-vegetation.							
										Site clearance and activities should be restricted to the approved footprint. Contractors areas should be established on already disturbed footprints.							
										All vehicular traffic should be restricted to the existing service roads and the selected road servitude as far as practically possible							
			Clearing vegetation beyond the demarcated areas will result in the exposure of soil, which may in turn lead to soil erosion, in addition to this, stockpiling of topsoil material on sloping areas leading to increased runoff and erosion. The areas where the infrastructure is proposed are mostly gradual, however the exploration activities will be located among the mountainous setting and this is where erosion is considered moderately high. The natural and undisturbed soils will become more vulnerable to erosion once the vegetation is cleared for construction activities, and the soils will inevitably be exposed to wind and some surface runoff during intensive rainfall events.	N	-2	-3	-4	-4	-13	The approved Storm Water Management Plan must be implemented.	N	-1	-1	-2	-1	-5	R
										Clean and dirty water systems must be maintained.							
										Ensure the required erosion protection measures are monitored and corrected where necessary.							
										Bare soils can be regularly dampened with water to suppress dust during the construction phase, especially when strong wind conditions are predicted according to the local weather forecast							
										All disturbed areas adjacent to the footprint areas can be re-vegetated with an indigenous grass mix, if necessary, to re-establish a protective cover, to minimise soil erosion and dust emission. Natural vegetation establishment (self-succession) will be encouraged on cleared areas, and topsoil stockpiles.							
										If natural succession of vegetation is not established within one rainy season, after rehabilitation, the disturbed areas and areas adjacent to the infrastructural areas must be re-vegetated with an indigenous grass mix, if necessary, to re-establish a protective cover, to minimise soil erosion and dust emission.							

Name of Activity			Potential Impacts	Rating Prior to Measures						Mitigation Type	Rating Post Measures					Significance	
Activities	**Project**	**Impact Area**	**Potential Impacts**	**Status**	**Extent**	**Duration**	**Probability**	**Intensity**	**SbM**	**Mitigation Measures**	**Status**	Extent	Duration	Probability	Intensity	SaM	**CvA/R/Ir**
										The mine will investigate an appropriate seed mix for the rehabilitation purposes should self-succession not establish on rehabilitated sites. If possible, vegetation clearance and commencement of construction activities can be scheduled to coincide with low rainfall conditions when the erosive stormwater and wind are anticipated to be low. The approved areas should be clearly demarcated to restrict vegetation clearing activities within the infrastructure footprint as far as practically possible. No project related activities may be undertaken outside of the demarcated areas. No open fires must be allowed.							
			Potential of Soil Contamination - All the identified soils are considered equally predisposed to potential contamination (i.e. hydrocarbons), as contamination sources are generally unpredictable and often occur as incidental spills or leak for construction developments. The significance of soil contamination is medium-high for all identified soils, largely depending on the nature, volume and/or concentration of the contaminant of concern. The ratings given in the columns on the left is for Project 1 , Project 2 and Project 3-5.	N	-2	-3	-4	-4	-13	Contamination prevention measures should be addressed in the Environmental Management Programme (EMP) for the proposed development, and this should be implemented and made available, and accessible always to the contractors and construction crew conducting the works on site for reference A spill prevention and emergency spill response plan, as well as dust suppression, and fire prevention plans should also be compiled to guide the construction works Vehicles and Machinery will be regularly maintained. Maintenance programmes will be established and implemented. All refuelling of vehicles and equipment maintenance must be done within designated bunded areas. Spill and absorption kits must be available and readily accessible at the truck parking. There should always be a spare kit available at any given time. If necessary, the polluted soils will be remediated and affected areas rehabilitated. An emergency response contingency plan should be put in place to address clean-up measures should a spill and/or a leak occur, as well as preventative measures to prevent ingress Burying of any waste including rubble, domestic waste, empty containers on the site should be strictly prohibited and all construction rubble waste must be removed to an approved disposal site	N	-1	-1	-2	-1	-5	R
		Ecology (Fauna and Flora)	Impact on Floral Habitat and Diversity due to: 1. Clearance of floral species within the proposed footprint areas as well as nationally and provincially protected floral species; 2. Habitat	-	-	-	-	-	-	Prior to any vegetation clearance activities taking place a walkdown of the footprint must be undertaken and all floral and faunal SCC encountered must be GPS marked and the necessary permits applied for with the relevant national and	-	-	-	-	-	-	R

Name of Activity	Project		Potential Impacts	Rating Prior to Measures						Mitigation Type	Rating Post Measures					Significance	
Activities	Project	Impact Area	Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM	CvA/R/Ir
			fragmented and reduced dispersal opportunities for plant species as the disturbed / impacted areas will be less attractive to faunal species who are important mechanisms for seed dispersal; 3. Increase risk of erosion and poor stormwater management - resulting in loss of soils, the down-slope sedimentation of habitat and the consequent loss of habitat beyond the planned footprint; 4. AIP proliferation and woody encroachment into natural vegetation, displacing indigenous flora and altering favourable habitat conditions for the establishment of indigenous species. Probable Residual Impacts could occur due to 1. Fragmentation of ecologically intact habitat resulting in altered ecological functioning of habitat beyond the authorised projects, notably Project 2; 2. Potential further loss of and altered floral species diversity outside of the footprint areas, including loss of favourable habitat for SCC if effects from AIP proliferation and the intensification of woody encroachment are not managed; and 3. Loss of NFA protected tree species as a result of vegetation clearing and/or potential harvesting in the region. Cumulative Impacts - A significant threat for the floral ecology associated with the five projects is the potential proliferation of AIP species and particularly a potential for indigenous bush encroachment, resulting in the overall loss of native floral communities within the local area.							provincial departments. The site walk down is to be conducted prior to clearance activities and ideally post good rains between November and February when the smaller bulbous plants are growing and visible							
			Sekhukhune Mountain Bushveld - Project 1	N	-1	-2	-4	-4	-11	The construction footprint must be kept as small as possible to minimise impact on the surrounding environment (edge effect management) Removal of vegetation must be restricted to what is absolutely necessary and should remain within the approved footprint; In the establishment of fences, erect fences in such a manner as to limit the potential of animals to enter the project areas. This could involve the placement of rocks and materials at on the surface of the fences. As far as possible clearing of vegetation should take place in a phased manner moving away from fences and/or barriers. This will allow for any faunal species within the proposed footprints to flee and avoid harm;	N	-1	-1	-2	-2	-6	
			Secondary Bushveld - Project 1	N	-1	-2	-4	-4	-11	Smaller species such as scorpions and reptiles will not as readily able to move out of an area ahead of ground clearing. As such should any be observed in the construction	N	-1	-1	-2	-2	-6	

Name of Activity	Project		Potential Impacts	Rating Prior to Measures						Mitigation Type	Rating Post Measures					Significance	
Activities	Project	Impact Area	Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM	CvA/R/Ir
										site during clearing and construction activities, they are to be carefully and safely moved to an area of similar habitat outside of the disturbance footprint. Construction personnel are to be educated about these species and instructed not to kill them. Smaller scorpion species and harmless reptiles (that are likely present within the footprint areas) should be carefully relocated by a suitably nominated construction person. For larger venomous snakes, a suitably trained specialist, or on-site personnel, should be contacted to carry out the relocation of the species, should it not move off on its own							
										Vehicles should be restricted to travelling only on designated roadways to limit the ecological footprint of the construction activities. Additional road construction should be limited to what is absolutely necessary, and the footprint thereof kept to a minimal							
										No hunting or trapping of faunal species is to be allowed by construction personnel							
			Transformed Habitat	N	-1	-1	-2	-1	-5	Informal fires by construction personnel should be prohibited, and no uncontrolled fires whatsoever should be allowed	N	-1	-1	-2	-1	-5	
			Impact on Faunal Habitat and Diversity due to 1. Clearance of habitat leading to the displacement of faunal species; 2. Habitat fragmented and resulting in reduced movement of species and potentially reduced dispersal opportunities; 3. Increased risk of trapping / snaring and the potential collection for the pet / traditional medicine trade; and 4. AIP proliferation and woody encroachment into natural vegetation, displacing indigenous vegetation and altering favourable habitat conditions for faunal species. Probable Residual Impacts on fauna are considered to be: 1. Loss of / altered faunal species diversity in the footprint areas and the areas adjacent to the proposed projects; 2. Edge effects such as habitat fragmentation, AIP proliferation and bush encroachment limiting faunal species habitat utilisation; 3. Potential further loss of SCC/protected faunal species and suitable habitat for such species; and 4. It is unlikely that disturbed areas will be rehabilitated to an ecologically functioning state resulting in significant loss of habitat and species diversity, with reinstatement to premining levels being unlikely.	-	-	-	-	-	-	Care should be taken during the construction of the five proposed projects to limit edge effects to surrounding natural habitat. This can be achieved by: × Demarcating all footprint areas during construction activities; × No dumping of litter, rubble or cleared vegetation on site should be allowed. Rubble / waste should be disposed of at an appropriate registered dump site away from the development footprint. No temporary dump sites should be allowed in areas with natural vegetation. It is advised that waste disposal containers and bins be provided during the construction phase for all construction rubble and general waste; and × Manage the spread of AIP species as per the mines mine's AIP control plan.	-	-	-	-	-	-	CbA
			Sekhukhune Mountain Bushveld - Project 1	N	-1	-2	-4	-4	-11	Appropriate sanitary facilities must be provided during the construction of the development and must be removed to an appropriate waste disposal site	N	-1	-1	-2	-2	-6	

Name of Activity	Project		Potential Impacts	Rating Prior to Measures						Mitigation Type	Rating Post Measures					Significance	
Activities	Project	Impact Area	Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM	CvA/R/Ir
			Secondary Bushveld - Project 1							If any spills occur, they should be immediately cleaned up to avoid soil contamination that can hinder floral rehabilitation later down the line. Spill kits should be kept on-site at all times. In the event of a breakdown, maintenance of vehicles must take place with care, and the recollection of spillage should be practised, preventing the ingress of hydrocarbons into the topsoil							
										Upon completion of construction activities, it must be ensured that no bare areas remain, and that indigenous species be used to revegetate the disturbed area							
				N	-1	-2	-4	-4	-11	Edge effects arising from the proposed development, such as erosion and alien plant species proliferation, which may affect adjacent natural areas, need to be strictly managed. Specific mention in this regard is made of Category 1b AIP species (as listed in the NEM:BA Alien species lists, 2020), in line with the NEM:BA Alien and Invasive Species Regulations (2020);	N	-1	-1	-2	-2	-6	
										The poaching and/or hunting of animals will be strictly forbidden.							
										AIP monitoring and clearing/control should take place throughout the construction phase of the development, and a 30 m buffer surrounding the proposed railway loop should be regularly checked for AIP proliferation and to prevent inward and or/outward spread of AIPs, notably into non infested areas outside of the proposed railway loop or into newly rehabilitated areas							
			Transformed Habitat	N	-1	-1	-2	-1	-5	Alien vegetation that is removed must not be allowed to lay on unprotected ground as seeds might disperse upon it. All cleared plant material to be disposed of at a licensed waste facility which complies with legal standards.	N	-1	-1	-2	-1	-5	
			Impact on Floral SCC - The proposed five projects are associated with floral SCC, which will likely be directly impacted by the proposed activities. The SCC recorded on site (Sclerocarya birrea subsp. caffra) is protected under the NFA. Additionally, there is an increased chance that several other NFA and LEMA listed floral SCC may occur within the footprint areas. The proposed 5 projects are not anticipated to have a high impact on floral SCC and with mitigation measures implemented the impacts can remain localised in extent. Succulents and geophytes are good candidates for rescue and relocation to suitable sites outside of the proposed footprints, either to surrounding natural habitat or to the Dwarsrivier nursery. Woody species are less likely to be successfully relocated, especially larger individuals. Where woody SCC species are to be cleared and not	N	-1	-2	-1	-3	-7	Should any floral SCC be relocated, the relocation success of such species should be monitored during the construction phase to ensure immediate actions can be taken if it becomes evident that relocation is not successful.	N	-1	-1	-1	-2	-5	CbA

Name of Activity			Potential Impacts	Rating Prior to Measures						Mitigation Type	Rating Post Measures					Significance	
Activities	Project	Impact Area	Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM	CvA/R/Ir
			relocated, it must be ensured that the same species are currently being propagated in the nursery. If this is not the case, seeds can be harvested from the surrounding areas and / or from the individuals that will be cleared as part of vegetation clearing activities to be propagated off-site and reinstated as part of rehabilitation activities. Activities which are likely to negatively affect the flora of conservation concern within and around the proposed five projects include, but are not limited to, the following: 1. Disturbance, fragmentation and alteration of floral SCC habitat; 2. Destruction, removal or harvesting of floral SCC during construction and operational activities; and 3. Potentially poorly implemented and monitored rescue and relocation of SCC or not ensuring that the same species are being propagated in the Dwarsrivier nursery. Impact on CBAs, ESAs, Threatened Vegetation and Protected Areas - According to the desktop database, the proposed five projects will impact on a CBA 1 and the Sekhukhune Mountainlands threatened ecosystem, however, following the site assessment this is more accurately only applicable to the RWD of Project 1 and the footprint areas of Project 2. The remaining areas associated with the TSF (Project 1) and Projects 3-5 have all been impacted on and are associated with the active mining footprint. According to the desktop database, a small portion of Project 4 will impact on an ESA however, this section of the ESA has been degraded in terms of habitat integrity and is located within the active mining area.														
			Impacts on Faunal SCC - The five proposed projects are associated with habitats that are known to host faunal SCC, notably the Sekhukhune Mountain Bushveld habitat. The remaining habitats may serve as intermediary or transitionary habitats for such species, but not permanent habitat. One SCC was recorded on site, namely Pycna sylvia (Cicada) whilst Python natalensis (African Python, VU) has also been recorded in the adjacent areas. Panthera pardus (Leopard, Vulnerable, TOPS Listed), Parahyaena brunnea (Brown hyaena, NT, TOPS Listed), Sagittarius serpentarius (Secretary bird, VU), Polemaetus bellicosus (Martial Eagle, VU) and Neotis denhami (Denham's Bustard, NT) are also considered to have a medium probability of occurring, however such occurrences are likely to be transitionary and not permanent, as the	N	-1	-2	-1	-3	-7	Edge effect control needs to be implemented to prevent further degradation and potential loss of floral and faunal SCC outside of the five proposed project footprint areas Should the presence of any faunal or floral SCC be noted within the development footprint post walkdown and during vegetation clearance / construction activities, a suitably qualified specialist should be consulted on the best way to proceed	N	-1	-1	-1	-2	-5	CbA

Name of Activity	Project	Impact Area	Potential Impacts	Rating Prior to Measures						Mitigation Type	Rating Post Measures					Significance	
Activities			Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM	CvA/R/Ir
			footprint areas are not sufficient in extent to permanently host these species nor are there sufficient food resources within the five proposed project footprint areas alone to support these species. Mammalian, avifaunal and some reptilian SCC are likely to maintain large home ranges that will far exceed the extent of the five proposed project footprint areas. Due to the small project footprint extents and ability of many of the SCC to relocate ahead of construction activities, impacts stemming from the proposed projects are not expected to pose a significant risk to these species.														
			Habitat degradation due to dust: Increased dust will occur in all areas where vegetation is cleared. Dust will be caused by excavation, and construction. Dust in the area will be greatly increased due to the dry weather conditions and the nature of the soil in the area. Dust settling on plant material can reduce the amount of light reaching the chlorophyll in the leaves, thereby reducing photosynthesis, which in turn reduces plant productivity, growth and recruitment.	N	-2	-2	-2	-2	-8	Maintain the current air quality monitoring stations that determine fallout and implemented respirable dust (PM10) monitoring that could arise from the mining activities. Dust suppression should be undertaken where and when dust is present.	N	-1	-1	-2	-1	-5	CbA
			Direct Impact: Increased erosion can eventually lead to the loss of vegetation and habitats for further species. Soils in the area are prone to erosion in areas where vegetation is cleared, this is further compounded by the fact that precipitation in the area occurs through heavy rainfall events in in the form of thundershowers in summer. Furthermore large areas will be cleared before construction leaving these areas prone to erosion.	N	-3	-3	-5	-5	-16	Ensure the required erosion protection measures are monitored and corrected where necessary. Storm water management plan should be implemented prior to construction to ensure that runoff does not lead to the formation of erosion gulleys. Where vegetation cannot be established during the life of construction and operations, appropriate measure will be taken to control erosion. These will include grading of surfaces to prevent rapid run-off of storm water and / or the use of energy dissipaters. An erosion monitoring and mitigation plan should be put in place.	N	-1	-1	-2	-2	-6	CbA
			Accidental death of animals on the roads.	N	-2	-3	-2	-5	-12	Clearly marked signs will be erected along the transportation routes to create awareness of animal crossings. A clearly marked and enforced vehicle speed will be implemented on the internal mine and transportation routes. A detailed induction programme will be in place to ensure that all parties are aware of the rules and regulations on site in terms of the use of roads. Vehicles may only travel on demarcated roads on site.	N	-1	-3	-1	-3	-1	CbA
		Freshwater Ecosystems	TSF: Operation and maintenance of the clean and dirty water separation system around the TSF and RWD:	N	-2	-2	-2	-2	-8	The clean water outlet structures should be constructed from energy dissipating structures (such as Armorflex or reno mattresses) to slow down the velocity of water inflow into the watercourse	N	-1	-1	-1	-2	-5	CbA

Name of Activity			Potential Impacts	Rating Prior to Measures						Mitigation Type	Rating Post Measures					Significance	
Activities	Project	Impact Area	Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM	CvA/R/Ir
			•Increased flood peaks into the watercourse as a result of formalisation and concentration of surface runoff; •Potential for erosion of terrestrial areas as a result of the formation of preferential flow paths, leading to sedimentation of the watercourse; •Reduction in volume of water entering the watercourse, leading to loss of recharge (and thus potential desiccation) of the watercourse systems; •Erosion and sedimentation of the watercourse at the outlet of the clean water trench; and •Altered vegetation communities due to moisture stress.							After construction of the outlet, the area surrounding the outlet should be re-seeded with indigenous watercourse vegetation.							
			TSF: Potential Risk of failure of TSF or RWD leading to spill of tailings in the vicinity of watercourses leading to deposition in the aquatic environment: •Loss of aquatic habitat and refugia; •Silt deposition may lead to smothering of benthic layer. •Loss of aquatic biodiversity and loss of aquatic taxa; •Negative impact on aquatic biota community diversity and integrity due to deterioration of water quality.	N	-3	-2	-2	-4	-11	The TSF and RWD must be managed throughout the life of both facilities in such a way to ensure that storage and surge capacity is available if a rainfall event occurs; An Emergency Response Plan must be compiled. The Emergency Response Plan must contain the following measures: In the case of failure, as much sediment as possible, contaminated by the spill, must be removed from the point of its source, following the spill path to the affected watercourse. Sediment must be removed until the natural in situ substrate is reached or until a clear change in the sediment colour is reached indicating that the natural soil level has been reached All silt removed should be returned to the TSF or disposed of at a suitably managed site; Following the removal of the contaminated sediment, it must be ensured the slope of the excavated areas is in line with the natural topography – i.e. a low gradient no more than 1:3; Edge effects must be strictly controlled – for example no removal of sediment must take place beyond the spill pathway Possible seepage and contamination of the groundwater resources is possible and should be monitored at suitable groundwater monitoring points, as guided by the geohydrological study; Toxicological monitoring of the receiving environment and of the RWD must occur immediately following the first rain event after rehabilitation and again at the end of the wet season. The aquatic ecologist should make a recommendation concerning the necessity of future monitoring following the assessment.	N	-2	-1	-1	-2	-6	CbA
		Hydrology	Contamination of surface water resources due to potential hydrocarbon spillages washed into drainage lines and depressions	N	-2	-3	-2	-3	-10	Ongoing water, biomonitoring and groundwater monitoring should be undertaken. Machinery, trucks and vehicles must be well maintained and serviced regularly as per the recommended service guide.	N	-1	-1	-2	-1	-5	CbA

Name of Activity			Potential Impacts	Rating Prior to Measures						Mitigation Type	Rating Post Measures					Significance	
Activities	Project	Impact Area	Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM	CvA/R/Ir
										Refuelling must be undertaken over hard park bunded areas that adequately capture and contain spillages. Machinery and vehicles should be parked on appropriately lined areas. Drip trays must be used under leaking machinery. Spillages should be reported immediately and spill kits should be readily available at all times.							
			Due to the small size of the TSF and Capital Projects, the loss of contributing area will be negligible (less than 0.5 %) in comparison to the runoff area of quaternary catchment B41G.	N	-1	-2	-1	-1	-5	Runoff from dirty areas must be contained according to GN704 regulations. There are no mitigation measures for a loss of contributing catchment area. The loss of catchment area is extremely small and would therefore have a negligible impact on reducing the catchment yield. Implement and maintain the approved Storm Water Management Plan as defined in the EMPr, or as subsequently been approved.	N	-1	-2	-1	-1	-5	
			Placement of the Khulu TSF infrastructure in a potential non-perennial drainage line located towards the north-eastern side of the TSF. According to the 1:50 000 topographical map 2430CC Kennedy's Vale, a non-perennial drainage line runs along the north-eastern boundary of the Khulu TSF site. This area was assessed on the site visit and it was noted that the area was highly disturbed by what appeared to be old stockpiles and borrow pits, most likely from previous road construction in the area. Water is likely to pond in this area as a result of the disturbance, and therefore it is highly unlikely that this area functions as a drainage line.	N	-2	-3	-2	-3	-10	The implementation of the proposed clean water diversion trench around the TSF will assist with drainage in this area.	N	-1	-2	-1	-1	-5	
			The proposed Khulu TSF, silt trap, PCD, diesel storage tanks and emulsion transfer area have the potential to contaminate the surrounding clean environment should spills occur.	N	-3	-3	-3	-4	-13	Runoff from the Khulu TSF will be captured in a perimeter trench (solution trench) which must be lined and sized appropriately according to GN704 regulations. Clean water should be diverted around the TSF through the implementation of a diversion trench. The TSF silt trap must be regularly inspected and desilted. Desilted material must be placed temporarily on a lined bunded area and disposed of either back on the TSF or at an appropriate facility. Silt from the silt trap, should be dried on designated designed drying pads, contained for such purpose. Silt should be disposed of at suitable designed areas or onto the TSF. The proposed pipeline must be regularly inspected for leaks A safety berm will be provided along the crest to provide a physical demarcation of the edge of the TSF and to direct stormwater runoff to the down chutes. Contained bunded areas should be placed at all booster stations to ensure that any potential leak can be contained.	N	-1	-2	-1	-1	-5	

Name of Activity	Project		Potential Impacts	Rating Prior to Measures						Mitigation Type	Rating Post Measures					Significance	
Activities		Impact Area	Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM	CvA/R/Ir
										Where pipeline links are present, or where clean up points are identified, the necessary containment should be implemented to ensure that spills in this area, can be contained. Tailings spills must be cleaned within 48 hours from occurrence, and taken to demarcated areas (such as the TSF) or within suitably bunded or contained areas.							
										The PCD must be lined and appropriately sized so as not to spill more than once in 50 years, in accordance with GN704 regulations. The freeboard of the PCD must be monitored daily.							
		Geohydrology	Contamination of groundwater resources. The model was used to assess the impact on groundwater quality at the end of the operational phase. This was assumed to coincide with the end of life of the Khulu TSF, which is indicated as 21 years. During the operational phase, it is assumed that the liner at the TSF and the PCD will remain intact and that seepage from the tailings material will be collected above and below the drains to installed. As such, no significant seepage from the Khulu TSF to the underlying aquifers is expected. Impacts associated with other sources of contamination to groundwater, including the plant, the historical TSF (before it is reworked), the dirty water dams, pit backfill areas and the underground workings are assumed to continue to impact over the life of the operations. It is noted that Dwarsrivier Mine is in the process of developing a groundwater remediation strategy to reduce nitrate concentrations in groundwater in the plant area. This project will be evaluated in a separate study. The results of the simulations to estimate the impact at the end of the operational phase, indicate the following: • Nitrate contamination in the weathered aquifer will be contained to the plant and opencast mining areas. Based on the current characterisation of the alluvial aquifer, it is unlikely that nitrate concentrations in the weathered	N	-3	-3	-3	-4	-13	The leak detection systems of the TSF should be monitored regularly.	N	-1	-2	-1	-2	-6	R
										The water level in the PCD must be diligently monitored to avoid spills and/or seepage. If excess water collects in the PCD, this water must be pumped to the LOWER RWD for reuse in the mine water balance.							
										Dwarsrivier Mine must monitor the volumes of water transferred to and from the Khulu TSF and PCD as part of its flow meter monitoring network. Instruments installed to measure flow must be maintained and calibrated to ensure that accurate measurements are made. The data collected from the flow meters must be used to confirm that the assumptions on which this impact assessment are based, remain valid. If significant deviations in terms of water flow volumes are recorded, the impact assessment presented in this report must be re-evaluated, especially in terms of the volume of seepage available for infiltration from the TSF and PCD.							
										Monitor the risk of overflow and/or spill at the PCD and the LOWER RWD to avoid adverse impacts on groundwater quality.							
										Quarterly engineering inspections should be undertaken to ensure that the disposal methodology and designs, as well as the stability considerations are in line with the design principles.							
										Capture seepage from the Khulu TSF and reuse it in the mine water balance.							
										Dwarsrivier Mine must implement the planned groundwater remediation strategy to address existing nitrate							

Name of Activity			Potential Impacts	Rating Prior to Measures						Mitigation Type	Rating Post Measures					Significance	
Activities	**Project**	**Impact Area**	**Potential Impacts**	**Status**	**Extent**	**Duration**	**Probability**	**Intensity**	**SbM**	**Mitigation Measures**	**Status**	Extent	Duration	Probability	Intensity	SaM	**CvA/R/Ir**
			aquifer would exceed 11 mg/l in the vicinity of the Groot Dwars River. • No significant impact is expected on the shallow weathered and alluvial aquifers during the operational phase. Nitrate concentrations in these aquifers at the Khulu TSF footprint are expected to remain below 11 mg/l in general. • No impact on groundwater quality is expected in the vicinity of the Klein Dwars River west and northwest of the Khulu TSF and PCD at the end of the operational phase. • Based on the conceptualisation of preferential groundwater flow in the fractured rock aquifer, the nitrate plume is expected to migrate in a northerly direction along the N-S striking fault. This contamination originates from the plant, historical TSF, dirty water dams, open cast and underground mining areas and not from the Khulu TSF and PCD. • At the Khulu TSF footprint, nitrate concentrations may increase to above 400 mg/l along the fault line. It is likely that the plume may migrate more than 500m north of the Dwarsrivier Mine mineral rights boundary by the end of the operational phase. The extent to which contamination may migrate from existing mining and mineral processing activities will depend on the manner in which the sources to groundwater are managed as well as the permeability and porosity of the preferential flow path. • As noted above, Dwarsrivier Mine is in the process of developing a groundwater remediation strategy to address existing nitrate contamination. This strategy will be addressed in a separate study, but it will be designed to reduce the impact on the fractured rock aquifer in the long-term. • Nitrate concentrations in the Farm House borehole may increase to around 200mg/l by the end of the operational phase. At present, the nitrate concentration in this borehole is 46 mg/l.							contamination, which must be designed to reduce the impact on the fractured rock aquifer in the long-term Ongoing water, biomonitoring and groundwater monitoring should be undertaken. Groundwater monitoring must be maintained in all boreholes dedicated to the Khulu TSF. Both groundwater quality and groundwater levels must be monitored in the boreholes according to the strategy below. The information from the monitoring programme must be kept in a spreadsheet. Trends must be analysed to ensure that any exceedances are immediately detected. In the event of deterioration in groundwater quality, an inspection must be held to identify the source of contamination. Any non-compliances must be rectified immediately to avoid prolonged negative impacts on groundwater. If any of the monitoring boreholes are destroyed during construction and/or operation of the TSF, these must be placed as a matter of urgency. Of specific concern is the location of boreholes DRM11S and D, which is located on the edge of the Khulu TSF design. These boreholes target the SW-NE trending fault and must be redrilled on this structure if destroyed to ensure efficient monitoring of groundwater in this position. Update the numerical groundwater flow and contaminant transport modelling as additional monitoring information becomes available, but at least every five years. The final closure numerical groundwater modelling must be undertaken five years before closure of the facility.							
		Air Quality	Sensitive receptors are identified as areas that may be impacted negatively due to emissions from the proposed TSF. Four receptors (villages and dwellings) were identified in the area surrounding the proposed project area, within a 10 km radius, and were used for this assessment. Long-term (annual) and short-term (24-hour average) concentrations for the pollutants of concern were	N	-2	-1	-3	-3	-9	Install air quality monitoring stations that determine fallout and respirable dust (PM10) concentrations that could arise from the mining activities. Wetting of exposed stockpiles to limit the dispersion of wind-blown dust and particulate emissions Use of water sprays at crushing and transfer points During operational phase of the mine, haulage roads will be treated with dust suppression techniques such as wet to reduce dust creation.	N	-1	-1	-2	-2	-2	CbA

Name of Activity	Project	Impact Area	Potential Impacts	Rating Prior to Measures						Mitigation Type	Rating Post Measures					Significance	
Activities			Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM	CvA/R/Ir
			compared with the South African NAAQS and dust fallout levels with the NDCR standards. PM10 CONCENTRATIONS – For Scenario 1 (current mining operations) and Scenario 2 (current with proposed TSF) ambient 24-hour (P99) and annual average PM10 concentrations are predicted to be compliant at all sensitive receptors; – Changes in predicted PM10 concentrations between Scenario 1 and Scenario 2 are substantial, with a 66% average increase in the 24-hour (P99) concentrations and a 69% average increase in annual average concentrations across all sensitive receptors. However, despite the increase, predicted concentrations at all receptors remain well below the standards during Scenario 2; – Highest predicted 24-hour and annual average off-site concentrations are compliant with the respective standards for Scenario 1. Highest concentrations are predicted on the north-western portion of the mine, predominately around the areas of existing haulage roads; – Highest predicted 24-hour average off-site concentrations during Scenario 2 are non-compliant with the relevant 24-hour standard, due to the close proximity of the new TSF road to the boundary of the mine. However, highest predicted annual average concentrations remain compliant with the standard; and – However, despite the non-compliance predicted for the 24-hour PM10 off-site concentrations (Scenario 2), all concentrations predicted at neighbouring sensitive receptors remain complaint with their relevant standard, as noted previously. PM2.5 CONCENTRATIONS – For Scenario 1 (current mining operations) and Scenario 2 (current with proposed TSF), ambient 24-hour (P99) and annual average PM2.5 concentrations are predicted to be compliant at all sensitive receptors; – Changes in predicted PM2.5 concentrations between Scenario 1 and Scenario 2 are substantial, with a 72% average increase in the 24-hour (P99) concentrations and a 68% average increase in annual average concentrations across all sensitive receptors. However, despite the increase, predicted concentrations at all receptors remain well below the standards during Scenario 2; and – Highest predicted 24-hour average and annual average off-site concentrations remain compliant with the relevant standards for both scenarios.							Avoid dust generating works during the most windy conditions;							

Name of Activity	Project		Potential Impacts	Rating Prior to Measures						Mitigation Type	Rating Post Measures					Significance	
Activities	Project	Impact Area	Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM	CvA/R/Ir
			DUST FALLOUT – For both scenarios, no exceedances of the dust fallout residential standard are predicted at any of the neighbouring sensitive receptors; – Scenario 1 and Scenario 2 highest predicted off-site dust fallout rates remain compliant with the non-residential standard; and – Overall levels of dust fallout anticipated to occur as a result of the proposed TSF are below the respective National Dust Control Regulations.														
		Heritage	No further impacts are foreseen.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Noise	Noise of vehicles traversing the access roads will create a constant source of noise. It is however not foreseen that the roads proposed would contribute to any additional noise levels in the area.	N	-1	-4	-1	-1	-7	Machinery and vehicles will be well maintained to prevent excessive nose and to comply with national and provincial regulations. All vehicles will have muffles to minimise noise emissions, where necessary. Where noise becomes a nuisance nose management measures will be investigated and implemented to address these concerns. Operational mining activities with potential noise impacts should be mitigated and should not be undertaken during night time. Noise generating activities should thus be kept to normal working hours where possible Personnel should be equipped with the necessary noise protection equipment. Noise monitoring will be undertaken (ambient conditions) to ensure that noise levels comply with Health and Safety Standards.	N	-1	-1	-1	-1	-4	CbA
		Visual	Deposition of tailings on the TSF.	N	-3	-3	-3	-2	-11	There are no real mitigation measures as the TSF will increase in height and will be approved for a certain height, however, the TSF should be vegetated as soon as practicably possible and should not exceed the approved height.	N	-2	-2	-1	-1	-6	R
			The presence of a new TSF in the landscape.	N	-3	-3	-2	-2	-10	The natural landscape of the area has already been altered by mining. The proposed mine infrastructure is in line with the current land use and will add to the already altered landscape. It is not foreseen that the current visual quality of the area will be significantly altered by the proposed TSF. However, it is recommended that the TSF is vegetated as soon as practicably possible, and that the associated infrastructure is painted earthy colours to blend into the landscape.	N	-2	-2	-1	-1	-6	R
			Impact on Sense of Place (Social impact) - Site B has previously been used for farming activities, although no farming is currently being undertaken within the area. The site is situated within an area characterised by mining	N	-2	-2	-3	-3	-10	Mining areas should be rehabilitated as soon as the Mining Works Programme allows. Un-rehabilitated and poorly rehabilitated mining areas must not be allowed to remain.	N	-2	-2	-2	-3	-9	CbA

Name of Activity			Potential Impacts	Rating Prior to Measures						Mitigation Type	Rating Post Measures					Significance	
Activities	Project	Impact Area	Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM	CvA/R/Ir
			infrastructure. Although Site B would be highly visible from the R577 and the Richmond Road, the proposed TSF will blend in with the existing overall sense of place, as the area is already disturbed by existing mining activities. The development of the TSF will thus not create a new impact on the sense of place. The area where site B is proposed is currently not used for other purposes e.g. farming, and therefore one can conclude that no significant land-use sterilisation would occur. With regards to the overall impact of the Khulu TSF and the capital projects on the sense of place, there would be additional impacts associated with the different projects, although it would not significantly scar the existing visual characteristics of the environment.							Environmental management of the mining activities must adhere to environmental regulations and strive towards international best practice. The eradication of alien invasives, aimed at ensuring the integrity of the biodiversity, should form part of the mitigation to limit further negative impacts on the overall sense of place. The power lines and servitude to the east of Site B must be considered in the detailed design to avoid interruptions in electricity provision. Placement of lighting at infrastructure should be optimally placed with the least negative visual impacts possible. The design of the TSF must consider the visual impacts and aim to lessen this by attending to the slope angles/steepness and possible landscaping around the facility (e.g. tree barrier line).							
			Operation of the TSF and security measures.	N	-3	-3	-2	-3	-11	Down lighting and lighting shields should be used as far as possible.	N	-2	-1	-1	-1	-5	CbA
			The presence and use of heavy machinery, trucks and vehicles during the operational phase.	N	-2	-3	-2	-2	-9	Machinery, trucks and vehicles are already present in the area and are unlikely create any additional significant presence. Trees should be planted along the main roads to conceal activities from motorists. Dust suppression measures should be implemented to limit the generation of dust.	N	-1	-1	-2	-1	-5	CbA
		Social	There is approximately 1200 permanent and 800 contractor employees in service at Dwarsrivier Mine. This employment profile will be sustained as the proposed project would allow the operation to meet the existing production capacity. Approximately 24 employees will be directly involved with the operations related to the TSF. No new employment positions will be created as these employees are already employed at Dwarsrivier Mine. However, the existing socio-economic benefits created through Dwarsrivier Mine being a key employer in the area would continue. The social services support as part of the SLP requirements will also continue to be implemented. As no additional workers are anticipated, the inflow of jobseekers is also anticipated to be of limited significance.	P	2	2	3	3	10	The procurement of locals should receive preference if there is any need for additional employees. The ideal objective should be to reach 100% recruitment of additional/ new unskilled labour from local communities where skills are locally available.	P	3	2	3	3	11	CbA
			Existing employees would continue to be responsible for the overall mining activities. Limited additional temporary workers could over time be required for specific tasks associated with the proposed Khulu TSF and capital projects. When that occurs, new mining activities can then be allocated to appointed specialist contractors.	P	2	2	3	3	10	Targets for the procurement of capital goods, consumer goods and services should be set and Dwarsrivier Mine should develop an action plan to meet these targets. Contract executions by SMMEs should be strictly monitored to determine whether SMMEs require assistance with regards to general business principles, financial	P	3	2	3	3	11	CbA

Name of Activity			Potential Impacts	Rating Prior to Measures						Mitigation Type	Rating Post Measures					Significance	
Activities	Project	Impact Area	Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM	CvA/R/Ir
			Even if limited procurement is foreseen, this variable is still regarded as positive, due to the indirect impacts of Dwarsrivier Mine's mining activity on the local economy through the creation of possible business opportunities (e.g. local service industry) and local procurement of material, services and equipment.							management, management of stock, competitive costing (pricing), and marketing of their businesses. Enterprise development is a key enhancement measure in this regard. The proponent should assist small businesses and/or SMME's to develop to a certain level. Such measures recommended could include the following: The establishment of joint ventures between small businesses and established companies with relevant experiences with regards to tender processes can be considered; Flexible payment systems can be considered to assist smaller businesses in terms of expenditure, but such a system must be strictly controlled, An audit of existing local enterprises that could provide services, goods and material should be undertaken with the assistance of local leaders and community representatives, as well as local business structures The procurement process should be based on competitive business principles and the quality of services to be rendered, to ensure adherence to standards and to maximise overall welfare.							
			Socio-Economic Development - The socio-economic impact of the proposed projects would be based on the mine's continued contribution to the Gross Geographical Product (GGP) and the number of direct (continued employment at the mine) and indirect jobs that would be created. Therefore, except for ongoing direct employment, that would generate income and increase local spending, people living in the vicinity of the study area is also expected to benefit by the earnings of those employed by the mine and the local buying power in the area. Through employment and income generation during the mining processes, some economic benefits to the region and local communities therefore accrue. The mine would continue to contribute to the local economy through its employee wages, procurement of local contractors and services, purchasing of water and electricity and through payment of taxes to the Fetakgomo Tubatse Local Municipality. Dwarsrivier Mine, through their mining activities, is involved in various Local Economic Development Initiatives linked to the Integrated Development Plan (IDP) of the Fetakgomo Tubatse Local Municipality, as well as other government initiatives. These activities would thus continue, and the constant positive socio-economic	P	3	2	3	3	11	Dwarsrivier Mine, through their SLP, must continue to provide skills development opportunities for employees that include functional literacy and numeracy programmes, career progression plans, up-skilling for hard to fill vacancies and management positions, bursary and internships and portable skills training. Develop a database of SMME's for the procurement of goods and services that could potentially be outsourced to the local community. Dwarsrivier Mine to continue to adhere to the Social and Labour Plans as per the Regulation 46 of the Mineral and Petroleum Resources Development Act (Act 28 of 2002) and the Mining Charter (2018).	P	3	2	3	4	12	CbA

Name of Activity	Project	Impact Area	Potential Impacts	Rating Prior to Measures						Mitigation Type	Rating Post Measures					Significance	
Activities			Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM	CvA/R/Ir
			impacts thereof would remain to benefit of the local communities.														
			Capacity Building - Although education and training are mainly the responsibility of government, there is increased pressure on the business sector in South Africa to increase the development and skills of their workforce. Dwarsrivier Mine is involved in capacity building and training. Further to these focus areas, the company also concentrate on local employment creation and poverty alleviation, as well as environmental management, rural development and the provision of infrastructure. The above-mentioned inputs would continue if Dwarsrivier Mine is successful in sustaining their mining operations in the area. Dwarsrivier Mine has thus played an important role in the area in this regard and commits to continue with these efforts which would benefit the local communities within the Fetakgomo Tubatse Local Municipality area.	P	3	2	3	3	11	Dwarsrivier Mine should continue with a Human Resources Development (HRD) strategy as part of the Social and Labour Plan (SLP). The focus should remain of career development programmes, bursaries, learnership programmes, skills development and training. Learnership programmes should preferably focus on individuals from the core and affected areas in close proximity to Dwarsrivier Mine to maximise the long-term employment opportunities of these local community members. Local goods and services should be used as far as possible and therefore contractual requirements for contractors to use local goods and services should be implemented as far as possible Local Economic Development initiatives should continue	P	3	2	3	4	12	CbA
			Safety and Security Related Impacts - The production capacity associated with the proposed Khulu TSF project and the capital projects would remain approximately similar to the current situation and it is therefore not anticipated that the transportation of material or products would escalate. However, the continuous movement of mining related vehicles transporting goods and materials on the local roads can still continue to create safety and security risks. The method to be used at the Khulu TSF involves dry stacking by means of the filter cake which is of a solid content. This method minimises the risk of tailings dam failures and can lessen possible seepage significantly. From a socio-economic perspective this method will thus limit safety and security risks, as well as health risks.	N	-2	-2	-2	-2	-8	A Fire/Emergency Management Plan should be developed and implemented, if not yet in place. It would be important to regularly review the functionality and efficiency of such a plan in conjunction with the local emergency teams, mine management and affected communities as well as neighbouring landowners. Appropriate firefighting equipment should be on site and workers should be appropriately trained for firefighting Warning signs would have to be posted to alert residents and road users to possible dangers associated with mining related traffic and activities.	N	-2	-2	-2	-2	-8	CbA
			Health Related Risks - During the operational phase dust impacts are anticipated due to general mining activities and vehicles travelling on the access and haul roads. The dust concentrations as a result of this movement are not anticipated to reach residential areas and the impact would possibly be localised on site. Fugitive dust from stockpile areas and waste rock dumps are also of concern. Windblown dust from these facilities will vary according to the season, with possible higher	N	-2	-2	-3	-3	-10	The Mine Health and Safety Act (Act No 29 of 1996), standards stipulated in SANS 10286, NEMA and related regulations and standards must be adhered to. Vehicles and equipment must be in good working order and must be regularly serviced. Infrastructure e.g. pipelines must be regularly inspected and maintained to avoid spillages. Mining activities should adhere to all the relevant environmental and health guidelines and should be undertaken in accordance with the EMP	N	-2	-2	-2	-2	-8	CbA

Name of Activity			Potential Impacts	Rating Prior to Measures						Mitigation Type	Rating Post Measures					Significance	
Activities	Project	Impact Area	Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM	CvA/R/Ir
			levels and frequency during the windy months. The probability and intensity of these possible impacts would further depend on the wind directions and the proximity of sensitive receptors. The nearest residential area is approximately 10 km to the north and east of the mining area. Should there be a possible increase in the air pollution (dust), these sensitivities should be adequately dealt with and be taken into account in the monitoring processes stipulated as part of the EMPr. In the event that sensitive receptors are affected (worst case scenario), based on dust fallout rates, the necessary mitigation measures as stipulated through the Air Quality specialist study must be implemented. The rating below is based on the general air quality impacts usually experienced with mining projects and the proximity of sensitive receptors in the study area. Emissions would include vehicle emissions (carbon monoxide and nitrogen oxide) and emissions from large construction equipment. Industrial, solid and hazardous waste would be created during the mining operations. As is currently the case, these different types of waste should continue to be responsibly disposed of to avoid any health-related impacts in this regard. Storing of diesel and emulsion can create health related risks. As mitigation, the emulsion will be stored in underground tankers. The majority of the pipelines will further be underground to limit risks in this regard and possible spills. The Khulu TSF, as indicated above would include dry stacking. This method can minimise health risks usually associated with conventional tailings facilities. Surface water runoff and possible seepage are still possible and can contaminate water resources. The designs should avoid such pollution in order to avoid public health impacts due to the potential impact on the water quality. It should also again be noted that the nearest residential settlement is approximately 10 km away from the mining activities. In mining areas there are further concerns relating to migrant employees bringing health risks, and nowadays the threat of Covid-19 infection, to mining areas or small towns. The Fetakgomo Tubatse Local Municipality area is already characterised by vulnerable households and inadequate public health services that cannot always							The TSF design should ensure that contaminated surface water runoff do not contaminate other water sources and that no seepage occurs. Extracting water from the slurry/slimes will limit the water content of the TSF. Dust suppression methods along haul roads should be continued to be implemented Dwarsrivier Mine must continue to distribute information with regards to health matters and nutrition to its workers and surrounding communities The SLP should make provision for addressing any possible direct health related risks and providing a supporting role to minimise the vulnerabilities of the communities, without having to take over the role of the local health services and municipality. On site, all the appropriate health, hygiene and distancing measures aimed at protecting the employees' safety and health, must be implemented. Dwarsrivier Mine can investigate ways to support to the local clinics through their community support programmes and SLP initiatives. Educational videos on COVID-19, and general health and hygiene measures associated with the pandemic should be provided to employees							

Name of Activity			Potential Impacts	Rating Prior to Measures						Mitigation Type	Rating Post Measures					Significance	
Activities	Project	Impact Area	Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM	CvA/R/Ir
			effectively deal with the health risks associated with the pandemic. It will remain the responsibility of Dwarsrivier Mine to continue their support to their employees and surrounding communities to reduce vulnerability and to implement the required Covid-19 Protocol.														
TSF	1	Socio-Economic	The existing dam break analysis indicates that should an impact occur that the Eskom Sub Station will be in the zone of influence (refer to Annexure 4).	N	-3	-2	-2	-5	-12	The necessary emergency preparedness plans must be developed and implemented in consultation with Eskom to proactively plan and manage an instance should dam break be encountered. The TSF must be designed, constructed and operated in line with the approved designs.	N	-3	-1	-1	-2	-7	CbA
Operation of Projects 3, 4, 5	1	Geology	No further impacts are foreseen.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Topography	No further impacts are foreseen.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Soils and Land Capability	Soil compaction outside of demarcated areas	N	-2	-3	-4	-2	-11	The mine will ensure that all activities, material and equipment storage and personnel movement take place within the designated area. A site plan must be developed, indicating the following: Location of all approved activities; 1:100 year buffer around all watercourses; Location of the CBA and Endangered Ecosystems and mark these areas where construction is not approved as a no-go zone's All vegetation management zones as per the Biodiversity Action Plan. Laydown areas should be located within disturbed soils (anthrosols) to avoid compaction of natural soils. All contractors must receive induction. The induction should be updated on site, to make provision for the site plan and a detailed explanation on the purpose of the no-go zones, presence of protected species, presence of the CBA and ESAs and the meeting thereof. The management of topsoil stockpiles should be undertaken in terms of the Topsoil Management Plan included into this EMPr to ensure that the topsoil stockpiles maintain its integrity and are not subjected to compaction. Restrict the amount of mechanical handling, as each handling event increases that compaction level and the changes to the soil structure. Wherever possible, the 'cut and cover' technique (where the stripped soils is immediately placed in an area already prepared for rehabilitation, thus avoiding stockpiling) should be used. A fine system/disciplinary system must be implemented on site for all significant or recurring environmental non-compliances. Compacted soils adjacent to the mining blocks and associated infrastructure footprint can be lightly ripped to	N	-1	-1	-2	-1	-5	R

Name of Activity	Project		Potential Impacts	Rating Prior to Measures						Mitigation Type	Rating Post Measures					Significance	
Activities	Project	Impact Area	Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM	CvA/R/Ir
										at least 25cm below ground surface to alleviate compaction prior to re-vegetation. Site clearance and activities should be restricted to the approved footprint. Contractors areas should be established on already disturbed footprints. All vehicular traffic should be restricted to the existing service roads and the selected road servitude as far as practically possible							
			Clearing vegetation beyond the demarcated areas will result in the exposure of soil, which may in turn lead to soil erosion, in addition to this, stockpiling of topsoil material on sloping areas leading to increased runoff and erosion. The areas where the infrastructure is proposed are mostly gradual, however the exploration activities will be located among the mountainous setting and this is where erosion is considered moderately high. The natural and undisturbed soils will become more vulnerable to erosion once the vegetation is cleared for construction activities, and the soils will inevitably be exposed to wind and some surface runoff during intensive rainfall events. The ratings given in the columns on the left is for Project 1 , Project 2 and Project 3-5.	N	-2	-3	-3	-2	-10	The approved Storm Water Management Plan must be implemented. Clean and dirty water systems must be maintained. Ensure the required erosion protection measures are monitored and corrected where necessary. Bare soils can be regularly dampened with water to suppress dust during the construction phase, especially when strong wind conditions are predicted according to the local weather forecast All disturbed areas adjacent to the footprint areas can be re-vegetated with an indigenous grass mix, if necessary, to re-establish a protective cover, to minimise soil erosion and dust emission. Natural vegetation establishment (self-succession) will be encouraged on cleared areas, and topsoil stockpiles. If natural succession of vegetation is not established within one rainy season, after rehabilitation, the disturbed areas and areas adjacent to the infrastructural areas must be re-vegetated with an indigenous grass mix, if necessary, to re-establish a protective cover, to minimise soil erosion and dust emission. The mine will investigate an appropriate seed mix for the rehabilitation purposes should self-succession not establish on rehabilitated sites. If possible, vegetation clearance and commencement of construction activities can be scheduled to coincide with low rainfall conditions when the erosive stormwater and wind are anticipated to be low. The approved areas should be clearly demarcated to restrict vegetation clearing activities within the infrastructure footprint as far as practically possible. No project related activities may be undertaken outside of the demarcated areas. No open fires must be allowed.	N	-1	-1	-2	-1	-5	R
			Potential of Soil Contamination - All the identified soils are considered equally predisposed to potential	N	-2	-3	-3	-2	-10	Contamination prevention measures should be addressed in the Environmental Management Programme (EMP) for the	N	-1	-1	-2	-1	-5	R

Name of Activity			Potential Impacts	Rating Prior to Measures						Mitigation Type	Rating Post Measures					Significance	
Activities	Project	Impact Area	Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM	CvA/R/Ir
			contamination (i.e. hydrocarbons), as contamination sources are generally unpredictable and often occur as incidental spills or leak for construction developments. The significance of soil contamination is medium-high for all identified soils, largely depending on the nature, volume and/or concentration of the contaminant of concern.							proposed development, and this should be implemented and made available, and accessible always to the contractors and construction crew conducting the works on site for reference A spill prevention and emergency spill response plan, as well as dust suppression, and fire prevention plans should also be compiled to guide the construction works Vehicles and Machinery will be regularly maintained. Maintenance programmes will be established and implemented. All refuelling of vehicles and equipment maintenance must be done within designated bunded areas. Spill and absorption kits must be available and readily accessible at the truck parking. There should always be a spare kit available at any given time. If necessary, the polluted soils will be remediated and affected areas rehabilitated. An emergency response contingency plan should be put in place to address clean-up measures should a spill and/or a leak occur, as well as preventative measures to prevent ingress Burying of any waste including rubble, domestic waste, empty containers on the site should be strictly prohibited and all construction rubble waste must be removed to an approved disposal site							
		Ecology (Fauna and Flora)	Impact on Floral Habitat and Diversity due to: 1. Clearance of floral species within the proposed footprint areas as well as nationally and provincially protected floral species; 2. Habitat fragmented and reduced dispersal opportunities for plant species as the disturbed / impacted areas will be less attractive to faunal species who are important mechanisms for seed dispersal; 3. Increase risk of erosion and poor stormwater management - resulting in loss of soils, the down-slope sedimentation of habitat and the consequent loss of habitat beyond the planned footprint; 4. AIP proliferation and woody encroachment into natural vegetation, displacing indigenous flora and altering favourable habitat conditions for the establishment of indigenous species. Probable Residual Impacts could occur due to 1. Fragmentation of ecologically intact habitat resulting in altered ecological functioning of habitat beyond the authorised projects, notably Project 2; 2. Potential further loss of and altered floral species diversity outside of the	-	-	-	-	-	-	Prior to any vegetation clearance activities taking place a walkdown of the footprint must be undertaken and all floral and faunal SCC encountered must be GPS marked and the necessary permits applied for with the relevant national and provincial departments. The site walk down is to be conducted prior to clearance activities and ideally post good rains between November and February when the smaller bulbous plants are growing and visible	-	-	-	-	-	-	R

Name of Activity			Potential Impacts	Rating Prior to Measures						Mitigation Type	Rating Post Measures					Significance	
Activities	Project	Impact Area	Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM	CvA/R/Ir
			footprint areas, including loss of favourable habitat for SCC if effects from AIP proliferation and the intensification of woody encroachment are not managed; and 3. Loss of NFA protected tree species as a result of vegetation clearing and/or potential harvesting in the region. Cumulative Impacts - A significant threat for the floral ecology associated with the five projects is the potential proliferation of AIP species and particularly a potential for indigenous bush encroachment, resulting in the overall loss of native floral communities within the local area.														
			Sekhukhune Mountain Bushveld - Project 3-5	N	-1	-2	-4	-4	-11	The construction footprint must be kept as small as possible to minimise impact on the surrounding environment (edge effect management) Removal of vegetation must be restricted to what is absolutely necessary and should remain within the approved footprint; In the establishment of fences, erect fences in such a manner as to limit the potential of animals to enter the project areas. This could involve the placement of rocks and materials at on the surface of the fences.	N	-1	-1	-2	-2	-6	
			Secondary Bushveld - Project 3-5	N	-1	-1	-2	-1	-5	As far as possible clearing of vegetation should take place in a phased manner moving away from fences and/or barriers. This will allow for any faunal species within the proposed footprints to flee and avoid harm; Smaller species such as scorpions and reptiles will not as readily able to move out of an area ahead of ground clearing. As such should any be observed in the construction site during clearing and construction activities, they are to be carefully and safely moved to an area of similar habitat outside of the disturbance footprint. Construction personnel are to be educated about these species and instructed not to kill them. Smaller scorpion species and harmless reptiles (that are likely present within the footprint areas) should be carefully relocated by a suitably nominated construction person. For larger venomous snakes, a suitably trained specialist, or on-site personnel, should be contacted to carry out the relocation of the species, should it not move off on its own Vehicles should be restricted to travelling only on designated roadways to limit the ecological footprint of the construction activities. Additional road construction should be limited to what is absolutely necessary, and the footprint thereof kept to a minimal No hunting or trapping of faunal species is to be allowed by construction personnel	N	-1	-1	-2	-1	-5	

Name of Activity	Project		Potential Impacts	Rating Prior to Measures						Mitigation Type	Rating Post Measures					Significance	
Activities	**Project**	**Impact Area**	**Potential Impacts**	**Status**	**Extent**	**Duration**	**Probability**	**Intensity**	**SbM**	**Mitigation Measures**	**Status**	Extent	Duration	Probability	Intensity	SaM	**CvA/R/Ir**
			Transformed Habitat	N	-1	-1	-2	-1	-5	Informal fires by construction personnel should be prohibited, and no uncontrolled fires whatsoever should be allowed	N	-1	-1	-2	-1	-5	
			Impact on Faunal Habitat and Diversity due to 1. Clearance of habitat leading to the displacement of faunal species; 2. Habitat fragmented and resulting in reduced movement of species and potentially reduced dispersal opportunities; 3. Increased risk of trapping / snaring and the potential collection for the pet / traditional medicine trade; and 4. AIP proliferation and woody encroachment into natural vegetation, displacing indigenous vegetation and altering favourable habitat conditions for faunal species. Probable Residual Impacts on fauna are considered to be: 1. Loss of / altered faunal species diversity in the footprint areas and the areas adjacent to the proposed projects; 2. Edge effects such as habitat fragmentation, AIP proliferation and bush encroachment limiting faunal species habitat utilisation; 3. Potential further loss of SCC/protected faunal species and suitable habitat for such species; and 4. It is unlikely that disturbed areas will be rehabilitated to an ecologically functioning state resulting in significant loss of habitat and species diversity, with reinstatement to premining levels being unlikely.	-	-	-	-	-	-	Care should be taken during the construction of the five proposed projects to limit edge effects to surrounding natural habitat. This can be achieved by: × Demarcating all footprint areas during construction activities; × No dumping of litter, rubble or cleared vegetation on site should be allowed. Rubble / waste should be disposed of at an appropriate registered dump site away from the development footprint. No temporary dump sites should be allowed in areas with natural vegetation. It is advised that waste disposal containers and bins be provided during the construction phase for all construction rubble and general waste; and × Manage the spread of AIP species as per the mines mine's AIP control plan.	-	-	-	-	-	-	CbA
			Sekhukhune Mountain Bushveld - Project 3-5	N	-1	-2	-4	-4	-11	Appropriate sanitary facilities must be provided during the construction of the development and must be removed to an appropriate waste disposal site If any spills occur, they should be immediately cleaned up to avoid soil contamination that can hinder floral rehabilitation later down the line. Spill kits should be kept on-site at all times. In the event of a breakdown, maintenance of vehicles must take place with care, and the recollection of spillage should be practised, preventing the ingress of hydrocarbons into the topsoil Upon completion of construction activities, it must be ensured that no bare areas remain, and that indigenous species be used to revegetate the disturbed area	N	-1	-1	-2	-2	-6	
			Secondary Bushveld - Project 3-5	N	-1	-1	-2	-1	-5	Edge effects arising from the proposed development, such as erosion and alien plant species proliferation, which may affect adjacent natural areas, need to be strictly managed. Specific mention in this regard is made of Category 1b AIP species (as listed in the NEMBA Alien species lists, 2020), in line with the NEMBA Alien and Invasive Species Regulations (2020);	N	-1	-1	-2	-1	-5	

Name of Activity	Project	Impact Area	Potential Impacts	Rating Prior to Measures						Mitigation Type	Rating Post Measures					Significance	
Activities			Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM	CvA/R/Ir
										The poaching and/or hunting of animals will be strictly forbidden.							
										AIP monitoring and clearing/control should take place throughout the construction phase of the development, and a 30 m buffer surrounding the proposed railway loop should be regularly checked for AIP proliferation and to prevent inward and or/outward spread of AIPs, notably into non infested areas outside of the proposed railway loop or into newly rehabilitated areas							
			Transformed Habitat	N	-1	-1	-2	-1	-5	Alien vegetation that is removed must not be allowed to lay on unprotected ground as seeds might disperse upon it. All cleared plant material to be disposed of at a licensed waste facility which complies with legal standards.	N	-1	-1	-2	-1	-5	
			Impact on Floral SCC - The proposed five projects are is associated with floral SCC, which will likely be directly impacted by the proposed activities. The SCC recorded on site (Sclerocarya birrea subsp. caffra) is protected under the NFA. Additionally, there is a an increased chance that several other NFA and LEMA listed floral SCC may occur within the footprint areas. The proposed 5 projects are not anticipated to have a high impact on floral SCC and with mitigation measures implemented the impacts can remain localised in extent. Succulents and geophytes are good candidates for rescue and relocation to suitable sites outside of the proposed footprints, either to surrounding natural habitat or to the Dwarsrivier nursery. Woody species are less likely to be successfully relocated, especially larger individuals. Where woody SCC species are to be cleared and not relocated, it must be ensured that the same species are currently being propagated in the nursery. If this is not the case, seeds can be harvested from the surrounding areas and / or from the individuals that will be cleared as part of vegetation clearing activities to be propagated off-site and reinstated as part of rehabilitation activities. Activities which are likely to negatively affect the flora of conservation concern within and around the proposed five projects include, but are not limited to, the following: 1. Disturbance, fragmentation and alteration of floral SCC habitat; 2. Destruction, removal or harvesting of floral SCC during construction and operational activities; and 3. Potentially poorly implemented and monitored rescue and relocation of SCC or not ensuring that the same species are being propagated in the Dwarsrivier nursery. Impact on CBAs, ESAs, Threatened Vegetation and	N	-1	-1	-1	-1	-4	Should any floral SCC be relocated, the relocation success of such species should be monitored during the construction phase to ensure immediate actions can be taken if it becomes evident that relocation is not successful.	N	-1	-1	-1	-1	-4	CbA

Name of Activity	Project	Impact Area	Potential Impacts	Rating Prior to Measures						Mitigation Type	Rating Post Measures					Significance	
Activities			Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM	CvA/R/Ir
			Protected Areas - According to the desktop database, the proposed five projects will impact on a CBA 1 and the Sekhukhune Mountainlands threatened ecosystem, however, following the site assessment this is more accurately only applicable to the RWD of Project 1 and the footprint areas of Project 2. The remaining areas associated with the TSF (Project 1) and Projects 3-5 have all been impacted on and are associated with the active mining footprint. According to the desktop database, a small portion of Project 4 will impact on an ESA however, this section of the ESA has been degraded in terms of habitat integrity and is located within the active mining area.														
			Impacts on Faunal SCC - The five proposed projects are associated with habitats that are known to host faunal SCC, notably the Sekhukhune Mountain Bushveld habitat. The remaining habitats may serve as intermediary or transitionary habitats for such species, but not permanent habitat. One SCC was recorded on site, namely Pycna sylvia (Cicada) whilst Python natalensis (African Python, VU) has also been recorded in the adjacent areas. Panthera pardus (Leopard, Vulnerable, TOPS Listed), Parahyaena brunnea (Brown hyaena, NT, TOPS Listed), Sagittarius serpentarius (Secretary bird, VU), Polemaetus bellicosus (Martial Eagle, VU) and Neotis denhami (Denham's Bustard, NT) are also considered to have a medium probability of occurring, however such occurrences are likely to be transitionary and not permanent, as the footprint areas are not sufficient in extent to permanently host these species nor are there sufficient food resources within the five proposed project footprint areas alone to support these species. Mammalian, avifaunal and some reptilian SCC are likely to maintain large home ranges that will far exceed the extent of the five proposed project footprint areas. Due to the small project footprint extents and ability of many of the SCC to relocate ahead of construction activities, impacts stemming from the proposed projects are not expected to pose a significant risk to these species.	N	-1	-1	-1	-1	-4	Edge effect control needs to be implemented to prevent further degradation and potential loss of floral and faunal SCC outside of the five proposed project footprint areas	N	-1	-1	-1	-1	-4	CbA
			Habitat degradation due to dust: Increased dust will occur in all areas where vegetation is cleared. Dust will be caused by excavation, and construction. Dust in the area will be greatly increased due to the dry weather conditions and the nature of the soil in the area. Dust settling on plant material can reduce the amount of light reaching the chlorophyll in the leaves, thereby reducing	N	-2	-2	-2	-2	-8	Maintain the current air quality monitoring stations that determine fallout and implemented respirable dust (PM10) monitoring that could arise from the mining activities. Dust suppression should be undertaken where and when dust is present.	N	-1	-1	-2	-1	-5	CbA

Name of Activity			Potential Impacts	Rating Prior to Measures						Mitigation Type	Rating Post Measures					Significance	
Activities	**Project**	**Impact Area**	**Potential Impacts**	**Status**	**Extent**	**Duration**	**Probability**	**Intensity**	**SbM**	**Mitigation Measures**	**Status**	Extent	Duration	Probability	Intensity	SaM	**CvA/R/Ir**
			photosynthesis, which in turn reduces plant productivity, growth and recruitment.														
			Direct Impact: Increased erosion can eventually lead to the loss of vegetation and habitats for further species. Soils in the area are prone to erosion in areas where vegetation is cleared, this is further compounded by the fact that precipitation in the area occurs through heavy rainfall events in in the form of thundershowers in summer. Furthermore large areas will be cleared before construction leaving these areas prone to erosion.	N	-3	-3	-5	-5	-16	Ensure the required erosion protection measures are monitored and corrected where necessary. Storm water management plan should be implemented prior to construction to ensure that runoff does not lead to the formation of erosion gulleys. Where vegetation cannot be established during the life of construction and operations, appropriate measure will be taken to control erosion. These will include grading of surfaces to prevent rapid run-off of storm water and / or the use of energy dissipaters. An erosion monitoring and mitigation plan should be put in place.	N	-1	-1	-2	-2	-6	CbA
			Accidental death of animals on the roads.	N	-2	-3	-2	-5	-12	Clearly marked signs will be erected along the transportation routes to create awareness of animal crossings. A clearly marked and enforced vehicle speed will be implemented on the internal mine and transportation routes. A detailed induction programme will be in place to ensure that all parties are aware of the rules and regulations on site in terms of the use of roads. Vehicles may only travel on demarcated roads on site.	N	-1	-3	-1	-3	-1	CbA
		3, 4, 5	Operation of the parking areas and access roads: •Potential contamination of stormwater runoff from hard surfaces by hydrocarbons from vehicles, leading to potential contamination of surface water, groundwater and soil; •Increased volume of stormwater runoff entering the episodic drainage line as a result of increased catchment hardening.	N	-1	-1	-2	-2	-6	As this is an expansion of an existing parking facility, additional risk posed is considered insignificant. General ‘best practice’ mitigation measures are recommended. Development of an Emergency Response Plan prior to construction to provide a protocol in the event of a spill Retention of as much natural vegetation as possible around the sites to provide stormwater and sediment trapping capacity As the soil in the area is susceptible to erosion, it is strongly recommended that regular monitoring for erosion takes place. Should any preferential flow paths or erosion gullies form, these must be immediately managed in accordance with the mine’s existing soil management protocols.	N	-1	-1	-1	-2	-5	CbA
		Hydrology	Contamination of surface water resources.	N	-2	-2	-2	-2	-8	Machinery, trucks and vehicles must be well maintained and serviced regularly as per the recommended service guide. Refuelling must be undertaken over hard park bunded areas that adequately capture and contain spillages. Machinery and vehicles should be parked on appropriately lined areas. Drip trays must be used under leaking machinery. Spillages should be reported immediately and spill kits should be readily available at all times.	N	-1	-2	-1	-1	-5	CbA

Name of Activity			Potential Impacts	Rating Prior to Measures						Mitigation Type	Rating Post Measures					Significance	
Activities	Project	Impact Area	Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM	CvA/R/Ir
										Ongoing water, biomonitoring and groundwater monitoring should be undertaken. Implement and maintain the approved Storm Water Management Plan as defined in the EMPr, or as subsequently been approved.							
		Geohydrology	No further impacts are foreseen.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Air Quality	The use of unsurfaced roads may lead to an increase of dust emissions in the area.	N	-2	-1	-3	-3	-9	Install air quality monitoring stations that determine fallout and respirable dust (PM10) concentrations that could arise from the mining activities. Dust suppression should be undertaken if required [(i.e. on recommendation by the Environmental Control Officer and/or if indicated in the monitoring reports, that the current dust fall out results are increasing towards unacceptable levels (non-compliances)]. Roads around office areas will be paved as far as practically possible. During operational phase of the mine, haulage roads will be treated with dust suppression techniques such as wet to reduce dust creation.	N	-1	-1	-2	-2	-2	CbA
		Heritage	No further impacts are foreseen.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Noise	Noise of vehicles traversing the access roads will create a constant source of noise. It is however not foreseen that the roads proposed would contribute to any additional noise levels in the area.	N	-1	-4	-1	-1	-7	Machinery and vehicles will be well maintained to prevent excessive nose and to comply with national and provincial regulations. All vehicles will have muffles to minimise noise emissions, where necessary. Where noise becomes a nuisance nose management measures will be investigated and implemented to address these concerns. Noise monitoring will be undertaken (ambient conditions) to ensure that noise levels comply with Health and Safety Standards.	N	-1	-1	-1	-1	-4	CbA
		Visual	The presence and use of heavy machinery, trucks and vehicles during the operational phase.	N	-2	-3	-2	-2	-9	Machinery, trucks and vehicles are already present in the area and are unlikely create any additional significant presence. Trees should be planted along the main roads to conceal activities from motorists. Dust suppression measures should be implemented to limit the generation of dust.	N	-1	-1	-2	-1	-5	CbA
		Social	There is approximately 1200 permanent and 800 contractor employees in service at Dwarsrivier Mine. This employment profile will be sustained as the proposed project would allow the operation to meet the existing production capacity. Approximately 24 employees will be directly involved with the operations related to the TSF. No new employment positions will be created as these employees are already employed at Dwarsrivier Mine.	P	2	2	3	3	10	The procurement of locals should receive preference if there is any need for additional employees. The ideal objective should be to reach 100% recruitment of additional/ new unskilled labour from local communities where skills are locally available.	P	3	2	3	3	11	CbA

Name of Activity	Project	Impact Area	Potential Impacts	Rating Prior to Measures						Mitigation Type	Rating Post Measures					Significance	
Activities	Project	Impact Area	Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM	CvA/R/Ir
			However, the existing socio-economic benefits created through Dwarsrivier Mine being a key employer in the area would continue. The social services support as part of the SLP requirements will also continue to be implemented. As no additional workers are anticipated, the inflow of jobseekers is also anticipated to be of limited significance.														
			Existing employees would continue to be responsible for the overall mining activities. Limited additional temporary workers could over time be required for specific tasks associated with the proposed Khulu TSF and capital projects. When that occurs, new mining activities can then be allocated to appointed specialist contractors. Even if limited procurement is foreseen, this variable is still regarded as positive, due to the indirect impacts of Dwarsrivier Mine's mining activity on the local economy through the creation of possible business opportunities (e.g. local service industry) and local procurement of material, services and equipment.	P	2	2	3	3	10	Targets for the procurement of capital goods, consumer goods and services should be set and Dwarsrivier Mine should develop an action plan to meet these targets. Contract executions by SMMEs should be strictly monitored to determine whether SMMEs require assistance with regards to general business principles, financial management, management of stock, competitive costing (pricing), and marketing of their businesses. Enterprise development is a key enhancement measure in this regard. The proponent should assist small businesses and/or SMME's to develop to a certain level. Such measures recommended could include the following: The establishment of joint ventures between small businesses and established companies with relevant experiences with regards to tender processes can be considered; Flexible payment systems can be considered to assist smaller businesses in terms of expenditure, but such a system must be strictly controlled, An audit of existing local enterprises that could provide services, goods and material should be undertaken with the assistance of local leaders and community representatives, as well as local business structures; and The procurement process should be based on competitive business principles and the quality of services to be rendered, to ensure adherence to standards and to maximise overall welfare.	P	3	2	3	3	11	CbA
			Socio-Economic Development - The socio-economic impact of the proposed projects would be based on the mine's continued contribution to the Gross Geographical Product (GGP) and the number of direct (continued employment at the mine) and indirect jobs that would be created. Therefore, except for ongoing direct employment, that would generate income and increase local spending, people living in the vicinity of the study area is also expected to benefit by the earnings of those employed by the mine and the local buying power in the area. Through employment and income generation during the mining processes, some economic benefits to the region	P	3	2	3	3	11	Dwarsrivier Mine, through their SLP, must continue to provide skills development opportunities for employees that include functional literacy and numeracy programmes, career progression plans, up-skilling for hard to fill vacancies and management positions, bursary and internships and portable skills training. Develop a database of SMME's for the procurement of goods and services that could potentially be outsourced to the local community. Dwarsrivier Mine to continue to adhere to the Social and Labour Plans (SLP) as per the Regulation 46 of the MPRDA and the Mining Charter (2018).	P	3	2	3	4	12	CbA

Name of Activity			Potential Impacts	Rating Prior to Measures						Mitigation Type	Rating Post Measures					Significance	
Activities	Project	Impact Area	Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM	CvA/R/Ir
			and local communities therefore accrue. The mine would continue to contribute to the local economy through its employee wages, procurement of local contractors and services, purchasing of water and electricity and through payment of taxes to the Fetakgomo Tubatse Local Municipality. Dwarsrivier Mine, through their mining activities, is involved in various Local Economic Development Initiatives linked to the Integrated Development Plan (IDP) of the Fetakgomo Tubatse Local Municipality, as well as other government initiatives. These activities would thus continue, and the constant positive socio-economic impacts thereof would remain to benefit of the local communities.															
			Capacity Building - Although education and training are mainly the responsibility of government, there is increased pressure on the business sector in South Africa to increase the development and skills of their workforce. Dwarsrivier Mine is involved in capacity building and training. Further to these focus areas, the company also concentrate on local employment creation and poverty alleviation, as well as environmental management, rural development and the provision of infrastructure. The above-mentioned inputs would continue if Dwarsrivier Mine is successful in sustaining their mining operations in the area. Dwarsrivier Mine has thus played an important role in the area in this regard and commits to continue with these efforts which would benefit the local communities within the Fetakgomo Tubatse Local Municipality area.	P	3	2	3	3	11	Dwarsrivier Mine should continue with a Human Resources Development (HRD) strategy as part of the SLP. The focus should remain of career development programmes, bursaries, learnership programmes, skills development and training. Learnership programmes should preferably focus on individuals from the core and affected areas in close proximity to Dwarsrivier Mine to maximise the long-term employment opportunities of these local community members. Local goods and services should be used as far as possible and therefore contractual requirements for contractors to use local goods and services should be implemented as far as possible Local Economic Development initiatives should continue	P	3	2	3	4	12	CbA
			Safety and Security Related Impacts - Construction of the access crossing between the plant and North Mine, as well as the widening of the access road between the South Shaft/Main Offices and Plant would reduce these risks and create a positive impact in this regard. The negative impact prior to mitigation can thus be changed to a medium positive impact.	N	-2	-2	-2	-2	-8	A Fire/Emergency Management Plan should be developed and implemented, if not yet in place. It would be important to regularly review the functionality and efficiency of such a plan in conjunction with the local emergency teams, mine management and affected communities as well as neighbouring landowners. Appropriate firefighting equipment should be on site and workers should be appropriately trained for firefighting Warning signs would have to be posted to alert residents and road users to possible dangers associated with mining related traffic and activities. Access to the mine via the new parking extension should consider all safety and security measures and have as little impact on the traffic on the R577 as possible	N	-2	-2	-2	-2	-8	CbA

Name of Activity	Project	Impact Area	Potential Impacts	Rating Prior to Measures						Mitigation Type	Rating Post Measures					Significance	
Activities	Project	Impact Area	Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM	CvA/R/Ir
			Health Related Risks - During the operational phase dust impacts are anticipated due to general mining activities and vehicles travelling on the access and haul roads. The dust concentrations as a result of this movement are not anticipated to reach residential areas and the impact would possibly be localised on site. Fugitive dust from stockpile areas and waste rock dumps are also of concern. Windblown dust from these facilities will vary according to the season, with possible higher levels and frequency during the windy months. The probability and intensity of these possible impacts would further depend on the wind directions and the proximity of sensitive receptors. The nearest residential area is approximately 10 km to the north and east of the mining area. Should there be a possible increase in the air pollution (dust), these sensitivities should be adequately dealt with and be taken into account in the monitoring processes stipulated as part of the EMPr. In the event that sensitive receptors are affected (worst case scenario), based on dust fallout rates, the necessary mitigation measures as stipulated through the Air Quality specialist study must be implemented. The rating below is based on the general air quality impacts usually experienced with mining projects and the proximity of sensitive receptors in the study area. Emissions would include vehicle emissions (carbon monoxide and nitrogen oxide) and emissions from large construction equipment. Industrial, solid and hazardous waste would be created during the mining operations. As is currently the case, these different types of waste should continue to be responsibly disposed of to avoid any health-related impacts in this regard. Storing of diesel and emulsion can create health related risks. As mitigation, the emulsion will be stored in underground tankers. The majority of the pipelines will further be underground to limit risks in this regard and possible spills. In mining areas there are further concerns relating to migrant employees bringing health risks, and nowadays the threat of Covid-19 infection, to mining areas or small towns. The Fetakgomo Tubatse Local Municipality area is	N	-2	-2	-3	-3	-10	The Mine Health and Safety Act (Act No 29 of 1996), standards stipulated in SANS 10286, NEMA and related regulations and standards must be adhered to. Vehicles and equipment must be in good working order and must be regularly serviced. Infrastructure e.g. pipelines must be regularly inspected and maintained to avoid spillages. Mining activities should adhere to all the relevant environmental and health guidelines and should be undertaken in accordance with the EMP Dust suppression methods along haul roads should be continued to be implemented Dwarsrivier Mine must continue to distribute information with regards to health matters and nutrition to its workers and surrounding communities The SLP should make provision for addressing any possible direct health related risks and providing a supporting role to minimise the vulnerabilities of the communities, without having to take over the role of the local health services and municipality. On site, all the appropriate health, hygiene and distancing measures aimed at protecting the employees' safety and health, must be implemented. Dwarsrivier Mine can investigate ways to support to the local clinics through their community support programmes and SLP initiatives. Educational videos on Covid-19, and general health and hygiene measures associated with the pandemic should be provided to employees	N	-2	-2	-2	-2	-8	CbA

Name of Activity	Project		Potential Impacts	Rating Prior to Measures						Mitigation Type	Rating Post Measures					Significance	
Activities		Impact Area	Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM	CvA/R/Ir
			already characterised by vulnerable households and inadequate public health services that cannot always effectively deal with the health risks associated with the pandemic. It will remain the responsibility of Dwarsrivier Mine to continue their support to their employees and surrounding communities to reduce vulnerability and to implement the required Covid-19 Protocol.														
Diesel Storage and Underground Supply	3	Geology	No direct impact.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Topography	No direct impact.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Soils and Land Capability	Soil compaction outside of demarcated areas.	N	-2	-3	-4	-2	-11	The mine will ensure that all activities, material and equipment storage and personnel movement take place within the designated area. A site plan must be developed, indicating the following: Location of all approved activities; 1:100 year buffer around all watercourses; Location of the CBA and Endangered Ecosystems and mark these areas where construction is not approved as a no-go zone's All vegetation management zones as per the Biodiversity Action Plan. Laydown areas should be located within disturbed soils (anthrosols) to avoid compaction of natural soils. All contractors must receive induction. The induction should be updated on site, to make provision for the site plan and a detailed explanation on the purpose of the no-go zones, presence of protected species, presence of the CBA and ESAs and the meeting thereof. The management of topsoil stockpiles should be undertaken in terms of the Topsoil Management Plan included into this EMPr to ensure that the topsoil stockpiles maintain its integrity and are not subjected to compaction. Restrict the amount of mechanical handling, as each handling event increases that compaction level and the changes to the soil structure. Wherever possible, the 'cut and cover' technique (where the stripped soils is immediately placed in an area already prepared for rehabilitation, thus avoiding stockpiling) should be used. A fine system/disciplinary system must be implemented on site for all significant or recurring environmental non-compliances. Compacted soils adjacent to the mining blocks and associated infrastructure footprint can be lightly ripped to at least 25cm below ground surface to alleviate compaction prior to re-vegetation. Site clearance and activities should be restricted to the approved footprint. Contractors areas should be established on already disturbed footprints.	N	-1	-1	-2	-1	-5	R

Name of Activity			Potential Impacts	Rating Prior to Measures						Mitigation Type	Rating Post Measures					Significance	
Activities	Project	Impact Area	Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM	CvA/R/Ir
										All vehicular traffic should be restricted to the existing service roads and the selected road servitude as far as practically possible							
			Clearing vegetation beyond the demarcated areas will result in the exposure of soil, which may in turn lead to soil erosion, in addition to this, stockpiling of topsoil material on sloping areas leading to increased runoff and erosion. The areas where the infrastructure is proposed are mostly gradual, however the exploration activities will be located among the mountainous setting and this is where erosion is considered moderately high. The natural and undisturbed soils will become more vulnerable to erosion once the vegetation is cleared for construction activities, and the soils will inevitably be exposed to wind and some surface runoff during intensive rainfall events. The ratings given in the columns on the left is for Project 1 , Project 2 and Project 3-5.	N	-2	-3	-3	-2	-10	The approved Storm Water Management Plan must be implemented. Clean and dirty water systems must be maintained. Ensure the required erosion protection measures are monitored and corrected where necessary. Bare soils can be regularly dampened with water to suppress dust during the construction phase, especially when strong wind conditions are predicted according to the local weather forecast All disturbed areas adjacent to the footprint areas can be re-vegetated with an indigenous grass mix, if necessary, to re-establish a protective cover, to minimise soil erosion and dust emission. Natural vegetation establishment (self-succession) will be encouraged on cleared areas, and topsoil stockpiles. If natural succession of vegetation is not established within one rainy season, after rehabilitation, the disturbed areas and areas adjacent to the infrastructural areas must be re-vegetated with an indigenous grass mix, if necessary, to re-establish a protective cover, to minimise soil erosion and dust emission. The mine will investigate an appropriate seed mix for the rehabilitation purposes should self-succession not establish on rehabilitated sites. If possible, vegetation clearance and commencement of construction activities can be scheduled to coincide with low rainfall conditions when the erosive stormwater and wind are anticipated to be low. The approved areas should be clearly demarcated to restrict vegetation clearing activities within the infrastructure footprint as far as practically possible. No project related activities may be undertaken outside of the demarcated areas. No open fires must be allowed.	N	-1	-1	-2	-1	-5	R
			Potential of Soil Contamination - All the identified soils are considered equally predisposed to potential contamination (i.e. hydrocarbons), as contamination sources are generally unpredictable and often occur as incidental spills or leak for construction developments. The significance of soil contamination is medium-high for all identified soils,	N	-2	-3	-3	-2	-10	Contamination prevention measures should be addressed in the EMPr for the proposed projects, and this should be implemented and made available, and accessible always to the contractors and construction crew conducting the works on site for reference Storage of fuels and oils, the refuelling of vehicles and equipment maintenance must be limited to designated,	N	-1	-1	-2	-1	-5	R

Name of Activity	Project		Potential Impacts	Rating Prior to Measures						Mitigation Type	Rating Post Measures					Significance	
Activities	Project	Impact Area	Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM	CvA/R/Ir
			largely depending on the nature, volume and/or concentration of the contaminant of concern. The ratings given in the columns on the left is for Project 1 , Project 2 and Project 3-5.							bunded (bunds to be 110% of volume of the materials stored) areas.							
										All fuels and soils must be stored in appropriate containers and bunded areas.							
										A spill prevention and emergency spill response plan, as well as dust suppression, and fire prevention plans should also be compiled to guide the construction works							
										Chemicals and hazardous material must be stored in suitable containers, fit for purpose and in line with SDS requirements.							
										Oils and potentially hazardous materials must be disposed of at a licensed facility and waste certificates obtained.							
										Vehicles and Machinery will be regularly maintained. Maintenance programmes will be established and implemented.							
										Safety signage must be used at designated storage areas.							
										All refuelling of vehicles and equipment maintenance must be done within designated bunded areas.							
										Spill and absorption kits must be available and readily accessible at the parking extension. There should always be a spare kit available at any given time.							
										If necessary, the polluted soils will be remediated and affected areas rehabilitated.							
										An emergency response contingency plan should be put in place to address clean-up measures should a spill and/or a leak occur, as well as preventative measures to prevent ingress							
										If a spill occurs, the contaminated soil must be removed immediately. Contaminated soil must be stored according to best practices until it can be disposed of at a suitably licensed facility.							
										Any significant spills must be captured in the incident reports and must be reported to the relevant department (LEDET, Catchment Management Agency/DWS).							
										At least weekly inspections should be undertaken around the diesel bunded areas and supply pipelines.							
										Burying of any waste including rubble, domestic waste, empty containers on the site should be strictly prohibited and all construction rubble waste must be removed to an approved disposal site.							
		Ecology (Fauna and Flora)	Impact on Floral Habitat and Diversity due to: 1. Clearance of floral species within the proposed footprint areas as well as nationally and provincially protected floral species; 2. Habitat fragmented and reduced dispersal opportunities for plant species as the disturbed / impacted areas will be less attractive to faunal	-	-	-	-	-	-	Prior to any vegetation clearance activities taking place a walkdown of the footprint must be undertaken and all floral and faunal SCC encountered must be GPS marked and the necessary permits applied for with the relevant national and provincial departments. The site walk down is to be conducted prior to clearance activities and ideally post good	-	-	-	-	-	-	R

Name of Activity	Project		Potential Impacts	Rating Prior to Measures						Mitigation Type	Rating Post Measures					Significance	
Activities	Project	Impact Area	Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM	CvA/R/Ir
			species who are important mechanisms for seed dispersal; 3. Increase risk of erosion and poor stormwater management - resulting in loss of soils, the down-slope sedimentation of habitat and the consequent loss of habitat beyond the planned footprint; 4. AIP proliferation and woody encroachment into natural vegetation, displacing indigenous flora and altering favourable habitat conditions for the establishment of indigenous species. Probable Residual Impacts could occur due to 1. Fragmentation of ecologically intact habitat resulting in altered ecological functioning of habitat beyond the authorised projects, notably Project 2; 2. Potential further loss of and altered floral species diversity outside of the footprint areas, including loss of favourable habitat for SCC if effects from AIP proliferation and the intensification of woody encroachment are not managed; and 3. Loss of NFA protected tree species as a result of vegetation clearing and/or potential harvesting in the region. Cumulative Impacts - A significant threat for the floral ecology associated with the five projects is the potential proliferation of AIP species and particularly a potential for indigenous bush encroachment, resulting in the overall loss of native floral communities within the local area.							rains between November and February when the smaller bulbous plants are growing and visible.							
			Sekhukhune Mountain Bushveld - Project 2	N	-2	-2	-4	-4	-12	The construction footprint must be kept as small as possible to minimise impact on the surrounding environment (edge effect management). Removal of vegetation must be restricted to what is absolutely necessary and should remain within the approved footprint. In the establishment of fences, erect fences in such a manner as to limit the potential of animals to enter the project areas. This could involve the placement of rocks and materials at on the surface of the fences. As far as possible clearing of vegetation should take place in a phased manner moving away from fences and/or barriers. This will allow for any faunal species within the proposed footprints to flee and avoid harm. Smaller species such as scorpions and reptiles will not as readily able to move out of an area ahead of ground clearing. As such should any be observed in the construction site during clearing and construction activities, they are to be carefully and safely moved to an area of similar habitat outside of the disturbance footprint. Construction	N	-1	-1	-2	-2	-6	

Name of Activity			Potential Impacts	Rating Prior to Measures						Mitigation Type	Rating Post Measures					Significance	
Activities	Project	Impact Area	Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM	CvA/R/Ir
										personnel are to be educated about these species and instructed not to kill them. Smaller scorpion species and harmless reptiles (that are likely present within the footprint areas) should be carefully relocated by a suitably nominated construction person. For larger venomous snakes, a suitably trained specialist, or on-site personnel, should be contacted to carry out the relocation of the species, should it not move off on its own.							
			Secondary Bushveld - Project 2	N	-1	-2	-4	-4	-11	Vehicles should be restricted to travelling only on designated roadways to limit the ecological footprint of the construction activities. Additional road construction should be limited to what is absolutely necessary, and the footprint thereof kept to a minimum. No hunting or trapping of faunal species is to be allowed by construction personnel.	N	-1	-1	-2	-2	-6	
			Transformed Habitat	N	-1	-1	-2	-1	-5	Informal fires by construction personnel should be prohibited, and no uncontrolled fires whatsoever should be allowed.	N	-1	-1	-2	-1	-5	
			Impact on Faunal Habitat and Diversity due to 1. Clearance of habitat leading to the displacement of faunal species; 2. Habitat fragmented and resulting in reduced movement of species and potentially reduced dispersal opportunities; 3. Increased risk of trapping / snaring and the potential collection for the pet / traditional medicine trade; and 4. AIP proliferation and woody encroachment into natural vegetation, displacing indigenous vegetation and altering favourable habitat conditions for faunal species. Probable Residual Impacts on fauna are considered to be: 1. Loss of / altered faunal species diversity in the footprint areas and the areas adjacent to the proposed projects; 2. Edge effects such as habitat fragmentation, AIP proliferation and bush encroachment limiting faunal species habitat utilisation; 3. Potential further loss of SCC/protected faunal species and suitable habitat for such species; and 4. It is unlikely that disturbed areas will be rehabilitated to an ecologically functioning state resulting in significant loss of habitat and species diversity, with reinstatement to premining levels being unlikely.	-	-	-	-	-	-	Care should be taken during the construction of the five proposed projects to limit edge effects to surrounding natural habitat. This can be achieved by: × Demarcating all footprint areas during construction activities; × No dumping of litter, rubble or cleared vegetation on site should be allowed. Rubble / waste should be disposed of at an appropriate registered dump site away from the development footprint. No temporary dump sites should be allowed in areas with natural vegetation. It is advised that waste disposal containers and bins be provided during the construction phase for all construction rubble and general waste; and × Manage the spread of AIP species as per the mines mine's AIP control plan. A fire management plan must be maintained for the mine. Fire belts must be constructed around the boundaries of the mine. Daily fire danger ratings must be viewed and addressed where required. The mine must have equipment, protecting clothing and trained personnel for extinguishing fires. No open fires must be allowed.	-	-	-	-	-	-	CbA
			Sekhukhune Mountain Bushveld - Project 2	N	-2	-2	-4	-4	-12	Appropriate sanitary facilities must be provided during the construction of the development and must be removed to an appropriate waste disposal site. If any spills occur, they should be immediately cleaned up to avoid soil contamination that can hinder floral rehabilitation later down the line. Spill kits should be kept on-site at all	N	-1	-1	-2	-2	-6	

Name of Activity	**Project**		**Potential Impacts**	**Rating Prior to Measures**						**Mitigation Type**	**Rating Post Measures**					**Significance**	
Activities	**Project**	**Impact Area**	**Potential Impacts**	**Status**	**Extent**	**Duration**	**Probability**	**Intensity**	**SbM**	**Mitigation Measures**	**Status**	Extent	Duration	Probability	Intensity	SaM	**CvA/R/Ir**
										times. In the event of a breakdown, maintenance of vehicles must take place with care, and the recollection of spillage should be practised, preventing the ingress of hydrocarbons into the topsoil. Upon completion of construction activities, it must be ensured that no bare areas remain, and that indigenous species be used to revegetate the disturbed area.							
			Secondary Bushveld - Project 2	N	-1	-2	-4	-4	-11	Edge effects arising from the proposed development, such as erosion and alien plant species proliferation, which may affect adjacent natural areas, need to be strictly managed. Specific mention in this regard is made of Category 1b AIP species (as listed in the NEMBA Alien species lists, 2020), in line with the NEMBA Alien and Invasive Species Regulations (2020). The poaching and/or hunting of animals will be strictly forbidden. AIP monitoring and clearing/control should take place throughout the construction phase of the development, and a 30 m buffer surrounding the proposed railway loop should be regularly checked for AIP proliferation and to prevent inward and or/outward spread of AIPs, notably into non infested areas outside of the proposed railway loop or into newly rehabilitated areas	N	-1	-1	-2	-2	-6	
			Transformed Habitat	N	-1	-1	-2	-1	-5	Alien vegetation that is removed must not be allowed to lay on unprotected ground as seeds might disperse upon it. All cleared plant material to be disposed of at a licensed waste facility which complies with legal standards.	N	-1	-1	-2	-1	-5	
			Impact on Floral SCC - The proposed five projects are is associated with floral SCC, which will likely be directly impacted by the proposed activities. The SCC recorded on site (Sclerocarya birrea subsp. caffra) is protected under the NFA. Additionally, there is a an increased chance that several other NFA and LEMA listed floral SCC may occur within the footprint areas. The proposed 5 projects are not anticipated to have a high impact on floral SCC and with mitigation measures implemented the impacts can remain localised in extent. Succulents and geophytes are good candidates for rescue and relocation to suitable sites outside of the proposed footprints, either to surrounding natural habitat or to the Dwarsrivier nursery. Woody species are less likely to be successfully relocated, especially larger individuals. Where woody SCC species are to be cleared and not relocated, it must be ensured that the same species are currently being propagated in the nursery. If this is not the case, seeds can be harvested from the surrounding	N	-1	-2	-4	-4	-11	Should any floral SCC be relocated, the relocation success of such species should be monitored during the construction phase to ensure immediate actions can be taken if it becomes evident that relocation is not successful.	N	-1	-1	-1	-2	-5	CbA

Name of Activity	**Project**	**Impact Area**	**Potential Impacts**	**Rating Prior to Measures**						**Mitigation Type**	**Rating Post Measures**					**Significance**	
Activities			**Potential Impacts**	**Status**	**Extent**	**Duration**	**Probability**	**Intensity**	**SbM**	**Mitigation Measures**	**Status**	Extent	Duration	Probability	Intensity	SaM	**CvA/R/Ir**
			areas and / or from the individuals that will be cleared as part of vegetation clearing activities to be propagated off-site and reinstated as part of rehabilitation activities. Activities which are likely to negatively affect the flora of conservation concern within and around the proposed five projects include, but are not limited to, the following: 1. Disturbance, fragmentation and alteration of floral SCC habitat; 2. Destruction, removal or harvesting of floral SCC during construction and operational activities; and 3. Potentially poorly implemented and monitored rescue and relocation of SCC or not ensuring that the same species are being propagated in the Dwarsrivier nursery. Impact on CBAs, ESAs, Threatened Vegetation and Protected Areas - According to the desktop database, the proposed five projects will impact on a CBA 1 and the Sekhukhune Mountainlands threatened ecosystem, however, following the site assessment this is more accurately only applicable to the RWD of Project 1 and the footprint areas of Project 2. The remaining areas associated with the TSF (Project 1) and Projects 3-5 have all been impacted on and are associated with the active mining footprint. According to the desktop database, a small portion of Project 4 will impact on an ESA however, this section of the ESA has been degraded in terms of habitat integrity and is located within the active mining area.															
			Impacts on Faunal SCC - The five proposed projects are associated with habitats that are known to host faunal SCC, notably the Sekhukhune Mountain Bushveld habitat. The remaining habitats may serve as intermediary or transitionary habitats for such species, but not permanent habitat. One SCC was recorded on site, namely Pycna sylvia (Cicada) whilst Python natalensis (African Python, VU) has also been recorded in the adjacent areas. Panthera pardus (Leopard, Vulnerable, TOPS Listed), Parahyaena brunnea (Brown hyaena, NT, TOPS Listed), Sagittarius serpentarius (Secretary bird, VU), Polemaetus bellicosus (Martial Eagle, VU) and Neotis denhami (Denham's Bustard, NT) are also considered to have a medium probability of occurring, however such occurrences are likely to be transitionary and not permanent, as the footprint areas are not sufficient in extent to permanently host these species nor are there sufficient food resources within the five proposed project footprint areas alone to	N	-1	-2	-4	-4	-11	Edge effect control needs to be implemented to prevent further degradation and potential loss of floral and faunal SCC outside of the five proposed project footprint areas	N	-1	-1	-1	-2	-5	CbA

Name of Activity	Project	Impact Area	Potential Impacts	Rating Prior to Measures						Mitigation Type	Rating Post Measures					Significance	
Activities			Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM	CvA/R/Ir
			support these species. Mammalian, avifaunal and some reptilian SCC are likely to maintain large home ranges that will far exceed the extent of the five proposed project footprint areas. Due to the small project footprint extents and ability of many of the SCC to relocate ahead of construction activities, impacts stemming from the proposed projects are not expected to pose a significant risk to these species.														
			Habitat degradation due to dust: Increased dust will occur in all areas where vegetation is cleared. Dust will be caused by excavation, and construction. Dust in the area will be greatly increased due to the dry weather conditions and the nature of the soil in the area. Dust settling on plant material can reduce the amount of light reaching the chlorophyll in the leaves, thereby reducing photosynthesis, which in turn reduces plant productivity, growth and recruitment.	N	-2	-2	-2	-2	-8	Maintain the current air quality monitoring stations that determine fallout and implemented respirable dust (PM10) monitoring that could arise from the mining activities. Dust suppression should be undertaken where and when dust is present.	N	-1	-1	-2	-1	-5	CbA
			Direct Impact: Increased erosion can eventually lead to the loss of vegetation and habitats for further species. Soils in the area are prone to erosion in areas where vegetation is cleared, this is further compounded by the fact that precipitation in the area occurs through heavy rainfall events in in the form of thundershowers in summer. Furthermore large areas will be cleared before construction leaving these areas prone to erosion.	N	-3	-3	-5	-5	-16	Ensure the required erosion protection measures are monitored and corrected where necessary. Storm water management plan should be implemented prior to construction to ensure that runoff does not lead to the formation of erosion gulleys. Where vegetation cannot be established during the life of construction and operations, appropriate measure will be taken to control erosion. These will include grading of surfaces to prevent rapid run-off of storm water and / or the use of energy dissipaters. An erosion monitoring and mitigation plan should be put in place.	N	-1	-1	-2	-2	-6	CbA
			Accidental death of animals on the roads.	N	-2	-3	-2	-5	-12	Clearly marked signs will be erected along the transportation routes to create awareness of animal crossings. A clearly marked and enforced vehicle speed will be implemented on the internal mine and transportation routes. A detailed induction programme will be in place to ensure that all parties are aware of the rules and regulations on site in terms of the use of roads. Vehicles may only travel on demarcated roads on site.	N	-1	-3	-1	-3	-1	CbA
		Freshwater Ecosystems	Diesel and Emulsion Batching Areas: Operation of the diesel and emulsion batching areas: •Potential contamination of stormwater runoff from hard surfaces by hydrocarbons from vehicles, leading to potential contamination of surface water, groundwater and soil; •Increased volume of stormwater runoff entering the ephemeral drainage lines as a result of increased	N	-1	-2	-1	-2	-6	Development of an Emergency Response Plan prior to construction to provide a protocol in the event of a spill Retention of as much natural vegetation as possible around the sites to provide stormwater and sediment trapping capacity As the soil in the area is susceptible to erosion, it is strongly recommended that regular monitoring for erosion takes place. Should any preferential flow paths or erosion gullies	N	-1	-1	-1	-2	-5	CbA

Name of Activity	Project		Potential Impacts	Rating Prior to Measures						Mitigation Type	Rating Post Measures					Significance	
Activities	**Project**	**Impact Area**	**Potential Impacts**	**Status**	**Extent**	**Duration**	**Probability**	**Intensity**	**SbM**	**Mitigation Measures**	**Status**	Extent	Duration	Probability	Intensity	SaM	**CvA/R/Ir**
			catchment hardening. As the fuel batching sites are situated more than 200 m from watercourses, the risk posed is considered minimal. Nevertheless general 'best practice' mitigation measures are recommended.							form, these must be immediately managed in accordance with the mine's existing soil management protocols.							
		Hydrology	Contamination of surface water resources due to potential hydrocarbon spillages washed into drainage lines and depressions	N	-2	-3	-2	-3	-10	Ongoing water, biomonitoring and groundwater monitoring should be undertaken. Machinery, trucks and vehicles must be well maintained and serviced regularly as per the recommended service guide. Refuelling must be undertaken over hard park bunded areas that adequately capture and contain spillages. Machinery and vehicles should be parked on appropriately lined areas. Drip trays must be used under leaking machinery. Spillages should be reported immediately and spill kits should be readily available at all times.	N	-1	-1	-2	-1	-5	CbA
			Due to the small size of the TSF and Capital Projects, the loss of contributing area will be negligible (less than 0.5 %) in comparison to the runoff area of quaternary catchment B41G.	N	-1	-2	-1	-1	-5	Runoff from dirty areas must be contained according to GN704 regulations. There are no mitigation measures for a loss of contributing catchment area. The loss of catchment area is extremely small and would therefore have a negligible impact on reducing the catchment yield. Implement and maintain the approved Storm Water Management Plan as defined in the EMPr, or as subsequently been approved.	N	-1	-2	-1	-1	-5	
			The proposed Khulu TSF, silt trap, PCD, diesel storage tanks and emulsion transfer area have the potential to contaminate the surrounding clean environment should spills occur.	N	-3	-3	-3	-4	-13	Lined bunded areas that are sized to accommodate 110 % of the storage capacity of the diesel tanks must be implemented beneath the tanks and should be operated empty at all times. The emulsion transfer area must be lined and sloped towards a sump to capture any potential spills. The sump should be inspected and emptied on a regular basis and disposed at an appropriate facility. Clean water should be diverted around the diesel and emulsion batching areas to prevent any unnecessary cross contamination.	N	-1	-2	-1	-1	-5	

Name of Activity	Project		Potential Impacts	Rating Prior to Measures						Mitigation Type	Rating Post Measures					Significance	
Activities	Project	Impact Area	Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM	CvA/R/Ir
		Groundwater	Large scale hydrocarbon spills could be present at the mining area.	N	-1	-1	-4	-4	-10	Pipelines but be monitored in terms of volumes of hydrocarbons and oils piped to the underground workings. Monitoring should be recorded on mine recording system (active at any time) to determine when there may be a potential leak on a pipeline. At least weekly inspections should be undertaken around the diesel bunded areas and supply pipelines. No activities associated with hydrocarbons and/or chemicals may be undertaken outside of an effectively designed and contained area. Provision should be to protect the soils from hydrocarbon spills/drips by the vehicles and refuelling trucks entering and existing the site (i.e. grid system or permanently manned personnel to treat soils during periods of refuelling). In the event of a large spill include total petroleum hydrocarbon (TPH) in the next groundwater monitoring cycle. If elevated TPH is recorded, additional measures must be implemented to clean and/or rehabilitate affected areas. Soil samples must be taken after rehabilitation to confirm the presence of hydrocarbons that could pose a threat to groundwater contamination. All used oils must be removed from site by a licensed company and disposed of at a suitably licensed site. Any spills occurring during the collection process must be cleaned up immediately. Any significant spills must be captured in the incident reports and must be reported to the relevant department (LEDET, Catchment Management Agency/DWS). All equipment and machinery should be kept in good working order. A clean up procedure (i.e. Works Instruction) must be in place.	N	-1	-1	-2	-1	-5	CbA
			Handling of hydrocarbons and associated hazardous waste (old oils and contaminated soils) the area could lead to contamination of groundwater if not well managed.	N	-2	-2	-2	-4	-10	Clean and Dirty water separation systems should be incorporated in terms of the 2016 SWMP or any approved update thereafter. The workshop should be designed with the suitable waste containment measures (berms, sumps, oil separators). Waste management training must be implemented on site. Clear signs informing staff of waste management practices must be implemented on site. Hazardous waste handling should only take place within bunded and/or lined areas, with a capacity of at least 110% of the volume stored. Hazardous waste should be removed by a licenced removal company and taken to a suitable and licenced landfill site.	N	-1	-1	-2	-2	-6	CbA

Name of Activity	Project		Potential Impacts	Rating Prior to Measures						Mitigation Type	Rating Post Measures					Significance	
Activities	Project	Impact Area	Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM	CvA/R/Ir
										Documentation of removal and safe disposal must be available on site.							
		Air Quality	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Heritage	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Noise	Noise of vehicles traversing the access roads will create a constant source of noise. It is however not foreseen that the roads proposed would contribute to any additional noise levels in the area.	N	-1	-4	-1	-1	-7	Machinery and vehicles will be well maintained to prevent excessive nose and to comply with national and provincial regulations. All vehicles will have muffles to minimise noise emissions, where necessary. Where noise becomes a nuisance nose management measures will be investigated and implemented to address these concerns. Noise monitoring will be undertaken (ambient conditions) to ensure that noise levels comply with Health and Safety Standards.	N	-1	-1	-1	-1	-4	CbA
		Visual	The presence and use of heavy machinery, trucks and vehicles during the operational phase.	N	-2	-3	-2	-2	-9	Machinery, trucks and vehicles are already present in the area and are unlikely create any additional significant presence. Trees should be planted along the main roads to conceal activities from motorists. Dust suppression measures should be implemented to limit the generation of dust.	N	-1	-1	-2	-1	-5	CbA
		Social	There is approximately 1200 permanent and 800 contractor employees in service at Dwarsrivier Mine. This employment profile will be sustained as the proposed project would allow the operation to meet the existing production capacity. Approximately 24 employees will be directly involved with the operations related to the TSF. No new employment positions will be created as these employees are already employed at Dwarsrivier Mine. However, the existing socio-economic benefits created through Dwarsrivier Mine being a key employer in the area would continue. The social services support as part of the SLP requirements will also continue to be implemented. As no additional workers are anticipated, the inflow of jobseekers is also anticipated to be of limited significance.	P	2	2	3	3	10	The procurement of locals should receive preference if there is any need for additional employees. The ideal objective should be to reach 100% recruitment of additional/ new unskilled labour from local communities where skills are locally available.	P	3	2	3	3	11	CbA
			Existing employees would continue to be responsible for the overall mining activities. Limited additional temporary workers could over time be required for specific tasks associated with the proposed Khulu TSF and capital projects. When that occurs, new mining activities can then be allocated to appointed specialist contractors. Even if limited procurement is foreseen, this variable is	P	2	2	3	3	10	Targets for the procurement of capital goods, consumer goods and services should be set and Dwarsrivier Mine should develop an action plan to meet these targets. Contract executions by SMMEs should be strictly monitored to determine whether SMMEs require assistance with regards to general business principles, financial management, management of stock, competitive costing (pricing), and marketing of their businesses.	P	3	2	3	3	11	CbA

Name of Activity	Project	Impact Area	Potential Impacts	Rating Prior to Measures						Mitigation Type	Rating Post Measures					Significance	
Activities	Project	Impact Area	Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM	CvA/R/Ir
			still regarded as positive, due to the indirect impacts of Dwarsrivier Mine's mining activity on the local economy through the creation of possible business opportunities (e.g. local service industry) and local procurement of material, services and equipment.							Enterprise development is a key enhancement measure in this regard. The proponent should assist small businesses and/or SMME's to develop to a certain level. Such measures recommended could include the following: The establishment of joint ventures between small businesses and established companies with relevant experiences with regards to tender processes can be considered; Flexible payment systems can be considered to assist smaller businesses in terms of expenditure, but such a system must be strictly controlled, An audit of existing local enterprises that could provide services, goods and material should be undertaken with the assistance of local leaders and community representatives, as well as local business structures The procurement process should be based on competitive business principles and the quality of services to be rendered, to ensure adherence to standards and to maximise overall welfare.							
			Socio-Economic Development - The socio-economic impact of the proposed projects would be based on the mine's continued contribution to the Gross Geographical Product (GGP) and the number of direct (continued employment at the mine) and indirect jobs that would be created. Therefore, except for ongoing direct employment, that would generate income and increase local spending, people living in the vicinity of the study area is also expected to benefit by the earnings of those employed by the mine and the local buying power in the area. Through employment and income generation during the mining processes, some economic benefits to the region and local communities therefore accrue. The mine would continue to contribute to the local economy through its employee wages, procurement of local contractors and services, purchasing of water and electricity and through payment of taxes to the Fetakgomo Tubatse Local Municipality. Dwarsrivier Mine, through their mining activities, is involved in various Local Economic Development Initiatives linked to the Integrated Development Plan (IDP) of the Fetakgomo Tubatse Local Municipality, as well as other government initiatives. These activities would thus continue, and the constant positive socio-economic impacts thereof would remain to benefit of the local communities.	P	3	2	3	3	11	Dwarsrivier Mine, through their SLP, must continue to provide skills development opportunities for employees that include functional literacy and numeracy programmes, career progression plans, up-skilling for hard to fill vacancies and management positions, bursary and internships and portable skills training. Develop a database of SMME's for the procurement of goods and services that could potentially be outsourced to the local community. Dwarsrivier Mine to continue to adhere to the Social and Labour Plans as per the Regulation 46 of the Mineral and Petroleum Resources Development Act (Act 28 of 2002) and the Mining Charter (2018).	P	3	2	3	4	12	CbA

Name of Activity			Potential Impacts	Rating Prior to Measures						Mitigation Type	Rating Post Measures					Significance	
Activities	Project	Impact Area	Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM	CvA/R/Ir
			Capacity Building - Although education and training are mainly the responsibility of government, there is increased pressure on the business sector in South Africa to increase the development and skills of their workforce. Dwarsrivier Mine is involved in capacity building and training. Further to these focus areas, the company also concentrate on local employment creation and poverty alleviation, as well as environmental management, rural development and the provision of infrastructure. The above-mentioned inputs would continue if Dwarsrivier Mine is successful in sustaining their mining operations in the area. Dwarsrivier Mine has thus played an important role in the area in this regard and commits to continue with these efforts which would benefit the local communities within the Fetakgomo Tubatse Local Municipality area.	P	3	2	3	3	11	Dwarsrivier Mine should continue with a Human Resources Development (HRD) strategy as part of the Social and Labour Plan (SLP). The focus should remain of career development programmes, bursaries, learnership programmes, skills development and training. Learnership programmes should preferably focus on individuals from the core and affected areas in close proximity to Dwarsrivier Mine to maximise the long-term employment opportunities of these local community members. Local goods and services should be used as far as possible and therefore contractual requirements for contractors to use local goods and services should be implemented as far as possible Local Economic Development initiatives should continue	P	3	2	3	4	12	CbA
			Safety and Security Related Impacts - Construction of the access crossing between the plant and North Mine, as well as the widening of the access road between the South Shaft/Main Offices and Plant would reduce these risks and create a positive impact in this regard. The negative impact prior to mitigation can thus be changed to a medium positive impact.	N	-2	-2	-2	-2	-8	A Fire/Emergency Management Plan should be developed and implemented, if not yet in place. It would be important to regularly review the functionality and efficiency of such a plan in conjunction with the local emergency teams, mine management and affected communities as well as neighbouring landowners. Appropriate firefighting equipment should be on site and workers should be appropriately trained for firefighting Warning signs would have to be posted to alert residents and road users to possible dangers associated with mining related traffic and activities. Access to the mine via the new parking extension should consider all safety and security measures and have as little impact on the traffic on the R577 as possible	N	-2	-2	-2	-2	-8	CbA
			Health Related Risks - During the operational phase dust impacts are anticipated due to general mining activities and vehicles travelling on the access and haul roads. The dust concentrations as a result of this movement are not anticipated to reach residential areas and the impact would possibly be localised on site. Fugitive dust from stockpile areas and waste rock dumps are also of concern. Windblown dust from these facilities will vary according to the season, with possible higher levels and frequency during the windy months. The probability and intensity of these possible impacts would further depend on the wind directions and the proximity of sensitive receptors. The nearest residential area is approximately 10 km to the north and east of the mining	N	-2	-2	-3	-3	-10	The Mine Health and Safety Act (Act No 29 of 1996), standards stipulated in SANS 10286, NEMA and related regulations and standards must be adhered to. Vehicles and equipment must be in good working order and must be regularly serviced. Infrastructure e.g. pipelines must be regularly inspected and maintained to avoid spillages. Mining activities should adhere to all the relevant environmental and health guidelines and should be undertaken in accordance with the EMP Dust suppression methods along haul roads should be continued to be implemented Dwarsrivier Mine must continue to distribute information with regards to health matters and nutrition to its workers and surrounding communities	N	-2	-2	-2	-2	-8	CbA

Name of Activity	**Project**		**Potential Impacts**	**Rating Prior to Measures**						**Mitigation Type**	**Rating Post Measures**					**Significance**	
Activities		**Impact Area**	**Potential Impacts**	**Status**	**Extent**	**Duration**	**Probability**	**Intensity**	**SbM**	**Mitigation Measures**	**Status**	Extent	Duration	Probability	Intensity	SaM	**CvA/R/Ir**
			area. Should there be a possible increase in the air pollution (dust), these sensitivities should be adequately dealt with and be taken into account in the monitoring processes stipulated as part of the EMPr. In the event that sensitive receptors are affected (worst case scenario), based on dust fallout rates, the necessary mitigation measures as stipulated through the Air Quality specialist study must be implemented. The rating below is based on the general air quality impacts usually experienced with mining projects and the proximity of sensitive receptors in the study area. Emissions would include vehicle emissions (carbon monoxide and nitrogen oxide) and emissions from large construction equipment. Industrial, solid and hazardous waste would be created during the mining operations. As is currently the case, these different types of waste should continue to be responsibly disposed of to avoid any health-related impacts in this regard. Storing of diesel and emulsion can create health related risks. As mitigation, the emulsion will be stored in underground tankers. The majority of the pipelines will further be underground to limit risks in this regard and possible spills. In mining areas there are further concerns relating to migrant employees bringing health risks, and nowadays the threat of Covid-19 infection, to mining areas or small towns. The Fetakgomo Tubatse Local Municipality area is already characterised by vulnerable households and inadequate public health services that cannot always effectively deal with the health risks associated with the pandemic. It will remain the responsibility of Dwarsrivier Mine to continue their support to their employees and surrounding communities to reduce vulnerability and to implement the required Covid-19 Protocol.							Storing of emulsion and diesel must not be in close proximity to any flammable materials. The SLP should make provision for addressing any possible direct health related risks and providing a supporting role to minimise the vulnerabilities of the communities, without having to take over the role of the local health services and municipality. On site, all the appropriate health, hygiene and distancing measures aimed at protecting the employees' safety and health, must be implemented. Dwarsrivier Mine can investigate ways to support to the local clinics through their community support programmes and SLP initiatives. Educational videos on Covid-19, and general health and hygiene measures associated with the pandemic should be provided to employees.							
Waste Management and Handling Hydrocarbon spills within the Mining Area and the	1, 2, 3, 4	Geology	No direct impact.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Topography	No direct impact.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Soils	Contamination of soil resources due to hydrocarbon spills.	N	-1	-2	-4	-4	-11	Storage of fuels and oils, the refuelling of vehicles and equipment maintenance must be limited to designated, bunded (bunds to be 110% of volume of the materials stored) areas. All fuels and soils must be stored in appropriate containers.	N	-1	-2	-1	-1	-5	R

Name of Activity	Project		Potential Impacts	Rating Prior to Measures						Mitigation Type	Rating Post Measures					Significance	
Activities	Project	Impact Area	Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM	CvA/R/Ir
management of Domestic and Hazardous Waste										Chemicals and hazardous material must be stored in suitable containers, fit for purpose and in line with SDS requirements. Where drip trays are too small, specially prepared, non-pervious bunds with solution trenches must be used to capture spillages Oils and potentially hazardous materials must be disposed of at a licensed facility and waste certificates obtained. A spill kit must be provided to be used in the event of a spill. If a spill occurs, the contaminated soil must be removed immediately. Contaminated soil must be stored according to best practices until it can be disposed of at a suitably licensed facility. Safety signage must be used at designated storage areas. All workers must undergo an induction which includes environmental awareness training to make them aware of the environmental incident management procedures as well as the importance of complying with management measures.							
			Contamination of soils as a result of a lack of sanitary services	N	-1	-2	-4	-4	-11	Chemical toilets must be readily available to employees where permanent infrastructure is not available. Licensed companies must be appointed to remove any contaminated material and or wastes to licensed landfill sites.	-	-1	-2	-1	-1	-5	-
		Ecology	The unmanaged disposal of waste, could result in the spread of invader species, as well as the influx of opportunistic species.	N	-2	-3	-3	-4	-12	Develop dedicated waste handling areas; prevent access to rodents and opportunistic species; prevent the spread of waste. Develop dedicated waste handling areas, fit for purpose and prevent the spread of waste.	N	-1	-1	-2	-1	-5	CbA
		Riparian Habitat and Wetlands	Various non perennial drainage channels are present in this area. The Truck Parking will also be located in close proximity to a drainage channel.	N	-3	-2	-2	-3	-10	Remain at all times outside of the 1:100 year flood line of the watercourses. Ongoing Biomonitoring Monitoring should be undertaken at the upstream and downstream points. Ongoing surface water monitoring should be undertaken at the upstream and downstream monitoring points. The storm water management plans should be implemented in and around the facilities to ensure that dirty water runoff or water with high sediment loads do not enter the existing watercourses.	N	-1	-1	-1	-2	-5	CbA

Name of Activity	Project		Potential Impacts	Rating Prior to Measures						Mitigation Type	Rating Post Measures					Significance	
Activities	Project	Impact Area	Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM	CvA/R/Ir
										Develop dedicated waste handling areas, fit for purpose and prevent the spread of waste.							
		Hydrology	Handling of Hazardous Waste within diesel storage areas, laydown areas and general mine area could contaminate the dirty water storage areas. The water is then reused in the system and could have impacts on the integrity of the storm water system and also the production.	N	-3	-2	-2	-4	-11	Clean and Dirty water separation systems should be incorporated in terms of the 2016 SWMP or any approved update thereafter. A detailed waste management strategy will be established and implemented, which will clearly demarcate the containments for different waste streams. Waste management training must be implemented on site. Clear signs informing staff of waste management practices must be implemented on site. Hazardous waste handling should only take place within bunded and/or lined areas. Any significant spills must be captured in the incident reports and must be reported to the relevant department (LDEDET, Catchment Management Agency/DWS). Hazardous waste should be removed by a licenced removal company and taken to a suitable and licenced landfill site. Documentation of removal and safe disposal must be kept on record and in good order. The mine will adopt a cradle-to grave (inspection of disposal sites) approach to ensure that the waste is removed and disposed of in a legally compliant manner. Weekly inspections of Storm Water Management Systems must be undertaken. Any blockages or maintenance requirements must be documented and an action plan developed.	N	-1	-1	-2	-2	-6	CbA
		Hydrology	Handling and Storing of Domestic Waste should have no impact on the surface water resources due to the location of the facility. However, incorrect disposal of waste could hamper the integrity of the storm water system.	N	-1	-2	-3	-3	-9	Clean and Dirty water separation systems should be incorporated in terms of the 2016 SWMP or any approved update thereafter. Waste management training must be implemented on site. Weekly inspections of Storm Water Management Systems must be undertaken. Any blockages or maintenance requirements must be documented and an action plan developed. Clear signs informing staff of waste management practices must be implemented on site. Access control must be strictly enforced. Recycling practices must be investigated and implemented on site.	N	-1	-1	-2	-1	-5	CbA
		Groundwater	Large scale hydrocarbon spills could be present at the mining area	N	-1	-1	-4	-4	-10	Clean and Dirty water separation systems should be incorporated in terms of the 2016 SWMP or any approved update thereafter.	N	-1	-1	-2	-1	-5	CbA

Name of Activity	Project		Potential Impacts	Rating Prior to Measures						Mitigation Type	Rating Post Measures					Significance	
Activities	Project	Impact Area	Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM	CvA/R/Ir
										No activities associated with hydrocarbons and/or chemicals may be undertaken outside of an effectively designed and contained area. All used oils must be removed from site by a licensed company and disposed of at a suitably licensed site. Any spills occurring during the collection process must be cleaned up immediately. Any significant spills must be captured in the incident reports and must be reported to the relevant department (LDEDET, Catchment Management Agency/DWS). All equipment and machinery should be kept in good working order. A clean up procedure (i.e. Works Instruction) must be in place.							
			Handling or Hazardous Waste within workshops and general mine area.	N	-2	-2	-2	-4	-10	Clean and Dirty water separation systems should be incorporated in terms of the 2016 SWMP or any approved update thereafter. The workshop should be designed with the suitable waste containment measures (berms, sumps, oil separators). Waste management training must be implemented on site. Clear signs informing staff of waste management practices must be implemented on site. Hazardous waste handling should only take place within bunded and/or lined areas, with a capacity of at least 110% of the volume stored. Hazardous waste should be removed by a licenced removal company and taken to a suitable and licenced landfill site. Documentation of removal and safe disposal must be available on site.	N	-1	-1	-2	-2	-6	CbA
			Handling and Storing of Domestic Waste	N	-3	-3	-3	-3	-12	Clean and Dirty water separation systems should be incorporated in terms of the 2016 SWMP or any approved update thereafter. Waste management training must be implemented on site. Clear signs informing staff of waste management practices must be implemented on site. All waste must be removed by licensed contractors and disposed of at a licensed landfill site. As a duty of care and the cradle to grave principles, the mine should regularly inspect disposal site to ensure that best practices are implemented.	N	-2	-3	-2	-2	-9	CbA

Name of Activity			Potential Impacts	Rating Prior to Measures						Mitigation Type	Rating Post Measures					Significance	
Activities	Project	Impact Area	Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbM	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM	CvA/R/Ir
										Recycling practices must be investigated and implemented on site. Records and manifests of waste disposal should be kept on file and in good order.							
		Air Quality	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Heritage	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Noise	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Visual	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Social	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 79: Decommissioning Phase Impact Assessment and Management Measures (Significance before Mitigation –SbM; Significance after Mitigation – SaM; Can be avoided – CbA; R – Reversible; Ir - Irreversible)

Name of Activity			Potential Impacts	Rating Prior to Measures						Mitigation Type	Rating Post Measures					Significance	
Activities	Project	Impact Area	Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbA	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM	CvA/R/Ir
Legal Requirements (Environmental Permits)	1, 2, 3, 4 & 5	Legal Compliance	Unlawful activities could lead to NWA Directives and Section 24G Rectification fines.	N	-4	-3	-2	-5	-14	A legal assessment of all activities must be undertaken annually to ensure that all are licensed. A detailed closure plan must be developed and submitted to the relevant departments for approval. All legally appointed personnel responsible or involved in activities on site must receive training on the requirements of the Environmental Authorisations and EMPr's.	P	4	3	5	5	17	CbA

Name of Activity			Potential Impacts	Rating Prior to Measures						Mitigation Type	Rating Post Measures					Significance	
Activities	**Project**	**Impact Area**	**Potential Impacts**	**Status**	**Extent**	**Duration**	**Probability**	**Intensity**	**SbA**	**Mitigation Measures**	**Status**	**Extent**	**Duration**	**Probability**	**Intensity**	**SaM**	**CvA/R/Ir**
										Quarterly assessments must be undertaken, on the lawful implementation of the Environmental Authorisation. Environmental Authorisations must be available on site at all times. The legal register must be updated to indicate all updated activities.							
General Rehabilitation	1, 2, 3, 4, &5	Geology	No direct impact.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Topography	Returning the area to be stable and free draining.	N	-2	-3	-5	-4	-14	The TSF should be closed in terms of the approved design principles. The roads should be sloped and landscaped to blend into the surrounding environment. Where the slopes have steep gradients due to the surrounding landscape measures should be implemented to assist with the trapping of seeds and to protect the crest from wind erosion. All rehabilitated areas should be effectively fenced off to avoid access thereto by unauthorised parties up until full rehabilitation has been achieved.	P	2	3	3	5	13	CbA
			A concept for the TSF closure design was developed to illustrate how the TSF could be rehabilitated once the deposition of tailings stops and the TSF has reached the design height. It is important to note that this concept could change depending on how the TSF develop over time. For example, if the tailings stored in the TSF is reclaimed (reworked) before the TSF reaches the final design height the closure design could look different from the proposed details. The concept design assumes that the TSF will be developed as indicated on the drawings submitted with this EMPr. The TSF will be rehabilitated by shaping the top of the TSF to be free draining and capping the top and the slopes with soil. The concept design also assumes that the area under the silt trap platform and PCD will be rehabilitated. The surface of the TSF will be capped using a layer of compacted soil overlain by hydroseeded topsoil. Bench drains will be constructed along the current benches to collect stormwater draining down the rehabilitated slope of the TSF. The bench drains will be shaped to drain towards riprap-lined down chutes that will be provided to convey stormwater down to the toe. The dirty water canal that will be provided during the operation of the TSF will be rehabilitated. It is expected that the silt trap, dirty water canal and PCD will not be required once the TSF is rehabilitated. It is assumed that the footprint of the PCD and the silt trap platform will be rehabilitated by backfilling and reshaping.	N	-2	-3	-3	-4	-14	The designs as approved should be implemented.	P	2	3	4	3	12	CbA
			Soil compaction - Heavy equipment traffic during construction and exploration activities is anticipated to	N	-2	-3	-5	-4	-14	The contractor will ensure that all activities, material and equipment storage and personnel movement take place within the designated area.	N	-1	-1	-2	-1	-5	R

Name of Activity			Potential Impacts	Rating Prior to Measures						Mitigation Type	Rating Post Measures					Significance	
Activities	Project	Impact Area	Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbA	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM	CvA/R/Ir
			cause soil compaction. The severity of this impact is anticipated to be medium-high for Acardia soils due to clayey texture. Whereas soils with a relatively shallow bedrock and lithocutanic character (partly weathered rock material) such as the Glenrosa/Mispah soil forms are anticipated to be less impaired due to the resistance offered by the underlying bedrock. The ratings given in the columns on the left is for Project 1 , Project 2 and Project 3-5.							All rehabilitated areas should be effectively fenced off to avoid access thereto by unauthorised parties up until full rehabilitation has been achieved.							
				N	-2	-3	-4	-2	-11	Laydown areas should be located within disturbed soils (anthrosols) to avoid compaction of natural soils.	N	-1	-1	-2	-1	-5	
										All contractors must receive induction. The induction should be updated on site, to make provision for the site plan and a detailed explanation on the purpose of the no-go zones, presence of protected species, presence of the CBA and ESAs and the meeting thereof.							
				N	-2	-3	-4	-2	-11	The management of topsoil stockpiles should be undertaken in terms of the Topsoil Management Plan included into this EMPr to ensure that the topsoil stockpiles maintain its integrity and are not subjected to compaction.	N	-1	-1	-2	-1	-5	
										Restrict the amount of mechanical handling, as each handling event increases that compaction level and the changes to the soil structure. Wherever possible, the 'cut and cover' technique (where the stripped soils is immediately placed in an area already prepared for rehabilitation, thus avoiding stockpiling) should be used.							
										A fine system/disciplinary system must be implemented on site for all significant or recurring environmental non-compliances.							
										Compacted soils adjacent to activities infrastructure footprint can be lightly ripped to at least 25cm below ground surface to alleviate compaction prior to re-vegetation.							
										Site clearance and activities should be restricted to the approved footprint. Contractors areas should be established on already disturbed footprints.							
										All vehicular traffic should be restricted to the existing service roads and the selected road servitude as far as practically possible							
			Clearing vegetation will result in the exposure of soil, which may in turn lead to soil erosion, in addition to this, stockpiling of topsoil material on sloping areas leading to increased runoff and erosion. The areas where the infrastructure is proposed are mostly gradual, however the exploration activities will be located among the mountainous setting and this is where erosion is considered moderately high. The natural and undisturbed soils will become more vulnerable to erosion once the vegetation is cleared for construction activities, and the soils will inevitably be exposed to wind and some surface runoff during intensive rainfall events. The ratings given in the columns on the left is for Project 1 , Project 2 and Project 3-5.	N	-2	-3	-5	-4	-14	The approved Storm Water Management Plan must be implemented up until rehabilitation has been completed.	N	-1	-1	-2	-1	-5	R
										Ensure the required erosion protection measures are monitored and corrected where necessary.							
										Bare soils can be regularly dampened with water to suppress dust during the construction phase, especially when strong wind conditions are predicted according to the local weather forecast							
										All disturbed areas adjacent to the footprint areas can be re-vegetated with an indigenous grass mix, if necessary, to re-establish a protective cover, to minimise soil erosion and dust emission. Natural vegetation establishment (self-succession) will be encouraged on cleared areas, and topsoil stockpiles.							
										If natural succession of vegetation is not established within one rainy season, after rehabilitation, the disturbed areas and areas adjacent to the infrastructural areas must be re-vegetated with an indigenous grass							

Name of Activity			Potential Impacts	Rating Prior to Measures						Mitigation Type	Rating Post Measures					Significance	
Activities	Project	Impact Area	Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbA	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM	CvA/R/Ir
										mix, if necessary, to re-establish a protective cover, to minimise soil erosion and dust emission.							
				N	-2	-3	-4	-2	-11	The mine will investigate an appropriate seed mix for the rehabilitation purposes should self-succession not establish on rehabilitated sites. No project related activities may be undertaken outside of the demarcated areas.	N	-1	-1	-2	-1	-5	
				N	-2	-3	-4	-2	-11	No open fires must be allowed.	N	-1	-1	-2	-1	-5	
			Potential of Soil Contamination due to a lack of chemical toilets or hydrocarbon spills - All the identified soils are considered equally predisposed to potential contamination (i.e. hydrocarbons), as contamination sources are generally unpredictable and often occur as incidental spills or leak for construction developments. The significance of soil contamination is medium-high for all identified soils, largely depending on the nature, volume and/or concentration of the contaminant of concern. The ratings given in the columns on the left is for Project 1 , Project 2 and Project 3-5.	N	-2	-3	-5	-4	-14	Contamination prevention measures should be addressed in the Environmental Management Programme (EMP) for the proposed development, and this should be implemented and made available, and accessible always to the contractors and construction crew conducting the works on site for reference. Chemical toilets should be available on site.	N	-1	-1	-2	-1	-5	R
				N	-2	-3	-4	-2	-11	A spill prevention and emergency spill response plan, as well as dust suppression, and fire prevention plans should also be compiled to guide the construction works. An emergency response contingency plan should be put in place to address clean-up measures should a spill and/or a leak occur, as well as preventative measures to prevent ingress.	N	-1	-1	-2	-1	-5	
				N	-2	-3	-4	-2	-11	Burying of any waste including rubble, domestic waste, empty containers on the site should be strictly prohibited and all construction rubble waste must be removed to an approved disposal site	N	-1	-1	-2	-1	-5	
		Ecology	The decommissioning activities could lead to the increase of the harvesting of plants in the area. Other activities identified by the specialist included: Potential ineffective rehabilitation will lead to the proliferation of alien and invasive plant species and further floral habitat and species loss Bare soil areas, if not rehabilitated will lead to increased runoff, erosion and the sedimentation of downslope habitats Potential continued loss of habitat will result in a further loss of floral SCC Permanently altered habitat may result in the alteration of floral species abundance and diversity of which a number are endemic to the region.	N	-2	-3	-3	-4	-12	All contractors must receive induction. The induction should be updated on site, to make provision for the site plan and a detailed explanation on the purpose of the no-go zones, presence of protected species, presence of the CBA and ESAs and the meeting thereof. Vehicles should be restricted to travelling only on designated roadways to limit the ecological footprint of the construction activities. Additional road construction should be limited to what is absolutely necessary, and the footprint thereof kept to a minimal. Harvesting of plants and poaching of animals will be prohibited and a fine system will be developed for any person not complying. No open fires must be allowed. A grass mixture off endemic grasses recommended by an ecologist should be utilised in the seeding process. Note that hydro-seeding is primarily for grasses and smaller shrubs. Larger shrubs and trees will need to be hand-planned. The seed mixture should be incorporated into mulch which includes fertiliser and germination acceleration agents where required. No hunting or trapping of faunal species is to be allowed by personnel.	P	3	3	3	5	14	CbA

Name of Activity			Potential Impacts	Rating Prior to Measures						Mitigation Type	Rating Post Measures					Significance	
Activities	Project	Impact Area	Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbA	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM	CvA/R/Ir
										No collection of floral SCC must be allowed by construction personnel without the relevant permits.							
										Regular application of fertiliser should take place, where identified, in order to ensure efficient establishment of vegetation cover until such time as sufficient organic matter is being produced by the established grasses to allow for self-sustaining growth							
										Informal fires by construction personnel should be prohibited, and no uncontrolled fires whatsoever should be allowed.							
										Compacted soils adjacent to the project area and associated infrastructure footprint can be lightly ripped to at least 25cm below ground surface to alleviate compaction prior to re-vegetation.							
										The recovered soils during construction should be re-used to rehabilitate the mine footprint following mine closure.							
										If re-seeding for basal cover establishment was not effective during 1st application, a second application of hydro-seed mixture may have to be applied in certain areas. The application of hydro-seed should be at the discretion of the specialist contractor.							
										Edge effects arising from the proposed development, such as erosion and alien plant species proliferation, which may affect adjacent natural areas, need to be strictly managed. Specific mention in this regard is made of Category 1b AIP species (as listed in the NEMBA Alien species lists, 2020), in line with the NEMBA Alien and Invasive Species Regulations (2020).							
										AIP monitoring and clearing/control should take place throughout the construction phase of the development, and a 30 m buffer surrounding the proposed railway loop should be regularly checked for AIP proliferation and to prevent inward and or/outward spread of AIPs, notably into non infested areas outside of the proposed railway loop or into newly rehabilitated areas.							
										Alien vegetation that is removed must not be allowed to lay on unprotected ground as seeds might disperse upon it. All cleared plant material to be disposed of at a licensed waste facility which complies with legal standards.							
										No grazing on rehabilitated areas is to occur within three years of reseeding completion.							
										A fire management plan must be maintained for the mine. Fire belts must be constructed around the boundaries of the mine. Daily fire danger ratings must be viewed and addressed where required. The mine must have equipment, protecting clothing and trained personnel for extinguishing fires.							
										No open fires must be allowed.							
										Once sufficient basal cover has been established, the introduction of species representative of the Sekhukhune Mountain Bushveld vegetation type may commence.							
										Introduction of these species should commence through the stages of natural succession, i.e. Pioneer species (grasses, herbaceous species), Secondary species (grasses, small shrubs, and small trees) and Climax							

Name of Activity			Potential Impacts	Rating Prior to Measures						Mitigation Type	Rating Post Measures					Significance	
Activities	Project	Impact Area	Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbA	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM	CvA/R/Ir
										state (larger shrubs, large trees). This process will also occur naturally as seeds from the neighbouring Sekhukhune Mountain Bushveld areas are introduced and germinate. Certain tree species can be selectively introduced, however consideration will need to be given to rooting depths and soil stability as well as the ability of the trees to establish on the subject area.							
		Riparian Habitat	Loss or Impact on NEFPA Sites	N	-1	-2	-1	-4	-8	No activities are planned within 500m from any NEFPA sites unless authorised. This restriction should be maintained.	N	-1	-1	-1	-1	-4	CbA
		Hydrology	It is likely that the Khulu TSF will remain, however, the other infrastructure will most likely be removed and rehabilitated. Rehabilitation activities can potentially result in exposed soils leading to erosion and sedimentation. Decommissioning activities may impact on the runoff and siltation of watercourses.	N	-2	-3	-2	-3	-10	If possible, the Khulu TSF should be vegetated. Temporary erosion measures should be employed at exposed areas until vegetated. The topography should be returned to its former state (as far as practically possible). Where the slopes have steep gradients due to the surrounding landscape measures should be implemented to assist with the trapping of seeds and to protect the crest from wind erosion. The topsoil stockpiles should be used to fill in areas and to create a suitable substrate to re-vegetate areas. If natural succession of vegetation is not established within one rainy season, after rehabilitation, the disturbed areas and areas adjacent to the infrastructural areas must be re-vegetated with an indigenous grass mix, if necessary, to re-establish a protective cover, to minimise soil erosion and dust emission.	N	-2	-1	-2	-1	-1	CbA
		Groundwater	Contamination of groundwater resources. This scenario assumes that the TSF and PCD liners will fail after 280 years. In this event, seepage from the TSF and PCD may reach the underlying aquifers at a rate of 0,024m3/d per ha. The following is concluded from the results of the simulations: • Seepage through the TSF and PCD liners are expected to increase nitrate concentrations in the weathered aquifer underneath the footprint areas. Nitrate concentrations may increase to above 600 mg/l over the footprint areas in the weathered and alluvial aquifers in the long-term. • The nitrate plume is expected to migrate in a north-westerly direction towards the Klein Dwars River in the weathered and alluvial aquifers. At 300 years after mine closure, simulations suggest that it is unlikely that groundwater with nitrate concentrations exceeding 11 mg/l would reach the Klein Dwars River from the Khulu TSF and PCD to any significant extent. • The effect of liner failure at the Khulu TSF and PCD on the fractured rock aquifer is not expected to add significantly to the pollution load associated with other Dwarsrivier Mine mining and mineral processing	N	-3	-3	-3	-4	-13	Monitoring of groundwater should continue until the rehabilitation activities associated with the new TSF have proven successful. Analyse monitoring results to improve understanding of the conceptual model and risk groundwater contamination. Implement an effective rehabilitation strategy geared at reducing the volume of seepage from the Khulu TSF to the underlying aquifers. Continue with remediation activities up until groundwater pollution plume has been restricted to agreed demarcation in line with the Groundwater Remediation Project. Keep dirty water containment facilities, including the cut off trench and berm, the liner drainage system and the PCD intact to manage seepage volumes post closure.	N	-1	-2	-2	-1	-6	CbA

Name of Activity			Potential Impacts	Rating Prior to Measures						Mitigation Type	Rating Post Measures					Significance	
Activities	Project	Impact Area	Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbA	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM	CvA/R/Ir
			activities. • Nitrate concentrations may increase to above 180 mg/l in the fractured rock aquifer as a result of infiltration over the Khulu TSF and PCD footprint areas. This is an estimated 20 mg/l increase in concentration compared to the no project option discussed above. • The nitrate plumes originating from the Khulu TSF and PCD are expected to migrate in a northerly direction along the preferential flow paths identified. Contamination along these geological structures are however expected to be dominated by Dwarsrivier Mine mining and mineral processing activities and not significantly as a result of seepage from the Khulu TSF and PCD. • In the long-term, nitrate concentrations in the Farm House borehole could reduce to below 100 mg/l from the anticipated 200 mg/l at the end of the operational phase. This borehole is located along a preferential groundwater flow path, which means that long-term plume migration will result in elevated nitrate in this borehole under the rehabilitation measures implemented. • The nitrate plume is expected to migrate more than 900m north outside the Dwarsrivier Mine MRAalong the N-S striking in the long-term for this scenario. • Additional measures to reduce nitrate concentrations associated with the plant and historical TSF areas will be investigated and developed as part of the Dwarsrivier Mine Groundwater Remediation Strategy, which will be undertaken in a separate study. These measures will be focussed around the preferential flow paths identified and will be geared at reducing long-term contamination.														
		Heritage	No direct impact.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Visual	The removal of infrastructure and the rehabilitation of the TSF will visually improve the area.	N	-3	-3	-2	-2	-10	The removal of infrastructure associated with the TSF should be undertaken. The TSF should be vegetated to blend into the surrounding area.	N	-1	-2	-1	-1	-5	CbA
		Air Quality	All activities associated with the removal of infrastructure and rehabilitation has the potential to release dust.	N	-2	-2	-4	1	-7	The dust monitoring network and dust suppression programme established during the construction phase of the project will be maintained throughout the closure phase of the mine. With respect to haul road dust levels, it is recommended to limit vehicle speeds, especially during high risk periods of high winds, high temperature and low humidity.	N	-2	-1	-3	1	-5	CbA

Name of Activity			Potential Impacts	Rating Prior to Measures						Mitigation Type	Rating Post Measures					Significance	
Activities	Project	Impact Area	Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbA	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM	CvA/R/Ir
		Noise	No direct impact.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Socio-Economic	Unlawful and unscheduled access.	N	-3	-2	-4	-4	-13	Detailed contracts must be reviewed and implemented to avoid later disputes. These contracts should include the timing of activities and the people who will access the land. All activities should remain within the approved contracts. A list of contact people and responsible parties should be updated	-	-2	-1	-1	5	1	CbA
Dismantling and decommissioning of infrastructure and buildings	1, 2, 3, 4, 5	Geology	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Topography	Removal of infrastructure may impact on the topography.	N	-2	-3	-4	-4	-13	Linear Infrastructure constructed by the mine will be removed if it proves to inhibit land use at decommissioning. Where possible infrastructure will remain for social investment opportunities, this will be decided in conjunction with the Integrated Development Plan of the area ant eh local authorities. Ensure the entire site remains fenced for the duration of rehabilitation. Retain security access control to the site for the duration of rehabilitation. All fixed assets that can be profitably removed will be removed for salvage or resale (the salvage and resale value have however not been incorporated into the closure cost estimate as per the legislative requirements) All surface structures, infrastructure and 'hard surfaces' (inter alia, redundant surfaced roads, parking and paved areas) are to be demolished and removed from the disturbed mine footprint; unless an alternative/continued use for any such items is agreed upon, in writing, with the Department of Mineral Resources (DMR). All surface infrastructure would be demolished and removed to a depth of 500mm. Any infrastructure below 500mm will be sealed, made safe and left in situ. All fences erected around the infrastructure be dismantled and either disposed of at a permitted disposal site or sold off as scrap (provided that these structures will no longer be required by the post mining land owner). Fences erected to cordon off dangerous excavations will remain in place and will be maintained as and when required. Water pollution control structures will remain until the completion of all demolition and associated rehabilitation activities where after these will be rehabilitated.	P	3	3	4	4	14	CbA
		Soil, Land Use and Land Capability	Spills around the diesel storage areas and product stockpiles may result in the contamination of soils.	N	-1	-2	-4	-4	-11	Draw up a plan clearly defining the area where the removal of infrastructure should take place. Implement the plan with sufficient measures in place not to compact new areas. Any hydrocarbon, effluent or other contaminants should be collected and the soils remediated immediately.	N	-1	-1	-2	-1	-5	CbA
			Contamination of soils as a result of a lack of sanitary services	N	-1	-2	-4	-4	-11	Chemical toilets must be readily available to contractors.	N	-1	-1	-2	-1	-5	

Name of Activity			Potential Impacts	Rating Prior to Measures						Mitigation Type	Rating Post Measures					Significance	
Activities	Project	Impact Area	Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbA	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM	CvA/R/Ir
										Licensed companies must be appointed to remove any contaminated material and or wastes to licensed landfill sites.							
			Loss of soils due to decommissioning activities present on site.	N	-1	-2	-4	-4	-11	Draw up a plan clearly defining the area where the removal of infrastructure should take place. Implement the plan with sufficient measures in place not to compact new areas. Desilt the silt traps and the surrounding area that has been affected by removing silt to a depth of 500mm. Remove the liners of the PCD and silt traps and dispose thereof at the correct hazardous waste disposal facility. Remove supporting plints for pipeline as well as foundations of other associated infrastructure. Remaining structures should be demolished to 1m below surface and the demolition rubble removed and any re-usable items should be removed from site. Compacted soils adjacent to the mining blocks and associated infrastructure footprint can be lightly ripped to at least 25 cm below ground surface to alleviate compaction prior to re-vegetation. Soil along the TSF pipeline and at the PCD and Silt Trap should be tested for contamination. If contaminated is discovered, this should be removed and disposed of in the appropriate waste disposal facility. The footprints of the silt traps and PCD should be ripped to at least 200mm. Undertake a Contaminated Land Assessment around areas used for diesel storage and supply to determine whether remediation of the areas are required. Implement a strict penalty fine system for rule breaking with regard to vehicular movement. Maintain clean and dirty water systems and undertake regular monitoring and maintenance thereof.	N	-1	-2	-1	-1	-5	
		Ecology	Please refer to the impacts and management measures stipulated under General Rehabilitation.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Riparian Habitat	Impact on wetlands and riparian habitats due to decommissioning activities	N	-2	-2	-2	-3	-9	Remain at all times outside of the 1:100 year flood line of the watercourses where not authorised. Rehabilitation of affected freshwater resources must ensure that riparian structure and function are reinstated in such a way as to ensure the ongoing functionality of the larger drainage systems at pre-mining levels Ongoing Biodiversity Monitoring should be undertaken at the upstream and downstream points. Ongoing surface water monitoring should be undertaken at the upstream and downstream monitoring points.	N	-1	-1	-1	-2	-5	CbA

Name of Activity			Potential Impacts	Rating Prior to Measures						Mitigation Type	Rating Post Measures					Significance	
Activities	Project	Impact Area	Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbA	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM	CvA/R/Ir
										The storm water management plans should be retained in and around the facilities to ensure that dirty water runoff or water with high sediment loads do not enter the existing watercourses.							
		Hydrology	Erosion control over rehabilitated areas and the prevention of erosion gullies.	N	-1	-1	-4	-2	-8	The topography of all disturbed areas must be rehabilitated in such a manner that the surrounding natural area blends naturally with the rehabilitated areas well as to be free-draining. This will reduce soil erosion and improve natural re-vegetation.	N	-1	-1	-2	-2	-6	CbA
			Contamination of surface water as a result of removal of infrastructure.	N	-2	-2	-4	-3	-11	The detailed waste management strategy implemented during the construction and operation phases must be continuously implemented throughout the closure and decommissioning phase.	N	-1	-1	-2	-2	-6	CbA
			Rubble and waste from site could pollute local water resources.	N	-1	-1	-4	-2	-8	Waste that is not removed from site should be spread, covered and suitably rehabilitated.	N	-1	-1	-2	-2	-6	CbA
		Geohydrology	No direct impact	-	0	0	0	0	0	-	-	0	0	0	0	0	-
		Heritage	No direct impact	-	0	0	0	0	0	-	-	0	0	0	0	0	-
		Visual	Fugitive dust emissions as a result of infrastructure removal and associated exposed/bare areas may have an impact in terms of air quality and visual characteristics.	N	-2	-2	-4	-3	-11	The dust monitoring network and dust suppression programme established during the construction phase of the project will be maintained throughout the closure phase of the mine. With respect to haul road dust levels, it is recommended to limit vehicle speeds, especially during high risk periods of high winds, high temperature and low humidity. Establish and implement a dust suppression plan in consultation with the environmental control officer and an air quality specialist as part of the contractor's responsibility.	N	-2	-1	-3	1	-5	CbA
		Air Quality	All activities associated with the removal of infrastructure and rehabilitation has the potential to release dust.	N	-2	-2	-4	1	-7	The dust monitoring network and dust suppression programme established during the construction phase of the project will be maintained throughout the closure phase of the mine. With respect to haul road dust levels, it is recommended to limit vehicle speeds, especially during high risk periods of high winds, high temperature and low humidity.	N	-2	-1	-3	1	-5	CbA
		Noise	All activities associated with the removal of infrastructure and rehabilitation has the potential to generate noise.	N	-2	-2	-4	1	-7	Decommissioning hours must preferably be limited to daylight day hours e.g., 6 am to 6 pm where possible. Where noise becomes a nuisance, management measures will be investigated and implemented to address these.	N	-2	-1	-3	1	-5	CbA
		Social	Disruption and nuisance factors associated with the actual decommissioning such as noise, visual and traffic related impacts.	N	-2	-2	-4	1	-7	Local residents, with the focus on the surrounding landowners, should receive accurate information with regards to the project status, timeframes for decommissioning and other relevant information about issues that could influence their daily living and movement patterns.	N	-2	-1	-3	1	-5	CbA
Earth Moving, shaping and	1, 2, 3, 4, 5	Geology	No direct impact	-	0	0	0	0	0	-	-	-	-	-	-	-	-
		Topography		P	1	3	4	5	13	Pre-mining topography should be reasonably restored through shaping and landscaping, such that the topography of rehabilitated areas will	-	1	3	5	5	14	-

Name of Activity			Potential Impacts	Rating Prior to Measures						Mitigation Type	Rating Post Measures					Significance	
Activities	Project	Impact Area	Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbA	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM	CvA/R/Ir
ripping of ground			The shaping of the site should be undertaken in such a manner that it improves the overall topography of the site.							ultimately be commensurate with that of adjacent, non-disturbed areas. The final shaping should be viable to allow for potential agricultural activities and grazing opportunities post mining. If possible ensure a continuation of the premining surface drainage pattern.							
		Soils	Soil erosion	N	-2	-3	-4	-3	-12	Re-vegetate as soon as possible	N	-1	-1	-2	-1	-5	CbA
			Ripping and topsoil replacement will restore the soil physical characteristics prior to re-vegetation.	P	1	3	4	5	13	Compacted soils will be ripped and topsoil will be replaced. After the topsoil has been replaced the area should be ameliorated and seeded, should self-succession of vegetation not take place. Only species indigenous to the area will be included. The soil fertility status should be determined by soil chemical analysis after levelling (before seeding/re-vegetation. Soil amelioration should be done according soil analyses as recommended by a soil specialist, to correct the pH and nutrition status before revegetation. Where sites have been alienated of vegetation or where soils have been compacted or covered with concretes, these sites will be ripped and ploughed. The topsoil and sub-soils with the appropriate seedbed as stripped during the construction and operational phases will be placed over these areas to a depth as specified by a qualified specialist. The topsoil shall be appropriately ameliorated to allow vegetation to grow rapidly if required – it should be noted that the mine will encourage self-succession of vegetation, if this does not take place effectively a re-vegetation project will be implemented.	P	1	3	5	5	14	CbA
		Terrestrial Ecology (Fauna & Flora)	The rehabilitation of the site will allow reestablishment of natural vegetation.	P	1	2	3	4	10	Compacted soils will be ripped and topsoil will be replaced. After the topsoil has been replaced the area should be ameliorated and seeded, should self-succession of vegetation not take place. Only species indigenous to the area will be included. Remove alien vegetation post decommissioning, with long term follow-up afterwards. On-going AIP control is required through all phases of rehabilitation. If a reasonable assessment indicates that the re-establishment of vegetation is unacceptable slow, the soil need to be analysed and any deleterious effects must be corrected and the area be seeded with a seed mix to specification Access to rehabilitated areas should be restricted to vehicles/machinery specifically required for the implementation of the closure plan.	P	3	3	3	4	13	CbA
		Hydrology	Runoff from rehabilitated areas will impact on watercourses especially during intensive rainstorms especially if the area are not free draining.	N	-2	-1	-3	1	-5	The areas will be landscaped to be free draining in line with the approved storm water management plan. Berms, should they be necessary, must remain upstream and downstream of the areas to ensure that clean water is kept separate from dirty water until the area is free draining and re-vegetation has occurred.	P	3	3	3	4	13	CbA
		Geohydrology	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Name of Activity			Potential Impacts	Rating Prior to Measures						Mitigation Type	Rating Post Measures					Significance	
Activities	Project	Impact Area	Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbA	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM	CvA/R/Ir
		Heritage	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Visual	The rehabilitation (ripping, topsoil replacement and landscaping) will remove the visual incongruity.	P	2	4	4	1	11	An overall visual improvement will be noticed once all mining related infrastructure has been demolished and the area has been landscaped and re-vegetated. Demarcate the decommissioning area and limit the decommissioning activities as far as possible. Final shaping will be implemented such that the final profile of the rehabilitated areas are formed to emulate natural contours of the area. Foundations will be removed to a depth of 500cm below the surface and the area rehabilitated. All material recovered from the demolition of buildings and/or structures will either be transported to a permitted disposal site, or made available to the local community as building materials (provided they are in a satisfactory condition following demolition). Linear infrastructure constructed by the mine (i.e. roads, conveyors and power lines) will be removed if it proves to inhibit land use at decommissioning. All fences erected around the mine will be dismantled and disposed of at a permitted disposal site.	P	2	4	4	3	13	CbA
		Air Quality	All activities associated with the removal of infrastructure has the potential to release dust.	N	-2	-2	-4	1	-7	Dust sampling will be undertaken on a monthly basis. Monthly monitoring reports will be generated by the mine or through a suitably qualified air quality specialist.	N	-2	-1	-3	1	-5	CbA

Name of Activity			Potential Impacts	Rating Prior to Measures						Mitigation Type	Rating Post Measures					Significance	
Activities	Project	Impact Area	Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbA	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM	CvA/R/Ir
										In the event that air quality or dust issues are identified based on the monitoring programme, an independent specialist should be appointed to determine the best course of action to ameliorate the situation.							
		Noise	All activities associated with the removal of infrastructure and rehabilitation has the potential to generate noise.	N	-2	-1	-4	3	-4	The removal of all infrastructure is to take place during daytime periods only. Where noise becomes a nuisance, management measures will be investigated and implemented to address these. Machinery with low noise levels and maintained in a good order to be used and to comply with the IFC's Health and Safety Regulations. Speed control measures will be implemented by the mine through the placement of adequate signage. Implement a penalty system for non-compliance to speed control measures and ensure that all workers are made aware of the penalty systems. Gravel roads to be maintained in as good and smooth a condition as possible.	N	-2	-1	-3	1	-5	CbA
		Social	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cessation of Labour Contracts		Geology	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Topography	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Soil, Land Use and Land Capability	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Terrestrial Ecology (Fauna & Flora)	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Wetland	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Hydrology	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Geohydrology	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Heritage	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Visual	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Air Quality	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Noise	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Socio-Economic	Infrastructure areas could benefit the local community.	N	-3	-3	-4	-5	-15	Instead of demolition of certain areas, these areas could be sold off as commercial property for use in the local community. All surface structures, infrastructure and 'hard surfaces' (inter alia, redundant surfaced roads, parking and paved areas) are to be demolished and removed from the disturbed mine footprint; unless an alternative/continued use for any such items is agreed upon, in writing, with the DMRE.	P	3	3	4	4	14	CbA
	All		At this stage, the life of mine is anticipated to be 25 which can be extended by the implementation of the projects. Possible social impacts to be experienced during decommissioning (closure of the mine) could include the following: • Job losses due to mine closure; • Decline in the sustainability of the local economy as a	N	-3	-2	-3	-5	-13	The mine should continue with the skills development programme and Social and Labour Plan commitments to empower the workforce to undertake other economically viable activities. As decommissioning or the replacement of the infrastructure is likely to only take place within approximately 25 years, it is recommended that a detailed Social Impact Assessment be undertaken then to determine the actual impacts on the changing social environment at that stage.	N	-3	-2	-2	-4	-11	CbA

Name of Activity			Potential Impacts	Rating Prior to Measures						Mitigation Type	Rating Post Measures					Significance	
Activities	Project	Impact Area	Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbA	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM	CvA/R/Ir
			result of the loss of employment, household income and capital investments; • Reduced economic activities within the area with subsequent negative impacts on smaller businesses; • A decline in the local economy would also have a direct impact on the financial status of the affected local municipalities. This, and the fact that one of the key role players, such as the mine, falls away, would seriously impede the municipality in exercising its functions in terms of strengthening the Local Economic Development (LED) process; • Negative impact on the revenue base of the local municipalities; • Population changes and 'outflux' of people from the area; • Negative impact on the social fabric and social networks; • A new class of jobseekers targeting other mines in the area; • Inflow of illegal miners creating social, safety, economic and legal problems and risks; • Decrease in the quality of life of the surrounding communities due to the discontinuation of social development support and local economic development programmes; • Possible relocation of families; • Negative impacts on the local schools; • Skilled workers moving out of the area in search of employment elsewhere; • Negative impact on infrastructure development and maintenance; • A change in community infrastructure; • A change in the industrial focus of the area; • Disruptions and nuisance factors associated with the actual decommissioning such as noise, visual and traffic related impacts; • Increased safety risks associated with the decommissioning of the infrastructure; • Possible negative impact on the crime levels due to increased unemployment rate; • Possibility of additional temporary job creation during the decommissioning phase; • Remnants of possible environmental impacts; and • Remaining visual impact as a result of mining.							· In the event of downscaling and subsequent retrenchments, plans should be developed to put measures in place to assist the affected employees to find alternative forms of employment to limit the negative socio-economic impacts in this regard. · Low risk land-uses to be implemented that would avoid any potential health risks, but that would support livelihood and access to land. · Possible surface and groundwater pollution must be avoided in order to avoid regional negative impacts and impacts on nearby mines that continue to operate. · Rehabilitation according to best practices are imperative to avoid windblown dust, water pollution, land degradation and land instability. · The development of a post closure water management and monitoring strategy must receive priority. Closure strategies must be developed to ensure collaboration between Dwarsrivier Mine, the other mines operating in the area and various stakeholders (landowners, municipality, business, community leaders and so forth) in ensuring environmental sustainability and socioeconomic mitigation plans during and post mine closure.							
Waste Management and	All	Geology	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Topography	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Name of Activity			Potential Impacts	Rating Prior to Measures						Mitigation Type	Rating Post Measures					Significance	
Activities	Project	Impact Area	Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbA	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM	CvA/R/Ir
decommissioning of hazardous (also fuels) substances		Soil, Land Use and Land Capability	Spills around the diesel storage areas and product stockpiles may result in the contamination of soils.	N	-1	-2	-4	-4	-11	Any hydrocarbon, effluent or other contaminants should be collected and the soils remediated immediately. A contaminated land assessment should be undertaken at all areas where diesel was stored, as well as where fuel pipelines were placed.	N	-1	-2	-1	-1	-5	R
		Terrestrial Ecology (Fauna & Flora)	No additional impact.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Wetland	No additional impact.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Groundwater	Handling or Hazardous Waste within workshops and general mine area.	N	-2	-2	-2	-4	-10	Clean and Dirty water separation systems should be incorporated in terms of the 2016 SWMP or any approved update thereafter. Waste management training must be implemented on site. Clear signs informing staff of waste management practices must be implemented on site. Hazardous waste handling should only take place within bunded and/or lined areas. Hazardous waste should be removed by a licenced removal company and taken to a suitable and licenced landfill site. Documentation of removal and safe disposal must be available on site.	N	-1	-1	-2	-2	-6	CbA
			Handling of Building Rubble	N	-2	-2	-2	-3	-9	All infrastructure will be removed and rehabilitated, should no alternative use be found for the structures. Foundations will be removed to a depth of 500cm below surface. All building rubble will follow the waste hierarchy and will therefore either be sold for reuse where possible and as a last option be disposed of at a licensed facility suitable for such waste.	N	-1	-1	-2	-2	-6	CbA
			Handling and Storing of Domestic Waste	N	-3	-3	-3	-3	-12	Clean and Dirty water separation systems should be maintained. Waste management training must be implemented on site. Clear signs informing staff of waste management practices must be implemented on site. Groundwater monitoring must be undertaken in such a manner as to ensure that any potential impacts from the site can be detected. Recycling practices must be investigated and implemented on site.	N	-2	-3	-2	-2	-9	CbA
		Surface Water	Handling of Hazardous Waste within workshops and general mine area could contaminate the dirty water storage areas. The water is then reused in the system	N	-3	-2	-2	-4	-11	Clean and Dirty water separation systems should be maintained up until closure. Waste management training must be implemented on site.	N	-1	-1	-2	-2	-6	CbA

Name of Activity			Potential Impacts	Rating Prior to Measures						Mitigation Type	Rating Post Measures					Significance	
Activities	Project	Impact Area	Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbA	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM	CvA/R/Ir
			and could have impacts on the integrity of the storm water system and also the production..							Clear signs informing staff of waste management practices must be implemented on site. Hazardous waste handling should only take place within bunded and/or lined areas. Hazardous waste and contaminated materials should be removed by a licenced removal company and taken to a suitable and licenced landfill site. Documentation of removal and safe disposal must be available on site. Weekly inspections of Storm Water Management Systems must be undertaken. Any blockages or maintenance requirements must be documented and an action plan developed.							
			Handling and Storing of Domestic Waste should have no impact on the surface water resources due to the location of the facility. However, incorrect disposal of waste could hamper the integrity of the storm water system.	N/A	-1	-2	-3	-3	-9	Clean and Dirty water separation systems should be maintained up until closure. Waste management training must be implemented on site. Weekly inspections of Storm Water Management Systems must be undertaken. Any blockages or maintenance requirements must be documented and an action plan developed. Clear signs informing staff of waste management practices must be implemented on site. Recycling practices must be investigated and implemented on site. Building rubble must be disposed of in line with the requirements of the NEMWA. Access control must be strictly enforced.	N	-1	-1	-2	-1	-5	CbA
		Air Quality	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Heritage	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Visual	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Air Quality	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Name of Activity			Potential Impacts	Rating Prior to Measures						Mitigation Type	Rating Post Measures					Significance	
Activities	Project	Impact Area	Potential Impacts	Status	Extent	Duration	Probability	Intensity	SbA	Mitigation Measures	Status	Extent	Duration	Probability	Intensity	SaM	CvA/R/Ir
		Noise	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Social	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-	-

1.j Summary of Specialist Reports

The following table presents the summary of the specialist reports:

Table 80: Specialist Study Outcomes

List of studies undertaken	Recommendations of specialist reports	Specialist recommendations that have been included in the EIA report	Reference to applicable section of report where specialist recommendations have been included.
Soils, Land Use and Capability,	**General Discussion** None of the footprint areas earmarked for the various projects are currently under cultivation or have been utilised for agricultural purposes in the past, with the exception of the proposed Khulu TSF area which has previously been cultivated for subsistence purposes, but has since been laid fallow. Scrutiny of the satellite imagery indicate that the dominant land uses in the surrounding areas are mining and wilderness, with very few residential areas northeast of the Mining Right Area (MRA). No cultivated agriculture was observed within the immediate vicinity of the MRA. Overall, relatively small areas of the footprint areas comprise of arable soils with a moderate potential for agriculture, whilst the rest of the footprint area is located on very shallow soils not considered suitable for agricultural production. The extent of arable Bonheim soils are not considered sufficient for viable cultivated small commercial farming. In addition, low rainfall (less than 600-650mm per annum) further disqualifies the area from being ideal for agricultural production, and high temperatures occurring in this area are also likely to cause crop permanent wilting, thus affecting crop yield. Given these constraints, the extent of the high productivity soils is not considered sufficient for viable cultivated commercial farming. Based on the above-mentioned limiting factors the proposed project is anticipated to have a relatively low cumulative loss of arable land and medium low cumulative loss of natural vegetation for grazing and/or ecological conservation. Livestock commercial farming is not considered an optimum land use for the footprint areas due to the veld being classified as having a low grazing capacity of 6 ha Per Large Animal Unit. **Impact Statement** From a soil, land use and land capability point of view, this project is not regarded as being fatally flawed due to various natural constraints posed by the local soil types and climate for commercial agricultural production, however mitigation measures and recommendations outlined in this document need to be strongly considered and implemented accordingly in efforts to conserve soil resources and general pedological processes important in terms of sustainable development. The proposed Project 2 will most likely result in the clearance of vegetation as part of the construction phase which has the potential to lead to loss of soil through erosion and subsequent loss of land capability. Given the small footprint of this project, the loss of land capability is however not anticipated to be significant, provided that the project footprint remains within the demarcated areas and mitigation measures are implemented during all phases of development. The extent of the access road required for this project will be limited since this project is located adjacent the current TRP mine's new TSF pipeline and service road. The TSF maintenance road will serve as the main access road and as such the impact of the access road will be negligibly low. The proposed Projects 3, 4 & 5 are located within the existing mine operational footprint where soils have already been subjected to significant disturbance associated with mining and related infrastructure. The extension of the existing infrastructure will not lead to a significant losses of land capability given the disturbance that has occurred on the surrounding soils. Impact such as soil erosion, compaction and soil contamination are however likely to occur during the construction phase which will lead to further degradation of the surrounding soils and the subsequent loss of land capability. However, the overall impact significance of the proposed project will be negligibly low, after mitigation measures have been put in place during all phases of development. **Management Measures**	Yes	Refer to Table 76 to Table 79 for the rating of the impacts before and after management measures, with the recommended management measures provided. Section 1.g.v.4 for the Soils, Land Use and Capability Description Section 1.g.vi.3.a.1 and 1.g.vi.4.a.1 for the summary of impacts and management measures Annexure 7: Soils

List of studies undertaken	Recommendations of specialist reports	Specialist recommendations that have been included in the EIA report	Reference to applicable section of report where specialist recommendations have been included.
	The management measures presented in this report, focusses on: - Soil Stripping and Stockpile Management; - Soil Erosion and Dust Emission Management; - Soil Compaction Management; - Soil Contamination Management; and - Loss of Land Capability Management. **Specialist Opinion** It is the opinion of the specialist that this study provides the relevant information to ensure that appropriate consideration of the agricultural resources in the project site will be made in support of the principles of Integrated Environmental Management (IEM) and sustainable development.		
Ecological Assessment	**General Discussion** The proposed five projects are situated within the Savanna Biome and the Central Bushveld Bioregion. The project areas are further associated with the Sekhukhune Mountain Bushveld which is listed as least concern (Mucina & Rutherford, 2006), whilst the National Threatened Ecosystems database (2011) indicated that the project areas are located in the Sekhukhune Mountainlands which is listed as endangered. Based on the results of the field investigation of three broad habitat units were distinguished for the proposed 5 projects: 1. The Sekhukhune Mountain Bushveld, which is considered to be representative of the reference vegetation type (Mucin & Rutherford, 2006); SAS 218221 October 2021 48 2. The Secondary Bushveld, which comprises of old agricultural lands and areas which have historically been cleared during construction and mining activities, which are in a state of secondary succession. This habitat unit is not considered representative of the reference vegetation type; and 3. The Transformed areas, associated with existing gravel roads and the active mining area, comprising of little to no remaining vegetation. Sekhukhune Mountain Bushveld habitat: The majority of Project 2 is located within the habitat unit, with smaller portions of the other project footprint areas being located in this habitat unit. The vegetation structure and floral species composition is representative of the vegetation type as described by Mucina & Rutherford (2006), and as such, is generally considered to be intact and of increased sensitivity. During the assessment, the National Forestry Act (1998) (NFA) listed tree species *Sclerocarya birrea subsp. caffra* was observed in the footprint area of Project 2. The intact vegetation structure supports an increased diversity of faunal species, with the endemic insect species *Pycna sylvia* (Cicada) also being observed. Secondary Bushveld habitat: This habitat unit is associated with areas of historical agriculture as well as areas where vegetation clearance associated with mining took place. Vegetation has been allowed to naturally recovery, however these areas are largely dominated by pioneer and subclimax plant species and of a decreased species diversity. This habitat unit is not considered representative of the reference vegetation type. Faunal species diversity was notably lower in this habitat unit, attributable to the decreased habitat and food resource availability herein. No faunal or floral SCC are expected to occur within this habitat unit. Transformed areas: Associated with existing gravel roads and the active mining area, comprising of little to no remaining vegetation. **Impact Statement**	Yes	Refer to Table 76 to Table 79 for the rating of the impacts before and after management measures, with the recommended management measures provided. Section 1.g.v.5 for the Ecological Description Section 1.g.vi.3.a.2 & Section 1.g.vi.4.a.2 for the summary of impacts and management measures Annexure 8: Ecology

List of studies undertaken	Recommendations of specialist reports	Specialist recommendations that have been included in the EIA report	Reference to applicable section of report where specialist recommendations have been included.
	Prior to mitigation measures implemented, impact significance on faunal habitat and diversity varies between Medium high and Very Low. With mitigation measures implemented, the impacts on the faunal habitat, diversity and SCC can mostly be reduced to Low and Very low. In summary, but are not limited to, the following: - Clearance of vegetation within the footprint areas; - Impacts on Floral and Faunal species of conservation importance; - Impact on Critical Biodiversity Areas (CBAs), Ecological Support Areas (ESAs), a listed Threatened Ecosystem and Protected Areas - Habitat fragmented and resulting in reduced movement of species and reduced dispersal opportunities for plant species; - Increased risk of erosion and poor stormwater management - resulting in loss of soils, the downslope sedimentation of habitat and the consequent loss of habitat beyond the planned footprints; and - Alien and Invasive Plant (AIP) species proliferation and woody encroachment into natural vegetation, displacing indigenous flora and altering favourable habitat conditions for the establishment of indigenous species. **Management Measures** - Habitat Diversity Management; - AIP Management; - Manage Impacts on Floral and Faunal Species of Conservation Importance - Edge Effect Management; - Rehabilitation **Specialist Opinion** It is the opinion of the ecologists that this study provides the relevant information required in order to implement Integrated Environmental Management (IEM) and to ensure that the best long-term use of the ecological resources in the proposed five project areas will be made in support of the principle of sustainable development.		
Freshwater Ecosystems	**General Description** Two primary freshwater ecosystems were identified in association with the five project area, namely the Dwars River, and the Springkaanspruit (a tributary of the Groot Dwars River). Both rivers have been subjected to various impacts relating to ongoing mining activities within the MRA and the greater catchment and are considered moderately modified (Present Ecological State (PES) Category C). The Dwars River is deemed of very high Ecological Importance and Sensitivity (EIS) whilst the Springkaanspruit is of High EIS. No freshwater ecosystems were identified directly within the proposed footprint areas of the Diesel and Emulsion Batching Areas, although the headwaters of two small ephemeral drainage systems are located within 500m thereof. Those ephemeral drainage systems are not deemed at risk from the proposed project and were therefore not assessed in detail, although it is strongly recommended that mitigation measures be implemented throughout all phases of the proposed batching areas to ensure that no risks or impacts are posed by edge effects.	Yes	Refer to Table 76 to Table 79 for the rating of the impacts before and after management measures, with the recommended management measures provided. Section 1.g.v.6 for the Freshwater Ecological Description

<table>
<tr><th>List of studies undertaken</th><th>Recommendations of specialist reports</th><th>Specialist recommendations that have been included in the EIA report</th><th>Reference to applicable section of report where specialist recommendations have been included.</th></tr>
<tr><td></td><td>Impact Statement

There are four key ecological impacts on the watercourses that are anticipated to occur namely:
- Loss of habitat and ecological structure;
- Changes to the sociocultural and service provision;
- Impacts on the hydrology and sediment balance; and
- Impacts on water quality.

The outcome of the DWS Risk Assessment applied to the proposed activities indicated that, provided a high level of mitigation takes place throughout all phases of each project, the risk significance associated with each is ‘Low’, largely due to the distances of most projects from the applicable watercourse. Nevertheless, this does not preclude the necessity for the implementation of well-developed, environmentally sound, site-specific mitigation measures.

Management Measures

The key mitigation measures are summarised below:

- Sound environmental management practices, such as dust suppression, limiting disturbance footprints, alien vegetation management, erosion monitoring and soil management and continued monitoring of ground and surface water quality (amongst others) must be applied to all activities throughout the life of mine to minimise the impact significance of edge effects;
- The construction of sediment traps around the downgradient boundary of all construction areas is strongly recommended to minimise the volume of sediment transported in runoff from the construction site which would ultimately report to the Dwars River;
- The watercourses must be protected against erosion arising from the discharge of stormwater. In this regard, energy dissipating structures should be installed to prevent erosion. Water should also be distributed in a diffuse manner to prevent canalisation;
- With specific regards to the proposed TSF:
  o An Emergency Response Plan must be compiled, and must include the measures below:
    ▪ In the case of failure, as much sediment as possible, contaminated by the spill, must be removed from the point of its source, following the spill path to the affected watercourse. Sediment must be removed until the natural in situ substrate is reached or until a clear change in the sediment colour is reached indicating that the natural soil level has been reached;
    ▪ All silt removed should be returned to the TSF or disposed of at a suitably managed site;
    ▪ Following the removal of the contaminated sediment, it must be ensured the slope of the excavated areas is in line with the natural topography – i.e. a low gradient no more than 1:3;
    ▪ Edge effects must be strictly controlled – for example no removal of sediment must take place beyond the spill pathway;
    ▪ Possible seepage and contamination of the groundwater resources is possible and should be monitored at suitable groundwater monitoring points; and
    ▪ Toxicological monitoring of the receiving environment and of the PCD must occur immediately following the first rain event after rehabilitation and again at the end of the wet season. A suitably qualified aquatic ecologist should make a recommendation concerning the necessity of future monitoring following the assessment.
Specialist Opinion</td><td></td><td>Section 1.g.vi.3.a.4 & Section 1.g.vi.4.a.3 for the summary of impacts and management measures

Annexure 9</td></tr>
</table>

List of studies undertaken	Recommendations of specialist reports	Specialist recommendations that have been included in the EIA report	Reference to applicable section of report where specialist recommendations have been included.
	Based on the outcome of the ecological assessment and risk assessment, provided that strict implementation of cogent, site-specific and general 'good practice' mitigation measures takes place throughout the life of all proposed projects, it is the specialist's opinion that the five projects may be considered for authorisation with the knowledge that the significance of risk to the receiving environment is limited.		
Hydrology	**General Description** The Mean Annual Precipitation (MAP) for the study area is 650mm, with the wettest months occurring from November to January, and the driest months from June to August. The mean annual Symons Pan (S-Pan) evaporation is 1 500mm. The proposed Khulu TSF and Capital Projects are located in quaternary catchment B41G which is situated within the Olifants Water Management Area (WMA). A number of non-perennial drainage lines drain the mountain ridges and hills within the MRA. These non-perennial drainage lines are ephemeral in nature (only flowing for short periods of time in response to high rainfall) and drain into the Klein and Groot Dwars Rivers. The Klein Dwars River flows through the centre of the MRA in a north-easterly direction, whilst the Groot Dwars River flows in a north-westerly direction. These two rivers form a confluence near the north of the MRA, forming the Dwars River, which flows into the Steelpoort River 8.5km northwest of the MRA. The Steelpoort River flows into the Olifants River, 40km north-east of the town of Steelpoort. According to the 1:50 000 topographical map 2430CC Kennedy's Vale, a non-perennial drainage line runs along the north-eastern boundary of the proposed Khulu TSF and PCD site. During the site visit, this area was assessed, and it was noted to be highly disturbed by what appeared to be old stockpiles and borrow pits, possibly from previous road construction in the area. As a result, water is likely to pond in this area and it is therefore highly unlikely that this area functions as a drainage line. Furthermore, the Freshwater Ecological Assessment (SAS, 2021) did not identify this area as a potential watercourse. Surface water quality data was obtained from the Dwarsrivier Chrome Mine Quarterly Environmental Water Quality Report for the period January 2021 – March 2021 (Aquatico, 2021). The following provides a summary of the water quality of the instream receiving environment: - The pH has been alkaline (> 7) and within limits at all monitoring points; - Total Dissolved Solids (TDS) exceeded the WUL limit at all monitoring points and have been particularly elevated at SP4, S2 and S4. The elevated TDS at S2 is most likely from the upstream activities from the other mines in the Klein Dwars River catchment; - Sulphate has been within the WUL limit at all monitoring points except on one occasion at S2 in February 2020; - Nitrate exceeded the WUL limit at S1 – S4 between January 2021 and March 2021. Nitrate has regularly exceeded the limit in the past at S1, S3 and S4, however, between December 2020 and March 2021 levels significantly declined; and - The water quality for all other variables monitored were within the WUL limits. **Impact Statement** No watercourses are located within the 1:100 year floodline or within 100m of the Khulu TSF or Diesel and Emulsion Batching Areas, however, the proposed Main Parking Extension, Access Road Widening and Subway Crossing are located within a 100m horizontal distance of a watercourse (but not within the 1:100 year floodline). The impact assessment indicated that all identified impacts would have a medium significance pre-mitigation, and that these impacts can be mitigated to a low significance should mitigation measures be adhered to. Typical impacts identified include:	Yes	Refer to Table 76 to Table 79 for the rating of the impacts before and after management measures, with the recommended management measures provided. Section 1.g.v.7 for the Hydrological Description Section 1.g.vi.3.a.5 & Section 1.g.vi.4.a.4 for the summary of impacts and management measures Annexure 10: Hydrology

List of studies undertaken	Recommendations of specialist reports	Specialist recommendations that have been included in the EIA report	Reference to applicable section of report where specialist recommendations have been included.

	- Erosion of exposed soils leading to siltation and sedimentation of downslope drainage channels;
	- Potential hydrocarbon spillages washed into downslope drainage channels;
	- Alteration in natural drainage patterns leading to erosion and siltation;
	- Loss of hydrological connection and water quantity;
	- Loss of natural seasonal storage areas; and
	- Loss of water quantity to downstream users. Due to the arid climate this is likely to be a very small to negligible impact.
	
	Management Measures
	
	The following provides a summary of the main recommendations of the study:
	
	- GN704 exemptions must be applied for, for the following proposed infrastructure located within a 100m horizontal distance of a watercourse:
	  o Main Parking Extension;
	  o Widening of an Access Road between South Shaft/Main Offices and Plant; and
	  o Subway Crossing between the Plant and North Mine
	- A clean water diversion berm should be constructed upslope of the proposed Khulu TSF;
	- Clean diversion berms are constructed on the upslope side of the proposed diesel and emulsion batching areas to divert any unnecessary clean water from flowing through these facilities;
	- All diesel tanks must be appropriately bunded. The bunds should have sufficient capacity to contain 110 % of the diesel tank storage capacity and should be operated empty at all times;
	- The area where the transfer of emulsion from the tanker will take place, should be on an impermeable hard surface area, that is sloped to a sump, to capture any possible spills. The sump should be inspected regularly and liquid within the sump disposed of at an appropriate facility;
	- Vegetation clearance should be kept to absolute minimum;
	- Erosion measures such as hessian nets should be employed around working areas when construction is taking place;
	- The Khulu TSF silt trap must be regularly inspected and desilted. Desilted material must be placed temporarily on a lined bunded area and disposed of either back on the TSF or at an appropriate facility; and
	- The PCD must be lined and appropriately sized so as not to spill more than once in 50 years, in accordance with GN704 regulations. The freeboard of the PCD must be monitored daily.
	
	Specialist Opinion
	
	Should the mitigation measures, recommendations and monitoring plans provided in this study be adhered to, then from a surface water perspective, the proposed projects can commence.		

Hydrogeology	**General Discussion** Three aquifers are typically present in the region. These include an alluvial aquifer associated with the floodplains of the Groot and Klein Dwars Rivers; a shallow weathered aquifer present in the upper 15m of the geological succession; and a deeper fractured rock aquifer in the pyroxenites, anorthosites and norites.	Yes	Refer to Table 76 to Table 79 for the rating of the impacts before and after management measures, with the recommended

List of studies undertaken	Recommendations of specialist reports	Specialist recommendations that have been included in the EIA report	Reference to applicable section of report where specialist recommendations have been included.
	The geohydrological specialist study completed for the EIA includes the results of a fieldwork programme geared at obtaining sufficient information with which to characterise the aquifers present. The fieldwork includes a hydrocensus to identify and quantify existing groundwater use near the Khulu TSF footprint. The only private borehole is located 230m northeast of the TSF. A geophysical survey was completed to confirm the locations of perceived faults and dykes that are present near the TSF. A total of seven new monitoring boreholes were drilled on the geophysical targets, including three sets of shallow and deep monitoring boreholes to target the aquifers present and one shallow borehole adjacent to an existing old deep monitoring borehole identified during the hydrocensus. Aquifer tests were completed in the deep monitoring boreholes, while observations were made in the shallow boreholes. The drilling programme and aquifer tests were used to obtain information to characterise the aquifers present. Based on the information evaluated, a north-south trending fault, associated with a replacement pegmatoid body mapped in the underground mine plan, is identified as a preferential flow path to groundwater and therefore also for potential contamination associated with the Khulu TSF. This fault intersects the eastern edge of the TSF. A second southwest-northeast trending fault was also identified and characterised. This fault transects the Khulu TSF footprint and also exhibits enhanced aquifer conditions, which are variable along its strike. A borehole situated down gradient of the Khulu TSF on this fault line was dry at the time of drilling. Groundwater seepage was recorded afterwards in the borehole. This structure may therefore also be considered as a preferential flow path to groundwater, but with less significance compared to the north-south trending fault. A dyke situated east of the Khulu TSF could act as a preferential flow path to groundwater, south of the TSF footprint. In the vicinity of the Khulu TSF, the significance of the preferential flow along the dyke contact is considered less prominent as it does not intersect the footprint area. An analysis of aquifer transmissivities calculated from field data was undertaken. The information suggests that the N-S striking fault is the most prominent preferential flow path to groundwater. Evaluation of monitoring data obtained during aquifer tests suggest that there is limited vertical movement between the shallow weathered and deeper fractured aquifers at the Khulu TSF footprint. Further south in the plant area, high transmissivities were recorded for the N-S striking fault in shallow and deep boreholes. It is thought that contamination from surface enters the fractured rock aquifer in this area. Groundwater flow patterns confirm preferential flow along the N-S striking fault and to a lesser extent along the SW-NW striking fault and the dyke. Groundwater levels measured in shallow boreholes indicate that groundwater follows the topography in the weathered aquifer and discharges towards rivers and streams. Groundwater flow in the underlying fractured rock aquifer is only partially governed by the topography. Preferential flow along geological structures and the impact of mine dewatering also affects the fractured rock aquifer. The average rate of recharge to the aquifers was calculated from groundwater level and rainfall data as around 4% of the mean annual precipitation. This is within the expected range for the aquifers present. Existing groundwater abstraction by Dwarsrivier Mine to supply the operational with potable and process water was taken into consideration during simulations. An assessment of process water quality and rock leach tests completed indicates that the risk of acid mine drainage associated with the operations is low. An analysis of the mine's monitoring database confirms that nitrate is the indicator element for the project. The impact assessment presented in this report is therefore completed at the hand of nitrate concentrations in groundwater.		management measures provided. Section 1.g.v.9 for the Groundwater Description Section 1.g.vi.3.a.6 & Section 1.g.vi.4.a.5 for the summary of impacts and management measures Annexure 11: Hydrogeology

List of studies undertaken	Recommendations of specialist reports	Specialist recommendations that have been included in the EIA report	Reference to applicable section of report where specialist recommendations have been included.
	The latest available groundwater quality sampling data shows that the nitrate concentration in the existing dirty water dams linked to the Plant and the North TSF are comparable and exceed 1,000mg/l. Water quality in the Lower RWD, which is used to supply the plant and will impact on seepage quality in tailings deposited on the Khulu TSF has a nitrate concentration exceeding 1,500mg/l. Groundwater quality data further indicate that the fractured rock already exhibits elevated nitrate concentrations at the Khulu TSF footprint. This contamination is thought to originate in the Plant area and migrate preferentially along the faults and dykes in a northerly direction. Groundwater quality in the shallow weathered aquifer is not impacted at the TSF footprint. An analysis of the rate of contaminant migration in the alluvial aquifer and along the dyke structure confirms similar aquifer permeabilities/transmissivities to those calculated with aquifer testing data. The available dataset was used to conceptualise the aquifers present at the Khulu TSF and generate input for the numerical groundwater flow and contaminant transport model updated and re-calibrated to complete the impact assessment. The source term used to simulate the impact of the project on nitrate concentrations in groundwater was generated from existing monitoring and leach test data. Jones and Wagner calculated the potential rate of leakage through the TSF and PCD liners. This information was incorporated in the groundwater model to complete the impact prediction simulations. <u>Model calibration and sensitivity analysis</u> Model calibration was undertaken with field-measured groundwater levels from the latest monitoring dataset. Both steady state and transient calibration was completed. Calibration results complied with the pre-set calibration criteria set. The results indicate that the model is most sensitive to changes in the permeabilities of the regional geological structures that act as preferential flow paths, including the N-S dyke, the SW-NE fault, the rock matrix and the N-S fault. The level of confidence in the outcome of simulations can be improved if additional monitoring data is obtained to characterise aquifer characteristics. This can be done through ongoing water level monitoring in the existing boreholes as well as monitoring on-site rainfall rates. Modelling further indicates that the contaminant transport model is sensitive to changes in the porosity of the rocks and the geological structures. The porosities used to complete the impact assessment were kept low in order to avoid under-estimating impacts. Adjustments to the porosities were undertaken to match monitoring data. It is however recommended that more work is undertaken to improve the understanding of aquifer porosities to be included in future simulations. **Impact Assessment** The designs and operational life of the Khulu TSF was integrated into the model to complete the geohydrological impact assessment for the project. The estimated impact at the end of the operational phase of the TSF and mine was calculated. An assessment of the no-project option is also included in the report. Three long-term liner scenarios were tested, namely: - **Scenario 1:** Good liner installation for the Khulu TSF and PCD. Exposure to the atmosphere is managed and limited to a minimum, resulting in a life of liner of 280 years. During this time, it is assumed that seepage will be collected above and below the TSF and PCD liner and that this water will be transferred to the PCD. No seepage is therefore expected to infiltrate to the underlying aquifers. This is considered the best case scenario. - **Scenario 2:** Good liner installation for the Khulu TSF and PCD. Exposure to the atmosphere cannot be managed, resulting in a life of liner of 69 years. After 69 years, the liner starts seeping into the aquifers according to the rates presented provided by JAW.		

List of studies undertaken	Recommendations of specialist reports	Specialist recommendations that have been included in the EIA report	Reference to applicable section of report where specialist recommendations have been included.
	- **Scenario 3:** Poor liner installation for the Khulu TSF and PCD. Exposure to the atmosphere cannot be managed, resulting in a life of liner of 69 years. After 69 years, the liner starts seeping into the aquifers at the maximum rate. This is considered the worst case scenario. During simulations, the specifications and findings of the latest overall annual rehabilitation plan for the operations were incorporated. The requirements of the 2018 Groundwater Remediation Strategy were not considered in this report. This strategy will be updated and finalised based on the outcome of fieldwork completed in 2021 and is outside of this project. Groundwater management scenarios will be assessed as part of a separate study during 2022 after which the implementation of the Groundwater Remediation Strategy will be finalised. It is acknowledged that groundwater management measures implemented as part of the remediation strategy will also benefit impacts associated with the Khulu TSF. The simulated plumes presented in this report are delineated by the 30 mg/l nitrate concentration contour. This is equivalent to the long-term average nitrate concentration for the receiving water quality in the Groot Dwars River. Activities upstream of Dwarsrivier Mine already impact on nitrate concentrations, which affect surface water and to some extent groundwater quality in the Dwarsrivier Mine mining area. The South African Drinking Water nitrate standard of 11mg/l is also indicated on simulated plumes as reference. *Impacts on groundwater quality at the end of the operational phase:* - Nitrate contamination in the weathered aquifer will be contained to the Plant and opencast mining areas. Based on the current characterisation of the alluvial and shallow weathered aquifers, it is unlikely that nitrate concentrations in the weathered aquifer would exceed 11mg/l in the vicinity of the Groot Dwars River down-gradient of the Khulu TSF. - No impact on groundwater quality is expected in the vicinity of the Klein Dwars River west and northwest of the Khulu TSF and PCD at the end of the operational phase. - Based on the conceptualisation of preferential groundwater flow in the fractured rock aquifer, the nitrate plume is expected to migrate in a northerly direction along the N-S striking fault. This contamination originates from the plant, historical TSF, dirty water dams, open cast and underground mining areas and not from the Khulu TSF and PCD. *Long-term impacts on groundwater quality if the project is not implemented:* - The simulations indicate that the nitrate plume will recede in the long-term in the weathered aquifer if all sources of contamination are removed at mine closure as part of the rehabilitation programme. - At the Khulu TSF foot, nitrate concentrations are not expected to significantly exceed 11mg/l in the long-term for this scenario. - The impact on the Groot and Klein Dwars River is expected to reduce significantly in the long-term for this scenario. Nitrate concentrations in groundwater reaching these rivers in the weathered and alluvial aquifers are not expected to exceed 11mg/l. - The plume in the fractured aquifer is expected to continue to migrate along the preferential flow paths and to a lesser extent in unfractured rock matrix in the long-term. Nitrate concentrations are however expected to reduce inside the affected area as a result of plume dilution from recharge of fresh rainwater and groundwater throughflow. Over the footprint area of the Khulu TSF, nitrate concentrations are expected to reduce to below 160mg/l on average. *Long-term impacts on groundwater quality associated with Scenario 1:*		

List of studies undertaken	Recommendations of specialist reports	Specialist recommendations that have been included in the EIA report	Reference to applicable section of report where specialist recommendations have been included.
	• Seepage through the TSF and PCD liners are expected to increase nitrate concentrations in the weathered aquifer underneath the Khulu TSF and PCD footprint areas. Nitrate concentrations may increase to above 600mg/l over the footprint areas in the weathered and alluvial aquifers in the long-term. • The nitrate plume is expected to migrate in a north-westerly direction towards the Klein Dwars River in the weathered and alluvial aquifers. At 300 years after mine closure, simulations suggest that it is unlikely that groundwater with nitrate concentrations exceeding 11mg/l would reach the Klein Dwars River from the Khulu TSF and PCD to any significant extent. • The effect of liner failure at the Khulu TSF and PCD on the fractured rock aquifer is not expected to add significantly to the pollution load associated with other Dwarsrivier Mine mining and mineral processing activities. • Nitrate concentrations may increase to above 180mg/l in the fractured rock aquifer as a result of infiltration over the Khulu TSF and PCD footprint areas. This is an estimated 20mg/l increase in concentration compared to the no project option discussed above. • The nitrate plumes originating from the Khulu TSF and PCD are expected to migrate in a northerly direction along the preferential flow paths identified. Contamination along these geological structures is however expected to be dominated by Dwarsrivier Mine mining and mineral processing activities and not significantly as a result of seepage from the Khulu TSF and PCD. • The nitrate plume is expected to migrate more than 900m north outside the Dwarsrivier Mine MRA along the N-S striking in the long-term for this scenario. *Long-term impacts on groundwater quality associated with Scenario 2:* • The extent of the impact on groundwater quality for this scenario is similar to that reported for Scenario 1. The extent of the plume is driven by aquifer parameters like permeability and porosity and to a lesser extent by the concentration gradient for Scenarios 1 and 2. This is due to the fact that the rate of seepage from the Khulu TSF liner for good installation is reported to be comparatively low, which means the concentration gradient from the source to the aquifer is low. • Nitrate concentrations inside the delineated plumes are however expected to increase for this scenario compared to Scenario 1, as the seepage will take place for a longer period of time. The liner failure occurs after 69 years for this scenario, compared to after 280 years for Scenario 1. • In the weathered and alluvial aquifers, nitrate concentrations may increase to above 800 mg/l in the long-term for this scenario. This is an increase of 200mg/l compared to Scenario 1. • The contamination is expected to migrate in a north-westerly direction towards the Klein Dwars River in the long-term. Nitrate concentrations are however not expected to significantly exceed 11mg/l in groundwater reaching the Klein Dwars River in this time. • The nitrate plume in the fractured rock aquifer will migrate preferentially along the N-S striking fault and the other preferential flow paths identified. As reported for Scenario 1, the nitrate plume may migrate more than 900m north along the N-S striking fault outside the Dwarsrivier Mine MRA in the long-term. • Nitrate concentrations in the fractured rock aquifer immediately underneath the Khulu TSF and PCD may increase to above 240mg/l for this scenario. This is an increase of 60mg/l in nitrate concentration compared to Scenario 1. • Nitrate concentrations at the Farm House borehole may decrease to around 170mg/l in the long-term compared to the 200mg/l expected at the end of the operational phase. This is however an increase of around 70mg/l compared to the results of Scenario 1.		

List of studies undertaken	Recommendations of specialist reports	Specialist recommendations that have been included in the EIA report	Reference to applicable section of report where specialist recommendations have been included.
	• Plume movement in unfractured rock matrix is expected to be low. Nitrate concentrations in the fractured rock aquifer immediately down gradient of the Khulu TSF and PCD are not likely to exceed 11mg/l near the Klein Dwars River in the long-term. *Long-term impacts on groundwater quality associated with Scenario 3:* • Liner failure and maximum seepage rates to the underlying aquifers for this scenario is expected to result in a significant negative impact on groundwater quality. With the increased seepage rate, the concentration gradient at the Khulu TSF and PCD footprint will increase significantly, resulting in an accelerated spread of contamination in the long-term. The plume is also expected to migrate radially away from the Khulu TSF footprint area due to the high infiltration rates. A mound in groundwater levels is expected around the footprint in this case. It is noted that the rate of infiltration is significantly high and is most probably not a reality. • The extent of the impact on the weathered and alluvial aquifers is expected to significantly increase for this scenario. Over the footprint area, nitrate concentrations may increase to 1,500mg/l in the long-term. • The plume is expected to migrate in a north-westerly and westerly direction towards the Klein Dwars River. Nitrate concentrations in groundwater reaching the Klein Dwars River are expected to increase to above 30mg/l over a length of 250m along the river. In places, nitrate concentrations in groundwater reaching the Klein Dwars River in the weathered and alluvial aquifers could exceed 200mg/l for this scenario. This is expected to result in a noticeable impact on surface quality in the long-term. • The plume is also likely to reach the Groot Dwars River southwest of the Khulu TSF due to the anticipated radial flow from the footprint area. Groundwater reaching the Groot Dwars River may have nitrate concentrations exceeding 30mg/l over a stretch of around 200m along the river. In places, nitrate concentrations in groundwater may increase to above 150mg/l at the river. This is also expected to result in a noticeable impact on surface water quality in the long-term. • The high seepage rates from the Khulu TSF and PCD are also expected to result in significant vertical flow to the underlying fractured rock aquifer. This is different to the outcome of Scenarios 1 and 2, where the concentration gradient under lower seepage rates did not result in significant impacts on the fractured rock aquifer. • Once the nitrate concentrations reach the fractured rock aquifer, preferential flow is expected along the N-S and the SW-NE striking fault lines. • Over the Khulu TSF and PCD footprint areas, nitrate concentrations may increase to above 1,200mg/l in the fractured rock aquifer for this scenario, which is a significant increase from the impacts associated with Scenarios 1 and 2. • Along the N-S striking fault, nitrate concentrations may exceed 700 mg/l in the long-term. This plume is also expected to migrate more than 1300m north and outside the Dwarsrivier Mine mineral rights area, as indicated. • Nitrate concentrations in the SW-NE striking fault may increase to above 1000 mg/l in the long-term. In addition, a nitrate plume is expected to migrate along this structure in a south westerly direction towards the Groot Dwars River. In the long-term, nitrate concentrations may increase to around 450 mg/l in the fault line at the intersection with the Groot Dwars River. • The groundwater mound that will develop underneath the Khulu TSF and PCD footprint areas is also expected to drive migration of the nitrate plume in the unfractured rock matrix towards the Klein Dwars River west of the site. On the long-term, this could result in an increase in nitrate concentrations in the fractured rock aquifer at the river of more than 30mg/l, possibly as high as 50mg/l. A*n evaluation of the simulated nitrate concentration fluctuation with time indicate the following:*		

List of studies undertaken	Recommendations of specialist reports	Specialist recommendations that have been included in the EIA report	Reference to applicable section of report where specialist recommendations have been included.
	• The residual long-term impact on groundwater associated with other Dwarsrivier Mine mining and mineral processing activities will continue to impact on groundwater quality in the long-term, especially in the fractured rock aquifer. Even if the Khulu TSF and PCD is not constructed, nitrate concentrations are expected to be elevated above the average receiving surface water concentration of 30mg/l in this aquifer. • With the implementation of rehabilitation measures at mine closure aimed at source reduction, the long-term nitrate concentrations in the fractured rock aquifer is expected to reduce by between 100 and 200mg/l in the long-term for no project option and Scenarios 1 and 2. • Similar trends are observed for the weathered aquifer, but at lower concentrations compared to the fractured rock aquifer. This is as a result of preferential groundwater flow associated with the regional faults and dykes targeted in the fractured rock aquifer as part of this study. • Liner failure for Scenario 1 will only impact on groundwater quality 280 years after liner installation, as discussed above. The increased nitrate concentrations in monitoring boreholes around the Khulu TSF footprint as a result of increased seepage rate after liner failure is expected manifest over a period of 40 – 60 years, after which concentrations are expected to plateau at 300 – 400mg/l in the weathered aquifer. • Liner failure for Scenario 2 will impact on groundwater quality 69 years after installation. At this point, nitrate concentrations are expected to increase to 300 – 400 mg/l over a period of 40 – 80 years and start to plateau at concentrations of between 300 – 400mg/l. • The significant impact of liner failure under Scenario 3 is evident from the graphs. It is shown that nitrate concentrations will increase significantly in both the shallow weathered and deeper fractured rock aquifers over a period of 10 – 20 years. In the weathered aquifer, nitrate concentrations may increase to above 1,200mg/l during this period. After the initial rapid increase in concentration, nitrate is expected to plateau at between 800 and 1,300mg/l in the weathered aquifer over a period of 100 years or longer. *Summary of impacts on groundwater quality and the receiving water body* • As discussed above, even without construction of the Khulu TSF and PCD, the existing Dwarsrivier Mine mining and mineral processing activities will continue to impact on groundwater quality in the long-term. Dwarsrivier Mine is in the process of developing and implementing a Groundwater Remediation Strategy that will be designed to reduce nitrate concentrations in groundwater. This strategy will be developed as part of a separate study. • Liner failure under good installation conditions is expected to result in an increase in nitrate concentrations of between 20 and 80mg/l in the long-term. The outcome of Scenario 1 resulted in the least significant impacts on groundwater and the receiving water quality. • If the liners are poorly installed and managed, negative impacts are expected on the receiving water bodies (the Klein and Groot Dwars Rivers) as well as on groundwater quality. Groundwater baseflow to the rivers at the concentrations reported will most likely result in an increase in nitrate concentrations in the rivers. The increased nitrate concentrations in groundwater will result in an unacceptable long-term impact. • Based on the outcome of the assessment, the preferred option in terms of liner design for the Khulu TSF and PCD is Scenario 1. For this scenario, good liner installation will be implemented and the liner will not be exposed to the atmosphere excessively. If this is achieved, the life of the liner is estimated to be 280 years. Simulations indicate that even if the liner fails, long-term impacts on the receiving water bodies are not expected to be significant. **Recommendations** The following recommendations are made:		

List of studies undertaken	Recommendations of specialist reports	Specialist recommendations that have been included in the EIA report	Reference to applicable section of report where specialist recommendations have been included.
	<u>Groundwater management and monitoring programme</u> The results of the impact assessment were used to develop a groundwater management and monitoring programme for the Khulu TSF and PCD. The main objective of the management programmes is to reduce adverse impacts on the receiving water bodies and to prevent further deterioration of groundwater quality at the operations. In order to achieve this, overarching general groundwater management measures are proposed, mostly linked to good house-keeping measures. Specific groundwater management measures to address impacts on groundwater quality are provided. These include: • Finalise the implementation plan for the Groundwater Remediation Strategy for the operations, based on the outcome of fieldwork completed during 2021. The most effective groundwater management strategies must be developed and implemented as part of a groundwater impact assessment study to be completed during 2022. Due to the fact that groundwater quality at the Khulu TSF is affected by preferential flow along regional faults and dykes, it is accepted that the Groundwater Remediation Strategy will also improve groundwater quality at the TSF and PCD in the long-term. • The outcome of the groundwater impact assessment presented in this report indicates that the Scenario 1 liner design is the preferred option to ensure that long-term impacts on groundwater quality are limited. This entails good installation of the liner and limited exposure of the HDPE to the atmosphere. Under these measures, the liner is expected to have a life of 280 years. Once the liner fails, the rate of seepage to the underlying aquifers is minimised with good liner installation. • The liner design must include the above and below liner capture of seepage. Any seepage collected must be diverted to the PCD for containment. • The water level in the PCD must be diligently monitored to avoid spills and/or seepage. If excess water collects in the PCD, this water must be pumped to the Lower RWD for reuse in the mine water balance. • Dwarsrivier Mine must monitor the volumes of water transferred to and from the Khulu TSF and PCD as part of its flow meter monitoring network. Instruments installed to measure flow must be maintained and calibrated to ensure that accurate measurements are made. The data collected from the flow meters must be used to confirm that the assumptions on which this impact assessment are based, remain valid. If significant deviations in terms of water flow volumes are recorded, the impact assessment presented in this report must be re-evaluated, especially in terms of the volume of seepage available for infiltration from the TSF and PCD. • All newly drilled monitoring boreholes must be surveyed to confirm accurate positions and elevations. The coordinates presented in this report were recorded with a hand-held GPS. • Groundwater monitoring must be maintained in all boreholes dedicated to the Khulu TSF. Both groundwater quality and groundwater levels must be monitored in the boreholes according to the strategy below. The information from the monitoring programme must be kept in a spreadsheet. Trends must be analysed to ensure that any exceedances are immediately detected. • In the event of deterioration in groundwater quality, an inspection must be held to identify the source of contamination. Any non-compliances must be rectified immediately to avoid prolonged negative impacts on groundwater. • If any of the monitoring boreholes are destroyed during construction and/or operation of the TSF, these must be placed as a matter of urgency. Of specific concern is the location of boreholes DRM11S and D, which is located on the edge of the Khulu TSF design. These boreholes target the SW-NE trending fault and must be redrilled on this structure if destroyed to ensure efficient monitoring of groundwater in this position.		

List of studies undertaken	Recommendations of specialist reports	Specialist recommendations that have been included in the EIA report	Reference to applicable section of report where specialist recommendations have been included.
	- Additional monitoring boreholes, as detailed below, must be drilled prior to the commencement of construction of the Khulu TSF and PCD to ensure that a baseline can be generated. Based on the outcome of this assessment, three additional groundwater monitoring boreholes are recommended. These include a shallow and deep monitoring borehole northwest of the PCD. These boreholes must target the fault line indicated in this area, which is perceived to be a preferential flow path to groundwater. The third borehole is a shallow borehole on the north-western corner of the TSF located in the delineated plume of the weathered aquifer. No geological structures are thought to be present in this area. Specific monitoring requirements and trigger response criteria were set for the project. These include monitoring of groundwater levels and quality at the Khulu TSF and PCD, the volumes of water pumped to and from the Khulu TSF and PCD and rainfall. A monitoring trigger-response criteria is set for each monitoring parameter, which must be reviewed on an annual basis and updated as necessary based on monitoring results. If significant exceedances are recorded, appropriate and timeous action must be taken to address these and to limit adverse impacts on groundwater. **Specialist Opinion** Based on the outcome of the assessment, the preferred option in terms of liner design for the Khulu TSF and PCD is Scenario 1. For this scenario, good liner installation will be implemented and the liner will not be exposed to the atmosphere excessively. If this is achieved, the life of the liner is estimated to be 280 years. Simulations indicate that even if the liner fails, long-term impacts on the receiving water bodies are not expected to be significant.		
Air Quality	**General Discussion** The main pollutants of concern at the Dwarsrivier Mine is particulate matter and dust fallout. Particulate matter and dust fallout originate from a variety of sources on-site including loading and unloading, crushing, vehicle entrainment on unpaved roads and wind erosion. **Impact Statement** Sensitive receptors are identified as areas that may be impacted negatively due to emissions from the proposed TSF. Four receptors (villages and dwellings) were identified in the area surrounding the proposed project area, within a 10km radius, and were used for this assessment. Long-term (annual) and short-term (24-hour average) concentrations for the pollutants of concern were compared with the South African National Ambient Air Quality Standards (NAAQS) and dust fallout rates with the National Dust Control Regulations (NDCR) standards. Sensitive receptors are identified as areas that may be impacted negatively due to emissions from the proposed TSF. Four receptors (villages and dwellings) were identified in the area surrounding the proposed project area, within a 10 km radius, and were used for this assessment. PM10 Concentrations - For Scenario 1 (current mining operations) and Scenario 2 (current with proposed TSF) ambient 24-hour (P99) and annual average PM10 concentrations are predicted to be compliant at all sensitive receptors;	Yes	Refer to Table 76 to Table 79 for the rating of the impacts before and after management measures, with the recommended management measures provided. Section 1.g.v.11 for the Air Quality Description Section 1.g.vi.3.a.6.1 & Section 1.g.vi.4.a.6 for the summary of impacts and management measures Annexure 13: Air Quality

List of studies undertaken	Recommendations of specialist reports	Specialist recommendations that have been included in the EIA report	Reference to applicable section of report where specialist recommendations have been included.
	- Changes in predicted PM10 concentrations between Scenario 1 and Scenario 2 are substantial, with a 66% average increase in the 24-hour (P99) concentrations and a 69% average increase in annual average concentrations across all sensitive receptors. However, despite the increase, predicted concentrations at all receptors remain well below the standards during Scenario 2; - Highest predicted 24-hour and annual average off-site concentrations are compliant with the respective standards for Scenario 1. Highest concentrations are predicted on the north-western portion of the mine, predominately around the areas of existing haulage roads; - Highest predicted 24-hour average off-site concentrations during Scenario 2 are non-compliant with the relevant 24-hour standard, due to the close proximity of the new TSF road to the boundary of the mine. However, highest predicted annual average concentrations remain compliant with the standard; and - However, despite the non-compliance predicted for the 24-hour PM10 off-site concentrations (Scenario 2), all concentrations predicted at neighbouring sensitive receptors remain complaint with their relevant standard, as noted previously. PM2.5 Concentrations - For Scenario 1 (current mining operations) and Scenario 2 (current with proposed TSF), ambient 24-hour (P99) and annual average PM2.5 concentrations are predicted to be compliant at all sensitive receptors; - Changes in predicted PM2.5 concentrations between Scenario 1 and Scenario 2 are substantial, with a 72% average increase in the 24-hour (P99) concentrations and a 68% average increase in annual average concentrations across all sensitive receptors. However, despite the increase, predicted concentrations at all receptors remain well below the standards during Scenario 2; and - Highest predicted 24-hour average and annual average off-site concentrations remain compliant with the relevant standards for both scenarios. Dust Fallout - For both scenarios, no exceedances of the dust fallout residential standard are predicted at any of the neighbouring sensitive receptors; - Scenario 1 and Scenario 2 highest predicted off-site dust fallout rates remain compliant with the non-residential standard; and - Overall levels of dust fallout anticipated to occur as a result of the proposed TSF are below the respective National Dust Control Regulations. Cumulative Assessment - During both scenarios, the cumulative concentrations are below the respective 24-hour and annual average standard for PM10 and PM2.5; - Changes in predicted PM10 concentrations between Scenario 1 and Scenario 2 are substantial, with a 24-hour average increase of 66% and annual average increase of 69% across all sensitive receptors; and - Changes in predicted PM2.5 concentrations between Scenario 1 and Scenario 2 are substantial, with a 24-hour average increase of 72% and annual average increase of 68% across all sensitive receptors. **Management Measures** Important mitigation measures to be implemented during mining operations are: - All incoming and outgoing truck loads must be covered;		

List of studies undertaken	Recommendations of specialist reports	Specialist recommendations that have been included in the EIA report	Reference to applicable section of report where specialist recommendations have been included.
	- Use of water sprays at crushing and transfer points; - Continuous wetting of the access road during vehicle transport; - Wetting of exposed stockpiles to limit the dispersion of wind-blown dust and particulate emissions; - Avoid dust generating works during the most windy conditions; and - Frequent wetting of the access roads. In addition to the above, the Visual Impact Assessment recommended the planting of trees along the road to mitigate visual intrusion; this could also aid in the mitigation of dust. **Specialist Opinion** The proposed TSF will result in minimal air quality impacts on nearby receptors. Given the low impacts on the receiving environment, based on the findings of this Air Quality Impact Assessment, it is recommended the proposed TSF be authorised.		
Heritage and Palaeontology	**General Description** Key findings of the assessment include: - The study area is characterised by extensive mining activities; - The survey recorded two areas with historical/recent residential elements (Feature 4 and 6), the remains of Iron Age sites (Features 2,3, and 5) marked by a scatter of ceramics, and a stone cairn (Feature 1) of unknown purpose that although unlikely could possibly indicate a grave site; and - The study area is of insignificant and low paleontological sensitivity and no further studies are required for this aspect. The potential impact of the project on the recorded heritage resources is high prior to mitigation but can be mitigated to an acceptable level. The project can commence provided that the recommendations in this report are adhered to, based on the South African Heritage Resource Authority's (SAHRA) approval. **Impact Statement** Impacts to heritage resources are permanent and irreversible. Based on the high significance of burial sites (Feature 1) the impact will be high if it is confirmed to be a grave. If the feature is not a grave it is of no heritage significance. Features 4 and 6 (possible labourer dwelling and structural remains) is of low heritage significance (unless proven that there are graves) and the impact will be low, unless the presence of graves is confirmed, if this is the case the graves will be of high social significance. Features 2, 3 and 5 is of medium significance and with no mitigation measures the impact will be medium to high. With the implementation of the correct mitigation measures at each feature the impact can be mitigated to an acceptable level. **Management Measures**	Yes	Refer to Table 76 to Table 79 for the rating of the impacts before and after management measures, with the recommended management measures provided. Section 1.g.v.13 for the Cultural, Heritage, and Paleontological Description Section 1.g.vi.3.a.9 & Section 1.g.vi.4.a.8 for the summary of impacts and management measures Annexure 12: Heritage

<table>
<tr><th>List of studies undertaken</th><th>Recommendations of specialist reports</th><th>Specialist recommendations that have been included in the EIA report</th><th>Reference to applicable section of report where specialist recommendations have been included.</th></tr>
<tr><td></td><td>

The stone cairn of unknown purpose at Feature 1 should be avoided with a 30 m buffer. If this is not possible it should be confirmed whether this is a grave through stakeholder consultation/ Ground Penetrating Radar/ Test Excavations and if confirmed to be a grave it should be relocated as per all the relevant legal requirements;
Features 2,3 and 5 should be shovel pit tested (with the required mitigation measures and permit) to determine the presence of subsurface deposit after which a destruction permit can be applied for;
The lack of graves at Features 4 and 6 should be confirmed prior to construction by the social team and monitored during construction; and
A chance find procedure for the project should be developed and implemented.

Specialist Opinion
The overall impact can be mitigated to an acceptable level. Residual impacts can be managed to an acceptable level through implementation of the recommendations made in this report. The socio-economic benefits also outweigh the possible impacts of the development if the correct mitigation measures are implemented for the project.
</td><td></td><td></td></tr>
<tr><td>Visual</td><td>
General Description
Due to the limited infrastructure height of the capital projects (establishment of Diesel and Emulsion Batching infrastructure, Main Parking Extension at the mine, Widening of an Access Road and an Access Crossing between the Plant and North Mine), the focus of the Visual Impact Assessment is solely on the proposed TSF.
The following were the main findings of the study:

The regional topography can be described as undulating with numerous mountain ridges and valleys;
The study area falls within the Sekhukhune Mountain Bushveld with vegetation characterised as open and closed broad leafed savannah on hills and mountain slopes (Mucina & Rutherford, 2006). According to the 2018 South African National Land Cover map (GeoTerraImage, 2019), the land cover of the study area consists mostly of grassland, forested land, cultivated areas and mining areas;
The landscape of the study area can be broadly divided into two main categories:

Natural areas – consisting of natural bushveld areas; and
Mining areas – consisting of mine dumps, bare areas and mine infrastructure.

The visual receptors identified within the study area include:

Houses;
Lodges; and
Motorists travelling on roads within the study area.

The natural mountainous bushveld sense of place has largely been converted into a mining landscape by the existing mines in the area;
The cultural landscape of the region is characterised by a rural area that has extensively been disturbed by mining activities and in the recent past by agricultural activities.

Impact Statement
The following were the main findings of the study:
</td><td>Yes</td><td>
Refer to Table 76 to Table 79 for the rating of the impacts before and after management measures, with the recommended management measures provided.
Section 1.g.v.10 for the Visual Description
Section 1.g.vi.3.a.8 & Section 1.g.vi.4.a.7 for the summary of impacts and management measures
Annexure 14: Visual
</td></tr>
</table>

List of studies undertaken	Recommendations of specialist reports	Specialist recommendations that have been included in the EIA report	Reference to applicable section of report where specialist recommendations have been included.
	• Viewshed modelling indicated that the proposed Khulu TSF will affect much of the same area and visual receptors that are already visually disturbed by the existing TSFs in the area; • The visual quality of the area prior to any mining activities would have been high, with the bushveld and mountainous landscape that would have fully characterised the area. However, much of this has been converted and the dominant land use in the area is now mining. The remaining bushveld and mountainous backdrops still provide scenic views, and for this reason, a medium scenic quality was assigned to the study area. • In terms of the Visual Absorption Capacity (VAC), the mountainous terrain on either side of the Dwars River conceals views of the Khulu TSF to within the valley. The vegetation immediately surrounding the Khulu TSF site is fairly open, as this area was previously used for agriculture, and therefore, the vegetation will provide very little cover to conceal the proposed TSF. Further away from the TSF, particularly along the rivers, thicker vegetation occurs, which will conceal views of the TSF. Taking into account the general vegetation and topography of the study area, the VAC was determined to be moderate; • Due to a number of existing TSFs in the area, as well as other mine infrastructure, the visual intrusion of the proposed Khulu TSF in the landscape was determined to be low; • The viewer sensitivity of the proposed TSF from farmhouses in the area was determined to have a moderate sensitivity, as the area is already dominated by mining activities. Motorists travelling on the main roads in the area will pass a number of mining activities other than the proposed TSF, and the lodges in the area provide accommodation for people working on the mines and are therefore dependent on the mines. The viewer sensitivity of motorists and the lodges was determined to be low; and • The impact assessment indicated that all impacts would have a medium significance pre-mitigation, with most achieving a low significance post-mitigation. **Management Measures** • Vegetation clearance should be kept to an absolute minimum. • Exposed areas should be vegetated as soon as possible. • Dust suppression measures should be implemented to limit the generation of dust. • Trees should be planted along the main roads to conceal the TSF from motorists. • There are no real mitigation measures as the TSF will increase in height and will be approved for a certain height, however, the TSF should be vegetated as soon as practicably possible and should not exceed the approved height. • In terms of closure, The TSF should be vegetated to blend into the surrounding area. **Specialist Opinion** The natural bushveld landscape of the area has already been altered by mining activities. The proposed mine infrastructure is in line with the current land use and will add to the already altered landscape. It is not foreseen that the current visual quality of the area will be significantly altered by the proposed Khulu TSF. It is therefore the opinion of the specialist that the project can commence, provided that the recommendations and mitigation measures provided are implemented.		
Socio Economic	**General Description** The area falls under the jurisdiction of the Sekhukhune District and the Fetakgomo Tubatse Local Municipality.	Yes	Refer to Table 76 to Table 79 for the rating of the impacts before and after management measures, with

<table>
<tr><th>List of studies undertaken</th><th>Recommendations of specialist reports</th><th>Specialist recommendations that have been included in the EIA report</th><th>Reference to applicable section of report where specialist recommendations have been included.</th></tr>
<tr><td></td><td>According to the recent official demographic survey results (2016), the Fetakgomo Tubatse Local Municipality has a total population of 490 381 people (Statistics South Africa Community Survey, 2016).

There is overwhelming strong statistical evidence that the population is growing at an exponential rate. There are more females 251 923 (51%) than males 238 458 (49%) in the population pyramid. Of the total population within the Fetakgomo Tubatse Local Municipality, 223 214 are young people. The youth thus represent 46% of the total population figure.

The Dwarsrivier Mine falls within Ward 27 of the Fetakgomo Tubatse Local Municipality and has a population of 12 527 (Statistics from 2011). Ward 27 has the following villages: Moshate, Tsakane, Kalkfontein, Mabelane, Makakatela, Kutullo A&B, Shushumela & Matepe, Kutullo C&D, Dithamaga and Madibeng.

The main economic sectors within Fetakgomo Tubatse Local Municipality include agriculture, mining and quarrying, trade, tourism, manufacturing, general government, community, social and personal services, catering and accommodation.

Impact Statement

During the construction phase the following <u>negative impacts</u> could occur:
Possible visual impacts on neighbouring landowners/operators; although it is not anticipated that the possible visual impacts would differ significantly from the existing visual impacts created by the mining activities;
Intrusion impacts (although limited) as a result of the increased traffic flows and movement of workers to and from the construction sites;
Increase in nuisance factors (e.g. noise, dust/air pollution) especially with regards to the extension of the main parking area due to the proximity to the office complex, with limited off-site intrusions;
Possible impact on existing infrastructure and servitudes;
Possible impact on traffic flow on Sekhukhune Road when the access crossing between the existing Plant and the North Mine will be constructed with subsequent intrusion impacts; and
Safety and security risks due to movement of heavy vehicles and machinery.
During the operational phase the following negative impacts could occur:
Safety and security risks related to general mining activities and the new TSF;
Nuisance factors (e.g. increase in fallout dust and noise disturbances);
Negative visual impacts with impacts on the sense of place, although the character of the area would not change as mining is already taking place at different sites within the larger study area;
Potential negative impact on surface water pollution and groundwater pollution if leachate and seepage are not effectively contained. This could have negative downstream impacts on communities reliant on water from the river or boreholes;
Health related risks due to possible water pollution, dust pollution, emissions, migrant employees bringing health risks, and nowadays the threat of Covid-19 infection, to mining areas or small towns, as well as the storage of hazardous substances; and
Impact on daily movement patterns at the mine and surrounding area.</td><td></td><td>the recommended management measures provided.

Section 1.g.v.14 for the Socio-Economic Description

Section 1.g.vi.3.a.10 & Section 1.g.vi.4.a.9 for the summary of impacts and management measures

Annexure 15: Socio-Economic</td></tr>
</table>

<table>
<tr><th>List of studies undertaken</th><th>Recommendations of specialist reports</th><th>Specialist recommendations that have been included in the EIA report</th><th>Reference to applicable section of report where specialist recommendations have been included.</th></tr>
<tr><td></td><td>
During the decommissioning phase the following negative impacts could occur:

Reduced economic activities within the area with subsequent negative trickle-down economic impacts;
Negative impact on the revenue base of the local municipality;
Loss of jobs and income of households due to closure; and
Reduced or no benefits to the local communities experienced through the Mine’s Social and Labour Plan (SLP).

The <u>positive impacts</u> associated with the proposed project include the continuation of employment during the operational phase and some employment creation as part of the various construction activities. This could also have potential positive impacts on the adjacent local area. Dwarsrivier Mine will further continue with local procurement, capacity building and the overall socio-economic development within the area. Targets for the procurement of capital goods, consumer goods and services should be set and Dwarsrivier Mine can develop an action plan to meet these targets.
No negative social impacts that could be classified as fatal have been identified and there are also no impacts of such a high significance that they could prevent the project from continuing. It is thus concluded that the proposed project is acceptable from a social point of view, provided that mitigation measures are implemented.
Management Measures

Mitigation and enhancement measures proposed should be noted as recommendation measures and should be included as part of the EMPr.
The use of local labour, if any additional labour would be required, should be maximised as it could assist in mitigating various other social impacts, but would also enhance the potential benefits of the proposed project to the local community members.
Local procurement, especially during the operational phase, would have various trickle down positive socio-economic impacts on the beneficiary communities and local businesses. This aspect should thus be pursued as far as possible.
Capacity building and skills training among employees are critical and would be highly beneficial to those involved, especially if they receive portable skills to enable them to also find work elsewhere and in other similar environments.
Local residents, with the focus on the surrounding landowners and communities, should receive accurate information with regards to the project status, timeframes for construction and other relevant information about issues that could influence their daily living and movement patterns.
Socio-economic issues and concerns could arise during the implementation of the project. These should be thoroughly dealt with taking the sensitivities into consideration.

Specialist Opinion
From a social perspective it can be concluded that the socio-economic benefits associated with the project outweigh the negative social impacts. The negative impacts can be successfully mitigated if appropriate and successful environmental management, as well as the strict implementation of pro-active mitigation and management measures are applied.
The proposed Dwarsrivier Mine Khulu TSF and Capital Project can thus be supported. It is recommended that the development of these projects be approved by the relevant authorities.
</td><td></td><td></td></tr>
</table>

1.k Environmental Impact Statement

1.k.i Summary of the Key Findings of the Environmental Impact Assessment

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

1.k.i.1 Other License Requirements

A Water Use Licence Application (WULA) has been initiated with the DWS on the EWULAAS system. No activities will be undertaken without the necessary approvals.

The WUL will not only cater for this project, but will be an update of the overall mine WUL to correct all changes and administrative errors. For this project, the following activities may trigger water uses as indicated:

- Section 21c&i applications where these activities are located within the 500m and 100m riparian buffer zones: 100m specifically relates to the Main Parking Extension, Widening of the Access Road and the Subway crossing between the plan and north mine.
- Section 21g for the construction of the TSF and associated infrastructure (PCD).

1.k.i.2 Khulu TSF

The Khulu TSF will require the following approvals from the DWS in terms of the NWA:

- Section 21(g) for the disposal of a waste (PCD and TSF);
- Section 21(c) and (i) for placement within 500m of a riparian zone (TSF; pipeline, filter press)

In terms of the NHRA, the following will be required:

- The stone cairn of unknown purpose at Feature 1 (west of proposed PCD) should be avoided with a 30m buffer, if this is not possible it should be confirmed whether this is a grave through stakeholder consultation/Ground Penetrating Radar/ Test Excavations and if confirmed to be a grave it should be relocated as per all the relevant legal requirements. The lack of graves at Feature 6 (proposed TSF) should be confirmed prior to construction by the social team and monitored during construction. Should this be determined a grave two options must will be followed:
    - Excavation permits will be applied for; or
    - 30m buffer zone (as recommended by the HIA report as no blasting or invasive activities is planned with the construction the TSF)) must be adhered to in order to conserve the cemetery against any potential damage during construction. A social consultation process in terms of Chapter XI of the NHRA Regulations, must be carried out to identify the descendants of the burials and to obtain permission to fence in the identified cemetery. If the mine is unable to retain the grave in situ the permission must be obtained from the families of the deceased, if they agree to the relocation of their graves then a section 36 of the NHRA permit application must be logged on SAHRIS.
- Feature 5 (south of proposed TSF) should be shovel pit tested (with the required mitigation permit) to determine the presence of subsurface deposit after which a destruction permit can be applied for.

1.k.i.3 Diesel and Emulsion Dispatching Area

The Diesel and Emulsion Area will require the following approvals from the DWS in terms of the NWA:

- None

In terms of the NHRA, the following will be required:

- The lack of graves at Feature 4 should be confirmed prior to construction by the social team and monitored during construction. Should this be determined a grave two options must will be followed:
    - Excavation permits will be applied for; or
    - 30m buffer zone (as recommended by the HIA report as no blasting or invasive activities is planned with the construction the TSF)) must be adhered to in order to conserve the cemetery against any potential damage during construction. A social consultation process in terms of Chapter XI of the NHRA Regulations, must be carried out to identify the descendants of the

burials and to obtain permission to fence in the identified cemetery. If the mine is unable to retain the grave in situ the permission must be obtained from the families of the deceased, if they agree to the relocation of their graves then a section 36 of the NHRA permit application must be logged on SAHRIS.

- Feature 2,3 (both at the Emulsion and Diesel Storage) should be shovel pit tested (with the required mitigation permit) to determine the presence of subsurface deposit after which a destruction permit can be applied for.

1.k.i.4 Main Parking Area, Widening of Access Road and Subway Crossing

The Diesel and Emulsion Area will require the following approvals from the DWS in terms of the NWA:

- Section 21(c) and (i) for placement within 500m of a riparian zone (greater area of widening of access road)
- Section 21(c) and (i) for placement within 100m of a Springkaanspruit (Main Parking area; greater area of widening of access road, 50% of subway crossing).

In terms of the NHRA, the following will be required:

- None

1.k.ii Final Site Map

Refer to Figure *3* for the final site map.

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

The demand for chrome has increased globally due to the increase in China Markets. With the current TSF reaching its operational capacity, a new facility is required to ensure ongoing mining and processing practices. Without this facility, the mine will not be able to continue with beneficiation processes and the primary mining activities. This will result in a severe loss of the beneficiation of chrome and optimal mining of chrome in terms of the approved Mining Works Programme, income to the local municipality, loss of employment opportunities, and loss of opportunities in terms of the Social and Labour Plant contributions the mine is making into the Local Municipality.

The other Capital Projects are required for the safe and logistically efficient operation of the mining operations.

No fatal flaws or impacts which cannot be mitigated or managed have been identified in this Environmental Impact Assessment

Please refer to Section 1.g.vi.3 for a detailed discussion of the potential impacts identified. Also consider the concise summary of the specialist outcomes provided in Table 80.

1.k.iii.1 Direct Impacts during the Planning Phase

The key impacts to be managed during the Planning Phase to ensure that the Construction Phase can proceed includes:

- Obtain approval from the DWS for all Water Uses triggered by this project;
- Pro-active management of groundwater resources, by the implementation of groundwater remediation studies as recommended in the Hydrogeological Report (Annexure 11);
- Pro-active management of the ecological character, by conducting site walk overs and applying for the required tree and plant removal permits where required.
- Loss of heritage resources, by not pro-activity investigating the specific status of the identified areas of concern as per the Heritage Assessment (Annexure 12);
- In relation to the above point it is important to consult with the owners of the graves prior to any decision made in terms of protection and/or excavation;
- Risk with the placement of the PCD in an area previously undermined by a neighbouring mine;
- Risk on the TRP pipeline route, without proper planning of the construction activities associated with the Diesel and Emulsion Batching area.

1.k.iii.2 Direct Impacts during Construction

The main impacts during the construction phase includes:

Topography:

- Changes to the topography could lead to unstable land, resulting in increased erosion.

Soils (no fatal flaw or activity which cannot be managed to reduce or avoid impacts has been identified):

- Loss of soil and future land capability should topsoil stripping not be optimised;
- Loss of soil due to erosion taking place should the necessary stabilising and water management structures not be included into designs;
- Soil compaction and loss of land capability, should activities not be strictly demarcated;
- Soil contamination due to poor management of hydrocarbons, construction phase and other dangerous goods.

Ecology (no fatal flaw or activity which cannot be managed to reduce or avoid impacts has been identified). Direct impacts on floral habitat and species diversity will be greatest during the construction phase, with secondary impacts from poorly managed edge effects (e.g., AIP proliferation, disturbed areas left unrehabilitated and erosion) to be most significant during the operational and maintenance phases:

- Clearance of floral species within the proposed footprint areas as well as nationally and provincially protected floral species;
- Habitat fragmented and reduced dispersal opportunities for plant species as the disturbed / impacted areas will be less attractive to faunal species who are important mechanisms for seed dispersal;
- Increase risk of erosion and poor stormwater management - resulting in loss of soils, the down-slope sedimentation of habitat and the consequent loss of habitat beyond the planned footprint; and
- AIP proliferation and woody encroachment into natural vegetation, displacing indigenous flora and altering favourable habitat conditions for the establishment of indigenous species.
- The SCC recorded on site (*Sclerocarya birrea subsp. caffra*) (Marula Tree) is protected under the NFA. Additionally, there is an increased chance that several other NFA and LEMA listed floral SCC may occur within the footprint area:
    - Boscia foetida (NFA, LEMA) (Shepherds Tree);
    - Lydenburgia cassinoides (NFA) (Sekhukhuni Bushman' Tea Tree);
    - Aloe castanea (LEMA) (Cat's Tail Aloe);
    - Chlorophytum cf. cyperaceum (Anthericum cyperaceum) (LEMA); and
    - Euphorbia spp (LEMA).
        - Without mitigation implemented, the anticipated impact significance on floral SCC communities varies between Medium Low and Very Low. The impacts on SCC are deemed to be mitigatable and thus with mitigation measures implemented, the impact significance can be reduced to Low and Very low significance levels. The proposed five (5) projects are not anticipated to have a high impact on floral SCC and with mitigation measures implemented the impacts can remain localised in extent. Succulents and geophytes are good candidates for rescue and relocation to suitable sites outside of the proposed footprints, either to surrounding natural habitat or to the Dwarsrivier nursery. Woody species are less likely to be successfully relocated, especially larger individuals. Where woody SCC species are to be cleared and not relocated, it must be ensured that the same species are currently being propagated in the nursery. If this is not the case, seeds can be harvested from the surrounding areas and / or from the individuals that will be cleared as part of vegetation clearing activities to be propagated off-site and reinstated as part of rehabilitation activities:
    - Disturbance, fragmentation and alteration of floral SCC habitat;
    - Destruction, removal or harvesting of floral SCC during construction and operational activities; and
    - Potentially poorly implemented and monitored rescue and relocation of SCC or not ensuring that the same species are being propagated in the Dwarsrivier nursery.
- The proposed five (5) projects will impact on a CBA 1 and the Sekhukhune Mountainlands threatened ecosystem, however, following the site assessment this is more accurately only applicable to the PCD of Project 1 and the footprint areas of Project 2. The remaining areas associated with the TSF (Project 1) and Projects 3-5 have all been impacted on and are associated with the active mining footprint. According to the desktop database, a small portion of Project 4 will impact on an ESA however, this

section of the ESA has been degraded in terms of habitat integrity and is located within the active mining area.

Faunal Impacts (no fatal flaw or activity which cannot be managed to reduce or avoid impacts has been identified). Direct impacts on faunal habitat and species diversity will be greatest during the construction phase with secondary impacts stemming from poorly managed edge effects and potential hunting/snaring of species during this phase:

- Clearance of habitat leading to the displacement of faunal species;
- Habitat fragmented and resulting in reduced movement of species and potentially reduced dispersal opportunities;
- Increased risk of trapping / snaring and the potential collection for the pet / traditional medicine trade;
- Edge effects such as habitat fragmentation, AIP proliferation and bush encroachment limiting faunal species habitat utilisation
- AIP proliferation and woody encroachment into natural vegetation, displacing indigenous vegetation and altering favourable habitat conditions for faunal species.
- Potential further loss of SCC/protected faunal species and suitable habitat for such species. One SCC was recorded on site, namely *Pycna sylvia* (Cicada) whilst *Python natalensis* (African Python, VU) has also been recorded in the adjacent areas. Panthera pardus (Leopard, Vulnerable, TOPS Listed), *Parahyaena brunnea* (Brown hyaena, NT, TOPS Listed), *Sagittarius serpentarius* (Secretary bird, VU), *Polemaetus bellicosus* (Martial Eagle, VU) and *Neotis denhami* (Denham's Bustard, NT) are also considered to have a medium probability of occurring, however such occurrences are likely to be transitionary and not permanent, as the footprint areas are not sufficient in extent to permanently host these species nor are there sufficient food resources within the five proposed project footprint areas alone to support these species.
- It is unlikely that disturbed areas will be rehabilitated to an ecologically functioning state resulting in significant loss of habitat and species diversity, with reinstatement to pre-mining levels being unlikely.

Freshwater and Hydrological Impacts (no fatal flaw or activity which cannot be managed to reduce or avoid impacts has been identified):

- No activities are planned in the 1:100 year floodline, however the subway crossing, main parking extension and access road between main offices and the plant is located within the 100m watercourse buffer;
- Loss of Habitat;
- Impact on Catchments yield:
  - Due to the small size of the TSF and Capital Projects, the loss of contributing area will be negligible (less than 0.5 %) in comparison to the runoff area of quaternary catchment B41G.
  - According to the 1:50 000 topographical map 2430CC Kennedy's Vale, a non-perennial drainage line runs along the north-eastern boundary of the Khulu TSF site. This area was assessed on the site visit and it was noted that the area was highly disturbed by what appeared to be old stockpiles and borrow pits, most likely from previous road construction in the area. Water is likely to pond in this area as a result of the disturbance, and therefore it is highly unlikely that this area functions as a drainage line.
- Changes to the Sociocultural and Service Provision:
  - Altered vegetation community structure and diversity due to moisture stress and changes to goods and service provision;
  - Decreased ecoservice provision and biodiversity maintenance capacity
  - Reduction in volume of water entering the watercourse, leading to loss of recharge of the watercourse;
- Impacts on hydrology and sediment balance:
  - Exposure of soil, leading to increased runoff, erosion and stream incision, and thus potentially increased sedimentation of the Dwars River;
  - Potential of backfill material to enter the downgradient watercourse, increasing the sediment load of the watercourse
  - Increased flood peaks into the watercourse as a result of formalisation and concentration of surface runoff
- Impacts on Water Quality:
  - Increased sedimentation of the watercourse may lead to smothering of flora and benthic biota and potentially further alter surface water quality;

- Potential impacts on the water quality of runoff which may potentially enter the downgradient watercourse and contamination of soils
- Potential impacts on water quality due to leaks and spills from construction machinery and increased sediment availability.

Hydrogeology:

- No specific impacts associated with the Construction Phase.

Air Quality:

- No significant impacts associated with the Construction Phase.

Visual:

- No significant impacts associated with the Construction Phase.

Heritage and Palaeontology (no fatal flaw or activity which cannot be managed to reduce or avoid impacts has been identified):

- Impacts to heritage resources are permanent and irreversible.
- Based on the high significance of burial sites (Feature 1) (Khulu TSF PCD) the impact will be high if it is confirmed to be a grave. If the feature is not a grave it is of no heritage significance.
- Feature 4 (Diesel and Emulsion Batching Area) and 6 (Khulu TSF) (possible labourer dwelling and structural remains) is of low heritage significance (unless proven that there are graves) and the impact will be low, unless the presence of graves is confirmed, if this is the case the graves will be of high social significance.
- Feature 2 (Diesel and Emulsion Batching Area), 3 (Diesel and Emulsion Batching Area) and 5 (Khulu TSF) is of medium significance and with no mitigation measures the impact will be medium to high. With the implementation of the correct mitigation measures at each feature the impact can be mitigated to an acceptable level.
- It is assumed that the pre-construction phase involves the removal of topsoil and vegetation as well as the establishment of infrastructure. These activities can have a negative and irreversible impact on heritage features if any occur. Impacts include destruction or partial destruction of non-renewable heritage resources.
- During this phase, the impacts and effects are similar in nature but more extensive than the pre-construction phase. Potential impacts include destruction or partial destruction of non-renewable heritage resources.

Noise

- No impact is foreseen as part of the operational phase.

Socio-Economic Impacts (no fatal flaw or activity which cannot be managed to reduce or avoid impacts has been identified):

- Positive Employment and income opportunities during build-up phase
  - For the construction of the Khulu TSF, a total of 64 construction workers would be employed for the whole duration. Forty of these would be contractors. From the total employees required, 12 would be medium skilled (workers with technical qualifications up to grade 12) and 16 would be low skilled (grade 10 and lower).
  - Furthermore, some outside contractors will be involved with specific projects such as the construction of the diesel and batching areas (5 individuals on a part-time basis); main parking extension (5 individuals on a part-time basis), widening of the existing access road (10 full time contractors) and new access crossing (16 full time contractors).
  - A section of the workforce would consist of low skilled workers (e.g. general construction laborer's), as well as medium skilled site operators and skilled supervisors.
  - As existing mining is taking place at Dwarsrivier Mine, some of the above employment opportunities will be filled by existing employees. It is anticipated that a total of 36 new employment positions will be created which will result in positive economic impacts. Dwarsrivier Mine is further committed to source all the individuals falling within the medium and lower skilled categories from the local labour pool, and as many as possible falling within the high skilled category. To enhance the benefit to the local communities, it is recommended that local labour (from within the local municipal area) be procured as far as possible for all levels of skills.

- Community Safety and Security
- Traffic Movement

1.k.iii.3 Direct Impacts during the Operational Phase

Topography (no fatal flaw or activity which cannot be managed to reduce or avoid impacts has been identified):

- Ongoing development of the TSF will lead to an ongoing change in the topography and potential impact on land stability (i.e. increased erosion) if not managed.

Soils, Land Use and Land Capability (no fatal flaw or activity which cannot be managed to reduce or avoid impacts has been identified):

- Loss of soil due to erosion taking place should the necessary stabilising and water management structures not be included into designs;
- Soil compaction and loss of land capability, should activities not be strictly demarcated;
- Soil contamination due to poor management of hydrocarbons, construction phase and other dangerous goods.

Ecology (no fatal flaw or activity which cannot be managed to reduce or avoid impacts has been identified:)

- The establishment of weeds and invasive species.
- Unmanaged fires could lead to loss of faunal and floral species.
- Poaching of animals;
- Harvesting of medicinal plants;
- Accidental death of animals on the existing roads.

Hydrology (no fatal flaw or activity which cannot be managed to reduce or avoid impacts has been identified):

- Contamination of surface water resources. There are no surface water resources in the area where the infrastructure is proposed, however, the natural runoff, which must be managed internally on site could become impacted.

Geohydrology (no fatal flaw or activity which cannot be managed to reduce or avoid impacts has been identified)

- Three (3) scenarios have been assessed in the Numerical Model (Annexure 11).:
  - Scenario 1: Good liner installation for the Khulu TSF and PCD. Exposure to the atmosphere is managed and limited to a minimum, resulting in a life of liner of 280 years. During this time, it is assumed that seepage will be collected above and below the TSF and PCD liner and that this water will be transferred to the PCD. No seepage is therefore expected to infiltrate to the underlying aquifers. This is considered the best case scenario.
  - Scenario 2: Good liner installation for the Khulu TSF and PCD. Exposure to the atmosphere cannot be managed, resulting in a life of liner of 69 years. After 69 years, the liner starts seeping into the aquifers according to the rates presented in Table 56.
  - Scenario 3: Poor liner installation for the Khulu TSF and PCD. Exposure to the atmosphere cannot be managed, resulting in a life of liner of 69 years. After 69 years, the liner starts seeping into the aquifers at the maximum rate. This is considered the worst case scenario.
    - Based on the outcomes of the study, the only option going forward would be the option of Scenario 1.
      - Seepage through liner:
        - Based on a good liner installation, the estimated seepage through the liner to be installed underneath the Khulu TSF is 2.4E-2m^3/d per ha (0.024m^3/ha). If proper quality control is not implemented and the liner system is constructed poorly, this seepage rate may increase to 2.7m^3/d per ha. The Khulu TSF design includes a below liner drainage system designed to collect seepage through the liner and the relieve possible pressure build up under the liner. The below liner drainage system is designed to remove the seepage volumes calculated.
        - Similar calculations were made for the Khulu TSF PCD. The results indicate that the seepage rate through the PCD liner is around 4.7E-1m^3/d per ha (0.47m^3/ha). The below liner drainage system is however designed to remove 23 times more seepage than the

estimated volume. With good installation, no seepage should escape the liner system and therefore no seepage is expected to reach the underlying aquifers.

- Preferential Flow:
    - Preferential flow along the alluvial aquifer, due slightly elevated permeability. This aquifer is associated with the floodplains of the rivers and streams. The Khulu TSF and PCD footprint areas are located on the alluvium. It is however noted that the designs for the facilities take the interception of seepage above and below the liners into consideration.
    - Vertical flow through the soil horizon from surface sources of contamination to the underlying aquifers. The rate at which the vertical flow can take place is governed by the vertical permeability of the soils and the weathered aquifer, which was assumed to be 1/10th of the horizontal permeabilities.
    - Lateral flow through the weathered and alluvial aquifers to the receiving water bodies, which are the rivers and streams down gradient of the mining area. At the Khulu TSF and PCD, the receiving water body is the Groot Dwars River.
    - Vertical flow from the weathered and alluvial aquifers to the underlying fractured rock aquifer. There is no geological evidence that these two aquifers are separated by an impermeable layer. For this reason, it is assumed that the two aquifers are interconnected (however, not a strong interconnection according to the fieldwork).
    - Once the possible contamination reaches the fractured rock aquifer, the preferential flow paths include the N-S and SW-NE striking faults and the contact zone with the N-S striking dyke. The locations of dykes and faults were inferred from Gap Geophysics (2018) and are discussed above. Aquifer testing data from monitoring boreholes that intersect these structures confirm enhanced aquifer conditions.
    - Groundwater will also flow through the rock matrix, but at much lower rates compared to the preferential pathways listed above. Flow in the rock matrix is considered insignificant in the context of this study.
- Receptors
    - Watercourses associated with the rivers and streams, including the Groot and Klein Dwars Rivers.
    - The Farm House borehole identified during the hydrocensus is located up gradient of the Khulu TSF and as such will not be affected by any impacts from the operation and management of tailings deposition in this area. No other private boreholes are located between the Khulu TSF and the Groot Dwars River.
- Anticipated Impacts:
    - During the operational phase, it is assumed that the liner at the TSF and the PCD will remain intact and that seepage from the tailings material will be collected above and below the drains to installed. As such, no significant seepage from the Khulu TSF to the underlying aquifers is expected.
    - Impacts associated with other sources of contamination to groundwater, including the plant, the historical TSF (before it is reworked), the dirty water dams, pit backfill areas and the underground workings are assumed to continue to impact over the life of the operations. It is noted that Dwarsrivier Mine is in the process of developing a groundwater remediation strategy to reduce nitrate concentrations in groundwater in the plant area. This project will be evaluated in a separate study.

- No impact on groundwater quality is expected in the vicinity of the Klein Dwars River west and northwest of the Khulu TSF and PCD at the end of the operational phase.
- Based on the conceptualisation of preferential groundwater flow in the fractured rock aquifer, the nitrate plume is expected to migrate in a northerly direction along the N-S striking fault. This contamination originates from the plant, historical TSF, dirty water dams, open cast and underground mining areas and not from the Khulu TSF and PCD.

Air Quality (no fatal flaw or activity which cannot be managed to reduce or avoid impacts has been identified)

- Increase in PM10, and 2.5, as well as dust fallout from the proposed operations, especially from the TSF associated activities:
  - Ambient 24-hour (P99) and annual average PM10 concentrations are predicted to be compliant at all sensitive receptors. No exceedances were predicted at sensitive receptors with predicted concentrations well below the standard.
    - Maximum predicted 24-hour off-site concentrations are non-compliant with the relevant standard due to the close proximity of the new TSF road to the boundary of the mine. Maximum predicted annual average off-site concentrations remain compliant with the annual standard.
    - However, despite the non-compliance predicted for the 24-hour off-site concentrations, all concentrations predicted at neighbouring sensitive receptors remain complaint with their relevant standard.
  - Ambient 24-hour (P99) and annual average PM2.5 concentrations are predicted to be compliant at all sensitive receptors with the proposed TSF activities. No exceedances were predicted at sensitive receptors, with concentrations remaining below the respective standards.
  - Highest predicted 24-hour and annual average off-site concentrations are compliant with the 24-hour and annual average standard respectively.
  - Highest concentrations are predicted on the north-western portion of the mine, predominately around the areas of the new TSF and TSF road.
  - Maximum daily dust deposition rates as a result of mining and TSF activities were well within the NDCR residential and non-residential standards at all sensitive receptors.
  - Highest predicted daily average off-site dust fallout rates remain compliant with the non-residential standard.
  - Highest predicted dust fallout rates are along the new TSF road close to the boundary of the mine.

Visual (no fatal flaw or activity which cannot be managed to reduce or avoid impacts has been identified)

- The visual quality of the area prior to any mining activities would have been high, with the bushveld and mountainous landscape that would have fully characterised the area. However, much of this has been converted and the dominant land use in the area is now mining. The remaining bushveld and mountainous backdrops still provides scenic views, and for this reason, a medium scenic quality has been assigned to the study area.
- Taking into account the general vegetation and topography of the study area, the VAC was determined to be moderate.
- Due to a number of existing TSFs in the area, as well as other mine infrastructure, the proposed project is in line with the current land use of the area, and will have a low visual intrusion.
- The proposed project will cumulatively add to the historical and active mining in the area. Since the landscape has already been transformed by mining activities, it is not foreseen that the visual quality of the area would be further significantly reduced. The visual quality, will however, be improved once rehabilitation has been successfully implemented.

Noise (no fatal flaw or activity which cannot be managed to reduce or avoid impacts has been identified)

- No further impact is foreseen as part of the operational phase.

Heritage (no fatal flaw or activity which cannot be managed to reduce or avoid impacts has been identified)

- No impact on heritage resources is foreseen. However, change findings must be managed.

Socio-Economic (no fatal flaw or activity which cannot be managed to reduce or avoid impacts has been identified)

- The proposed Khulu TSF and capital projects forms part of the Dwarsrivier Mine's overall objective to ensure continued mining and sufficient supply of their product to chrome markets. The proposed projects will thus assist in achieving this objective as it will improve logistics on site and ensure a proper disposal system for the production requirements.
- Existing employees would continue to be responsible for the overall mining activities. Limited additional temporary workers could over time be required for specific tasks associated with the proposed Khulu TSF and capital projects. When that occurs, new mining activities can then be allocated to appointed specialist contractors.
- The socio-economic impact of the proposed projects would be based on the mine's continued contribution to the Gross Geographical Product (GGP) and the number of direct (continued employment at the mine) and indirect jobs that would be created. Therefore, except for ongoing direct employment, that would generate income and increase local spending, people living in the vicinity of the study area is also expected to benefit by the earnings of those employed by the mine and the local buying power in the area.
- Through employment and income generation during the mining processes, some economic benefits to the region and local communities therefore accrue. The mine would continue to contribute to the local economy through its employee wages, procurement of local contractors and services, purchasing of water and electricity and through payment of taxes to the Fetakgomo Tubatse Local Municipality.

1.k.iii.4 Direct Impacts during Decommissioning and Closure

Generally similar impacts than that of the construction phase will be relevant during the decommissioning and closure phase, with increase potential for encroachment beyond footprint boundaries, which could result in vegetation loss, disturbances to ecosystems and habitat and soil compaction.

The above could result in increased erosion and the associated siltation of watercourses if not managed.

Increase of contractors may also give rise to increase in the potential for poaching and harvesting of medicinal plants.

The main impact however to take note of is the long term impact associated with groundwater (Annexure 11).

A modelling scenario was run to estimate the long-term impact (300 years after mine closure) on groundwater quality if the Khulu TSF project does not go ahead. The following is concluded from the simulations presented:

- The simulations indicate that the nitrate plume will recede in the long-term in the weathered aquifer. Nitrate concentrations are expected to reduce to below 60mg/l in the plant area if all sources of contamination are removed at mine closure as part of the rehabilitation programme.
- At the Khulu TSF, nitrate concentrations are not expected to significantly exceed 11mg/l in the long-term for this scenario.
- The impact on the Groot and Klein Dwars Rivers is expected to reduce significantly in the long-term for this scenario. Nitrate concentrations in groundwater reaching these rivers in the weathered and alluvial aquifers are not expected to exceed 11mg/l.
- Long-term impacts associated with leakage through the North TSF and the associated dirty water dams liners are however expected to impact on groundwater quality in the long-term. A detailed discussion of this impact falls outside the scope of this report.
- The plume in the fractured aquifer is expected to continue to migrate along the preferential flow paths and to a lesser extent in unfractured rock matrix in the long-term. Nitrate concentrations are however expected to reduce inside the affected area as a result of plume dilution from recharge of fresh rain water and groundwater throughflow. Over the footprint area of the Khulu TSF, nitrate concentrations are expected to reduce to below 160mg/l on average.

Scenario 1 (recommended for this project) assumes that the TSF and PCD liners will fail after 280 years. In this event, seepage from the TSF and PCD may reach the underlying aquifers at a rate of 0.024m^3/d per ha.

The following is concluded from the results of the simulations:

- Seepage through the TSF and PCD liners are expected to increase nitrate concentrations in the weathered aquifer underneath the footprint areas. Nitrate concentrations may increase to above 600 mg/l over the footprint areas in the weathered and alluvial aquifers in the long-term.
- The nitrate plume is expected to migrate in a north-westerly direction towards the Klein Dwars River in the weathered and alluvial aquifers. At 300 years after mine closure, simulations suggest that it is unlikely that groundwater with nitrate concentrations exceeding 11 mg/l would reach the Klein Dwars River from the Khulu TSF and PCD to any significant extent.
- The effect of liner failure at the Khulu TSF and PCD on the fractured rock aquifer is not expected to add significantly to the pollution load associated with other Dwarsrivier Mine mining and mineral processing activities.
- Nitrate concentrations may increase to above 180 mg/l in the fractured rock aquifer as a result of infiltration over the Khulu TSF and PCD footprint areas. This is an estimated 20 mg/l increase in concentration compared to the no project option discussed above.
- The nitrate plumes originating from the Khulu TSF and PCD are expected to migrate in a northerly direction along the preferential flow paths identified. Contamination along these geological structures are however expected to be dominated by Dwarsrivier Mine mining and mineral processing activities and not significantly as a result of seepage from the Khulu TSF and PCD.
- In the long-term, nitrate concentrations in the Farm House borehole could reduce to below 100 mg/l from the anticipated 200 mg/l at the end of the operational phase. This borehole is located along a preferential groundwater flow path, which means that long-term plume migration will result in elevated nitrate in this borehole under the rehabilitation measures implemented.
- The nitrate plume is expected to migrate more than 900m north outside the Dwarsrivier Mine mineral rights boundary along the N-S striking in the long-term for this scenario.
- Additional measures to reduce nitrate concentrations associated with the plant and historical TSF areas will be investigated and developed as part of the Dwarsrivier Mine Groundwater Remediation Strategy, which will be undertaken in a separate study. These measures will be focussed on the preferential flow paths identified and will be geared at reducing long-term contamination.

However, should good liner installation be undertaken, but be exposed to atmosphere (reduced liner life of 69 years) the following is expected:

- The extent of the impact on groundwater quality for this scenario is similar to that reported for Scenario 1. The extent of the plume is driven by aquifer parameters like permeability and porosity and to a lesser extent by the concentration gradient for Scenarios 1 and 2. This is due to the fact that the rate of seepage from the Khulu TSF liner for good installation is reported to be comparatively low, which means the concentration gradient from the source to the aquifer is low.
- Nitrate concentrations inside the delineated plumes are however expected to increase for this scenario compared to Scenario 1, as the seepage will take place for a longer period of time. The liner failure occurs after 69 years for this scenario, compared to after 280 years for Scenario 1.
- In the weathered and alluvial aquifers, nitrate concentrations may increase to above 800 mg/l in the long-term for this scenario. This is an increase of 200 mg/l compared to Scenario 1.
- The contamination is expected to migrate in a north-westerly direction towards the Klein Dwars River in the long-term. Nitrate concentrations are however not expected to significantly exceed 11 mg/l in groundwater reaching the Klein Dwars River in this time.
- The nitrate plume in the fractured rock aquifer will migrate preferentially along the N-S striking fault and the other preferential flow paths identified. As reported for Scenario 1, the nitrate plume may migrate more than 900m north along the N-S striking fault outside the Dwarsrivier Mine mineral rights boundary in the long-term.
- Nitrate concentrations in the fractured rock aquifer immediately underneath the Khulu TSF and PCD may increase to above 240 mg/l for this scenario. This is an increase of 60 mg/l in nitrate concentration compared to Scenario 1.
- Nitrate concentrations in at the Farm House borehole may decrease to around 170 mg/l in the long-term compared to the 200 mg/l expected at the end of the operational phase. This is however an increase of around 70 mg/l compared to the results of Scenario 1.
- Plume movement in unfractured rock matrix is expected to be low. Nitrate concentrations in the fractured rock aquifer immediately down gradient of the Khulu TSF and PCD are not likely to exceed 11 mg/l near the Klein Dwars River in the long-term.

if the Khulu TSF and PCD liners are poorly installed and exposed to the atmosphere. Under these conditions, the life of the liner is 69 years. The following impacts are foreseen:

The following is concluded from the simulation results:

- Liner failure and maximum seepage rates to the underlying aquifers for this scenario is expected to result in a significant negative impact on groundwater quality. With the increased seepage rate, the concentration gradient at the Khulu TSF and PCD footprint will increase significantly, resulting in an accelerated spread of contamination in the long-term. The plume is also expected to migrate radially away from the Khulu TSF footprint area due to the high infiltration rates. A mound in groundwater levels is expected around the footprint in this case. It is noted that the rate of infiltration is significantly high and is most probably not a reality.
- The extent of the impact on the weathered and alluvial aquifers is expected to significantly increase for this scenario. Over the footprint area, nitrate concentrations may increase to 1500 mg/l in the long-term.
- The plume is expected to migrate in a north-westerly and westerly direction towards the Klein Dwars River. Nitrate concentrations in groundwater reaching the Klein Dwars River are expected to increase to above 30 mg/l over a length of 250m along the river. In places, nitrate concentrations in groundwater reaching the Klein Dwars River in the weathered and alluvial aquifers could exceed 200 mg/l for this scenario. This is expected to result in a noticeable impact on surface quality in the long-term.
- The plume is also likely to reach the Groot Dwars River southwest of the Khulu TSF due to the anticipated radial flow from the footprint area. Groundwater reaching the Groot Dwars River may have nitrate concentrations exceeding 30 mg/l over a stretch of around 200m along the river. In places, nitrate concentrations in groundwater may increase to above 150 mg/l at the river. This is also expected to result in a noticeable impact on surface water quality in the long-term.
- The high seepage rates from the Khulu TSF and PCD are also expected to result in significant vertical flow to the underlying fractured rock aquifer. This is different to the outcome of Scenarios 1 and 2, where the concentration gradient under lower seepage rates did not result in significant impacts on the fractured rock aquifer.
- Once the nitrate concentrations reach the fractured rock aquifer, preferential flow is expected along the N-S and the SW-NE striking fault lines.
- Over the Khulu TSF and PCD footprint areas, nitrate concentrations may increase to above 1200 mg/l in the fractured rock aquifer for this scenario, which is a significant increase from the impacts associated with Scenarios 1 and 2.
- Along the N-S striking fault, nitrate concentrations may exceed 700 mg/l in the long-term. This plume is also expected to migrate more than 1300m north and outside the Dwarsrivier Mine mineral rights area, as indicated.
- Nitrate concentrations in the SW-NE striking fault may increase to above 1000 mg/l in the long-term. In addition, a nitrate plume is expected to migrate along this structure in a south westerly direction towards the Groot Dwars River. In the long-term, nitrate concentrations may increase to around 450 mg/l in the fault line at the intersection with the Groot Dwars River.
- The groundwater mound that will develop underneath the Khulu TSF and PCD footprint areas is also expected to drive migration of the nitrate plume in the unfractured rock matrix towards the Klein Dwars River west of the site. On the long-term, this could result in an increase in nitrate concentrations in the fractured rock aquifer at the river of more than 30 mg/l, possibly as high as 50 mg/l.

Please refer to Table 59 which presents a summary of the groundwater impact prediction simulations.

1.k.iv Direct Cumulative Impacts

The cumulative impacts are associated with:

- The proliferation of AIP species;
- The Dwars Valley and notably the Sekhukhune Mountain Bushveld vegetation habitat has, over the years, been exposed to significant impacts in terms of vegetation clearance for mining development. This has led to a notable decrease in species diversity and abundance levels in the region. The remaining intact areas are as such becoming of increased importance for the remaining species. The five proposed projects will result in the loss of habitat, pushing species within those areas into the adjacent remaining habitats. This may result in increased competition for space and food resources, potentially leading to further loss of species. It is important to note that the TRP mine has recently constructed a new TSF

pipeline between the two proposed footprints of Project 2, further adding to the cumulative loss of habitat and species displacement in that area. Projects 1 and 3 - 5 are all located adjacent to the current Dwarsrivier active mining footprint and as such, these projects will further add to the cumulative loss of habitat in this area, although much of this habitat has already been somewhat disturbed. Such additional impacts will, however add to potential long term impacts and rehabilitation efforts during mine closure.

- Groundwater impacts, in the event that Scenario 1 is not achieved – i.e. good installation of liner with no atmospheric contact.

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

Please refer to PART B: EMPr (Table 89 to Table 92) for the detailed assessment of impacts and recommended objectives. The key objectives to consider will include:

- The EMPr must be utilised to:
  - Provide sufficient information to strategically plan the activities as to avoid unnecessary social and environmental impacts.
  - Provide sufficient information and guidance to plan activities in a manner that would reduce impacts (both social and environmental) as far as practically possible.
  - Ensure an approach that will provide the necessary confidence in terms of environmental compliance.
  - Provide a management plan that is effective and practical for implementation.

The proposed impact management objectives as referred to in the Table 89 includes:

- To operate within the enviro-legal ambits of South Africa.
- To be aware of the latest environmental legal requirements.
- Limit the impact of the activities on the ecological setting of the area.
- Operate the water management circuit on site to increase mining efficiency and reduce the need for maintenance of these facilities.
- Implement the proposed groundwater remediation study as recommended in the Hydrogeological Report (Annexure 11),
- Limit the loss of soils as far as possible and ensure that the integrity remains during stockpiling for the purposes of successful rehabilitation.
- Remain within the designated area demarcated for activities.
- Remain within the National Environmental Management: Air Quality Act (Act No. 9 of 2004) (NEM:AQA) Dust Regulation guidelines for rural communities.
- Protect heritage resources for future generations.
- Protect the groundwater resources to ensure that limited to no impact on groundwater resources occur as a result of the proposed activities.
- Follow the waste hierarchy approach.
- Protect the integrity of the clean and dirty water management system.
- Return the area to its intended final land use (wilderness land).

The following objectives and targets are proposed for groundwater management at the operations:

- Implement a Groundwater Remediation Strategy with the objective that no further deterioration in groundwater quality occurs at the operations. It is acknowledged that this objective cannot be achieved immediately, as residual impacts on groundwater quality are expected to remain up to mine closure in some areas.
- Implement management plans aimed at reducing adverse impacts on the receiving water bodies.
- Track and record the progress of implementation of all groundwater management measures. This process must be geared at optimising the measures earmarked for implementation from the Groundwater Remediation Strategy.
- Implement sufficient monitoring procedures to measure the effectiveness of groundwater management measures within the delineated zones of influence.
- Analyse the information obtained from all monitoring programmes against compliance targets to establish trends as well as the objectives of the Groundwater Remediation Strategy.

- Should the trends indicate adverse impacts on groundwater levels and/or quality, implement suitable measures within the shortest possible time to remediate and/or eliminate such adverse impacts identified.

Through the implementation of the proposed mitigation measures, it is anticipated that the identified impacts can be managed and mitigated effectively, and the objectives set can be met. Through the implementation of the mitigation and management measures it is expected that:

- The pollution of soil and water resources can be effectively managed through containment.
- Impact on unknown heritage sites can be effectively managed to the implementation of a management protocol in the event that such facilities are encountered.
- Ecological impacts can be managed through the implementation of pollution prevention measures, minimising land clearing, restricting working hours (faunal disturbance), maintaining speed limits on roads and rehabilitation (including control of weeds and invasive species).

1.m Final Proposed Alternatives

Please refer to Section 1.g for the alternatives considered.

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

It is recommended that, due to the importance of the following conditions on the required management measures to address potential impacts, these should be included in the Environmental Authorisation in addition to the general conditions recommended by the Competent Authority:

- Finalise the implementation plan for the Groundwater Remediation Strategy (scheduled for 2022) for the operations, based on the outcome of fieldwork completed during 2021. The most effective groundwater management strategies must be developed and implemented as part of a Groundwater Impact Assessment to be completed during 2022. Due to the fact that groundwater quality at the Khulu TSF is affected by preferential flow along regional faults and dykes, it is accepted that the Groundwater Remediation Strategy will also improve groundwater quality at the TSF and PCD in the long-term. This strategy will be developed as part of a separate study, but the strategy to be implemented must be finalised within six (6) months of the issuance of the Environmental Authorisation, with the implementation of the studies within 12 months from the issuance of the Environmental Authorisation.
- The outcome of the Hydrogeological Report presented in this report indicates that the Scenario 1 liner design, as recommended in the TSF Design Report must be implemented ensure that long-term impacts on groundwater quality are limited.
- Additional monitoring boreholes, as recommended in the Hydrogeological Report, 2022, must be drilled prior to the commencement of construction of the Khulu TSF and PCD to ensure that a baseline can be generated.
- The stone cairn of unknown purpose at Feature 1 (as stipulated in the Heritage Assessment Report, 2021) should be avoided with a 30m buffer. If this is not possible it should be confirmed whether this is a grave through stakeholder consultation/ Ground Penetrating Radar/ Test Excavations and if confirmed to be a grave it should be relocated as per all the relevant legal requirements;
- Features 2, 3 and 5 (as stipulated in the Heritage Impact Assessment Report, 2021) should be shovel pit tested (with the required mitigation measures and permit) to determine the presence of subsurface deposit after which a destruction permit can be applied for.
- The lack of graves at Feature 4 and 6 (as stipulated in the Heritage Impact Assessment Report, 2021) should be confirmed prior to construction by the social team and monitored during construction.

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

The following assumptions, uncertainties and gaps are applicable to this project:

- Specific assumptions are included in each of the specialist reports provided.
- This EIA and EMPr Report is based on existing available environmental information and those presented by the specialists and is considered as true and correct;
- Specific to the groundwater study, the potential liner seepage rates for the Khulu TSF and PCD were calculated by JAW (2021) and considered true and correct. The designs of the facilities include above and below liner drains, which means that all seepage should be captured and removed before it can impact on

aquifers. Scenario modelling will be undertaken as part of this study to estimate the impact of tailings seepage on aquifers should the design measures fail.

- In terms of the Heritage Impact Assessment, it should be noted that due to the nature of heritage resources and pedestrian surveys, the possibility exists that some features or artefacts may not have been discovered/recorded and the possible occurrence of unrecorded graves and other cultural material cannot be excluded. Similarly, the depth of cultural deposits and the extent of heritage sites cannot be accurately determined due its subsurface nature. This study only dealt with the footprint area of the proposed development and consisted of non-intrusive surface surveys. This study did not assess the impact on medicinal plants and intangible heritage as it is assumed that these components would have been highlighted through the public consultation process if relevant. It is possible that new information could come to light in future, which might change the results of this Impact Assessment.
- The project description is based on the information presented by the applicant and is considered as true and correct.

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

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

It is the opinion of the EAP that the activity should regarded favourable and be authorised.

Aim of the Project

Dwarsrivier Mine is serviced by approximately 1,200 permanent and 800 contractor employees. The majority of the employees are locals drawn from Lydenburg and villages around the mine, including Steelpoort Park, Kalkfontein and Buffelshoek.

In terms of the Fetakgomo Tubatse Local Municipality Integrated Development Plan (IDP), mining is regarded as an opportunity offered by the municipality, with the IDP stating that the mining activities and natural resources available in the area have created a definite potential to develop tourism and thereby to diversify the economic base of the municipality. When one further considers the importance of chrome in the global market it should be noted that according to an article by S&P Global Plats, 6 March 2017 (https://www.platts.com/latest-news/metals/tokyo/strong-chrome-demand-to-hold-but-views-divided-26678512), "strong demand for chromite feedstock of ferrochrome will continue to hold on the back of robust Chinese stainless steel output, but views are divided on whether global supply will move into deficit due to constraints of South African production to meet that demand, industry sources told S&P Global Platts Monday". According to the article, "sources said there are two possible scenarios arising from South Africa trying to meet Chinese demand amid stagnated output: the market will be short on chrome ore supply as other global suppliers will not be able to fully meet China's demand, or China will reduce dependency on South African chromite supply and diversify to other resources." According to the Mining Weekly Online (http://m.miningweekly.com/article/strong-outlook-for-recovering-ferrochrome-industry-merafe-2017-03-08/rep_id:3861): "The Chinese economy, on which the ferrochrome and chrome ore markets are heavily dependent, grew by 6.7% year-on-year, underpinning pleasing growth in stainless steel production. Ferrochrome-using stainless steel production is projected to grow by 3.5% in 2017 and by 3.8% in 2018, which should be followed by increased ferrochrome demand."

Project 1: Khulu Tailings Storage Facility

Dwarsrivier Mine is currently depositing tailings material at the existing North TSF to the east of the mine's Beneficiation Plant, located on the remaining portion (Portion RE) of the Farm Dwarsrivier 372KT. It is anticipated that the existing active North TSF will reach its full capacity sooner than anticipated due to tonnage ramp-ups. The existing North TSF was designed to contain production tonnages for 23 years, with 29 000 tonnes received for the first two (2) years of operation and allowing for a deposition rate of 17 280 tonnes per month for the remaining twenty-one (21) years. The deposited tonnage rate was later revised to allow for deposition of 33 500 tonnes per month for the first two (2) years, which is higher than what was originally designed for and is anticipated to reduce the expected life of the North TSF of 23 years. It is anticipated that the existing North TSF will reach its full capacity within the next three (3) to five (5) years. For this reason, additional storage capacity on site is required. The mine therefore proposes the development of a new TSF, to be referred to as the Khulu TSF, in order to accommodate tailings material once the full capacity of the North TSF is reached. In consideration of the above, the overall aim of the proposed activities is to ensure that a well-designed tailings disposal system is operated on site to allow for the production requirements on site.

The mine initially identified seven (7) potential TSF sites, which have since been reduced to three (3) site alternatives, namely Sites B, C and D, with Site B being the most favourable for the mine based on the findings of the engineering and geotechnical studies. Site F was also considered during the specialist investigations, however, this area was excluded from the future assessments due to the distance from the Plant.

The surface areas and anticipated heights of the proposed Khulu TSF that each of the site alternatives can accommodate are as follows (please take note that the heights are approximate heights at this time and will be subject to further design finalisation):

- Site B: 20ha, 42m high;
- Site C: 28ha, 29m high; and
- Site D: 21ha, 49m high.

Project 2: Diesel and Emulsion Batching

The placement of the Diesel and Emulsion Batching Areas were developed in line with the underground mining operations. The placement will ensure the opportunity to directly pipe diesel and emulsion to the underground workings without excessive surface pipeline systems, which could lead to spills.

Project 3: Main Parking Extension

This project is purely for logistical purposes. The current parking area is about 0.8ha with the parking bays not sufficient to cater for the number of vehicles. The current parking area comprises of a paved surface area and steel roof parking bays. The same principle will be applied at the proposed extended area. No new entrances will be required.

Project 4: Widening of Access Road between South Shaft/Main Offices and Plant

This project is purely for safety and logistical purposes. The purpose is to improve the safe operation of traffic on this access road.

Project 5: Access Crossing between Plant and North Mine (Subway Crossing)

This project is purely for logistical purposes. In order to ensure more optimal logistical management of traffic between the South Mine, where the Beneficiation Plant is located and the North Mine, and to reduce the number of vehicles on the regional road, the mine is planning on construction a road under the regional Sekhukhune Road bridge to allow for access between the two areas.

Alternatives Considered:

Alternatives which were assessed as part of this project included:

- Location of the proposed Pollution Control Dam (PCD);
- Location of the TSF;
- TSF Deposition Technology; and
- No go alternatives (i.e. should the projects not be approved).

TSF Location

Based on the outcomes of the site selection currently undertaken for the purposes of this Environmental Scoping Report (ESR), Site (TSF Option) B presents as the most feasible location alternative.

The outcomes of the Site Selection are presented in the table below.

Site Selection Matrix (1 preferred, 3 least preferred)

Discussion	Site B	Site C	Site D
Engineering			
Engineering considerations, including topography	1	3	2
Engineering Outcomes	1	3	2
Environmental			
Soils, Land Use and Land Capability	2	3	1
Terrestrial Ecology	1	3	2
Hydrology/ Surface Water	1	3	2
Hydrogeology	2	3	1
Freshwater Resources (wetlands)	1	3	2

Discussion	Site B	Site C	Site D
Engineering			
Visual Character	3	2	1
Air Quality	2	3	1
Heritage	1	2	3*
Socio-Economic	1	1	1
Ranking	14	23	14
Environmental Outcomes	1	3	1
Combined	1	3	2

The following concluding statements were received from the specialist reports:

Soils, Land Use and Land Capability: From a soil, land use and land capability perspective, Site D is recommended as the preferred site for TSF development, in comparison to the other two (2) TSF alternatives, given the proximity to existing mining infrastructure, thus eliminating the need for significant further disturbance of undisturbed soils in other areas within the mining area.

However, considering the location of Site B and the fact that this is also located in close proximately to the mining activities, it is the view of the EAP that either Site B or D would be suitable options. As a result, Site B is also highlighted for consideration.

Terrestrial Ecology: From a long-term ecological maintenance perspective Site B is deemed to be the preferred option, as this site is already disturbed, is located adjacent to the current mine operations and will not lead to the loss of habitat connectivity. This option does however pose a potential risk to the Groot Dwars River, which needs to be investigated in terms of mitigatory and management requirements.

Hydrology/ Surface Water: The site selection assessment indicated that the most preferred option from a surface water perspective is Site B, followed by Site D and C, respectively, as Site B has no direct impact on watercourse (not located with 1:100 year flood lines).

Hydrogeology: Site B scored similar to Site D and could therefore also be considered as a preferred alternative, provided that the risks identified are managed to avoid or minimise negative impacts on groundwater. The risks associated with Site B include the presence of the alluvial aquifer under or near the TSF footprint, the presence of potential preferential flow paths to groundwater and shallow groundwater level conditions.

Freshwater Resources: The construction of the proposed TSF within Site C or Site D has the potential to have an unacceptably high impact on the watercourse within each respective site. Such impacts may also potentially affect downstream systems. From a freshwater ecological perspective therefore, Site B is the preferred option, as no direct impacts arising from the construction and operation of the TSF within that location to the receiving freshwater environment are anticipated. Nevertheless, indirect impacts, including potential failure of the TSF, could occur and may potentially be detrimental to the Dwars River specifically, if suitable mitigation measures are not strictly implemented throughout all phases.

Visual Character: Site C has the smallest visible area and least number of visual receptors impacted, and is therefore ranked most favourable, followed by Site B and then Site D.

Although Site C is the most favourable in terms of the criteria used to assess the TSF site alternatives, it must be noted that all alternatives fall within an area dominated by mining activities and infrastructure. Due to the visual aesthetics and sense of place of the area being previously altered from rural bushveld to mining, it is unlikely that the implementation of any of the TSF options would result in a significant visual impact.

Air Quality: This study comprises an environmentally conservative/'worst-case' air quality impact assessment and did not find predicted pollutant concentrations to exceed regulated ambient air quality standards. Further, impacts predicted at Site D were anticipated to be the lowest and as such, it is recommended that the proposed TSF be located at Site D.

Heritage and Palaeontology: Initially in terms of the site selection report, Site D was the preferred site from a heritage point of view, but Site B was also considered as this was previously agricultural land. Both Sites B and D have previously been disturbed. For Site D, no heritage resources were identified inside the footprint area of this proposed TSF site alternative. *Subsequent to the site selection and with ongoing consultation with the land claimants, a grave was identified in the footprint of Site D, rendering this site least preferred in terms of heritage considerations, where previously it was considered preferred in terms of this context.* At Site B, the stone wall foundations of a ruin and a possible Early Iron Age site were recorded. The Site B study area is however disturbed, possibly by previous cultivation reducing the significance of the recorded finds. It should be noted that a cemetery occurs on the periphery of Site C, and this area should be demarcated and avoided. From a heritage point of view the heritage sensitivity associated with Site C is considered to be high due to the high number of sites in the impact area and this alternative is not recommended for the proposed development.

Socio-Economic: It is concluded that either Site B, Site C or Site D would be most preferred from a socio-economic perspective.

Pollution Control Dam (PCD) Location

It is important to note that the proposed PCD was previously considered to be located on Portion 6 of the Farm Dwarsrivier or on Portion RE of the Farm Dwarsrivier. The former property is owned by TRP, and to ensure that all activities are placed on land owned by the applicant, this location has therefore been rejected and the proposed PCD site is located on Portion RE of the Farm Dwarsrivier, owned by the applicant.

TSF Deposition Technology

The mine is planning on changing the TSF technology of deposition to a filter press system. The filter press methods involve equipment used in liquid/solid separation. The filter press separates liquids and solids utilising pressure filtration. A slurry/slimes is pumped into the filter press and is dewatered under pressure. The filter cake will be deposited via trucks or a conveyor system onto the proposed Khulu TSF, and water will be recirculated to the Plant or proposed PCD. The filter press will be designed based on the volume and type of slurry that needs to be dewatered. This project will reduce water storage on the facility, which will be advantageous in terms of groundwater and surface water management, as well as giving effect to Water Conservation and Demand principles.

No Go Option

Should the project not be approved (No Go Option) the following implications may arise:

The demand for chrome has increased globally due to the increase in China Markets. With the current North TSF reaching its operational capacity, a new facility is required to ensure ongoing mining and processing practices. Without this facility, the mine will not be able to continue with beneficiation processes and the primary mining activities. This will result in a severe loss of the beneficiation of chrome and optimal mining of chrome in terms of the approved Mining Work Programme, loss of income to the local municipality, loss of employment opportunities, and loss of opportunities in terms of the Social and Labour Plan contributions the mine is making into the Local Municipality.

The other Capital Projects are required for the safe and logistically efficient operation of the mining operations.

Pollution Control Dam (PCD) Location

It is important to note that the location of the proposed PCD previously considered to be placed on portion 6 of the Farm Dwarsrivier or on Portion RE of the Farm Dwarsrivier. The first property is owned by Two Rivers Platinum. To ensure that all activities are placed on land owned by the applicant this position has been rejected and the site is located on Portion RE, owned by the applicant.

TSF Technology

The mine is further planning on changing the TSF technology of deposition to a filter press system. The filter press methods involve equipment used in liquid/solid separation. The filter press separates liquids and solids utilising pressure filtration. A slurry/slimes is pumped into the filter press and is dewatered under pressure. The filter cake will be deposited via trucks or a conveyor system onto the TSF, and water will be recirculated to the Plant or proposed PCD. The filter press will be designed based on the volume and type of slurry that needs to be dewatered. This project will reduce water storage on the facility, which will be advantageous in terms of groundwater and surface water management, as well as giving effect to Water Conservation and Demand principles.

No Go Option

Should the project not be approved (No Go Option) the following implications may arise:

The demand for chrome has increased globally due to the increase in China Markets. With the current TSF reaching its operational capacity, a new facility is required to ensure ongoing mining and processing practices. Without this facility, the mine will not be able to continue with beneficiation processes and the primary mining activities. This will result in a severe loss of the beneficiation of chrome and optimal mining of chrome in terms of the approved Mining Works Programme, income to the local municipality, loss of employment opportunities, and loss of opportunities in terms of the Social and Labour Plant contributions the mine is making into the Local Municipality.

The other Capital Projects are required for the safe and logistically efficient operation of the mining operations.

<u>Outcomes of Impact Statements – Specialist Opinions</u>

Design Considerations in terms of Undermining and Geology

Construction activities will not intercept groundwater.

The TSF footprint area is not mined through or undermined, but the current Dwarsrivier Mine Life of Mine (LoM) plan provided to the TSF Design Engineers indicate that the TSF footprint could be undermined in future. The depth to the underground resource under the proposed TSF footprint varies from 100m on the eastern side of the TSF to 200m on the western side. The impact of the TSF on the future mining was not raised as a concern, and will be taken into account with the design of the future mining activities under the TSF.

A geological fault runs in a north-south direction under the TSF and near its eastern toe. There are exploration boreholes within the infrastructure footprint area that will be sealed prior to constructing the infrastructure.

A toe drain is provided around the toe of the TSF to ensure that no pore pressures build up along the toe of the TSF side slope that could negatively impact the stability of the facility.

Soils Assessment

It is the opinion of the specialist therefore that this study provides the relevant information to ensure that appropriate consideration of the agricultural resources in the project site will be made in support of the principles of Integrated Environmental Management (IEM) and sustainable development.

Ecological Assessment

It is the opinion of the ecologists that this study provides the relevant information required in order to implement Integrated Environmental Management (IEM) and to ensure that the best long-term use of the ecological resources in the proposed five project areas will be made in support of the principle of sustainable development.

Freshwater Ecosystem Assessment

Based on the outcome of the ecological assessment and risk assessment, provided that strict implementation of cogent, site-specific and general ‘good practice’ mitigation measures takes place throughout the life of all proposed projects, it is the specialist’s opinion that the five projects may be considered for authorisation with the knowledge that the significance of risk to the receiving environment is limited.

Hydrology

Should the mitigation measures, recommendations and monitoring plans provided in this study be adhered to, the proposed projects can commence from a surface water perspective,.

Hydrogeological Assessment

Based on the outcome of the assessment, the preferred option in terms of liner design for the Khulu TSF and PCD is Site 1. For this scenario, good liner installation will be implemented and the liner will not be exposed to the atmosphere excessively. If this is achieved, the life of the liner is estimated to be 280 years. Simulations indicate that even if the liner fails, long-term impacts on the receiving water bodies are not expected to be significant.

Air Quality Assessment

The proposed TSF will result in minimal air quality impacts on nearby receptors. Given the low impacts on the receiving environment, based on the findings of this AQIA, it is recommended the proposed TSF be authorised.

Heritage and Palaeontology Assessment

The overall impact can be mitigated to an acceptable level. Residual impacts can be managed to an acceptable level through implementation of the recommendations made in this report. The socio-economic benefits also outweigh the possible impacts of the development if the correct mitigation measures are implemented for the project.

Visual Impact Assessment

The natural bushveld landscape of the area has already been altered by mining activities. The proposed mine infrastructure is in line with the current land use and will add to the already altered landscape. It is not foreseen that the current visual quality of the area will be significantly altered by the proposed Khulu TSF. It is therefore the opinion of the specialist that the project can commence, provided that the recommendations and mitigation measures provided are implemented.

Socio-Economic Assessment

From a social perspective it can be concluded that the socio-economic benefits associated with the project outweigh the negative social impacts. The negative impacts can be successfully mitigated if appropriate and successful environmental management, as well as the strict implementation of pro-active mitigation and management measures are applied.

The proposed Dwarsrivier Khulu TSF and capital project can thus be supported. It is recommended that the development of these projects be approved by the relevant authorities.

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

1.p.ii.1 Specific conditions to be included into the compilation and approval of the EMPr

It is recommended that, due to the importance of the following conditions on the required management measures to address potential impacts, these should be included in the Environmental Authorisations in addition to the general conditions recommended by the Competent Authority:

- Finalise the implementation plan for the Groundwater Remediation Strategy for the operations, based on the outcome of fieldwork completed during 2021. The most effective groundwater management strategies must be developed and implemented as part of a Hydrogeological Study to be completed during 2022. Due to the fact that groundwater quality at the Khulu TSF is affected by preferential flow along regional faults and dykes, it is accepted that the Groundwater Remediation Strategy will also improve groundwater quality at the TSF and PCD in the long-term. This strategy will be developed as part of a separate study, but the strategy to be implemented must be finalised within six (6) months of the issuance of the Environmental Authorisation, with the implementation of the studies within 12 months from the issuance of the Environmental Authorisation.
- The outcome of the groundwater impact assessment presented in this report indicates that the Scenario 1 liner design, as recommended in the TSF Design Report must be implemented ensure that long-term impacts on groundwater quality are limited.
- Additional monitoring boreholes, as recommended in the Hydrogeological Report, 2022, must be drilled prior to the commencement of construction of the Khulu TSF and PCD to ensure that a baseline can be generated.
- The stone cairn of unknown purpose at Feature 1 (as stipulated in the Heritage Assessment Report, 2021) should be avoided with a 30m buffer. If this is not possible it should be confirmed whether this is a grave through stakeholder consultation/ Ground Penetrating Radar/ Test Excavations and if confirmed to be a grave it should be relocated as per all the relevant legal requirements;
- Features 2,3 and 5 (as stipulated in the HIA, 2021) should be shovel pit tested (with the required mitigation permit) to determine the presence of subsurface deposit after which a destruction permit can be applied for.
- The lack of graves at Features 4 and 6 (as stipulated in the Heritage Assessment Report, 2021) should be confirmed prior to construction by the social team and monitored during construction..

1.p.iii Concluding Statement

The projects in question are recommended to ensure an ongoing life of mine in excess of 27 years for Dwarsrivier Mine. Tailings disposal is an integral part of the beneficiation process utilised by the mine. The applicant has initiated studies to determine the best disposal technology and has committed to the disposal of a dried material, achieved through filter press technology. The Capital Projects are recommended to further improve logistical considerations on the mine surface layout, as well as to support mining operations.

In addition to this, the applicant is investigating the option of reprocessing or selling tailings dependent on whether the mine will obtain approval to exclude tailings from the definition of a waste in terms of GNR 715 of the National Environmental Management: Waste Act (Act No. 59 of 2008) (NEMWA) (18 July 2018). This is in an attempt to further improve economic benefits from the facility, but also to reduce the volumes of waste to be disposed to give effect to the National Waste Management Hierarchy.

Based on the outcomes of the specialist studies, no fatal flaws have been identified by the specialists or the EAP. Impacts identified as part of this project, have been proven based on the findings of the various specialist studies to be avoidable, reversible or mitigated by the implementation of the management measures provided in the EMPr.

Financial provision will be made available in the form of a bank guarantee to ensure that the recommended rehabilitation activities be undertaken.

It is the opinion of the EAP that this EIA and EMPr provides the necessary and relevant information required in order to implement the principles of Integrated Environmental Management so as to ensure that the best long-term use of the natural resources in the project footprint areas will be made in support of the principle of sustainable development.

Recommendations of the EAP and specialists have been considered favourably by the applicant and the final project plan has incorporated these recommendations. If the proposed management and mitigation measures are not properly applied or if the applicant intentionally disregards any of these measures, it will negatively affect the environment and have potential consequences, and for this reason it is important that the recommendations for conditions for inclusion as presented in Section 1.p.ii.1 be included should the Environmental Authorisation be considered favourably by the Competent Authority.

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

1.q Period for which the Environmental Authorisation is required

The project is required for the duration of Life of Mine, which may still continue in excess of 27 years. The life of mine for the TSF is planned for about 25 years.

1.r Undertaking

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

1.s Financial Provision

The current available bank guarantees in place are presented in the table below:

Table 81: Available Bank Guarantees

Guarantee no.	Guarantee amount	Guarantee date
LG19069ZA0001441*as amended*	R 119 939 899.71	15 April 2019 (*amended on 23 November 2021*)
LG17296ZA0000481	R 57 892 744.48	3 November 2017
TRN No. M581120	R 44 500 000.00	22 July 2015
	R 222 332 644.19	

Financial provision required for the proposed project has been developed based on the agreed rates as submitted with the 2020 Financial provision submission, with a Consumer Price Index (CPI) inflation of 5.9% levied (http://www.statssa.gov.za/publications/P0141/P0141December2021.pdf). This will be assessed annually in line with the Financial Provision regulations, 2015 (as amended).

A Subtotal 1 Amount of approximately R 14 764 470.92 (excluding VAT), will be required for the purposes of this project.

1.s.i Explain how the amount was derived

Digby Wells Environmental (9Digby Wells) was appointed by Dwarsrivier Mine during 2020 and 2021 to complete the financial provision assessment for the rehabilitation and closure of the mine and in the process also considered the projects being applied for.

1.s.i.1 Method of Assessment

Digby Wells updated the closure costs assessment based on the regulatory requirements encapsulated in the MPRDA for the current closure scenario (unscheduled closure). The quantities calculated and presented in the DMRE model are based on previous assessment undertaken and the site verification visit undertaken in June 2020.

According to the 2018 Financial Provision Report, which was updated by Digby Wells during 2019 and 2020, successful closure depends on setting, continually reviewing and validating and finally meeting closure goals that align with company and stakeholder requirements. There should be minimal residual risk to the environment, and the community should realise benefits that will continue to exist without further involvement from the company. This philosophy was considered in the development of the financial provision for the current mine, life of mine and proposed projects.

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

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

The above vision has been incorporated in the development of the management measures for the proposed projects.

Based on the DMRE Guideline Document mine classification and weightings are as follows:

- The mine is classified as Primary Risk Class A (Chrome Mine, comprising of a Mine, Mine Waste, Plant and Plant Waste);
- High Sensitivity Criteria in terms of Biophysical, Social and Economic considerations;
- Located in an Undulating Terrain, rendering a Weighting Factor 1 of 1.1;
- Located in a Peri-Urban area, rending a Weighting Factor 2 of 1.05.

The closure cost model consists of an input sheet, containing measurements of the infrastructure, a standard rate sheet and a summary sheet, which summarises the costs for closure. The closure cost model calculates the cost of demolishing, removing and rehabilitating each component of the mining area infrastructure. This model was updated with CPI inflation of 5.9% (December 2020 to December 2021) and utilised in the calculation of the proposed project's financial provision requirements.

The current calculated closure cost for the overall mine amounts to R 14 764 470.92 (excluding VAT) (excluding P&Gs, Contingencies and VAT). The cost is derived from utilising the Master Rates as submitted with the accepted 2020 Financial Provision Report, including the CPI inflation of 5.9%;

- Obtainable extent of areas, based on the design drawings of the TSF (JAW, 2021);
- KMZ drawings for the Project 2 to 5.

1.s.i.2 Preliminary Cost Estimation

The following table presents the Financial Provision recommended to be made available for the proposed projects.

Table 82: Financial Provision

Dwarsrivier Mine Khulu and other Capital Projects		Unit:	A	B	C	D	E=A*B*C*D	Comment
			Quantity	Master rate	Multiplication factor	Weighting factor 1	Amount (Rands)	
1	Dismantling of processing plant & related structures (incl. overland conveyors & Power lines)	m^3		R 16,70	1,00	1,10	R 0	
2 (A)	Demolition of steel buildings & Structures (carport)	m^2	6 235,00	R 232,68	1,00	1,10	R 1 595 860	50% of new parking area; 50% of filter press footprint
2 (B)	Demolition of reinforced concrete buildings & structures	m^2	11 919,00	R 342,89	1,00	1,10	R 4 495 644	Bunds for emulsion and diesel, TSF concrete channel, silt trap,

Dwarsrivier Mine Khulu and other Capital Projects		Unit:	A	B	C	D	E=A*B*C*D	Comment
			Quantity	Master rate	Multiplication factor	Weighting factor 1	Amount (Rands)	
								culvert, provision for pump house (concrete bund) at PCD, concreted area for filter press plant
3	Rehabilitation of access roads and parking	m^2	21 826,00	R 41,64	1,00	1,10	R 999 715	Parking, road crossing, emulsion road, haul road, PCD access, Pipeline service road
4(A)	Demolition & rehabilitation of electrified railway lines	m		R 404,14	1,00	1,10	R 0	
4(B)	Demolition & rehabilitation of non-electrified railway lines	m		R 220,43	1,00	1,10	R 0	
5	Demolition of housing &/or administration facilities	m^2	470,00	R 465,37	1,00	1,10	R 240 595	Security Access Building at Batching area, small operating building at filter press
6	Opencast rehabilitation including final voids & ramps	ha		R 236 844,85	**1,00**	1,10	R 0	
7	Sealing of shafts, adits & inclines	m^3		R 124,91	1,00	1,10	R 0	
8(A)	Rehabilitation of overburden & spoils	ha		R 162 631,84	1,00	1,10	R 0	
8(B)	Rehabilitation of processing waste deposits & evaporation ponds (basic, salt producing waste)	ha	25,50	R 202 555,00	1,00	1,10	R 5 681 668	TSF and RWD
8(C)	Rehabilitation of processing waste deposits & evaporation ponds (acidic, metal-rich waste)	ha		R 588 315,76	**1,00**	1,10	R 0	
9	Rehabilitation of subsided areas	ha		R 136 179,67	1,00	1,10	0	
10	General surface rehabilitation	ha	8,00	R 128 831,84	1,00	1,10	R 1 133 720	Parking, emulsion, diesel, road crossing, pipelines, topsoil dump
11	River diversions	ha		R 128 831,84	1,00	1,10	R 0	
12	Fencing	m	721,00	R 146,96	1,00	1,10	R 116 552	Emulsion and diesel
13	Water management	ha		R 48 985,50	**1,00**	1,10	R 0	
14	2 to 3 years of maintenance & aftercare	ha	26,55	R 17 144,92	1,00	1,10	R 500 718	Parking, emulsion, diesel, road crossing, TSF and PCD
							14 764 470,92	
Weighting Factor 2 (step 4.4)			**1,05**		**Sub Total 1**		**15 502 694,47**	
				Preliminary and General	6% of Sub Total 1		930 161,67	
				Contingency	10% of Sub Total 1		1 550 269,45	
					Sub Total 2		**17 983 125,59**	
					VAT (15%)		**2 697 468,84**	
					GRAND TOTAL		**20 680 594,42**	

1.s.i.3 Financial Provision

The rehabilitation and liability estimate for the proposed project related to this application only was determined as a clean closure estimate, with no allowance for off-sets or salvage value. The assessment was conducted in accordance with the DMRE Guideline and current best practice.

A Subtotal 1 Amount of approximately R 14 764 470.92 (excluding VAT), will be required.

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

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

For the purposes of Dwarsrivier Mine, a Financial Bank Guarantee will be issued.

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

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

1.s.ii Confirm that this amount can be provided for from Operating Expenditure

The mine has a guarantee in place to cater for the financial provision of rehabilitation activities. This is assessed annually to ensure that suitable funds are available. The next assessment will be undertaken in 2022 and annually thereafter.

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

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

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

1.t.ii Motivation of the deviation

No deviations from the methodology proposed in the Scoping Report.

1.u Other information required by the Competent Authority

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

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

The positive impacts associated with the proposed project include the continuation of employment during the operational phase and some employment creation as part of the various construction activities. This could also have potential positive impacts on the adjacent local area. Dwarsrivier Mine will further continue with local procurement, capacity building and the overall socio-economic development within the area. Targets for the procurement of capital goods, consumer goods and services should be set and Dwarsrivier Mine can develop an action plan to meet these targets.

In general (and not specific to this project only), from a social perspective, the objectives and measures as set out in the tables below must be enforced.

Maximise Employment Opportunities and Limit Skills Inequities

Objective	Maximise local employment opportunities and limit skills inequities associated with the construction and operation	
Mitigation: Action/control	Responsibility	Timeframe
Prioritise local labour in the recruitment process as part of the company's own recruitment policy or as part of contractor management plan during construction and operations	Human resources/ Social and Labour Plan (SLP) officer	Before activities commences
Meet the targets of mining legislation and the relevant mining charter for employment of Historically Disadvantaged South Africans (HDSA) in management positions and core skills	Human resources/ SLP officer	Before construction activities commences
Put a procurement strategy as well as a contractor management plan (if relevant) in place to ensure that as close to 100% as possible local employment target in terms of unskilled labour is met	Human resources/ SLP officer	Before construction activities commences

Up-skill the local labour force as per SLP		Human resources/ SLP officer	Before construction activities commences
Develop a database of goods and services that could potentially be outsourced to the local community		Supply chain management	Before construction activities commences
Where local contractors are used, put a contractor management plan in place (if relevant) to ensure that the local employment and procurement targets of the operations are met		Supply chain management	Before construction activities commences
Performance Indicator	% local labour employed in different skill categories % HDSA in management positions Training programmes completed by local labour force. % of goods and services procured from local community by type of product		
Monitoring	Annually as per SLP and procurement strategies		

Minimise external costs for the local community

Objective	Minimise external costs for the local community		
Mitigation: Action/control		**Responsibility**	**Timeframe**
Implement management measures of specialist reports (ground and surface water and transport)		Environmental Officer	During planning phase
Establish a community forum to discuss potential complaints related to environmental considerations		Environmental Officer	During construction phase
Participate on a regular basis in the local business chambers and/or mining forums and address issues that could negatively impact on the area		Environmental Officer	During construction phase
Performance Indicator	The number of community complaints received and resolved. The number of chamber meetings attended, complaints received and resolved		
Monitoring	Per quarter (4 times a year)		

Minimise the negative economic impacts related to mine closure

Objective	Minimise the negative economic impacts related to mine closure		
Mitigation: Action/control		**Responsibility**	**Timeframe**
As per the requirements of the SLP, develop mechanisms to assist employees, prior to retrenchment date in the transition phase after closure of the operations including portable skilled development programmes during the operational phase of the mine, providing assistance in accessing available and suitable jobs with other local mines or companies etc.		Human resources/ SLP officer/	During operations/ before closure
Focus on non-core related local supply links during the operational phases of the mine to facilitate easier transitioning of local suppliers to other costumers		Supply chain/procurement	During construction
Plan community projects with an exit strategy of which beneficiaries are aware of		SLP officer, corporate social investment programme	During operations/ before closure
Performance Indicator	% spending on non-core mining local inputs % of employees that receive portable skills training % of retrenched employees placed in alternative employment Exit strategies for every community investment programme		
Monitoring	Annually/ just before closure		

1.u.i.2 Impact on any National Estate referred to in Section 3(2) of the National Heritage Resources Act

A Heritage Impact Assessment was conducted for this project. The following outcomes were identified:

The stone cairn of unknown purpose at Feature 1 (west of proposed PCD) should be avoided with a 30m buffer, if this is not possible it should be confirmed whether this is a grave through stakeholder consultation/Ground Penetrating Radar/ Test Excavations and if confirmed to be a grave it should be relocated as per all the relevant legal requirements

Features 2, 3 (both at the Emulsion and Diesel Storage Areas) and 5 (south of proposed TSF) should be shovel pit tested (with the required mitigation permit) to determine the presence of subsurface deposit after which a destruction permit can be applied for.

The lack of graves at Features 4 (Emulsion and Diesel Storage Areas) and 6 (proposed TSF) should be confirmed prior to construction by the social team and monitored during construction.

Case ID 16879 has been opened by the SAHRA. As part of the current communication by the SAHRA the following has been stated:

- The SAHRA Archaeology, Palaeontology and Meteorites (APM) accepts the HIA report and it's proposed recommendations.
- Furthermore, we grant the development from undertaking an assessment of impacts to palaeontological resources as it is located in a very low palaeo sensitivity zone according to the SAHRIS Palaeomap.
- The SAHRA has no objection to the development going ahead on the following conditions:
    - If the mine is unable to conserve the identified archaeological sites in situ then the sites must be mitigated by a suitably qualified archaeologist. A permit issued under s35 of the NHRA will be required to conduct such work. On completion of the mitigation work the developer can apply for a destruction permit with the backing of the mitigation report.
    - If fossil remains or trace fossils are discovered during any phase of construction, either on the surface or exposed by excavations the Environmental Officer (EO) in charge of these developments must be informed. These discoveries ought to be protected and the ECO must report to SAHRA.
    - In the event that fossils are uncovered during construction then construction must cease within the immediate vicinity, a buffer of 30 m must be established, and a palaeontologist called in to inspect the finds. The palaeontologist must obtain a section 35(4) permit in terms of NHRA and Chapter IV NHRA Regulations, before any fossils are collected.
    - If there are any new heritages resources are discovered during construction and operation phases of the proposed development, then a professional archaeologist or palaeontologist, depending on the nature of the finds, must be contracted as soon as possible to inspect the findings at the expense of the developer.
    - If the newly discovered heritage resources prove to be of archaeological or palaeontological significance, a Phase 2 rescue operation may be required at the expense of the developer. Mitigation will only be carried out

These conditions have been included into the EMPr.

All information will be presented to SAHRA and comments will be submitted to the DMRE as part of the final EIA Report.

1.v Other Matters required in terms of sections 24(4)(a) and (b) of the Act

Information regarding the baseline and potential impacts for this Dwarsrivier Mine project, is based on the existing information available, discussions with stakeholders (refer to Annexure 6 and Section 1.g.iv), specialists (please refer to Annexure 7 to Annexure 15), the applicant and discussions with authorities (refer to Annexure 6 and Section 1.g.iv). The EAP has included all identified impacts, based on the current scope of the project, in this EIA and has assigned appropriate management measures to reduce and manage each identified impact, which are included in this EMPr.

PART B

ENVIRONMENTAL MANAGEMENT PROGRAMME REPORT

1.a Contact Person and Correspondence Address

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

Table 83: Details of EAP

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

1.a.ii Expertise of the EAP

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

Table 84: Experience of EAP

Name	Position	Qualification	Professional Registrations	Experience
Tanja Bekker	Registered Environmental Assessment Practitioner	M.Sc. Environmental Management (RAU, now University of Johannesburg)	Environmental Assessment Practitioners Association of South Africa (EAPASA) Reg No. 306/2019 Professional Natural Scientist (Pr.Sci.Nat) with the South African Council for National Scientific Professions (SACNASP) Reg No. 400198/09 Member of the International Association of Impact Assessors (IAIA) Member of the Environmental Law Association of South Africa (ELA)	20 Years

Please refer to Annexure 2 for the EAPs Curriculum Vitae.

<u>Education</u>

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

<u>Career Enhancing Courses</u>

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

<u>Professional Affiliations</u>

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

<u>Summary of the EAP's past experience</u>

Ms. Bekker is registered as a Professional Natural Scientist with SACNASP and is also a registered Environmental Assessment Practitioner (EAP) with EAPASA, a legal requirement stipulated by the National Environmental Management Act, 1998. She is further certified as an ISO 14001 Lead Auditor. Her qualifications include a BSc. Earth Sciences (Geology and Geography), BSc. (Hons.) Geography, and a MSc. Environmental Management. In addition to these tertiary qualifications, she obtained a Certificate in Project Management, and completed the Management Advance Programme at Wits Business School.

With more than 19 years' working experience in environmental management and the consulting industry and managing various Large Account Clients, she understands the South African Regulatory System, and can advise client with due diligence on their environmental regulatory requirements and offer a solution driven service to their project life cycle. She is equipped with exceptional project management and coordination skills, which especially enhances the service she offers clients within the environmental permitting system.

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

1.a.iii Details of the Applicant

Dwarsrivier Chrome Mine (Pty) Ltd (hereafter referred to as "the mine" or "Dwarsrivier Mine") is wholly owned by Assore Ltd.

According to information obtained from the official Dwarsrivier Web Page, the origin of the mine took place as a result of neighbouring properties to the north and south of Dwarsrivier Mine, which had existing chrome mining operations at the time of purchase in 1998. The owners of Dwarsrivier Mine, therefore invested in a feasibility study for the Plant, old Tailings Storage Facility (hereafter referred to as the "Old TSF") and the mining of chrome. The designs for the opencast- and underground mines then commenced. Approval to proceed with the final design and construction of work was given in July 1999 (http://www.assmang.co.za/chrome.asp). The mine ceased opencast operations in 2006 and is currently operating as an underground (trackless, board and pillar operation) mine, producing chromite ore, with a Dense Medium Separation and Spiral Beneficiation Plant. Dwarsrivier Mine currently produces approximately 200,000t of chromite ore per month.

Table 85: Details of Applicant

Project applicant:	Dwarsrivier Chrome Mine (Pty) Ltd		
Registration no (if any):	2011/105280/07		
Trading name (if any):	N/A		
Responsible Person, (e.g. Director, CEO, etc.):	Environmental Representative		
Contact person:	Mr. Pieter Schoeman		
Physical address:	The mine is situated 25km outside of Steelpoort on the Remainder of Portion 1 (RE of Portion 1) and the Remainder Portion (Portion 0) of the farm Dwarsrivier 372KT and Portion 4 (a portion of Portion 3) of the Farm De Grooteboom 373KT		
Postal address:	PO Box 567, Lydenburg		
Postal code:	1120	Cell:	+27 (0) 76 028 7680
Telephone:	+27 (0) 13 230 5300	Fax:	+27 (0) 13 230 5318
E-mail:	pieters@dwarsrivier.co.za		

1.a.iv Environmental Authorisations

The mine is operating with all required environmental authorisations as indicated in the table below. Those highlighted are applicable to the current project.

Table 86: List of Environmental Authorisations

#	Legislation	Licence	Reference	Date
1	Minerals Act, 1991 (Act No. 50 of 1991)	Approval for Dwarsrivier Phase II Chrome Project	OT6/2/2/426A	14 December 1999
2	National Water Act, 1998 (Act No. 36 of 1998) (NWA)	Regulation 4b (GN704) Exemption for undermining 2006	16/2/7/B400/C83/1	12 September 2006 (no longer applicable, replaced by the WUL, 2008)

#	Legislation	Licence	Reference	Date
3	NWA	Overall Water Use Licence (WUL)	16/2/7/B400/C83	21 January 2008, updated 10 June 2021
4	Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002) (MPRDA)	Environmental Management Programme (EMPr)	-	December 2010
5	NWA	WUL – Tailings Dam	04/B41G/G/792	8 July 2011, amended 28 June 2021
6	National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA)	Environmental Authorisation for the proposed construction of a new Tailings Storage Facility	12/1/9-7/1e/GS4	9 July 2011
7	National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) (NEMWA)	Waste Licence – Hazardous Waste Temporary Storage Facilities[16]	12/9/11/L290/5	21 July 2011
8	MPRDA	Dwarsrivier Mine Tailings Storage Facility Environmental Management Programme	LP30/5/1/3/2/1(179)EM	22 August 2011
9	MPRDA	Approval for Three Plants	LP30/5/1/3/2/1 (179)EM	11 January 2012
10	NEMWA	Waste Licence – Temporary General Waste Storage Facilities	12/4/10-A/1/GS3	29 March 2012
11	NEMA	Construction of a Low-Level Bridge over the Groot Dwarsrivier	12/1/9/1-GS22	11 June 2012
12	NEMA	Environmental Permission for Construction of a Bridge over the Springkaanspruit River	12/1/9/1-GS62	19 September 2013
13	NWA	WUL – River Crossings	04/B41G/CI/2240	4 October 2013, amended 10 August 2021
14	NEMA	Section 24G Rectification	12/1/9-7/S24G/7-GS1	26 August 2014
15	NEMWA & NEMA	Integrated Environmental Authorisation	179EM	15 February 2018
16	NEMA	Integrated Environmental Authorisation	179EM	29 May 2019
17	NEMA	Centralised Store	179EM	15 March 2021

1.b Description of the Aspects of the Activity

The activities associated with this EMPr is presented in Section 1.d of Part A of this report (see Section 1.g.iii.1). The specific aspects associated with the activities are presented in Section 1.g.vi.1.

1.c Composite Map

For further information regarding the environmental characteristics of the area, please refer to Section A (Section 1.g.v) for the various environmental considerations. The key surface considerations include location of the heritage resources (Figure 56 to Figure 62) and the various Zones of Regulations to be considered (Figure 64 and Figure 65).

[16] Note that the Licence Holder has not and will not be commissioning the activity. The Environmental Authorisation has therefore not been implemented on site. The Licence Holder is not in contravention with the Environmental Authorisation.

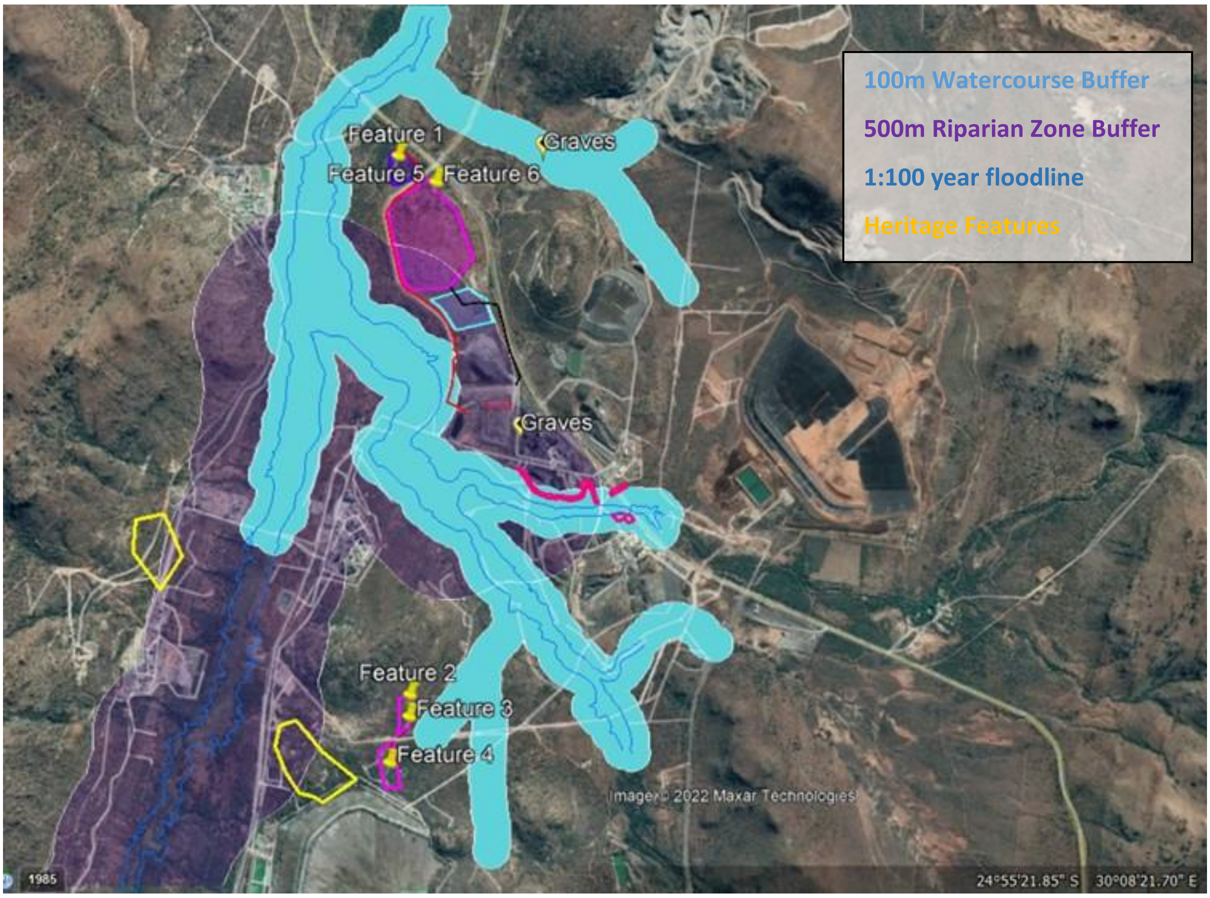


Figure 92: Composite map of key Environmental Features

1.d Description of Impact Management Objectives including management statement

1.d.i Determination of Closure Objectives

The rehabilitation plan is developed on the basis that the rehabilitated areas are safe, stable, and non-polluting and are able to support a self-sustaining ecosystem similar to that of the surrounding natural environment. To ensure that the rehabilitation plan is aligned with the closure objectives, a high-level risk assessment of the project components has been undertaken to establish the potential risks associated therewith.

Please refer to Table 89 to Table 92 for the detailed assessment of impacts and recommended objectives. The key aim of decommissioning and closure is to ensure that all the significant impacts are ameliorated. All rehabilitated areas should be left in a stable, self-sustainable state. The key objectives to consider will include:

- Future public health and safety are not compromised;
- The post-mining use of the site is beneficial and sustainable in the long-term;
- The opportunity is taken to maximize socio-economic benefits;
- Operate within the enviro-legal ambits of South Africa.
- Be aware of the latest environmental legal requirements.
- Include local labour and/or third party contracts where possible.
- Manage the logistic activities on roads in terms of truck parking and usage to minimise impact on other road users.
- Limit the impact of the activities on the ecological setting of the area.
- Operate the water management circuit on site to increase mining efficiency and reduce the need for maintenance of these facilities.
- Limit the loss of soils as far as possible and ensure that the integrity remains during stockpiling for the purposes of successful rehabilitation.
- Remain within the designated area demarcated for activities.
- Remain within the NEM:AQA Dust Regulation guidelines for rural communities.

- Protect the groundwater and surface water resources to ensure that limited to no impact on groundwater resources occur as a result of the operation of the reworking activities.
- Follow the waste hierarchy approach.
- Protect the integrity of the clean and dirty water system.
- Return the area to its intended final land use.

The proposed final land use would be to return the area to wilderness area. This would include demolishing surface infrastructure that will not be handed over to a third party and promoting the growth of the surrounding Sekhukhune Mountain Bushveld species. It is evident that the re-establishment of this vegetation biome on site will not be difficult as areas that have already undergone rehabilitation have seen a large success in terms of the revegetation.

The following objectives and targets are specifically proposed for groundwater management at the operations:

- Implement a Groundwater Remediation Strategy with the objective that no further deterioration in groundwater quality occurs at the operations. It is acknowledged that this objective cannot be achieved immediately, as residual impacts on groundwater quality are expected to remain up to mine closure in some areas.
- Implement management plans aimed at reducing adverse impacts on the receiving water bodies.
- Track and record the progress of implementation of all groundwater management measures. This process must be geared at optimising the measures earmarked for implementation from the Groundwater Remediation Strategy.
- Implement sufficient monitoring procedures to measure the effectiveness of groundwater management measures within the delineated zones of influence.
- Analyse the information obtained from all monitoring programmes against compliance targets to establish trends as well as the objectives of the Groundwater Remediation Strategy.
- Should the trends indicate adverse impacts on groundwater levels and/or quality, implement suitable measures within the shortest possible time to remediate and/or eliminate such adverse impacts identified.

Specific objectives associated with this application include:

<u>Rehabilitation of Roads and Linear Infrastructure (Parking and Roads)</u>

- Roads should be rehabilitated as per the management measures, unless legally transferred or sold to another party;
- Mine roads that are not needed for closure and post-closure uses at the site (e.g. security and monitoring) will be closed;
- Removal of all signage, fencing, shade structures, traffic barriers, etc.;
- All 'hard top' surfaces to be ripped and bitumen/concrete removed along with any culverts and concrete structures;
- All concrete lined drainage channels and sumps will be demolished and removed;
- All potentially contaminated soils are to be identified and should be removed and remediated;
- All haul roads that have been treated with saline dust suppression water need to be treated as “sealed” roads with the upper surface ripped and removed to designated contaminant disposal areas;
- All power and water services to be disconnected and certified as safe prior to commencement of any demolition works;
- Salvageable equipment will be removed and transported offsite prior to the commencement of demolition;
- Concrete slabs and footings will be broken and buried on site. The concrete (and metal) will be broken up and disposed of in the box cut;
- Revegetate where self-succession has not been successful;
- Monitor and maintain vegetation establishment;
- Remove alien invasive vegetation; and
- Prevent access of people/machinery/vehicles/grazing animals on newly rehabilitated land to allow regeneration of vegetation and reduce erosion.

<u>Rehabilitation of Topsoil Stockpile footprint areas</u>

- All stockpiled topsoil must be removed and utilised in rehabilitation activities;
- If contamination in the soil is discovered around stockpiled areas, this soil should be removed and disposed of in the appropriate waste disposal facility;

- Rehabilitated areas must be shaped to be free draining and roughly emulate the surrounding surface topography;
- Rip dump and stockpile footprint areas to alleviate compaction;
- Monitor and maintain vegetation establishment;
- Revegetate where self-succession has not been successful;
- Remove alien invasive vegetation; and
- Prevent access of people/machinery/vehicles/grazing animals on newly rehabilitated land to allow regeneration of vegetation and reduce erosion.

Rehabilitation of Tailings Storage Facility

- It is expected that the silt trap, dirty water canal and PCD will not be required once the TSF is rehabilitated. It is assumed that the footprint of the PCD and the silt trap platform will be rehabilitated by backfilling and reshaping. PCD and Silt Trap:
  - Desilt the PCD;
  - Desilt the silt traps and the surrounding area that has been affected by removing silt to a depth of 500mm;
  - Remove liners – these should be disposed of at the correct hazardous waste disposal facility;
  - Doze the dam walls;
  - Remove supporting plinths for pipeline as well as foundations and other associated infrastructure;
  - Remaining structures should be demolished to 1m below surface and the demolition rubble removed and any re-usable items should be removed from site;
  - Soi9ls should be tested for contamination;
  - If contamination is discovered, this soils should be removed and disposed of in the appropriate waste disposal facility;
  - The footprints of dams must be ripped to 200mm;
  - Topsoil from the topsoil stockpiles should be replaced to a minimum thickness of 300mm on the rehabilitated areas;
  - Monitor and maintain vegetation establishment;
  - Remove alien invasive vegetation; and
  - Prevent access of people/machinery/vehicles/grazing animals on newly rehabilitated land to allow regeneration of vegetation and reduce erosion.
- TSF:
  - Where possible remove tailings for beneficial processing, to reduce volumes of waste stored on site;
  - The surface of the TSF will be capped using a layer of compacted soils overlain by hydroseeded topsoil;
  - Facilitate drainage from upper slopes of TSF to storm water channels. Bench drains will be constructed along the current benches to collect stormwater draining down the rehabilitated slope of the TSF. The bench drains will be shaped to drain towards riprap-lined down chutes that will be provided to convey stormwater down to the toe;
  - Conduct routing of storm water flow along TSF toe;
  - The dirty water canal that will be provided during the operation of the TSF will be rehabilitated.
  - Establish vegetation on TSF as per engineering designs;
  - Remove alien invasive vegetation; and
  - Prevent access of people/machinery/vehicles/grazing animals on newly rehabilitated land to allow regeneration of vegetation and reduce erosion.

Rehabilitation of Diesel Storage and Supply areas

- Remove diesel tanks (by owner) and associated infrastructure from site (it is assumed that all potential contamination is removed during operations);
- Thereafter, demolish concrete bund wall and dispose of contaminated material at a hazardous waste facility;
- Once the site has been cleared of all infrastructure and rubble and no contamination is present, the exposed area should be reshaped to create a gently sloping, free-draining topography;
- Revegetate where self-succession has not been successful;
- Monitor and maintain vegetation establishment; and
- Remove alien invasive vegetation; and

- Prevent access of people/machinery/vehicles/grazing animals on newly rehabilitated land to allow regeneration of vegetation and reduce erosion.

Through the implementation of the proposed mitigation measures, it is anticipated that the identified impacts can be managed and mitigated effectively, and the objectives set can be met. Through the implementation of the mitigation and management measures it is expected that:

- The pollution of soil and water resources can be effectively managed through containment and implementation of impact specific management measures.
- Impact on unknown heritage sites can be effectively managed to the implementation of a management protocol in the event that such facilities are encountered.
- Ecological impacts can be managed through the implementation of pollution prevention measures, minimising land clearing, restricting working hours (faunal disturbance), maintain speed limits and rehabilitation (including control of invasive species).

Please refer to Table 89 to Table 92 for the rehabilitation requirements for each of the project areas.

1.d.ii Potential risk of Acid Mine Drainage

An Acid Base Accounting study was not completed as part of this assessment.

Leach tests were however completed with distilled water as part of a waste classification study completed on mine residue deposits, including tailings material produced (iLEH, 2018).

A fresh tailing sample was submitted during 2021 for leach tests in order to confirm the source term for the Khulu TSF impact assessment. The 2021 leach tests included both distilled water and acid rain methods.

The pH of the distilled water leach tests completed is neutral (above 7) as indicated in Table 87. Due to the nature of the Acid Rain test, an acidic pH is reported for this analysis. This is however not reflective of a risk of acid mine drainage from the tailings material.

The leach tests presented in Table 87 are compared to Leachable Concentration Thresholds (LCT) according to the Waste Classification and Management Regulations (R635) of the National Environmental Management: Waste Act (Act No. 59 of 2008) (NEMWA) in the table. The results of the leach tests are discussed in more detail below when the source term for the project is defined.

The Dwarsrivier Mine monitoring programme furthermore confirm that both groundwater have neutral to alkaline pH conditions, as indicated in Graph 18.

The pH of dirty water associated with the existing North TSF (North RWD and North PCD) has a neutral to alkaline nature, which confirms that the metallurgical process in the plant does not increase the risk of acidification of the tailings material on the Khulu TSF. The risk of acidification of the tailings material is therefore considered to be low.

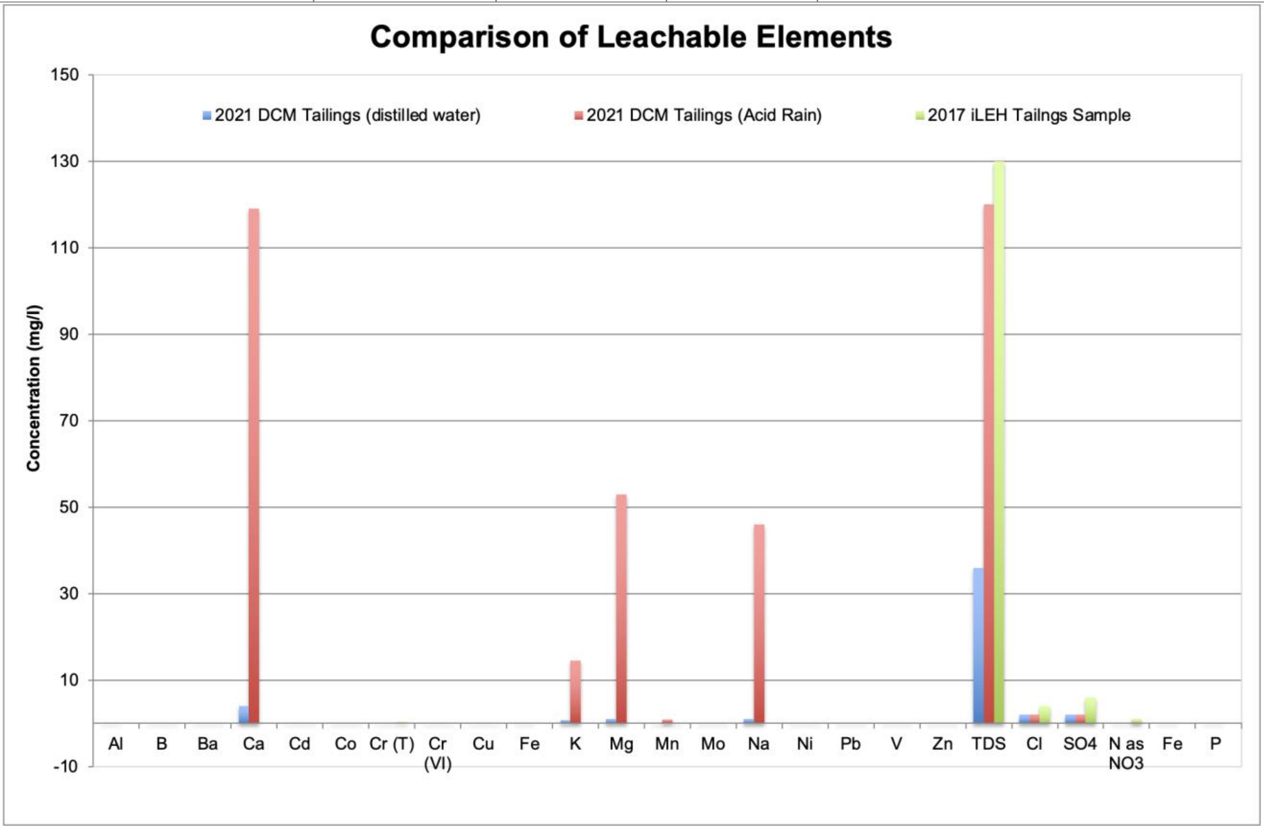
Similarly, pH conditions in the two pollution control dams, the Lower RWD and Upper RWD, also has a neutral to alkaline nature. These dams are used to receive and transfer the bulk of the dirty water within the mine water balance and are therefore a good indication of mine water quality.

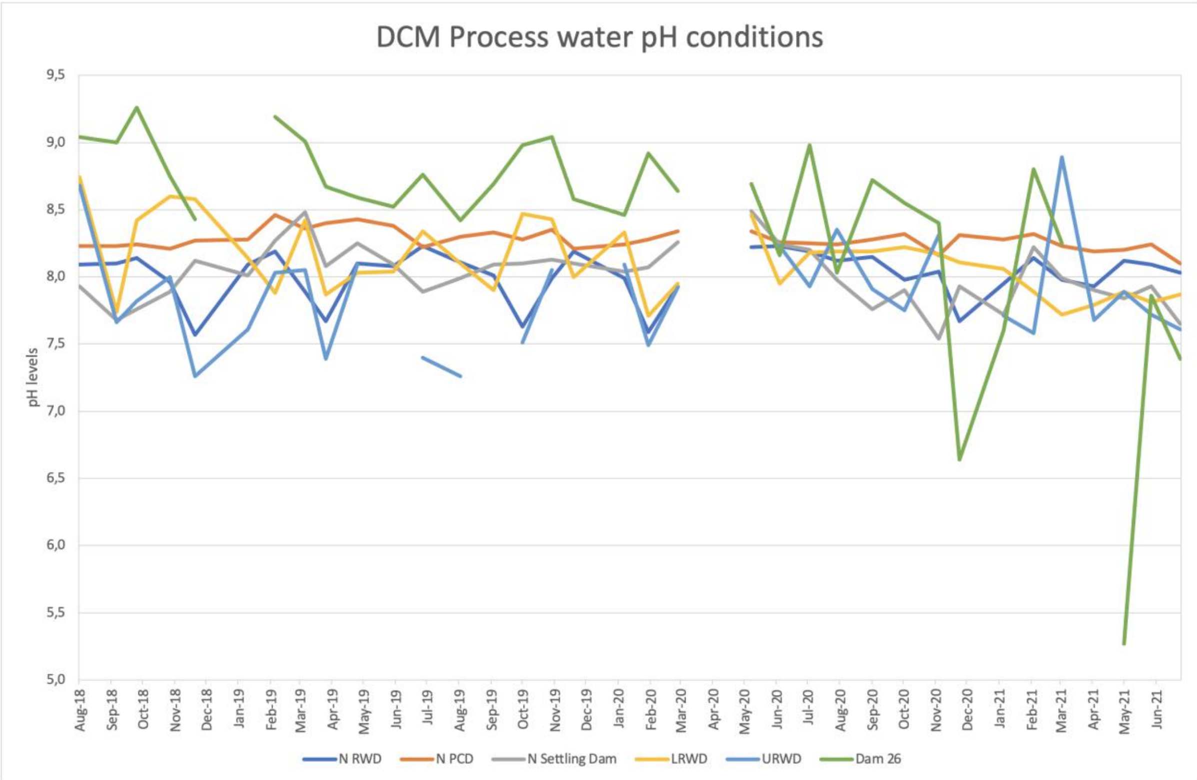
It is noted from Graph 18 that the pH of Dam 26 has steadily changed from alkaline in 2018 to slightly acidic to neutral at present. This could be attributed to the impact of the Water Treatment Plant (WTP) operated at Dam 26. All water from the dam is treated at the WTP after which it is returned to Dam 26 for reuse in the mine water balance. An assessment of the impact of Dam 26 falls outside the scope of this study, but it is recommended that the potential long-term impact of acidification of the mine water circuit as a result of introducing water from Dam 26 is investigated in more detail.

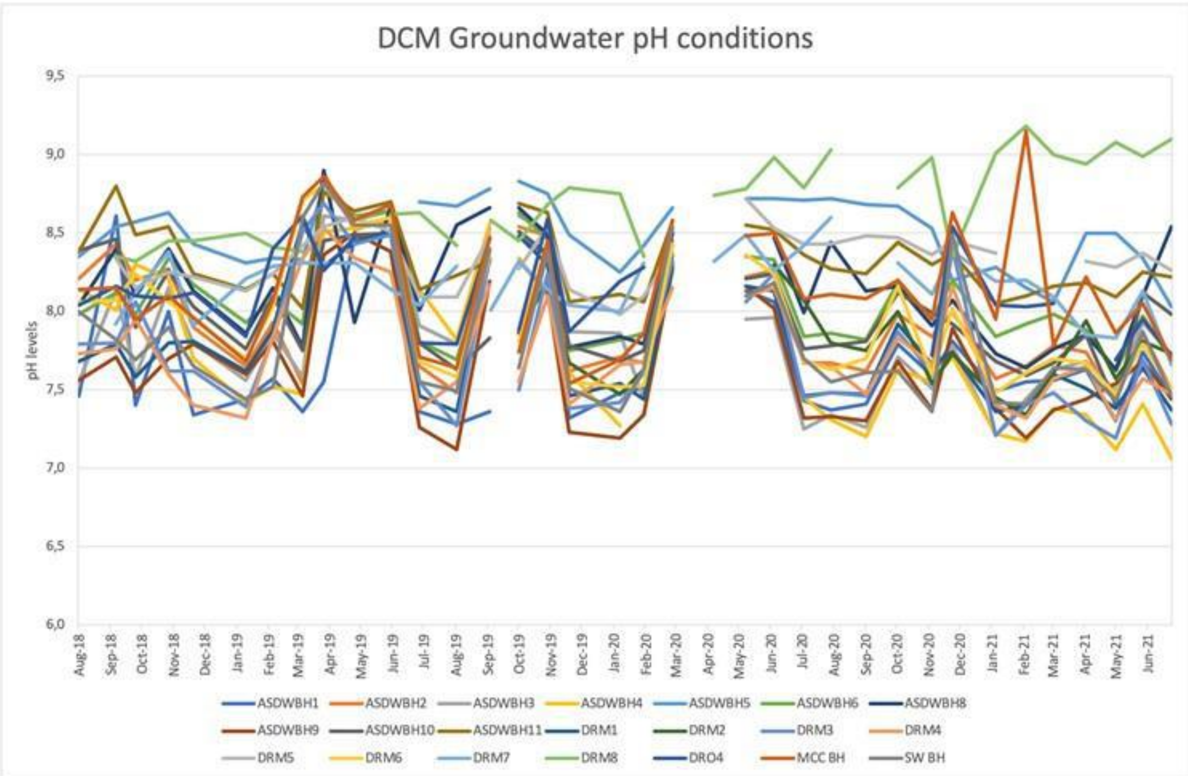
Information presented in EScience (2010c) confirms the fact that the mine is unlikely to acidify, including the tailings material generated. Acid-base accounting undertaken as part of this study indicates that the tailings and waste rock is relatively inert and has low levels of potential acid generation. Sulphides are present, but in extremely minor quantities and in highly competent and impermeable rock. Sulphate concentrations in in groundwater is therefore also expected to remain low. The neutralising potential exceeds the acid generating potential in all cases. In the long-term, neutral pH conditions are therefore expected. Under these conditions, low dissolved metal concentrations are expected.

Table 87: Tailings leach test results

Elements	2021 Dwarsrivier Mine Tailings (distilled water)	2021 Dwarsrivier Mine Tailings (Acid Rain)	2018 iLEH Tailings Sample	LCT0 (mg/l)	LCT1 (mg/l)	LCT2 (mg/)l	LCT3 (mg/l)
Al, Aluminium	<0,025	0,149					
B, Boron	<0,025	0,084	<0.025	0,5	25	50	200
Ba, Barium	<0,025	0,054	0,04	0,7	35	70	280
Ca, Calcium	4	119					
Cd, Cadmium	<0,001	<0,001	<0.003	0,003	0,15	0,3	1,2
Co, Cobalt	<0,025	<0,025	<0.025	0,5	25	50	200
Cr (Tota)l, Chromium Total	0,027	<0,025	0,39	0,1	5	10	40
Cr(VI), Chromium (VI)	<0,01	<0,01	<0.010	0,05	2,5	5	20
Cu, Copper	<0,01	<0,01	0,047	2	100	200	800
Fe, Iron	0,124	0,161					
K, Potassium	0,8	14,5					
Mg, Magnesium	1	53					
Mn, Manganese	<0,025	0,92	0,235	0,5	25	50	200
Mo, Molybdenum	<0,025	<0,025	<0.025	0,07	3,5	7	28
Na, Sodium	<1	46					
Ni, Nickel	<0,025	<0,025	0,114	0,07	3,5	7	28
Pb, Lead	<0,001	<0,001	0,012	0,01	0,5	1	4
V, Vanadium	<0,025	<0,025	<0.025	0,2	10	20	80
Zn, Zinc	<0,025	<0,025	<0.025	5	250	500	2000
Total Dissolved Solids	36	120	130	1000	12500	25000	100000
Chloride as Cl	<2	<2	4	300	15000	30000	120000
Sulphate as SO_4	<2	<2	6	250	12500	25000	100000
Nitrate as N	<0,1	0,2	1	11	550	1100	4400
Fluoride as F	0,11	<0,05	0,3	1,5	75	150	600
Ortho-Phosphate, P	<0,1	<0,1					
pH	7,7	5,1	7,3	Not specified			







Graph 18: Dwarsrivier Mine process water and groundwater pH conditions

1.d.iii Steps taken to investigate, assess, and evaluate the impact of acid mine drainage

Please refer to the section above.

1.d.iv Engineering or mine design solutions to be implemented to avoid or remedy acid mine drainage

Please refer to the sections above. Based on the specialist studies there are no acid mine drainage expected from activities taking place on site.

1.d.v Measures that will be put in place to remedy any residual or cumulative impact that may result from acid mine drainage.

Please refer to the sections above. Based on the specialist studies there are no acid mine drainage expected from activities taking place on site and proposed project.

1.d.vi Volumes and rate of water use required for the mining, trenching or bulk sampling operation.

No additional water requirements are associated with this Environmental Authorisation.

Potable water is currently supplied from groundwater abstracted from three boreholes on the property, namely BH D1, D2 and E. Six groundwater supply boreholes are however in place at the operations. Boreholes A, B and C are not currently in use. The locations of these boreholes are indicated on Figure 93. Boreholes A, B and E are situated near the Main Office complex and were drilled into a fractured rock aquifer. Groundwater from BH E is pumped to the Main Office Tank from where it is distributed for use. Boreholes D1 and D2 are drilled into the alluvial aquifer associated with the Groot Dwars River. Groundwater is pumped from these boreholes to the Plant and Main Office tanks for potable use at the operations. Borehole C is drilled into the fractured rock aquifer situated on the northern side of the R557 and was used to supply North Mine up until April 2017. No groundwater is currently abstracted from this borehole.

In terms of the Water Balance, 2021 which guides the requirements for the WULA, the mine wishes to retain its allocation for abstraction from water from the Dwarsrivier at 660 000m^3/a. The volume will be augmented with the two existing alluvial boreholes D1 and D2 at a volume of 94 608m^3/a.

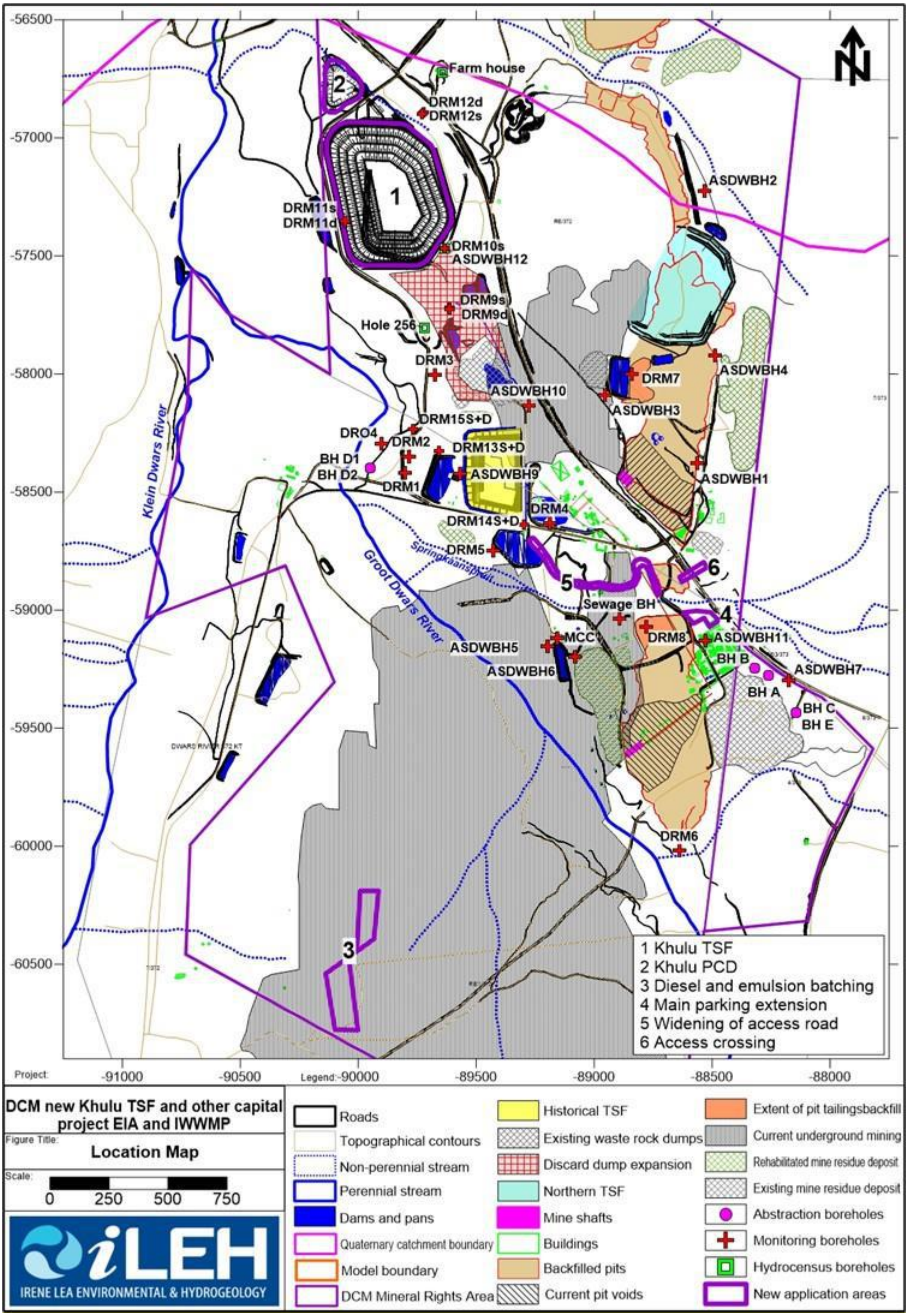


Figure 93: Location of Boreholes

1.d.vii Has a water use licence has been applied for?

The mine has three (3) approved Water Use Licences (WULs).

- Licence Number: 24053346, dated 21 January 2008;
- Licence Number: 04/B41G/G/792, dated 8 July 2011; and
- Licence Number: 04/B41G/CL/2240, dated 4 October 2013.

The first WUL was issued on 21 January 2008 (Ref. No.: 24053346), by the Chief Director of Water Use in the Department of Water Affairs and Forestry (DWAF; now Department of Water and Sanitation (DWS)). The WUL is issued under Chapter 4 (Sections 21 – 55) of the National Water Act (Act No. 39 of 1998) (NWA) and makes provision for the following water uses:

- Section 21(a) – Taking water from the Groot Dwars River, a surface water resource, subject to conditions set out in Appendices I and II.
- Section 21(c) – Impeding or diverting the flow of water in a watercourse and, subject to the conditions set out in Appendices I and IV.
- Section 21(g) – Disposing of waste or water containing waste in a manner that may detrimentally impact on a water resource, subject to the conditions set out in Appendices I and V.
- Section 21(i) – Altering the bed, banks, course or characteristics of a watercourse, subject to the conditions set out in Appendices I and IV.
- Section 21(j) – Taking water from a groundwater resource, and removing water from underground, subject to the conditions set out in Appendices I and III.

The second WUL, a stand-alone application, i.e. not integrated with the initial WUL, was issued on 8 July 2011 (Ref. No.: 04/B41G/G/792), by the Acting Director General in the Department of Water Affairs (DWA; now DWS). The WUL is issued under Chapter 4 (Sections 21 – 55) of the NWA and makes provision for the following water uses:

- Section 21(g) – Disposing of waste or water containing waste in a manner that may detrimentally impact on a water resource, subject to the conditions set out in Appendices I and II.

This last mentioned 2011 WUL was specifically undertaken for the North TSF and associated RWD.

The third WUL was issued on 4 October 2013 (Ref. No.: 04/B41G/CL/2240) and was specific for the Low-Level River Crossing (bridge) construction over Groot Dwars River and the existing pipeline crossing over Springkaanspruit. This WUL makes provision for the following water uses:

- Section 21(c) – Impeding or diverting the flow of water in a watercourse and, subject to the conditions set out in Appendices I and IV.
- Section 21(i) – Altering the bed, banks, course or characteristics of a watercourse, subject to the conditions set out in Appendices I and IV.

In addition to the above, the mine also has Exemptions issued by the DWS (then known as DWAF). The Exemptions issued by DWS are as follows:

- Exemption 16/2/7/B4000/C83/1 - "Dwars River Chrome Mine is hereby exempted in terms of Regulation 3 of Government Notice 704 as published in the Government Gazette for the undermining of the Dwars River on the properties set out in 3 (a) below and subject to the conditions set out in Appendix A of the license".
- Dwarsrivier was exempted from the following GN 704 Activities as part of the 2008 WUL:
    - Exemption from Regulation 4(a) and 4(b) for the conveyor belt, haul road crossings, non-perennial stream diversions; and
    - Exemption from Regulation 4(c) and 4(d) for the disposal of tailings in the North and South Pits.

The DWS issued amended WULs to all three the WULs to correct various administrative conditions in 2021:

- WUL 2008 – Amended 10 June 2021;
- WUL 2011 – Amended 28 June 2021; and
- WUL 2013 – Amended 10 August 2021.

A Water Use Licence Application (WULA) has been initiated with the DWS on the online Water Use Licence Application and Authorisation System (EWULAAS) system. No activities will be undertaken without the necessary water use approvals.

The WUL will not only cater for the projects applied for as part of this current application, but will be an update of the overall mine WUL to correct all technical amendments and water uses required for inclusion. For this project, the following activities may trigger water uses as indicated:

- Section 21(c) & (i) applications where these activities are located within the 500m and 100m riparian buffer zones: the 100m and 500m buffer specifically relates to the Main Parking Extension, Widening of the Access Road and the Subway Crossing between the Plant and North Mine.
- Section 21(g) for the construction of the TSF and associated PCD.

<u>Khulu TSF Other Licences</u>

The Khulu TSF will require the following approvals from the DWS in terms of the NWA:

- Section 21(g) for the disposal of a waste (TSF and PCD and TSF).
- Section 21(c) and (i) for placement within 500m of a riparian zone (TSF, pipeline, and filter press).

In terms of the National Heritage Resources Act (Act No. 25 of 1999) (NHRA), the following will be required:

- The stone cairn of unknown purpose at Feature 1 (west of proposed PCD) should be avoided with a 30m buffer. If this is not possible, it should be confirmed whether this is a grave through stakeholder consultation/ Ground Penetrating Radar/ Test Excavations and if confirmed to be a grave it should be relocated as per all the relevant legal requirements. Should this be determined a grave, two options must will be considered:
    - Excavation permits are to be applied for; or
    - A 30m buffer zone (as recommended by the HIA report as no blasting or invasive activities are planned with the construction the TSF) must be adhered to in order to conserve the grave against any potential damage during construction. A social consultation process in terms of Chapter XI of the NHRA Regulations must be carried out to identify the descendants of the burials and to obtain permission to fence in the identified grave. If the mine is unable to retain the grave *in situ,* permission must be obtained from the families of the deceased to relocate the grave. If they agree to the relocation of the grave, then a Section 36 of the NHRA permit application must be logged on SAHRIS.
- Feature 5 (south of proposed TSF) should be shovel pit tested (with the required mitigation measures and permit in place) to determine the presence of subsurface deposit, after which a destruction permit can be applied for.
- The lack of graves at Feature 6 (proposed TSF) should be confirmed prior to construction by the social team and monitored during construction.

<u>Diesel and Emulsion Batching Area</u>

The Diesel and Emulsion Batching Areas will require no approvals from the DWS in terms of the NWA.

In terms of the NHRA, the following will be required:

- The lack of graves at Feature 4 should be confirmed prior to construction by the social team and monitored during construction.
- Should graves be confirmed, two options must will be considered:
    - Excavation permits will be applied for; or
    - Excavation permits are to be applied for; or
    - A 30m buffer zone (as recommended by the HIA report as no blasting or invasive activities are planned with the construction the TSF) must be adhered to in order to conserve the grave against any potential damage during construction. A social consultation process in terms of Chapter XI of the NHRA Regulations must be carried out to identify the descendants of the burials and to obtain permission to fence in the identified grave. If the mine is unable to retain the grave *in situ,* permission must be obtained from the families of the deceased to relocate the grave. If they agree to the relocation of the grave, then a Section 36 of the NHRA permit application must be logged on SAHRIS.

- Features 2 & 3 (both located at the Diesel and Emulsion Batching Areas) should be shovel pit tested (with the required mitigation measures and permit in place) to determine the presence of subsurface deposit after which a destruction permit can be applied for.

Main Parking Area, Widening of Access Road and Subway Crossing

The proposed Main Parking Area, Widening of Access Road and Subway Crossing Projects will require the following approvals from the DWS in terms of the NWA:

- Section 21(c) and (i) for placement of infrastructure within 500m of a riparian zone (majority of the area associated with the Widening of the Access Road)
- Section 21(c) and (i) for placement of infrastructure within 100m of a Springkaanspruit (Main Parking Area; majority of the area associated with the Widening of the Access Road; approximately half the areas associated with the proposed Subway Crossing).

The EWULAAS process has been initiated on 15 January 2022.

The following table presents the preliminary water uses (existing and those proposed for this project) to the pending Water Use Licence Application:

Table 88: Preliminary Water Use Table

Green	New Uses
Grey	Technical Amendment
White	Approved Uses

Water Use Section	Water Use Name		Reference	Farm	Portion	Purpose	Volume Approved	WUL Date	Coordinates from WUL & Applications		Outline of new required WUL				
									S	E	Water Use Name	Volume Required	Coordinates S	Coordinates E	Reason/Motivation
Section 21a	Taking water for potable wtaer supplyy	D1 (plant drinking and process) - on one application form - twin boreholes)	1a	372KT	RE/1	To be used for mining purposes on Portions 1 and RE	-	-	-	-	Approved Abstraction Point BH D1 (twin boreholes)	94 608m3/a	24°55'41.59"S	30° 6'34.24"E	New Application (Existing Use)
		D2 (plant drinking and process) - on one application form - twin boreholes)	1b	372KT	RE/1				-	-	Approved Abstraction Point BH D2 (twin boreholes)		S24 55'41.59"	E30 06'34.24"	
	Taking of Water from river	D1 (plant drinking and process) - on one application form - twin boreholes)	2	372KT	RE/1	To be used for mining purposes on Portions 1 and RE	Max: 660 035m³/annum (average 1 808m³/day)	2008	-	-	River abstraction (process wter use)	Max: 660 000m³/annum (average 1 808m³/day)	24°56'02.4"S	30° 06'45.8"E	Approved
	South Shaft Dewatering	South Water Dewatering	3	372KT	RE/1	To be reused in the mining process	376 360m3/a (average of 272m3/day)	2008	24°56'16.60"S	30° 7'15.10"E	South Shaft Dewatering	376 360m3/a (average of 272m3/day)	24°56'16.60"S	30° 7'15.10"E	Approved
	Taking of groundwater for use	BHA, B & E	4a	373KT	3	For personal use in offices and technical facilities (BH4 and 5)	71 520m³/annum	2008	24°56'10.50"S	30°7'34.2"E	BH A	71 520m³/annum	24°56'10.50"S	30°7'34.2"E	Approved
			4b	373KT	3				24°56'9.50"S	30° 7'32.2"E	BH B		24°56'9.50"S	30° 7'32.2"E	
			4c	373KT	3				24°56'15.70"S	30° 7'38.40"E	BH E		24°56'15.70"S	30° 7'38.40"E	

Water Use Section	Water Use Name		Reference	Farm	Portion	Purpose	Volume Approved	WUL Date	Coordinates from WUL & Applications		Outline of new required WUL				
									S	E	Water Use Name	Volume Required	Coordinates S	Coordinates E	Reason/Motivation
	North Shaft Dewatering	North Shaft Dewatering	5	372KT	RE	To be reused in the mining process	165 700m³ /annum(average of 452m³/day)	2008	24°55'42.28"S	30° 7'14.01"E	North Shaft Dewatering	165 700m³ /annum(average of 452m³/day)	24°55'42.28"S	30° 7'14.01"E	Approved
Section 21(b)		Clinic Tank 1 & 2	1	372KT	RE/1	Storing of Drinking Water		Generally Authorised	-	-	Jo Jo Tank Drinking Water (Clinic)	2 x 5 m3	24°55'41.60"S	30° 6'22.00"E	New Water Use Application (Existing Use)
		North Shaft Tank	2	372KT	RE	Storing of Drinking Water		Generally Authorised	-	-	Jo Jo Tank (North Shaft)	2 x 10 m3	24°55'43.25"S	30° 7'20.35"E	New Water Use Application (Existing Use)
		Plant Tank	3	372KT	RE/1	Storing of Drinking Water		Generally Authorised	-	-	Square Steel Tank (Plant)	32 m3	24°55'51.12"S	30° 7'8.18"E	New Water Use Application (Existing Use)
		Main Office Tank	4	372KT	RE/1	Storing of Drinking Water		Generally Authorised	-	-	Jo Jo Tank (Office)	4 x 10 m3	24°56'8.77"S	30° 7'29.51"E	New Water Use Application (Existing Use)
		Emergency Fire Water x2 (South) - B/H E	5	372KT	RE/1	Storing of Fire Protection Water		New Application	-	-	Emergency Fire Water x2 (South) - B/H E	2x20 000m3 (each)	24°56'10.60"S	30° 7'25.02"E	New Water Use Application (Existing Use)
		Plant emergency fire tank	6	372KT	RE/1	Storing of Fire Protection Water		New Application	-	-	Plant emergency fire tank x2	2 x 290 m3(each)	24°55'40.5"S	30° 7'08.01"E	New Water Use Application (Existing Use)
	Impede or divert the flow in the alluvial aquifer by undermining of the Groot Dwars River		1	372KT 373KT	RE/1 & RE 4 of 3	By undermining the Groot Dwars River and in effect altering the bed, banks, course or characteristics of the River; and Construct culverts where the access road to the works crosses any drainage lines or watercourse	Undermining of approximately 2.65km of the Groot Dwars River	2008	24°56'49.03"S 24°55'10.64"S	30° 7'23.74"E 30° 6'6,59"E	Impede or divert the flow in the alluvial aquifer by undermining of the Groot Dwars River	No change	24°56'49.03"S 24°55'10.64"S	30° 7'23.74"E 30° 6'6,59"E	No change
	Alter the course of the Sprinkaan Spruit		2	372KT	RE/1	Conveyor & Road Crossing	-	2008	24°55'57.7"S 24°55'58.0"S	30°07'19.7"E 30°07'18.8"E	Alter the course of the Sprinkaan Spruit	No change	24°55'59.38"S 24°56'1.27"S	30° 7'17.97"E 30° 7'20.28"E	Slight Coordinate Adjustment - WUL only provides start coordinate

Water Use Section	Water Use Name		Reference	Farm	Portion	Purpose	Volume Approved	WUL Date	Coordinates from WUL & Applications		Outline of new required WUL				
									S	E	Water Use Name	Volume Required	Coordinates S	Coordinates E	Reason/Motivation
	Alter the course of the unnamed tributaries of the Groot Dwarsriver		3	372KT	RE/1	Mining of South Pit	-	2008	24°56'17.7" S-24°56'22.8"S	30°07'32.6"E - 30°07'16.9"E	Alter the course of the unnamed tributaries of the Groot Dwarsriver	No change	24°56'17.7" S-24°56'22.8"S	30°07'32.6"E - 30°07'16.9"E	No change
	Alter the course of the Sprinkaan Spruit as well as the unnamed tributaries of the Groot Dwarsriver		4	372KT	RE	Mining of North Pit	-	2008	24°55'24.4"S - 24°55'29.0"S	30°07'34.9"E-30°07'10.8"E	Alter the course of the Sprinkaan Spruit as well as the unnamed tributaries of the Groot Dwarsriver	No change	24°55'25.68"S	30° 7'27.02"E	No change
	Construction of low level bridge at Groot Dwars River		5	372KT	RE/1	Will serve as an access point for the planned vent shaft	-	2013	24°56'31,01"S2 4°56'33,87"S	30°07'13,81"E3 0°07'12,96"E	Construction of low level bridge at Groot Dwars River	No change	24°56'31,01"S24° 56'33,87"S	30°07'13,81"E30° 07'12,96"E	No change
	Construct a pipeline crossing over the Sprinkaanspruit River		6	372KT	RE/1	Pipeline for the transportation of dirty water to the RWD	-	2013	24°55'58,89"S 24°56'0,86"S	30°07'0,51"E 30°07'0,58"E	Construct a pipeline crossing over the Sprinkaanspruit River	No change	24°55'58.89"S 24°56'0.86"S	30° 7'0.51"E 30° 7'0.58"E	No change
	Crossing of diverted stream towards Discard Dump	Specific Crossing 1 (c&i)	7	372KT	RE/1	Road crossing	-	New Application	-	-	Access road to the Discard Dump from the plant.	New Application	24°55'32.69"S 24°55'33.78"S	30° 6'56.65"E 30° 6'58.66"E	Existing Infrastructure New Water Use Application (existing infrastrucutre assoicated with existing S21g water uses)
	Truck stop (500m buffer and 100m from non perennial drainage line)	Within 500m (i)	8	372KT	RE/1	Construction within 500m from the Dwarsrivier Riparian Zone and 100m from non perennial drainage line)	-	New Application				New Application	24°55'35.42"S	30° 6'43.54"E	Existing Infrastructure New Water Use Application
	Fence Crossing 1	Specific Crossing 1 (c&i)	9	372KT	RE/1	Fence crossing over the Springkaanspruit	-	New Application				New Application	24°55'59.50"S 24°56'1.00"S	30° 7'24.00"E 30° 7'25.16"E	Existing Infrastructure New Water Use Application

Water Use Section	Water Use Name		Reference	Farm	Portion	Purpose	Volume Approved	WUL Date	Coordinates from WUL & Applications		Outline of new required WUL				
											Water Use Name	Volume Required	Coordinates		Reason/Motivation
									S	E			S	E	
	Fence Crossing 2	Specific Crossing 1 (c&i)	10	372KT	RE/1	Fence crossing over the Springkaanspruit	-	New Application				New Application	24°55'58.13"S 24°56'0.51"S	30° 7'0.50"E 30° 7'0.81"E	Existing Infrastructure New Water Use Application
	Fence Crossing 3	Specific Crossing 1 (c&i)	11	372KT	RE/1	Fence crossing over the Groot Dwarsrivier	-	New Application				New Application	24°56'45.74"S 24°56'45.47"S	30° 7'21.35"E 30° 7'24.93"E	Existing Infrastructure New Water Use Application
	Exploration Drilling on Portion RE	Within 500m (i)	12	372KT	RE	Temporary Exploration Access Road construction within 500m from the Dwarsrivier Riparian Zone	-	New Application				New Application	24°55'15.60"S 24°55'5.96"S	30° 6'34.67"E 30° 6'34.78"E	Existing Infrastructure New Water Use Application
	Exploration Drilling on Portion RE	Within 500m (i)	13	372KT	RE	Drilling Activities within 500m from the Dwarsrivier Riparian Zone		New Application				New Application	24°55'13.03"S	30° 6'29.16"E	New Water Use Application
	Exploration Drilling on Portion RE	Within 500m (i)	14	372KT	RE	Temporary Exploration Access Road construction within 500m from the Dwarsrivier Riparian Zone	-	New Application				New Application	24°55'34.51"S 24°55'34.33"S	30° 6'43.01"E 30° 6'48.68"E	New Water Use Application
	Exploration Drilling on Portion 1	Within 500m (i)	15	372KT	RE/1	Temporary Exploration Access Road construction within 500m from the Springkaanspruit Riparian Zone	-	New Application				New Application	24°55'57.48"S 24°56'2.29"S	30° 7'5.97"E 30° 7'5.86"E	New Water Use Application
	Exploration Drilling on Portion 1	Within 500m (i)	16	372KT	RE/1	Temporary Exploration Access Road construction within 500m from the	-	New Application				New Application	24°55'48.69"S 24°55'53.39"S	30° 6'41.25"E 30° 6'40.12"E	New Water Use Application

Water Use Section	Water Use Name		Reference	Farm	Portion	Purpose	Volume Approved	WUL Date	Coordinates from WUL & Applications		Outline of new required WUL				
											Water Use Name	Volume Required	Coordinates		Reason/Motivation
									S	E			S	E	
						Dwarsrivier Riparian Zone									
	Exploration Drilling on Portion 1	Within 1:100year Floodline	17	372KT	RE/1	Access Exploration Road (temporary) with in the 1:100 year floodline of the Dwarsrivier	-	New Application				New Application	24°55'48.01"S 24°56'5.32"S	30° 6'22.24"E 30° 6'36.61"E	New Water Use Application
	Exploration Drilling on Portion 1	Within 500m (i)	18	372KT	RE/1	Temporary Exploration Access Road construction within 500m from the Dwarsrivier Riparian Zone	-	New Application				New Application	24°55'59.11"S 24°56'4.72"S	30° 6'23.22"E 30° 6'33.48"E	New Water Use Application
	Exploration Drilling on Portion 1	Within 500m (i)	19	372KT	RE/1	Temporary Exploration Access Road construction within 500m from the Dwarsrivier Riparian Zone	-	New Application				New Application	24°56'28.47"S 24°56'34.92"S	30° 6'14.31"E 30° 6'13.89"E	New Water Use Application
	Exploration Drilling on Portion 1	Within 500m (i)	20	372KT	RE/1	Temporary Exploration Access Road construction within 500m from the Dwarsrivier Riparian Zone	-	New Application				New Application	24°56'37.12"S 24°56'43.41"S	30° 6'6.38"E 30° 6'14.34"E	New Water Use Application
	Exploration Drilling on Portion 7 (Polygon)	Within 500m (i)	21	372KT	7	Drilling Activities (roads and boreholes) within 500m Riparian Zone of the Dwarsrivier		New Application				New Application	24°56'8.87"S 24°55'54.95"S 24°56'2.56"S 24°56'25.72"S 24°56'33.18"S 24°57'4.59"S 24°57'9.55"S 24°56'51.91"S 24°56'46.02"S 24°56'23.66"S 24°56'14.87"S 24°55'58.82"S	30° 6'5.39"E 30° 6'21.32"E 30° 6'24.89"E 30° 6'14.64"E 30° 6'6.63"E 30° 6'3.95"E 30° 5'57.02"E 30° 5'50.36"E 30° 5'55.74"E 30° 6'1.74"E 30° 6'5.06"E 30° 6'9.66"E	New Water Use Application

Water Use Section	Water Use Name		Reference	Farm	Portion	Purpose	Volume Approved	WUL Date	Coordinates from WUL & Applications		Outline of new required WUL				
									S	E	Water Use Name	Volume Required	Coordinates S	Coordinates E	Reason/Motivation
													24°56'39.83"S 24°56'39.91"S	30° 5'59.81"E 30° 6'4.35"E	
	Exploration Drilling on Portion 6 (Polygon)	Within 500m (i)	22	372KT	6	Drilling Activities (roads and boreholes) within 500m Riparian Zone of the Dwarsrivier		New Application				New Application	24°55'1.53"S 24°54'57.68"S 24°55'3.97"S 24°55'16.27"S 24°55'26.63"S 24°55'28.68"S 24°55'49.05"S 24°55'48.88"S 24°55'21.90"S	30° 5'56.35"E 30° 6'5.07"E 30° 6'1.89"E 30° 6'1.03"E 30° 5'59.56"E 30° 6'1.50"E 30° 5'57.31"E 30° 5'45.54"E 30° 5'48.64"E	New Water Use Application
	Exploration Drilling on Portion RE	Within 100m (i)	23	372KT	RE	Drilling Activities 100m from the Dwarsrivier		New Application				New Application	24°54'26.92"S 24°54'23.02"S 24°54'25.68"S 24°54'28.56"S	30° 6'18.66"E 30° 6'25.97"E 30° 6'26.69"E 30° 6'19.74"E	New Water Use Application
	Exploration Drilling on Portion 1	Within 100m (i)	24	327KT	RE/1	Drilling Activities 100m from the Groot Dwarsrivier		New Application				New Application	24°55'30.91"S 24°55'26.73"S 24°55'24.31"S 24°55'32.81"S 24°55'35.07"S 24°55'26.99"S	30° 6'12.83"E 30° 6'10.75"E 30° 6'13.45"E 30° 6'27.92"E 30° 6'26.01"E 30° 6'14.84"E	New Water Use Application
	Exploration Drilling on Portion 1	Within 100m (i)	25	327KT	RE/1	Drilling Activities 100m from the Klein Dwarsrivier		New Application				New Application	24°55'58.78"S	30° 6'7.12"E	New Water Use Application
	Exploration Drilling on Portion 6 (Polygon)	Within 100m (i)	26	327KT	6	Drilling Activities 100m from the Dwarsrivier		New Application				New Application	24°54'31.59"S 24°54'34.33"S 24°54'39.93"S 24°54'48.45"S 24°54'50.90"S 24°54'56.10"S 24°55'1.90"S 24°54'59.74"S 24°54'40.11"S 24°54'35.92"S	30° 6'24.82"E 30° 6'25.57"E 30° 6'16.06"E 30° 6'16.37"E 30° 6'18.31"E 30° 6'17.54"E 30° 6'14.72"E 30° 6'14.18"E 30° 6'13.64"E 30° 6'18.02"E	New Water Use Application

Water Use Section	Water Use Name		Reference	Farm	Portion	Purpose	Volume Approved	WUL Date	Coordinates from WUL & Applications		Outline of new required WUL				
											Water Use Name	Volume Required	Coordinates		Reason/Motivation
									S	E			S	E	
	Exploration Drilling on Portion 6 (Polygon)	Within 100m (i)	27	327KT	6	Drilling Activities 100m from the Dwarsrivier		New Application				New Application	24°54'29.32"S 24°54'30.58"S 24°54'41.67"S 24°54'40.48"S	30° 6'14.71"E 30° 6'16.37"E 30° 6'8.40"E 30° 6'6.62"E	New Water Use Application
	Exploration Drilling on Portion 6 (Polygon)	Within 100m (i)	28	327KT	6	Drilling Activities 100m from the Dwarsrivier		New Application				New Application	24°54'58.66"S 24°55'19.95"S 24°55'28.73"S 24°55'30.33"S 24°55'25.08"S 24°55'24.89"S 24°55'18.30"S 24°55'1.28"S	30° 6'5.11"E 30° 6'2.65"E 30° 6'5.18"E 30° 6'3.81"E 30° 6'0.58"E 30° 6'0.46"E 30° 6'0.35"E 30° 6'3.08"E	New Water Use Application
	Exploration Drilling on Portion 6 (Polygon)	Within 100m (i)	29	327KT	6	Drilling Activities 100m from the unnamed tributary of the Dwarsrivier		New Application				New Application	24°54'43.72"S 24°54'43.07"S 24°54'45.53"S 24°54'45.26"S	30° 5'57.07"E 30° 6'7.13"E 30° 6'7.23"E 30° 5'57.76"E	New Water Use Application
	Exploration Drilling on Portion 6 (Polygon)	Within 100m (i)	30	327KT	6	Drilling Activities 100m from the unnamed tributary of the Dwarsrivier		New Application				New Application	24°54'48.96"S 24°54'48.65"S 24°54'50.37"S 24°54'50.54"S	30° 5'53.33"E 30° 6'6.68"E 30° 6'6.23"E 30° 5'53.99"E	New Water Use Application
	Exploration Drilling on Portion 6 (Polygon)	Within 100m (i)	31	327KT	6	Drilling Activities 100m from the unnamed tributary of the Klein Dwarsrivier		New Application				New Application	24°55'48.58"S 24°55'50.46"S 24°55'52.21"S 24°55'50.46"S	30° 5'50.71"E 30° 5'58.85"E 30° 5'58.31"E 30° 5'50.58"E	New Water Use Application
	Exploration Drilling on Portion 6 (Polygon)	Within 100m (i)	32	327KT	6	Drilling Activities 100m from the unnamed tributary of the Klein Dwarsrivier		New Application				New Application	24°55'56.40"S 24°55'57.32"S 24°55'59.42"S 24°55'57.79"S	30° 5'43.62"E 30° 5'57.30"E 30° 5'57.01"E 30° 5'43.61"E	New Water Use Application
	Exploration Drilling on Portion 6 (Polygon)	Within 100m (i)	33	327KT	6	Drilling Activities 100m from the Klein Dwarsrivier		New Application				New Application	24°56'5.38"S 24°56'1.06"S 24°56'2.70"S 24°56'6.73"S	30° 5'53.14"E 30° 5'58.69"E 30° 5'59.88"E 30° 5'55.52"E	New Water Use Application

Water Use Section	Water Use Name		Reference	Farm	Portion	Purpose	Volume Approved	WUL Date	Coordinates from WUL & Applications		Outline of new required WUL				
											Water Use Name	Volume Required	Coordinates		Reason/Motivation
									S	E			S	E	
	Exploration Drilling on Portion 6 (Point)	Within 100m (i)	34	327KT	6	Drilling Activities 100m from the unnamed tributary of the Klein Dwarsrivier		New Application				New Application	24°56'5.19"S	30° 5'49.84"E	New Water Use Application
	Exploration Drilling on Portion 6 (Polygon)	Within 100m (i)	35	327KT	6	Drilling Activities 100m from the unnamed tributary of the Klein Dwarsrivier		New Application				New Application	24°56'9.34"S 24°56'9.98"S 24°56'11.80"S 24°56'11.81"S	30° 5'42.21"E 30° 5'54.41"E 30° 5'54.13"E 30° 5'42.19"E	New Water Use Application
	Exploration Drilling on Portion 6 (Polygon)	Within 100m (i)	36	327KT	6	Drilling Activities 100m from the unnamed tributary of the Klein Dwarsrivier		New Application				New Application	24°56'14.16"S 24°56'16.28"S 24°56'18.52"S 24°56'16.64"S	30° 5'42.02"E 30° 5'49.41"E 30° 5'49.12"E 30° 5'41.65"E	New Water Use Application
	Exploration Drilling on Portion 6 (Point)	Within 100m (i)	37	327KT	6	Drilling Activities 100m from the unnamed tributary of the Klein Dwarsrivier		New Application				New Application	24°56'25.73"S	30° 5'46.67"E	New Water Use Application
	Exploration Drilling on Portion 6 (Point)	Within 100m (i)	38	327KT	6	Drilling Activities 100m from the unnamed tributary of the Klein Dwarsrivier		New Application				New Application	24°56'40.07"S 24°56'42.71"S 24°56'40.45"S 24°56'43.63"S	30° 5'39.35"E 30° 5'43.73"E 30° 5'44.69"E 30° 5'44.16"E	New Water Use Application
	Exploration Drilling on Portion 6 (Polygon)	Within 100m (i)	39	327KT	6	Drilling Activities 100m from the Klein Dwarsrivier		New Application				New Application	24°56'44.26"S 24°56'46.08"S 24°56'54.31"S 24°56'53.76"S	30° 5'37.23"E 30° 5'39.36"E 30° 5'37.46"E 30° 5'35.80"E	New Water Use Application
	Exploration Drilling on Portion 6 (Polygon)	Within 100m (i)	40	327KT	6	Drilling Activities 100m from the Klein Dwarsrivier		New Application				New Application	24°56'54.09"S 24°56'54.26"S 24°57'2.86"S 24°57'3.55"S	30° 5'43.24"E 30° 5'45.16"E 30° 5'45.06"E 30° 5'42.16"E	New Water Use Application
	Exploration Drilling on Portion 6 (Polygon)	Within 100m (i)	41	327KT	6	Drilling Activities 100m from the unnamed tributary of the Klein Dwarsrivier		New Application				New Application	24°57'3.76"S 24°57'4.20"S 24°57'5.35"S 24°57'4.86"S	30° 5'42.79"E 30° 5'55.07"E 30° 5'54.27"E 30° 5'42.90"E	New Water Use Application

Water Use Section	Water Use Name		Reference	Farm	Portion	Purpose	Volume Approved	WUL Date	Coordinates from WUL & Applications		Outline of new required WUL				
											Water Use Name	Volume Required	Coordinates		Reason/Motivation
									S	E			S	E	
	Exploration Drilling on Portion 6 (Point)	Within 100m (i)	42	327KT	6	Drilling Activities 100m from the unnamed tributary of the Klein Dwarsrivier		New Application				New Application	24°57'10.22"S	30° 5'48.17"E	New Water Use Application
	Exploration Drilling on Portion 6 (Polygon)	Within 100m (i)	43	327KT	6	Drilling Activities 100m from the Klein Dwarsrivier		New Application				New Application	24°57'8.16"S 24°57'8.27"S 24°57'12.75"S 24°57'12.47"S	30° 5'37.18"E 30° 5'38.50"E 30° 5'39.10"E 30° 5'37.10"E	New Water Use Application
	Exploration Drilling on Portion 6 (Polygon)	Within 100m (i)	44	327KT	6	Drilling Activities 100m from the unnamed tributary of the Klein Dwarsrivier		New Application				New Application	24°57'14.13"S 24°57'11.96"S 24°57'19.66"S 24°57'21.46"S 24°57'18.99"S	30° 5'40.50"E 30° 5'41.50"E 30° 5'53.68"E 30° 5'52.88"E 30° 5'47.08"E	New Water Use Application
	Exploration Drilling on Portion 6 (Polygon)	Within 100m (i)	45	327KT	6	Drilling Activities 100m from the unnamed tributary of the Klein Dwarsrivier		New Application				New Application	24°57'19.83"S 24°57'18.46"S 24°57'19.98"S 24°57'25.10"S 24°57'25.91"S 24°57'26.77"S 24°57'25.99"S 24°57'21.16"S	30° 5'36.05"E 30° 5'35.90"E 30° 5'42.09"E 30° 5'48.83"E 30° 5'58.03"E 30° 5'57.25"E 30° 5'46.74"E 30° 5'41.16"E	New Water Use Application
	Exploration Drilling on Portion 6 (Polygon)	Within 100m (i)	46	327KT	6	Drilling Activities 100m from the unnamed tributary of the Klein Dwarsrivier		New Application				New Application	24°57'42.42"S 24°57'40.84"S 24°57'45.59"S 24°57'51.66"S 24°57'47.41"S 24°57'43.57"S 24°57'44.04"S	30° 5'33.19"E 30° 5'40.21"E 30° 5'56.20"E 30° 5'55.76"E 30° 5'51.50"E 30° 5'39.58"E 30° 5'34.70"E	New Water Use Application
	Exploration Drilling on Portion 6 (Polygon)	Within 100m (i)	47	327KT	6	Drilling Activities 100m from the unnamed tributary of the Klein Dwarsrivier		New Application				New Application	24°57'51.20"S 24°57'48.90"S 24°58'1.12"S 24°58'1.79"Sx 24°57'50.99"S 24°57'53.94"S	30° 5'32.56"E 30° 5'44.65"E 30° 5'55.21"E 30° 5'53.50"E 30° 5'46.17"E 30° 5'33.27"E	New Water Use Application

Water Use Section	Water Use Name		Reference	Farm	Portion	Purpose	Volume Approved	WUL Date	Coordinates from WUL & Applications		Outline of new required WUL				
									S	E	Water Use Name	Volume Required	Coordinates S	Coordinates E	Reason/Motivation
	Exploration Drilling on Portion 6 (Polygon)	Within 100m (i)	48	327KT	6	Drilling Activities 100m from the unnamed tributary of the Klein Dwarsrivier		New Application				New Application	24°58'4.49"S 24°58'3.68"S 24°58'23.84"S 24°58'25.95"S	30° 5'57.17"E 30° 5'59.38"E 30° 6'15.62"E 30° 6'13.91"E	New Water Use Application
	Exploration Drilling on Portion 6 (Polygon)	Within 100m (i)	49	327KT	6	Drilling Activities 100m from the unnamed tributary of the Klein Dwarsrivier		New Application				New Application	24°58'1.59"S 24°58'1.22"S 24°58'7.23"S 24°58'22.70"S 24°58'23.92"S	30° 6'5.79"E 30° 6'10.45"E 30° 6'14.89"E 30° 6'20.90"E 30° 6'18.34"E	New Water Use Application
	Exploration Drilling on Portion 6 (Polygon)	Within 100m (i)	50	327KT	6	Drilling Activities 100m from the unnamed tributary of the Klein Dwarsrivier		New Application				New Application	24°57'56.01"S 24°57'57.31"S 24°57'58.58"S 24°57'57.87"S	30° 6'0.10"E 30° 6'11.41"E 30° 6'10.49"E 30° 6'0.84"E	New Water Use Application
	Exploration Drilling on Portion 7 (Polygon)	Within 100m (i)	51	327KT	7	Drilling Activities 100m from the unnamed tributary of the Klein Dwarsrivier		New Application				New Application	24°57'4.15"S 24°57'4.69"S 24°57'10.25"S 24°57'10.65"S	30° 5'58.29"E 30° 5'59.73"E 30° 5'59.34"E 30° 5'58.29"E	New Water Use Application
	Exploration Drilling on Portion 7 (Point)	Within 100m (i)	52	327KT	7	Drilling Activities 100m from the unnamed tributary of the Klein Dwarsrivier		New Application				New Application	24°56'47.16"S	30° 6'0.10"E	New Water Use Application
	Exploration Drilling on Portion 7 (Polygon)	Within 100m (i)	53	327KT	7	Drilling Activities 100m from the unnamed tributary of the Klein Dwarsrivier		New Application				New Application	24°56'40.12"S 24°56'41.61"S 24°56'43.54"S 24°56'42.00"S	30° 5'56.13"E 30° 6'1.92"E 30° 6'1.57"E 30° 5'55.80"E	New Water Use Application
	Exploration Drilling on Portion 7 (Polygon)	Within 100m (i)	54	327KT	7	Drilling Activities 100m from the Klein Dwarsrivier		New Application				New Application	24°56'17.25"S 24°56'18.31"S 24°56'27.57"S 24°56'32.61"S 24°56'31.94"S 24°56'27.66"S 24°56'26.05"S	30° 5'59.97"E 30° 6'1.03"E 30° 6'0.17"E 30° 5'58.75"E 30° 5'56.67"E 30° 5'59.26"E 30° 5'57.45"E	New Water Use Application

Water Use Section	Water Use Name		Reference	Farm	Portion	Purpose	Volume Approved	WUL Date	Coordinates from WUL & Applications		Outline of new required WUL				
									S	E	Water Use Name	Volume Required	Coordinates S	Coordinates E	Reason/Motivation
	Discard Dump Extension	Within 500m (i)	55	372KT	RE	Facility within 500m from the Dwarsrivier Riparian Zone		New Application				New Application	24°55'20.93"S	30° 6'45.75"E	Existing Water Use New Water Use Application
	Low Grade Metallurgical Stockpile and ancilliary infrastructure (workshop, sewage treatment facility and loadout area)	Within 500m (i)	56	372KT	RE/1	Drilling Activities within 500m from the Dwarsrivier Riparian Zone		New Application				New Application	24°55'55.65"S	30° 7'6.65"E	Existing Water Use New Water Use Application
	Plant Workshop and TMM Sewage Treatment Works	Within 500m (i)	57	372KT	RE/1	Infrastructure placed within 500m from the Dwarsrivier Riparian Zone						New Application	24°55'53.19"S	30° 7'7.63"E	Existing Water Use New Water Use Application
	South Laydown Area	Within 500m (i)	58	372KT	RE/1	Infrastructure placed within 500m from the Dwarsrivier Riparian Zone						New Application	24°56'10.45"S	30° 7'12.80"E	Existing Water Use New Water Use Application
	Main parking extension	Withing 100m	59	372KT	RE/1	Infrastructure placed within 100m of buffer of the Springkaanspruit		New Application				New Application	24°56'2.04"S	30° 7'23.33"E	New Water Use Application
	Khulu TSF	South Western Portion (about 8ha) of facilty located withing 500m	60	372KT	RE	Infrastructure placed within 500m from the Dwarsrivier Riparian Zone		New Application				New Application	24°55'8.00"S	30° 6'32.87"E	New Water Use Application
	Khulu TSF Haul Road	Within 500m (i)	60b	372KT	RE	Infrastructure placed within 500m from the Dwarsrivier Riparian Zone		New Application				New Application	24°55'16.69"S 24°55'13.39"S	30° 6'50.59"E 30° 6'42.55"E	New Water Use Application

Water Use Section	Water Use Name		Reference	Farm	Portion	Purpose	Volume Approved	WUL Date	Coordinates from WUL & Applications		Outline of new required WUL				
											Water Use Name	Volume Required	Coordinates		Reason/Motivation
									S	E			S	E	
	Khulu TSF Topsoil Stockpile	Within 500m (i)	60c	372KT	RE	Infrastructure placed within 500m from the Dwarsrivier Riparian Zone		New Applic ation				New Application	24°55'17.97"S	30° 6'45.67"E	New Water Use Application
	Khulu TSF Pipeline	Within 500m (i)	60d	372KT	RE	Infrastructure placed within 500m from the Dwarsrivier Riparian Zone		New Applic ation				New Application	24°55'40.14"S 24°55'4.48"S	30° 6'46.34"E 30° 6'28.64"E	New Water Use Application
	Khulu TSF Filter Press	Within 500m (i)	60e	372KT	RE	Infrastructure placed within 500m from the Dwarsrivier Riparian Zone		New Applic ation				New Application	24°55'38.56"S	30° 6'54.52"E	New Water Use Application
	Exploration Drilling on Portion 7 (Polygon)	Withing 500m	61	372KT	RE	Drilling Activities within 500m from the Dwarsrivier Riparian Zone		New Applic ation				New Application	24°57'32.72"S 24°57'33.16"S 24°57'38.10"S 24°57'35.16"S 24°57'33.69"S 24°57'36.70"S 24°57'35.42"S	30° 5'2.99"E 30° 5'10.12"E 30° 5'6.79"E 30° 5'1.36"E 30° 5'2.18"E 30° 5'6.10"E 30° 5'6.93"E	New Water Use Application
	Exploration Drilling on Portion 1 (Polygon)	Withing 500m	62	372KT	RE/1	Drilling Activities within 500m from the Dwarsrivier Riparian Zone		New Applic ation				New Application	24°55'31.77"S 24°55'36.16"S 24°55'47.34"S 24°55'51.56"S 24°55'58.01"S 24°55'49.59"S	30° 6'13.79"E 30° 6'27.21"E 30° 6'21.77"E 30° 6'25.56"E 30° 6'9.74"E 30° 6'9.07"E	New Water Use Application
	Exploration Drilling on Portion 6 (Polygon)	Withing 500m	63	372KT	6	Drilling Activities within 500m from the Dwarsrivier Riparian Zone		New Applic ation				New Application	24°55'3.42"S 24°54'59.71"S 24°55'4.70"S 24°55'17.10"S 24°55'16.24"S	30° 6'14.60"E 30° 6'17.24"E 30° 6'26.64"E 30° 6'27.17"E 30° 6'22.00"E	New Water Use Application
	Exploration Drilling on Portion 6 (Polygon)	Withing 500m	64	372KT	6	Drilling Activities within 500m from the Dwarsrivier Riparian Zone		New Applic ation				New Application	24°55'59.52"S 24°56'0.82"S 24°56'3.21"S 24°56'4.05"S	30° 5'44.33"E 30° 5'57.55"E 30° 5'55.03"E 30° 5'44.35"E	New Water Use Application

Water Use Section	Water Use Name		Reference	Farm	Portion	Purpose	Volume Approved	WUL Date	Coordinates from WUL & Applications		Outline of new required WUL				
											Water Use Name	Volume Required	Coordinates		Reason/Motivation
									S	E			S	E	
	Exploration Drilling on Portion 6 (Polygon)	Withing 500m	65	372KT	6	Drilling Activities within 500m from the Dwarsrivier Riparian Zone		New Applic ation				New Application	24°56'25.19"S 24°56'25.41"S 24°56'21.86"S 24°56'18.13"S 24°56'19.67"S 24°56'25.50"S 24°56'25.35"S 24°56'22.12"S 24°56'21.59"S	30° 5'42.10"E 30° 5'40.68"E 30° 5'38.43"E 30° 5'39.84"E 30° 5'47.88"E 30° 5'46.92"E 30° 5'43.72"E 30° 5'41.74"E 30° 5'39.25"E	New Water Use Application
	Exploration Drilling on Portion 6 (Polygon)	Withing 500m	66	372KT	6	Drilling Activities within 500m from the Dwarsrivier Riparian Zone		New Applic ation				New Application	24°56'38.73"S 24°56'33.89"S 24°56'34.51"S 24°56'42.00"S	30° 5'37.90"E 30° 5'39.38"E 30° 5'46.02"E 30° 5'42.94"E	New Water Use Application
	Exploration Drilling on Portion 6 (Polygon)	Withing 500m	67	372KT	6	Drilling Activities within 500m from the Dwarsrivier Riparian Zone		New Applic ation				New Application	24°57'56.04"S 24°57'52.89"S 24°58'13.43"S 24°58'18.17"S 24°58'17.32"S 24°58'8.93"S	30° 5'32.01"E 30° 5'44.98"E 30° 5'42.59"E 30° 5'38.08"E 30° 5'29.73"E 30° 5'32.82"E	New Water Use Application
	Exploration Drilling on Portion 6 (Polygon)	Withing 500m	68	372KT	6	Drilling Activities within 500m from the Dwarsrivier Riparian Zone		New Applic ation				New Application	24°57'21.26"S 24°57'21.92"S 24°57'28.12"S 24°57'34.58"S 24°57'41.42"S 24°57'38.24"S 24°57'29.85"S 24°57'31.65"S 24°57'27.16"S	30° 5'36.02"E 30° 5'39.88"E 30° 5'47.76"E 30° 5'44.67"E 30° 5'49.61"E 30° 5'32.90"E 30° 5'33.92"E 30° 5'38.31"E 30° 5'34.48"E	New Water Use Application
	Exploration Drilling on Portion 6 (Polygon)	Withing 500m	69	372KT	6	Drilling Activities within 500m from the Dwarsrivier Riparian Zone		New Applic ation				New Application	24°56'55.27"S 24°56'55.32"S 24°57'2.95"S 24°57'0.63"S	30° 5'46.28"E 30° 5'51.76"E 30° 5'54.33"E 30° 5'46.95"E	New Water Use Application

Water Use Section	Water Use Name		Reference	Farm	Portion	Purpose	Volume Approved	WUL Date	Coordinates from WUL & Applications		Outline of new required WUL				Reason/Motivation
											Water Use Name	Volume Required	Coordinates		
									S	E			S	E	
	Exploration Drilling on Portion 6 (Polygon)	Withing 500m	70	372KT	6	Drilling Activities within 500m from the Dwarsrivier Riparian Zone		New Applic ation				New Application	24°57'10.94"S 24°57'9.31"S 24°57'11.78"S 24°57'11.09"S 24°57'18.15"S 24°57'17.10"S	30° 5'42.25"E 30° 5'43.23"E 30° 5'49.09"E 30° 5'57.07"E 30° 5'52.31"E 30° 5'49.01"E	New Water Use Application
	Exploration Drilling on Portion 7 (Polygon)	Withing 500m	71	372KT	7	Drilling Activities within 500m from the Dwarsrivier Riparian Zone		New Applic ation				New Application	24°56'55.50"S 24°56'54.74"S 24°56'50.32"S 24°56'49.62"S 24°57'3.29"S 24°57'2.52"S	30° 5'52.15"E 30° 5'55.81"E 30° 5'58.59"E 30° 6'5.17"E 30° 6'3.88"E 30° 5'54.79"E	New Water Use Application
	Exploration Drilling on Portion 6 (Polygon)	Drilling Activities 100m from the Dwarsrivier	72	327KT	6	Drilling Activities 100m from the unnamed tributary of the Klein Dwarsrivier		New Applic ation				New Application	24°57'8.86"S 24°57'7.73"S 24°57'9.33"S 24°57'11.18"S	30° 5'42.41"E 30° 5'42.61"E 30° 5'49.11"E 30° 5'48.80"E	New Water Use Application
	Exploration Drilling on Portion 7 (Polygon)	Drilling Activities 100m from the Dwarsrivier	73	327KT	7	Drilling Activities 100m from the uKlein Dwarsrivier		New Applic ation				New Application	24°56'51.41"S 24°56'47.48"S 24°56'46.51"S 24°56'48.09"S 24°56'48.91"S 24°56'51.79"S 24°56'54.75"S	30° 5'50.76"E 30° 5'56.02"E 30° 6'1.32"E 30° 6'1.43"E 30° 5'57.00"E 30° 5'56.12"E 30° 5'52.33"E	New Water Use Application
	Plant Stockpiles	Within 500m	74	327KT	RE	Placed within 500m Riparian Buffer		New Applic ation				New Application	24°55'44.02"S	30° 7'1.15"E	New Water Use Application (Existing Use)
	High Grade Met Stockpile	Within 500m	75	327KT	RE/1	Placed within 500m Riparian Buffer		New Applic ation				New Application	24°55'55.73"S	30° 7'6.62"E	New Water Use Application (Existing Use)
	Old TSF	Within 500m	76	327KT	RE/1	Placed within 500m Riparian Buffer		New Applic ation				New Application	24°55'42.33"S	30° 6'54.08"E	Approved S21g Water Use. New Application (Existing Use)
	Upper RWD	Within 500m	77	372KT	RE/1	Placed within 500m Riparian Buffer		New Applic ation			-	New Application	24°55'42.71"S	30° 6'44.58"E	Approved S21g Water Use. New Application (Existing Use)
	Lower RWD	Within 500m	78	372KT	RE/1	Placed within 500m Riparian Buffer		New Applic ation			-	New Application	24°55'52.61"S	30° 6'56.48"E	Approved S21g Water Use. New Application (Existing Use)

Water Use Section	Water Use Name		Reference	Farm	Portion	Purpose	Volume Approved	WUL Date	Coordinates from WUL & Applications		Outline of new required WUL				
									S	E	Water Use Name	Volume Required	Coordinates		Reason/Motivation
													S	E	
	Dam 26	Within 500m	79	372KT	RE/1	Placed within 500m Riparian Buffer		New Application			-	New Application	24°56'7.16"S	30° 7'3.35"E	Approved S21g Water Use. New Application (Existing Use)
	Water Treatement Plant	Within 100m (i)	80	372KT	RE/1	Placed wtihin 100m from river system		New Application			-	New Application	24°56'4.66"S	30° 7'3.62"E	Approved S21g Water Use. New Application (Existing Use)
	Subway crossing	Within 100m (i)	80	372KT	RE/1	Placed wtihin 100m from river system		New Application			-	New Application	24°55'56.44"S	30° 7'21.65"E	New Water Use Application
Section 21(g)	Upper RWD		1	372KT	RE/1	Receive water from Dam 26 and Plant	240m^3/day (capacity 23500m^3)	2008	S24°56'03.7"; S24°56'04.8"; S24°56'05.5"; S24°56'08.6"; S24°56'08.7"; S24°56'03.7"	E30°07'03.3"; E30°07'04.4"; E30°07'04.2"; E30°07'05.0"; E30°07'03.7"; E30°07'02.7"	-	capacity 23500m3	24°55'42.71"S	30° 6'44.58"E	No change
	Lower RWD		2	372KT	RE/1	Receive water from Plant and Northern Mine	273m^3/day (capacity 23400m3)	2008	S24°55'37.9"; S24°55'37.9"; S24°55'44.3"; S24°55'44.7"	E30°06'45.2"; E30°06'47.9"; E30°06'45.5"; E30°06'43.3"	-	capacity 23400m3	24°55'52.61"S	30° 6'56.48"E	No change
	Clarifier (treatment facility)	not to licence (treatment facility)	3	372KT	RE/1	Receives water from Undeground operation	-	-	Not available	Not available	-	720m3	24°56'15.32"S	30° 7'12.28"E	Not to be lisenced (Treatment Facility)
	Dam 26		4	372KT	RE/1	Receives water from Undeground operation	capacity 20000m^3	2008	Not available	Not available	-	No change	24°56'7.16"S	30° 7'3.35"E	No change
	Dispose of mine residue on South Pit Overburden Dump East		5	373KT	3	Dispose of mine residue on South Pit Overburden Dump East	600 000m^3/annum	2008	Not available	Not available	South Residue Dump East	No change	24°56'15.82"S	30° 7'35.28"E	No change
	North Residue Dump East (no longer in use, but not rehabilitated)		6	372KT	RE	Disposal of mine residue on North Pit Overburden Dump East	375 000m^3/annum	2008	Not available	Not available	North Residue Dump East (Rehab)	No change	24°55'36.04"S	30° 7'25.95"E	No change
	Dispose of mine residue on North Pit Overburden Dump West		7	372KT	RE	Dispose of mine residue on North Pit Overburden Dump West	65 000m^3/annum	2008	Not available	Not available	North Residue Dump West	No change	24°55'28.24"S	30° 7'8.24"E	No change

Water Use Section	Water Use Name		Reference	Farm	Portion	Purpose	Volume Approved	WUL Date	Coordinates from WUL & Applications		Outline of new required WUL				
											Water Use Name	Volume Required	Coordinates		Reason/Motivation
									S	E			S	E	
	Dispose of mine residue on South Residue Dump West (the Discard Dump (WRD).		8	372KT	RE/1	Dispose of mine residue on Discard Dump (WRD) (South Residue Dump West)	23 000m^3/annum	2008	Not available	Not available	South Residue Dump West (Discard Dump)	198 113m3/annum 3 760 801m3 169 956m2	24°55'29.96"S	30° 6'53.11"E	A change to the footprint and capacity of the Discard Dump is required. The current footprint is approximatley 4.5ha, with an increase requried of 16ha to and overall area of 20.5ha.
	Dispose of mine tailings on the Tailings Dam		9	372KT	RE/1	Dispose of mine tailings on the Tailings Dam	190000m^3/day	2008	Not available	Not available	Old TSF (for future rework)	No change	24°55'42.33"S	30° 6'54.08"E	No change
	Dispose of tailings into North and South Opencast Pit areas		10	372KT	RE	Dispose of tailings into North and South Opencast Pit areas	309m^3/day (to a maximum of 112 800m^3/annum)	2008	Not available	Not available	North Pit Tailing Backfill Area	No change	24°55'29.88"S	30° 7'14.13"E	Disposal of Waste Rock into the opencast voids for rehabilitation, and not tailings.
			11	372KT	RE/1				Not available	Not available	South Pit Tailings Backfill Area		24°56'4.07"S	30° 7'16.33"E	Disposal of Waste Rock into the opencast voids for rehabilitation, and not tailings.
	North TSF		12	372KT	RE	North TSF	207 360 tons per annum (capacity 5.05 million tons)	2011	24° 55' 22.8"S; 24° 55' 24.2"S; 24° 55' 16"S; 24° 55' 9.1"S	30° 07' 13.7"E; 30° 07' 24.7"E; 30° 07' 29.1"E; 30° 07' 22.6"E	North TSF	463 691t/annum (86 165m3/annum) (capacity 5.05 million tons)	24° 55' 22.8"S; 24° 55' 24.2"S; 24° 55' 16"S; 24° 55' 9.1"S	30° 07' 13.7"E; 30° 07' 24.7"E; 30° 07' 29.1"E; 30° 07' 22.6"E	Change in deposition rate. Amendment Required

Water Use Section	Water Use Name		Reference	Farm	Portion	Purpose	Volume Approved	WUL Date	Coordinates from WUL & Applications		Outline of new required WUL				
											Water Use Name	Volume Required	Coordinates		Reason/Motivation
									S	E			S	E	
	TSF Water Collection Sump		13	372KT	RE	TSF Water Collection Sump	Form part of North TSF	2011	24°55'9.55"S	30° 7'26.42"E		2 300m3	24°55'9.55"S	30° 7'26.42"E	No change
	North RWD		14	372KT	RE	RWD (contain decant, seepage and dirty runoff form the tailings)	33 000m3	2011	24°55'29.49"S	30° 7'11.59"E	RWD	33000m3	24°55'29.49"S	30° 7'11.59"E	No change
	Underground Fissure Water Tank		15	372KT	RE/1	-	740 m3	New Applic ation	-	-	Fissure Water Tank	740 m3	24°56'13.67"S	30° 7'13.69"E	New Water Use Application (Existing Use)
	Dewatering Dams		16	372KT	RE	Water Treatment Works	-	New Applic ation	-	-	North Dewatering Dam	4825m3 (capacity)	24°55'43.47"S	30° 7'13.88"E	New Water Use Application (Existing Use)
	Dewatering Dams		17	372KT	RE/1	Water Treatment Works	-	New Applic ation	-	-	South Dewatering Dam	1405m3 (capacity)	24°56'19.74"S	30° 7'14.67"E	New Water Use Application (Existing Use)
	Main Sewage Treatment Works	not to licence (treatment facility)	18	372KT	RE/1	Water Treatment Works	-	2008	-	-	Main Sewage Treatment Works	18m3	24°56'2.30"S	30° 7'12.93"E	New Water Use Application
	Plant Sewage Treatment Works	not to licence (treatment facility)	19	372KT	RE/1	Water Treatment Works	-	-	-	-	Plant Sewage Treatment Works	18m3	24°55'50.73"S	30° 7'4.73"E	New Water Use Application
	TMM Proposed Sewage Treatment Works	not to licence (treatment facility)	20	372KT	RE/1	Water Treatment Works	-	-	-	-	TMM Proposed Sewage Treatment Works	700m3	24°55'52.53"S	30° 7'7.63"E	New Water Use Application
	Sewage Sump - North		21	372KT	RE	-		Gener ally Author ised	-		North Shaft Septic Tank	$7,5m^3$	24^0 55'50.8"S	30^0 07'19.0"E	New Water Use Application
	Sewage Sump - South		22	372KT	RE/1	-		Gener ally Author ised	-	-	South Shaft lamp room Septic Tank	$5m^3$	24^0 56'15.2"S	30^0 07'25.2"E	New Water Use Application
	Sewage Sump - North TSF		23	372KT	RE	-		Gener ally Author ised		-	Fraser Alexander site TSF Septic Tank	$5m^3$	24^0 55'50.08"S	30^0 07'19.0"E	New Water Use Application
	Settling Dam 1 - North		24	372KT	RE	Water Treatment Works	-	-	-	-	Settling Dam 1 - North	1500m3 (capacity)	24°55'37.55"S	30° 7'18.12"E	New Water Use Application (Existing Use)

Water Use Section	Water Use Name		Reference	Farm	Portion	Purpose	Volume Approved	WUL Date	Coordinates from WUL & Applications		Outline of new required WUL				
											Water Use Name	Volume Required	Coordinates		Reason/Motivation
									S	E			S	E	
	Setting Dam 2 - North		25	372KT	RE	Water Treatment Works	-	-	-	-	Setting Dam 2 - North	500m3 (capacity)	24°55'38.32"S	30° 7'17.00"E	New Water Use Application (Existing Use)
	Settling Dam 3 - North		26	372KT	RE	Water Treatment Works	-	-	-	-	Settling Dam 3 - North	500m3 (capacity)	24°55'37.27"S	30° 7'17.08"E	New Water Use Application (Existing Use)
	Dust Suppression - North		27	372KT	RE	-		New Applic ation	-	-	Dust Suppression	35760m3/a	Dust suppression on roads on South mine	Dust Suppression on roads South Mine	New Water Use Application (Existing Use)
	Dust Suppression - South		28	372KT	RE/1	-		New Applic ation	-	-	Dust Suppression	35760m3/a	Dust suppression on roads on North mine	Dust Suppression on roads North Mine	New Water Use Application (Existing Use)
	South Residue Dump South (Rehab)	formation as part of backfilling	29	372KT	RE/1			-	-	-	South Residue Dump South (Rehab)	-	24°56'11.41"S	30° 7'17.91"E	Rehabilitated - not to be licensed.
	WTW Clean Water Reservoir		30	372KT	RE/1	Storage of Treated water from the Water Treatment Plant (Domestic Water Quality Standards)	-	New Applic ation	-	-	WTP Reservoir	900m3 (capacity)	24°56'5.11"S	30° 7'4.23"E	New Water Use Application (Existing Use)
	WTW Dirty Water Storage Tank		31	372KT	RE/1	Storage of dirty water prior to treatment	-	New Applic ation	-	-	WTP Dirty Water Tank	30m3 (capacity)	24°56'5.15"S	30° 7'2.99"E	New Water Use Application (Existing Use)
	Overland ROM (STH2)		32	372KT	RE/1	ROM Stockpile	-	New Applic ation	-	-	ROM Stockpile	6 450m2 35 880m3	30° 7'3.70"E	30° 7'3.70"E	New Water Use Application (Existing Use)
	Underground ROM (STH1)		33	372KT	RE/1	ROM Stockpile	-	New Applic ation	-	-	ROM Stockpile	2 169m2 9 430m3	24°56'12.51"S	30° 7'26.60"E	New Water Use Application (Existing Use)
	(Plant Feed ROM S/P)		34	372KT	RE/1	ROM Stockpile	-	New Applic ation	-	-	ROM Stockpile	3413m2 25 510m3	24°55'50.18"S	30° 7'12.63"E	New Water Use Application (Existing Use)

Water Use Section	Water Use Name		Reference	Farm	Portion	Purpose	Volume Approved	WUL Date	Coordinates from WUL & Applications		Outline of new required WUL				
									S	E	Water Use Name	Volume Required	Coordinates S	Coordinates E	Reason/Motivation
	Plant Product Stockpiles		35	372KT	RE/1	Storage of Product for dispach via trucks	-	New Applic ation	-	-	Plant Stockpile	24 430m2 117 343m3	24°55'43.67"S 24°55'46.27"S 24°55'52.26"S 24°55'56.50"S 24°55'57.71"S 24°55'48.86"S 24°55'34.56"S 24°55'33.27"S	30° 7'4.65"E 30° 6'58.77"E 30° 7'5.36"E 30° 7'9.76"E 30° 7'7.51"E 30° 6'58.23"E 30° 6'57.39"E 30° 6'59.48"E	New Water Use Application (Existing Use)
	High Grade Met Stockpile		36	372KT	RE/1	Storage of Product for dispach via trucks		New Applic ation			Plant Stockpile	4 223m2 29 940m3	24°55'55.73"S	30° 7'6.62"E	New Water Use Application (Existing Use)
	Khulu TSF		37	372KT	RE	Storage of filter cake tailings		New Applic ation			New TSF	22,5ha 34 100m3/a	24°55'2.96"S	30° 6'37.36"E	New Water Use Application
	Kkulu PCD		38	372KT	RE	Storage of process water and water from Khulu TSF		New Applic ation			New PCD	49 000m3	24°54'48.37"S	30° 6'29.99"E	New Water Use Application
Section 21(j)	South Shaft Dewatering	South Water Dewatering	3	372KT	RE/1	To be reused in the mining process	376 360m3/a (average of 272m3/day)	2008	24 55'39.7"S; 24 55'36.5"S	30 06'34.7"E; 30 06'37.2"E	South Shaft Dewatering	No change	24°56'16.60"S	30° 7'15.10"E	Approved
	North Shaft Dewatering	North Shaft Dewatering	5	372KT	RE	To be reused in the mining process	165 700m³ /annum(average of 452m³/day)	2008	24 55'39.7"S; 24 55'36.5"S	30 06'34.7"E; 30 06'37.2"E	North Shaft Dewatering	No change	24°55'42.28"S	30° 7'14.01"E	Approved
GN 704 Regulation 4(a) and (b) exemption	(a) Locate or place any residue deposit, dam, reservoir, together with any associated structure within 1:100 year flood-line or within a horizontal distance of 100 m of a watercourse or borehole, excluding boreholes drilled specifically to monitor the pollution of ground water, or on ground likely to become water-logged, undermined, unstable or cracked						Conveyor belt, haul road crossings, non-perennial stream diversions	2008	-	-	-	-	-	-	-

Water Use Section	Water Use Name	Reference	Farm	Portion	Purpose	Volume Approved	WUL Date	Coordinates from WUL & Applications		Outline of new required WUL				
								S	E	Water Use Name	Volume Required	Coordinates S	Coordinates E	Reason/Motivation
	(b) No opencast mining, prospecting or any other operation or activity under or within the 1:50 year flood-line or within a horizontal distance of 100m from any watercourse						2008	-	-	-	-	-	-	-
GN 704 Regulation 4 (c) and (d)	(c) No placement or disposal of any residue or substance which causes or is likely to cause pollution of a water resoure, in the underground workings or opencast excavation					Specifically for the disposal of tailings in the North and South pits	2008	-	-	-	-	-	-	-
	(d) Locate any sanitary convenience, fuel depots, reservoir or depots for any substance which causes or is likely to cause pollution within the 1:50 year flood line of any watercourse.						2008	-	-	-	-	-	-	-
Regulation 4a	(a) Locate or place any residue deposit, dam, reservoir, together with any associated structure within 1:100 year flood-line or within a horizontal distance of 100 m of a watercourse or borehole, excluding boreholes drilled specifically to monitor the pollution of ground water, or on ground likely to become water-logged, undermined, unstable or cracked					For the WRD on the south eastern part of the Dwarsrivier - located next to an unamed tibutary of the Dwarsrivier	WUL Amendment 2021	-	-	-	-	-	-	-
Regulation 4a	(a) Locate or place any residue deposit, dam, reservoir, together with any associated structure within 1:100 year flood-line or within a horizontal distance of 100 m of a watercourse or borehole, excluding boreholes drilled specifically to monitor the pollution of ground water, or on ground likely to become water-logged, undermined, unstable or cracked					Emulsion Tanks: located next to the Groote Dwarsrivier		-	-	-	-	-	-	
Regulation 4a	(a) Locate or place any residue deposit, dam, reservoir, together with any associated structure within 1:100 year flood-line or within a horizontal distance of 100 m of a watercourse or borehole, excluding boreholes drilled specifically to monitor the pollution of ground water, or on ground likely to become water-logged, undermined, unstable or cracked					Vent Shaft: located next to the Emulsion Tank		-	-	-	-	-	-	
Regulation 4a	(a) Locate or place any residue deposit, dam, reservoir, together with any associated structure within 1:100 year flood-line or within a horizontal distance of 100 m of a watercourse or borehole, excluding boreholes drilled specifically to monitor the pollution of ground water, or on ground likely to become water-logged, undermined, unstable or cracked					Sewage Treatment Plant: located next to the Dwarsrivier		-	-	-	-	-	-	

Water Use Section	Water Use Name	Reference	Farm	Portion	Purpose	Volume Approved	WUL Date	Coordinates from WUL & Applications		Outline of new required WUL				
								S	E	Water Use Name	Volume Required	Coordinates S	Coordinates E	Reason/Motivation
Regulation 4a	(a) Locate or place any residue deposit, dam, reservoir, together with any associated structure within 1:100 year flood-line or within a horizontal distance of 100 m of a watercourse or borehole, excluding boreholes drilled specifically to monitor the pollution of ground water, or on ground likely to become water-logged, undermined, unstable or cracked					Pollution Control Dam/ Return Water Dam: located next to the Dwarsrivier		-	-	-	-	-	-	
Regulation 4a	(a) Locate or place any residue deposit, dam, reservoir, together with any associated structure within 1:100 year flood-line or within a horizontal distance of 100 m of a watercourse or borehole, excluding boreholes drilled specifically to monitor the pollution of ground water, or on ground likely to become water-logged, undermined, unstable or cracked					Bunded area below the emulsion tank		-	-	-	-	-	-	
Regulation 4 (c)	(c) No placement or disposal of any residue or substance which causes or is likely to cause pollution of a water resoure, in the underground workings or opencast excavation					PCD: New tailings area		-	-	-	-	-	-	
Regulation 4a	*No Regulation 4(a) exemption required as this is more than 100m from the watercourse							-	-	-	-	-	-	
Regulation 4 (a)	(a) Locate or place any residue deposit, dam, reservoir, together with any associated structure within 1:100 year flood-line or within a horizontal distance of 100 m of a watercourse or borehole, excluding boreholes drilled specifically to monitor the pollution of ground water, or on ground likely to become water-logged, undermined, unstable or cracked					TSF water collection sump: located to the north of the new TSF		-	-	-	-	-	-	
Regulation 4 (c)	(c) No placement or disposal of any residue or substance which causes or is likely to cause pollution of a water resoure, in the underground workings or opencast excavation					RWD located to the south of the new TSF		-	-	-	-	-	-	
Regulation 5	No person in control of a mine or activity may use any residue or substance which causes or is likely to cause pollution of a water resource for the construction of any dam or other impoundment or any embankment, road or railway, or for any other purpose which is likely to cause pollution of a water resource.					The use of discard in the construction of roads and berms where required (portion RE and RE/1 of the farm Dwarsrivier.	New Application	-	-	-	-	-	-	New application
Regulation 4a	(a) Locate or place any residue deposit, dam, reservoir, together with any associated structure within 1:100 year flood-line or within a horizontal distance of 100 m of a watercourse or borehole, excluding boreholes drilled specifically to monitor the pollution of ground water, or on ground likely to become water-logged, undermined, unstable or cracked					Subway Crossing, Mine Office Parking and Extension, Access Road Widening	New Application	-	-	-	-	-	-	New application

1.d.viii Impacts to be mitigated in their respective phases

Please refer to Table 8 for the discussion on the sizes of disturbance. The following table presents the impacts to be mitigated, also indicating the significance before and after the implementation of mitigation measures. The table further provides the performance objectives and goals to be met over the life of mine, with an action plan for consideration by the applicant. The action plan (in terms of timeframes and responsibility) is dynamic and could be amended based on the development of the project. However, the management measures in all cases should be met.

Table 89: Planning Phase Impact Table with Management Measure, Objectives and Standards (Significance before Mitigation –SbM; Significance after Mitigation – SaM; Can be avoided – CbA; R – Reversible; Ir – Irreversible; ST: 1-12 months; MT: 1-5 yrs.; LT: 5 years and more; LOM: Life of Mine)

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	**Project**	**Impact Area**	**Potential Impacts**	**SbM**	**Mitigation Measures**	**SaM**	**CvA/R/Ir**	**Performance Objectives**	**Goals**	**ST**	**MT**	**LT**	**LOM**	**Compliance with Standard**	**Functional Requirements for Monitoring**	**Responsibilities**	**Monitoring and Reporting Frequency**
Legal Requirements (Environmental Permits)	1, 2, 3, 4 &5	Legal Compliance	Unlawful water and waste activities, which could lead to NWA Directives and Section 24G Rectification fines.	-14	A legal assessment of all activities and future planned activities must be undertaken annually to ensure that all activities are authorised.	17	CbA	To operate within the enviro-legal ambits of South Africa.	Ensure that all activities undertaken by the mine are lawful with the required environmental licences in place.				x	Compliance in terms of Regulatory Requirements and the implementation of the EMP.	Appointment of an Independent Environmental Control Officer to assess compliance with the EMP.	Independent ECO	Monthly ECO inspections for the construction phase. Biannual internal and external audits can be undertaken during the construction phase. Annual internal and external audits during operational phase. Monthly update of legal register.
					All legally appointed personnel responsible or involved in water use activities and activities associated in the Environmental Authorisations on site must receive training on the requirements of the Environmental Authorisations and relevant Environmental Legislation.			To be aware of the latest environmental legal requirements.	All Departments responsible for development of the mine and associated capital projects, must understand the requirements of the environmental legislation and					Compliance in terms of Regulatory Requirements and the implementation of the EMP.	Monthly environmental meetings must be implemented to discuss the mining plan, implementation thereof, implication on current Environmental Regulations and	SHEQ Department to Coordinate	Monthly Environmental Meetings. Monthly update of legal register. Regular updates of Code of Practices and Strategic Operating Plans.

Name of Activity	Project		Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
					Biannually (construction) internal and external audits must be undertaken during the construction phase, whereafter Biennial (every second year) audits can be undertaken, on the lawful implementation of the Environmental Authorisation				approved Environmental Authorisations and must include such into their planning processes.						potential constraints and liabilities. Minutes must be kept of these meetings and action plans with responsibilities must be drafted. The following must be placed at the site and is applicable to all activities: • Relevant Legislation; • Acts; • Regulations • COP's • SOP's Management and staff must be trained to understand the contents of these documents and to adhere thereto Environmental Awareness training must be provided to employees. A site layout with all the no-go zones should be compiled.		Annual induction which includes the relevant contents of Environmental Authorisations, approved Environmental Reports and applicable Environmental Legislation. No go zones map - immediately Walkover and identification of sensitive and protected ecology for relocation - prior to site clearance Application and obtaining of ecological removal permits - prior to site clearance.
					Additional monitoring boreholes, as detailed in the Numerical Model, 2022, must be drilled prior to the commencement of construction of the Khulu TSF and PCD to ensure that a baseline can be generated. In addition to this the following should be undertaken to plan toward groundwater management prior to the construction of the TSF: • Survey newly drilled monitoring boreholes. • Drill three additional monitoring boreholes, two down gradient of the PCD and one on the north-western corner of the TSF. • Implement the monitoring programme dedicated to the Khulu TSF in boreholes. • Finalise the Groundwater Remediation Strategy for the Dwarsrivier Mine operations. The objective of the strategy must be to												

Name of Activity	Project		Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
					avoid further deterioration of groundwater quality. The study must be based on the field data obtained from newly drilled monitoring boreholes during 2021. • The TSF design should consider the locations of all monitoring boreholes to avoid borehole destruction. • Develop a conceptual rehabilitation plan that takes the outcome of the geohydrological study into consideration. This plan should consider the implementation of concurrent rehabilitation during the operational phase to reduce long-term impacts.												
					Water Use Licence must be available on site at all times. GN704 exemptions are applied for, for the following proposed infrastructure located within a 100 m horizontal distance of a watercourse: Main Parking Extension; Widening of an Access Road between South Shaft/Main Offices and Plant; and Subway Crossing between the Plant and North Mine												

Name of Activity	Project		Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
					The following buffers should be maintained: No activities within 1:100 year floodline unless approved in terms of the NWA; No activities of 100m2 and more may be undertaken within 32m of the riparian zones unless approved in terms of the NEMA; Where necessary and recommended as part of the Heritage Assessment, buffers must remain as stipulated, alternatively the required permits must be obtained from the SAHRA should this be determined necessary.			Protection of sensitive environments.	Protection of sensitive environments.								
					For NFA protected tree species, attempting to relocate mature individuals are often too expensive and/or result in unsuccessful re-establishment due to unavoidable damage to their root systems during their excavation. Where possible, seedlings of affected tree species should be targeted for relocation, and seeds must be harvested prior to vegetation clearance to use in rehabilitation activities. It is important that seedlings and seeds be harvested within a close proximity of an area to be impacted, so												

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
					as to prevent alteration of population genetics.												
					All efforts must be made to avoid damage or destruction of protected trees.												
					Floral SCC recorded within the proposed mining footprint included species protected under the NFA and the NEMBA TOPS regulations. A walkdown of the footprint area is required before construction activities commence, where all anticipated floral SCC/protected species are searched and marked for relocation and/or destruction so that all necessary permits can be obtained from the LEDET and DFFE.												
					A rescue and relocation plan must be drafted and approved by the relevant authorities for all floral SCC that will potentially be impacted by the proposed mining activities. The Rescue and Relocation Plan must be used in conjunction with an approved Rehabilitation Plan for the Mine to ensure successful translocation and/or reinstatement of floral SCC and habitat for such species.												

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	**Project**	**Impact Area**	**Potential Impacts**	**SbM**	**Mitigation Measures**	**SaM**	**CvA/R/Ir**	**Performance Objectives**	**Goals**	**ST**	**MT**	**LT**	**LOM**	**Compliance with Standard**	**Functional Requirements for Monitoring**	**Responsibilities**	**Monitoring and Reporting Frequency**
					Where relocation of protected trees and plant species cannot be undertaken the necessary removal permits must be applied for at the DFFE.												
					The legal register must be updated to indicate all activities associated with Environmental Authorisations.			Proactive knowledge of potential system errors and/or constraints will avoid potential non compliance or process delays.	Operational Environmental Management System that addresses the needs and responsibilities of all departments.								
Land Claims and associated grave ownership	1, 2, 3, 4 &5	Socio-Economic	There are land claims present on the farm Dwarsrivier and De Grooteboom. No known graves are being impacted upon by the activities in question, although the diesel and emulsion storage project are in close proximity to some of the graves. All known graves are located more than 170m from the proposed activities. The heritage study recorded two areas with historical/recent residential elements (Feature 4 and 6), the remains of Iron Age sites (Feature 2,3, and 5) marked by a scatter of ceramics, and a stone cairn (Feature 1) of unknown purpose that although unlikely could possibly indicate a grave site. However, the presence for chance finds should be considered.	-14	The mine should conduct an overall heritage assessment in consultation with the land claimants to determine the presence of any other graves not known off.	-5	CbA	Maintain good relationships with Interested and Affected Parties by participating in the process of land claims Ensure compliance with relevant legislation and recommendations from SAHRA under Section 35, 36 and 38 of NHRA	Approved operating procedure for the relocation of the powerline.				x	Continuation of economic activities in the areas. Economic benefit to all parties who have a direct impact or interest in the mining operation.	Ongoing follow up with the Department of Land Affairs to determine the status of the land claims with records kept of discussions.	Legal Department	Quarterly
					The stone cairn of unknown purpose at Feature 1 (west of proposed PCD) should be avoided with a 30m buffer, if this is not possible it should be confirmed whether this is a grave through stakeholder consultation/Ground Penetrating Radar/ Test Excavations and if confirmed to be a grave it should be relocated as per all the relevant legal requirements. Should this be determined a grave two options must be followed: o Excavation permits will be applied for; or										Implement heritage monitoring plan as per the EMPr.	SHEQ Department	Weekly during pre construction and construction phase.

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
					o 30m buffer zone (as recommended by the HIA report as no blasting or invasive activities is planned with the construction the TSF)) must be adhered to in order to conserve the cemetery against any potential damage during construction. A social consultation process in terms of Chapter XI of the NHRA Regulations, must be carried out to identify the descendants of the burials and to obtain permission to fence in the identified cemetery. If the mine is unable to retain the grave in situ the permission must be obtained from the families of the deceased, if they agree to the relocation of their graves then a section 36 of the NHRA permit application must be logged on SAHRIS.												
					Feature 2,3 (both at the Emulsion and Diesel Storage) and 5 (south of proposed TSF) should be shovel pit tested (with the required mitigation permit) to determine the presence of subsurface deposit after which a destruction permit can be applied for.										Participate in land claim meetings should these be required.	Legal Department, SED, SHEQ Department and Mine Manager	At least annually

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	**Project**	**Impact Area**	**Potential Impacts**	**SbM**	**Mitigation Measures**	SaM	**CvA/R/Ir**	**Performance Objectives**	**Goals**	**ST**	**MT**	**LT**	**LOM**	**Compliance with Standard**	**Functional Requirements for Monitoring**	**Responsibilities**	**Monitoring and Reporting Frequency**
					The lack of graves at Feature 4 (Emulsion and Diesel Storage) and 6 (proposed TSF) should be confirmed prior to construction by the social team and monitored during construction.												
					If risks are manifested (accidental discovery of heritage resources) the chance find procedure should be implemented: Cease all works immediately; Report incident to the Sustainability Manager; Contact an archaeologist/ palaeontologist to inspect the site; Report incident to the competent authority; and Employ reasonable mitigation measures in accordance with the requirements of the relevant authorities. Only recommence operations once impacts have been mitigated.												
					The mine should ensure that they are abreast the developments of the land claim assessment and in consultation with the relevant department.												
					If the mine is unable to conserve the identified archaeological sites in situ then the sites must be mitigated by a												

Name of Activity	Project		Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
					suitably qualified archaeologist. A permit issued under s35 of the NHRA will be required to conduct such work. On completion of the mitigation work the developer can apply for a destruction permit with the backing of the mitigation report.												
					All activities should remain within the approved contracts.			Ensure the practical and economic use of mineral resources within the mining rights area.	Good relationship with surrounding mines.						Annual assessment in terms of compliance with the Social and Labour Plan and legal required reporting to the DMR.	Exploration Geologist and Engineering Department.	Annually
Location of infrastructure on mining rights areas.	1	Geology and Economic Activities	The PCD associated with the TSF will be located north of the TSF, across the Richmond Road. The PCD will be located very close to the property boundary between Dwarsrivier Mine and Two Rivers Platinum mine (TRP mine) but on Dwarsrivier Mine's surface rights. The northern portion of the PCD is located on an area which was previously undermined (mining rights belong to Tweefontein Mine).	-13	Permission to locate the PCD over the undermining will be obtained by Dwarsrivier Mine from the mining rights owner and the authorities.	12	CbA	Implement preferred design objectives	Legal compliance. Ensure good relationship with surrounding mines. Ensure the continuation of economic activities by all mines.	x			x	Continuation of economic activities. Compliance with Mine Health and Safety Requirements. Compliance with Environmental Authorisations.	Initiate discussions with the Competent Authorities and impacted parties.	Engineering Manager.	Immediately
Location of Diesel and Emulsion Storage Area near TRP TSF Pipeline route.	2	Geology and Economic Activities	The proposed Diesel and Emulsion Storage Area are located on Dwarsrivier Mine owned property, however, with the two facilities located on either side of the pipeline route and associated access route of the TRP TSF Pipeline.	-13	The mine should consult with TRP in terms of construction plan and schedule to ensure that the activities and associated access requirements do not	12	CbA	Ensure continuation of economic and operational activities by both mines.	Legal compliance. Ensure good relationship with surrounding mines.	x			x	Continuation of economic activities. Compliance with Mine Health and Safety Requirements.	Initiate discussions with TRP to discuss construction plan and activities. Development	Engineering Manager.	Immediately

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
			Construction of the two facilities may impact on the pipeline route if not suitably planned.		impact on either of the two mines activities.				Ensure the continuation of economic activities by all mines.					Compliance with Environmental Authorisations.	of construction plan and management actions throughout the construction phase.		
Protection of Lebolelo Pipeline	1	Water Supply	The Lebolelo Pipeline is located between the TSF and PCD.	-13	The mine should ensure that the pipeline is protected from the mining related activities to ensure that there is no impact on water supply	12		Maintain good relationship with surrounding water uses.	No damage to the water supply system	x			x	Continuation of economic activities. No impact on water supply due to tailings activities	Monitoring of pipeline area.	Engineering Manager.	Ongoing
Relocation of Mine owned and State (Eskom) Owned (where possible) Powerline	6	Socio-Economic	The TSF will be located between the existing D1261 public road (Richmond Road) and existing Eskom powerline servitudes. The Richmond Road will constrain the development of the TSF to the north and to the west. Existing powerlines are a constrain to the east and to the south. The Richmond Road, existing powerlines and mine property boundary are a constrain for the PCD associated with the Khulu TSF. An Eskom substation and future extension and servitudes of this substation constrains the site to the south. However, these will not be impacted. There is an existing Eskom powerline that crosses the PCD site which will need to be diverted. The relocation of the powerlines (applicant owned and/or Eskom owned) could temporarily	-12	The mine should obtain approval from the relevant parties regarding the relocation of the powerlines where this be required.	-5	CbA	Maintain good relationship with surrounding mines.	Approved operating procedures, safety files and communication structure and compliance thereto.	x				Continuation of economic activities. Compliance with Health and Safety Requirements. Compliance with Environmental Authorisations.	Initiate discussions with Eskom regarding the procedures for the relocation process.	Engineering Manager.	Immediately
					Buffers along the substation and other Eskom Powerline infrastructure should be agreed to between parties.										Initiate discussions with the impacted parties.	Engineering Manager.	Immediately
					The mine should enter into discussions with affected parties to develop an operating procedure and time			No impact on economic activities in the area.	Good relationship with surrounding landowners.						Monitor the implementation of the Operating procedure	Environmental Department.	During planning phase

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
			disrupt Economic Activities in the area which the powerline supplies. Consultation with Eskom has been initiated and the relocation of the powerlines will accordingly be managed.		line for the removal of the powerlines. The powerlines may not be removed without the required approvals by the relevant authorities (if applicable).										during the relocation of the powerline (powerline relocation will be undertaken under Eskom environmental procedures).		During planning phase
Location of Eskom Owned Sub Station	1	Socio-Economic	The existing dam break analysis indicates that should an impact occur that the Eskom Sub Station will be in the zone of influence (refer to Annexure 4).	-12	The necessary emergency preparedness plans must be developed and implemented in consultation with Eskom to proactively plan and manage an instance should dam break be encountered. The TSF must be designed, constructed and operated in line with the approved designs.	-7	CbA	No impact on economic activities in the area.	Maintain the integrity of the TSF				x	Compliance with TSF International Design Standards and operational procedures.	Quarterly Engineering inspection and annual design inspections and reporting.	TSF Engineer	Quarterly inspections. Annual stability inspections and reporting.

Table 90: Construction Phase Impact Table with Management Measure, Objectives and Standards (Significance before Mitigation –SbM; Significance after Mitigation – SaM; Can be avoided – CbA; R – Reversible; Ir – Irreversible; ST: 1-12 months; MT: 1-5 yrs.; LT: 5 years and more; LOM: Life of Mine)

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
Land and Footprint Clearance Topsoil Stripping and Stockpiling and Vegetation Removal	-	Geology	No direct impact expected on geology.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	1, 2 & 3	Topography	Direct impact: Alteration of topography. Removal of vegetation and the associated shaping of the area will lead to change in topographical characteristics of the area. The impact is not considered significant due to the fairly flat nature of the topography and the location of the activities in the immediate vicinity of the existing plant area.	-9	The footprint areas of all surface infrastructure must remain as small as possible within the parameters of operational and engineering requirements. Footprint areas should be accessed through existing road network, where feasible to avoid unnecessary excavation. Excavation and long-term stockpiling of soil should be limited within the demarcated areas as far as practically possible Construction areas must be clearly demarcated to control movement of personnel and vehicles, providing clear boundaries for construction sites in order to limit the spread of impacts. Markers and pegs will be erected and maintained along the boundaries of the working areas, access roads, haul roads and paths before commencing any work. If proved insufficient for control, these shall be replaced by fencing. Designs of the facilities (TSF and landscaping) must be undertaken by a registered Engineer.	-5	R	Remain within demarcated areas. Design facilities to blend into the existing site character as far as practically possible.	No disturbed areas should remain beyond the demarcated areas. 100% compliance to remain with approved footprint areas.	x				Soil Erosion and incorrect stockpiling of topsoil.	Appointment of an Independent Environmental Control Officer to assess compliance with the EMP. The SHEQ department should undertake ongoing site monitoring to determine whether activities on site are undertaken in accordance with the EMP Requirements.	Independent ECO and SHEQ Department.	ECO: Monthly for the construction phase. Thereafter annual external audits can be undertaken. SHEQ: Weekly monitoring

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
					Draw up a procedure clearly reflecting the method and phases of clearance of vegetation only in areas where construction will take place.												
					Removal of vegetation must be undertaken in a phased approach to limit surface exposure.												
					Temporary erosion control measures may be used to protect the disturbed soils during the construction phase until adequate vegetation has established.												
					Clean and dirty water separation must be implemented early in the construction phase, especially down-gradient of construction areas to ensure that the natural runoff patterns are impacted as little as possible.												
					Activities must remain outside of the 1;100 year flood lines, where this is not possible, the required approval must be obtained from the DWS and activities should further be restrained to the dry season.												
					Linear infrastructure must follow for as far as practically possible the natural contours of the area.												
	1, 2, 3, 4 & 5		Direct impact: The removal and stockpiling of topsoil	-14	Excavation and long-term stockpiling of soil should	-5	Irr	Limit the loss of soils as far as	The integrity of the soils	x			x	Soil Erosion and incorrect	Appointment of an Independent		ECO: Monthly for the

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
		Soil, Land Use and Land Capability	may lead to a loss of soil resource and land capability through erosion of the stockpiles and chemical and physical degradation. This impact is considered important due to the fact that the mine may be operating on a negative topsoil balance and therefore the retaining of suitable topsoil is important for successful rehabilitation. The Project 1 area is largely dominated by arable soils which have been historically subjected to cultivation but have since been laid to fallow. It is evident that these soils are capable of supporting agriculture. It should however be noted that the extent of these soils is small to support commercial scale cultivated agriculture. The best suited farming scale in this instance is subsistence farming or grazing. The overall impact of project 1 on the local, regional, provincial and national scale is anticipated to be limited given that the soils occur in a small patch and that they are not actively being used for agriculture. The proposed Project 2 will most likely result in the clearance of vegetation as part of the construction phase which will lead to loss of soil through erosion and subsequent loss of		be limited within the demarcated areas Adhere to Soil Stripping, Soil Stockpiling and Soil Management Plan as part of the EMP (where feasible). Prior to construction of the road the soil will be stripped and placed on a soil stockpile. The A-horizon (0-30cm) and B horizon (50-80cm) can be stripped as one horizon since the physical characteristics of both these horizons are similar. Both layers are regarded useable as topsoil during closure. This is largely influenced by the fact that these soils have been previously cultivated and thus the tillage practices have mixed the soil to a degree such that both horizons can be utilised as a growth medium. The 2021 Soils report states that the topsoil within the TSF area is available up until 80cm and that this should be stripped if feasible. However, without compromising the stability and integrity of the facility. According to the Engineering Report for the Khulu TSF, a maximum of 30cm must be stripped. Stripping of topsoil should be documented, to determine that the maximum volume of topsoil has been removed.			possible and ensure that the integrity remains during stockpiling for the purposes of successful rehabilitation. Protect the soil resources within the area in which the mine operates.	stockpiled must remain suitable for the purposes of rehabilitation. No disturbed areas should remain beyond the demarcated areas. 100% compliance to remain with approved footprint areas. Maximum volumes of topsoil should be removed.					stripping and stockpiling of topsoil.	Environmental Control Officer to assess compliance with the EMP. The SHEQ department should undertake ongoing site monitoring to determine whether activities on site are undertaken in accordance with the EMP Requirements. Erosion protection measures should be implemented and monitored on areas identified. Photographic records of assessments must be kept. Induction should be reviewed and updated annually. Topsoil stripping records should be kept on file. Determine the integrity of topsoil	Independent ECO and SHEQ Department.	construction phase. Thereafter annual external audits can be undertaken. SHEQ: Weekly monitoring. Induction Updates: Every 12 months Documentation of topsoil stripping: daily record keeping, monthly reporting with photographic records. Topsoil Stockpile Analysis: Annually

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
			land capability. Given the small footprint of this project, the loss of land capability is not anticipated to be significant, provided that the project occurs within the demarcated areas and mitigation measures are implemented during all phases of development. The extent of the access road required for this project will be limited since this project is located adjacent the current TRP mines new TSF pipeline and service road. The TSF maintenance road will serve as the main access road and as such the impact of the access road will be negligibly low. The proposed projects (3,4 & 5) are located within the existing mine operational footprint where soils have already been subjected to significant disturbance associated with mining and related infrastructure. The extension of the existing infrastructure will not lead to a significant losses of land capability given the disturbance that has occurred on the surrounding soils. Impact such as soil erosion, compaction and soil contamination will likely occur during the construction phase which will lead to further degradation of the surrounding soils and the subsequent loss of land		The topsoil associated with the RWD infrastructure should be stripped to 30cm or in manner that does not compromise the design and will not lead to infrastructural damage.										stockpiled for rehabilitation activities.		
					Topsoil should be stockpiled on designated topsoil stockpiles, unless around linear infrastructure, where the topsoil could be stockpiled next to the linear structure.												
					Separate stockpiling of different soil to obtain the highest post-mining land capability												
					Restrict the amount of mechanical handling, as each handling event increases that compaction level and the changes to the soil structure. Wherever possible, the 'cut and cover' technique (where the stripped soils is immediately placed in an area already prepared for rehabilitation, thus avoiding stockpiling) should be used.												
					The management of topsoil stockpiles should be undertaken in terms of the Topsoil Management Plan included into this EMPr to ensure that the topsoil stockpiles maintain its integrity and are not subjected to compaction.												
					Stockpile height should be restricted to that which can deposited without additional traversing by												

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
			capability. However, the overall impact significance of the proposed project will be negligibly low, after mitigation measures have been put in place during all phases of development. The ratings given in the columns on the left is for Project 1 , and Project 2-5.		machinery. Stockpiles should be treated with temporary soil stabilisation methods, such as the application of organic matter to promote soil aggregate formation, leading to increased infiltration rate, thereby reducing soil erosion.												
					The use of lime to stabilise soil pH levels will be required in some instances.												
					Restrict the amount of mechanical handling, as each handling event increases that compaction level and the changes to the soil structure. Wherever possible, the 'cut and cover' technique (where the stripped soils is immediately placed in an area already prepared for rehabilitation, thus avoiding stockpiling) should be used.												
				-10	Temporary stockpiles must be protected by means of suitable geotextiles such as hessian sheeting, silt curtains, sandbags etc. to prevent contamination of runoff and sedimentation of freshwater resources in the vicinity of the surface infrastructure and should remain outside of the buffer zones.	-5											
					The stockpile should be treated with temporary soil stabilisation methods; such as the application of organic matter to												

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
					promote soil aggregate formation, leading to increased infiltration rate, thereby reducing soil erosion. Also, the use of lime to stabilise soil pH levels.		R										
					Stockpiled soils should be stored for a maximum of 3-5 years to ensure that the soil quality does not deteriorate. In addition, concurrent rehabilitation must strongly be considered to reduce the duration of stockpile storage to ensure that the quality of stored soil material does not deteriorate excessively; especially with regard to leaching and acidification.												
					Soil erosion should be controlled on stockpiles by having control measures to reduce erosion risk such as erosion control blankets, soil binders, revegetation, contours, diversion banks and spillways.												
					Temporary berms can be installed, around stockpile areas whilst vegetation cover has not established to avoid soil loss through erosion												
					The topsoil stockpile should be vegetated and while vegetating, measures will be needed to contain erosion of the stockpile during rain events.												
					The recovered soils should be re-used to rehabilitate the mine												

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
					footprint following mine closure.												
			Soil compaction - Heavy equipment traffic during construction and exploration activities is anticipated to cause soil compaction. The severity of this impact is anticipated to be medium-high for Acardia soils due to clayey texture. Whereas soils with a relatively shallow bedrock and lithocutanic character (partly weathered rock material) such as the Glenrosa/Mispah soil forms are anticipated to be less impaired due to the resistance offered by the underlying bedrock. The ratings given in the columns on the left is for Project 1 , Project 2 and Project 3-5.	-14	The contractor will ensure that all activities, material and equipment storage and personnel movement take place within the designated area.	-5	R										
					A site plan must be developed, indicating the following: Location of all approved activities; 1:100 year buffer around all watercourses; Location of the CBA and Endangered Ecosystems and mark these areas where construction is not approved as a no-go zone's All vegetation management zones as per the Biodiversity Action Plan.												
				-11	Laydown areas should be located within disturbed soils (anthrosols) to avoid compaction of natural soils.	-5											
					All contractors must receive induction. The induction should be updated on site, to make provision for the site plan and a detailed explanation on the purpose of the no-go zones, presence of protected species, presence of the CBA and ESAs and the meeting thereof.												
				-11	The management of topsoil stockpiles should be undertaken in terms of the Topsoil Management Plan included into this	-5											

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
					EMPr to ensure that the topsoil stockpiles maintain its integrity and are not subjected to compaction.												
					Restrict the amount of mechanical handling, as each handling event increases that compaction level and the changes to the soil structure. Wherever possible, the ‘cut and cover’ technique (where the stripped soils is immediately placed in an area already prepared for rehabilitation, thus avoiding stockpiling) should be used.												
					A fine system/disciplinary system must be implemented on site for all significant or recurring environmental non-compliances.												
					Compacted soils adjacent to the mining blocks and associated infrastructure footprint can be lightly ripped to at least 25cm below ground surface to alleviate compaction prior to re-vegetation.												
					Site clearance and activities should be restricted to the approved footprint. Contractors areas should be established on already disturbed footprints.												
					All vehicular traffic should be restricted to the existing service roads and the selected road servitude as far as practically possible												

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	**Project**	**Impact Area**	**Potential Impacts**	**SbM**	**Mitigation Measures**	**SaM**	**CvA/R/Ir**	**Performance Objectives**	**Goals**	**ST**	**MT**	**LT**	**LOM**	**Compliance with Standard**	**Functional Requirements for Monitoring**	**Responsibilities**	**Monitoring and Reporting Frequency**
			Clearing vegetation will result in the exposure of soil, which may in turn lead to soil erosion, in addition to this, stockpiling of topsoil material on sloping areas leading to increased runoff and erosion. The areas where the infrastructure is proposed are mostly gradual, however the exploration activities will be located among the mountainous setting and this is where erosion is considered moderately high. The natural and undisturbed soils will become more vulnerable to erosion once the vegetation is cleared for construction activities, and the soils will inevitably be exposed to wind and some surface runoff during intensive rainfall events. The ratings given in the columns on the left is for Project 1 , Project 2 and Project 3-5.	-14	The approved Storm Water Management Plan must be implemented. Clean and dirty water systems must be established prior to construction. Ensure the required erosion protection measures are monitored and corrected where necessary. Bare soils can be regularly dampened with water to suppress dust during the construction phase, especially when strong wind conditions are predicted according to the local weather forecast All disturbed areas adjacent to the footprint areas can be re-vegetated with an indigenous grass mix, if necessary, to re-establish a protective cover, to minimise soil erosion and dust emission. Natural vegetation establishment (self-succession) will be encouraged on cleared areas, and topsoil stockpiles. If natural succession of vegetation is not established within one rainy season, after rehabilitation, the disturbed areas and areas adjacent to the infrastructural areas must be re-vegetated with an indigenous grass mix, if necessary, to re-establish a protective cover, to	-5	R	Limit the loss of soils as far as possible and ensure that the integrity remains during stockpiling for the purposes of successful rehabilitation. Protect the soil resources within the area in which the mine operates. Retaining soil integrity for rehabilitation. Protect the soil resources within the area in which the mine operates. Protect surface and groundwater resources against siltation and contamination.	The integrity of the soils stockpiled must remain suitable for the purposes of rehabilitation.	x			x	Soil Erosion and incorrect stockpiling of topsoil. Encroachment of activities outside of demarcated areas.	Appointment of an Independent Environmental Control Officer to assess compliance with the EMP. The SHEQ department should undertake ongoing site monitoring to determine whether activities on site are undertaken in accordance with the EMP Requirements. Erosion protection measures should be implemented and monitored on areas identified. Photographic records of assessments must be kept.	Independent ECO and SHEQ Department.	ECO: Monthly for the construction phase. Thereafter annual external audits can be undertaken. SHEQ: Weekly monitoring Biomonitoring in line with WUL requirements.

Name of Activity	Project		Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	**Project**	**Impact Area**	**Potential Impacts**	**SbM**	**Mitigation Measures**	**SaM**	**CvA/R/Ir**	**Performance Objectives**	**Goals**	**ST**	**MT**	**LT**	**LOM**	**Compliance with Standard**	**Functional Requirements for Monitoring**	**Responsibilities**	**Monitoring and Reporting Frequency**
					minimise soil erosion and dust emission.												
				-11	The mine will investigate an appropriate seed mix for the rehabilitation purposes should self-succession not establish on rehabilitated sites.	-5											
					If possible, vegetation clearance and commencement of construction activities can be scheduled to coincide with low rainfall conditions when the erosive stormwater and wind are anticipated to be low.												
					The footprint of the proposed areas should be clearly demarcated to restrict vegetation clearing activities within the infrastructure footprint as far as practically possible.												
					No construction or project related activities may be undertaken outside of the demarcated areas.												
				-11	A fire management plan must be developed for the mine. Fire belts must be constructed around the boundaries of the mine. Daily fire danger ratings must be viewed and addressed where required. The mine must have equipment, protecting clothing and trained personnel for extinguishing fires.	-5											

Name of Activity	Project		Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
					No open fires must be allowed.												
			Potential of Soil Contamination - All the identified soils are considered equally predisposed to potential contamination (i.e. hydrocarbons), as contamination sources are generally unpredictable and often occur as incidental spills or leak for construction developments. The significance of soil contamination is medium-high for all identified soils, largely depending on the nature, volume and/or concentration of the contaminant of concern. The ratings given in the columns on the left is for Project 1 , Project 2 and Project 3-5.	-14	Contamination prevention measures should be addressed in the Environmental Management Programme (EMP) for the proposed development, and this should be implemented and made available, and accessible always to the contractors and construction crew conducting the works on site for reference	-5	R	Protect the soil resources within the area in which the mine operates. Protect surface and groundwater resources against siltation and contamination.	The integrity of the soils stockpiled must remain suitable for the purposes of rehabilitation. No disturbed areas should remain beyond the demarcated areas. 100% compliance to remain with approved footprint areas.	x			x	Encroachment of activities outside of demarcated areas.	Appointment of an Independent Environmental Control Officer to assess compliance with the EMP. The SHEQ department should undertake ongoing site monitoring to determine whether activities on site are undertaken in accordance with the EMP Requirements. Erosion protection measures should be implemented and monitored on areas identified. Photographic records of assessments must be kept.	SHEQ Department	Groundwater and Surface Water Monitoring in line with WUL requirements, including TPH monitoring. ECO: Monthly for the construction phase. Thereafter annual external audits can be undertaken. SHEQ: Weekly monitoring
				-11	A spill prevention and emergency spill response plan, as well as dust suppression, and fire prevention plans should also be compiled to guide the construction works	-5											
					An emergency response contingency plan should be put in place to address clean-up measures should a spill and/or a leak occur, as well as preventative measures to prevent ingress												
				-11	Burying of any waste including rubble, domestic waste, empty containers on the site should be strictly prohibited and all construction rubble waste must be removed to an approved disposal site	-5											
			Impact on land use - The footprint areas comprise of relatively small areas where arable soils with a moderate potential for agriculture, whilst the rest of the footprint area is	-14	Direct surface disturbance of soils should be avoided where possible	-5	R	Remain within the Closure objectives as stipulated for the mine.	Achieve annual rehabilitation plan compliance.	x			x	Encroachment of activities outside of demarcated areas.	Appointment of suitably qualified specialist to conduct annual rehabilitation reviews.	SHEQ Department	Annual Rehabilitation Plan Updates Assessment of Financial Provision
					The footprint as well as areas affected by edge effect should be ripped to alleviate compaction												

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
			comprised on very shallow soils not considered suitable for agricultural production. The extent of arable Bonheim soils therefore cannot be considered sufficient for viable cultivated small commercial farming. In addition, lack of rainfall (less than 600 mm per annum) further disqualifies the area from being ideal for agricultural production. Furthermore, high temperatures occurring in this area are also likely to cause crop permanent wilting, thus affecting crop yield. Given these constraints the extent of the high productivity soils is not considered sufficient for viable cultivated commercial farming. Based on the above-mentioned limiting factors the proposed project is anticipated to have a relatively low cumulative loss of arable land and medium low cumulative loss of natural grasslands for grazing and/or ecological conservation. Livestock commercial farming is not considered an optimum land use for the footprint areas due to the veld being classified as having a grazing capacity of 6 ha Per Large Animal Unit. This can be attributed to the scarcity of vegetation as well as lack of palatable grasses.		Stored topsoil should be replaced (if any) and ameliorated according to soil chemical analysis The recovered soils should be re-used to rehabilitate the mine footprint following mine closure												Progress: Annually

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
			Impact on Floral Habitat and Diversity due to: 1. Clearance of floral species within the proposed footprint areas as well as nationally and provincially protected floral species; 2. Habitat fragmented and reduced dispersal opportunities for plant species as the disturbed / impacted areas will be less attractive to faunal species who are important mechanisms for seed dispersal; 3. Increase risk of erosion and poor stormwater management - resulting in loss of soils, the down-slope sedimentation of habitat and the consequent loss of habitat beyond the planned footprint; 4. AIP proliferation and woody encroachment into natural vegetation, displacing indigenous flora and altering favourable habitat conditions for the establishment of indigenous species. Probable Residual Impacts could occur due to 1. Fragmentation of ecologically intact habitat resulting in altered ecological functioning of habitat beyond the authorised projects, notably Project 2; 2. Potential further loss of and altered floral species diversity outside of the footprint areas, including loss of favourable habitat for SCC if effects from AIP	-	Prior to any vegetation clearance activities taking place a walkdown of the footprint must be undertaken and all floral and faunal SCC encountered must be GPS marked and the necessary permits applied for with the relevant national and provincial departments. The site walk down is to be conducted prior to clearance activities and ideally post good rains between November and February when the smaller bulbous plants are growing and visible	-	R	Limit the impact of the mining operation on the Ecological Setting of the area.	Zero animal fatality rates should be achieved.	x			x	Limit the impact of the construction on the Ecological Setting of the area.	Appointment of an Independent Environmental Control Officer to assess compliance with the EMP. The SHEQ department should undertake ongoing site monitoring to determine whether activities on site are undertaken in accordance with the EMP Requirements.	Independent ECO and SHEQ Department.	ECO: Monthly for the construction phase. Thereafter annual external audits can be undertaken. SHEQ: Weekly monitoring

Name of Activity	Project		Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
			proliferation and the intensification of woody encroachment are not managed; and 3. Loss of NFA protected tree species as a result of vegetation clearing and/or potential harvesting in the region. Cumulative Impacts - A significant threat for the floral ecology associated with the five projects is the potential proliferation of AIP species and particularly a potential for indigenous bush encroachment, resulting in the overall loss of native floral communities within the local area.														
			Sekhukhune Mountain Bushveld - Project 1	-11	The construction footprint must be kept as small as possible to minimise impact on the surrounding environment (edge effect management)	-6								Restriction of access.	The Project Manager should implement the necessary design concepts to limit the impact on the ecological connectivity and functioning of the ecosystem.	Project Manager	As part of the project design. Prior to construction.
			Sekhukhune Mountain Bushveld - Project 2	-12	Removal of vegetation must be restricted to what is absolutely necessary and should remain within the approved footprint;	-6											
					In the establishment of fences, erect fences in such a manner as to limit the potential of animals to enter the project areas. This could involve the placement of rocks and materials at on the surface of the fences.												
			Sekhukhune Mountain Bushveld - Project 3-5	-11	As far as possible clearing of vegetation should take place in a phased manner moving away from fences	-6											

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
					and/or barriers. This will allow for any faunal species within the proposed footprints to flee and avoid harm;												
			Secondary Bushveld - Project 1	-11	Smaller species such as scorpions and reptiles will not as readily able to move out of an area ahead of ground clearing. As such should any be observed in the construction site during clearing and construction activities, they are to be carefully and safely moved to an area of similar habitat outside of the disturbance footprint. Construction personnel are to be educated about these species and instructed not to kill them. Smaller scorpion species and harmless reptiles (that are likely present within the footprint areas) should be carefully relocated by a suitably nominated construction person. For larger venomous snakes, a suitably trained specialist, or on-site personnel, should be contacted to carry out the relocation of the species, should it not move off on its own	-6											
			Secondary Bushveld - Project 2	-11	Vehicles should be restricted to travelling only on designated roadways to limit the ecological footprint of the construction activities. Additional road construction should be limited to what is absolutely necessary, and	-6											

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	**Project**	**Impact Area**	**Potential Impacts**	**SbM**	**Mitigation Measures**	**SaM**	**CvA/R/Ir**	**Performance Objectives**	**Goals**	**ST**	**MT**	**LT**	**LOM**	**Compliance with Standard**	**Functional Requirements for Monitoring**	**Responsibilities**	**Monitoring and Reporting Frequency**
					the footprint thereof kept to a minimal												
			Secondary Bushveld - Project 3-5	-5	No hunting or trapping of faunal species is to be allowed by construction personnel	-5											
			Transformed Habitat	-5	Informal fires by construction personnel should be prohibited, and no uncontrolled fires whatsoever should be allowed	-5											
			Impact on Faunal Habitat and Diversity due to 1. Clearance of habitat leading to the displacement of faunal species; 2. Habitat fragmented and resulting in reduced movement of species and potentially reduced dispersal opportunities; 3. Increased risk of trapping / snaring and the potential collection for the pet / traditional medicine trade; and 4. AIP proliferation and woody encroachment into natural vegetation, displacing indigenous vegetation and altering favourable habitat conditions for faunal species. Probable Residual Impacts on fauna are considered to be: 1. Loss of / altered faunal species diversity in the footprint areas and the areas adjacent to the proposed projects; 2. Edge effects such as habitat fragmentation, AIP proliferation and bush encroachment limiting	-	Care should be taken during the construction of the five proposed projects to limit edge effects to surrounding natural habitat. This can be achieved by: × Demarcating all footprint areas during construction activities; × No dumping of litter, rubble or cleared vegetation on site should be allowed. Rubble / waste should be disposed of at an appropriate registered dump site away from the development footprint. No temporary dump sites should be allowed in areas with natural vegetation. It is advised that waste disposal containers and bins be provided during the construction phase for all construction rubble and general waste; and × Manage the spread of AIP species as per the mines mine's AIP control plan.	-	CbA										

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
			faunal species habitat utilisation; 3. Potential further loss of SCC/protected faunal species and suitable habitat for such species; and 4. It is unlikely that disturbed areas will be rehabilitated to an ecologically functioning state resulting in significant loss of habitat and species diversity, with reinstatement to premining levels being unlikely.														
			Sekhukhune Mountain Bushveld - Project 1	-11	Appropriate sanitary facilities must be provided during the construction of the development and must be removed to an appropriate waste disposal site	-6											
			Sekhukhune Mountain Bushveld - Project 2	-12	If any spills occur, they should be immediately cleaned up to avoid soil contamination that can hinder floral rehabilitation later down the line. Spill kits should be kept on-site at all times. In the event of a breakdown, maintenance of vehicles must take place with care, and the recollection of spillage should be practised, preventing the ingress of hydrocarbons into the topsoil	-6		Awareness creation on the importance of that natural ecosystem in which the mine operates. Rehabilitation of disturbed areas with indigenous vegetation. Smallest possible area of disturbance philosophy.	Eradication of invasive species within the mining area footprint. Successful self succession to be achieved. 100% compliance to remain with approved footprint areas. Initiate rehabilitation of disturbed areas within one year of final activity.					Invasion of Weeds and Alien Vegetation.	A weed eradication plan must be implemented on site in line with the current Khumani monitoring programme. This must be undertaken prior to the growing season.	SHEQ Department and a Specialised Ecologist.	Weed monitoring (monthly); Weed eradication (annually or as required); Ecological Study (Biodiversity Action Plan) (annually)
			Sekhukhune Mountain Bushveld - Project 3-5	-11	Upon completion of construction activities, it must be ensured that no bare areas remain, and that indigenous species be used to revegetate the disturbed area	-6											

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
			Secondary Bushveld - Project 1	-11	Edge effects arising from the proposed development, such as erosion and alien plant species proliferation, which may affect adjacent natural areas, need to be strictly managed. Specific mention in this regard is made of Category 1b AIP species (as listed in the NEM:BA Alien species lists, 2020), in line with the NEM:BA Alien and Invasive Species Regulations (2020);	-6											
			Secondary Bushveld - Project 2	-11	The poaching and/or hunting of animals will be strictly forbidden.	-6											
			Secondary Bushveld - Project 3-5	-5	AIP monitoring and clearing/control should take place throughout the construction phase of the development, and a 30 m buffer surrounding the proposed railway loop should be regularly checked for AIP proliferation and to prevent inward and or/outward spread of AIPs, notably into non infested areas outside of the proposed railway loop or into newly rehabilitated areas	-5											
			Transformed Habitat	-5	Alien vegetation that is removed must not be allowed to lay on unprotected ground as seeds might disperse upon it. All cleared plant material to be disposed of at a licensed waste facility which complies with legal standards.	-5											

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
			Impact on Floral SCC - The proposed five projects are associated with floral SCC, which will likely be directly impacted by the proposed activities. The SCC recorded on site (Sclerocarya birrea subsp. caffra) is protected under the NFA. Additionally, there is an increased chance that several other NFA and LEMA listed floral SCC may occur within the footprint areas. The proposed 5 projects are not anticipated to have a high impact on floral SCC and with mitigation measures implemented the impacts can remain localised in extent. Succulents and geophytes are good candidates for rescue and relocation to suitable sites outside of the proposed footprints, either to surrounding natural habitat or to the Dwarsrivier nursery. Woody species are less likely to be successfully relocated, especially larger individuals. Where woody SCC species are to be cleared and not relocated, it must be ensured that the same species are currently being propagated in the nursery. If this is not the case, seeds can be harvested from the surrounding areas and / or from the individuals that will be cleared as part of vegetation clearing activities to be propagated	-	Should any floral SCC be relocated, the relocation success of such species should be monitored during the construction phase to ensure immediate actions can be taken if it becomes evident that relocation is not successful.	-	CbA										

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
			off-site and reinstated as part of rehabilitation activities. Activities which are likely to negatively affect the flora of conservation concern within and around the proposed five projects include, but are not limited to, the following: 1. Disturbance, fragmentation and alteration of floral SCC habitat; 2. Destruction, removal or harvesting of floral SCC during construction and operational activities; and 3. Potentially poorly implemented and monitored rescue and relocation of SCC or not ensuring that the same species are being propagated in the Dwarsrivier nursery. Impact on CBAs, ESAs, Threatened Vegetation and Protected Areas - According to the desktop database, the proposed five projects will impact on a CBA 1 and the Sekhukhune Mountainlands threatened ecosystem, however, following the site assessment this is more accurately only applicable to the RWD of Project 1 and the footprint areas of Project 2. The remaining areas associated with the TSF (Project 1) and Projects 3-5 have all been impacted on and are associated with														

Name of Activity	Project		Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
			the active mining footprint. According to the desktop database, a small portion of Project 4 will impact on an ESA however, this section of the ESA has been degraded in terms of habitat integrity and is located within the active mining area.														
			Project 1	-7		-5											
			Project 2	-11		-5											
			Project 3-5	-4		-4											
			Impacts on Faunal SCC - The five proposed projects are associated with habitats that are known to host faunal SCC, notably the Sekhukhune Mountain Bushveld habitat. The remaining habitats may serve as intermediary or transitionary habitats for such species, but not permanent habitat. One SCC was recorded on site, namely Pycna sylvia (Cicada) whilst Python natalensis (African Python, VU) has also been recorded in the adjacent areas. Panthera pardus (Leopard, Vulnerable, TOPS Listed), Parahyaena brunnea (Brown hyaena, NT, TOPS Listed), Sagittarius serpentarius (Secretary bird, VU), Polemaetus bellicosus (Martial Eagle, VU) and Neotis denhami (Denham's Bustard, NT) are also considered to have a medium probability of occurring, however such	-	Edge effect control needs to be implemented to prevent further degradation and potential loss of floral and faunal SCC outside of the five proposed project footprint areas	-	CbA										

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
			occurrences are likely to be transitionary and not permanent, as the footprint areas are not sufficient in extent to permanently host these species nor are there sufficient food resources within the five proposed project footprint areas alone to support these species. Mammalian, avifaunal and some reptilian SCC are likely to maintain large home ranges that will far exceed the extent of the five proposed project footprint areas. Due to the small project footprint extents and ability of many of the SCC to relocate ahead of construction activities, impacts stemming from the proposed projects are not expected to pose a significant risk to these species.															
			Project 1	-7	Should the presence of any faunal or floral SCC be noted within the development footprint post walkdown and during vegetation clearance / construction activities, a suitably qualified specialist should be consulted on the best way to proceed	-5											
			Project 2	-11	A walk down must be undertaken to determine the presence of any faunal species of concern and all construction teams are monitored to ensure no snare or traps are set.	-5											

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	**Project**	**Impact Area**	**Potential Impacts**	**SbM**	**Mitigation Measures**	**SaM**	**CvA/R/Ir**	**Performance Objectives**	**Goals**	**ST**	**MT**	**LT**	**LOM**	**Compliance with Standard**	**Functional Requirements for Monitoring**	**Responsibilities**	**Monitoring and Reporting Frequency**
			Project 3-5	-4	No species may be collected for the pet / traditional medicine trade either.	-4											
			Habitat degradation due to dust: Increased dust will occur in all areas where vegetation is cleared. Dust will be caused by excavation, and construction. Dust in the area will be greatly increased due to the dry weather conditions and the nature of the soil in the area. Dust settling on plant material can reduce the amount of light reaching the chlorophyll in the leaves, thereby reducing photosynthesis, which in turn reduces plant productivity, growth and recruitment.	-8	Maintain the current air quality monitoring stations that determine fallout and implemented respirable dust (PM10) monitoring that could arise from the mining activities. Dust suppression should be undertaken where and when dust is present.	-5	CbA	Recording of dust fall out to determine trends.	Meeting ambient dust fall out limits in terms of applicable NEM:AQA Regulations.	x			x	National Dust Regulation Compliance.	Dust dispersion will be monitored in line with the current dust monitoring programme	SHEQ Department.	Monthly Monitoring with Annual Reporting.
			Accidental death of animals on the roads.	-8	Clearly marked signs will be erected along the transportation routes to create awareness of animal crossings. A clearly marked and enforced vehicle speed will be implemented on the internal mine and transportation routes. A detailed induction programme will be in place to ensure that all parties are aware of the rules and regulations on site in terms of the use of roads. Vehicles may only travel on demarcated roads on site.	-1	CbA	Awareness creation on the importance of that natural ecosystem in which the mine operates. Implementation of safe operation practices.	Zero animal fatality.	x			x	Creation of Awareness.	Induction with the view on creating environmental awareness.	SHEQ Department	Annually for permanent staff. Start of each visit for contractors.

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
			Direct Impact: Increased erosion can eventually lead to the loss of vegetation and habitats for further species. Soils in the area are prone to erosion in areas where vegetation is cleared, this is further compounded by the fact that precipitation in the area occurs through heavy rainfall events in in the form of thundershowers in summer. Furthermore large areas will be cleared before construction leaving these areas prone to erosion.	-16	Ensure the required erosion protection measures are monitored and corrected where necessary. Storm water management plan should be implemented prior to construction to ensure that runoff does not lead to the formation of erosion gulleys. Where vegetation cannot be established during the life of construction and operations, appropriate measure will be taken to control erosion. These will include grading of surfaces to prevent rapid run-off of storm water and / or the use of energy dissipaters. An erosion monitoring and mitigation plan should be put in place.	-6	CbA	Limit the impact of the mining operation on the Ecological Setting of the area. Limited to no presence of erosion gulleys. Retaining soil integrity for rehabilitation.	Maintaining soil integrity, with successful vegetation establishment.	x			x	Soil Erosion	Appointment of an Independent Environmental Control Officer to assess compliance with the EMP. The SHEQ department should undertake ongoing site monitoring to determine whether activities on site are undertaken in accordance with the EMP Requirements.	ECO and SHEQ Department	ECO: Monthly for the construction phase. Thereafter annual external audits can be undertaken. SHEQ: Weekly monitoring. Rectification of erosion gulley should be undertaken immediately upon observation.
	1	Freshwater Ecosystems	**TSF:** **Site preparation prior to construction activities of surface infrastructure, including placement of contractor laydown areas and storage facilities may lead to:** **•Exposure of soil, leading to increased runoff, erosion and stream incision, and thus potentially increased sedimentation of the Dwars River;** **•Increased sedimentation of the watercourse may lead to smothering of flora and benthic biota and potentially** **further alter surface water**	-8	The approved construction footprint of the TSF and RWD must be adhered to, to ensure that there is no encroachment on the watercourse; As far as practically possible, clearing and construction activities must take place during the dry season to limit potential impacts to the watercourse as a result of clearing and construction activities The construction of sediment traps around the downgradient boundary of the construction area is strongly recommended to	-5	CbA	**Remain within or approve upon the current Aquatic Health and Water Quality baseline conditions.**	**Improve upon the current aquatic health and water quality baseline conditions.**	**x**			**x**	**Compliance in terms of GN704 and the aquatic monitoring requirements.**	**Remain within demarcated areas.** **Construction and maintenance of the infrastructure and erosion controls.** **Assess Aquatic Habitat Characteristics where required.**	**Engineering department & Environmental Department.** **Specialist Aquatic Ecologist**	Biomonitoring biannually (winter and summary monitoring). Annual vegetation monitoring of rehabilitated areas.

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
			quality; •Decreased ecoservice provision; and *Further proliferation of alien vegetation or increased bush encroachment as a result of disturbances.		minimise the volume of sediment transported in runoff from the construction site												
					Contractor laydown areas, vehicle re-fuelling areas and material storage facilities to remain outside of the delineated watercourse and applicable setback area												
					Construction footprint areas to remain as small as possible and vegetation clearing to be limited to what is absolutely essential;												
					Vegetation removal to be kept to a minimum, and preferably only alien floral species to be removed;												
					Retain as much indigenous vegetation as possible												
	1		TSF: Construction of the proposed TSF and RWD and associated clean and dirty water systems: •Loss of catchment yield resulting from stormwater containment; •Increased flood peaks as a result of formalisation and concentration of surface runoff in clean water diversion structures; •Potential for erosion, leading to sedimentation of the watercourse; •Reduction in volume of water entering the watercourse, leading to loss of recharge of the watercourse; •Altered vegetation	-7	The design of the TSF and the RWD must ensure that no dirty water runoff must be permitted to reach the watercourse in line with GN704 as it relates to the NWA and appropriate clean and dirty water separation and stormwater management controls must be developed as the first part of the construction activities;	-5	CbA										
					The TSF and RWD must be designed to contain a minimum storm event of a 24 hour 1 in 50 year flood event;												
					The TSF and RWD must be appropriately lined with HDPE liners to prevent seepage												

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
			community structure and diversity due to moisture stress and changes to goods and service provision; •Disturbances of soil leading to increased alien vegetation proliferation or bush encroachment, and in turn to further alteration of surrounding watercourse and terrestrial habitat, with potential to affect the downgradient watercourse habitat; •Altered runoff patterns, leading to increased erosion and sedimentation of the downgradient watercourse; •Erosion of the exposed areas; •Potential impacts on the water quality of runoff which may potentially enter the downgradient watercourse and contamination of soils due to concrete being cast; and •Potential of backfill material to enter the downgradient watercourse, increasing the sediment load of the watercourse..		Clean runoff captured in the clean and dirty water separation system should be returned back into the adjacent watercourse. Dirty water must be managed within the mine's existing water management system; The watercourse must be protected against erosion arising from the discharge of diverted clean stormwater. In this regard, energy dissipating structures should be installed to prevent erosion. Water should also be distributed in a diffuse manner to prevent canalisation No mixed concrete may be deposited outside of the designated construction footprint; Protective equipment should be provided, onto which any mixed concrete can be deposited whilst it awaits placing Concrete spilled outside of the demarcated area must be promptly removed and taken to a suitably licensed waste disposal site													
	2		Diesel and Emulsion Batching Areas: Site preparation and construction activities of surface infrastructure, including placement of contractor laydown areas and storage facilities may lead to: •Damage to and loss of	-7	As far as practically possible, clearing and construction activities must be restricted to the dry season to minimise the risk of sediment-laden runoff entering the downgradient watercourses and reduce the risk of erosion and	-5	CbA										

Name of Activity	Project		Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities		Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
			vegetation, leading to exposed/compacted soil, in turn leading to potential for increased runoff from exposed areas, erosion of the downgradient watercourses and potential for increased sedimentation of the watercourses; •Increased sedimentation of the watercourses may lead to changes in instream habitat, potentially altered surface water quality particularly in the downstream reaches of the system, and smothering of vegetation and/or altered vegetation composition; •Potential impacts on water quality due to leaks and spills from construction machinery and increased sediment availability; •Decreased ecoservice provision and biodiversity maintenance capacity; and •Proliferation of alien vegetation as a result of disturbances.		formation of preferential flow paths Sediment traps must be constructed around the construction sites line to minimise the risk of sediment entering the downgradient watercourses; Limit the footprint of vegetation clearing to what is absolutely essential; Retain as much indigenous vegetation as possible; Rehabilitation and revegetation of disturbed areas (as a result of construction) must take place immediately after construction Appropriate control methods for alien vegetation in line with existing and approved alien vegetation control within the mine must be implemented												
	3		Expansion of Parking at Main Offices: Site clearing prior to commencement of construction activities, including vegetation clearing (approximately 280 m of riparian vegetation), removal of topsoil and stockpiling for use in rehabilitation, levelling of ground and placement of contractor	-9	As much as practically feasible, limit site preparation and construction activities to the dry season to minimise the volume of contaminated runoff potentially entering the watercourse; Sediment traps must be erected around the construction site prior to commencement of	-5	CbA										

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
			laydown areas. Also considering the laying of tar and construction of steel roof parking bays and the potential indiscriminate disposal of wastes within a watercourse; •Damage to marginal and non-marginal vegetation, leading to exposed/compacted soil, in turn leading to potential for increased runoff from exposed areas, erosion of the watercourse and potential for increased sedimentation of the watercourse; •Increased sedimentation of the watercourse may lead to changes in instream habitat, potentially altered surface water quality particularly in the downstream reaches of the system, and smothering of vegetation and/or altered vegetation composition; •Potential impacts on water quality due to leaks and spills from construction machinery; •Decreased ecoservice provision and biodiversity maintenance capacity; and •Proliferation of alien vegetation as a result of disturbances.		construction activities to minimise the risk of sediment entering the downgradient watercourses; Limit the footprint of vegetation clearing to what is absolutely essential; Retain as much indigenous vegetation as possible Rehabilitation and revegetation of disturbed areas (as a result of construction) must take place immediately after construction Appropriate control methods for alien vegetation in line with existing and approved alien vegetation control within the mine must be implemented No waste material is permitted to be disposed of within the watercourse; The watercourse must be demarcated with an appropriate barrier to prevent unauthorised access to the watercourse												
	4&5		Widening of Existing Access Road between South Shaft/Main Offices and Plant & Access Crossing between Plant and North Mine: Site preparation prior to	-5	General 'best practice' mitigation measures are recommended including but not limited to: •Dust suppression during construction; •Placement of sediment	-5	CbA										

Name of Activity	Project		Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
			widening of roadway, including placement of contractor laydown areas and storage facilities: Exposure of soil, leading to increased runoff, erosion and stream incision, and thus increased sedimentation of the watercourse. •Increased sedimentation of already transformed riparian and instream habitat, leading to smothering of flora and benthic biota, alterations to the characteristics of the stream bed and potentially further altering surface water quality; •Decreased ecoservice provision; and •Further proliferation of alien vegetation or Phragmites australis as a result of disturbances. No direct impacts to the watercourse are anticipated due to the distance of the proposed activity from the watercourse (approximately 25 m at the closest point).		control devices along the northern delineated boundary of the Springkaanspruit to minimise transportation of sediment into the watercourse via stormwater; and •Undertake the upgrade activities during the dry season if feasible to minimise the chance of runoff entering the watercourse.												
	1, 3, 4 & 5	Hydrology	Removal of vegetation for the Khulu TSF, Capital Projects and associated infrastructure, could lead to the erosion of exposed soils leading to siltation and sedimentation of downslope drainage channels.	-7	Vegetation clearance should be kept to an absolute minimum. Temporary erosion measures should be employed at exposed areas. The storm water management plans should be implemented in and around the facilities to	-4	CbA	Operate the water management circuit on site to increase mining efficiency and reduce the need for maintenance of these facilities. Protect the	Implement the SWMP on site and comply with GN704 requirements.	x				Compliance in terms of the WUL and the SWMP.	Annual compliance in terms of the designs of the facility and compliance in terms of the WUL must be undertaken. The integrity of	SHEQ Department and Hydrologist	Surface Water Monitoring in line with the current monitoring programme. Aquatic Biomonitoring - biannually

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
					ensure that dirty water runoff or water with high sediment loads do not enter the existing watercourses. This must be undertaken in terms of the Storm Water management Plan as approved in this EMPr or subsequently approved. Specific storm water management measures should include: ■ A clean water diversion berm should be constructed upslope of the proposed Khulu TSF			surrounding demarcated watercourses.							the demarcated watercourses must be maintained.		Annual vegetation monitoring of rehabilitated areas.
					Erosion measures such as hessian nets should be employed around working areas when construction is taking place												
					Rehabilitate open areas as soon as practically possible. Self-succession should be encouraged. If natural succession of vegetation is not established within one rainy season, after rehabilitation, the disturbed areas and areas adjacent to the infrastructural areas must be re-vegetated with an indigenous grass mix, if necessary, to re-establish a protective cover, to minimise soil erosion and dust emission.												
			Alteration in the natural topography through the development of the compacted areas and new storm water management systems.	-11	Development footprints should be kept to minimum footprint area.	-5											
					The creation of steep slopes should be avoided as far as possible.												

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
					Culverts should be placed at topographically low positions to allow for suitable drainage.												
			Use of heavy machinery, trucks and vehicles for construction purposes, which could lead to potential hydrocarbon spillages washed into downslope drainage channels.	-8	The storm water management plans should be implemented in and around the facilities to ensure that dirty water runoff or water with high sediment loads do not enter the existing watercourses. This must be undertaken in terms of the Storm Water management Plan as approved in this EMPr or subsequently approved.	-4											
					Water and soil contamination shall be avoided by implementing proper storm water management during the entire life of the operation. The applicant must ensure that storm water is diverted away from all the working areas. The storm water leaving the construction area must not be contaminated by any substance, whether that substance is a solid, liquid, vapour or any combination thereof												
					Refuelling must be undertaken over hard park bunded areas that adequately sized to capture and contain spillages.												
					Machinery, trucks and vehicles must be well maintained and serviced regularly as per a recommended service guide.												

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
					Machinery and vehicles should be parked on appropriately lined areas. Drip trays must be employed under stationary machinery. Spillages should be reported immediately, and spill kits should be readily available at all times.												
	-	Geohydrology	No direct impact during the construction phase.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	1 & 2	Heritage	The presence for chance finds should be considered.	-13	The possibility of the occurrence of subsurface finds cannot be excluded. Therefore, if during construction any possible finds such as stone tool scatters, artefacts or bone and fossil remains are made, the operations must be stopped and a qualified archaeologist must be contacted for an assessment of the find and therefor chance find procedures should be put in place as part of the EMP. A short summary of chance find procedures is discussed below. This procedure applies to the developer's permanent employees, its subsidiaries, contractors and subcontractors, and service providers. The aim of this procedure is to establish monitoring and reporting procedures to ensure compliance with this policy and its associated procedures. Construction crews must be properly inducted to ensure they are fully	-1	CbA	Protect heritage resources for future generations.	Ensure that there is a 100% non-occurrence of impacts to heritage resources. Ensure compliance with relevant legislation and recommendations from SAHRA under Section 35, 36 and 38 of NHRA	x				Presence of archaeological artefacts.	Implementation of the Heritage Management Plan during construction. Implementation of a Chance Find Procedure during construction. Known graves should be indicated on development plans and avoided. Training of all contractors and responsible parties must be undertaken to ensure that all parties are aware of the need to protect these resources and what to observe for. Daily inspections must be	Engineering Department.	Development of Heritage Management Plan and Chance Find Procedure - prior to site clearance Fencing of graves - immediately Monitoring of grave and/or heritage sites conditions - weekly Training - prior to site clearance and thereafter annually

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
					aware of the procedures regarding chance finds as discussed below. • If during the pre-construction phase, construction, operations or closure phases of this project, any person employed by the developer, one of its subsidiaries, contractors and subcontractors, or service provider, finds any artefact of cultural significance or heritage site, this person must cease work at the site of the find and report this find to their immediate supervisor, and through their supervisor to the senior on-site manager. • It is the responsibility of the senior on-site Manager to make an initial assessment of the extent of the find, and confirm the extent of the work stoppage in that area. • The senior on-site Manager will inform the ECO of the chance find and its immediate impact on operations. The ECO will then contact a professional archaeologist for an assessment of the finds who will notify the SAHRA The possibility of the occurrence of subsurface finds cannot be excluded. Therefore, if during construction any possible finds such as stone tool scatters, artefacts or bone and fossil remains are										undertaken during the site clearance and excavation phases.		

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
					made, the operations must be stopped and a qualified archaeologist must be contacted for an assessment of the find and therefor chance find procedures should be put in place as part of the EMP.												
					If fossil remains or trace fossils are discovered during any phase of construction, either on the surface or exposed by excavations the Environmental Officer (EO) in charge of these developments must be informed. These discoveries ought to be protected and the ECO must report to SAHRA. In the event that fossils are uncovered during construction then construction must cease within the immediate vicinity, a buffer of 30 m must be established, and a palaeontologist called in to inspect the finds. The palaeontologist must obtain a section 35(4) permit in terms of NHRA and Chapter IV NHRA Regulations, before any fossils are collected. If there are any new heritages resources are discovered during construction and operation phases of the proposed development, then a professional archaeologist or palaeontologist, depending on the nature of the finds, must be												

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
					contracted as soon as possible to inspect the findings at the expense of the developer. If the newly discovered heritage resources prove to be of archaeological or palaeontological significance, a Phase 2 rescue operation may be required at the expense of the developer. Mitigation will only be carried out after the archaeologist or palaeontologist obtains a permit in terms of section 35 of the NHRA (Act 25 of 1999).												
					Development of a Heritage Management Plan .												
					The Heritage Management Plan and Chance Find Procedure should form part of the Contractor's Tender Documentation, as well as form part of site specific induction and training processes.												
					Access to graves must be awarded to grave owners.												
					Graves on site must be clearly demarcated and well fenced off.												
					If risks are manifested (accidental discovery of heritage resources) the chance find procedure should be implemented: Cease all works immediately; Report incident to the Sustainability Manager; Contact an archaeologist/ palaeontologist to inspect												

Name of Activity	Project		Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
					the site; Report incident to the competent authority; and Employ reasonable mitigation measures in accordance with the requirements of the relevant authorities. Only recommence operations once impacts have been mitigated.												
					In the event that fossils are uncovered during construction then construction must cease within the immediate vicinity, a buffer of 30 m must be established, and a palaeontologist called in to inspect the finds. The palaeontologist must obtain a section 35(4) permit in terms of NHRA and Chapter IV NHRA Regulations, before any fossils are collected.												
					If there are any new heritages resources are discovered during construction and operation phases of the proposed development, then a professional archaeologist or palaeontologist, depending on the nature of the finds, must be contracted as soon as possible to inspect the findings at the expense of the mine.												
					If the newly discovered heritage resources prove to be of archaeological or palaeontological significance, a Phase 2 rescue operation may be												

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	**Project**	**Impact Area**	**Potential Impacts**	**SbM**	**Mitigation Measures**	**SaM**	**CvA/R/Ir**	**Performance Objectives**	**Goals**	**ST**	**MT**	**LT**	**LOM**	**Compliance with Standard**	**Functional Requirements for Monitoring**	**Responsibilities**	**Monitoring and Reporting Frequency**
					required at the expense of the developer. Mitigation will only be carried out												
	1, 2, 3, 4 & 5	Visual	Soil stripping and footprint clearance. The main visual impact associated with the construction phase would be the actual construction sites, possible storage of equipment and construction vehicles (laydown area), as well as the disruption of the soil and vegetation. Construction activities associated with the access crossing and the Khulu TSF will be visible to the road users.	-8	Stripping of vegetation and soils should be undertaken within the demarcated areas and be kept to a minimum.	-4	R	Retain the aesthetics of the area as far as practically possible.	Design and construction infrastructure to blend in with the general topography as far as practically possible. No encroachment outside of demarcated areas.	x				Retain activities in demarcated areas.	The Project Manager should implement the necessary design concepts ensure that the development of infrastructure is undertaken with closure in mind.	Project Manager & SHEQ Department	As part of the project design. Prior to construction. Review design drawings, quarterly in terms of compliance to actual operation.
					Exposed areas should be vegetated as soon as possible. Self succession will be preferred, however if vegetation establishment is not successful after the first rainy season, revegetation practices should be implemented.												
					Dust suppression measures should be implemented to limit the generation of dust.												
			The presence and use of heavy machinery, trucks and vehicles for construction purposes. Due to the existing mining in the area, vehicles and heavy machinery are already present and are not uncommon.	-7	Trees should be planted along the main roads to conceal the TSF from motorists.	-4	R								Successful establishment of trees. Successful dustfall out results	SHEQ Department	Monthly ECO inspections for the construction phase. Biannual internal and external audits can be undertaken during the construction phase. Annual internal and external audits during operational phase.
					Dust suppression measures should be implemented to limit the generation of dust.												
	1, 2, 3, 4 & 5	Air Quality	Potential increase in dust fall out. Despite the non-compliance predicted for the 24-hour PM10 off-site concentrations, all	-7	Utilised the existing monitoring network to monitor dust fall out in and around the construction area.	-5	CbA	Recording of dust fall out to determine trends.	Meeting ambient dust fall out limits in terms of applicable				x	National Dust Regulation Compliance.	Dust dispersion will be monitored as part of the overall mine	SHEQ Department.	Dust monitoring to be done in line with the current

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	**Project**	**Impact Area**	**Potential Impacts**	**SbM**	**Mitigation Measures**	**SaM**	**CvA/R/Ir**	**Performance Objectives**	**Goals**	**ST**	**MT**	**LT**	**LOM**	**Compliance with Standard**	**Functional Requirements for Monitoring**	**Responsibilities**	**Monitoring and Reporting Frequency**
			concentrations predicted at neighbouring sensitive receptors remain complaint with their relevant standard. In terms of PM2.5, the highest predicted 24-hour average and annual average off-site concentrations remain compliant with the relevant standards for both scenarios. Overall levels of dust fallout anticipated to occur as a result of the proposed TSF are below the respective National Dust Control Regulation. The outcomes of the air quality model stated that the proposed TSF will result in minimal air quality impacts on nearby receptors.		Strictly enforced speed limits on all roads - not to exceed 40km/hr. All areas, should be rehabilitated once construction has been compiled, and in the case with the drilling pads, once the drilling activities at that pad had been concluded. Bare soils can be regularly dampened with water to suppress dust during the construction phase, especially when strong wind conditions are predicted according to the local weather forecast Limit site clearance to designated areas. Dust suppression should be undertaken on all exposed roads, where increased dust fallout is observed. A dust management plan must be strictly implemented. Exposed areas should be vegetated as soon as possible. Self succession will be preferred, however if vegetation establishment is not successful after the first rainy seasuon, revegetation practices should be implemented.				NEM:AQA Regulations.						dust monitoring programme.		monitoring programme
	All	Noise	The area is located within the mining area. Noise impacts are not considered to be significant but can occur during excavation and construction activities.	-7	Equipment will be well maintained to reduce excessive noise creation. The necessary safety warning signs will be clearly visible in and around the sites.	-5	CbA	Remain with the required health and safety standards.	Remain within the regulated guidelines and limits as required by the Mine Health and Safety Act.	x			x	Mine Health and Safety Act Compliance	Adjacent landowners will be informed of the planned dates of the significant land clearance	SHEQ Department.	Ongoing consultation with surrounding landowners. Regulator noise

Name of Activity	Project		Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	**Project**	**Impact Area**	**Potential Impacts**	**SbM**	**Mitigation Measures**	SaM	**CvA/R/Ir**	**Performance Objectives**	**Goals**	**ST**	**MT**	**LT**	**LOM**	**Compliance with Standard**	**Functional Requirements for Monitoring**	**Responsibilities**	**Monitoring and Reporting Frequency**
					The required Professional Protective Equipment (PPE) will be issued to all employees were required. Construction hours must preferably be limited to daylight day hours where possible.										activities where applicable. Daily noise monitoring will be undertaken in the areas where high levels of noise take place.		monitoring in terms of Mine Health and Safety Standards.
	All	Social	For the construction of the Khulu TSF, a total of 64 construction workers would be employed for the whole duration. Forty of these would be contractors. From the total employees required, 12 would be medium skilled (workers with technical qualifications up to grade 12) and 16 would be low skilled (grade 10 and lower). Furthermore, some outside contractors will be involved with specific projects such as the construction of the diesel and batching areas (5 individuals on a part-time basis); main parking extension (5 individuals on a part-time basis), widening of the existing access road (10 full time contractors) and new access crossing (16 full time contractors). A section of the workforce would consist of low skilled workers (e.g. general construction labourers), as well as medium skilled site operators and skilled supervisors. As existing mining is taking	5	Prioritise any possible new local labour in the recruitment process as part of the company's own recruitment policy or as part of the contractor management plan and stipulate the procurement of new employees, especially in the medium to lower skilled categories, from the local communities. Where possible involve land claimants in the development of closure objectives and potential economic involvement where practically and legally possible. Contractual obligations for contractors (if required) should be introduced to use local labour as far as possible where applicable. Contractors should ensure that workers reside in suitable facilities and not establish informal houses.	9	CbA	Positive contribution to the Socio-Economic Setting of the Local Municipality. Maintenance of logistical characteristics and requirements of the local area. Employment and procurement as per Social and Labour Plan. Operating the mine with Closure and Land Use Objectives in mind. Obtaining sustainable objectives between the mine and Land Claimants.	Meeting local procurement and employment targets as set out in the SLP. Maintenance of relationships with surrounding landowners, land claimants, mines and road users. Meeting the approved objectives and goals of the SLP.	x			x	Monitoring of the Social and Labour Plan.	The HR department should remain in ongoing consultation with the Local Municipality. Regular stakeholder focus meetings should be scheduled to discuss any perceived impacts or concerns.	HR and SED Department	Annual review and update of the SLP. Implementation of all EMPr conditions as approved. At least annual stakeholder focus meetings.

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
			place at Dwarsrivier Mine, some of the above employment opportunities will be filled by existing employees. It is anticipated that a total of 36 new employment positions will be created which will result in positive economic impacts. Dwarsrivier Mine is further committed to source all the individuals falling within the medium and lower skilled categories from the local labour pool, and as many as possible falling within the high skilled category. To enhance the benefit to the local communities, it is recommended that local labour (from within the local municipal area) be procured as far as possible for all levels of skills. The socio-economic benefit of the build-up area can have limited short-term positive impacts and would possibly be similar to what is currently being experienced with the existing mining operation. It is not anticipated that the build-up period associated with the Khulu TSF and capital projects would necessarily create significant business opportunities within the local economy. Due to the relative short timeframe and extent of the build-up period, as well as the expected number of														

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
			workers involved, it is however highly unlikely that the project would result in large numbers of in-migration of jobseekers and workers to the local area. Therefore, no population change is anticipated as a direct result of the proposed Khulu TSF and capital projects.														
			The total spending (excluding salaries and wages) during the construction can total approximately R450 million. The majority of this spending will be procured from the local municipal area (80%) and from BEE suppliers (80%). Only 10% or less would be spend on foreign imports. The local benefits and economic spin-offs opportunities are thus substantial.	8	Targets for the procurement of capital goods, consumer goods and services should be set and Dwarsrivier Mine should develop an action plan to meet these targets. The procurement process should be based on competitive business principles and the quality of services to be rendered, to ensure adherence to standards and to maximise overall welfare.	9	CbA										
			Community Safety and Security - During the construction phase, community safety can be at risk, mainly due the movement of construction vehicles and construction activities (e.g. blasting) affecting the R577 due to the construction of the access crossing underneath the R577 to allow ease of access between the South and the North Mine. Safety hazards to mine personnel would also occur during the construction activities forming part of the extension of the main	-9	Maximise the use of local labour and contractors where possible by developing a strategy to involve local labour in the construction process to limit the inflow of outsiders. Construction vehicles must adhere to all mine related safety regulations and drivers must adhere to road regulations. Drivers and operators must have the necessary qualifications to operate the vehicles and equipment they are assigned to.	-7	CbA										

Name of Activity	Project		Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities		Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
			parking area and widening of the access road between the plant and North Mine, due to the continued movement of mining vehicles on this section of road. These impacts are anticipated to be mitigated by implementing construction related precautionary measures and warning signs/notifications. The development of the Khulu TSF and batching areas can furthermore create possible safety hazards. On site, mining activities pose safety risks which must be managed according to the relevant Health and Safety Plans of the mine to ensure the safety of workers and adjacent communities. These anticipated impacts will further respond to the environmental monitoring and management measures to be implemented.		Construction vehicles must be in a good working order. Inspections of vehicles, as well as maintenance must be undertaken on a regular basis. Discussions and approvals with regards to required construction authorisations between Dwarsrivier Mine and Dept. of Roads and Public Works to be in place. Warning signs with regards to construction activities to be erected to inform public road users of activities and possible dangers.												
			Traffic Movement - Construction activities will mainly include clearing of vegetation and preparation of the different sites, the widening of the access road, the construction of the new access crossing, construction of the infrastructure associated with the diesel and emulsion batching areas and the development of the	-9	Unauthorised entry onto the mining area must not be allowed. Access control should continue to be implemented. Mining areas must be secured and fenced. All construction vehicles should be in a good condition and adhere to road worthy standards. Construction vehicles must keep to speed limits.	-7	CbA										

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	**Project**	**Impact Area**	**Potential Impacts**	**SbM**	**Mitigation Measures**	**SaM**	**CvA/R/Ir**	**Performance Objectives**	**Goals**	**ST**	**MT**	**LT**	**LOM**	**Compliance with Standard**	**Functional Requirements for Monitoring**	**Responsibilities**	**Monitoring and Reporting Frequency**
			TSF. These activities will result in the movement of heavy machinery and vehicles within the boundaries of the site and with some movement of construction vehicles on the provincial road R577. The number of vehicles involved in the process and equipment details are unknown. The increased noise and dust created by these vehicles, vehicle emissions and increased risk of accidents as well as possible impact on the road surfaces create additional intrusions. These impacts, however, will be intermittent and of a short duration.		Limit construction hours to daylight hours e.g., 6am to 6 pm. Road users must be notified if delays would be experienced due to the access road construction. Warning signs with regards to the construction activities need to be erected at strategic places along the R577 and must be clearly visible at night. Road deviations, if required, must be clearly indicated by road signs and must be clearly visible at night.												
Establishment of Surface Infrastructure	1	Geology	The TSF footprint area is not mined through or undermined, but the current Dwarsrivier Mine Life of Mine (LoM) plan provided to Jones and Wagner indicate that the TSF footprint could be undermined in future. The depth to the underground resource under the proposed TSF footprint varies from 100m on the eastern side of the TSF to 200 m on the western side. The impact of the TSF on the future mining was not raised as a concern, and will be taken into account with the design of the future mining activities under the TSF.	-13	Permission to undermine the TSF should be obtained from the DMRE should this be required in the future.	12	CbA	Implement preferred design objectives Ensure safe mining conditions Ensure the stability of the TSF	Legal compliance. Ensure good relationship with surrounding mines. Maintain all stability factors required for the TSF. Ensure the continuation of economic activities by all mines.	x			x	**Continuation of economic activities.** **Compliance with Mine Health and Safety Requirements.** **Compliance with Environmental Authorisations.**	Initiate discussions with the Competent Authorities.	Engineering Manager.	Immediately

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
	1	Topography	During the site clearance activity, the required storm water management systems and shaping of land would have been completed. The construction of the TSF will have the greatest impact on the topographic setting of the area. With the establishment of infrastructure the topography will be impacted.	-9	Activities should be constructed and developed within the approved design concepts. Specifically in terms of the TSF, the design and construction should be undertaken with closure design principles. Linear infrastructure must follow for as far as practically possible the natural contours of the area.	-7	R	Retain the aesthetics of the area as far as practically possible.	Design and construction infrastructure to blend in with the general topography as far as practically possible. No encroachment outside of demarcated areas.	x			x	Retain activities in demarcated areas.	Maintain landscape to such an extent to ensure that impacts on geomorphology is reduced.	SHEQ Department ECO	Monthly ECO inspections for the construction phase. Biannual internal and external audits can be undertaken during the construction phase. Annual internal and external audits during operational phase. Weekly walkabouts/site inspections by supervisors.
	2, 3, 4, 5		Alteration in the natural topography through the construction of infrastructure, roads and parking areas.	-11	Linear infrastructure must follow for as far as practically possible the natural contours of the area. The creation of steep slopes should be avoided as far as possible. All required storm water management measures should be implemented. The aim in this instance, is to mitigate any potential erosion during the construction phase. Culverts should be placed at topographically low positions to allow for suitable drainage.	-5	CbA	Protect the integrity of the geomorphological conditions of the area as far as practically possible.	Stable environmental footprints.	x			x	Meet best practice design objectives.			
	1, 2, 3, 4 &5	Soil, Land Use and Land Capability	Site clearance would have been completed, and storm water management infrastructure will be implemented. However, construction activities with surrounding exposed soil may in turn lead to soil erosion.	-12	Ensure that all design drawings include effective erosion control measures and that these are implemented during the establishment of the infrastructure. Areas of construction must be clearly demarcated. No construction or project related activities may be	-5	CbA	Limit the loss of soils as far as possible and ensure that the integrity remains during stockpiling for the purposes of successful rehabilitation.	The integrity of the soils stockpiled must remain suitable for the purposes of rehabilitation.	x			x	Soil Erosion and incorrect stockpiling of topsoil.	Appointment of an Independent Environmental Control Officer to assess compliance with the EMP. The SHEQ department should undertake ongoing site	Independent ECO and SHEQ Department.	ECO: Monthly for the construction phase. Thereafter annual external audits can be undertaken. SHEQ: Weekly monitoring Erosion gulleys should be rehabilitated

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
					undertaken outside of the demarcated areas.										monitoring to determine whether activities on site are undertaken in accordance with the EMP Requirements. Erosion protection measures should be implemented and monitored on areas identified. Photographic records of assessments must be kept.		immediately upon observation.
					Clean and dirty water systems must be established prior to construction and must be maintained throughout the life of mine.			Retaining soil integrity for rehabilitation.		x			x	Soil Erosion and incorrect stockpiling of topsoil.	Appointment of an Independent Environmental Control Officer to assess compliance with the EMP. The SHEQ department should undertake ongoing site monitoring to determine whether activities on site are undertaken in accordance with the EMP Requirements.	Independent ECO and SHEQ Department.	ECO: Monthly for the construction phase. Thereafter annual external audits can be undertaken. SHEQ: Weekly monitoring
					Where vegetation cannot be established during the life of construction and operations, appropriate measure will be taken to control erosion. These will									Soil integrity analysis.	Assessment of the fertility of Soils	Soil Scientist.	Prior to placement of soils.

Name of Activity	Project		Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities		Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
					include grading of surfaces to prevent rapid run-off of storm water and / or the use of energy dissipaters.												
					Provision should be to protect the soils from hydrocarbon spills/drips by the vehicles and refuelling trucks entering and existing the site (i.e. grid system or permanently manned personnel to treat soils during periods of refuelling).												
					Where erosion gulley is formed, these will be recorded on the Isometrix system for immediate action.												
	-	Terrestrial Ecology (Fauna & Flora)	Please refer to site clearance for the required impacts and management measures.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	-	Freshwater Ecosystems	Please refer to site clearance for the required impacts and management measures.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	1	Geohydrology	Impact on the alluvial aquifer due to the presence of the TSF.	-12	The TSF and associated infrastructure should be lined according to the identified designs.	-6	CbA	Remain within or approve upon the current groundwater quality.	Improve upon the current groundwater quality.	x			x	Groundwater Pollution and potential trends.	• Implement a Groundwater Remediation Strategy with the objective that no further deterioration in groundwater quality occurs at the operations. It is acknowledged that this objective cannot be achieved immediately, as residual	SHEQ Department & Engineering Department	Cost benefit analysis, prior to construction. Development of groundwater remediation project action plan and timeframes: prior to construction. Groundwater monitoring: As per EMPr and approved WUL monitoring
					Additional monitoring boreholes, as detailed below, must be drilled prior to the commencement of construction of the Khulu TSF and PCD to ensure that a baseline can be generated.												
					Develop and implement a sound surface runoff management plan for the project. This plan must focus on containing all dirty water that could be												

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
					generated during the project and preventing clean runoff from entering the footprint area. These measures are considered in the TSF designs, as well as the EMPr Storm Water Management Plan. The required storm water management measures must be implemented. Finalise the implementation plan for the Groundwater Remediation Strategy for the operations, based on the outcome of fieldwork completed during 2021. The most effective groundwater management strategies must be developed and implemented as part of a groundwater impact assessment study to be completed during 2022. Due to the fact that groundwater quality at the Khulu TSF is affected by preferential flow along regional faults and dykes, it is accepted that the Groundwater Remediation Strategy will also improve groundwater quality at the TSF and PCD in the long-term. The outcome of the groundwater impact assessment presented in this report indicates that the Scenario 1 liner design is the preferred option to ensure that long-term impacts on groundwater quality are limited. This entails good installation of										impacts on groundwater quality are expected to remain up to mine closure in some areas. • Implement management plans aimed at reducing adverse impacts on the receiving water bodies. • Track and record the progress of implementation of all groundwater management measures. This process must be geared at optimising the measures earmarked for implementation from the Groundwater Remediation Strategy. • Implement sufficient monitoring procedures to measure the effectiveness of groundwater management measures within the delineated zones of influence. • Analyse the		network. Application for GN704: To be undertaken as part of WUL Amendment, 2017

Name of Activity	Project		Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
					the liner and limited exposure of the HDPE to the atmosphere. Under these measures, the liner is expected to have a life of 280 years. Once the liner fails, the rate of seepage to the underlying aquifers is minimised with good liner installation.										information obtained from all monitoring programmes against compliance targets to establish trends as well as the objectives of the Groundwater Remediation Strategy. • Should the trends indicate adverse impacts on groundwater levels and/or quality, implement suitable measures within the shortest possible time to remediate and/or eliminate such adverse impacts identified.		
					The liner design must include the above and below liner capture of seepage. Any seepage collected must be diverted to the PCD for containment.												
					All newly drilled monitoring boreholes must be surveyed to confirm accurate positions and elevations. The coordinates presented in this report were recorded with a hand-held GPS.												
					If any of the monitoring boreholes are destroyed during construction and/or operation of the TSF, these must be placed as a matter of urgency. Of specific concern is the location of boreholes DRM11S and D, which is located on the edge of the Khulu TSF design. These boreholes target the SW-NE trending fault and must be redrilled on this structure if destroyed to ensure efficient monitoring of groundwater in this position.												
					Groundwater monitoring must be undertaken in												

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
					line with the EMPr Groundwater Monitoring Network. Ongoing groundwater monitoring must be undertaken.												
	1, 2, 3, 4, 5		The use of waste rock in the compaction of the roads and surface footprints should not lead to an impact on the groundwater resources as the material is not considered a pollutant, as the material is relatively inert. Results of leach tests indicate that the waste rock material is a Type 4 waste and does not pose a threat to groundwater contamination. Rate of evaporation of water used for dust suppression is high.	-9	The use of waste rock will only be undertaken when an alternative such as paving proved to be economically flawed. Record the volume of water used for dust suppression Continue with and evaluate groundwater monitoring programme, specifically in newly drilled shallow boreholes at the Plant. Exemption in terms of GN704 (Regulation 5) should be obtained from the DWS for the use of the Waste Rock in the construction of the proposed activities.	-5	CbA	Remain within or approve upon the current groundwater quality.	Improve upon the current groundwater quality.	x			x	Groundwater Pollution and potential trends.	Cost benefit analysis should be undertaken to ensure that the best road surfaces and compaction material are being used. Application for GN704 Regulation 5 should be obtained prior to construction.	SHEQ Department & Engineering Department	Cost benefit analysis, prior to construction. Groundwater monitoring: As per current monitoring network. Application for GN704: To be undertaken as part of WUL Amendment, 2017
	-	Heritage	No further impacts are foreseen.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	1, 2, 3, 4, 5	Visual	Impact on the visual character of the site.	-11	Activities should be restricted within the approved footprints. Indigenous trees should be planted along the roads where the TSF is planned to be constructed.	-7	R	Retain the aesthetics of the area as far as practically possible.	Design and construction infrastructure to blend in with the general topography as far as practically possible. No encroachment outside of demarcated areas.	x			x	Remain within demarcated areas.	The Project Manager should implement the necessary design concepts to limit the impact on the soil resources and ecological connectivity and functioning of the ecosystem.	Project Manager and SHEQ Department.	As part of the project design. Prior to construction. Monitoring of trees: monthly

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	**Project**	**Impact Area**	**Potential Impacts**	**SbM**	**Mitigation Measures**	**SaM**	**CvA/R/Ir**	**Performance Objectives**	**Goals**	**ST**	**MT**	**LT**	**LOM**	**Compliance with Standard**	**Functional Requirements for Monitoring**	**Responsibilities**	**Monitoring and Reporting Frequency**
															Avail a map to all project parties detailing the approved location of all infrastructure. Progress of tree establishment should be monitored.		
	-	Air Quality	All impacts are assessed under Footprint Clearance.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	-	Noise	All impacts are assessed under Footprint Clearance.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	-	Social	All impacts are assessed under Footprint Clearance.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Waste Management and Handling Hydrocarbon spills within the Mining Area and the management of Domestic and Hazardous Waste	-	Geology	No direct impact.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	-	Topography	No direct impact.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	1, 2, 3, 4 & 5	Soils	Contamination of soil resources due to hydrocarbon spills.	-11	Storage of fuels and oils, the refuelling of vehicles and equipment maintenance must be limited to designated, bunded (bunds to be 110% of volume of the materials stored) areas. All contaminated material at the construction activities must be contained in mobile sumps. All fuels and soils must be stored in appropriate containers. Chemicals and hazardous material must be stored in suitable containers, fit for purpose and in line with SDS requirements. Where drip trays are too small, specially prepared, non-pervious bunds with solution trenches must be used to capture spillages	-5	CbA	Protecting of soil integrity.	Zero presence of contaminated land due to early detection and implementation of actions.	x			x	Soil Pollution Prevention	The SHEQ department should undertake ongoing site monitoring to determine whether activities on site are undertaken in accordance with the EMP Requirements. This should be undertaken by means of a thorough site visit, record keeping of findings in a checklist format, issuing of non conformances to responsible parties, listing	SHEQ Department	ECO: Annual external audits can be undertaken. SHEQ: Weekly monitoring.

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
															thereof on the Isometrics or similar reporting system and feedback to the management team.		
					Oils and potentially hazardous materials must be disposed of at a licensed facility and waste certificates obtained.										Ensure that a Hydrocarbon Management Procedure and Spill Prevention and Emergency Spill Response Plan is available on site and updated regularly.	SHEQ Department	Regular update in terms of procedure requirements.
					A spill kit must be provided to be used in the event of a spill.			Awareness creation on site regarding duty of care and waste management.							Induction with the view on creating environmental awareness.	SHEQ Department	Annually for permanent staff. Start of each visit for contractors.
					If a spill occurs, the contaminated soil must be removed immediately. Contaminated soil must be stored according to best practices until it can be disposed of at a suitably licensed facility.												
					Safety signage must be used at designated storage areas.												
					All workers must undergo an induction which includes environmental awareness training to make them aware of the environmental incident management procedures as well as the importance of complying with management measures.												
				-11	Chemical toilets must be readily available to	-5	CbA	Protecting of soil integrity.	Zero presence of contaminated				x	Soil Integrity	Contracts must be in place for	SHEQ Department	Daily internal inspections

Name of Activity	Project		Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities		Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
			Contamination of soils as a result of a lack of sanitary services		employees where permanent infrastructure is not available. Licensed companies must be appointed to remove any contaminated material and or wastes to licensed landfill sites.				land due to early detection and implementation of actions.						the provision of chemical toilets where required. Removal companies must have the necessary contracts and permits in place.		Annual review of supply and removal companies contracts and permits.
	1, 2, 3, 4 & 5	Ecology	The unmanaged disposal of waste, could result in the spread of invader species, as well as the influx of opportunistic species.	-12	Develop dedicated waste handling areas; prevent access to rodents and opportunistic species; prevent the spread of waste. Develop dedicated waste handling areas, fit for purpose and prevent the spread of waste.	-5	CbA	Proper waste management practices on site.	No unlawful disposal of waste. Registration of all waste handling and/or storage areas on site.	x			x	Ongoing Rehabilitation	Ongoing waste classification and management processes to be implemented. Updated waste inventory to be available on site. Waste Management and Handling Procedure to be available on site and updated regularly.	SHEQ Department	SHEQ: Weekly inspections. Regular update in terms of procedure requirements. Waste Classification of Waste Rock every five (5) years.
	-	Freshwater Ecosystems	Please refer to site clearance for the required impacts and management measures.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	1, 2, 3, 4 & 5	Surface Water	Handling of Hazardous Waste within workshops and general mine area could contaminate the dirty water storage areas. The water is then reused in the system and could have impacts on the integrity of the storm water system and also the production.	-11	Clean and Dirty water separation systems should be incorporated in terms of the 2016 SWMP or any approved update thereafter. A detailed waste management strategy will be established and implemented, which will clearly demarcate the	-6	CbA	Protect the integrity of the Storm Water Management System.	Implement the SWMP on site.	x				Surface Water Pollution & Soil Assessments.	To ensure a proactive approach, the SHEQ department should undertake ongoing site monitoring to determine whether	SHEQ Department	Assessments: Weekly. Monitoring: As per approved WUL Reporting of incidents in terms of Environmental Authorisations,

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
					containments for different waste streams.										activities on site are undertaken in accordance with the EMP Requirements. The water quality (constituents listed in the WUL) must be monitored and records must be kept of these result in a centralised system. Analysis of results must be undertaken by an accredited laboratory. An incident reporting procedures should be available on site and definitions must be developed to determine when an incident is reportable. Reportable incidents should be reported to the Regulatory Authority as per the regulatory requirements, as well as stipulations as part of the WUL		but generally within 24 hours of occurrence. Update of the Incident Reporting Procedure in terms of the procedure requirements.
					Waste management training must be implemented on site.				Aim to achieve a zero-spill record.				x				
					Clear signs informing staff of waste management practices must be implemented on site.												
					All contaminated material at the Exploration Activities must be contained in mobile sumps. The mobile sumps must maintain a suitable freeboard, to ensure when these are moved/transported, that no spillage will occur.												
					Hazardous waste handling should only take place within bunded and/or lined areas.				Maintain a 100% safe disposal record on the disposal of hazardous waste.				x				
					Hazardous waste should be removed by a licenced removal company and taken to a suitable and licenced landfill site.				Provide training to all staff on best practices regarding waste management every year.	x			x				
					Clean spills, if occur within 24 hours.												
					Documentation of removal and safe disposal must be available on site.												
					The mine will adopt a cradle-to grave approach to ensure that the waste is removed and disposed of in a legally compliant manner.												
					Notify the relevant regulatory authorities in the event of the occurrence of a reportable incident.												
					Weekly inspections of Storm Water												

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
					Management Systems must be undertaken. Any blockages or maintenance requirements must be documented and an action plan developed.										and Environmental Authorisations.		
			Handling and Storing of Domestic Waste should have no impact on the surface water resources due to the location of the facility. However, incorrect disposal of waste could hamper the integrity of the storm water system.	-9	Clean and Dirty water separation systems should be incorporated in terms of the 2016 SWMP or any approved update thereafter. Waste management training must be implemented on site. Weekly inspections of Storm Water Management Systems must be undertaken. Any blockages or maintenance requirements must be documented and an action plan developed. Clear signs informing staff of waste management practices must be implemented on site. Access control must be strictly enforced. Waste should be disposed of by licensed companies to licenced facilities. Recycling practices must be investigated and implemented on site.	-5	CbA		Maintain a 100% compliance with the conditions of the NEMWA Permit on site for the Salvage Yards.	x			x				
	1, 2, 3, 4 &5	Groundwater	Large scale hydrocarbon spills could be present at the mining area	-12	Clean and Dirty water separation systems should be incorporated in terms of the 2016 SWMP. No activities associated with hydrocarbons and/or chemicals may be undertaken outside of an effectively designed and contained area. All used oils must be removed from site by a	-6	CbA	Protect the groundwater resources to ensure that limited to no impact on groundwater resources occur as a result of the mining operations.	Achieve 100% compliance to the water quality objectives as agreed to between the mine and the DWS based on the discussions within this IWWMP.		x		x	Groundwater Pollution and potential trends & Soil Assessments.	To ensure a proactive approach, the SHEQ department should undertake ongoing site monitoring to determine whether activities on site	SHEQ Department	Assessments: Weekly. Monitoring: Asper approved WUL

Name of Activity	Project		Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
					licensed company and disposed of at a suitably licensed site.										are undertaken in accordance with the EMP Requirements. The groundwater quality (constituents listed in the WUL) must be monitored monthly and records must be kept of these result in a centralised system. Analysis of results must be undertaken by an accredited laboratory.		
					Any spills occurring during the collection process must be cleaned up immediately.				Implement the SWMP on site.	x							
					Any significant spills must be captured in the incident reports and must be reported to the relevant department (LDEDET, Catchment Management Agency/DWS).				Aim to achieve a zero spill record.	x			x				
					All equipment and machinery should be kept in good working order.												
					In the event of a large spill include total petroleum hydrocarbon (TPH) in the next groundwater monitoring cycle. If elevated TPH is recorded, additional measures must be implemented to clean and/or rehabilitate affected areas.												
					Soil samples must be taken after rehabilitation to confirm the presence of hydrocarbons that could pose a threat to groundwater contamination.												
					A clean up procedure (i.e. Works Instruction) must be in place. Clean spills, if occur within 24 hours.												
			Handling or Hazardous Waste within workshops and general mine area.	-10	Clean and Dirty water separation systems should be incorporated in terms of the 2016 SWMP or any approved update thereafter.	-6	CbA	Protect the groundwater resources to ensure that limited to no impact on groundwater resources occur	Achieve 100% compliance to the water quality objectives as agreed to between the mine and the DWS based on		x		x	Groundwater Pollution and potential trends & Soil Assessments.	To ensure a proactive approach, the SHEQ department should undertake ongoing site	SHEQ Department	Assessments: Weekly. Monitoring: Quarterly (construction); Biannually (after construction)
					The workshop should be designed with the suitable												

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
					waste containment measures (berms, sumps, oil separators).			as a result of the mining operations.	the discussions within this IWWMP.						monitoring to determine whether activities on site are undertaken in accordance with the EMP Requirements. The groundwater quality (constituents listed in the WUL) must be monitored monthly and records must be kept of these result in a centralised system. Analysis of results must be undertaken by an accredited laboratory.		
					Waste management training must be implemented on site.				Maintain a 100% safe disposal record on the disposal of hazardous waste.	x			x				
					Clear signs informing staff of waste management practices must be implemented on site.												
					Hazardous waste handling should only take place within bunded and/or lined areas, with a capacity of at least 110% of the volume stored.												
					Hazardous waste should be removed by a licenced removal company and taken to a suitable and licenced landfill site.												
					Documentation of removal and safe disposal must be available on site.												
			Handling and Storing of Domestic Waste	-7	Clean and Dirty water separation systems should be incorporated in terms of the 2016 SWMP or any approved update thereafter.	-5	CbA		Achieve 100% compliance to the water quality objectives as agreed to between the mine and the DWS based on the discussions within this IWWMP.		x		x				
					Waste management training must be implemented on site.												
					Clear signs informing staff of waste management practices must be implemented on site.				Maintain a 100% compliance with the conditions of the NEMWA Permit on site for the Salvage Yards.	x			x				
					All waste must be removed by licensed contractors and disposed of at a licensed landfill site.												
					As a duty of care and the cradle to grave principles, the mine should regularly												

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
					inspect disposal site to ensure that best practices are implemented.												
					Recycling practices must be investigated and implemented on site where practical.				Maintain a 100% accurate recording of waste and submission of such recording to the Department.	x			x				
	-	Air Quality	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	-	Heritage	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	-	Noise	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	-	Visual	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	-	Social	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 91: Operational Phase Impact Table with Management Measure, Objectives and Standards (Significance before Mitigation –SbM; Significance after Mitigation – SaM; Can be avoided – CbA; R – Reversible; Ir – Irreversible; ST: 1-12 months; MT: 1-5 yrs.; LT: 5 years and more; LOM: Life of Mine)

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
Operation of TSF and associated infrastructure	1	Geology	The TSF footprint area is not mined through or undermined, but the current Dwarsrivier Mine Life of Mine (LoM) plan provided to Jones and Wagner indicate that the TSF footprint could be undermined in future. The depth to the underground resource under the proposed TSF footprint varies from 100m on the eastern side of the TSF to 200 m on the western side. The impact of the TSF on the future mining was not	-13	Permission to undermine the TSF should be obtained from the DMRE should this be required in the future.	12	CbA	Implement preferred design objectives Ensure safe mining conditions Ensure the stability of the TSF	Legal compliance. Ensure good relationship with surrounding mines. Maintain all stability factors required for the TSF. Ensure the continuation of economic	x			x	Continuation of economic activities. Compliance with Mine Health and Safety Requirements. Compliance with Environmental Authorisations.	Initiate discussions with the Competent Authorities.	Engineering Manager.	Immediately

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
			raised as a concern, and will be taken into account with the design of the future mining activities under the TSF.						activities by all mines.								
		Topography	The ongoing operation of the TSF will have the greatest impact on the topographic setting of the area.	-11	The TSF should be operated and designed in terms of the approved designs. The height of the TSF will be limited to allow sufficient space for operational plant to safely operate at the top of the facility. A safety berm will be provided along the crest to provide a physical demarcation of the edge of the TSF and to direct stormwater runoff to the down chutes. The TSF will have a side slope of 1V:3H with 5 m wide benches provided at 10m height intervals. The resulting average slope of the TSF is 1V:3.5H Rehabilitation should be undertaken concurrently with operation as far as practically possible and in line with the approved designs, or those reassessed and approved thereafter.	-7	R	Design and construction infrastructure to blend in with the general topography as far as practically possible. No encroachment outside of demarcated areas.	Develop towards the end closure plan.	x			x	Meet Closure Objectives through the development of the facility.	Annual audits by the engineer must be undertaken to ensure that the facility is developed with closure principles in mind.	Engineering Manager.	Annually
		Soils and Land Capability	Soil compaction outside of demarcated areas	-14	The mine will ensure that all activities, material and equipment storage and personnel movement take place within the designated area. A site plan must be developed, indicating the following: Location of all approved activities; 1:100 year buffer around all watercourses;	-5	R	Limit the loss of soils as far as possible and ensure that the integrity remains during stockpiling for the purposes of successful rehabilitation.	he integrity of the soils stockpiled must remain suitable for the purposes of rehabilitation. No disturbed areas should remain beyond the demarcated areas.		x		x	Remain within demarcated areas.	Annual audits by external EAP. Regular inspections by SHEQ Department.	SHEQ Department	Annual external audits can be undertaken. SHEQ: Monthly walkabouts

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
					Location of the CBA and Endangered Ecosystems and mark these areas where construction is not approved as a no-go zone's All vegetation management zones as per the Biodiversity Action Plan.				100% compliance to remain with approved footprint areas. Maximum volumes of topsoil should be removed.								
					Laydown areas should be located within disturbed soils (anthrosols) to avoid compaction of natural soils.												
					All contractors must receive induction. The induction should be updated on site, to make provision for the site plan and a detailed explanation on the purpose of the no-go zones, presence of protected species, presence of the CBA and ESAs and the meeting thereof.												
					The management of topsoil stockpiles should be undertaken in terms of the Topsoil Management Plan included into this EMPr to ensure that the topsoil stockpiles maintain its integrity and are not subjected to compaction.												
					Restrict the amount of mechanical handling, as each handling event increases that compaction level and the changes to the soil structure. Wherever possible, the 'cut and cover' technique (where the stripped soils is immediately placed in an area already prepared for rehabilitation, thus avoiding stockpiling) should be used.												
					A fine system/disciplinary system must be												

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
					implemented on site for all significant or recurring environmental non-compliances.												
					Compacted soils adjacent to the mining blocks and associated infrastructure footprint can be lightly ripped to at least 25cm below ground surface to alleviate compaction prior to re-vegetation.												
					Site clearance and activities should be restricted to the approved footprint. Contractors areas should be established on already disturbed footprints.												
					All vehicular traffic should be restricted to the existing service roads and the selected road servitude as far as practically possible												
			Clearing vegetation beyond the demarcated areas will result in the exposure of soil, which may in turn lead to soil erosion, in addition to this, stockpiling of topsoil material on sloping areas leading to increased runoff and erosion. The areas where the infrastructure is proposed are mostly gradual, however the exploration activities will be located among the mountainous setting and this is where erosion is considered moderately high. The natural and undisturbed soils will become more vulnerable to erosion once the vegetation is cleared for construction activities, and	-13	The approved Storm Water Management Plan must be implemented.	-5	R	Limit the loss of soils as far as possible and ensure that the integrity remains during stockpiling for the purposes of successful rehabilitation. Protect the soil resources within the area in which the mine operates. Retaining soil integrity for rehabilitation. Protect the soil resources within the area	The integrity of the soils stockpiled must remain suitable for the purposes of rehabilitation.		x		x	Soil Erosion and incorrect stockpiling of topsoil. Encroachment of activities outside of demarcated areas.	Appointment of an Independent EAP to assess compliance with the EMP. The SHEQ department should undertake ongoing site monitoring to determine whether activities on site are undertaken in accordance with the EMP Requirements. Erosion protection measures should be	Independent EAP and SHEQ Department.	Annual external audits can be undertaken. SHEQ: Monthly walkabouts Biomonitoring in line with WUL requirements.
					Clean and dirty water systems must be maintained.												
					Ensure the required erosion protection measures are monitored and corrected where necessary.												
					Bare soils can be regularly dampened with water to suppress dust during the construction phase, especially when strong wind conditions are predicted according to the local weather forecast												
					All disturbed areas adjacent to the footprint areas can be re-vegetated with an indigenous grass mix, if necessary, to re-establish a protective cover, to												

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	**Project**	**Impact Area**	**Potential Impacts**	**SbM**	**Mitigation Measures**	SaM	**CvA/R/Ir**	**Performance Objectives**	**Goals**	**ST**	**MT**	**LT**	**LOM**	**Compliance with Standard**	**Functional Requirements for Monitoring**	**Responsibilities**	**Monitoring and Reporting Frequency**
			the soils will inevitably be exposed to wind and some surface runoff during intensive rainfall events.		minimise soil erosion and dust emission. Natural vegetation establishment (self-succession) will be encouraged on cleared areas, and topsoil stockpiles.			in which the mine operates. Protect surface and groundwater resources against siltation and contamination.							implemented and monitored on areas identified. Photographic records of assessments must be kept.		
					If natural succession of vegetation is not established within one rainy season, after rehabilitation, the disturbed areas and areas adjacent to the infrastructural areas must be re-vegetated with an indigenous grass mix, if necessary, to re-establish a protective cover, to minimise soil erosion and dust emission.												
					The mine will investigate an appropriate seed mix for the rehabilitation purposes should self-succession not establish on rehabilitated sites.												
					If possible, vegetation clearance and commencement of construction activities can be scheduled to coincide with low rainfall conditions when the erosive stormwater and wind are anticipated to be low.												
					The approved areas should be clearly demarcated to restrict vegetation clearing activities within the infrastructure footprint as far as practically possible.												
					No project related activities may be undertaken outside of the demarcated areas.												
					No open fires must be allowed.												

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
			Potential of Soil Contamination - All the identified soils are considered equally predisposed to potential contamination (i.e. hydrocarbons), as contamination sources are generally unpredictable and often occur as incidental spills or leak for construction developments. The significance of soil contamination is medium-high for all identified soils, largely depending on the nature, volume and/or concentration of the contaminant of concern. The ratings given in the columns on the left is for Project 1 , Project 2 and Project 3-5.	-13	Contamination prevention measures should be addressed in the Environmental Management Programme (EMP) for the proposed development, and this should be implemented and made available, and accessible always to the contractors and construction crew conducting the works on site for reference A spill prevention and emergency spill response plan, as well as dust suppression, and fire prevention plans should also be compiled to guide the construction works Vehicles and Machinery will be regularly maintained. Maintenance programmes will be established and implemented. All refuelling of vehicles and equipment maintenance must be done within designated bunded areas. Spill and absorption kits must be available and readily accessible at the truck parking. There should always be a spare kit available at any given time. If necessary, the polluted soils will be remediated and affected areas rehabilitated. An emergency response contingency plan should be put in place to address clean-up measures should a spill and/or a leak occur, as well as preventative measures to prevent ingress Burying of any waste including rubble, domestic	-5	R	Protect the soil resources within the area in which the mine operates. Protect surface and groundwater resources against siltation and contamination.	The integrity of the soils stockpiled must remain suitable for the purposes of rehabilitation. No disturbed areas should remain beyond the demarcated areas. 100% compliance to remain with approved footprint areas.		x		x	Encroachment of activities outside of demarcated areas.	Appointment of an Independent EAP to assess compliance with the EMP. The SHEQ department should undertake ongoing site monitoring to determine whether activities on site are undertaken in accordance with the EMP Requirements. Erosion protection measures should be implemented and monitored on areas identified. Photographic records of assessments must be kept. Ensure that spill and absorption kits are present at all times.	SHEQ Department	Groundwater and Surface Water Monitoring in line with WUL requirements, including TPH monitoring. Annual external audits can be undertaken. SHEQ: Monthly walkabouts

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
					waste, empty containers on the site should be strictly prohibited and all construction rubble waste must be removed to an approved disposal site												
		Ecology (Fauna and Flora)	Impact on Floral Habitat and Diversity due to: 1. Clearance of floral species within the proposed footprint areas as well as nationally and provincially protected floral species; 2. Habitat fragmented and reduced dispersal opportunities for plant species as the disturbed / impacted areas will be less attractive to faunal species who are important mechanisms for seed dispersal; 3. Increase risk of erosion and poor stormwater management - resulting in loss of soils, the down-slope sedimentation of habitat and the consequent loss of habitat beyond the planned footprint; 4. AIP proliferation and woody encroachment into natural vegetation, displacing indigenous flora and altering favourable habitat conditions for the establishment of indigenous species. Probable Residual Impacts could occur due to 1. Fragmentation of ecologically intact habitat resulting in altered ecological functioning of habitat beyond the authorised projects, notably Project 2; 2.	-	Prior to any vegetation clearance activities taking place a walkdown of the footprint must be undertaken and all floral and faunal SCC encountered must be GPS marked and the necessary permits applied for with the relevant national and provincial departments. The site walk down is to be conducted prior to clearance activities and ideally post good rains between November and February when the smaller bulbous plants are growing and visible	-	R	Limit the impact of the mining operation on the Ecological Setting of the area.	Zero animal fatality rates should be achieved.	x			x	Limit the impact of the construction on the Ecological Setting of the area.	Appointment of an Independent Environmental Control Officer to assess compliance with the EMP. The SHEQ department should undertake ongoing site monitoring to determine whether activities on site are undertaken in accordance with the EMP Requirements.	Independent ECO and SHEQ Department.	ECO: Monthly for the construction phase. Thereafter annual external audits can be undertaken. SHEQ: Weekly monitoring

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
			Potential further loss of and altered floral species diversity outside of the footprint areas, including loss of favourable habitat for SCC if effects from AIP proliferation and the intensification of woody encroachment are not managed; and 3. Loss of NFA protected tree species as a result of vegetation clearing and/or potential harvesting in the region. Cumulative Impacts - A significant threat for the floral ecology associated with the five projects is the potential proliferation of AIP species and particularly a potential for indigenous bush encroachment, resulting in the overall loss of native floral communities within the local area.														
			Sekhukhune Mountain Bushveld - Project 1	-11	The construction footprint must be kept as small as possible to minimise impact on the surrounding environment (edge effect management) Removal of vegetation must be restricted to what is absolutely necessary and should remain within the approved footprint; In the establishment of fences, erect fences in such a manner as to limit the potential of animals to enter the project areas. This could involve the placement of rocks and materials at on the surface of the fences.	-6								Restriction of access.	The Project Manager should implement the necessary design concepts to limit the impact on the ecological connectivity and functioning of the ecosystem.	Project Manager	As part of the project design. Prior to construction.

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
					As far as possible clearing of vegetation should take place in a phased manner moving away from fences and/or barriers. This will allow for any faunal species within the proposed footprints to flee and avoid harm;												
			Secondary Bushveld - Project 1	-11	Smaller species such as scorpions and reptiles will not as readily able to move out of an area ahead of ground clearing. As such should any be observed in the construction site during clearing and construction activities, they are to be carefully and safely moved to an area of similar habitat outside of the disturbance footprint. Construction personnel are to be educated about these species and instructed not to kill them. Smaller scorpion species and harmless reptiles (that are likely present within the footprint areas) should be carefully relocated by a suitably nominated construction person. For larger venomous snakes, a suitably trained specialist, or on-site personnel, should be contacted to carry out the relocation of the species, should it not move off on its own	-6											
					Vehicles should be restricted to travelling only on designated roadways to limit the ecological footprint of the construction activities. Additional road construction should be limited to what is absolutely												

Name of Activity	Project		Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
					necessary, and the footprint thereof kept to a minimal												
					No hunting or trapping of faunal species is to be allowed by construction personnel												
				-5	Informal fires by construction personnel should be prohibited, and no uncontrolled fires whatsoever should be allowed	-5											
			Transformed Habitat Impact on Faunal Habitat and Diversity due to 1. Clearance of habitat leading to the displacement of faunal species; 2. Habitat fragmented and resulting in reduced movement of species and potentially reduced dispersal opportunities; 3. Increased risk of trapping / snaring and the potential collection for the pet / traditional medicine trade; and 4. AIP proliferation and woody encroachment into natural vegetation, displacing indigenous vegetation and altering favourable habitat conditions for faunal species. Probable Residual Impacts on fauna are considered to be: 1. Loss of / altered faunal species diversity in the footprint areas and the areas adjacent to the proposed projects; 2. Edge effects such as habitat fragmentation, AIP proliferation and bush encroachment limiting	-	Care should be taken during the construction of the five proposed projects to limit edge effects to surrounding natural habitat. This can be achieved by: × Demarcating all footprint areas during construction activities; × No dumping of litter, rubble or cleared vegetation on site should be allowed. Rubble / waste should be disposed of at an appropriate registered dump site away from the development footprint. No temporary dump sites should be allowed in areas with natural vegetation. It is advised that waste disposal containers and bins be provided during the construction phase for all construction rubble and general waste; and × Manage the spread of AIP species as per the mines mine's AIP control plan.	-	CbA										

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
			faunal species habitat utilisation; 3. Potential further loss of SCC/protected faunal species and suitable habitat for such species; and 4. It is unlikely that disturbed areas will be rehabilitated to an ecologically functioning state resulting in significant loss of habitat and species diversity, with reinstatement to premining levels being unlikely.														
			Sekhukhune Mountain Bushveld - Project 1	-11	Appropriate sanitary facilities must be provided during the construction of the development and must be removed to an appropriate waste disposal site	-6											
					If any spills occur, they should be immediately cleaned up to avoid soil contamination that can hinder floral rehabilitation later down the line. Spill kits should be kept on-site at all times. In the event of a breakdown, maintenance of vehicles must take place with care, and the recollection of spillage should be practised, preventing the ingress of hydrocarbons into the topsoil			Awareness creation on the importance of that natural ecosystem in which the mine operates. Rehabilitation of disturbed areas with indigenous vegetation. Smallest possible area of disturbance philosophy.	Eradication of invasive species within the mining area footprint. Successful self succession to be achieved. 100% compliance to remain with approved footprint areas. Initiate rehabilitation of disturbed areas within one year of final activity.					Invasion of Weeds and Alien Vegetation.	A weed eradication plan must be implemented on site in line with the current Khumani monitoring programme. This must be undertaken prior to the growing season.	SHEQ Department and a Specialised Ecologist.	Weed monitoring (monthly); Weed eradication (annually or as required); Ecological Study (Biodiversity Action Plan) (annually)
					Upon completion of construction activities, it must be ensured that no bare areas remain, and that indigenous species be used to revegetate the disturbed area												

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
			Secondary Bushveld - Project 1	-11	Edge effects arising from the proposed development, such as erosion and alien plant species proliferation, which may affect adjacent natural areas, need to be strictly managed. Specific mention in this regard is made of Category 1b AIP species (as listed in the NEM:BA Alien species lists, 2020), in line with the NEM:BA Alien and Invasive Species Regulations (2020);	-6											
					The poaching and/or hunting of animals will be strictly forbidden.												
					AIP monitoring and clearing/control should take place throughout the construction phase of the development, and a 30 m buffer surrounding the proposed railway loop should be regularly checked for AIP proliferation and to prevent inward and or/outward spread of AIPs, notably into non infested areas outside of the proposed railway loop or into newly rehabilitated areas												
			Transformed Habitat	-5	Alien vegetation that is removed must not be allowed to lay on unprotected ground as seeds might disperse upon it. All cleared plant material to be disposed of at a licensed waste facility which complies with legal standards.	-5											
			Impact on Floral SCC - The proposed five projects are associated with floral SCC, which will likely be directly	-7	Should any floral SCC be relocated, the relocation success of such species should be monitored during	-5	CbA										

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
			impacted by the proposed activities. The SCC recorded on site (Sclerocarya birrea subsp. caffra) is protected under the NFA. Additionally, there is an increased chance that several other NFA and LEMA listed floral SCC may occur within the footprint areas. The proposed 5 projects are not anticipated to have a high impact on floral SCC and with mitigation measures implemented the impacts can remain localised in extent. Succulents and geophytes are good candidates for rescue and relocation to suitable sites outside of the proposed footprints, either to surrounding natural habitat or to the Dwarsrivier nursery. Woody species are less likely to be successfully relocated, especially larger individuals. Where woody SCC species are to be cleared and not relocated, it must be ensured that the same species are currently being propagated in the nursery. If this is not the case, seeds can be harvested from the surrounding areas and / or from the individuals that will be cleared as part of vegetation clearing activities to be propagated off-site and reinstated as part of rehabilitation		the construction phase to ensure immediate actions can be taken if it becomes evident that relocation is not successful.												

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
			activities. Activities which are likely to negatively affect the flora of conservation concern within and around the proposed five projects include, but are not limited to, the following: 1. Disturbance, fragmentation and alteration of floral SCC habitat; 2. Destruction, removal or harvesting of floral SCC during construction and operational activities; and 3. Potentially poorly implemented and monitored rescue and relocation of SCC or not ensuring that the same species are being propagated in the Dwarsrivier nursery. Impact on CBAs, ESAs, Threatened Vegetation and Protected Areas - According to the desktop database, the proposed five projects will impact on a CBA 1 and the Sekhukhune Mountainlands threatened ecosystem, however, following the site assessment this is more accurately only applicable to the RWD of Project 1 and the footprint areas of Project 2. The remaining areas associated with the TSF (Project 1) and Projects 3-5 have all been impacted on and are associated with the active mining footprint.														

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
			According to the desktop database, a small portion of Project 4 will impact on an ESA however, this section of the ESA has been degraded in terms of habitat integrity and is located within the active mining area.														
			Impacts on Faunal SCC - The five proposed projects are associated with habitats that are known to host faunal SCC, notably the Sekhukhune Mountain Bushveld habitat. The remaining habitats may serve as intermediary or transitionary habitats for such species, but not permanent habitat. One SCC was recorded on site, namely Pycna sylvia (Cicada) whilst Python natalensis (African Python, VU) has also been recorded in the adjacent areas. Panthera pardus (Leopard, Vulnerable, TOPS Listed), Parahyaena brunnea (Brown hyaena, NT, TOPS Listed), Sagittarius serpentarius (Secretary bird, VU), Polemaetus bellicosus (Martial Eagle, VU) and Neotis denhami (Denham's Bustard, NT) are also considered to have a medium probability of occurring, however such occurrences are likely to be transitional and not permanent, as the footprint areas are not sufficient in extent to permanently host these	-7	Edge effect control needs to be implemented to prevent further degradation and potential loss of floral and faunal SCC outside of the five proposed project footprint areas	-5	CbA										
					Should the presence of any faunal or floral SCC be noted within the development footprint post walkdown and during vegetation clearance / construction activities, a suitably qualified specialist should be consulted on the best way to proceed												

Name of Activity	Project		Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities		Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
			species nor are there sufficient food resources within the five proposed project footprint areas alone to support these species. Mammalian, avifaunal and some reptilian SCC are likely to maintain large home ranges that will far exceed the extent of the five proposed project footprint areas. Due to the small project footprint extents and ability of many of the SCC to relocate ahead of construction activities, impacts stemming from the proposed projects are not expected to pose a significant risk to these species.														
			Habitat degradation due to dust: Increased dust will occur in all areas where vegetation is cleared. Dust will be caused by excavation, and construction. Dust in the area will be greatly increased due to the dry weather conditions and the nature of the soil in the area. Dust settling on plant material can reduce the amount of light reaching the chlorophyll in the leaves, thereby reducing photosynthesis, which in turn reduces plant productivity, growth and recruitment.	-8	Maintain the current air quality monitoring stations that determine fallout and implemented respirable dust (PM10) monitoring that could arise from the mining activities. Dust suppression should be undertaken where and when dust is present.	-5	CbA	Recording of dust fall out to determine trends.	Meeting ambient dust fall out limits in terms of applicable NEM:AQA Regulations.	x			x	National Dust Regulation Compliance.	Dust dispersion will be monitored in line with the current dust monitoring programme	SHEQ Department.	Monthly Monitoring with Annual Reporting.
			Direct Impact: Increased erosion can eventually lead to the loss of vegetation and habitats	-16	Ensure the required erosion protection measures are monitored and corrected where necessary.	-6	CbA	Limit the impact of the mining operation on	Maintaining soil integrity, with successful	x			x	Soil Erosion	Appointment of an Independent Environmental	ECO and SHEQ Department	ECO: Monthly for the construction phase. Thereafter annual external

Name of Activity	Project		Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	**Project**	**Impact Area**	**Potential Impacts**	**SbM**	**Mitigation Measures**	**SaM**	**CvA/R/Ir**	**Performance Objectives**	**Goals**	**ST**	**MT**	**LT**	**LOM**	**Compliance with Standard**	**Functional Requirements for Monitoring**	**Responsibilities**	**Monitoring and Reporting Frequency**
			for further species. Soils in the area are prone to erosion in areas where vegetation is cleared, this is further compounded by the fact that precipitation in the area occurs through heavy rainfall events in in the form of thundershowers in summer. Furthermore large areas will be cleared before construction leaving these areas prone to erosion.		Storm water management plan should be implemented prior to construction to ensure that runoff does not lead to the formation of erosion gulleys. Where vegetation cannot be established during the life of construction and operations, appropriate measure will be taken to control erosion. These will include grading of surfaces to prevent rapid run-off of storm water and / or the use of energy dissipaters. An erosion monitoring and mitigation plan should be put in place.			the Ecological Setting of the area. Limited to no presence of erosion gulleys. Retaining soil integrity for rehabilitation.	vegetation establishment.						Control Officer to assess compliance with the EMP. The SHEQ department should undertake ongoing site monitoring to determine whether activities on site are undertaken in accordance with the EMP Requirements.		audits can be undertaken. SHEQ: Weekly monitoring. Rectification of erosion gulley should be undertaken immediately upon observation.
			Accidental death of animals on the roads.	-12	Clearly marked signs will be erected along the transportation routes to create awareness of animal crossings. A clearly marked and enforced vehicle speed will be implemented on the internal mine and transportation routes. A detailed induction programme will be in place to ensure that all parties are aware of the rules and regulations on site in terms of the use of roads. Vehicles may only travel on demarcated roads on site.	-1	CbA	Awareness creation on the importance of that natural ecosystem in which the mine operates. Implementation of safe operation practices.	Zero animal fatality.	x			x	Creation of Awareness.	Induction with the view on creating environmental awareness.	SHEQ Department	Annually for permanent staff. Start of each visit for contractors.
		Freshwater Ecosystems	TSF: Operation and maintenance of the clean and dirty water separation system around the TSF and RWD: •Increased flood peaks into the watercourse as a result of formalisation and	-8	The clean water outlet structures should be constructed from energy dissipating structures (such as Armorflex or reno mattresses) to slow down the velocity of water inflow into the watercourse After construction of the outlet, the area surrounding	-5	CbA	Remain within or approve upon the current Aquatic Health and Water Quality baseline conditions.	Improve upon the current aquatic health and water quality baseline conditions.	x			x	Compliance in terms of GN704 and the aquatic monitoring requirements.	Remain within demarcated areas. Construction and maintenance of the infrastructure and erosion	Engineering department & Environmental Department. Specialist Aquatic Ecologist	Biomonitoring biannually (winter and summary monitoring). Annual vegetation monitoring of rehabilitated areas.

Name of Activity	Project		Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
			concentration of surface runoff; •Potential for erosion of terrestrial areas as a result of the formation of preferential flow paths, leading to sedimentation of the watercourse; •Reduction in volume of water entering the watercourse, leading to loss of recharge (and thus potential desiccation) of the watercourse systems; •Erosion and sedimentation of the watercourse at the outlet of the clean water trench; and •Altered vegetation communities due to moisture stress.		the outlet should be re-seeded with indigenous watercourse vegetation.										controls. Assess Aquatic Habitat Characteristics where required.		
			TSF: Potential Risk of failure of TSF or RWD leading to spill of tailings in the vicinity of watercourses leading to deposition in the aquatic environment: •Loss of aquatic habitat and refugia; •Silt deposition may lead to smothering of benthic layer. •Loss of aquatic biodiversity and loss of aquatic taxa; •Negative impact on aquatic biota community diversity and integrity due to deterioration of water quality.	-11	The TSF and RWD must be managed throughout the life of both facilities in such a way to ensure that storage and surge capacity is available if a rainfall event occurs; An Emergency Response Plan must be compiled. The Emergency Response Plan must contain the following measures: In the case of failure, as much sediment as possible, contaminated by the spill, must be removed from the point of its source, following the spill path to the affected watercourse. Sediment must be removed until the natural in situ substrate is reached or until a clear change in the sediment colour is reached indicating that the natural soil level has been reached	-6	CbA										

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
					All silt removed should be returned to the TSF or disposed of at a suitably managed site;												
					Following the removal of the contaminated sediment, it must be ensured the slope of the excavated areas is in line with the natural topography – i.e. a low gradient no more than 1:3;												
					Edge effects must be strictly controlled – for example no removal of sediment must take place beyond the spill pathway												
					Possible seepage and contamination of the groundwater resources is possible and should be monitored at suitable groundwater monitoring points, as guided by the geohydrological study;												
					Toxicological monitoring of the receiving environment and of the RWD must occur immediately following the first rain event after rehabilitation and again at the end of the wet season. The aquatic ecologist should make a recommendation concerning the necessity of future monitoring following the assessment.												
		Hydrology	Contamination of surface water resources due to potential hydrocarbon spillages washed into drainage lines and depressions	-10	Ongoing water, biomonitoring and groundwater monitoring should be undertaken.	-5	CbA	Remain within or approve upon the current Aquatic Health and Water Quality baseline conditions.	Improve upon the current aquatic health and water quality baseline conditions.	x			x	Compliance in terms of the current Water Use License. Remain within demarcated areas.	Ongoing Biodiversity and water quality assessments. Demarcation on site of all activities to be undertaken.	Aquatic Specialist. Water Quality Specialist Supervisor Engineer	Surface Water and Biomonitoring in line with the current monitoring programme. Daily walkabout to determine any potential
					Machinery, trucks and vehicles must be well maintained and serviced regularly as per the recommended service guide.												

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	**Project**	**Impact Area**	**Potential Impacts**	**SbM**	**Mitigation Measures**	**SaM**	**CvA/R/Ir**	**Performance Objectives**	**Goals**	**ST**	**MT**	**LT**	**LOM**	**Compliance with Standard**	**Functional Requirements for Monitoring**	**Responsibilities**	**Monitoring and Reporting Frequency**
					Refuelling must be undertaken over hard park bunded areas that adequately capture and contain spillages.										Develop a procedure and schedule for the exploration activities in terms of the wet and dry seasons. Maintenance of clean and dirty water management systems		concerns. Engineers must ensure that the clean and dirty water management systems are maintained at least quarterly.
					Machinery and vehicles should be parked on appropriately lined areas.												
					Drip trays must be used under leaking machinery.												
					Spillages should be reported immediately and spill kits should be readily available at all times.												
			Due to the small size of the TSF and Capital Projects, the loss of contributing area will be negligible (less than 0.5 %) in comparison to the runoff area of quaternary catchment B41G.	-5	Runoff from dirty areas must be contained according to GN704 regulations. There are no mitigation measures for a loss of contributing catchment area. The loss of catchment area is extremely small and would therefore have a negligible impact on reducing the catchment yield.	-5											
					Implement and maintain the approved Storm Water Management Plan as defined in the EMPr, or as subsequently been approved.												
			Placement of the Khulu TSF infrastructure in a potential non-perennial drainage line located towards the north-eastern side of the TSF. According to the 1:50 000 topographical map 2430CC Kennedy's Vale, a non-perennial drainage line runs along the north-eastern boundary of the Khulu TSF site. This area was assessed on the site visit and it was noted that	-10	The implementation of the proposed clean water diversion trench around the TSF will assist with drainage in this area.	-5											

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	**Project**	**Impact Area**	**Potential Impacts**	**SbM**	**Mitigation Measures**	**SaM**	**CvA/R/Ir**	**Performance Objectives**	**Goals**	**ST**	**MT**	**LT**	**LOM**	**Compliance with Standard**	**Functional Requirements for Monitoring**	**Responsibilities**	**Monitoring and Reporting Frequency**
			the area was highly disturbed by what appeared to be old stockpiles and borrow pits, most likely from previous road construction in the area. Water is likely to pond in this area as a result of the disturbance, and therefore it is highly unlikely that this area functions as a drainage line.														
			The proposed Khulu TSF, silt trap, PCD, diesel storage tanks and emulsion transfer area have the potential to contaminate the surrounding clean environment should spills occur.	-13	Runoff from the Khulu TSF will be captured in a perimeter trench (solution trench) which must be lined and sized appropriately according to GN704 regulations. Clean water should be diverted around the TSF through the implementation of a diversion trench. The TSF silt trap must be regularly inspected and desilted. Desilted material must be placed temporarily on a lined bunded area and disposed of either back on the TSF or at an appropriate facility. Silt from the silt trap, should be dried on designated designed drying pads, contained for such purpose. Silt should be disposed of at suitable designed areas or onto the TSF. The proposed pipeline must be regularly inspected for leaks A safety berm will be provided along the crest to provide a physical demarcation of the edge of the TSF and to direct	-5											

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
					stormwater runoff to the down chutes. Contained bunded areas should be placed at all booster stations to ensure that any potential leak can be contained. Where pipeline links are present, or where clean up points are identified, the necessary containment should be implemented to ensure that spills in this area, can be contained. Tailings spills must be cleaned within 48 hours from occurrence, and taken to demarcated areas (such as the TSF) or within suitably bunded or contained areas. The PCD must be lined and appropriately sized so as not to spill more than once in 50 years, in accordance with GN704 regulations. The freeboard of the PCD must be monitored daily.												
		Geohydrology	Contamination of groundwater resources. The model was used to assess the impact on groundwater quality at the end of the operational phase. This was assumed to coincide with the end of life of the Khulu TSF, which is indicated as 21 years. During the operational phase, it is assumed that the liner at the TSF and the PCD will remain intact and that seepage from the tailings material will be	-13	The leak detection systems of the TSF should be monitored regularly. The water level in the PCD must be diligently monitored to avoid spills and/or seepage. If excess water collects in the PCD, this water must be pumped to the Lower RWD for reuse in the mine water balance. Dwarsrivier Mine must monitor the volumes of water transferred to and from the Khulu TSF and PCD as part of its flow meter monitoring network.	-6	R	Remain with the conditions of the WUL	Protection of groundwater resources.	x			x	Compliance in terms of the current Water Use License. Remain within demarcated areas.	Ongoing groundwater monitoring. Induction with the view on creating environmental awareness.	SHEQ Department	Surface and Biomonitoring in line with the current monitoring programme. Groundwater monitoring in line with approved monitoring protocol. Monthly review of boreholes and stability to ensure that these can be

Name of Activity	Project		Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
			collected above and below the drains to installed. As such, no significant seepage from the Khulu TSF to the underlying aquifers is expected. Impacts associated with other sources of contamination to groundwater, including the plant, the historical TSF (before it is reworked), the dirty water dams, pit backfill areas and the underground workings are assumed to continue to impact over the life of the operations. It is noted that Dwarsrivier Mine is in the process of developing a groundwater remediation strategy to reduce nitrate concentrations in groundwater in the plant area. This project will be evaluated in a separate study. The results of the simulations to estimate the impact at the end of the operational phase, indicate the following: • Nitrate contamination in the weathered aquifer will be contained to the plant and opencast mining areas. Based on the current characterisation of the alluvial aquifer, it is unlikely that nitrate concentrations in the weathered aquifer would exceed 11 mg/l in the		Instruments installed to measure flow must be maintained and calibrated to ensure that accurate measurements are made. The data collected from the flow meters must be used to confirm that the assumptions on which this impact assessment are based, remain valid. If significant deviations in terms of water flow volumes are recorded, the impact assessment presented in this report must be re-evaluated, especially in terms of the volume of seepage available for infiltration from the TSF and PCD.												monitored. Implementation of Groundwater Remediation Project - Remediation Programme to be finalised. Update the Numerical Model - According to the WUL, but at least every five (5) years. Numerical Model must be undertaken five years before closure of the facility.
					Monitor the risk of overflow and/or spill at the PCD and the Lower RWD to avoid adverse impacts on groundwater quality.												
					Quarterly engineering inspections should be undertaken to ensure that the disposal methodology and designs, as well as the stability considerations are in line with the design principles.												
					Capture seepage from the Khulu TSF and reuse it in the mine water balance.												
					Dwarsrivier Mine must implement the planned groundwater remediation strategy to address existing nitrate contamination, which must be designed to reduce the impact on the fractured rock aquifer in the long-term												

Name of Activity	Project		Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
			vicinity of the Groot Dwars River. • No significant impact is expected on the shallow weathered and alluvial aquifers during the operational phase. Nitrate concentrations in these aquifers at the Khulu TSF footprint are expected to remain below 11 mg/l in general. • No impact on groundwater quality is expected in the vicinity of the Klein Dwars River west and northwest of the Khulu TSF and PCD at the end of the operational phase. • Based on the conceptualisation of preferential groundwater flow in the fractured rock aquifer, the nitrate plume is expected to migrate in a northerly direction along the N-S striking fault. This contamination originates from the plant, historical TSF, dirty water dams, open cast and underground mining areas and not from the Khulu TSF and PCD. • At the Khulu TSF footprint, nitrate concentrations may increase to above 400 mg/l along the fault line. It is likely that the plume may migrate more than 500m north of the Dwarsrivier Mine MRA by the end of the operational phase. The extent to which contamination may migrate from existing		Ongoing water, biomonitoring and groundwater monitoring should be undertaken.												
					Groundwater monitoring must be maintained in all boreholes dedicated to the Khulu TSF. Both groundwater quality and groundwater levels must be monitored in the boreholes according to the strategy below. The information from the monitoring programme must be kept in a spreadsheet. Trends must be analysed to ensure that any exceedances are immediately detected.												
					In the event of deterioration in groundwater quality, an inspection must be held to identify the source of contamination. Any non-compliances must be rectified immediately to avoid prolonged negative impacts on groundwater.												
					If any of the monitoring boreholes are destroyed during construction and/or operation of the TSF, these must be placed as a matter of urgency. Of specific concern is the location of boreholes DRM11S and D, which is located on the edge of the Khulu TSF design. These boreholes target the SW-NE trending fault and must be redrilled on this structure if destroyed to ensure efficient monitoring of groundwater in this position.												
					Update the numerical groundwater flow and												

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
			mining and mineral processing activities will depend on the manner in which the sources to groundwater are managed as well as the permeability and porosity of the preferential flow path. • As noted above, Dwarsrivier Mine is in the process of developing a groundwater remediation strategy to address existing nitrate contamination. This strategy will be addressed in a separate study, but it will be designed to reduce the impact on the fractured rock aquifer in the long-term. • Nitrate concentrations in the Farm House borehole may increase to around 200mg/l by the end of the operational phase. At present, the nitrate concentration in this borehole is 46 mg/l.		contaminant transport modelling as additional monitoring information becomes available, but at least every five years. The final closure numerical groundwater modelling must be undertaken five years before closure of the facility.												
		Air Quality	Sensitive receptors are identified as areas that may be impacted negatively due to emissions from the proposed TSF. Four receptors (villages and dwellings) were identified in the area surrounding the proposed project area, within a 10 km radius, and were used for this assessment. Long-term (annual) and short-term (24-hour average) concentrations	-9	Install air quality monitoring stations that determine fallout and respirable dust (PM10) concentrations that could arise from the mining activities. Wetting of exposed stockpiles to limit the dispersion of wind-blown dust and particulate emissions Use of water sprays at crushing and transfer points	-2	CbA	Reducing dust emissions on site.	Zero complaints from surrounding landowners regarding dust.	x			x	National Dust Regulations compliance.	Dust dispersion will be monitored as part of the overall mine dust monitoring programme.	SHEQ Department.	Monthly Dust Monitoring with Annual Reporting.
					During operational phase of the mine, haulage roads will be treated with dust suppression techniques such				Recording of dust fall out to determine trends.	x			x	Complaints Register.	A complaints register should be in place on site.	SHEQ Department.	Ongoing

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	**Project**	**Impact Area**	**Potential Impacts**	**SbM**	**Mitigation Measures**	**SaM**	**CvA/R/Ir**	**Performance Objectives**	**Goals**	**ST**	**MT**	**LT**	**LOM**	**Compliance with Standard**	**Functional Requirements for Monitoring**	**Responsibilities**	**Monitoring and Reporting Frequency**
			for the pollutants of concern were compared with the South African NAAQS and dust fallout levels with the NDCR standards. PM10 CONCENTRATIONS – For Scenario 1 (current mining operations) and Scenario 2 (current with proposed TSF) ambient 24-hour (P99) and annual average PM10 concentrations are predicted to be compliant at all sensitive receptors; – Changes in predicted PM10 concentrations between Scenario 1 and Scenario 2 are substantial, with a 66% average increase in the 24-hour (P99) concentrations and a 69% average increase in annual average concentrations across all sensitive receptors. However, despite the increase, predicted concentrations at all receptors remain well below the standards during Scenario 2; – Highest predicted 24-hour and annual average off-site concentrations are compliant with the respective standards for Scenario 1. Highest concentrations are predicted on the north-western portion of the mine, predominately around the areas of existing haulage roads; – Highest predicted 24-hour average off-site		as wet to reduce dust creation.				Meeting ambient dust fall out limits in terms of applicable NEM:AQA Regulations.								
					Avoid dust generating works during the most windy conditions;										Complaints should be acknowledged with an action plan recommended.	SHEQ Department	Acknowledgement within 24 hours, with an action plan within 7 days.

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
			concentrations during Scenario 2 are non-compliant with the relevant 24-hour standard, due to the close proximity of the new TSF road to the boundary of the mine. However, highest predicted annual average concentrations remain compliant with the standard; and − However, despite the non-compliance predicted for the 24-hour PM10 off-site concentrations (Scenario 2), all concentrations predicted at neighbouring sensitive receptors remain complaint with their relevant standard, as noted previously. PM2.5 CONCENTRATIONS − For Scenario 1 (current mining operations) and Scenario 2 (current with proposed TSF), ambient 24-hour (P99) and annual average PM2.5 concentrations are predicted to be compliant at all sensitive receptors; − Changes in predicted PM2.5 concentrations between Scenario 1 and Scenario 2 are substantial, with a 72% average increase in the 24-hour (P99) concentrations and a 68% average increase in annual average concentrations across all sensitive receptors. However, despite the increase, predicted concentrations at all														

Name of Activity	Project		Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
			receptors remain well below the standards during Scenario 2; and – Highest predicted 24-hour average and annual average off-site concentrations remain compliant with the relevant standards for both scenarios. DUST FALLOUT – For both scenarios, no exceedances of the dust fallout residential standard are predicted at any of the neighbouring sensitive receptors; – Scenario 1 and Scenario 2 highest predicted off-site dust fallout rates remain compliant with the non-residential standard; and – Overall levels of dust fallout anticipated to occur as a result of the proposed TSF are below the respective National Dust Control Regulations.														
		Heritage	No further impacts are foreseen.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Noise	Noise of vehicles traversing the access roads will create a constant source of noise. It is however not foreseen that the roads proposed would contribute to any additional noise levels in the area.	-7	Machinery and vehicles will be well maintained to prevent excessive nose and to comply with national and provincial regulations. All vehicles will have muffles to minimise noise emissions, where necessary. Where noise becomes a nuisance nose management measures will be investigated and implemented to address these concerns. Operational mining activities with potential noise impacts	-4	CbA	Protect the ambiance of the area, as well as maintain good relationships with surrounding land users.	Implement a noise monitoring network.	x			x	Elevated Noise Levels.	Ambient noise monitoring should be undertaken	SHEQ Department	Monthly (during the day and during the night)

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	**Project**	**Impact Area**	**Potential Impacts**	**SbM**	**Mitigation Measures**	**SaM**	**CvA/R/Ir**	**Performance Objectives**	**Goals**	**ST**	**MT**	**LT**	**LOM**	**Compliance with Standard**	**Functional Requirements for Monitoring**	**Responsibilities**	**Monitoring and Reporting Frequency**
					should be mitigated and should not be undertaken during night time. Noise generating activities should thus be kept to normal working hours where possible												
					Personnel should be equipped with the necessary noise protection equipment.												
					Noise monitoring will be undertaken (ambient conditions) to ensure that noise levels comply with Health and Safety Standards.												
		Visual	Deposition of tailings on the TSF.	-11	There are no real mitigation measures as the TSF will increase in height and will be approved for a certain height, however, the TSF should be vegetated as soon as practicably possible and should not exceed the approved height.	-6	R	Retain the aesthetics of the area as far as practicably possible.	Design and construction infrastructure to blend in with the general topography as far as practicably possible. No encroachment outside of demarcated areas.	x			x	Protect the long term aesthetics of the area.	Successful establishment of trees. Successful dustfall out results	SHEQ Department	Monthly ECO inspections for the construction phase. Biannual internal and external audits can be undertaken during the construction phase. Annual internal and external audits during operational phase.
			The presence of a new TSF in the landscape.	-10	The natural landscape of the area has already been altered by mining. The proposed mine infrastructure is in line with the current land use and will add to the already altered landscape. It is not foreseen that the current visual quality of the area will be significantly altered by the proposed TSF. However, it is recommended that the TSF is vegetated as soon as practicably possible, and that the associated infrastructure is painted earthy colours to blend into the landscape.	-6	R										

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
			Impact on Sense of Place (Social impact) - Site B has previously been used for farming activities, although no farming is currently being undertaken within the area. The site is situated within an area characterised by mining infrastructure. Although Site B would be highly visible from the R577 and the Richmond Road, the proposed TSF will blend in with the existing overall sense of place, as the area is already disturbed by existing mining activities. The development of the TSF will thus not create a new impact on the sense of place. The area where site B is proposed is currently not used for other purposes e.g. farming, and therefore one can conclude that no significant land-use sterilisation would occur. With regards to the overall impact of the Khulu TSF and the capital projects on the sense of place, there would be additional impacts associated with the different projects, although it would not significantly scar the existing visual characteristics of the environment.	-10	Mining areas should be rehabilitated as soon as the Mining Works Programme allows. Un-rehabilitated and poorly rehabilitated mining areas must not be allowed to remain. Environmental management of the mining activities must adhere to environmental regulations and strive towards international best practice. The eradication of alien invasives, aimed at ensuring the integrity of the biodiversity, should form part of the mitigation to limit further negative impacts on the overall sense of place. The power lines and servitude to the east of Site B must be considered in the detailed design to avoid interruptions in electricity provision. Placement of lighting at infrastructure should be optimally placed with the least negative visual impacts possible. The design of the TSF must consider the visual impacts and aim to lessen this by attending to the slope angles/steepness and possible landscaping around the facility (e.g. tree barrier line).	-9	CbA								The Project Manager should implement the necessary design concepts to limit the impact on the soil resources and ecological connectivity and functioning of the ecosystem.	Project Manager	As part of the project design. Prior to construction.
			Operation of the TSF and security measures.	-11	Down lighting and lighting shields should be used as far as possible.	-5	CbA								Development of infrastructure with closure in mine.	Project Manager & SHEQ Department	As part of the project design. Prior to construction.
			The presence and use of heavy machinery, trucks	-9	Machinery, trucks and vehicles are already present	-5	CbA										

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
			and vehicles during the operational phase.		in the area and are unlikely create any additional significant presence. Trees should be planted along the main roads to conceal activities from motorists. Dust suppression measures should be implemented to limit the generation of dust.												Review design drawings, quarterly in terms of compliance to actual operation. Annual Closure Plan and Ongoing Rehabilitation Plan Development.
		Social	There is approximately 1200 permanent and 800 contractor employees in service at Dwarsrivier Mine. This employment profile will be sustained as the proposed project would allow the operation to meet the existing production capacity. Approximately 24 employees will be directly involved with the operations related to the TSF. No new employment positions will be created as these employees are already employed at Dwarsrivier Mine. However, the existing socio-economic benefits created through Dwarsrivier Mine being a key employer in the area would continue. The social services support as part of the SLP requirements will also continue to be implemented. As no additional workers are anticipated, the inflow of jobseekers is also anticipated to be of limited significance.	10	The procurement of locals should receive preference if there is any need for additional employees. The ideal objective should be to reach 100% recruitment of additional/ new unskilled labour from local communities where skills are locally available.	11	CbA	Positive contribution to the Socio-Economic Setting of the Local Municipality. Maintenance of logistical characteristics and requirements of the local area.	Continuation of traffic logistics on the regional roads. Maintenance of relationships with surrounding landowners, mines and road users. Meeting the approved objectives and goals of the SLP. Maintain relationship with land claimants.		x			Monitoring of the Social and Labour Plan.	The HR department should remain in ongoing consultation with the Local Municipality. Regular stakeholder focus meetings should be scheduled to discuss any perceived impacts or concerns.	HR and SHEQ	Annual review and update of the SLP. Monthly dust monitoring. At least annual stakeholder focus meetings. Weekly inspections of the railway line construction activities and implementation of the temporary diversion activities.
			Existing employees would continue to be responsible	10	Targets for the procurement of capital goods, consumer	11	CbA										

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
			for the overall mining activities. Limited additional temporary workers could over time be required for specific tasks associated with the proposed Khulu TSF and capital projects. When that occurs, new mining activities can then be allocated to appointed specialist contractors. Even if limited procurement is foreseen, this variable is still regarded as positive, due to the indirect impacts of Dwarsrivier Mine's mining activity on the local economy through the creation of possible business opportunities (e.g. local service industry) and local procurement of material, services and equipment.		goods and services should be set and Dwarsrivier Mine should develop an action plan to meet these targets.												
					Contract executions by SMMEs should be strictly monitored to determine whether SMMEs require assistance with regards to general business principles, financial management, management of stock, competitive costing (pricing), and marketing of their businesses.												
					Enterprise development is a key enhancement measure in this regard. The proponent should assist small businesses and/or SMME's to develop to a certain level. Such measures recommended could include the following: The establishment of joint ventures between small businesses and established companies with relevant experiences with regards to tender processes can be considered; Flexible payment systems can be considered to assist smaller businesses in terms of expenditure, but such a system must be strictly controlled, An audit of existing local enterprises that could provide services, goods and material should be undertaken with the assistance of local leaders and community representatives, as well as local business structures												

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
					The procurement process should be based on competitive business principles and the quality of services to be rendered, to ensure adherence to standards and to maximise overall welfare.												
			Socio-Economic Development - The socio-economic impact of the proposed projects would be based on the mine's continued contribution to the Gross Geographical Product (GGP) and the number of direct (continued employment at the mine) and indirect jobs that would be created. Therefore, except for ongoing direct employment, that would generate income and increase local spending, people living in the vicinity of the study area is also expected to benefit by the earnings of those employed by the mine and the local buying power in the area. Through employment and income generation during the mining processes, some economic benefits to the region and local communities therefore accrue. The mine would continue to contribute to the local economy through its employee wages, procurement of local contractors and services, purchasing of water and electricity and through payment of taxes to the	11	Dwarsrivier Mine, through their SLP, must continue to provide skills development opportunities for employees that include functional literacy and numeracy programmes, career progression plans, up-skilling for hard to fill vacancies and management positions, bursary and internships and portable skills training. Develop a database of SMME's for the procurement of goods and services that could potentially be outsourced to the local community. Dwarsrivier Mine to continue to adhere to the Social and Labour Plans as per the Regulation 46 of the Mineral and Petroleum Resources Development Act (Act 28 of 2002) and the Mining Charter (2018).	12	CbA										

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
			Fetakgomo Tubatse Local Municipality. Dwarsrivier Mine, through their mining activities, is involved in various Local Economic Development Initiatives linked to the Integrated Development Plan (IDP) of the Fetakgomo Tubatse Local Municipality, as well as other government initiatives. These activities would thus continue, and the constant positive socio-economic impacts thereof would remain to benefit of the local communities.														
			Capacity Building - Although education and training are mainly the responsibility of government, there is increased pressure on the business sector in South Africa to increase the development and skills of their workforce. Dwarsrivier Mine is involved in capacity building and training. Further to these focus areas, the company also concentrate on local employment creation and poverty alleviation, as well as environmental management, rural development and the provision of infrastructure. The above-mentioned inputs would continue if Dwarsrivier Mine is successful in sustaining	11	Dwarsrivier Mine should continue with a Human Resources Development (HRD) strategy as part of the Social and Labour Plan (SLP). The focus should remain of career development programmes, bursaries, learnership programmes, skills development and training. Learnership programmes should preferably focus on individuals from the core and affected areas in close proximity to Dwarsrivier Mine to maximise the long-term employment opportunities of these local community members. Local goods and services should be used as far as possible and therefore contractual requirements for contractors to use local goods and services should be implemented as far as possible	12	CbA										

Name of Activity	Project		Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
			their mining operations in the area. Dwarsrivier Mine has thus played an important role in the area in this regard and commits to continue with these efforts which would benefit the local communities within the Fetakgomo Tubatse Local Municipality area.		Local Economic Development initiatives should continue												
			Safety and Security Related Impacts - The production capacity associated with the proposed Khulu TSF project and the capital projects would remain approximately similar to the current situation and it is therefore not anticipated that the transportation of material or products would escalate. However, the continuous movement of mining related vehicles transporting goods and materials on the local roads can still continue to create safety and security risks. The method to be used at the Khulu TSF involves dry stacking by means of the filter cake which is of a solid content. This method minimises the risk of tailings dam failures and can lessen possible seepage significantly. From a socio-economic perspective this method will thus limit safety and security risks, as well as health risks.	-8	A Fire/Emergency Management Plan should be developed and implemented, if not yet in place. It would be important to regularly review the functionality and efficiency of such a plan in conjunction with the local emergency teams, mine management and affected communities as well as neighbouring landowners. Appropriate firefighting equipment should be on site and workers should be appropriately trained for firefighting Warning signs would have to be posted to alert residents and road users to possible dangers associated with mining related traffic and activities.	-8	CbA										
			Health Related Risks - During the operational phase dust impacts are	-10	The Mine Health and Safety Act (Act No 29 of 1996), standards stipulated in SANS	-8	CbA										

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
			anticipated due to general mining activities and vehicles travelling on the access and haul roads. The dust concentrations as a result of this movement are not anticipated to reach residential areas and the impact would possibly be localised on site. Fugitive dust from stockpile areas and waste rock dumps are also of concern. Windblown dust from these facilities will vary according to the season, with possible higher levels and frequency during the windy months. The probability and intensity of these possible impacts would further depend on the wind directions and the proximity of sensitive receptors. The nearest residential area is approximately 10 km to the north and east of the mining area. Should there be a possible increase in the air pollution (dust), these sensitivities should be adequately dealt with and be taken into account in the monitoring processes stipulated as part of the EMPr. In the event that sensitive receptors are affected (worst case scenario), based on dust fallout rates, the necessary mitigation measures as stipulated		10286, NEMA and related regulations and standards must be adhered to. Vehicles and equipment must be in good working order and must be regularly serviced. Infrastructure e.g. pipelines must be regularly inspected and maintained to avoid spillages. Mining activities should adhere to all the relevant environmental and health guidelines and should be undertaken in accordance with the EMP The TSF design should ensure that contaminated surface water runoff do not contaminate other water sources and that no seepage occurs. Extracting water from the slurry/slimes will limit the water content of the TSF. Dust suppression methods along haul roads should be continued to be implemented Dwarsrivier Mine must continue to distribute information with regards to health matters and nutrition to its workers and surrounding communities The SLP should make provision for addressing any possible direct health related risks and providing a supporting role to minimise the vulnerabilities of the communities, without having to take over the role of the local health services and municipality.												

Name of Activity	Project		Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
			through the Air Quality specialist study must be implemented. The rating below is based on the general air quality impacts usually experienced with mining projects and the proximity of sensitive receptors in the study area. Emissions would include vehicle emissions (carbon monoxide and nitrogen oxide) and emissions from large construction equipment. Industrial, solid and hazardous waste would be created during the mining operations. As is currently the case, these different types of waste should continue to be responsibly disposed of to avoid any health-related impacts in this regard. Storing of diesel and emulsion can create health related risks. As mitigation, the emulsion will be stored in underground tankers. The majority of the pipelines will further be underground to limit risks in this regard and possible spills. The Khulu TSF, as indicated above would include dry stacking. This method can minimise health risks usually associated with conventional tailings facilities. Surface water runoff and possible seepage are still possible and can contaminate water resources. The designs		On site, all the appropriate health, hygiene and distancing measures aimed at protecting the employees' safety and health, must be implemented. Dwarsrivier Mine can investigate ways to support to the local clinics through their community support programmes and SLP initiatives. Educational videos on COVID-19, and general health and hygiene measures associated with the pandemic should be provided to employees												

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
			should avoid such pollution in order to avoid public health impacts due to the potential impact on the water quality. It should also again be noted that the nearest residential settlement is approximately 10 km away from the mining activities. In mining areas there are further concerns relating to migrant employees bringing health risks, and nowadays the threat of Covid-19 infection, to mining areas or small towns. The Fetakgomo Tubatse Local Municipality area is already characterised by vulnerable households and inadequate public health services that cannot always effectively deal with the health risks associated with the pandemic. It will remain the responsibility of Dwarsrivier Mine to continue their support to their employees and surrounding communities to reduce vulnerability and to implement the required Covid-19 Protocol.														
Operation of TSF and associated infrastructure	1	Socio-Economic	The existing dam break analysis indicates that should an impact occur that the Eskom Sub Station will be in the zone of influence (refer to Annexure 4).	-12	The necessary emergency preparedness plans must be developed and implemented in consultation with Eskom to proactively plan and manage an instance should dam break be encountered. The TSF must be designed, constructed and operated in line with the approved designs.	-7	CbA	No impact on economic activities in the area.	Maintain the integrity of the TSF				x	Compliance with TSF International Design Standards and operational procedures.	Quarterly Engineering inspection and annual design inspections and reporting.	TSF Engineer	Quarterly inspections. Annual stability inspections and reporting.

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
Operation of Projects 3, 4, 5	3, 4, 5	Geology	No further impacts are foreseen.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Topography	No further impacts are foreseen.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Soils and Land Capability	Soil compaction outside of demarcated areas	-11	The mine will ensure that all activities, material and equipment storage and personnel movement take place within the designated area. A site plan must be developed, indicating the following: Location of all approved activities; 1:100 year buffer around all watercourses; Location of the CBA and Endangered Ecosystems and mark these areas where construction is not approved as a no-go zone's All vegetation management zones as per the Biodiversity Action Plan. Laydown areas should be located within disturbed soils (anthrosols) to avoid compaction of natural soils. All contractors must receive induction. The induction should be updated on site, to make provision for the site plan and a detailed explanation on the purpose of the no-go zones, presence of protected species, presence of the CBA and ESAs and the meeting thereof. The management of topsoil stockpiles should be undertaken in terms of the Topsoil Management Plan included into this EMPr to ensure that the topsoil stockpiles maintain its	-5	R	Limit the loss of soils as far as possible and ensure that the integrity remains during stockpiling for the purposes of successful rehabilitation.	he integrity of the soils stockpiled must remain suitable for the purposes of rehabilitation. No disturbed areas should remain beyond the demarcated areas. 100% compliance to remain with approved footprint areas. Maximum volumes of topsoil should be removed.		x		x	Remain within demarcated areas.	Annual audits by external EAP. Regular inspections by SHEQ Department.	SHEQ Department	Annual external audits can be undertaken. SHEQ: Monthly walkabouts

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
					integrity and are not subjected to compaction.												
					Restrict the amount of mechanical handling, as each handling event increases that compaction level and the changes to the soil structure. Wherever possible, the 'cut and cover' technique (where the stripped soils is immediately placed in an area already prepared for rehabilitation, thus avoiding stockpiling) should be used.												
					A fine system/disciplinary system must be implemented on site for all significant or recurring environmental non-compliances.												
					Compacted soils adjacent to the mining blocks and associated infrastructure footprint can be lightly ripped to at least 25cm below ground surface to alleviate compaction prior to re-vegetation.												
					Site clearance and activities should be restricted to the approved footprint. Contractors areas should be established on already disturbed footprints.												
					All vehicular traffic should be restricted to the existing service roads and the selected road servitude as far as practically possible												
			Clearing vegetation beyond the demarcated areas will result in the exposure of soil, which may in turn lead to soil erosion, in addition to this,	-10	The approved Storm Water Management Plan must be implemented. Clean and dirty water systems must be maintained.	-5	R	Limit the loss of soils as far as possible and ensure that the integrity remains during	The integrity of the soils stockpiled must remain suitable for the		x		x	Soil Erosion and incorrect stockpiling of topsoil. Encroachment	Appointment of an Independent EAP to assess compliance with the EMP.	Independent EAP and SHEQ Department.	Annual external audits can be undertaken. SHEQ: Monthly walkabouts

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
			stockpiling of topsoil material on sloping areas leading to increased runoff and erosion. The areas where the infrastructure is proposed are mostly gradual, however the exploration activities will be located among the mountainous setting and this is where erosion is considered moderately high. The natural and undisturbed soils will become more vulnerable to erosion once the vegetation is cleared for construction activities, and the soils will inevitably be exposed to wind and some surface runoff during intensive rainfall events. The ratings given in the columns on the left is for Project 1 , Project 2 and Project 3-5.		Ensure the required erosion protection measures are monitored and corrected where necessary. Bare soils can be regularly dampened with water to suppress dust during the construction phase, especially when strong wind conditions are predicted according to the local weather forecast All disturbed areas adjacent to the footprint areas can be re-vegetated with an indigenous grass mix, if necessary, to re-establish a protective cover, to minimise soil erosion and dust emission. Natural vegetation establishment (self-succession) will be encouraged on cleared areas, and topsoil stockpiles. If natural succession of vegetation is not established within one rainy season, after rehabilitation, the disturbed areas and areas adjacent to the infrastructural areas must be re-vegetated with an indigenous grass mix, if necessary, to re-establish a protective cover, to minimise soil erosion and dust emission. The mine will investigate an appropriate seed mix for the rehabilitation purposes should self-succession not establish on rehabilitated sites. If possible, vegetation clearance and commencement of construction activities can			stockpiling for the purposes of successful rehabilitation. Protect the soil resources within the area in which the mine operates. Retaining soil integrity for rehabilitation. Protect the soil resources within the area in which the mine operates. Protect surface and groundwater resources against siltation and contamination.	purposes of rehabilitation.					of activities outside of demarcated areas.	The SHEQ department should undertake ongoing site monitoring to determine whether activities on site are undertaken in accordance with the EMP Requirements. Erosion protection measures should be implemented and monitored on areas identified. Photographic records of assessments must be kept.		Biomonitoring in line with WUL requirements.

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
					be scheduled to coincide with low rainfall conditions when the erosive stormwater and wind are anticipated to be low. The approved areas should be clearly demarcated to restrict vegetation clearing activities within the infrastructure footprint as far as practically possible. No project related activities may be undertaken outside of the demarcated areas. No open fires must be allowed.												
			Potential of Soil Contamination - All the identified soils are considered equally predisposed to potential contamination (i.e. hydrocarbons), as contamination sources are generally unpredictable and often occur as incidental spills or leak for construction developments. The significance of soil contamination is medium-high for all identified soils, largely depending on the nature, volume and/or concentration of the contaminant of concern.	-10	Contamination prevention measures should be addressed in the Environmental Management Programme (EMP) for the proposed development, and this should be implemented and made available, and accessible always to the contractors and construction crew conducting the works on site for reference A spill prevention and emergency spill response plan, as well as dust suppression, and fire prevention plans should also be compiled to guide the construction works Vehicles and Machinery will be regularly maintained. Maintenance programmes will be established and implemented. All refuelling of vehicles and equipment maintenance must be done within designated bunded areas.	-5	R	Protect the soil resources within the area in which the mine operates. Protect surface and groundwater resources against siltation and contamination.	The integrity of the soils stockpiled must remain suitable for the purposes of rehabilitation. No disturbed areas should remain beyond the demarcated areas. 100% compliance to remain with approved footprint areas.		x		x	Encroachment of activities outside of demarcated areas.	Appointment of an Independent EAP to assess compliance with the EMP. The SHEQ department should undertake ongoing site monitoring to determine whether activities on site are undertaken in accordance with the EMP Requirements. Erosion protection measures should be implemented and monitored on areas identified. Photographic	SHEQ Department	Groundwater and Surface Water Monitoring in line with WUL requirements, including TPH monitoring. Annual external audits can be undertaken. SHEQ: Monthly walkabouts

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	**Project**	**Impact Area**	**Potential Impacts**	**SbM**	**Mitigation Measures**	**SaM**	**CvA/R/Ir**	**Performance Objectives**	**Goals**	**ST**	**MT**	**LT**	**LOM**	**Compliance with Standard**	**Functional Requirements for Monitoring**	**Responsibilities**	**Monitoring and Reporting Frequency**
					Spill and absorption kits must be available and readily accessible at the truck parking. There should always be a spare kit available at any given time.										records of assessments must be kept. Ensure that spill and absorption kits are present at all times.		
					If necessary, the polluted soils will be remediated and affected areas rehabilitated.												
					An emergency response contingency plan should be put in place to address clean-up measures should a spill and/or a leak occur, as well as preventative measures to prevent ingress												
					Burying of any waste including rubble, domestic waste, empty containers on the site should be strictly prohibited and all construction rubble waste must be removed to an approved disposal site												
		Ecology (Fauna and Flora)	Impact on Floral Habitat and Diversity due to: 1. Clearance of floral species within the proposed footprint areas as well as nationally and provincially protected floral species; 2. Habitat fragmented and reduced dispersal opportunities for plant species as the disturbed / impacted areas will be less attractive to faunal species who are important mechanisms for seed dispersal; 3. Increase risk of erosion and poor stormwater management - resulting in loss of soils, the down-slope sedimentation of habitat and the consequent loss of habitat beyond the	-	Prior to any vegetation clearance activities taking place a walkdown of the footprint must be undertaken and all floral and faunal SCC encountered must be GPS marked and the necessary permits applied for with the relevant national and provincial departments. The site walk down is to be conducted prior to clearance activities and ideally post good rains between November and February when the smaller bulbous plants are growing and visible	-	R	Limit the impact of the mining operation on the Ecological Setting of the area.	Zero animal fatality rates should be achieved.	x			x	Limit the impact of the construction on the Ecological Setting of the area.	Appointment of an Independent Environmental Control Officer to assess compliance with the EMP. The SHEQ department should undertake ongoing site monitoring to determine whether activities on site are undertaken in accordance with the EMP Requirements.	Independent ECO and SHEQ Department.	ECO: Monthly for the construction phase. Thereafter annual external audits can be undertaken. SHEQ: Weekly monitoring

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
			planned footprint; 4. AIP proliferation and woody encroachment into natural vegetation, displacing indigenous flora and altering favourable habitat conditions for the establishment of indigenous species. Probable Residual Impacts could occur due to 1. Fragmentation of ecologically intact habitat resulting in altered ecological functioning of habitat beyond the authorised projects, notably Project 2; 2. Potential further loss of and altered floral species diversity outside of the footprint areas, including loss of favourable habitat for SCC if effects from AIP proliferation and the intensification of woody encroachment are not managed; and 3. Loss of NFA protected tree species as a result of vegetation clearing and/or potential harvesting in the region. Cumulative Impacts - A significant threat for the floral ecology associated with the five projects is the potential proliferation of AIP species and particularly a potential for indigenous bush encroachment, resulting in the overall loss of native floral communities within the local area.														

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
			Sekhukhune Mountain Bushveld - Project 3-5	-11	The construction footprint must be kept as small as possible to minimise impact on the surrounding environment (edge effect management) Removal of vegetation must be restricted to what is absolutely necessary and should remain within the approved footprint; In the establishment of fences, erect fences in such a manner as to limit the potential of animals to enter the project areas. This could involve the placement of rocks and materials at on the surface of the fences.	-6								Restriction of access.	The Project Manager should implement the necessary design concepts to limit the impact on the ecological connectivity and functioning of the ecosystem.	Project Manager	As part of the project design. Prior to construction.
			Secondary Bushveld - Project 3-5	-5	As far as possible clearing of vegetation should take place in a phased manner moving away from fences and/or barriers. This will allow for any faunal species within the proposed footprints to flee and avoid harm; Smaller species such as scorpions and reptiles will not as readily able to move out of an area ahead of ground clearing. As such should any be observed in the construction site during clearing and construction activities, they are to be carefully and safely moved to an area of similar habitat outside of the disturbance footprint. Construction personnel are to be educated about these species and instructed not to kill them. Smaller scorpion species and harmless reptiles (that are likely present within the	-5											

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
					footprint areas) should be carefully relocated by a suitably nominated construction person. For larger venomous snakes, a suitably trained specialist, or on-site personnel, should be contacted to carry out the relocation of the species, should it not move off on its own												
					Vehicles should be restricted to travelling only on designated roadways to limit the ecological footprint of the construction activities. Additional road construction should be limited to what is absolutely necessary, and the footprint thereof kept to a minimal												
					No hunting or trapping of faunal species is to be allowed by construction personnel												
			Transformed Habitat	-5	Informal fires by construction personnel should be prohibited, and no uncontrolled fires whatsoever should be allowed	-5											
			Impact on Faunal Habitat and Diversity due to 1. Clearance of habitat leading to the displacement of faunal species; 2. Habitat fragmented and resulting in reduced movement of species and potentially reduced dispersal opportunities; 3. Increased risk of trapping / snaring and the potential collection for the pet / traditional medicine trade; and 4. AIP	-	Care should be taken during the construction of the five proposed projects to limit edge effects to surrounding natural habitat. This can be achieved by: × Demarcating all footprint areas during construction activities; × No dumping of litter, rubble or cleared vegetation on site should be allowed. Rubble / waste should be disposed of at an appropriate registered dump site away from the	-	CbA										

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
			proliferation and woody encroachment into natural vegetation, displacing indigenous vegetation and altering favourable habitat conditions for faunal species. Probable Residual Impacts on fauna are considered to be: 1. Loss of / altered faunal species diversity in the footprint areas and the areas adjacent to the proposed projects; 2. Edge effects such as habitat fragmentation, AIP proliferation and bush encroachment limiting faunal species habitat utilisation; 3. Potential further loss of SCC/protected faunal species and suitable habitat for such species; and 4. It is unlikely that disturbed areas will be rehabilitated to an ecologically functioning state resulting in significant loss of habitat and species diversity, with reinstatement to premining levels being unlikely.		development footprint. No temporary dump sites should be allowed in areas with natural vegetation. It is advised that waste disposal containers and bins be provided during the construction phase for all construction rubble and general waste; and × Manage the spread of AIP species as per the mines mine's AIP control plan.												
			Sekhukhune Mountain Bushveld - Project 3-5	-11	Appropriate sanitary facilities must be provided during the construction of the development and must be removed to an appropriate waste disposal site	-6											
					If any spills occur, they should be immediately cleaned up to avoid soil contamination that can hinder floral rehabilitation later down the line. Spill kits			Awareness creation on the importance of that natural ecosystem in which the mine	Eradication of invasive species within the mining area footprint.					Invasion of Weeds and Alien Vegetation.	A weed eradication plan must be implemented on site in line with the	SHEQ Department and a Specialised Ecologist.	Weed monitoring (monthly); Weed eradication (annually or as required); Ecological Study

Name of Activity	Project		Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities		Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
					should be kept on-site at all times. In the event of a breakdown, maintenance of vehicles must take place with care, and the recollection of spillage should be practised, preventing the ingress of hydrocarbons into the topsoil			operates. Rehabilitation of disturbed areas with indigenous vegetation. Smallest possible area of disturbance philosophy.	Successful self succession to be achieved. 100% compliance to remain with approved footprint areas. Initiate rehabilitation of disturbed areas within one year of final activity.						current Khumani monitoring programme. This must be undertaken prior to the growing season.		(Biodiversity Action Plan) (annually)
					Upon completion of construction activities, it must be ensured that no bare areas remain, and that indigenous species be used to revegetate the disturbed area												
			Secondary Bushveld - Project 3-5	-5	Edge effects arising from the proposed development, such as erosion and alien plant species proliferation, which may affect adjacent natural areas, need to be strictly managed. Specific mention in this regard is made of Category 1b AIP species (as listed in the NEM:BA Alien species lists, 2020), in line with the NEM:BA Alien and Invasive Species Regulations (2020);	-5											
					The poaching and/or hunting of animals will be strictly forbidden.												
					AIP monitoring and clearing/control should take place throughout the construction phase of the development, and a 30 m buffer surrounding the proposed railway loop should be regularly checked for AIP proliferation and to prevent inward and or/outward spread of AIPs, notably into non infested areas outside of the												

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
					proposed railway loop or into newly rehabilitated areas												
			Transformed Habitat	-5	Alien vegetation that is removed must not be allowed to lay on unprotected ground as seeds might disperse upon it. All cleared plant material to be disposed of at a licensed waste facility which complies with legal standards.	-5											
			Impact on Floral SCC - The proposed five projects are is associated with floral SCC, which will likely be directly impacted by the proposed activities. The SCC recorded on site (Sclerocarya birrea subsp. caffra) is protected under the NFA. Additionally, there is a an increased chance that several other NFA and LEMA listed floral SCC may occur within the footprint areas. The proposed 5 projects are not anticipated to have a high impact on floral SCC and with mitigation measures implemented the impacts can remain localised in extent. Succulents and geophytes are good candidates for rescue and relocation to suitable sites outside of the proposed footprints, either to surrounding natural habitat or to the Dwarsrivier nursery. Woody species are less likely to be successfully relocated, especially larger	-4	Should any floral SCC be relocated, the relocation success of such species should be monitored during the construction phase to ensure immediate actions can be taken if it becomes evident that relocation is not successful.	-4	CbA										

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
			individuals. Where woody SCC species are to be cleared and not relocated, it must be ensured that the same species are currently being propagated in the nursery. If this is not the case, seeds can be harvested from the surrounding areas and / or from the individuals that will be cleared as part of vegetation clearing activities to be propagated off-site and reinstated as part of rehabilitation activities. Activities which are likely to negatively affect the flora of conservation concern within and around the proposed five projects include, but are not limited to, the following: 1. Disturbance, fragmentation and alteration of floral SCC habitat; 2. Destruction, removal or harvesting of floral SCC during construction and operational activities; and 3. Potentially poorly implemented and monitored rescue and relocation of SCC or not ensuring that the same species are being propagated in the Dwarsrivier nursery. Impact on CBAs, ESAs, Threatened Vegetation and Protected Areas - According to the desktop database, the proposed														

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
			five projects will impact on a CBA 1 and the Sekhukhune Mountainlands threatened ecosystem, however, following the site assessment this is more accurately only applicable to the RWD of Project 1 and the footprint areas of Project 2. The remaining areas associated with the TSF (Project 1) and Projects 3-5 have all been impacted on and are associated with the active mining footprint. According to the desktop database, a small portion of Project 4 will impact on an ESA however, this section of the ESA has been degraded in terms of habitat integrity and is located within the active mining area.														
			Impacts on Faunal SCC - The five proposed projects are associated with habitats that are known to host faunal SCC, notably the Sekhukhune Mountain Bushveld habitat. The remaining habitats may serve as intermediary or transitionary habitats for such species, but not permanent habitat. One SCC was recorded on site, namely Pycna sylvia (Cicada) whilst Python natalensis (African Python, VU) has also been recorded in the adjacent areas. Panthera pardus (Leopard, Vulnerable, TOPS Listed), Parahyaena	-4	Edge effect control needs to be implemented to prevent further degradation and potential loss of floral and faunal SCC outside of the five proposed project footprint areas	-4	CbA										

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
			brunnea (Brown hyaena, NT, TOPS Listed), Sagittarius serpentarius (Secretary bird, VU), Polemaetus bellicosus (Martial Eagle, VU) and Neotis denhami (Denham's Bustard, NT) are also considered to have a medium probability of occurring, however such occurrences are likely to be transitionary and not permanent, as the footprint areas are not sufficient in extent to permanently host these species nor are there sufficient food resources within the five proposed project footprint areas alone to support these species. Mammalian, avifaunal and some reptilian SCC are likely to maintain large home ranges that will far exceed the extent of the five proposed project footprint areas. Due to the small project footprint extents and ability of many of the SCC to relocate ahead of construction activities, impacts stemming from the proposed projects are not expected to pose a significant risk to these species.															
			Habitat degradation due to dust: Increased dust will occur in all areas where vegetation is cleared. Dust will be caused by excavation, and construction. Dust in the	-8	Maintain the current air quality monitoring stations that determine fallout and implemented respirable dust (PM10) monitoring that could arise from the mining activities.	-5	CbA	Recording of dust fall out to determine trends.	Meeting ambient dust fall out limits in terms of applicable NEM:AQA Regulations.	x			x	National Dust Regulation Compliance.	Dust dispersion will be monitored in line with the current dust monitoring programme	SHEQ Department.	Monthly Monitoring with Annual Reporting.

Name of Activity	Project		Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities		Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
			area will be greatly increased due to the dry weather conditions and the nature of the soil in the area. Dust settling on plant material can reduce the amount of light reaching the chlorophyll in the leaves, thereby reducing photosynthesis, which in turn reduces plant productivity, growth and recruitment.		Dust suppression should be undertaken where and when dust is present.												
			Direct Impact: Increased erosion can eventually lead to the loss of vegetation and habitats for further species. Soils in the area are prone to erosion in areas where vegetation is cleared, this is further compounded by the fact that precipitation in the area occurs through heavy rainfall events in in the form of thundershowers in summer. Furthermore large areas will be cleared before construction leaving these areas prone to erosion.	-16	Ensure the required erosion protection measures are monitored and corrected where necessary. Storm water management plan should be implemented prior to construction to ensure that runoff does not lead to the formation of erosion gulleys. Where vegetation cannot be established during the life of construction and operations, appropriate measure will be taken to control erosion. These will include grading of surfaces to prevent rapid run-off of storm water and / or the use of energy dissipaters. An erosion monitoring and mitigation plan should be put in place.	-6	CbA	Limit the impact of the mining operation on the Ecological Setting of the area. Limited to no presence of erosion gulleys. Retaining soil integrity for rehabilitation.	Maintaining soil integrity, with successful vegetation establishment.	x			x	Soil Erosion	Appointment of an Independent Environmental Control Officer to assess compliance with the EMP. The SHEQ department should undertake ongoing site monitoring to determine whether activities on site are undertaken in accordance with the EMP Requirements.	ECO and SHEQ Department	ECO: Monthly for the construction phase. Thereafter annual external audits can be undertaken. SHEQ: Weekly monitoring. Rectification of erosion gulley should be undertaken immediately upon observation.
			Accidental death of animals on the roads.	-12	Clearly marked signs will be erected along the transportation routes to create awareness of animal crossings. A clearly marked and enforced vehicle speed will be implemented on the internal mine and transportation routes.	-1	CbA	Awareness creation on the importance of that natural ecosystem in which the mine operates. Implementation of safe	Zero animal fatality.	x			x	Creation of Awareness.	Induction with the view on creating environmental awareness.	SHEQ Department	Annually for permanent staff. Start of each visit for contractors.

Name of Activity	Project		Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities		Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
					A detailed induction programme will be in place to ensure that all parties are aware of the rules and regulations on site in terms of the use of roads.			operation practices.									
					Vehicles may only travel on demarcated roads on site.												
		3, 4, 5	Operation of the parking areas and access roads: •Potential contamination of stormwater runoff from hard surfaces by hydrocarbons from vehicles, leading to potential contamination of surface water, groundwater and soil; •Increased volume of stormwater runoff entering the episodic drainage line as a result of increased catchment hardening.	-6	As this is an expansion of an existing parking facility, additional risk posed is considered insignificant. General 'best practice' mitigation measures are recommended.	-5	CbA										
					Development of an Emergency Response Plan prior to construction to provide a protocol in the event of a spill												
					Retention of as much natural vegetation as possible around the sites to provide stormwater and sediment trapping capacity												
					As the soil in the area is susceptible to erosion, it is strongly recommended that regular monitoring for erosion takes place. Should any preferential flow paths or erosion gullies form, these must be immediately managed in accordance with the mine's existing soil management protocols.												
		Hydrology	Contamination of surface water resources.	-8	Machinery, trucks and vehicles must be well maintained and serviced regularly as per the recommended service guide.	-5	CbA	Remain within or approve upon the current Aquatic Health and Water Quality baseline conditions.	Improve upon the current aquatic health and water quality baseline conditions.	x			x	Compliance in terms of the current Water Use License. Remain within demarcated areas.	Ongoing Biodiversity and water quality assessments. Demarcation on site of all activities to be undertaken.	Aquatic Specialist. Water Quality Specialist	Surface Water and Biomonitoring in line with the current monitoring programme. Weekly walkabouts by Supervisors to ensure that all
					Refuelling must be undertaken over hard park bunded areas that adequately capture and contain spillages.												

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
					Machinery and vehicles should be parked on appropriately lined areas.												activities are under taken in line with EMPr and that clean up procedures are implemented where required.
					Drip trays must be used under leaking machinery.												
					Spillages should be reported immediately and spill kits should be readily available at all times.												
					Ongoing water, biomonitoring and groundwater monitoring should be undertaken.												
					Implement and maintain the approved Storm Water Management Plan as defined in the EMPr, or as subsequently been approved.												
		Geohydrology	No further impacts are foreseen.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Air Quality	The use of unsurfaced roads may lead to an increase of dust emissions in the area.	-9	Install air quality monitoring stations that determine fallout and respirable dust (PM10) concentrations that could arise from the mining activities.	-2	CbA	Reducing dust emissions on site.	Zero complaints from surrounding landowners regarding dust.	x			x	National Dust Regulations compliance.	Dust dispersion will be monitored as part of the overall mine dust monitoring programme.	SHEQ Department.	Monthly Monitoring with Annual Reporting.
					Dust suppression should be undertaken if required [(i.e. on recommendation by the Environmental Control Officer and/or if indicated in the monitoring reports, that the current dust fall out results are increasing towards unacceptable levels (non-compliances)].												
					Roads around office areas will be paved as far as practically possible.												
					During operational phase of the mine, haulage roads will be treated with dust suppression techniques such as wet to reduce dust creation.				Recording of dust fall out to determine trends. Meeting ambient dust	x			x	Complaints Register.	A complaints register should be in place on site.	SHEQ Department.	Ongoing

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	**Project**	**Impact Area**	**Potential Impacts**	**SbM**	**Mitigation Measures**	**SaM**	**CvA/R/Ir**	**Performance Objectives**	**Goals**	**ST**	**MT**	**LT**	**LOM**	**Compliance with Standard**	**Functional Requirements for Monitoring**	**Responsibilities**	**Monitoring and Reporting Frequency**
									fall out limits in terms of applicable NEM:AQA Regulations.								
		Heritage	No further impacts are foreseen.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Noise	Noise of vehicles traversing the access roads will create a constant source of noise. It is however not foreseen that the roads proposed would contribute to any additional noise levels in the area.	-7	Machinery and vehicles will be well maintained to prevent excessive nose and to comply with national and provincial regulations. All vehicles will have muffles to minimise noise emissions, where necessary. Where noise becomes a nuisance nose management measures will be investigated and implemented to address these concerns. Noise monitoring will be undertaken (ambient conditions) to ensure that noise levels comply with Health and Safety Standards.	-4	CbA	Protect the ambiance of the area, as well as maintain good relationships with surrounding land users.	Implement a noise monitoring network.	x			x	Elevated Noise Levels.	Ambient noise monitoring should be undertaken	SHEQ Department	Monthly (during the day and during the night)
		Visual	The presence and use of heavy machinery, trucks and vehicles during the operational phase.	-9	Machinery, trucks and vehicles are already present in the area and are unlikely create any additional significant presence.	-5	CbA	Retain the aesthetics of the area as far as practically possible.	Design and construction infrastructure to blend in with the general topography as far as practically possible. No encroachment outside of demarcated areas.				x	Protect the long term aesthetics of the area.	Successful dustfall out results	SHEQ Department	Monthly
					Trees should be planted along the main roads to conceal activities from motorists.										Development of infrastructure with closure in mine.	Engineer	Ongoing during construction.
					Dust suppression measures should be implemented to limit the generation of dust.										The Project Manager should implement the necessary design concepts to limit the impact on the soil resources	Project Manager	Ongoing during construction.

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	**Project**	**Impact Area**	**Potential Impacts**	**SbM**	**Mitigation Measures**	**SaM**	**CvA/R/Ir**	**Performance Objectives**	**Goals**	**ST**	**MT**	**LT**	**LOM**	**Compliance with Standard**	**Functional Requirements for Monitoring**	**Responsibilities**	**Monitoring and Reporting Frequency**
															and ecological connectivity and functioning of the ecosystem.		
		Social	There is approximately 1200 permanent and 800 contractor employees in service at Dwarsrivier Mine. This employment profile will be sustained as the proposed project would allow the operation to meet the existing production capacity. Approximately 24 employees will be directly involved with the operations related to the TSF. No new employment positions will be created as these employees are already employed at Dwarsrivier Mine. However, the existing socio-economic benefits created through Dwarsrivier Mine being a key employer in the area would continue. The social services support as part of the SLP requirements will also continue to be implemented. As no additional workers are anticipated, the inflow of jobseekers is also anticipated to be of limited significance.	10	The procurement of locals should receive preference if there is any need for additional employees. The ideal objective should be to reach 100% recruitment of additional/ new unskilled labour from local communities where skills are locally available.	11	CbA	Positive contribution to the Socio-Economic Setting of the Local Municipality. Maintenance of logistical characteristics and requirements of the local area.	Continuation of traffic logistics on the regional roads. Maintenance of relationships with surrounding landowners, mines and road users. Meeting the approved objectives and goals of the SLP. Maintain relationship with land claimants.		x			Monitoring of the Social and Labour Plan.	The HR department should remain in ongoing consultation with the Local Municipality. Regular stakeholder focus meetings should be scheduled to discuss any perceived impacts or concerns.	HR and SHEQ	Annual review and update of the SLP. Monthly dust monitoring. At least annual stakeholder focus meetings. Weekly inspections of the railway line construction activities and implementation of the temporary diversion activities.
			Existing employees would continue to be responsible for the overall mining activities. Limited additional temporary workers could over time	10	Targets for the procurement of capital goods, consumer goods and services should be set and Dwarsrivier Mine should develop an action plan to meet these targets.	11	CbA										

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
			be required for specific tasks associated with the proposed Khulu TSF and capital projects. When that occurs, new mining activities can then be allocated to appointed specialist contractors. Even if limited procurement is foreseen, this variable is still regarded as positive, due to the indirect impacts of Dwarsrivier Mine's mining activity on the local economy through the creation of possible business opportunities (e.g. local service industry) and local procurement of material, services and equipment.		Contract executions by SMMEs should be strictly monitored to determine whether SMMEs require assistance with regards to general business principles, financial management, management of stock, competitive costing (pricing), and marketing of their businesses. Enterprise development is a key enhancement measure in this regard. The proponent should assist small businesses and/or SMME's to develop to a certain level. Such measures recommended could include the following: The establishment of joint ventures between small businesses and established companies with relevant experiences with regards to tender processes can be considered; Flexible payment systems can be considered to assist smaller businesses in terms of expenditure, but such a system must be strictly controlled, An audit of existing local enterprises that could provide services, goods and material should be undertaken with the assistance of local leaders and community representatives, as well as local business structures The procurement process should be based on competitive business principles and the quality of services to be rendered, to ensure adherence to												

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
					standards and to maximise overall welfare.												
			Socio-Economic Development - The socio-economic impact of the proposed projects would be based on the mine's continued contribution to the Gross Geographical Product (GGP) and the number of direct (continued employment at the mine) and indirect jobs that would be created. Therefore, except for ongoing direct employment, that would generate income and increase local spending, people living in the vicinity of the study area is also expected to benefit by the earnings of those employed by the mine and the local buying power in the area. Through employment and income generation during the mining processes, some economic benefits to the region and local communities therefore accrue. The mine would continue to contribute to the local economy through its employee wages, procurement of local contractors and services, purchasing of water and electricity and through payment of taxes to the Fetakgomo Tubatse Local Municipality. Dwarsrivier Mine, through their mining activities, is involved in various Local	11	Dwarsrivier Mine, through their SLP, must continue to provide skills development opportunities for employees that include functional literacy and numeracy programmes, career progression plans, up-skilling for hard to fill vacancies and management positions, bursary and internships and portable skills training. Develop a database of SMME's for the procurement of goods and services that could potentially be outsourced to the local community. Dwarsrivier Mine to continue to adhere to the Social and Labour Plans as per the Regulation 46 of the Mineral and Petroleum Resources Development Act (Act 28 of 2002) and the Mining Charter (2018).	12	CbA										

Name of Activity	Project		Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities		Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
			Economic Development Initiatives linked to the Integrated Development Plan (IDP) of the Fetakgomo Tubatse Local Municipality, as well as other government initiatives. These activities would thus continue, and the constant positive socio-economic impacts thereof would remain to benefit of the local communities.														
			Capacity Building - Although education and training are mainly the responsibility of government, there is increased pressure on the business sector in South Africa to increase the development and skills of their workforce. Dwarsrivier Mine is involved in capacity building and training. Further to these focus areas, the company also concentrate on local employment creation and poverty alleviation, as well as environmental management, rural development and the provision of infrastructure. The above-mentioned inputs would continue if Dwarsrivier Mine is successful in sustaining their mining operations in the area. Dwarsrivier Mine has thus played an important role in the area in this regard and commits to continue with these efforts which would	11	Dwarsrivier Mine should continue with a Human Resources Development (HRD) strategy as part of the Social and Labour Plan (SLP). The focus should remain of career development programmes, bursaries, learnership programmes, skills development and training. Learnership programmes should preferably focus on individuals from the core and affected areas in close proximity to Dwarsrivier Mine to maximise the long-term employment opportunities of these local community members. Local goods and services should be used as far as possible and therefore contractual requirements for contractors to use local goods and services should be implemented as far as possible Local Economic Development initiatives should continue	12	CbA										

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
			benefit the local communities within the Fetakgomo Tubatse Local Municipality area.														
			Safety and Security Related Impacts - Construction of the access crossing between the plant and North Mine, as well as the widening of the access road between the South Shaft/Main Offices and Plant would reduce these risks and create a positive impact in this regard. The negative impact prior to mitigation can thus be changed to a medium positive impact.	-8	A Fire/Emergency Management Plan should be developed and implemented, if not yet in place. It would be important to regularly review the functionality and efficiency of such a plan in conjunction with the local emergency teams, mine management and affected communities as well as neighbouring landowners. Appropriate firefighting equipment should be on site and workers should be appropriately trained for firefighting Warning signs would have to be posted to alert residents and road users to possible dangers associated with mining related traffic and activities. Access to the mine via the new parking extension should consider all safety and security measures and have as little impact on the traffic on the R577 as possible	-8	CbA										
			Health Related Risks - During the operational phase dust impacts are anticipated due to general mining activities and vehicles travelling on the access and haul roads. The dust concentrations as a result of this movement are not anticipated to reach residential areas and the impact would possibly	-10	The Mine Health and Safety Act (Act No 29 of 1996), standards stipulated in SANS 10286, NEMA and related regulations and standards must be adhered to. Vehicles and equipment must be in good working order and must be regularly serviced. Infrastructure e.g. pipelines must be regularly inspected	-8	CbA										

Name of Activity	Project		Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities		Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
			be localised on site. Fugitive dust from stockpile areas and waste rock dumps are also of concern. Windblown dust from these facilities will vary according to the season, with possible higher levels and frequency during the windy months. The probability and intensity of these possible impacts would further depend on the wind directions and the proximity of sensitive receptors. The nearest residential area is approximately 10 km to the north and east of the mining area. Should there be a possible increase in the air pollution (dust), these sensitivities should be adequately dealt with and be taken into account in the monitoring processes stipulated as part of the EMPr. In the event that sensitive receptors are affected (worst case scenario), based on dust fallout rates, the necessary mitigation measures as stipulated through the Air Quality specialist study must be implemented. The rating below is based on the general air quality impacts usually experienced with mining projects and the proximity of sensitive receptors in the study area.		and maintained to avoid spillages. Mining activities should adhere to all the relevant environmental and health guidelines and should be undertaken in accordance with the EMP Dust suppression methods along haul roads should be continued to be implemented Dwarsrivier Mine must continue to distribute information with regards to health matters and nutrition to its workers and surrounding communities The SLP should make provision for addressing any possible direct health related risks and providing a supporting role to minimise the vulnerabilities of the communities, without having to take over the role of the local health services and municipality. On site, all the appropriate health, hygiene and distancing measures aimed at protecting the employees' safety and health, must be implemented. Dwarsrivier Mine can investigate ways to support to the local clinics through their community support programmes and SLP initiatives. Educational videos on COVID-19, and general health and hygiene measures associated with the pandemic should be provided to employees												

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
			Emissions would include vehicle emissions (carbon monoxide and nitrogen oxide) and emissions from large construction equipment. Industrial, solid and hazardous waste would be created during the mining operations. As is currently the case, these different types of waste should continue to be responsibly disposed of to avoid any health-related impacts in this regard. Storing of diesel and emulsion can create health related risks. As mitigation, the emulsion will be stored in underground tankers. The majority of the pipelines will further be underground to limit risks in this regard and possible spills. In mining areas there are further concerns relating to migrant employees bringing health risks, and nowadays the threat of Covid-19 infection, to mining areas or small towns. The Fetakgomo Tubatse Local Municipality area is already characterised by vulnerable households and inadequate public health services that cannot always effectively deal with the health risks associated with the pandemic. It will remain the responsibility of Dwarsrivier Mine to continue their support to														

Name of Activity	Project		Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	**Project**	**Impact Area**	**Potential Impacts**	**SbM**	**Mitigation Measures**	**SaM**	**CvA/R/Ir**	**Performance Objectives**	**Goals**	**ST**	**MT**	**LT**	**LOM**	**Compliance with Standard**	**Functional Requirements for Monitoring**	**Responsibilities**	**Monitoring and Reporting Frequency**
			their employees and surrounding communities to reduce vulnerability and to implement the required Covid-19 Protocol.														
		Geology	No direct impact.	-	-	-	-		-	-	-	-	-	-	-	-	-
		Topography	No direct impact.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Diesel Storage and Underground Supply	3	Soils and Land Capability	Soil compaction outside of demarcated areas.	-11	The mine will ensure that all activities, material and equipment storage and personnel movement take place within the designated area. A site plan must be developed, indicating the following: Location of all approved activities; 1:100 year buffer around all watercourses; Location of the CBA and Endangered Ecosystems and mark these areas where construction is not approved as a no-go zone's All vegetation management zones as per the Biodiversity Action Plan. Laydown areas should be located within disturbed soils (anthrosols) to avoid compaction of natural soils. All contractors must receive induction. The induction should be updated on site, to make provision for the site plan and a detailed explanation on the purpose of the no-go zones, presence of protected species, presence of the CBA and ESAs and the meeting thereof. The management of topsoil stockpiles should be undertaken in terms of the Topsoil Management Plan	-5	R	Limit the loss of soils as far as possible and ensure that the integrity remains during stockpiling for the purposes of successful rehabilitation.	he integrity of the soils stockpiled must remain suitable for the purposes of rehabilitation. No disturbed areas should remain beyond the demarcated areas. 100% compliance to remain with approved footprint areas. Maximum volumes of topsoil should be removed.		x		x	Remain within demarcated areas.	Annual audits by external EAP. Regular inspections by SHEQ Department.	SHEQ Department	Annual external audits can be undertaken. SHEQ: Monthly walkabouts

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
					included into this EMPr to ensure that the topsoil stockpiles maintain its integrity and are not subjected to compaction.												
					Restrict the amount of mechanical handling, as each handling event increases that compaction level and the changes to the soil structure. Wherever possible, the ‘cut and cover’ technique (where the stripped soils is immediately placed in an area already prepared for rehabilitation, thus avoiding stockpiling) should be used.												
					A fine system/disciplinary system must be implemented on site for all significant or recurring environmental non-compliances.												
					Compacted soils adjacent to the mining blocks and associated infrastructure footprint can be lightly ripped to at least 25cm below ground surface to alleviate compaction prior to re-vegetation.												
					Site clearance and activities should be restricted to the approved footprint. Contractors areas should be established on already disturbed footprints.												
					All vehicular traffic should be restricted to the existing service roads and the selected road servitude as far as practically possible												
			Clearing vegetation beyond the demarcated areas will result in the	-10	The approved Storm Water Management Plan must be implemented.	-5	R	Limit the loss of soils as far as possible and	The integrity of the soils stockpiled must		x		x	Soil Erosion and incorrect stockpiling of	Appointment of an Independent	Independent EAP and SHEQ Department.	Annual external audits can be undertaken.

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	**Project**	**Impact Area**	**Potential Impacts**	**SbM**	**Mitigation Measures**	**SaM**	**CvA/R/Ir**	**Performance Objectives**	**Goals**	**ST**	**MT**	**LT**	**LOM**	**Compliance with Standard**	**Functional Requirements for Monitoring**	**Responsibilities**	**Monitoring and Reporting Frequency**
			exposure of soil, which may in turn lead to soil erosion, in addition to this, stockpiling of topsoil material on sloping areas leading to increased runoff and erosion. The areas where the infrastructure is proposed are mostly gradual, however the exploration activities will be located among the mountainous setting and this is where erosion is considered moderately high. The natural and undisturbed soils will become more vulnerable to erosion once the vegetation is cleared for construction activities, and the soils will inevitably be exposed to wind and some surface runoff during intensive rainfall events. The ratings given in the columns on the left is for Project 1 , Project 2 and Project 3-5.		Clean and dirty water systems must be maintained. Ensure the required erosion protection measures are monitored and corrected where necessary. Bare soils can be regularly dampened with water to suppress dust during the construction phase, especially when strong wind conditions are predicted according to the local weather forecast All disturbed areas adjacent to the footprint areas can be re-vegetated with an indigenous grass mix, if necessary, to re-establish a protective cover, to minimise soil erosion and dust emission. Natural vegetation establishment (self-succession) will be encouraged on cleared areas, and topsoil stockpiles. If natural succession of vegetation is not established within one rainy season, after rehabilitation, the disturbed areas and areas adjacent to the infrastructural areas must be re-vegetated with an indigenous grass mix, if necessary, to re-establish a protective cover, to minimise soil erosion and dust emission. The mine will investigate an appropriate seed mix for the rehabilitation purposes should self-succession not establish on rehabilitated sites.			ensure that the integrity remains during stockpiling for the purposes of successful rehabilitation. Protect the soil resources within the area in which the mine operates. Retaining soil integrity for rehabilitation. Protect the soil resources within the area in which the mine operates. Protect surface and groundwater resources against siltation and contamination.	remain suitable for the purposes of rehabilitation.					topsoil. Encroachment of activities outside of demarcated areas.	EAP to assess compliance with the EMP. The SHEQ department should undertake ongoing site monitoring to determine whether activities on site are undertaken in accordance with the EMP Requirements. Erosion protection measures should be implemented and monitored on areas identified. Photographic records of assessments must be kept.		SHEQ: Monthly walkabouts Biomonitoring in line with WUL requirements.

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
					If possible, vegetation clearance and commencement of construction activities can be scheduled to coincide with low rainfall conditions when the erosive stormwater and wind are anticipated to be low.												
					The approved areas should be clearly demarcated to restrict vegetation clearing activities within the infrastructure footprint as far as practically possible.												
					No project related activities may be undertaken outside of the demarcated areas.												
					No open fires must be allowed.												
			Potential of Soil Contamination - All the identified soils are considered equally predisposed to potential contamination (i.e. hydrocarbons), as contamination sources are generally unpredictable and often occur as incidental spills or leak for construction developments. The significance of soil contamination is medium-high for all identified soils, largely depending on the nature, volume and/or concentration of the contaminant of concern. The ratings given in the columns on the left is for	-10	Contamination prevention measures should be addressed in the Environmental Management Programme (EMP) for the proposed development, and this should be implemented and made available, and accessible always to the contractors and construction crew conducting the works on site for reference	-5	R	Protect the soil resources within the area in which the mine operates. Protect surface and groundwater resources against siltation and contamination.	The integrity of the soils stockpiled must remain suitable for the purposes of rehabilitation. No disturbed areas should remain beyond the demarcated areas. 100% compliance to remain with approved footprint areas.		x		x	Encroachment of activities outside of demarcated areas.	Appointment of an Independent EAP to assess compliance with the EMP. The SHEQ department should undertake ongoing site monitoring to determine whether activities on site are undertaken in accordance with the EMP Requirements. Erosion protection measures should be	SHEQ Department	Groundwater and Surface Water Monitoring in line with WUL requirements, including TPH monitoring. Annual external audits can be undertaken. SHEQ: Monthly walkabouts Supervisors: Weekly walkabouts
					Storage of fuels and oils, the refuelling of vehicles and equipment maintenance must be limited to designated, bunded (bunds to be 110% of volume of the materials stored) areas.												
					All fuels and soils must be stored in appropriate containers and bunded areas.												

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
			Project 1 , Project 2 and Project 3-5.		A spill prevention and emergency spill response plan, as well as dust suppression, and fire prevention plans should also be compiled to guide the construction works										implemented and monitored on areas identified. Photographic records of assessments must be kept. Ensure that spill and absorption kits are present at all times.		
					Chemicals and hazardous material must be stored in suitable containers, fit for purpose and in line with SDS requirements.												
					Oils and potentially hazardous materials must be disposed of at a licensed facility and waste certificates obtained.												
					Vehicles and Machinery will be regularly maintained. Maintenance programmes will be established and implemented.												
					Safety signage must be used at designated storage areas.												
					All refuelling of vehicles and equipment maintenance must be done within designated bunded areas.												
					Spill and absorption kits must be available and readily accessible at the truck parking. There should always be a spare kit available at any given time.												
					If necessary, the polluted soils will be remediated and affected areas rehabilitated.												
					An emergency response contingency plan should be put in place to address clean-up measures should a spill and/or a leak occur, as well as preventative measures to prevent ingress												
					If a spill occurs, the contaminated soil must be removed immediately.												

Name of Activity	Project		Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities		Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
					Contaminated soil must be stored according to best practices until it can be disposed of at a suitably licensed facility.												
					Any significant spills must be captured in the incident reports and must be reported to the relevant department (LDEDET, Catchment Management Agency/DWS).												
					At least weekly inspections should be undertaken around the diesel bunded areas and supply pipelines.												
					Burying of any waste including rubble, domestic waste, empty containers on the site should be strictly prohibited and all construction rubble waste must be removed to an approved disposal site												
		Ecology (Fauna and Flora)	Impact on Floral Habitat and Diversity due to: 1. Clearance of floral species within the proposed footprint areas as well as nationally and provincially protected floral species; 2. Habitat fragmented and reduced dispersal opportunities for plant species as the disturbed / impacted areas will be less attractive to faunal species who are important mechanisms for seed dispersal; 3. Increase risk of erosion and poor stormwater management - resulting in loss of soils, the down-slope sedimentation of habitat and the consequent loss of habitat beyond the	-	Prior to any vegetation clearance activities taking place a walkdown of the footprint must be undertaken and all floral and faunal SCC encountered must be GPS marked and the necessary permits applied for with the relevant national and provincial departments. The site walk down is to be conducted prior to clearance activities and ideally post good rains between November and February when the smaller bulbous plants are growing and visible	-	R	Limit the impact of the mining operation on the Ecological Setting of the area.	Zero animal fatality rates should be achieved.	x			x	Limit the impact of the construction on the Ecological Setting of the area.	Appointment of an Independent Environmental Control Officer to assess compliance with the EMP. The SHEQ department should undertake ongoing site monitoring to determine whether activities on site are undertaken in accordance with the EMP Requirements.	Independent ECO and SHEQ Department.	ECO: Monthly for the construction phase. Thereafter annual external audits can be undertaken. SHEQ: Weekly monitoring

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
			planned footprint; 4. AIP proliferation and woody encroachment into natural vegetation, displacing indigenous flora and altering favourable habitat conditions for the establishment of indigenous species. Probable Residual Impacts could occur due to 1. Fragmentation of ecologically intact habitat resulting in altered ecological functioning of habitat beyond the authorised projects, notably Project 2; 2. Potential further loss of and altered floral species diversity outside of the footprint areas, including loss of favourable habitat for SCC if effects from AIP proliferation and the intensification of woody encroachment are not managed; and 3. Loss of NFA protected tree species as a result of vegetation clearing and/or potential harvesting in the region. Cumulative Impacts - A significant threat for the floral ecology associated with the five projects is the potential proliferation of AIP species and particularly a potential for indigenous bush encroachment, resulting in the overall loss of native floral communities within the local area.														

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
			Sekhukhune Mountain Bushveld - Project 2	-12	The construction footprint must be kept as small as possible to minimise impact on the surrounding environment (edge effect management) Removal of vegetation must be restricted to what is absolutely necessary and should remain within the approved footprint; In the establishment of fences, erect fences in such a manner as to limit the potential of animals to enter the project areas. This could involve the placement of rocks and materials at on the surface of the fences. As far as possible clearing of vegetation should take place in a phased manner moving away from fences and/or barriers. This will allow for any faunal species within the proposed footprints to flee and avoid harm; Smaller species such as scorpions and reptiles will not as readily able to move out of an area ahead of ground clearing. As such should any be observed in the construction site during clearing and construction activities, they are to be carefully and safely moved to an area of similar habitat outside of the disturbance footprint. Construction personnel are to be educated about these species and instructed not to kill them. Smaller scorpion species and harmless reptiles (that are likely present within the	-6								Restriction of access.	The Project Manager should implement the necessary design concepts to limit the impact on the ecological connectivity and functioning of the ecosystem.	Project Manager	As part of the project design. Prior to construction.

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
					footprint areas) should be carefully relocated by a suitably nominated construction person. For larger venomous snakes, a suitably trained specialist, or on-site personnel, should be contacted to carry out the relocation of the species, should it not move off on its own												
			Secondary Bushveld - Project 2	-11	Vehicles should be restricted to travelling only on designated roadways to limit the ecological footprint of the construction activities. Additional road construction should be limited to what is absolutely necessary, and the footprint thereof kept to a minimal	-6											
					No hunting or trapping of faunal species is to be allowed by construction personnel												
			Transformed Habitat	-5	Informal fires by construction personnel should be prohibited, and no uncontrolled fires whatsoever should be allowed	-5											
			Impact on Faunal Habitat and Diversity due to 1. Clearance of habitat leading to the displacement of faunal species; 2. Habitat fragmented and resulting in reduced movement of species and potentially reduced dispersal opportunities; 3. Increased risk of trapping / snaring and the potential collection for the pet / traditional medicine trade; and 4. AIP	-	Care should be taken during the construction of the five proposed projects to limit edge effects to surrounding natural habitat. This can be achieved by: × Demarcating all footprint areas during construction activities; × No dumping of litter, rubble or cleared vegetation on site should be allowed. Rubble / waste should be disposed of at an appropriate registered dump site away from the	-	CbA										

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
			proliferation and woody encroachment into natural vegetation, displacing indigenous vegetation and altering favourable habitat conditions for faunal species. Probable Residual Impacts on fauna are considered to be: 1. Loss of / altered faunal species diversity in the footprint areas and the areas adjacent to the proposed projects; 2. Edge effects such as habitat fragmentation, AIP proliferation and bush encroachment limiting faunal species habitat utilisation; 3. Potential further loss of SCC/protected faunal species and suitable habitat for such species; and 4. It is unlikely that disturbed areas will be rehabilitated to an ecologically functioning state resulting in significant loss of habitat and species diversity, with reinstatement to premining levels being unlikely.		development footprint. No temporary dump sites should be allowed in areas with natural vegetation. It is advised that waste disposal containers and bins be provided during the construction phase for all construction rubble and general waste; and × Manage the spread of AIP species as per the mines mine's AIP control plan.												
					A fire management plan must be maintained for the mine.												
					Fire belts must be constructed around the boundaries of the mine.												
					Daily fire danger ratings must be viewed and addressed where required.												
					The mine must have equipment, protecting clothing and trained personnel for extinguishing fires.												
					No open fires must be allowed.												
			Sekhukhune Mountain Bushveld - Project 2	-12	Appropriate sanitary facilities must be provided during the construction of the development and must be removed to an appropriate waste disposal site	-6											
					If any spills occur, they should be immediately cleaned up to avoid soil contamination that can hinder floral rehabilitation later down the line. Spill kits			Awareness creation on the importance of that natural ecosystem in which the mine	Eradication of invasive species within the mining area footprint.					Invasion of Weeds and Alien Vegetation.	A weed eradication plan must be implemented on site in line with the	SHEQ Department and a Specialised Ecologist.	Weed monitoring (monthly); Weed eradication (annually or as required); Ecological Study

Name of Activity	Project		Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
					should be kept on-site at all times. In the event of a breakdown, maintenance of vehicles must take place with care, and the recollection of spillage should be practised, preventing the ingress of hydrocarbons into the topsoil			operates. Rehabilitation of disturbed areas with indigenous vegetation. Smallest possible area of disturbance philosophy.	Successful self succession to be achieved. 100% compliance to remain with approved footprint areas. Initiate rehabilitation of disturbed areas within one year of final activity.						current Khumani monitoring programme. This must be undertaken prior to the growing season.		(Biodiversity Action Plan) (annually)
					Upon completion of construction activities, it must be ensured that no bare areas remain, and that indigenous species be used to revegetate the disturbed area												
			Secondary Bushveld - Project 2	-11	Edge effects arising from the proposed development, such as erosion and alien plant species proliferation, which may affect adjacent natural areas, need to be strictly managed. Specific mention in this regard is made of Category 1b AIP species (as listed in the NEM:BA Alien species lists, 2020), in line with the NEM:BA Alien and Invasive Species Regulations (2020);	-6											
					The poaching and/or hunting of animals will be strictly forbidden.												
					AIP monitoring and clearing/control should take place throughout the construction phase of the development, and a 30 m buffer surrounding the proposed railway loop should be regularly checked for AIP proliferation and to prevent inward and or/outward spread of AIPs, notably into non infested areas outside of the												

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
					proposed railway loop or into newly rehabilitated areas												
			Transformed Habitat	-5	Alien vegetation that is removed must not be allowed to lay on unprotected ground as seeds might disperse upon it. All cleared plant material to be disposed of at a licensed waste facility which complies with legal standards.	-5											
			Impact on Floral SCC - The proposed five projects are is associated with floral SCC, which will likely be directly impacted by the proposed activities. The SCC recorded on site (Sclerocarya birrea subsp. caffra) is protected under the NFA. Additionally, there is a an increased chance that several other NFA and LEMA listed floral SCC may occur within the footprint areas. The proposed 5 projects are not anticipated to have a high impact on floral SCC and with mitigation measures implemented the impacts can remain localised in extent. Succulents and geophytes are good candidates for rescue and relocation to suitable sites outside of the proposed footprints, either to surrounding natural habitat or to the Dwarsrivier nursery. Woody species are less likely to be successfully relocated, especially larger	-11	Should any floral SCC be relocated, the relocation success of such species should be monitored during the construction phase to ensure immediate actions can be taken if it becomes evident that relocation is not successful.	-5	CbA										

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
			individuals. Where woody SCC species are to be cleared and not relocated, it must be ensured that the same species are currently being propagated in the nursery. If this is not the case, seeds can be harvested from the surrounding areas and / or from the individuals that will be cleared as part of vegetation clearing activities to be propagated off-site and reinstated as part of rehabilitation activities. Activities which are likely to negatively affect the flora of conservation concern within and around the proposed five projects include, but are not limited to, the following: 1. Disturbance, fragmentation and alteration of floral SCC habitat; 2. Destruction, removal or harvesting of floral SCC during construction and operational activities; and 3. Potentially poorly implemented and monitored rescue and relocation of SCC or not ensuring that the same species are being propagated in the Dwarsrivier nursery. Impact on CBAs, ESAs, Threatened Vegetation and Protected Areas - According to the desktop database, the proposed														

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
			five projects will impact on a CBA 1 and the Sekhukhune Mountainlands threatened ecosystem, however, following the site assessment this is more accurately only applicable to the RWD of Project 1 and the footprint areas of Project 2. The remaining areas associated with the TSF (Project 1) and Projects 3-5 have all been impacted on and are associated with the active mining footprint. According to the desktop database, a small portion of Project 4 will impact on an ESA however, this section of the ESA has been degraded in terms of habitat integrity and is located within the active mining area.														
			Impacts on Faunal SCC - The five proposed projects are associated with habitats that are known to host faunal SCC, notably the Sekhukhune Mountain Bushveld habitat. The remaining habitats may serve as intermediary or transitionary habitats for such species, but not permanent habitat. One SCC was recorded on site, namely Pycna sylvia (Cicada) whilst Python natalensis (African Python, VU) has also been recorded in the adjacent areas. Panthera pardus (Leopard, Vulnerable, TOPS Listed), Parahyaena	-11	Edge effect control needs to be implemented to prevent further degradation and potential loss of floral and faunal SCC outside of the five proposed project footprint areas	-5	CbA										

Name of Activity	Project		Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
			brunnea (Brown hyaena, NT, TOPS Listed), Sagittarius serpentarius (Secretary bird, VU), Polemaetus bellicosus (Martial Eagle, VU) and Neotis denhami (Denham's Bustard, NT) are also considered to have a medium probability of occurring, however such occurrences are likely to be transitionary and not permanent, as the footprint areas are not sufficient in extent to permanently host these species nor are there sufficient food resources within the five proposed project footprint areas alone to support these species. Mammalian, avifaunal and some reptilian SCC are likely to maintain large home ranges that will far exceed the extent of the five proposed project footprint areas. Due to the small project footprint extents and ability of many of the SCC to relocate ahead of construction activities, impacts stemming from the proposed projects are not expected to pose a significant risk to these species.															
			Habitat degradation due to dust: Increased dust will occur in all areas where vegetation is cleared. Dust will be caused by excavation, and construction. Dust in the	-8	Maintain the current air quality monitoring stations that determine fallout and implemented respirable dust (PM10) monitoring that could arise from the mining activities.	-5	CbA	Recording of dust fall out to determine trends.	Meeting ambient dust fall out limits in terms of applicable NEM:AQA Regulations.	x			x	National Dust Regulation Compliance.	Dust dispersion will be monitored in line with the current dust monitoring programme	SHEQ Department.	Monthly Monitoring with Annual Reporting.

Name of Activity	Project		Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities		Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
			area will be greatly increased due to the dry weather conditions and the nature of the soil in the area. Dust settling on plant material can reduce the amount of light reaching the chlorophyll in the leaves, thereby reducing photosynthesis, which in turn reduces plant productivity, growth and recruitment.		Dust suppression should be undertaken where and when dust is present.												
			Direct Impact: Increased erosion can eventually lead to the loss of vegetation and habitats for further species. Soils in the area are prone to erosion in areas where vegetation is cleared, this is further compounded by the fact that precipitation in the area occurs through heavy rainfall events in in the form of thundershowers in summer. Furthermore large areas will be cleared before construction leaving these areas prone to erosion.	-16	Ensure the required erosion protection measures are monitored and corrected where necessary. Storm water management plan should be implemented prior to construction to ensure that runoff does not lead to the formation of erosion gulleys. Where vegetation cannot be established during the life of construction and operations, appropriate measure will be taken to control erosion. These will include grading of surfaces to prevent rapid run-off of storm water and / or the use of energy dissipaters. An erosion monitoring and mitigation plan should be put in place.	-6	CbA	Limit the impact of the mining operation on the Ecological Setting of the area. Limited to no presence of erosion gulleys. Retaining soil integrity for rehabilitation.	Maintaining soil integrity, with successful vegetation establishment.	x			x	Soil Erosion	Appointment of an Independent Environmental Control Officer to assess compliance with the EMP. The SHEQ department should undertake ongoing site monitoring to determine whether activities on site are undertaken in accordance with the EMP Requirements.	ECO and SHEQ Department	ECO: Monthly for the construction phase. Thereafter annual external audits can be undertaken. SHEQ: Weekly monitoring. Rectification of erosion gulley should be undertaken immediately upon observation.
			Accidental death of animals on the roads.	-12	Clearly marked signs will be erected along the transportation routes to create awareness of animal crossings. A clearly marked and enforced vehicle speed will be implemented on the internal mine and transportation routes.	-1	CbA	Awareness creation on the importance of that natural ecosystem in which the mine operates. Implementation of safe	Zero animal fatality.	x			x	Creation of Awareness.	Induction with the view on creating environmental awareness.	SHEQ Department	Annually for permanent staff. Start of each visit for contractors.

Name of Activity	Project		Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities		Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
					A detailed induction programme will be in place to ensure that all parties are aware of the rules and regulations on site in terms of the use of roads.			operation practices.									
					Vehicles may only travel on demarcated roads on site.												
		Freshwater Ecosystems	Diesel and Emulsion Batching Areas: Operation of the diesel and emulsion batching areas: •Potential contamination of stormwater runoff from hard surfaces by hydrocarbons from vehicles, leading to potential contamination of surface water, groundwater and soil; •Increased volume of stormwater runoff entering the ephemeral drainage lines as a result of increased catchment hardening. As the fuel batching sites are situated more than 200 m from watercourses, the risk posed is considered minimal. Nevertheless general 'best practice' mitigation measures are recommended.	-6	Development of an Emergency Response Plan prior to construction to provide a protocol in the event of a spill	-5	CbA										
					Retention of as much natural vegetation as possible around the sites to provide stormwater and sediment trapping capacity												
					As the soil in the area is susceptible to erosion, it is strongly recommended that regular monitoring for erosion takes place. Should any preferential flow paths or erosion gullies form, these must be immediately managed in accordance with the mine's existing soil management protocols.												
		Hydrology	Contamination of surface water resources due to potential hydrocarbon spillages washed into drainage lines and depressions	-10	Ongoing water, biomonitoring and groundwater monitoring should be undertaken. Machinery, trucks and vehicles must be well maintained and serviced regularly as per the recommended service guide.	-5	CbA	Remain within or approve upon the current Aquatic Health and Water Quality baseline conditions.	Improve upon the current aquatic health and water quality baseline conditions.	x			x	Compliance in terms of the current Water Use License. Remain within demarcated areas.	Ongoing Biodiversity and water quality assessments. Demarcation on site of all activities to be undertaken.	Aquatic Specialist. Water Quality Specialist Supervisor Engineer	Surface Water and Biomonitoring in line with the current monitoring programme. Daily walkabout to determine any potential

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
					Refuelling must be undertaken over hard park bunded areas that adequately capture and contain spillages.										Develop a procedure and schedule for the exploration activities in terms of the wet and dry seasons. Maintenance of clean and dirty water management systems		concerns. Engineers must ensure that the clean and dirty water management systems are maintained at least quarterly.
					Machinery and vehicles should be parked on appropriately lined areas.												
					Drip trays must be used under leaking machinery.												
					Spillages should be reported immediately and spill kits should be readily available at all times.												
			Due to the small size of the TSF and Capital Projects, the loss of contributing area will be negligible (less than 0.5 %) in comparison to the runoff area of quaternary catchment B41G.	-5	Runoff from dirty areas must be contained according to GN704 regulations. There are no mitigation measures for a loss of contributing catchment area. The loss of catchment area is extremely small and would therefore have a negligible impact on reducing the catchment yield.	-5											
					Implement and maintain the approved Storm Water Management Plan as defined in the EMPr, or as subsequently been approved.												
			The proposed Khulu TSF, silt trap, PCD, diesel storage tanks and emulsion transfer area have the potential to contaminate the surrounding clean environment should spills occur.	-13	Lined bunded areas that are sized to accommodate 110 % of the storage capacity of the diesel tanks must be implemented beneath the tanks and should be operated empty at all times.	-5											
					The emulsion transfer area must be lined and sloped towards a sump to capture any potential spills. The sump should be inspected and emptied on a regular basis and disposed at an appropriate facility.												

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	**Project**	**Impact Area**	**Potential Impacts**	**SbM**	**Mitigation Measures**	**SaM**	**CvA/R/Ir**	**Performance Objectives**	**Goals**	**ST**	**MT**	**LT**	**LOM**	**Compliance with Standard**	**Functional Requirements for Monitoring**	**Responsibilities**	**Monitoring and Reporting Frequency**
					Clean water should be diverted around the diesel and emulsion batching areas to prevent any unnecessary cross contamination.												
		Groundwater	Large scale hydrocarbon spills could be present at the mining area.	-10	Pipelines but be monitored in terms of volumes of hydrocarbons and oils piped to the underground workings. Monitoring should be recorded on mine recording system (active at any time) to determine when there may be a potential leak on a pipeline.	-5	CbA	Protect the groundwater resources to ensure that limited to no impact on groundwater resources occur as a result of the mining operations.	Achieve 100% compliance to the water quality objectives as agreed to between the mine and the DWS based on the discussions within this IWWMP.		x		x	Groundwater Pollution and potential trends & Soil Assessments.	To ensure a proactive approach, the SHEQ department should undertake ongoing site monitoring to determine whether activities on site are undertaken in accordance with the EMP Requirements. The groundwater quality (constituents listed in the WUL) must be monitored monthly and records must be kept of these result in a centralised system. Analysis of results must be undertaken by an	SHEQ Department	Assessments: Weekly. Monitoring: As per approved WUL and Waste License

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
															accredited laboratory		
					At least weekly inspections should be undertaken around the diesel bunded areas and supply pipelines.										The SHEQ department should undertake ongoing site monitoring to determine whether activities on site are undertaken in accordance with the EMP Requirements. This should be undertaken by means of a thorough site visit, record keeping of findings in a checklist format, issuing of non conformances to responsible parties, listing thereof on the Isometrics or similar reporting system and feedback to the management team.		
					No activities associated with hydrocarbons and/or chemicals may be undertaken outside of an effectively designed and contained area.										An incident reporting procedure should be available on site and definitions must be developed to determine		

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	**Project**	**Impact Area**	**Potential Impacts**	**SbM**	**Mitigation Measures**	**SaM**	**CvA/R/Ir**	**Performance Objectives**	**Goals**	**ST**	**MT**	**LT**	**LOM**	**Compliance with Standard**	**Functional Requirements for Monitoring**	**Responsibilities**	**Monitoring and Reporting Frequency**
															when an incident is reportable.		
					Provision should be to protect the soils from hydrocarbon spills/drips by the vehicles and refuelling trucks entering and existing the site (i.e. grid system or permanently manned personnel to treat soils during periods of refuelling).										Reportable incidents should be reported to the Regulatory Authority as per the regulatory requirements, as well as stipulations as part of the WUL and Environmental Authorisations.		
					In the event of a large spill include total petroleum hydrocarbon (TPH) in the next groundwater monitoring cycle. If elevated TPH is recorded, additional measures must be implemented to clean and/or rehabilitate affected areas.												
					Soil samples must be taken after rehabilitation to confirm the presence of hydrocarbons that could pose a threat to groundwater contamination.												
					All used oils must be removed from site by a licensed company and disposed of at a suitably licensed site.										Induction with the view on creating environmental awareness.		
					Any spills occurring during the collection process must be cleaned up immediately.				Aim to achieve a zero-spill record.						The design of the facilities, especially where hydrocarbons are managed, should be maintained in such a manner as to ensure that spills cannot exist		

Name of Activity	Project		Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities		Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
					Any significant spills must be captured in the incident reports and must be reported to the relevant department (LDEDET, Catchment Management Agency/DWS). All equipment and machinery should be kept in good working order. A clean up procedure (i.e. Works Instruction) must be in place.										contained areas. Log of hydrocarbons stored and piped on site should be reconciled regularly to determine whether leaks are present.		
			Handling of hydrocarbons and associated hazardous waste (old oils and contaminated soils) the area could lead to contamination of groundwater if not well managed.	-10	Clean and Dirty water separation systems should be incorporated in terms of the 2016 SWMP or any approved update thereafter. The workshop should be designed with the suitable waste containment measures (berms, sumps, oil separators). Waste management training must be implemented on site. Clear signs informing staff of waste management practices must be implemented on site. Hazardous waste handling should only take place within bunded and/or lined areas, with a capacity of at least 110% of the volume stored. Hazardous waste should be removed by a licenced removal company and taken to a suitable and licenced landfill site. Documentation of removal and safe disposal must be available on site.	-6	CbA	Protect the groundwater resources to ensure that limited to no impact on groundwater resources occur as a result of the mining operations.	Achieve 100% compliance to the water quality objectives as agreed to between the mine and the DWS based on the discussions within this IWWMP. Maintain a 100% safe disposal record on the disposal of hazardous waste.		x		x	Groundwater Pollution and potential trends & Soil Assessments.	To ensure a proactive approach, the SHEQ department should undertake ongoing site monitoring to determine whether activities on site are undertaken in accordance with the EMP Requirements. The groundwater quality (constituents listed in the WUL) must be monitored monthly and records must be kept of these result in a centralised system. Analysis of results must	SHEQ Department	Assessments: Weekly. Monitoring: Quarterly (construction); Biannually (after construction)

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	**Project**	**Impact Area**	**Potential Impacts**	**SbM**	**Mitigation Measures**	**SaM**	**CvA/R/Ir**	**Performance Objectives**	**Goals**	**ST**	**MT**	**LT**	**LOM**	**Compliance with Standard**	**Functional Requirements for Monitoring**	**Responsibilities**	**Monitoring and Reporting Frequency**
															be undertaken by an accredited laboratory		
		Air Quality	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Heritage	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Noise	Noise of vehicles traversing the access roads will create a constant source of noise. It is however not foreseen that the roads proposed would contribute to any additional noise levels in the area.	-7	Machinery and vehicles will be well maintained to prevent excessive nose and to comply with national and provincial regulations. All vehicles will have muffles to minimise noise emissions, where necessary. Where noise becomes a nuisance nose management measures will be investigated and implemented to address these concerns. Noise monitoring will be undertaken (ambient conditions) to ensure that noise levels comply with Health and Safety Standards.	-4	CbA	Protect the ambiance of the area, as well as maintain good relationships with surrounding land users.	Implement a noise monitoring network.	x			x	Elevated Noise Levels.	Ambient noise monitoring should be undertaken	SHEQ Department	Monthly (during the day and during the night)
		Visual	The presence and use of heavy machinery, trucks and vehicles during the operational phase.	-9	Machinery, trucks and vehicles are already present in the area and are unlikely create any additional significant presence.	-5	CbA	Retain the aesthetics of the area as far as practically possible.	Design and construction infrastructure to blend in with the general topography as far as practically possible. No encroachment outside of demarcated areas.				x	Protect the long term aesthetics of the area.	Successful dustfall out results	SHEQ Department	Monthly
					Trees should be planted along the main roads to conceal activities from motorists.										Development of infrastructure with closure in mine.	Engineer	Ongoing during construction.
					Dust suppression measures should be implemented to limit the generation of dust.										The Project Manager should implement the necessary design concepts to limit the impact on the soil resources and ecological	Project Manager	Ongoing during construction.

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
															connectivity and functioning of the ecosystem.		
		Social	There is approximately 1200 permanent and 800 contractor employees in service at Dwarsrivier Mine. This employment profile will be sustained as the proposed project would allow the operation to meet the existing production capacity. Approximately 24 employees will be directly involved with the operations related to the TSF. No new employment positions will be created as these employees are already employed at Dwarsrivier Mine. However, the existing socio-economic benefits created through Dwarsrivier Mine being a key employer in the area would continue. The social services support as part of the SLP requirements will also continue to be implemented. As no additional workers are anticipated, the inflow of jobseekers is also anticipated to be of limited significance.	10	The procurement of locals should receive preference if there is any need for additional employees. The ideal objective should be to reach 100% recruitment of additional/ new unskilled labour from local communities where skills are locally available.	11	CbA	Positive contribution to the Socio-Economic Setting of the Local Municipality. Maintenance of logistical characteristics and requirements of the local area.	Continuation of traffic logistics on the regional roads. Maintenance of relationships with surrounding landowners, mines and road users. Meeting the approved objectives and goals of the SLP. Maintain relationship with land claimants.		x			Monitoring of the Social and Labour Plan.	The HR department should remain in ongoing consultation with the Local Municipality. Regular stakeholder focus meetings should be scheduled to discuss any perceived impacts or concerns.	HR and SHEQ	Annual review and update of the SLP. Monthly dust monitoring. At least annual stakeholder focus meetings. Weekly inspections of the railway line construction activities and implementation of the temporary diversion activities.
			Existing employees would continue to be responsible for the overall mining activities. Limited additional temporary workers could over time be required for specific tasks associated with the	10	Targets for the procurement of capital goods, consumer goods and services should be set and Dwarsrivier Mine should develop an action plan to meet these targets. Contract executions by SMMEs should be strictly	11	CbA										

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
			proposed Khulu TSF and capital projects. When that occurs, new mining activities can then be allocated to appointed specialist contractors. Even if limited procurement is foreseen, this variable is still regarded as positive, due to the indirect impacts of Dwarsrivier Mine's mining activity on the local economy through the creation of possible business opportunities (e.g. local service industry) and local procurement of material, services and equipment.		monitored to determine whether SMMEs require assistance with regards to general business principles, financial management, management of stock, competitive costing (pricing), and marketing of their businesses. Enterprise development is a key enhancement measure in this regard. The proponent should assist small businesses and/or SMME's to develop to a certain level. Such measures recommended could include the following: The establishment of joint ventures between small businesses and established companies with relevant experiences with regards to tender processes can be considered; Flexible payment systems can be considered to assist smaller businesses in terms of expenditure, but such a system must be strictly controlled. An audit of existing local enterprises that could provide services, goods and material should be undertaken with the assistance of local leaders and community representatives, as well as local business structures. The procurement process should be based on competitive business principles and the quality of services to be rendered, to ensure adherence to standards and to maximise overall welfare.												

Name of Activity	Project		Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
			Socio-Economic Development - The socio-economic impact of the proposed projects would be based on the mine's continued contribution to the Gross Geographical Product (GGP) and the number of direct (continued employment at the mine) and indirect jobs that would be created. Therefore, except for ongoing direct employment, that would generate income and increase local spending, people living in the vicinity of the study area is also expected to benefit by the earnings of those employed by the mine and the local buying power in the area. Through employment and income generation during the mining processes, some economic benefits to the region and local communities therefore accrue. The mine would continue to contribute to the local economy through its employee wages, procurement of local contractors and services, purchasing of water and electricity and through payment of taxes to the Fetakgomo Tubatse Local Municipality. Dwarsrivier Mine, through their mining activities, is involved in various Local Economic Development Initiatives linked to the	11	Dwarsrivier Mine, through their SLP, must continue to provide skills development opportunities for employees that include functional literacy and numeracy programmes, career progression plans, up-skilling for hard to fill vacancies and management positions, bursary and internships and portable skills training. Develop a database of SMME's for the procurement of goods and services that could potentially be outsourced to the local community. Dwarsrivier Mine to continue to adhere to the Social and Labour Plans as per the Regulation 46 of the Mineral and Petroleum Resources Development Act (Act 28 of 2002) and the Mining Charter (2018).	12	CbA										

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	**Project**	**Impact Area**	**Potential Impacts**	**SbM**	**Mitigation Measures**	SaM	**CvA/R/Ir**	**Performance Objectives**	**Goals**	**ST**	**MT**	**LT**	**LOM**	**Compliance with Standard**	**Functional Requirements for Monitoring**	**Responsibilities**	**Monitoring and Reporting Frequency**
			Integrated Development Plan (IDP) of the Fetakgomo Tubatse Local Municipality, as well as other government initiatives. These activities would thus continue, and the constant positive socio-economic impacts thereof would remain to benefit of the local communities.														
			Capacity Building - Although education and training are mainly the responsibility of government, there is increased pressure on the business sector in South Africa to increase the development and skills of their workforce. Dwarsrivier Mine is involved in capacity building and training. Further to these focus areas, the company also concentrate on local employment creation and poverty alleviation, as well as environmental management, rural development and the provision of infrastructure. The above-mentioned inputs would continue if Dwarsrivier Mine is successful in sustaining their mining operations in the area. Dwarsrivier Mine has thus played an important role in the area in this regard and commits to continue with these efforts which would benefit the local communities within the	11	Dwarsrivier Mine should continue with a Human Resources Development (HRD) strategy as part of the Social and Labour Plan (SLP). The focus should remain of career development programmes, bursaries, learnership programmes, skills development and training. Learnership programmes should preferably focus on individuals from the core and affected areas in close proximity to Dwarsrivier Mine to maximise the long-term employment opportunities of these local community members. Local goods and services should be used as far as possible and therefore contractual requirements for contractors to use local goods and services should be implemented as far as possible Local Economic Development initiatives should continue	12	CbA										

Name of Activity	Project		Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
			Fetakgomo Tubatse Local Municipality area.														
			Safety and Security Related Impacts - Construction of the access crossing between the plant and North Mine, as well as the widening of the access road between the South Shaft/Main Offices and Plant would reduce these risks and create a positive impact in this regard. The negative impact prior to mitigation can thus be changed to a medium positive impact.	-8	A Fire/Emergency Management Plan should be developed and implemented, if not yet in place. It would be important to regularly review the functionality and efficiency of such a plan in conjunction with the local emergency teams, mine management and affected communities as well as neighbouring landowners. Appropriate firefighting equipment should be on site and workers should be appropriately trained for firefighting Warning signs would have to be posted to alert residents and road users to possible dangers associated with mining related traffic and activities. Access to the mine via the new parking extension should consider all safety and security measures and have as little impact on the traffic on the R577 as possible	-8	CbA										
			Health Related Risks - During the operational phase dust impacts are anticipated due to general mining activities and vehicles travelling on the access and haul roads. The dust concentrations as a result of this movement are not anticipated to reach residential areas and the impact would possibly be localised on site.	-10	The Mine Health and Safety Act (Act No 29 of 1996), standards stipulated in SANS 10286, NEMA and related regulations and standards must be adhered to. Vehicles and equipment must be in good working order and must be regularly serviced. Infrastructure e.g. pipelines must be regularly inspected and maintained to avoid spillages.	-8	CbA										

Name of Activity	Project		Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities		Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
			Fugitive dust from stockpile areas and waste rock dumps are also of concern. Windblown dust from these facilities will vary according to the season, with possible higher levels and frequency during the windy months. The probability and intensity of these possible impacts would further depend on the wind directions and the proximity of sensitive receptors. The nearest residential area is approximately 10 km to the north and east of the mining area. Should there be a possible increase in the air pollution (dust), these sensitivities should be adequately dealt with and be taken into account in the monitoring processes stipulated as part of the EMPr. In the event that sensitive receptors are affected (worst case scenario), based on dust fallout rates, the necessary mitigation measures as stipulated through the Air Quality specialist study must be implemented. The rating below is based on the general air quality impacts usually experienced with mining projects and the proximity of sensitive receptors in the study area. Emissions would include vehicle emissions (carbon		Mining activities should adhere to all the relevant environmental and health guidelines and should be undertaken in accordance with the EMP Dust suppression methods along haul roads should be continued to be implemented Dwarsrivier Mine must continue to distribute information with regards to health matters and nutrition to its workers and surrounding communities Storing of emulsion and diesel must not be in close proximity to any flammable materials. The SLP should make provision for addressing any possible direct health related risks and providing a supporting role to minimise the vulnerabilities of the communities, without having to take over the role of the local health services and municipality. On site, all the appropriate health, hygiene and distancing measures aimed at protecting the employees' safety and health, must be implemented. Dwarsrivier Mine can investigate ways to support to the local clinics through their community support programmes and SLP initiatives. Educational videos on COVID-19, and general health and hygiene measures associated with												

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
			monoxide and nitrogen oxide) and emissions from large construction equipment. Industrial, solid and hazardous waste would be created during the mining operations. As is currently the case, these different types of waste should continue to be responsibly disposed of to avoid any health-related impacts in this regard. Storing of diesel and emulsion can create health related risks. As mitigation, the emulsion will be stored in underground tankers. The majority of the pipelines will further be underground to limit risks in this regard and possible spills. In mining areas there are further concerns relating to migrant employees bringing health risks, and nowadays the threat of Covid-19 infection, to mining areas or small towns. The Fetakgomo Tubatse Local Municipality area is already characterised by vulnerable households and inadequate public health services that cannot always effectively deal with the health risks associated with the pandemic. It will remain the responsibility of Dwarsrivier Mine to continue their support to their employees and surrounding communities		the pandemic should be provided to employees												

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
			to reduce vulnerability and to implement the required Covid-19 Protocol.														
Waste Management and Handling Hydrocarbon spills within the Mining Area and the management of Domestic and Hazardous Waste	1, 2, 3, 4	Geology	No direct impact.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Topography	No direct impact.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Soils	Contamination of soil resources due to hydrocarbon spills.	-11	Storage of fuels and oils, the refuelling of vehicles and equipment maintenance must be limited to designated, bunded (bunds to be 110% of volume of the materials stored) areas. All fuels and soils must be stored in appropriate containers. Chemicals and hazardous material must be stored in suitable containers, fit for purpose and in line with SDS requirements. Where drip trays are too small, specially prepared, non-pervious bunds with solution trenches must be used to capture spillages Oils and potentially hazardous materials must be disposed of at a licensed facility and waste certificates obtained.	-5	R	Protecting of soil integrity.	Zero presence of contaminated land due to early detection and implementation of actions.	x			x	Soil Pollution	The SHEQ department should undertake ongoing site monitoring to determine whether activities on site are undertaken in accordance with the EMP Requirements. This should be undertaken by means of a thorough site visit, record keeping of findings in a checklist format, issuing of non conformances to responsible parties, listing thereof on the Isometrics or similar reporting system and feedback to the management team.	SHEQ Department	ECO: Annual external audits can be undertaken. SHEQ: Weekly monitoring
					A spill kit must be provided to be used in the event of a spill. If a spill occurs, the contaminated soil must be removed immediately.			Awareness creation on site regarding duty of care and waste management.							Induction with the view on creating environmental awareness.	SHEQ Department	Annually for permanent staff. Start of each visit for contractors.

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
					Contaminated soil must be stored according to best practices until it can be disposed of at a suitably licensed facility. Safety signage must be used at designated storage areas. All workers must undergo an induction which includes environmental awareness training to make them aware of the environmental incident management procedures as well as the importance of complying with management measures.												
			Contamination of soils as a result of a lack of sanitary services	-11	Chemical toilets must be readily available to employees where permanent infrastructure is not available. Licensed companies must be appointed to remove any contaminated material and or wastes to licensed landfill sites.	-5	-	Protecting of soil integrity.	Zero presence of contaminated land due to early detection and implementation of actions.				x	Soil Integrity	Contracts must be in place for the provision of chemical toilets where required. Removal companies must have the necessary contracts and permits in place.	SHEQ Department	Daily internal inspections Annual review of supply and removal companies contracts and permits.
		Ecology	The unmanaged disposal of waste, could result in the spread of invader species, as well as the influx of opportunistic species.	-12	Develop dedicated waste handling areas; prevent access to rodents and opportunistic species; prevent the spread of waste. Develop dedicated waste handling areas, fit for purpose and prevent the spread of waste.	-5	CbA	Proper waste management practices on site.	No unlawful disposal of waste. Registration of all waste handling and/or storage areas on site.	x			x	Ongoing Rehabilitation	Ongoing waste classification and management processes to be implemented. Up to date waste manifests must be kept on site. Up to date permits of landfill sites, and waste	SHEQ Department	SHEQ: Weekly inspections.

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
															transporters should be kept on site.		
		Riparian Habitat and Wetlands	Various non perennial drainage channels are present in this area. The Truck Parking will also be located in close proximity to a drainage channel.	-10	Remain at all times outside of the 1:100 year flood line of the watercourses. Ongoing Biomonitoring Monitoring should be undertaken at the upstream and downstream points. Ongoing surface water monitoring should be undertaken at the upstream and downstream monitoring points. The storm water management plans should be implemented in and around the facilities to ensure that dirty water runoff or water with high sediment loads do not enter the existing watercourses. Develop dedicated waste handling areas, fit for purpose and prevent the spread of waste.	-5	CbA	Remain within or approve upon the current Aquatic Health and Water Quality baseline conditions.	Improve upon the current aquatic health and water quality baseline conditions.	x			x	Compliance in terms of the current Water Use License.	Ongoing Biodiversity and water quality assessments.	Aquatic Specialist.	Surface and Biomonitoring in line with the current monitoring programme.
		Hydrology	Handling of Hazardous Waste within diesel storage areas, laydown areas and general mine area could contaminate the dirty water storage areas. The water is then reused in the system and could have impacts on the integrity of the storm water system and also the production.	-11	Clean and Dirty water separation systems should be incorporated in terms of the 2016 SWMP or any approved update thereafter. A detailed waste management strategy will be established and implemented, which will clearly demarcate the containments for different waste streams.	-6	CbA	Protect the integrity of the Storm Water Management System.	Maintain the SWMP on site.				x	Surface Water Pollution & Soil Assessments.	To ensure a proactive approach, the SHEQ department should undertake ongoing site monitoring to determine whether activities on site are undertaken in accordance with the EMP Requirements.	SHEQ Department	Assessments: Weekly. Monitoring: As per approved WUL

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
					Waste management training must be implemented on site.										The water quality (constituents listed in the WUL) must be monitored and records must be kept of these result in a centralised system. Analysis of results must be undertaken by an accredited laboratory.		
					Clear signs informing staff of waste management practices must be implemented on site.				Aim to achieve a zero-spill record.								
					Hazardous waste handling should only take place within bunded and/or lined areas.										An incident reporting procedures should be available on site and definitions must be developed to determine when an incident is reportable.		
					Any significant spills must be captured in the incident reports and must be reported to the relevant department (LDEDET, Catchment Management Agency/DWS).												
					Hazardous waste should be removed by a licenced removal company and taken to a suitable and licenced landfill site.				Provide training to all staff on best practices regarding waste management every year.						Reportable incidents should be reported to the Regulatory Authority as per the regulatory requirements, as well as stipulations as part of the WUL and Environmental Authorisations.		
					Documentation of removal and safe disposal must be kept on record and in good order.												
					The mine will adopt a cradle-to grave (inspection of disposal sites) approach to ensure that the waste is removed and disposed of in a legally compliant manner.												
					Weekly inspections of Storm Water Management												

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
					Systems must be undertaken. Any blockages or maintenance requirements must be documented and an action plan developed.												
			Handling and Storing of Domestic Waste should have no impact on the surface water resources due to the location of the facility. However, incorrect disposal of waste could hamper the integrity of the storm water system.	-9	Clean and Dirty water separation systems should be incorporated in terms of the 2016 SWMP or any approved update thereafter. Waste management training must be implemented on site. Weekly inspections of Storm Water Management Systems must be undertaken. Any blockages or maintenance requirements must be documented and an action plan developed. Clear signs informing staff of waste management practices must be implemented on site. Access control must be strictly enforced. Recycling practices must be investigated and implemented on site.	-5	CbA	Proper waste management practices on site.	Maintain a 100% compliance with the conditions of the NEMWA Permit on site for the Salvage Yards.				x	Surface Water Pollution & Soil Assessments.	Up to date waste manifests must be kept on site. Up to date permits of landfill sites, and waste transporters should be kept on site.	SHEQ Department	
		Groundwater	Large scale hydrocarbon spills could be present at the mining area	-10	Clean and Dirty water separation systems should be incorporated in terms of the 2016 SWMP or any approved update thereafter.	-5	CbA	Protect the groundwater resources to ensure that limited to no impact on groundwater resources occur as a result of the mining operations.	Achieve 100% compliance to the water quality objectives as agreed to between the mine and the DWS based on the discussions within this IWWMP.		x		x	Groundwater Pollution and potential trends & Soil Assessments.	To ensure a proactive approach, the SHEQ department should undertake ongoing site monitoring to determine whether activities on site are undertaken in accordance	SHEQ Department	Assessments: Weekly. Monitoring: Asper approved WUL

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
															with the EMP Requirements. The groundwater quality (constituents listed in the WUL) must be monitored monthly and records must be kept of these result in a centralised system. Analysis of results must be undertaken by an accredited laboratory		
					No activities associated with hydrocarbons and/or chemicals may be undertaken outside of an effectively designed and contained area.										The SHEQ department should undertake ongoing site monitoring to determine whether activities on site are undertaken in accordance with the EMP Requirements. This should be undertaken by means of a thorough site visit, record keeping of findings in a checklist format, issuing of non conformances to responsible		

Name of Activity	Project		Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
															parties, listing thereof on the Isometrics or similar reporting system and feedback to the management team.		
					All used oils must be removed from site by a licensed company and disposed of at a suitably licensed site.										An incident reporting procedure should be available on site and definitions must be developed to determine when an incident is reportable.		
					Any spills occurring during the collection process must be cleaned up immediately.										Reportable incidents should be reported to the Regulatory Authority as per the regulatory requirements, as well as stipulations as part of the WUL and Environmental Authorisations.		
					Any significant spills must be captured in the incident reports and must be reported to the relevant department (LDEDET, Catchment Management Agency/DWS).										Induction with the view on creating environmental awareness.		

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
					All equipment and machinery should be kept in good working order.				Aim to achieve a zero-spill record.						The design of the facilities, especially where hydrocarbons are managed, should be maintained in such a manner as to ensure that spills cannot exist contained areas.		
					A clean up procedure (i.e. Works Instruction) must be in place.										Log of hydrocarbons stored and piped on site should be reconciled regularly to determine whether leaks are present.		
			Handling or Hazardous Waste within workshops and general mine area.	-10	Clean and Dirty water separation systems should be incorporated in terms of the 2016 SWMP or any approved update thereafter.	-6	CbA	Protect the groundwater resources to ensure that limited to no impact on groundwater resources occur as a result of the mining operations.	Achieve 100% compliance to the water quality objectives as agreed to between the mine and the DWS based on the discussions within this IWWMP.		x		x	Groundwater Pollution and potential trends & Soil Assessments.	To ensure a proactive approach, the SHEQ department should undertake ongoing site monitoring to determine whether activities on site are undertaken in accordance with the EMP Requirements. The groundwater quality (constituents listed in the WUL) must be	SHEQ Department	Assessments: Weekly. Monitoring: Quarterly (construction); Biannually (after construction)
					The workshop should be designed with the suitable waste containment measures (berms, sumps, oil separators).												
					Waste management training must be implemented on site.												
					Clear signs informing staff of waste management practices must be implemented on site.				Maintain a 100% safe disposal record on the disposal of hazardous waste.								
					Hazardous waste handling should only take place within bunded and/or lined areas, with a capacity of at least 110% of the volume stored.												

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
					Hazardous waste should be removed by a licenced removal company and taken to a suitable and licenced landfill site.										monitored monthly and records must be kept of these result in a centralised system. Analysis of results must be undertaken by an accredited laboratory		
					Documentation of removal and safe disposal must be available on site.												
			Handling and Storing of Domestic Waste	-12	Clean and Dirty water separation systems should be incorporated in terms of the 2016 SWMP or any approved update thereafter.	-9	CbA	Proper waste management practices on site.	Maintain a 100% compliance with the conditions of the NEMWA Permit on site for the Salvage Yards.				x	Surface Water Pollution & Soil Assessments.	Up to date waste manifests must be kept on site.	SHEQ Department	Assessments: Weekly. Monitoring: As per approved WUL and Waste License Waste Manifest reconsolidation weekly.
					Waste management training must be implemented on site.												
					Clear signs informing staff of waste management practices must be implemented on site.										Up to date permits of landfill sites, and waste transporters should be kept on site.		
					All waste must be removed by licensed contractors and disposed of at a licensed landfill site.												
					As a duty of care and the cradle to grave principles, the mine should regularly inspect disposal site to ensure that best practices are implemented.												
					Recycling practices must be investigated and implemented on site.												
					Records and manifests of waste disposal should be kept on file and in good order.												
		Air Quality	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Heritage	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Noise	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Visual	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Social	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 92: Decommissioning Phase Impact Table with Management Measure, Objectives and Standards (Significance before Mitigation –SbM; Significance after Mitigation – SaM; Can be avoided – CbA; R – Reversible; Ir – Irreversible; ST: 1-12 months; MT: 1-5 yrs.; LT: 5 years and more; LOM: Life of Mine)

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
Legal Requirements (Environmental Permits)	1, 2, 3, 4 & 5	Legal Compliance	Unlawful activities could lead to NWA Directives and Section 24G Rectification fines.	-14	A legal assessment of all activities must be undertaken annually to ensure that all are licensed. A detailed closure plan must be developed and submitted to the relevant departments for approval. All legally appointed personnel responsible or involved in activities on site must receive training on the requirements of the Environmental Authorisations and EMPs Quarterly assessments must be undertaken, on the lawful implementation of the Environmental Authorisation Environmental Authorisations must be available on site at all times. The legal register must be updated to indicate all updated activities.	17	CbA	To operate within the enviro-legal ambits of South Africa. To be aware of the latest environmental legal requirements.	Ensure that all activities undertaken by the mine are lawful with the required environmental licences in place. Ensure that all environmental authorisations on site is implemented on site and ongoing monitoring of compliance are undertaken to reach 100% compliance. All Departments responsible for development of the mine, must understand the requirements of the environmental legislation and must involve this into their planning processes.			x		Compliance in terms of Regulatory Requirements and the implementation of the EMP.	Appointment of an Independent Environmental Control Officer to assess compliance with the EMP. Quarterly (construction); Biannually (after construction) internal audits must be undertaken during the construction phase, where after biannual internal audits can be undertaken, to ensure compliance with the Environmental Authorisation and EMP. This should be undertaken by means of a thorough site visit, record keeping of findings in a checklist format, issuing of non conformances to responsible parties, listing thereof on the Isometrics or similar reporting system and feedback to the	Independent ECO & SHEQ	ECO: Weekly; SHEQ: Daily

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
															management team.		
General Rehabilitation	1, 2, 3, 4, &5	Geology	No direct impact.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Topography	Returning the area to be stable and free draining.	-14	The TSF should be closed in terms of the approved design principles.	13	CbA	Free draining environment.	Achieve 100% compliance with post land use commitment.				x	Ongoing rehabilitation	Appointment of an Engineer who will facilitate and manage the landscaping of the Environment.	SHEQ Department	Survey of the area: monthly
					The roads should be sloped and landscaped to blend into the surrounding environment. Where the slopes have steep gradients due to the surrounding landscape measures should be implemented to assist with the trapping of seeds and to protect the crest from wind erosion All rehabilitated areas should be effectively fenced off to avoid access thereto by unauthorised parties up until full rehabilitation has been achieved.										Appoint and Ecologist to initiate the revegetation of the slopes.	SHEQ Department	Ecological Study (annually) Weekly assessments of vegetation establishment: SHEQ
			A concept for the TSF closure design was developed to illustrate how the TSF could be rehabilitated once the deposition of tailings stops and the TSF has reached the design height. It is important to note that this concept could change depending on how the TSF develop over time. For example, if the	-14	The designs as approved should be implemented.	12	CbA										

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
			tailings stored in the TSF is reclaimed (reworked) before the TSF reaches the final design height the closure design could look different from the proposed details. The concept design assumes that the TSF will be developed as indicated on the drawings submitted with this EMPr. The TSF will be rehabilitated by shaping the top of the TSF to be free draining and capping the top and the slopes with soil. The concept design also assumes that the area under the silt trap platform and PCD will be rehabilitated. The surface of the TSF will be capped using a layer of compacted soil overlain by hydroseeded topsoil. Bench drains will be constructed along the current benches to														

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	**Project**	**Impact Area**	**Potential Impacts**	**SbM**	**Mitigation Measures**	**SaM**	**CvA/R/Ir**	**Performance Objectives**	**Goals**	**ST**	**MT**	**LT**	**LOM**	**Compliance with Standard**	**Functional Requirements for Monitoring**	**Responsibilities**	**Monitoring and Reporting Frequency**
			collect stormwater draining down the rehabilitated slope of the TSF. The bench drains will be shaped to drain towards riprap-lined down chutes that will be provided to convey stormwater down to the toe. The dirty water canal that will be provided during the operation of the TSF will be rehabilitated. It is expected that the silt trap, dirty water canal and PCD will not be required once the TSF is rehabilitated. It is assumed that the footprint of the PCD and the silt trap platform will be rehabilitated by backfilling and reshaping.														
			Soil compaction - Heavy equipment traffic during construction and exploration activities is anticipated to cause soil compaction. The severity of this impact is anticipated to be	-14	The contractor will ensure that all activities, material and equipment storage and personnel movement take place within the designated area. All rehabilitated areas should be effectively fenced off to avoid access thereto by unauthorised parties up until full rehabilitation has been achieved.	-5	R	Limit the loss of soils as far as possible and ensure that the integrity remains during stockpiling for the purposes of successful rehabilitation. Protect the soil resources	The integrity of the soils stockpiled must remain suitable for the purposes of rehabilitation.				x	Soil Erosion and incorrect stockpiling of topsoil. Encroachment of activities outside of demarcated areas.	Appointment of an Independent Environmental Control Officer to assess compliance with the EMP. The SHEQ department should undertake ongoing site monitoring to determine whether activities	Independent ECO and SHEQ Department.	ECO: Monthly for the decommissioning phase. Annual external audits must be undertaken. SHEQ: Weekly monitoring Biomonitoring in
				-11	Laydown areas should be located within disturbed soils	-5											

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
			medium-high for Acardia soils due to clayey texture. Whereas soils with a relatively shallow bedrock and lithocutanic character (partly weathered rock material) such as the Glenrosa/Mispah soil forms are anticipated to be less impaired due to the resistance offered by the underlying bedrock. The ratings given in the columns on the left is for Project 1 , Project 2 and Project 3-5.		(anthrosols) to avoid compaction of natural soils.			within the area in which the mine operates. Retaining soil integrity for rehabilitation. Protect the soil resources within the area in which the mine operates. Protect surface and groundwater resources against siltation and contamination.							on site are undertaken in accordance with the EMP Requirements. Erosion protection measures should be implemented and monitored on areas identified. Photographic records of assessments must be kept.		line with WUL requirements.
					All contractors must receive induction. The induction should be updated on site, to make provision for the site plan and a detailed explanation on the purpose of the no-go zones, presence of protected species, presence of the CBA and ESAs and the meeting thereof.												
				-11	The management of topsoil stockpiles should be undertaken in terms of the Topsoil Management Plan included into this EMPr to ensure that the topsoil stockpiles maintain its integrity and are not subjected to compaction.	-5											
					Restrict the amount of mechanical handling, as each handling event increases that compaction level and the changes to the soil structure. Wherever possible, the 'cut and cover' technique (where the stripped soils is immediately placed in an area already prepared for rehabilitation, thus avoiding stockpiling) should be used.												
					A fine system/disciplinary system must be implemented on site for all significant or recurring environmental non-compliances.												
					Compacted soils adjacent to activities infrastructure footprint can be lightly ripped to at least 25cm below ground surface to alleviate compaction prior to re-vegetation.												
					Site clearance and activities should be restricted to the approved footprint. Contractors areas should be established on already disturbed footprints.												

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	**Project**	**Impact Area**	**Potential Impacts**	**SbM**	**Mitigation Measures**	**SaM**	**CvA/R/Ir**	**Performance Objectives**	**Goals**	**ST**	**MT**	**LT**	**LOM**	**Compliance with Standard**	**Functional Requirements for Monitoring**	**Responsibilities**	**Monitoring and Reporting Frequency**
					All vehicular traffic should be restricted to the existing service roads and the selected road servitude as far as practically possible												
			Clearing vegetation will result in the exposure of soil, which may in turn lead to soil erosion, in addition to this, stockpiling of topsoil material on sloping areas leading to increased runoff and erosion. The areas where the infrastructure is proposed are mostly gradual, however the exploration activities will be located among the mountainous setting and this is where erosion is considered moderately high. The natural and undisturbed soils will become more vulnerable to erosion once the vegetation is cleared for construction activities, and the soils will inevitably be exposed to wind and some surface runoff during	-14	The approved Storm Water Management Plan must be implemented up until rehabilitation has been completed. Ensure the required erosion protection measures are monitored and corrected where necessary. Bare soils can be regularly dampened with water to suppress dust during the construction phase, especially when strong wind conditions are predicted according to the local weather forecast All disturbed areas adjacent to the footprint areas can be re-vegetated with an indigenous grass mix, if necessary, to re-establish a protective cover, to minimise soil erosion and dust emission. Natural vegetation establishment (self-succession) will be encouraged on cleared areas, and topsoil stockpiles. If natural succession of vegetation is not established within one rainy season, after rehabilitation, the disturbed areas and areas adjacent to the infrastructural areas must be re-vegetated with an indigenous grass mix, if necessary, to re-establish a protective cover, to minimise soil erosion and dust emission.	-5	R										
				-11	The mine will investigate an appropriate seed mix for the rehabilitation purposes should	-5											

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
			intensive rainfall events. The ratings given in the columns on the left is for Project 1 , Project 2 and Project 3-5.	-11	self-succession not establish on rehabilitated sites. No project related activities may be undertaken outside of the demarcated areas. No open fires must be allowed.	-5											
			Potential of Soil Contamination due to a lack of chemical toilets or hydrocarbon spills - All the identified soils are considered equally predisposed to potential contamination (i.e. hydrocarbons), as contamination sources are generally unpredictable and often occur as incidental spills or leak for construction developments. The significance of soil contamination is medium-high for all identified soils, largely depending on the nature, volume and/or concentration of the contaminant of concern. The ratings given	-14	Contamination prevention measures should be addressed in the Environmental Management Programme (EMP) for the proposed development, and this should be implemented and made available, and accessible always to the contractors and construction crew conducting the works on site for reference Chemical toilets should be available on site.	-5	R	Protect the soil resources within the area in which the mine operates. Protect surface and groundwater resources against siltation and contamination.	The integrity of the soils stockpiled must remain suitable for the purposes of rehabilitation. No disturbed areas should remain beyond the demarcated areas. 100% compliance to remain with approved footprint areas.	x			x	Encroachment of activities outside of demarcated areas.	Appointment of an Independent Environmental Control Officer to assess compliance with the EMP. The SHEQ department should undertake ongoing site monitoring to determine whether activities on site are undertaken in accordance with the EMP Requirements. Erosion protection measures should be implemented and monitored on areas identified. Photographic records of assessments must be kept.	SHEQ Department	Groundwater and Surface Water Monitoring in line with WUL requirements, including TPH monitoring. ECO: Monthly for the construction phase. Thereafter annual external audits can be undertaken. SHEQ: Weekly monitoring
				-11	A spill prevention and emergency spill response plan, as well as dust suppression, and fire prevention plans should also be compiled to guide the construction works An emergency response contingency plan should be put in place to address clean-up measures should a spill and/or a leak occur, as well as preventative measures to prevent ingress	-5											
				-11	Burying of any waste including rubble, domestic waste, empty containers on the site should be strictly prohibited and all construction rubble waste must be removed to an approved disposal site	-5											

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
			in the columns on the left is for Project 1 , Project 2 and Project 3-5.														
		Ecology	The decommissioning activities could lead to the increase of the harvesting of plants in the area. Other activities identified by the specialist included: Potential ineffective rehabilitation will lead to the proliferation of alien and invasive plant species and further floral habitat and species loss Bare soil areas, if not rehabilitated will lead to increased runoff, erosion and the sedimentation of downslope habitats Potential continued loss of habitat will result in a further loss of floral SCC Permanently altered habitat may result in the alteration of floral species abundance and	-12	All contractors must receive induction. The induction should be updated on site, to make provision for the site plan and a detailed explanation on the purpose of the no-go zones, presence of protected species, presence of the CBA and ESAs and the meeting thereof. Vehicles should be restricted to travelling only on designated roadways to limit the ecological footprint of the construction activities. Additional road construction should be limited to what is absolutely necessary, and the footprint thereof kept to a minimal. Harvesting of plants and poaching of animals will be prohibited and a fine system will be developed for any person not complying. No open fires must be allowed. A grass mixture off endemic grasses recommended by an ecologist should be utilised in the seeding process. Note that hydro-seeding is primarily for grasses and smaller shrubs. Larger shrubs and trees will need to be hand-planned. The seed mixture should be incorporated into mulch which includes fertiliser and germination acceleration agents where required. No hunting or trapping of faunal species is to be allowed by personnel. No collection of floral SCC must be allowed by construction	14	CbA	To achieve final land use	The primary goal is to achieve a stable, climax state, representative of the Sekhukhune Mountain Bushveld vegetation type where the ecological function of the plant community is tolerant of most environmental conditions it encounters				x	Ongoing rehabilitation	Appoint and Ecologist to initiate the revegetation of the slopes.	SHEQ Department.	Weed monitoring (monthly); Weed eradication (annually or as required); Ecological Study (annually)

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
			diversity of which a number are endemic to the region.		personnel without the relevant permits.												
					Regular application of fertiliser should take place, where identified, in order to ensure efficient establishment of vegetation cover until such time as sufficient organic matter is being produced by the established grasses to allow for self-sustaining growth												
					Informal fires by construction personnel should be prohibited, and no uncontrolled fires whatsoever should be allowed.												
					Compacted soils adjacent to the project area and associated infrastructure footprint can be lightly ripped to at least 25 cm below ground surface to alleviate compaction prior to re-vegetation.												
					The recovered soils during construction should be re-used to rehabilitate the mine footprint following mine closure												
					If re-seeding for basal cover establishment was not effective during 1st application, a second application of hydro-seed mixture may have to be applied in certain areas. The application of hydro-seed should be at the discretion of the specialist contractor.												
					Edge effects arising from the proposed development, such as erosion and alien plant species proliferation, which may affect adjacent natural areas, need to be strictly managed. Specific mention in this regard is made of Category 1b AIP species (as listed in the NEM:BA Alien species lists, 2020), in line with												

Name of Activity	Project		Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities		Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
					the NEM:BA Alien and Invasive Species Regulations (2020).												
					AIP monitoring and clearing/control should take place throughout the construction phase of the development, and a 30 m buffer surrounding the proposed railway loop should be regularly checked for AIP proliferation and to prevent inward and or/outward spread of AIPs, notably into non infested areas outside of the proposed railway loop or into newly rehabilitated areas.												
					Alien vegetation that is removed must not be allowed to lay on unprotected ground as seeds might disperse upon it. All cleared plant material to be disposed of at a licensed waste facility which complies with legal standards.												
					No grazing on rehabilitated areas is to occur within three years of reseeding completion												
					A fire management plan must be maintained for the mine. Fire belts must be constructed around the boundaries of the mine. Daily fire danger ratings must be viewed and addressed where required. The mine must have equipment, protecting clothing and trained personnel for extinguishing fires.												
					No open fires must be allowed.												
					Once sufficient basal cover has been established, the introduction of species representative of the Sekhukhune Mountain Bushveld vegetation type may commence.												

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
					Introduction of these species should commence through the stages of natural succession, i.e. Pioneer species (grasses, herbaceous species), Secondary species (grasses, small shrubs, and small trees) and Climax state (larger shrubs, large trees). This process will also occur naturally as seeds from the neighbouring Sekhukhune Mountain Bushveld areas are introduced and germinate												
					Certain tree species can be selectively introduced; however consideration will need to be given to rooting depths and soil stability as well as the ability of the trees to establish on the subject area												
		Riparian Habitat	Loss or Impact on NEFPA Sites	-8	No activities are planned within 500m from any NEFPA sites unless authorised. This restriction should be maintained.	-4	CbA	Protect sensitive ecosystems.	Remain within the designated footprints at all times.				x	Location of approved activities.	Appointment of an Independent Environmental Control Officer to assess compliance with the EMP. The SHEQ department should undertake ongoing site monitoring to determine whether activities on site are undertaken in accordance with the EMP Requirements.	ECO and SHEQ Department	ECO: Monthly for the decommissioning phase. . SHEQ: Weekly monitoring
		Hydrology	It is likely that the Khulu TSF will remain, however, the other infrastructure will most likely be removed and rehabilitated.	-10	If possible, the Khulu TSF should be vegetated.	-1	CbA	Final Land Use to have no impact on the surrounding or underlying water resource.	Achieve 100% compliance to the water quality objectives as agreed to between the mine and the DWS based on			x	x	Surface Water Runoff	To ensure a proactive approach, the SHEQ department should undertake ongoing site monitoring to determine	SHEQ Department	Assessments: Weekly. Monitoring: Monthly
					Temporary erosion measures should be employed at exposed areas until vegetated.												
					The topography should be returned to its former state (as far as practically possible).												

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
			Rehabilitation activities can potentially result in exposed soils leading to erosion and sedimentation. Decommissioning activities may impact on the runoff and siltation of watercourses.		Where the slopes have steep gradients due to the surrounding landscape measures should be implemented to assist with the trapping of seeds and to protect the crest from wind erosion The topsoil stockpiles should be used to fill in areas and to create a suitable substrate to re-vegetate areas. If natural succession of vegetation is not established within one rainy season, after rehabilitation, the disturbed areas and areas adjacent to the infrastructural areas must be re-vegetated with an indigenous grass mix, if necessary, to re-establish a protective cover, to minimise soil erosion and dust emission.				the discussions within this report						whether activities on site are undertaken in accordance with the EMP Requirements. The water quality (constituents listed in the WUL) must be monitored monthly and records must be kept of these result in a centralised system. Analysis of results must be undertaken by an accredited laboratory. Monitoring of the effectiveness of the rehabilitation programme must be undertaken. This should be undertaken by means of weekly inspections and keeping a photographic record.		
		Groundwater	Contamination of groundwater resources. This scenario assumes that the TSF and PCD liners will fail after 280 years. In this event, seepage from the TSF and PCD may reach the underlying aquifers at a rate of 0,024m3/d per	-13	Monitoring of groundwater should continue until the rehabilitation activities associated with the new TSF have proven successful. Analyse monitoring results to improve understanding of the conceptual model and risk groundwater contamination. Implement an effective rehabilitation strategy geared at reducing the volume of seepage from the Khulu TSF to the underlying aquifers.	-6	CbA	Protection of groundwater resources	Achieve 100% compliance to the water quality objectives as agreed to between the mine and the DWS based on the discussions within this report	-	-	-	x		Ongoing Monitoring.	SHEQ Department Groundwater specialists	Quarterly groundwater monitoring. Conclusion of the Remediation Project.

Name of Activity	Project		Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities		Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
			ha. The following is concluded from the results of the simulations: • Seepage through the TSF and PCD liners are expected to increase nitrate concentrations in the weathered aquifer underneath the footprint areas. Nitrate concentrations may increase to above 600 mg/l over the footprint areas in the weathered and alluvial aquifers in the long-term. • The nitrate plume is expected to migrate in a north-westerly direction towards the Klein Dwars River in the weathered and alluvial aquifers. At 300 years after mine closure, simulations suggest that it is unlikely that groundwater with nitrate concentrations exceeding 11 mg/l would reach the Klein Dwars River from the		Continue with remediation activities up until groundwater pollution plume has been restricted to agreed demarcation in line with the Groundwater Remediation Project.												
					Keep dirty water containment facilities, including the cut off trench and berm, the liner drainage system and the PCD intact to manage seepage volumes post closure.												

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
			Khulu TSF and PCD to any significant extent. • The effect of liner failure at the Khulu TSF and PCD on the fractured rock aquifer is not expected to add significantly to the pollution load associated with other Dwarsrivier Mine mining and mineral processing activities. • Nitrate concentrations may increase to above 180 mg/l in the fractured rock aquifer as a result of infiltration over the Khulu TSF and PCD footprint areas. This is an estimated 20 mg/l increase in concentration compared to the no project option discussed above. • The nitrate plumes originating from the Khulu TSF and PCD are expected to migrate in a northerly direction along the preferential														

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
			flow paths identified. Contamination along these geological structures is however expected to be dominated by Dwarsrivier Mine mining and mineral processing activities and not significantly as a result of seepage from the Khulu TSF and PCD. • In the long-term, nitrate concentrations in the Farm House borehole could reduce to below 100 mg/l from the anticipated 200 mg/l at the end of the operational phase. This borehole is located along a preferential groundwater flow path, which means that long-term plume migration will result in elevated nitrate in this borehole under the rehabilitation measures implemented. • The nitrate plume is expected to migrate more														

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
			than 900m north outside the Dwarsrivier Mine MRA along the N-S striking in the long-term for this scenario. • Additional measures to reduce nitrate concentrations associated with the plant and historical TSF areas will be investigated and developed as part of the Dwarsrivier Mine Groundwater Remediation Strategy, which will be undertaken in a separate study. These measures will be focussed on the preferential flow paths identified and will be geared at reducing long-term contamination.														
		Heritage	No direct impact.	-	-	-	-	-	-	-	-	-	-				
		Visual	The removal of infrastructure and the rehabilitation of the TSF will visually improve the area.	-10	The removal of infrastructure associated with the TSF should be undertaken. The TSF should be vegetated to blend into the surrounding area.	-5	CbA	Achieving final land use commitments.	Compliance with Closure Plan	-	-	-	x	-	Rehabilitation Plan progress.	SHEQ Department & Engineering Department	Weekly ECO inspections Quarterly Internal Audits Annual External Audits
		Air Quality	All activities associated with	-7	The dust monitoring network and dust suppression	-5	CbA	Remain within the regulated	Recording of dust fall out to				x	Comply with the National	Dust dispersion will be monitored	SHEQ Department.	Monthly Monitoring with

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
			the removal of infrastructure and rehabilitation has the potential to release dust.		programme established during the construction phase of the project will be maintained throughout the closure phase of the mine. With respect to haul road dust levels, it is recommended to limit vehicle speeds, especially during high risk periods of high winds, high temperature and low humidity.			guidelines and limits.	determine trends. Meeting ambient dust fall out limits in terms of applicable NEM:AQA Regulations.				x	Dust Regulations.	as part of the overall mine dust monitoring programme.		Annual Reporting.
		Noise	No direct impact.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Socio-Economic	Unlawful and unscheduled access.	-13	Detailed contracts must be reviewed and implemented to avoid later disputes. These contracts should include the timing of activities and the people who will access the land. All activities should remain within the approved contracts. A list of contact people and responsible parties should be updated	1	CbA	Maintain good relationship with surrounding mines. No impact on economic activities in the area.	Approved operating procedure for the operation of activities. Good relationship with surrounding mines.		x	x	x	Continuation of economic activities in the area resulting from the activities	Maintain ongoing discussions with landowners. Implement penalty systems for non compliance with decommissioning procedures.	Engineering Manager. SHEQ Department	Ongoing Ongoing
Dismantling and decommissioning of infrastructure and buildings	1, 2, 3, 4, 5	Geology	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Topography	Removal of infrastructure may impact on the topography.	-13	Linear Infrastructure constructed by the mine will be removed if it proves to inhibit land use at decommissioning. Where possible infrastructure will remain for social investment opportunities, this will be decided in conjunction with the Integrated Development Plan of the area ant eh local authorities. Ensure the entire site remains fenced for the duration of rehabilitation. Retain security access control to the site for the duration of rehabilitation. All fixed assets that can be profitably removed will be removed for salvage or resale (the salvage and resale value have however not been incorporated into the closure	14	CbA	Lawful removal of all infrastructure. Achieving final land use objectives.	Availability of safe disposal certificates. Free draining environment, with successful self-succession establishment.				x	Waste Disposal Ongoing Rehabilitation	Audits on safe disposal records and inspections at disposal sites. Inspections in terms of compliance with EMP commitments.	SHEQ Department	Monthly inspection of waste disposal records Biannual inspections of disposal sites Weekly inspections of rehabilitation progress.

Name of Activity	Project		Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	**Project**	**Impact Area**	**Potential Impacts**	**SbM**	**Mitigation Measures**	**SaM**	**CvA/R/Ir**	**Performance Objectives**	**Goals**	**ST**	**MT**	**LT**	**LOM**	**Compliance with Standard**	**Functional Requirements for Monitoring**	**Responsibilities**	**Monitoring and Reporting Frequency**
					cost estimate as per the legislative requirements)												
					All surface structures, infrastructure and 'hard surfaces' (inter alia, redundant surfaced roads, parking and paved areas) are to be demolished and removed from the disturbed mine footprint; unless an alternative/continued use for any such items is agreed upon, in writing, with the Department of Mineral Resources (DMR).												
					All surface infrastructure would be demolished and removed to a depth of 500mm. Any infrastructure below 500mm will be sealed, made safe and left in situ.												
					All fences erected around the infrastructure be dismantled and either disposed of at a permitted disposal site or sold off as scrap (provided that these structures will no longer be required by the post mining land owner). Fences erected to cordon off dangerous excavations will remain in place and will be maintained as and when required.												
					Water pollution control structures will remain until the completion of all demolition and associated rehabilitation activities where after these will be rehabilitated.												
		Soil, Land Use and Land Capability	Spills around the diesel storage areas and product stockpiles may result in the contamination of soils.	-11	Draw up a plan clearly defining the area where the removal of infrastructure should take place. Implement the plan with sufficient measures in place not to compact new areas. Any hydrocarbon, effluent or other contaminants should be	-5	CbA	Protection of Soil Integrity.	Zero presence of contaminated land due to early detection and implementation of actions.				x	Soil Integrity	Appointment of an Independent Environmental Control Officer to assess compliance with the EMP. The SHEQ department should undertake	SHEQ Department	Annual External Audit. Daily internal inspections. Recording of incidents when occurring.

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
					collected and the soils remediated immediately.										ongoing site monitoring to determine whether activities on site are undertaken in accordance with the EMP Requirements. This should be undertaken by means of a thorough site visit, record keeping of findings in a checklist format, issuing of non conformances to responsible parties, listing thereof on the Isometrics or similar reporting system and feedback to the management team.		
			Contamination of soils as a result of a lack of sanitary services	-11	Chemical toilets must be readily available to contractors. Licensed companies must be appointed to remove any contaminated material and or wastes to licensed landfill sites.	-5			Zero presence of contaminated land due to early detection and implementation of actions.				x	Soil Integrity	Contracts must be in place for the provision of chemical toilets where required. Removal companies must have the necessary contracts and permits in place.	SHEQ Department	Daily internal inspections Annual review of supply and removal companies contracts and permits.
			Loss of soils due to decommissioning activities present on site.	-11	Draw up a plan clearly defining the area where the removal of infrastructure should take place. Implement the plan with sufficient measures in place not to compact new areas.	-5			Maintaining soil integrity, with successful vegetation establishment.				x	Soil Erosion and incorrect stockpiling of topsoil.	Appointment of an Independent Environmental Control Officer to assess compliance with	Independent ECO and SHEQ Department.	ECO: Annual external audits can be undertaken. SHEQ: Weekly monitoring

Name of Activity	Project		Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
					Desilt the silt traps and the surrounding area that has been affected by removing silt to a depth of 500mm.										the EMP. The SHEQ department should undertake ongoing site monitoring to determine whether activities on site are undertaken in accordance with the EMP Requirements.		
					Remove the liners of the PCD and silt traps and dispose thereof at the correct hazardous waste disposal facility.												
					Remove supporting plints for pipeline as well as foundations of other associated infrastructure. Remaining structures should be demolished to 1m below surface and the demolition rubble removed and any re-usable items should be removed from site.												
					Compacted soils adjacent to the mining blocks and associated infrastructure footprint can be lightly ripped to at least 25 cm below ground surface to alleviate compaction prior to re-vegetation.												
					Soil along the TSF pipeline and at the PCD and Silt Trap should be tested for contamination. If contaminated is discovered, this should be removed and disposed of in the appropriate waste disposal facility.												
					The footprints of the silt traps and PCD should be ripped to at least 200mm.												
					Undertake a Contaminated Land Assessment around areas used for diesel storage and supply to determine whether remediation of the areas is required.												
					Implement a strict penalty fine system for rule breaking with regard to vehicular movement.												
					Maintain clean and dirty water systems and undertake regular									Soil integrity analysis	Assessment of the fertility of Soils	Soil Scientist	Prior to placement of soils.

Name of Activity	Project		Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
					monitoring and maintenance thereof.												
		Ecology	Please refer to the impacts and management measures stipulated under General Rehabilitation.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Riparian Habitat	Impact on wetlands and riparian habitats due to decommissioning activities	-9	Remain at all times outside of the 1:100 year flood line of the watercourses where not authorised. Rehabilitation of affected freshwater resources must ensure that riparian structure and function are reinstated in such a way as to ensure the ongoing functionality of the larger drainage systems at pre-mining levels Ongoing Biodiversity Monitoring should be undertaken at the upstream and downstream points. Ongoing surface water monitoring should be undertaken at the upstream and downstream monitoring points. The storm water management plans should be retained in and around the facilities to ensure that dirty water runoff or water with high sediment loads do not enter the existing watercourses.	-5	CbA	Remain within or approve upon the current Aquatic Health and Water Quality baseline conditions.	Improve upon the current aquatic health and water quality baseline conditions.	x			x	Compliance in terms of the current Water Use License.	Ongoing Biodiversity and water quality assessments.	Aquatic Specialist.	Surface and Biomonitoring in line with the current monitoring programme.
		Hydrology	Erosion control over rehabilitated areas and the prevention of erosion gullies.	-8	The topography of all disturbed areas must be rehabilitated in such a manner that the surrounding natural area blends naturally with the rehabilitated areas well as to be free-draining. This will reduce soil erosion and improve natural re-vegetation.	-6	CbA	Protect the water resources within the area in which the mine operates.	Maintenance of storm water management systems. Meeting the conditions in terms of Section 21c & of the WUL.				x	Surface Water Pollution & Soil Assessments.	To ensure a proactive approach, the SHEQ department should undertake ongoing site monitoring to determine whether activities on site are undertaken in	SHEQ Department	Assessments: Weekly. Monitoring: Monthly
			Contamination of surface water as a result of	-11	The detailed waste management strategy implemented during the	-6	CbA										

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
			removal of infrastructure.		construction and operation phases must be continuously implemented throughout the closure and decommissioning phase.										accordance with the EMP Requirements. The water quality (constituents listed in the WUL) must be monitored monthly and records must be kept of these result in a centralised system. Analysis of results must be undertaken by an accredited laboratory. Monitoring of the effectiveness of the rehabilitation programme must be undertaken. This should be undertaken by means of weekly inspections and keeping a photographic record.		
			Rubble and waste from site could pollute local water resources.	-8	Waste that is not removed from site should be spread, covered and suitably rehabilitated.	-6	CbA										
		Geohydrology	No direct impact	0	-	0	-	-	-	-	-	-	-	-	-	-	-
		Heritage	No direct impact	0	-	0	-	-	-	-	-	-	-	-	-	-	-
		Visual	Fugitive dust emissions as a result of infrastructure removal and associated exposed/bare areas may have an impact in terms of air quality and visual characteristics.	-11	The dust monitoring network and dust suppression programme established during the construction phase of the project will be maintained throughout the closure phase of the mine. With respect to haul road dust levels, it is recommended to limit vehicle speeds, especially during high risk periods of high winds, high temperature and low humidity. Establish and implement a dust suppression plan in consultation with the environmental control	-5	CbA	Remain within the regulated guidelines and limits.	Recording of dust fall out to determine trends.				x	Comply with the National Dust Regulations.	Dust dispersion will be monitored as part of the overall mine dust monitoring programme.	SHEQ Department.	Monthly Monitoring with Annual Reporting.

Name of Activity			**Potential Impacts**		**Mitigation Type**	**Significance**				**Time Period for Implementation**				**Action Plan**			
Activities	**Project**	**Impact Area**	**Potential Impacts**	**SbM**	**Mitigation Measures**	**SaM**	**CvA/R/Ir**	**Performance Objectives**	**Goals**	**ST**	**MT**	**LT**	**LOM**	**Compliance with Standard**	**Functional Requirements for Monitoring**	**Responsibilities**	**Monitoring and Reporting Frequency**
					officer and an air quality specialist as part of the contractor's responsibility.												
		Air Quality	All activities associated with the removal of infrastructure and rehabilitation has the potential to release dust.	-7	The dust monitoring network and dust suppression programme established during the construction phase of the project will be maintained throughout the closure phase of the mine. With respect to haul road dust levels, it is recommended to limit vehicle speeds, especially during high risk periods of high winds, high temperature and low humidity.	-5	CbA	Remain within the regulated guidelines and limits.	Recording of dust fall out to determine trends.				x	Comply with the National Dust Regulations.	Dust dispersion will be monitored as part of the overall mine dust monitoring programme.	SHEQ Department.	Monthly Monitoring with Annual Reporting.
									Meeting ambient dust fall out limits in terms of applicable NEM:AQA Regulations.				x				
		Noise	All activities associated with the removal of infrastructure and rehabilitation has the potential to generate noise.	-7	Decommissioning hours must preferably be limited to daylight day hours e.g., 6 am to 6 pm where possible.	-5	CbA	Remain within the regulated guidelines and limits.	Machinery with low noise levels and maintained in a good order to be used and to comply with the IFC's Health and Safety Regulations.				x	Noise Monitoring.	Adjacent landowners will be informed of the planned dates of the significant demolition activities where applicable. Daily noise monitoring will be undertaken in the areas where high levels of noise take place during decommissioning.	SHEQ Department.	Ongoing consultation with surrounding landowners. Daily noise monitoring.
					Where noise becomes a nuisance, management measures will be investigated and implemented to address these.				Health and Safety Regulations in terms of noise monitoring should be met.				x				
		Social	Disruption and nuisance factors associated with the actual decommissioning such as noise, visual and traffic related impacts.	-7	Local residents, with the focus on the surrounding landowners, should receive accurate information with regards to the project status, timeframes for decommissioning and other relevant information about issues that could influence their daily living and movement patterns.	-5	CbA	Remain within the regulated guidelines and limits.	The community forum established should continue, through which issues can be addressed, and a representative from Khumani should become involved.				x	Ongoing stakeholder consultation	Adjacent landowners will be informed of the planned dates of the significant demolition activities where applicable.	SHEQ Department.	Ongoing consultation with surrounding landowners.
Earth Moving, shaping and	1, 2, 3, 4, 5	Geology	No direct impact	0	-	-	-	-	-	-	-	-	-	-	-	-	-
		Topography	The shaping of the site should	13	Pre-mining topography should be reasonably restored through	14	-	Develop the area to its	Implement an action plan to				x	Final Land use	An operational rehabilitation	SHEQ Department.	Monthly monitoring.

Name of Activity	Project		Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities		Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
ripping of ground			be undertaken in such a manner that it improves the overall topography of the site.		shaping and landscaping, such that the topography of rehabilitated areas will ultimately be commensurate with that of adjacent, non-disturbed areas. The final shaping should be viable to allow for potential agricultural activities and grazing opportunities post mining. If possible ensure a continuation of the premining surface drainage pattern.			intended final land use.	systematically plan for closure.						plan must be implemented and audited by the SHEQ department.		
		Soils	Soil erosion	-12	Re-vegetate as soon as possible	-5	CbA	Develop the area to its intended final land use.	Continuous rehabilitation of the decommissioning area will be conducted in line with the Best Practice Guidelines released by the DWA.			x	x	Soil Erosion and incorrect stockpiling of topsoil.	Erosion protection measures should be implemented and monitored on areas identified. Photographic records of assessments must be kept.	Independent ECO and SHEQ Department.	ECO: Weekly for the decommissioning phase. Thereafter annual external audits can be undertaken. SHEQ: Weekly monitoring Pedologist: Weekly assessment of soil rehabilitation.
			Ripping and topsoil replacement will restore the soil physical characteristics prior to re-vegetation.	13	Compacted soils will be ripped and topsoil will be replaced. After the topsoil has been replaced the area should be ameliorated and seeded, should self-succession of vegetation not take place. Only species indigenous to the area will be included.	14	CbA										
					The soil fertility status should be determined by soil chemical analysis after levelling (before seeding/re-vegetation. Soil amelioration should be done according soil analyses as recommended by a soil specialist, to correct the pH and nutrition status before revegetation.												
					Where sites have been alienated of vegetation or where soils have been compacted or covered with concretes, these sites will be ripped and ploughed.												
					The topsoil and sub-soils with the appropriate seedbed as stripped during the construction and operational phases will be placed over these areas to a depth as specified by a qualified												

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
					specialist. The topsoil shall be appropriately ameliorated to allow vegetation to grow rapidly if required – it should be noted that the mine will encourage self-succession of vegetation, if this does not take place effectively a re-vegetation project will be implemented												
		Terrestrial Ecology (Fauna & Flora)	The rehabilitation of the site will allow reestablishment of natural vegetation.	10	Compacted soils will be ripped and topsoil will be replaced. After the topsoil has been replaced the area should be ameliorated and seeded, should self-succession of vegetation not take place. Only species indigenous to the area will be included. Remove alien vegetation post decommissioning, with long term follow-up afterwards. On-going alien and invasive floral species control is required through all phases of rehabilitation. If a reasonable assessment indicates that the re-establishment of vegetation is unacceptable slow, the soil need to be analysed and any deleterious effects must be corrected and the area be seeded with a seed mix to specification Access to rehabilitated areas should be restricted to vehicles/machinery specifically required for the implementation of the closure plan.	13	CbA	Protect the Ecology within which the mine operates	Free draining environment with successful self-succession in place.			x		Invasion of Weeds and Alien Vegetation.	A weed eradication plan must be implemented on site. This must be undertaken prior to the growing season. A ecological study should be undertaken to determine the status of revegetation on the site especially around the rehabilitated areas.	SHEQ Department and a Specialised Ecologist.	Weed monitoring (monthly); Weed eradication (annually or as required); Ecological Study (annually)
		Hydrology	Runoff from rehabilitated areas will impact on watercourses especially during intensive rainstorms especially if the	-5	The areas will be landscaped to be free draining in line with the approved storm water management plan. Berms, should they be necessary, must remain upstream and downstream of the areas to ensure that clean	13	CbA	Protect the water resources within the area in which the mine operates.	Continuous rehabilitation of the decommissioning area will be conducted in line with the Best Practice	x				Surface Water Pollution & Soil Assessments.	To ensure a proactive approach, the SHEQ department should undertake ongoing site monitoring to determine	SHEQ Department	Assessments: Weekly. Monitoring: Monthly

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	**Project**	**Impact Area**	**Potential Impacts**	**SbM**	**Mitigation Measures**	**SaM**	**CvA/R/Ir**	**Performance Objectives**	**Goals**	**ST**	**MT**	**LT**	**LOM**	**Compliance with Standard**	**Functional Requirements for Monitoring**	**Responsibilities**	**Monitoring and Reporting Frequency**
			area are not free draining.		water is kept separate from dirty water until the area is free draining and re-vegetation has occurred.				Guidelines released by the DWA.						whether activities on site are undertaken in accordance with the EMP Requirements. The water quality (constituents listed in the WUL) must be monitored monthly and records must be kept of these result in a centralised system. Analysis of results must be undertaken by an accredited laboratory. Monitoring of the effectiveness of the rehabilitation programme must be undertaken. This should be undertaken by means of weekly inspections and keeping a photographic record.		
		Geohydrology	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Heritage	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Visual	The rehabilitation (ripping, topsoil replacement and landscaping) will	11	An overall visual improvement will be noticed once all mining related infrastructure has been demolished and the area has	13	CbA	Successful establishment of vegetation.	Remain within the designated area demarcated for activities.				x	Comply with the National Dust Regulations.	Dust dispersion will be monitored as part of the overall mine dust	SHEQ Department.	Monthly Monitoring with Annual Reporting.

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
			remove the visual incongruity.		been landscaped and re-vegetated.				Remain within the National Environmental Management: Air Quality Act, 2004 Dust Regulation guidelines for rural communities.						monitoring programme.		
					Demarcate the decommissioning area and limit the decommissioning activities as far as possible.												
					Final shaping will be implemented such that the final profile of the rehabilitated areas are formed to emulate natural contours of the area.												
					Foundations will be removed to a depth of 500cm below the surface and the area rehabilitated.									Vegetation Establishment.	An ecological study should be undertaken to determine the status of revegetation on the site especially around the rehabilitated areas.	SHEQ Department	Monthly
					All material recovered from the demolition of buildings and/or structures will either be transported to a permitted disposal site, or made available to the local community as building materials (provided they are in a satisfactory condition following demolition).												
					Linear infrastructure constructed by the mine (i.e. roads, conveyors and power lines) will be removed if it proves to inhibit land use at decommissioning.												
					All fences erected around the mine will be dismantled and disposed of at a permitted disposal site.												
		Air Quality	All activities associated with the removal of infrastructure	-7	Dust sampling will be undertaken on a monthly basis.	-5	CbA	No concerns raised by surrounding landowners	Remain within the designated area demarcated for activities.	x			x	Dust dispersion.	Dust dispersion will be monitored as part of the overall mine dust	SHEQ Department.	Monthly Monitoring with Annual Reporting.
					Monthly monitoring reports will be generated by the mine or												

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
			has the potential to release dust.		through a suitably qualified air quality specialist. In the event that air quality or dust issues are identified based on the monitoring programme, an independent specialist should be appointed to determine the best course of action to ameliorate the situation.			regarding air quality.	Remain within the National Environmental Management: Air Quality Act, 2004 Dust Regulation guidelines for rural communities.						monitoring programme.		
		Noise	All activities associated with the removal of infrastructure and rehabilitation has the potential to generate noise.	-4	The removal of all infrastructure is to take place during daytime periods only. Where noise becomes a nuisance, management measures will be investigated and implemented to address these. Machinery with low noise levels and maintained in a good order to be used and to comply with the IFC's Health and Safety Regulations. Speed control measures will be implemented by the mine through the placement of adequate signage. Implement a penalty system for non-compliance to speed control measures and ensure that all workers are made aware of the penalty systems. Gravel roads to be maintained in as good and smooth a condition as possible.	-5	CbA	No concerns raised by surrounding landowners regarding air quality.	Remain within the designated area demarcated for activities. Remain within the National Environmental Management: Air Quality Act, 2004 Dust Regulation guidelines for rural communities.	x			x	Noise Monitoring.	Adjacent landowners will be informed of the planned dates of the significant demolition activities where applicable. Daily noise monitoring will be undertaken in the areas where high levels of noise take place during decommissioning.	SHEQ Department.	Ongoing consultation with surrounding landowners. Daily noise monitoring.
		Social	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cessation of Labour Contracts	All	Geology	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Topography	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Soil, Land Use and Land Capability	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Terrestrial Ecology (Fauna & Flora)	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
		Wetland	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Hydrology	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Geohydrology	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Heritage	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Visual	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Air Quality	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Noise	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Socio-Economic	Infrastructure areas could benefit the local community.	-15	Instead of demolition of certain areas, these areas could be sold off as commercial property for use in the local community. All surface structures, infrastructure and 'hard surfaces' (inter alia, redundant surfaced roads, parking and paved areas) are to be demolished and removed from the disturbed mine footprint; unless an alternative/continued use for any such items is agreed upon, in writing, with the Department of Mineral Resources (DMR).	14	CbA	Optimally utilise buildings and infrastructure.	Safe disposal and lawful operation of infrastructure.	x			x	Socio-Economic Character	Engage in consultation with municipalities and local industries to determine the need and recycling of existing infrastructure.	SHEQ Department.	Ongoing consultation prior to demolition.
			At this stage, the life of mine is anticipated to be 25 which can be extended by the implementation of the projects. Possible social impacts to be experienced during decommissioning (closure of the mine) could include the following: • Job losses due to mine closure; • Decline in the sustainability of the local economy as a	-13	The mine should continue with the skills development programme and Social and Labour Plan commitments to empower the workforce to undertake other economically viable activities.	-11	CbA	Ensuring successful skills development to allow for continued economically active people and opportunities in the area post mining.	Successful implementation of skills development and opportunities on site.		x	x	x	Socio-Economic Character	Compliance with the Social and Labour Plan.	HR Department	Biannually up until closure has been achieved.
					As decommissioning or the replacement of the infrastructure is likely to only take place within approximately 25 years, it is recommended that a detailed Social Impact Assessment be undertaken then to determine the actual impacts on the changing social environment at that stage.												

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
			result of the loss of employment, household income and capital investments; • Reduced economic activities within the area with subsequent negative impacts on smaller businesses; • A decline in the local economy would also have a direct impact on the financial status of the affected local municipalities. This, and the fact that one of the key role players, such as the mine, falls away, would seriously impede the municipality in exercising its functions in terms of strengthening the Local Economic Development (LED) process; • Negative impact on the revenue base of the local municipalities; • Population changes and 'outflux' of people from the area; • Negative		· In the event of downscaling and subsequent retrenchments, plans should be developed to put measures in place to assist the affected employees to find alternative forms of employment to limit the negative socio-economic impacts in this regard. · Low risk land-uses to be implemented that would avoid any potential health risks, but that would support livelihood and access to land. · Possible surface and groundwater pollution must be avoided in order to avoid regional negative impacts and impacts on nearby mines that continue to operate. · Rehabilitation according to best practices are imperative to avoid windblown dust, water pollution, land degradation and land instability. · The development of a post closure water management and monitoring strategy must receive priority. Closure strategies must be developed to ensure collaboration between Dwarsrivier Mine, the other mines operating in the area and various stakeholders (landowners, municipality, business, community leaders and so forth) in ensuring environmental sustainability and socioeconomic mitigation plans during and post mine closure.												

Name of Activity	Project		Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities		Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
			impact on the social fabric and social networks; • A new class of jobseekers targeting other mines in the area; • Inflow of illegal miners creating social, safety, economic and legal problems and risks; • Decrease in the quality of life of the surrounding communities due to the discontinuation of social development support and local economic development programmes; • Possible relocation of families; • Negative impacts on the local schools; • Skilled workers moving out of the area in search of employment elsewhere; • Negative impact on infrastructure development and maintenance; • A change in community infrastructure; • A change in the industrial focus														

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
			of the area; • Disruptions and nuisance factors associated with the actual decommissioning such as noise, visual and traffic related impacts; • Increased safety risks associated with the decommissioning of the infrastructure; • Possible negative impact on the crime levels due to increased unemployment rate; • Possibility of additional temporary job creation during the decommissioning phase; • Remnants of possible environmental impacts; and • Remaining visual impact as a result of mining.														
Waste Management and decommissioning of hazardous (also fuels) substances	All	Geology	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Topography	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Soil, Land Use and Land Capability	Spills around the diesel storage areas and product stockpiles may result in the	-11	Any hydrocarbon, effluent or other contaminants should be collected and the soils remediated immediately.	-5	R	Protection of Soil Integrity to achieve final land use objectives.	Zero presence of contaminated land due to early detection and implementation of actions.		x	x	x	Protection of Soil Resources.	Compliance with contaminated land objectives and limits.	SHEQ Department	Ongoing

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	**Project**	**Impact Area**	**Potential Impacts**	**SbM**	**Mitigation Measures**	**SaM**	**CvA/R/Ir**	**Performance Objectives**	**Goals**	**ST**	**MT**	**LT**	**LOM**	**Compliance with Standard**	**Functional Requirements for Monitoring**	**Responsibilities**	**Monitoring and Reporting Frequency**
			contamination of soils.		A contaminated land assessment should be undertaken at all areas where diesel was stored, as well as where fuel pipelines were placed.												
		Terrestrial Ecology (Fauna & Flora)	No additional impact.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Wetland	No additional impact.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Groundwater	Handling or Hazardous Waste within workshops and general mine area.	-10	Clean and Dirty water separation systems should be incorporated in terms of the 2016 SWMP or any approved update thereafter.	-6	CbA	Protect the groundwater resources to ensure that limited to no impact on groundwater resources occur as a result of the mining operations.	Achieve 100% compliance to the water quality objectives as agreed to between the mine and the DWS based on the discussions within this IWWMP.		x		x	Groundwater Pollution and potential trends.	The groundwater quality (constituents listed in the WUL) must be monitored monthly and records must be kept of these result in a centralised system. Analysis of results must be undertaken by an accredited laboratory	SHEQ Department	Quarterly (construction); Biannually (after construction)
					Waste management training must be implemented on site.												
					Clear signs informing staff of waste management practices must be implemented on site.				Maintain a 100% safe disposal record on the disposal of hazardous waste.				x				
					Hazardous waste handling should only take place within bunded and/or lined areas.												
					Hazardous waste should be removed by a licenced removal company and taken to a suitable and licenced landfill site.												
					Documentation of removal and safe disposal must be available on site.												
			Handling of Building Rubble	-9	All infrastructure will be removed and rehabilitated, should no alternative use be found for the structures.	-6	CbA										
					Foundations will be removed to a depth of 500cm below surface.												
					All building rubble will follow the waste hierarchy and will therefore either be sold for reuse where possible and as a				Implement and operate a detailed waste manifest on site			x	x				

Name of Activity	Project		Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
					last option be disposed of at a licensed facility suitable for such waste.				and maintain a 100% safe disposal record on the disposal of waste on site.								
			Handling and Storing of Domestic Waste	-12	Clean and Dirty water separation systems should be maintained.	-9	CbA		Achieve 100% compliance to the water quality objectives as agreed to between the mine and the DWS based on the discussions within this IWWMP.		x		x				
					Waste management training must be implemented on site.												
					Clear signs informing staff of waste management practices must be implemented on site.				Maintain a 100% compliance with the conditions of the ECA permit for the landfill site.				x				
					Groundwater monitoring must be undertaken in such a manner as to ensure that any potential impacts from the site can be detected.												
					Recycling practices must be investigated and implemented on site.				Maintain a 100% accurate recording of waste and submission of such recording to the Department.				x				
									Maintain daily covering of the landfill site.	x			x				
		Surface Water	Handling of Hazardous Waste within workshops and general mine area could contaminate the dirty water storage areas. The water is then reused in the system and could have impacts on	-11	Clean and Dirty water separation systems should be maintained up until closure.	-6	CbA	Develop the area to its intended final land use.	Maintain the SWMP on site.				x	Surface Water Pollution & Soil Assessments.	To ensure a proactive approach, the SHEQ department should undertake ongoing site monitoring to determine whether activities on site are undertaken in accordance with the EMP	SHEQ Department	Assessments: Weekly. Monitoring: Monthly
					Waste management training must be implemented on site.				Maintain a 100% no-spill record.				x				
					Clear signs informing staff of waste management practices must be implemented on site.				Clean spills, if occur witan 24 hours.				x				
					Hazardous waste handling should only take place within bunded and/or lined areas.				Maintain a 100% safe disposal record on the disposal of hazardous waste.				x				

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
			the integrity of the storm water system and also the production..		Hazardous waste and contaminated materials should be removed by a licenced removal company and taken to a suitable and licenced landfill site.										Requirements. The water quality (constituents listed in the WUL) of the dam must be monitored monthly and records must be kept of these result in a centralised system. Analysis of results must be undertaken by an accredited laboratory.		
					Documentation of removal and safe disposal must be available on site.				Provide training to all staff on best practices regarding waste management every year.	x			x				
					Weekly inspections of Storm Water Management Systems must be undertaken. Any blockages or maintenance requirements must be documented and an action plan developed.												
			Handling and Storing of Domestic Waste should have no impact on the surface water resources due to the location of the facility. However, incorrect disposal of waste could hamper the integrity of the storm water system.		Clean and Dirty water separation systems should be maintained up until closure.												
					Waste management training must be implemented on site.												
					Weekly inspections of Storm Water Management Systems must be undertaken. Any blockages or maintenance requirements must be documented and an action plan developed.				Maintain a 100% compliance with the conditions of the ECA permit for the landfill site.	x			x				
					Clear signs informing staff of waste management practices must be implemented on site.												
				-9	Recycling practices must be investigated and implemented on site.	-5	CbA										
					Building rubble must be disposed of in line with the requirements of the NEMWA.				Maintain daily covering of the landfill site up until final covering.	x			x				
					Access control must be strictly enforced.				Self-succession of vegetation should establish within the first rainy season after	x			x				

Name of Activity			Potential Impacts		Mitigation Type	Significance				Time Period for Implementation				Action Plan			
Activities	Project	Impact Area	Potential Impacts	SbM	Mitigation Measures	SaM	CvA/R/Ir	Performance Objectives	Goals	ST	MT	LT	LOM	Compliance with Standard	Functional Requirements for Monitoring	Responsibilities	Monitoring and Reporting Frequency
									construction has been completed.								
		Air Quality	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Heritage	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Visual	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Air Quality	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Noise	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Social	No direct impact	-	-	-	-	-	-	-	-	-	-	-	-	-	-

1.d.ix Impact Management Outcomes

Please refer to Table 89 to Table 92Table 89 for the impact management outcomes.

1.d.x Impact Management Actions

Please refer to Table 89 to Table 92 for the impact management outcomes. In addition to the actions identified, the following recommended Storm Water management Measures should be considered for implementation. The recommended Closure Action Plan as presented in past EMPr's and where required updated for this project is presented under Section 1.e.i.3 of the EMPr.

1.d.x.1 Conceptual Storm Water Management Plan

The purpose of the conceptual Stormwater Management Plan (SWMP) is to ensure that clean and dirty water are adequately separated, by diverting clean water away from dirty areas, and ensuring that dirty water is captured, contained and managed appropriately in accordance with GN704 regulations and the DWS Best Practice Guideline G1: Storm Water Management.

1.d.x.1.a Clean and Dirty Areas

The following should be managed as dirty areas:

- Khulu TSF footprint area; and
- Diesel and emulsion batching areas.

The main parking extension, widening of the access road and access crossing below the regional road will only require temporary measures while construction is taking place. The areas surrounding the above-mentioned dirty areas should be managed as clean areas.

1.d.x.1.b Khulu TSF

A design has been developed for the Khulu TSF by Jones & Wagner. This design makes provision for the following.

<u>Clean water diversion canal</u>

Clean stormwater draining towards the TSF and the PCD will be diverted around the facilities by means of canals and berms. A V-drain will be provided along the service roads to collect stormwater runoff generated between the clean water diversion canals (and berms) and the service road. Clean stormwater generated from the catchment southeast of the TSF drains towards the northwest in the direction of the TSF. To manage this water, a clean water diversion canal will be constructed to collect and divert the water towards the northern side. Stormwater generated from the catchment south of the TSF drains in a northern direction towards the TSF and will be diverted via a diversion berm towards the western side. The diverted water will flow towards the existing culverts provided along the Richmond road. Based on the catchment assessment, the catchment draining towards the Richmond road culverts will be greatly reduced due to the construction of the new infrastructure. Due to this the flow to the culverts post construction will be less than the flows prior to construction. The clean stormwater diversion system is indicated on Drawing No. I031-10-001 and 002.

The 2021 Hydrological Study provided the following further input:

Figure 94 shows the proposed clean water diversion trench design. It is proposed that the clean water trench is trapezoidal in shape, vegetated with natural occurring grass, and has side slopes of 1V:2H.

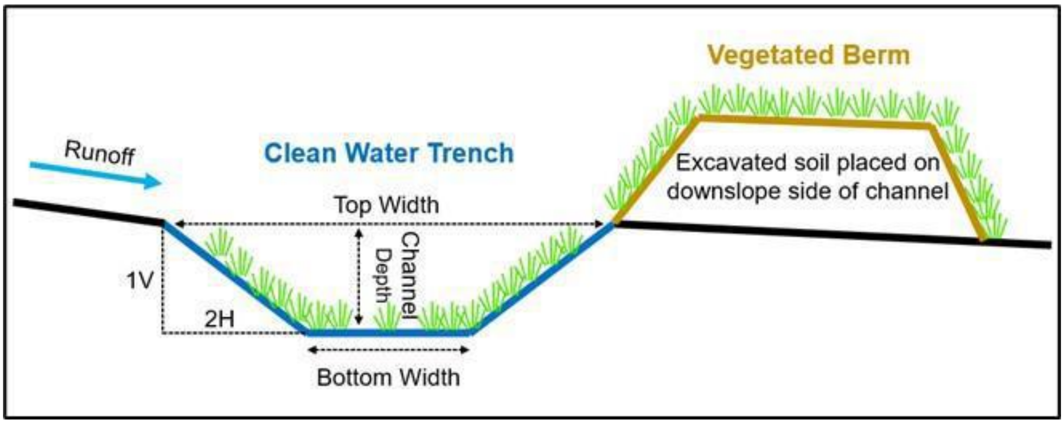


Figure 94: Proposed Khulu TSF clean water diversion trench design

The Soil Conservation Service (SCS) method (Schmidt and Schulze, 1987) was used to determine the 1:50 year 24 hour peak flow for the clean water catchment. The Manning Equation (SANRAL, 2013) was used to calculate the trench size to convey the 1:50 year peak flow as required by GN704 regulations. The table below provides the proposed clean water diversion trench sizing.

Table 93: Proposed Khulu TSF clean water diversion trench sizing

Catchment Area (km^2)	1:50 Year 24 Hour Peak Flow (m^3/s)	Bottom Width (m)	Top Width (m)	Channel Depth (m)	Length (m)
0.48	8.5	1	5	1	1 075

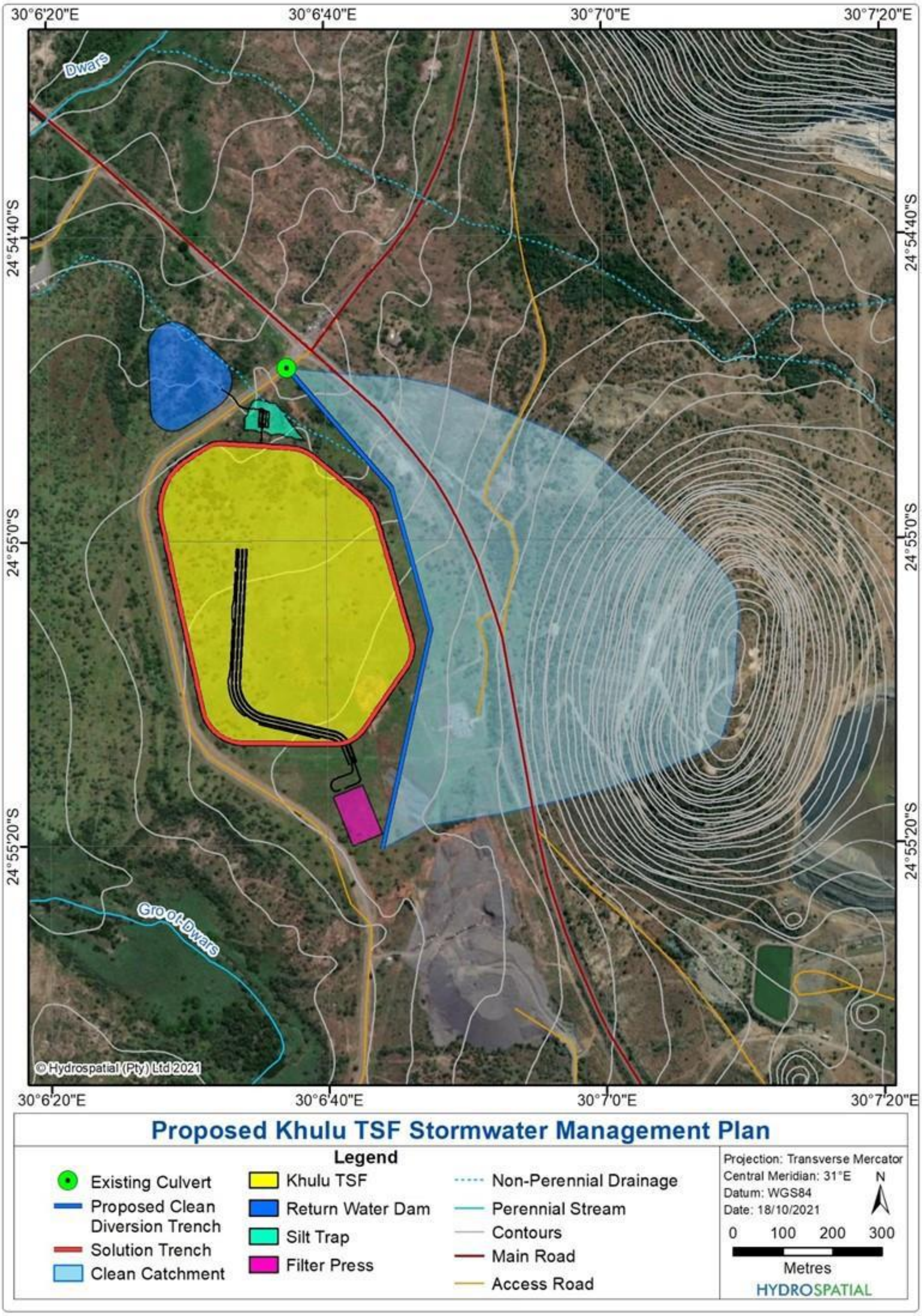


Figure 95: Proposed Khulu TSF stormwater management plan

Dirty water management

Dirty water canal

A dirty water collection canal will be constructed around the TSF. The canal will collect affected stormwater run-off generated from the TSF and any possible seepage from the above and below liner drains (refer to Drawing No. I031-10-001). Water collected in the dirty water canal will flow to a silt trap on the northern side of the TSF. The dirty water canal will be lined with concrete. The canal was sized to accommodate flows generated from the 1 in 50 year peak storm event of 5.2 m3 /s. The maximum discharge on dirty water canal is less than the 8.63 m3 /s which is the combined (from the east and western side of the TSF) maximum discharge to the silt trap during the 1 in 50 year peak storm event. The canal is trapezoidal with an invert width of 1m and 1V:1.5H side slopes. The maximum flow depth in the canal including freeboard was calculated to be 1.2m.

Bench drains

Drain pipes will be provided to drain stormwater generated from the top of the TSF and from the benches to the dirty water canal provided along the toe of the TSF. The top of the TSF will be shaped to drain towards the outer perimeter. An Operations and Maintenance Manual (OMM) will be compiled and will detail the development of the TSF to ensure that the design intent of the water management infrastructure is met. Stormwater generated from the slopes will drain and collect along the inside toe of the benches. The benches will also be sloped towards the inside to facilitate the collection of the stormwater. Water collected on the benches will flow along the inside toe to inlets that will be provided at specified location around the TSF. Pipes will be provided from the inlet to the next bench and finally to the stormwater canal. A detail of the bench drains is shown on Drawing No. I031-10-002.8.4.3

Silt trap

An earthworks platform is provided on the northern side of the TSF where a concrete silt trap will be constructed. A ramp will be constructed to link the service road provided around the TSF and the silt trap platform. Stormwater runoff generated from the TSF will be conveyed to the silt trap via the dirty water canal that is provided around the TSF. The silt trap is designed to settle suspended tailings solids that will wash away from the TSF surface with the runoff during storms. The silt trap was sized to settle chromite (SG of 3.53) silt particles with a minimum diameter (or equivalent for irregular shaped particles) of 0.05 mm during a 1 in 2 year peak storm event of 1.0m^3/s. The silt trap was sized according to Stoke’s law which determines the falling velocity of suspension particles falling through a fluid. The length and width of the silt trap were calculated to ensure that the design particles settle to the bottom of the silt trap bay before the flow reaches the end of the silt trap. The silt trap will have the following characteristics:

- Two settling compartments each 8.5 m wide by 36 m long. The operational depth of the silt trap bays is limited to 600 mm.
- A bypass canal between the settling bays to accommodate higher flows. The bypass channel was sized to accommodate flows for the peak discharge generated from up to the 1 in 50 year storm events. The higher flows will bypass the silt trap and flow directly to the PCD.
- A access ramp to each of the silt trap compartments. The ramps will allow cleaning equipment to access the silt trap to remove the settled silt.
- A sludge drying pad to temporary store wet silt removed from the silt trap for drying before collection if required. A clean water diversion drain will be provided at the toe of the silt trap platform to divert clean water around the platform as shown on Drawing No. I031-10-001. Stormwater generated from the platform will be clean and hence provision is made for the water to be released to the environment. This water will be collected via a side drain provided along the perimeter of the platform with outlets into the clean water diversion at the toe of the platform (refer to Drawing No. I031-10-001).

Richmond road culvert

The PCD will be located opposite the TSF and across the Richmond road. A new culvert will be constructed across the Richmond road to convey dirty water from the silt trap to the PCD. The culvert will consist of four 1200 mm wide by 900 mm high rectangular concrete culvert units as shown on Drawing No. I031-10-001. The outlet headwall (PCD side) of the culvert will be constructed above an existing water supply pipeline (Lebalelo pipeline) which belong to others. It is proposed to encase the pipeline in concrete to protect it before the construction of the culvert outlet headwall commences.

1.d.x.1.c Diesel and Emulsion Batching Area

The diesel batching area will involve the storage of two horizontal, aboveground diesel tanks of 33 m^3 each (as well as a possible future 22m^3 tank), a 40m^3 API self-bunded tank (Isotainer) for Hydraulic Oil and a 20 m^3 API self-bunded tank for Lube Oil. This will be a total combined storage of 148 m^3. An access road of approximately 55 m in length and 6 m in width, to the Diesel Batching area will be required.

The surface location of the emulsion batching area will only be used for the transfer of emulsion from a designated road tanker, via the off-loading pipeline to underground storage tanks. A total of 60 tons (60 m^3) of emulsion product is proposed to be stored underground. Emulsion will not be stored on surface. An access road of approximately 80m in length and 6m in width, to the Emulsion Batching area will be required.

Figure 96 indicates the proposed diesel and emulsion batching areas and access roads. The following stormwater measures are proposed:

- Clean diversion berms are constructed on the upslope side, to divert any unnecessary clean water from flowing through the proposed diesel and emulsion batching areas;
- All diesel tanks must be appropriately bunded. The bunds should have sufficient capacity to contain 110 % of the diesel tank storage capacity and should be operated empty at all times;
- The area where the transfer of emulsion from the tanker will take place, should be on an impermeable hard surface area, that is sloped to a sump, to capture any possible spills; and
- Erosion measures such as hessian nets should be employed around the proposed access roads when construction is taking place.

1.d.x.1.d Main Parking Extension, Access Road Widening and Subway Crossing

Figure 97 indicates the proposed main parking extension, access road widening and subway crossing. All three of the proposed projects are located outside of the 1:100 year floodline and should therefore not be at risk of flooding, however, they are located within a 100 m horizontal distance from a watercourse, and therefore, a GN704 exemption will be required. The following measures are proposed during construction:

- Vegetation clearance should be kept to absolute minimum; and
- Erosion measures such as hessian nets should be employed around working areas when construction is taking place.

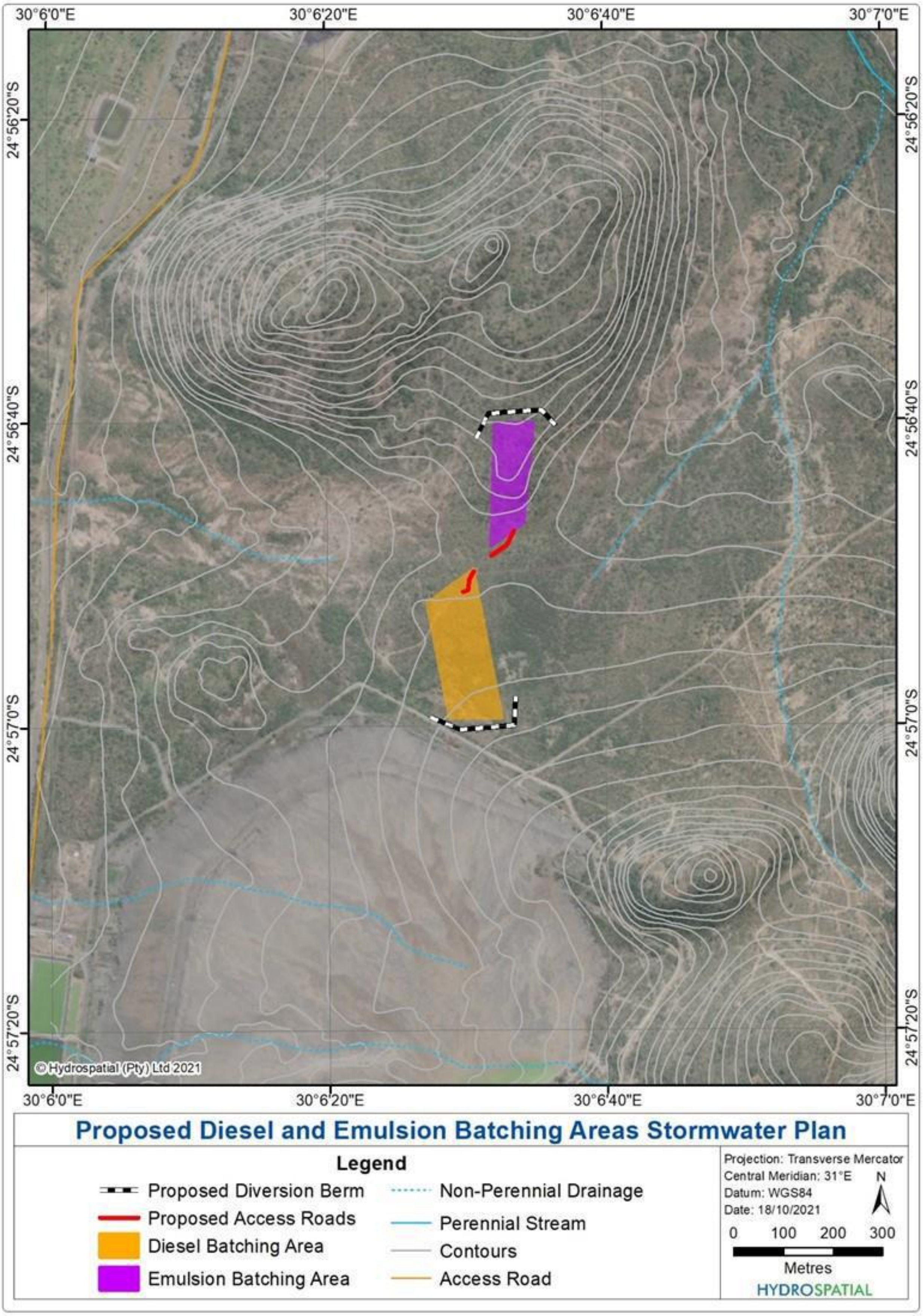


Figure 96: Proposed diesel and emulsion batching areas

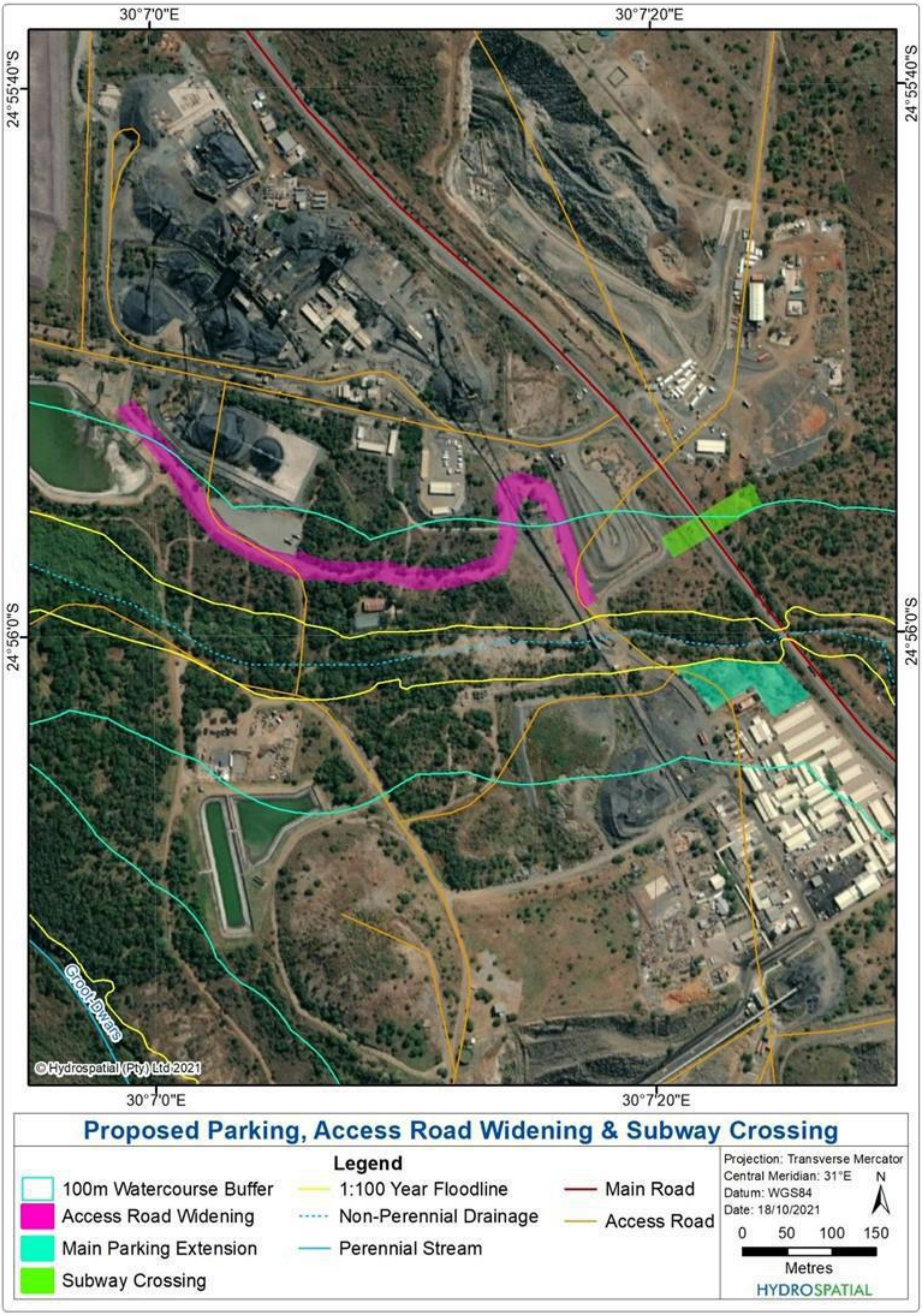


Figure 97: Proposed main parking extension, access road widening and subway crossing

1.e Financial Provision

1.e.i Determination of Financial Provision

1.e.i.1 Describe the closure objectives and the extent to which they have been aligned to the baseline environment described under Regulation 22(2)(d) as described in 2.4 herein

The closure objectives of this project, therefore, will tie into the overall mine's closure objectives, which includes:

- To operate within the enviro-legal ambits of South Africa.
- To be aware of the latest environmental legal requirements.
- Limit the impact of the activities on the ecological setting of the area.
- Operate the water management circuit on site to increase mining efficiency and reduce the need for maintenance of these facilities.
- Limit the loss of soils as far as possible and ensure that the integrity remains during stockpiling for the purposes of successful rehabilitation.
- Remain within the designated area demarcated for activities.
- Remain within the NEM:AQA Dust Regulation guidelines for rural communities.
- Protect heritage resources for future generations.
- Protect the groundwater resources to ensure that limited to no impact on groundwater resources occur as a result of the activities associated with the proposed project.
- Follow the waste hierarchy approach.
- Protect the integrity of the clean and dirty water system.
- Return the area to its intended final land use.

The closure objectives have been developed to reach the final land use as defined in the mine's Rehabilitation Plan, December 2016. The overall objectives of the closure plan are to achieve the following:

"The proposed final land use would be to return the area to wilderness area. This would include demolishing all infrastructure that will not be handed over to a third party and promoting the growth of the surrounding Sekhukhune Mountain Bushveld species. It is evident that the re-establishment of this vegetation biome on site will not be difficult as areas that have already undergone rehabilitation have seen a large success in terms of the revegetation."

Please refer to the previous section and Table 89 to Table 92 providing a detailed description of the management objectives and the standards required to be achieved.

1.e.i.2 Confirm specifically that the environmental objectives in relation to closure have been consulted with landowner and interested and affected parties

Please refer to Part A, for the detailed discussion regarding I&AP Consultation. The detailed issues and response report is attached to Annexure 4. The draft EIA report and EMPr will be made available electronically to all stakeholders and in hard copy to all commenting authorities.

1.e.i.3 Provide a rehabilitation plan that describes and shows the scale and aerial extent of the main mining activities, including the anticipated mining area at the time of closure

As presented in Part A of this document, the following table presents the key closure requirements:

The following table specifically highlights closure actions important to the proposed activities:

Table 94: Summary of Rehabilitation and Closure Actions

Target Area	Main Actions
Roads and Parking Areas	Mine roads that are not needed for closure and post-closure uses at the site (e.g. security and monitoring) will be closed; Removal of all signage, fencing, shade structures, traffic barriers, etc.; All 'hard top' surfaces to be ripped and bitumen/concrete removed along with any culverts and concrete structures; All concrete lined drainage channels and sumps will be demolished and removed; All potentially contaminated soils are to be identified and should be removed and remediated; All haul roads that have been treated with saline dust suppression water need to be treated as "sealed" roads with the upper surface ripped and removed to designated contaminant disposal areas; Monitor and maintain vegetation establishment; and Remove alien invasive vegetation; and Prevent access of people/machinery/vehicles/grazing animals on newly rehabilitated land to allow regeneration of vegetation and reduce erosion.
Linear infrastructure	All power and water services to be disconnected and certified as safe prior to commencement of any demolition works; Conveyor belts to be removed, cut up and disposed offsite; Salvageable equipment will be removed and transported offsite prior to the commencement of demolition; Concrete slabs and footings will be broken and buried on site. The concrete (and metal) will be broken up and disposed of in the box cut; Monitor and maintain vegetation establishment; and Remove alien invasive vegetation; and Prevent access of people/machinery/vehicles/grazing animals on newly rehabilitated land to allow regeneration of vegetation and reduce erosion.
PCD, Silt Traps, Water Pipelines (silt traps if required at the truck parking area and water pipelines to and from the reservoir)	Desilt the silt traps and the surrounding area that has been affected by removing silt to a depth of 500 mm; Remove liners – these should be disposed of at the correct hazardous waste disposal facility; Doze the dam walls; Remove supporting plinths for pipeline as well as foundations and other associated infrastructure; Remaining structures should be demolished to 1 m below surface and the demolition rubble removed and any re-usable items should be removed from the site; Soil should be tested for contamination; If contamination is discovered, this soil should be removed and disposed of in the appropriate waste disposal facility; The footprints of dams must be ripped to 200 mm; Appropriate topsoil sourced from the topsoil stockpiles should be replaced to a minimum thickness of 300 mm on the rehabilitated areas; Monitor and maintain vegetation establishment; and Remove alien invasive vegetation; and Prevent access of people/machinery/vehicles/grazing animals on newly rehabilitated land to allow regeneration of vegetation and reduce erosion.
TSF	Where possible remove tailings for beneficial processing, to reduce volumes of waste stored on site; The surface of the TSF will be capped using a layer of compacted soils overlain by hydroseeded topsoil; Facilitate drainage from upper slopes of TSF to storm water channels. Bench drains will be constructed along the current benches to collect stormwater draining down the rehabilitated slope of the TSF. The bench drains will be shaped to drain towards riprap-lined down chutes that will be provided to convey stormwater down to the toe; Conduct routing of storm water flow along TSF toe; The dirty water canal that will be provided during the operation of the TSF will be rehabilitated. Establish vegetation on TSF as per engineering designs; Remove alien invasive vegetation; and Prevent access of people/machinery/vehicles/grazing animals on newly rehabilitated land to allow regeneration of vegetation and reduce erosion.
Diesel Storage Tanks	Remove diesel tanks (by owner) and associated infrastructure from site (it is assumed that all potential contamination is removed during operations); Thereafter, demolish concrete bund wall and dispose of contaminated material at a hazardous waste facility; Once the site has been cleared of all infrastructure and rubble and no contamination is present, the exposed area should be reshaped to create a gently sloping, free-draining topography; Monitor and maintain vegetation establishment; and Remove alien invasive vegetation; and Prevent access of people/machinery/vehicles/grazing animals on newly rehabilitated land to allow regeneration of vegetation and reduce erosion.

Target Area	Main Actions
Topsoil Stockpiles	Use topsoil material as part of rehabilitation activities; The stockpile footprint area should be ripped to alleviate compaction and to assist with vegetation establishment; Monitor and maintain vegetation establishment; and Remove alien invasive vegetation.

The following figure presents the current closure layout – indicating that the Dwarsrivier Mine area, post mining will revert to Wilderness land – this will be extrapolated to the current project areas, as the objectives as approved in the current rehabilitation plans will be superimposed on these projects:

Figure 98: 2019 Rehabilitation Plan layout

1.e.i.4 Explain why it can be confirmed that the rehabilitation plan is compatible with the closure objectives.

The rehabilitation requirements stipulated in this EMPr is based on current approved closure conditions as approved in the mine's overall approved EMPr, as well as the input of various specialist studies as discussed in this report.

The rehabilitation measures requires:

- Removal of infrastructure;
- Rehabilitation and capping of the TSF;
- Sloping of areas to be free draining where possible;
- Replacement of topsoil;
- Allowance for self-succession, but where this is not possible, the implementation of a revegetation programme.

Digby Wells Environmental updated the closure costs assessment based on the regulatory requirements encapsulated in the MPRDA for the current closure scenario (unscheduled closure). The quantities calculated and presented in the DMRE model are based on previous assessment undertaken and the site verification visit undertaken in June 2020.

According to the 2018 Financial Provision Report, which was updated by Digby Wells Environmental, during 2019 and 2020. Successful closure depends on setting, continually reviewing and validating and finally meeting closure goals that align with company and stakeholder requirements. There should be minimal residual risk to the environment, and the community should realise benefits that will continue to exist without further involvement from the company. This philosophy was considered in the development of the financial provision for the current mine, life of mine and proposed projects.

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

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

The above vision has been incorporated in the development of the management measures for the proposed projects.

Digby Wells Environmental updated the financial provision during 2020 and compiled a closure cost model using Microsoft Excel and focussing on the DMRE Guideline Document mine classification and weightings:

- The mine is classified as Primary Risk Class A (Chrome Mine, comprising of a Mine, Mine Waste, Plant and Plant Waste);
- High Sensitivity Criteria in terms of Biophysical, Social and Economic considerations;
- Located in an Undulating Terrain, rendering a Weighting Factor 1 of 1.1;
- Located in a Peri-Urban area, rending a Weighting Factor 2 of 1.05.

The closure cost model consists of an input sheet, containing measurements of the infrastructure, a standard rate sheet and a summary sheet, which summarises the costs for closure. The closure cost model calculates the cost of demolishing, removing and rehabilitating each component of the mining area infrastructure. This model was updated with CPI inflation of 5.9% (December 2020 to December 2021) and utilised in the calculation of the proposed project's financial provision requirements.

1.e.i.5 Calculate and state the quantum of the financial provision required to manage and rehabilitate the environment in accordance with the applicable guideline

The current calculated closure cost for the overall mine amounts to R 14 764 470,92 (excluding VAT) (excluding P&Gs, Contingencies and VAT). The cost is derived from utilising the Master Rates as submitted with the accepted 2020 Financial Provision Report, including the CPI inflation of 5.9%;

- Obtainable extent of areas, based on the design drawings of the TSF (JW, 2021);
- KMZ drawings for the Project 2 to 5.

1.e.i.6 Confirm that the financial provision will be provided as determined.

It is hereby confirmed that the financial provision will be provided as determined. The mine has a guarantee in place to cater for the financial provision of rehabilitation activities. This is assessed annually to ensure that suitable funds are available. The next assessment will be undertaken in 2022 and annually thereafter.

All areas disturbed will be included in the financial provision as calculated during the annual evaluation and will be updated and provided for annually as per the required Regulations.

1.f Mechanisms for monitoring compliance with and performance assessment against the EMPr and reporting thereon

The following sections present the monitoring requirements of the mine as presented in the 2018 approved EMPr and still relevant.

1.f.i Heritage Monitoring

Ideally, site monitoring should be conducted by an experienced archaeologist or heritage specialist. Day to day monitoring can be conducted by the Environmental Control Officers (ECO). The ECO or other responsible persons should be trained along the following lines:

- Induction training: Responsible staff identified by the developer should attend a short course on heritage management and identification of heritage resources.
- Site monitoring and watching brief: As most heritage resources occur below surface, all earth-moving activities need to be routinely monitored in case of accidental discoveries. The greatest potential impacts are the initial soil removal and subsequent earthworks during construction. The ECO should monitor all such activities daily. If any heritage resources are found, the chance finds procedure must be followed as outlined above.

Table 95: Heritage Monitoring

Aspect	Area	Responsible Person	Frequency	Proactive or reactive measure	Method
Clearing activities and construction	Entire project area	ECO	Weekly (pre construction and construction phase)	Proactively	If risks are manifested (accidental discovery of heritage resources) the chance find procedure should be implemented: 1. Cease all works immediately; 2. Report incident to the Sustainability Manager; 3. Contact an archaeologist/ palaeontologist to inspect the site; 4. Report incident to the competent authority; and 5. Employ reasonable mitigation measures in accordance with the requirements of the relevant authorities. Only recommence operations once impacts have been mitigated.
Feature 2,3,4,5,6	PCD, TSF and Diesel and Emulsion Batching Area	ECO	During Pre-construction and construction phase	Proactive	If risks are manifested (accidental discovery of heritage resources) the chance find procedure should be implemented: Cease all works immediately; • Report incident to the Sustainability Manager; • Contact an archaeologist/ palaeontologist to inspect the site; • Report incident to the competent authority; and • Employ reasonable mitigation measures in accordance with the requirements of the relevant authorities. • Only recommence operations once impacts have been mitigated.

1.f.ii Water Monitoring

Aquatico has developed an overall Water Monitoring Protocol for Dwarsrivier Mine.

The mine was issued with a WUL (Licence No: 24053346, Ref. 16/2/7/B400/C83) on the 21st of January 2008. An additional WUL was issued by the DWS on the 8th of July 2011 (Licence No: 04/B41G/G/792), primarily focusing on the deposition of the North TSF, capturing overflow from the RWD to a PCD, as well as to contain decant, seepage and dirty runoff water from the tailings dam into an RWD.

Both licences comprise of general and specific conditions to which must be adhered to. Specifically, in terms of the water monitoring programme, the licences state that the water resources shall be monitored on a monthly basis to determine the impact of the facility and other activities by taking samples at the monitoring localities set in the licences.

The term “surface water monitoring localities” includes the monitoring of both the wastewater into waste facilities (PCDs, process water, oil traps, etc.), as well as the water resources (dams, pans, rivers, streams, etc.) and therefore the IWULs have set separate conditions for the quality of waste water and water resources.

All fieldwork is conducted based on the protocols and specifications, and code of practice contained in the SABS ISO 5667-1-15. These international standards address all aspects from the program design, sampling methods as well as sample preservation and many other aspects. Sampling procedures are based on SABS standards, namely:

- ISO 5667-1: 2008 Part 1: Guidance on the design of sampling programs and sampling techniques
- ISO 5667-3: 2018 Part 3: Guidance on preservation and handling of samples
- ISO 5667-6: 2014 Part 6: Guidance on sampling of rivers and streams
- ISO 5667-11: 2015 Part 11: Guidance on sampling groundwater’s
- ISO 5667-14: 2016 Part 14: Guidance on quality assurance and quality control in taking environmental water samples · DWAF Best Practice Guidelines Series G3: General Guidelines for Water Monitoring Systems.

The June 2021 updates of the WULs have removed all limits on water qualities, and rather focus on the change of water quality from baseline conditions.

1.f.ii.1 Surface Water Monitoring

The receiving environment comprises of streams and tributaries within and around the mining area that can be impacted. The following table presents the list of localities used in monitoring the various streams and tributaries in the mining area, in addition to presenting which localities are required by the WUL, while the analysis package is presented thereafter. Streams associated within the two catchments comprise of the Groot Dwars River, Klein Dwars River and Springkaanspruit.

Based on both WULs, assessment sets and guideline limits only exist regarding the Klein Dwars River. It is stated that the impact of the activities of the mine on the Klein Dwars River be monitored.

Table 96: Surface Water Monitoring Point Locations

Sample Point ID	Coordinates		Description	Monitoring Period	
	Longitude	Latitude		From	To
S1	30°07'21.88''E	24°56'43.56''S	Groot Dwars River: Upstream of Project site.	2000	ongoing
S2	30°06'02.57''E	24°55'44.71''S	Klein Dwars River: Upstream of Project site.	2000	ongoing
S3	30°06'20.44''E	24°55'24.72''S	Groot Dwars River: Downstream of Project site, after confluence with Springkaanspruit.	2000	ongoing
S4	30°06'19.90''E	24°54'30.13''S	Groot Dwars River: Downstream of Project site.	2000	ongoing
S5	S24.94300	E30.12237	First stream next to DRM6	2019	ongoing
SP1	S24.93319	E30.12402	Bridge crossing Springkaanspruit (Upstream of Operation)	2019	ongoing
SP2	S24.93390	E30.12047	Springkaanspruit on mine premises (Close to Main Sewage Plant)	2019	ongoing
SP3	S24.93325	E30.11687	Springkaanspruit on mine premises (Downstream at mine perimeter)	2019	ongoing

SP4	S24.94142	E30.12996	Klein Dwars River (Downstream of Truck Parking Area)	2019	ongoing
SP5	S24.95529	E30.12785	Groot Dwars River (Bridge to Thorncliffe Mine)	2019	ongoing

The current water monitoring programme requires water quality analysis. The surface and groundwater-monitoring programme is assessed on an annual basis. Based on these assessments, new monitoring sites may be included in the monitoring programme. It is recommended that the water quality is monitored at the proposed Khulu PCD as well as on the Klein Dwars River immediately upstream of the proposed diesel batching area, which is currently included in the monitoring programme.

1.f.ii.2 Groundwater

Nineteen (19) monitoring boreholes form part of the Dwarsrivier Mine monitoring programme, while seventeen (17) are included in the WUL requirements. The monitored localities are presented in the following table, while the associated analysis packages can be viewed in the table thereafter. The boreholes are situated throughout the operation, while DRM6 is considered the background ambient monitoring borehole situated upgradient of the operation. The monitoring boreholes focus mainly around the following areas:

- Old TSF – DRM1, DRM2, DRM3, DRM8 ASDW BH9, ASDW BH10 and DRO4
- Upper Return Water Dam (Upper RWD) – DRM5
- Lower Return Water Dam (Lower RWD) – DRM1 and DRM2
- Plant area – DRM4
- Northern sump – ASDWBH2
- New Return Water Dam (NRWD) – ASDWBH3
- The new TSF – ASDWBH4
- North Pit – ASDWBH1
- Dam 26 – ASDWBH5 and ASDWBH6
- South Pit – ASDWBH11

Table 97: Groundwater monitoring locations

Locality	Description	Latitude	Longitude	Sampling Schedule
ASDW BH1	Upstream North Pit Monitoring Borehole	S24.92814	E30.12360	Monthly
ASDW BH2	Downstream of new TSF Monitoring Borehole	S24.91773	E30.12362	Monthly
ASDW BH3	Downstream of Old TSF (North Pit) Monitoring Borehole	S24.92552	E30.11938	Monthly
ASDW BH4	Upstream of new TSF (North Pit) Monitoring Borehole	S24.92404	E30.12398	Monthly
ASDW BH5	Downgradient Dam 26 Monitoring Borehole	S24.93508	E30.11691	Monthly
ASDW BH6 Up	Upgradient Dam 26 Monitoring Borehole	S24.93550	E30.11808	Monthly
ASDW BH8	Downgradient North Pit Decline Shaft Monitoring Borehole (ASDW BH7)	S24.93648	E30.12700	Monthly
ASDW BH9	Downstream of old TSF Monitoring Borehole	S24.92847	E30.11332	Monthly
ASDW BH10	Upgradient Discard Dump at Quarry Monitoring Borehole	S24.92590	E30.11619	Monthly
ASDW BH11	Upgradient of South Pit Monitoring Borehole	S24.93490	E30.12353	Monthly
DRM1	Lower RWD and Old TSF Monitoring Borehole	S24.92844	E30.11096	Monthly
DRM2	Lower RWD and Old TSF Monitoring Borehole	S24.92782	E30.11114	Monthly
DRM3	Downstream OF Old TSF	S24.92470	E30.11222	Monthly
DRM4	Processing Plant Monitoring Borehole	S24.93040	E30.11702	Monthly
DRM5	Upper RWD Monitoring Borehole	S24.93093	E30.11447	Monthly
DRM6	Background Monitoring Borehole (Upstream of Operations)	S24.94295	E30.12238	Monthly
DRM7	Borehole in proximity of new RWD (S11)	S24.92465	E30.12068	Monthly
DRM8	Old TSF Facility	S24.93420	E30.11000	Monthly
DR04	Downstream Lower RWD Monitoring Borehole (Clinic Bridge)	S24.92732	E30.11000	Monthly
DRM8	Next to Return Water Dam	S24.924651	E30.120688	Monthly
MCC Borehole	MCC Monitoring Borehole	S24.93476	E30.11727	Monthly
SW Borehole	Sewage Works Monitoring Borehole	S24.93407	E30.11992	Monthly

In addition to the existing monitoring programme, Dwarsrivier Mine must continue with monitoring of the newly drilled monitoring boreholes, as presented in the table below. It is noted that these boreholes are already included in the routine Dwarsrivier Mine monitoring programme.

Table 98: Summary of new monitoring borehole drilling results

		Borehole ID	DRM9s	DRM9d	DRM10s	DRM11s	DRM11d	DRM12s	DRM12d
Borehole Location	WGS84	Latitude	24°55'19.68"S	24°55'19.84"S	24°55'11.54"S	24°55'7.86"S	24°55'7.64"S	24°54'52.77"S	24°54'52.95"S
		Longitude	30° 6'46.42"E	30° 6'46.34"E	30° 6'45.66"E	30° 6'30.74"E	30° 6'30.66"E	30° 6'42.61"E	30° 6'42.37"E
		Elevation	932 mamsl	932 mamsl	930 mamsl	923 mamsl	923 mamsl	918 mamsl	918 mamsl
Borehole Data	Borehole Depth (m)		12	80	12	12	80	8	80
	Blow Yield (L/h)		Dry	5 760	Dry	Dry	Dry	Dry	8 600
	Water Strike depth (m)		None	19 m	None	None	None	None	14 to 20m
	Main Strike Geology		---	Fractured pyroxenite	---	---	---	---	Fractured pyroxenite
	Borehole Geology		Weathered dolerite	Anorthosite, Norite, Pyroxenite sequence	Pyroxenite, with dolerite at end	Dolerite, with norite last 5 m	Anorthosite, Norite, Pyroxenite sequence, with dolerite 12-24m	Norite	Pyroxenite and norite, with dolerite last 12m
	Static Water Level (m bgl)		10.70	10.09	Dry	Dry	68.25	5.46	5.40
	Depth of Weathering		5m	6 m	6 m	7 m	10 m	2 m	6 m
	Steel Casing Depths (m)		0-12m perforated	Solid 0-14m and 32-56m Perforated 14-32m and 56-80m	0-12m perforated	0-12m perforated	Solid 0-16m Perforated 16-64m	0-8m perforated	Solid 0-14m and 20-26m Perforated 14-20m

The deep boreholes were fitted with 152mm steel casing across the weathered and unstable formations in the borehole. The shallow boreholes were fitted with 177mm perforated steel casing across the full length of the borehole.

It is recommended that three additional monitoring boreholes are drilled to augment the new monitoring boreholes at the Khulu TSF and PCD, as indicated on the following figure. These include a set of shallow and deep monitoring boreholes down gradient of the PCD. These boreholes must target the fault line indicated in this area. The locations of these boreholes must be determined through surface geophysics to pinpoint the position of the fault line. In addition, it is recommended that a shallow monitoring borehole is drilled on the north-western corner of the Khulu TSF in the path of the plume in the shallow weathered aquifer. The position of this borehole is not dependent on a geological structure and can be drilled at a convenient location in this area.

Table 99: Proposed Khulu TSF additional monitoring boreholes

Monitoring ID	X Coordinate (LO31)	Y Coordinate (LO31 FN 2700000)	Depth (m)	Purpose
Proposed additional monitoring boreholes				
DRM16S and D	-90175*	-56640*	Shallow: 15m Deep: 80m	Target the fault line down gradient of the PCD, which is perceived to be a preferential flow path to groundwater
DRM17S	90144	-56972	15m	Drilled down gradient of the Khulu TSF in the delineated plume in the weathered aquifer.

* The coordinates of this set of boreholes must be confirmed with geophysics.

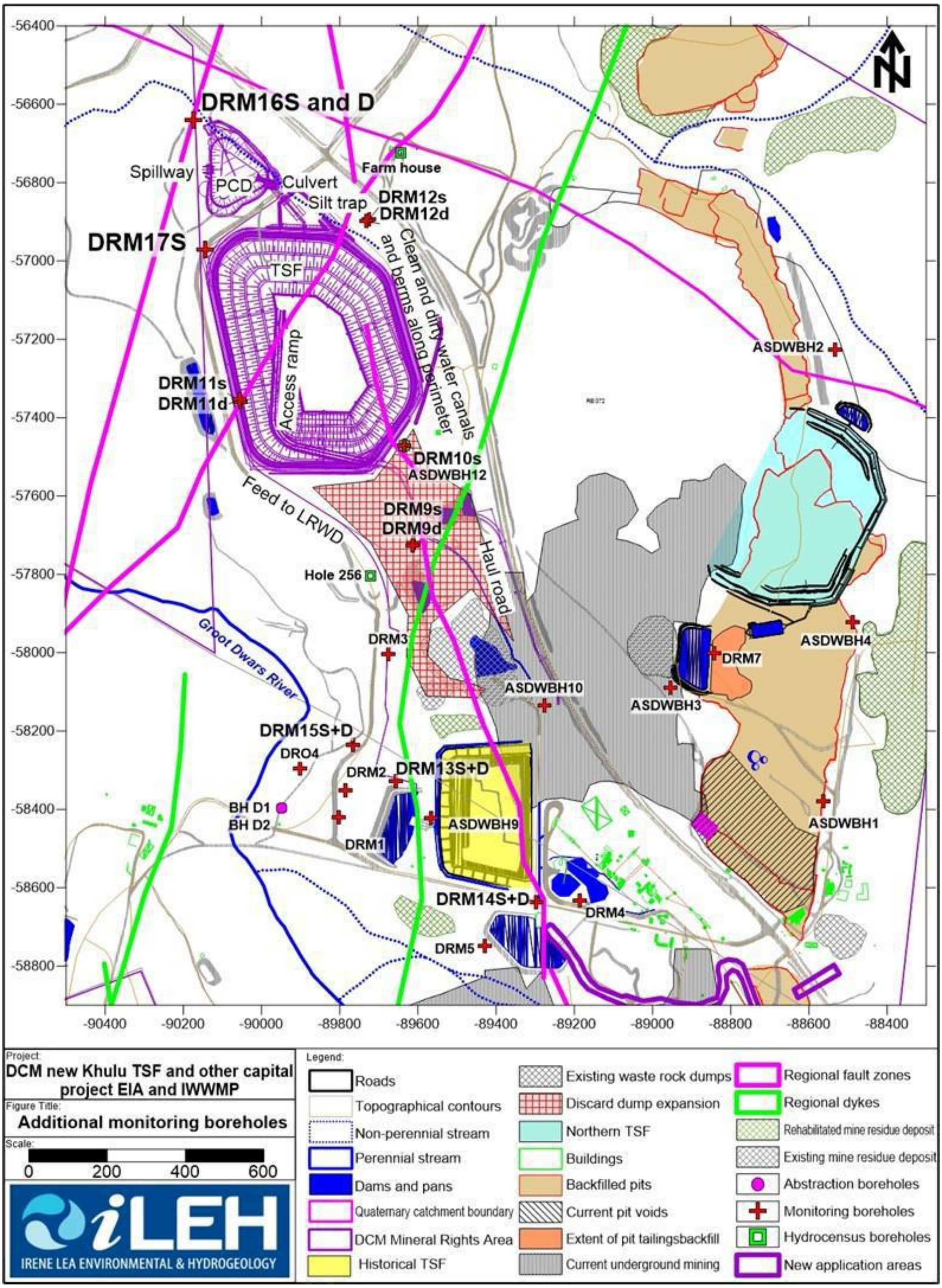


Figure 99: Proposed additional monitoring borehole locations

The parameters to be included during monitoring as well as the proposed frequency of monitoring are presented in the following table. It is recommended that groundwater levels are monitored in all the new and proposed additional Khulu TSF and PCD monitoring boreholes on a monthly basis. This information is important to improve the understanding of water level fluctuations in the area and groundwater level rise and fall in response to rainfall. This information will be used to improve the conceptual understanding of the aquifers and the interaction between shallow and deep aquifers.

It is recommended that all new and additional Khulu TSF and PCD groundwater monitoring positions are sampled on a quarterly basis. In order to keep continuity with the baseline information presented in this report, it is recommended that the elements listed in the table below are included in the water quality analyses.

Rainfall must be recorded daily at the operations. This information must be analysed with the results of the groundwater level monitoring in order to improve aquifer conceptualisation.

Table 100: Monitoring requirements in all proposed monitoring positions

Monitoring parameter	Element for analysis	Monitoring frequency	Monitoring trigger-response criteria
Depth to groundwater level in Khulu TSF boreholes	Groundwater level	Monthly	Variations by more than 3m for 2 consecutive months should be investigated.
Volume of water pumped to and from the Khulu TSF and PCD	Volume of water abstracted	Daily	This must be an on-going mine water management measure to confirm the assumptions made in this report.
Water quality analysis in all boreholes, including the additional boreholes	pH, Electrical Conductivity, Total Dissolved Solids, Total Alkalinity, Bicarbonate, P Alkalinity, Total Hardness, Aluminium, Calcium, Copper, Total Iron, Magnesium, Manganese, Potassium, Sodium, Chloride, Fluoride, Free & Saline Ammonia, Nitrate, Nitrite, Ortho Phosphate as P, Total Nitrogen as N, Kjeldahl Nitrogen, Sulphate, Cadmium, Lead, Total Chrome, Hexavalent Chromium, Barium, Boron, Nickel, Molybdenum, Cobalt, Silver, Vanadium, Zinc	Quarterly	Variations in concentrations by more than 15% for major cations and anions and more than 7% for metal concentrations for more than 2 consecutive months should be investigated. Any result that exceeds specified water quality objectives must be investigated when it occurs.
Rainfall	Rain depth (mm)	Daily on site	None

The monitoring trigger-response criteria listed in the table above must be reviewed on an annual basis and updated, based on the outcome of the monitoring programme results. All monitoring information must be entered into a spreadsheet for record keeping and analysis. Copies of the certificates of analyses must be kept on file for inspection. If significant exceedances are recorded during the monitoring programme as presented in the table above, the following actions should be taken:

- Log the exceedances in the incident reporting system within 24-hours of it occurring.
- Undertake an investigation to identify causes of the exceedances.
- Implement the necessary remedial actions according to the outcome of the investigation and consultation with the affected parties.

The results of the monitoring programme must be reported on a quarterly and annual basis for the purpose of internal Dwarsrivier Mine water management. Annual reports must also be submitted to the authorities for review.

Trend analysis must be undertaken in all reports.

1.f.iii Process and Effluent Water Monitoring

Thirteen process water localities, in addition to three (3) STP effluents form part of the Dwarsrivier Mine monitoring programme. The majority of the process water monitoring localities is situated within the South Plant, while three (3) dams are located at the North Pit. The monitored localities are presented within the following table.

Table 101: Process and Effluent Water Monitoring Locations

Locality	Description	Latitude	Longitude	Sampling Schedule
S10	Dam 26	S24.93507	E30.11724	Monthly
S11	North Return Water Dam	S24.92549	E30.12033	Monthly
S13	Settling Dam	S24.9271	E30.12162	Monthly

Locality	Description	Latitude	Longitude	Sampling Schedule
S6	Lower Return Water Dam	S24.92849	E30.11284	Quarterly (recommended monthly)
S7	Upper Return Water Dam	S24.93103	E30.11488	Quarterly (recommended monthly)
New	Khulu TSF PCD	S24.913536°	30.108440°	Monthly
Sump				
S12	Water Collection Sump	S24.91911	E30.12365	Monthly
Process Water				
S14	Grey Water (Sump Downstream of Workshop)	S24.93534	E30.12253	Monthly
Seepage				
S8	Old URWD (S7) seepage and run-off	S24.92868	E30.11343	Monthly
S9	Old TSF Seepage	S24.92816	E30.11342	Monthly
WTW Final				
WW1	Main Sewage Treatment Facility	S24.93409	E30.12011	Monthly
WW2	Plant Sewage Treatment Facility	S24.93108	E30.11835	Monthly

In terms of the new Projects, it is recommended that the following areas be included as part of the monitoring programme:

- New Khulu PCD.

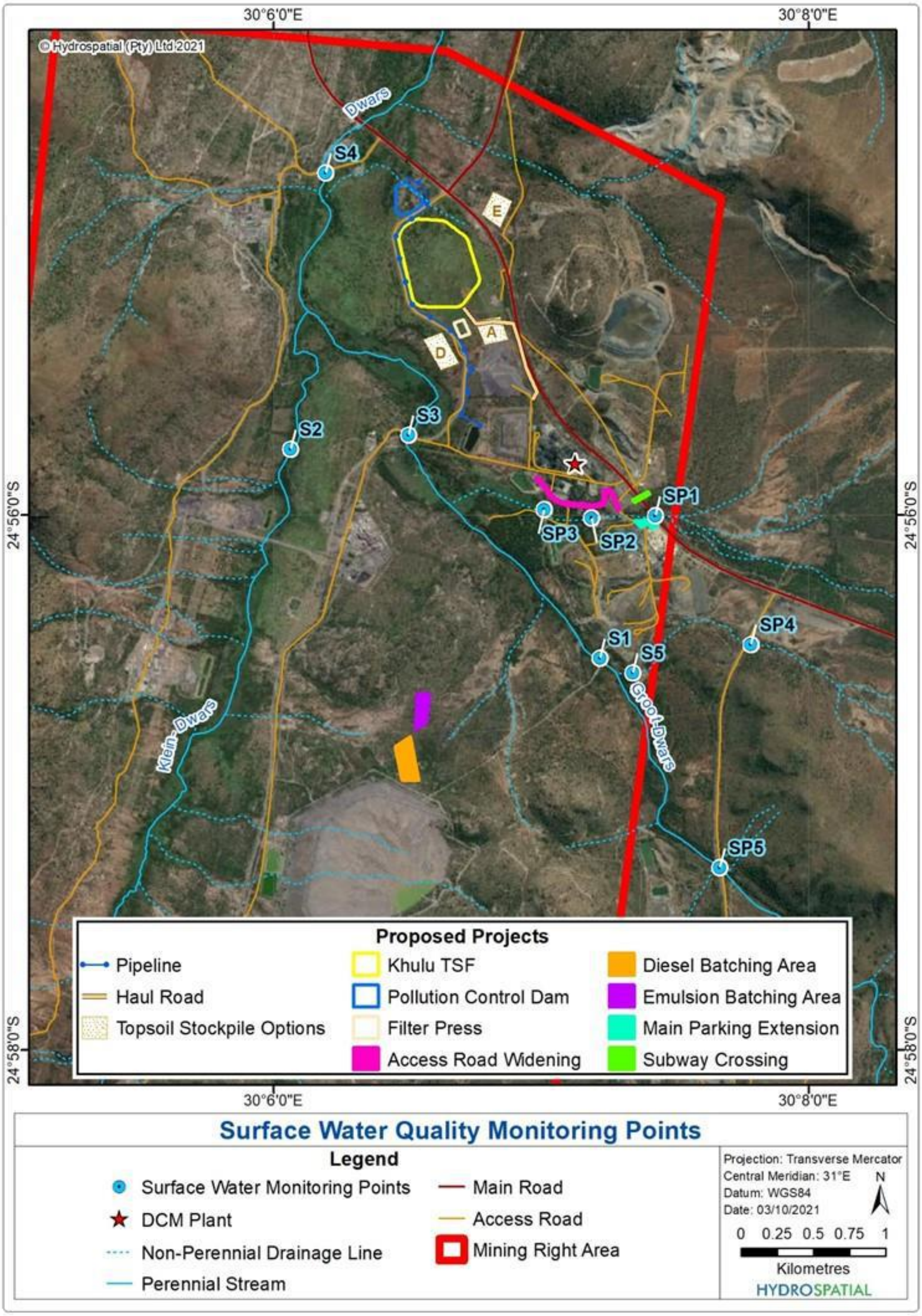


Figure 100: Surface Water Monitoring Points in terms of new infrastructure

1.f.iv Freshwater Ecosystem

Section 1.9.1 of Appendix VI of the WUL states that:

"An aquatic scientist approved by the Regional Director must establish a monitoring programme for the following indices: Invertebrate Habitat Assessment System (IHAS) and the latest South African Scoring System (SASS). Sampling must be done once during the high flow season and once during low flow period annually to reflect the status of the river upstream and downstream of the mining activities. This report aims to address the above-mentioned conditions of the Dwars River Chrome Mine WUL. "

Further objectives of the current biomonitoring program are to:

- comply with Dwars River Mine EMPr water monitoring requirements;
- assess the impacts on the aquatic ecosystem in areas which are affected by the activities associated to the Dwarsrivier Mine;
- monitor spatial and temporal trends in aquatic resource integrity in the vicinity of the mine;
- report any emerging issues; and
- preserve the aquatic ecosystem.

Two sites are assessed as specified in the WUL, one site up- and one downstream of the current mining operations along the Groot Dwars River. In addition, two sites are selected in the process water system of the Dwars River Mine for toxicological testing. Please refer to Figure 101 for an indication of the positions of the monitoring points.

Table 102 below contains geographic information with regards to the monitoring points. The monitoring program focused on the Groot Dwars River, as it is this system which would be affected by impacting activities from the Dwarsrivier Mine and not the Klein Dwars River.

Aquatic biomonitoring is undertaken to determine the impact of Dwarsrivier Mine's activities on the integrity and diversity of the aquatic ecology within the affected surface water resources. The surface water monitoring points are described in Table 102.

Table 102: Monitoring points for Biomonitoring at Dwarsrivier Mine

Id	Description	Coordinates	Period	Parameter
S1	Upstream of mine	24°56'41.7"S 30°07'20.0"E	Bi-annual (wet and dry season)	IHAS*
S2	Downstream of mine	24°55'45.3"S 30°06'03.4"E	Bi-annual (wet and dry season)	SASS**
Dam 26	Situated within the ACDRM complex	24°56'5.61"S 30° 7'3.35"E	Bi-annual (wet and dry season)	Toxicity
Lower RWD	Situated within the ACDRM complex	24°55'44.80"S 30° 6'42.60"E	Bi-annual (wet and dry season)	Toxicity

*Instream Habitat Assessment System
**South African Scoring System

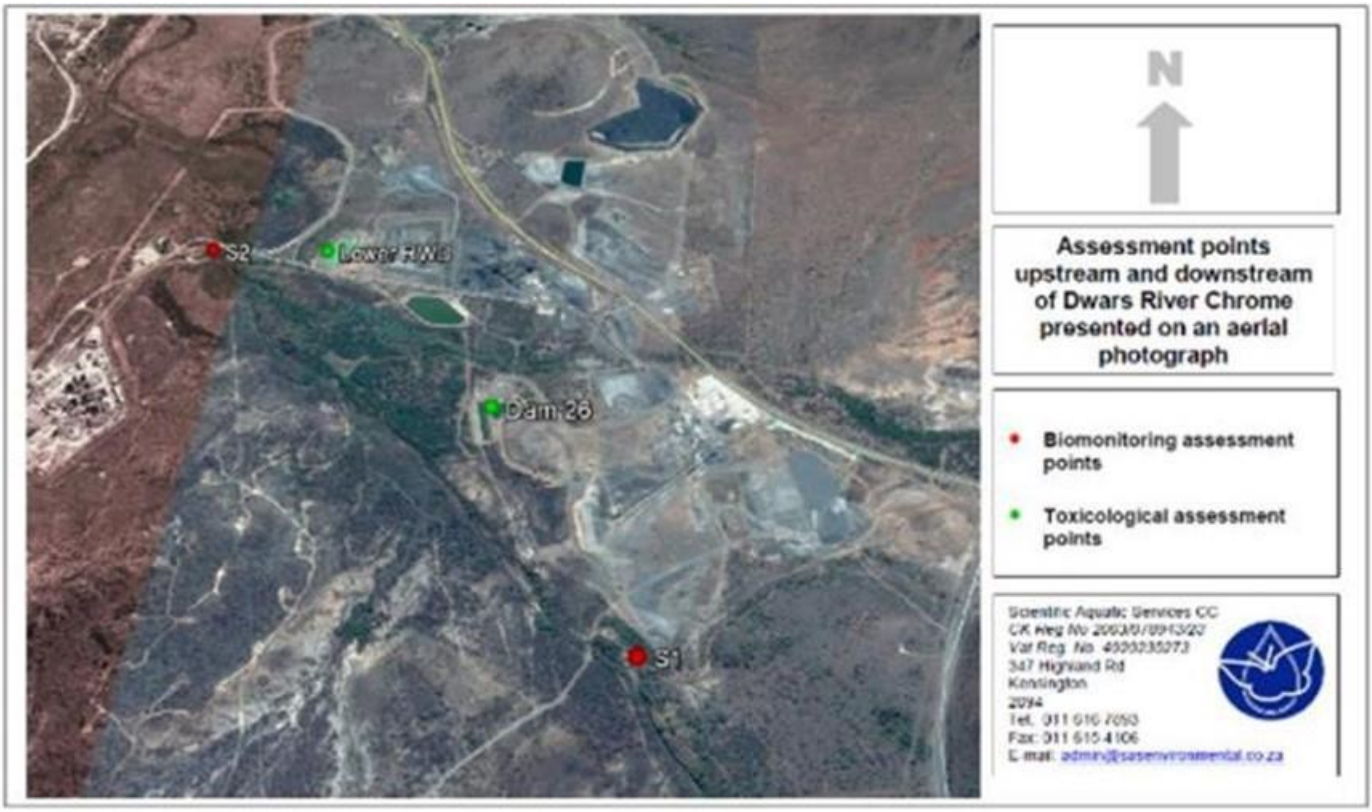


Figure 101: Biomonitoring Points

No additional monitoring has been recommended by the Freshwater Ecosystem Report, 2021, with the exception of the requirement of Toxicological Monitoring. Toxicological monitoring of the receiving environment and of the PCD must occur in terms of the current monitoring programme and again immediately following the first rain event after rehabilitation and again at the end of the wet season. The aquatic ecologist should make a

recommendation concerning the necessity of future monitoring following the assessment.

1.f.v Storm Water and Clean and Dirty Water Infrastructure

Stormwater infrastructure must be monitored on a monthly basis during the dry season, and on a weekly basis during the wet season. The freeboard of the proposed dirty water containment facilities must be inspected daily and records must be kept. Water infrastructure should further be monitored immediately after any large storm event. Should blockages, silted up structures or breaches occur, then immediate action must be undertaken to remove debris and repair breaches. Monitoring should be undertaken by the onsite Environmental Control Officer (ECO) or maintenance manager. Inspections must be recorded and should include the following:

- Date of inspection;
- Rainfall amount received in a 24-hour period prior to inspection;
- Photographs of blockages, silted up structures or breaches witnessed;
- Actions taken to fix issues and the amount of time taken to address them; and
- Photographs post action taken.

Inspection reports should be prepared on a monthly/quarterly basis and should be kept ready and supplied to the DWS when requested, or as part of the WUL conditions.

1.f.vi Air Quality Monitoring

Dust monitoring is undertaken using the latest ASTM standards. Dust monitoring is undertaken at five (5) points around the mine within a 28 - 31 day schedule:

- DWR001 (School);
- DWR002 (Far North Point);
- DWR003 (Parking Lot South Shaft);

- DWR004 (Discard Storage Facility South Shaft); and
- DWR005 (North Shaft.

Figure 102: Dust Monitoring Locations

The mine is located outside residential areas (non-residential) and should therefore comply with the following limits in terms of the National Dust Control Regulations, 2013:

Restriction Areas	Dust fall rate (D) (mg/m2/day) – averaged over 30 days.	Permitted frequency of exceeding dust fall rate
Residential area	D < 600	Two within a year, not sequential months.
Non-residential area	D < 1200	Two within a year, not sequential months.

1.f.vii Ecological Monitoring

Through initiating and maintaining a terrestrial monitoring programme, the biodiversity within Dwarsrivier Mine, comprising the unique and sensitive floral species composition associated with the Sekhukhuneland Centre of Floristic Endemism, with special mention of floral assemblages associated with Sekhukhune Mountain Bushveld, Sekhukhune Bushveld and rivers and associated instream habitat areas, will be protected.

Through maintaining a terrestrial bio-monitoring programme the biodiversity of the landscape, with special mention of sensitive environments and faunal and floral assemblages, can be monitored and information can be provided to adequately manage the biological resources associated with the mining footprint and associated sphere of influence. The broad objective of the biodiversity monitoring programme is to:

- Comply with the Dwarsrivier Safety, Health and Environment (SHE) standards, Environmental Management Programme (EMPr) and Environmental policies;
- Assess the Present Ecological State (PES) of terrestrial ecology within the Dwarsrivier Mine footprint and associated sphere of influence;
- Monitor spatial and temporal trends in biological resource integrity in the vicinity of Dwarsrivier Mine; and
- Report any emerging issues.

In order to ensure that impact mitigation takes place to an adequate level should the proposed mining expansion proceed, the Biodiversity Action Plan (BAP) must be updated with the additional activities and the relevant management actions which must be undertaken to manage impacts on the ecology of the region in association with other stakeholders in the area whom have an impact on the freshwater resources. The BAP and the implementation of additional management measures must continue to be overseen by an environmental panel which should include representatives from the mine, appropriately qualified specialists as well as local communities and water users in the greater catchment as well as other mines.

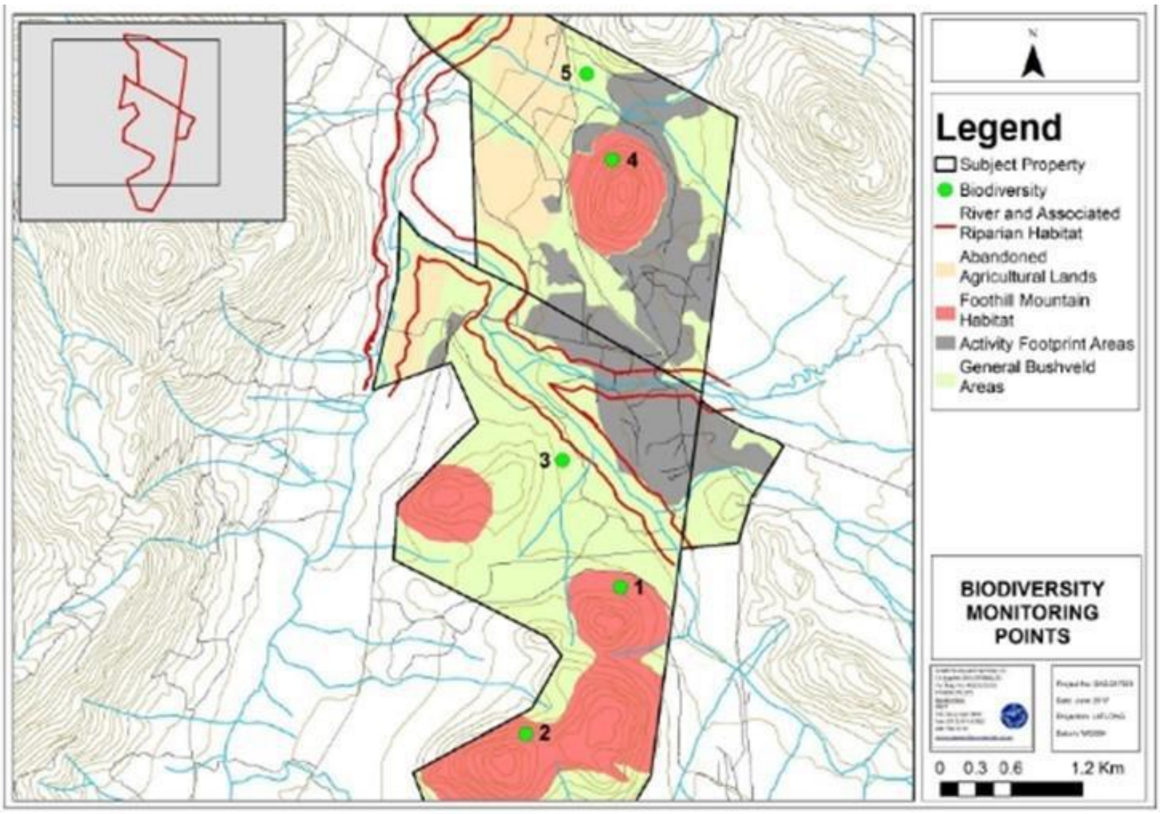


Figure 103: Locations of individual biodiversity monitoring points in relation to Dwarsrivier Mine.

1.f.viii Stability Monitoring

The mine has appointed a rock engineer who compiles quarterly reports on visual assessments on the pillars (beacons implemented to assessed movement/ subsidence of surface due to by underground mining) underneath the Dwars River, to assess the stability of the pillars with the purpose to assess regional stability. These pillars are placed in such a manner to assess whether the hanging wall collapse in the boards and overloading, and pillars below river flood line are successful in providing support.

1.f.ix Update of Water Balance

Generally, it is an accepted principle that the Water and Salt Balance be updated annually and to calculate the loads of waste emanating from the activities. Appendix VI, Condition 3.2 of the WUL, 2008 states that the Licensee shall at all times maintain the negative water balance. The water and salt balance report shall be submitted to the Regional Head on an annual basis.

The Licensee should determine the contribution of their activities to the mass balance for the water resource and must furthermore co-operate with other water users in the catchment to determine the mass balance for the water resource reserve compliance point.

The intention of the Water Balance should be to:

- Identify areas where water conservation and demand can be optimised;
- Identify areas where stricter control over water management and use should be implemented; and
- Identify whether the current water use approved are in line with the operational requirements of the facility.

1.f.x Closure Monitoring

The following monitoring programme is recommended upon closure:

Table 103: Post Closure Monitoring Programme

Component / Aspect	**Monitoring**		**Performance / success criteria**	**Corrective action**
	Methodology	**Frequency / duration**		
		Soil Management		
Soil fertility	• Undertake a visual assessment and delineate areas where poor vegetation growth has occurred; • Submit soil samples to an accredit soil laboratory to conduct soil fertility analysis.	Yearly until soil fertility supports the final land use or for at least 5 years post-closure	• Soil analysis results comply with remediation targets at a 95 percentile level; and • Self-sustaining vegetation establishment.	• Apply amelioration where required as informed by sampling undertaken.
Erosion	• Conduct a visual assessment to determine areas of potential erosion; and • Undertake field investigations, fixed point photography to document the significance of the erosion occurring on site	Twice yearly for at least 5 years post closure.	• No evidence of significant erosion; and • Good vegetation cover and species composition.	As required: • Re-shape areas to ensure that they are free-draining; • Establish vegetation on bare patches; and • Repair and stabilisation of erosion gullies and sheet erosion.
Post-mining end land use	• Assess activities completed, as well as legal and related documentation completed and signed-off; and • Ensure rehabilitation measures are aligned to the LUP.	Once off, at mine closure.	• Area has been rehabilitated to an aesthetic quality not to compromise potential tourism; • Transfer to third party operator has taken place once the area has been proven to be safe for redevelopment; • Legal and zoning issues have been addressed; and • Vegetation re-establishment, cover and composition are sustainable.	• Refer back to end land use approach and refine measures to be implemented in achieving the desired final land use.
Topography	• Conduct a visual assessment to determine areas of potential erosion; and • Undertake regular digital surveys of rehabilitated areas to confirm that final topography is aligned with landform designs.	During rehabilitation phase	• No evidence of significant erosion. • No evidence of water pooling on rehabilitated areas. • The final profile achieved should be acceptable in terms of surface water drainage requirements and the end land use objectives.	As required: • Re-shape areas to ensure that they are free-draining; and • Refer back to end land use approach and refine measures to be implemented in achieving the desired final land use.
Vegetation establishment	○ Determine whether re-established vegetation communities are on a trajectory of achieving a stable self-sustaining community dominated by species typical of the climax-species present in the adjacent areas; ○ Inspect rehabilitated areas to assess vegetation establishment and provide for early detection of erosion in recently planted/seeded areas (monthly); ○ Undertake fixed point photography at specific points at the rehabilitated sites to obtain a long term directly comparable method of determining changes in the landscape; and ○ Conduct evaluation of rehabilitated areas by means of field inspections. During these assessments measurement of	Quarterly for at least 5 years post-closure.	• Limited to no erosion; and • Self-sustaining vegetation ecosystem.	As required: • Revegetate poorly established rehabilitated areas; • Reseed bare patches; and • Apply additional fertiliser and/ or organic matter, depending on the condition of the vegetation and the initial organic material application.

Component / Aspect	Monitoring		Performance / success criteria	Corrective action
	Methodology	**Frequency / duration**		
	growth performance and species abundance will be carried out to determine: i. Plant basal cover and species abundance in the grassed areas. Estimates of vegetation canopy and ground cover as well as height; ii. Distribution, growth and survival of woody species; iii. Dominant plant species (woody and herbaceous); iv. Presence of exotic invasive species, and degree of encroachment; v. Browsing or grazing intensity; vi. Notes regarding erosion, such as, type, severity, degree of sediment build-up; and vii. Species composition and richness.			
Alien and Invasive floral species	• Visually inspect areas where invasive species have been previously eradicated and areas prone to invasive species (e.g. eroded/degraded areas, along drainage lines, etc.); and • Undertake surveys on relevant sites where bush encroachment has previously been identified to determine the status quo of invasive vegetation.	Yearly for at least 5 years post-closure.	• Limit and/or prevent declared Category 1, 2 and 3 invader species establishing; • Minimise extended threat to ecosystems, habitats or other species; • Increase the potential for natural systems to deliver goods and services; and • Minimise economic or environmental harm or harm to human health.	• Revisit mitigation measures; and • Continue control and management.
General site status	• Conduct a visual assessment with respect to compliance of the afore-mentioned closure measures and to ensure that the site is aesthetically neat and tidy, and that no health or safety risks exist on site.	Once-off following implementation of rehabilitation measures.	• Waste/rubble free sites.	As required: • Clear remnant rubble and dispose of in open quarry as backfill material.
Surface Water Quantity	• Visually assess the functionality of the surface water drainage systems feeding surface water runoff from rehabilitated areas. • Undertake field investigations, fixed point photography to document the significance of the erosion occurring on site.	After the first major rains of the season and after any major storm.	• No evidence of significant erosion; and • No evidence of water pooling on rehabilitated areas.	As required: • Re-shape areas to ensure that they are free-draining; and • Refer back to end land use approach and refine measures to be implemented in achieving the desired final land use.
Surface Water and Groundwater Quality	• Sample and monitor surface and groundwater quality.	Quarterly for at least 3 years post-closure.	• Water quality results within ranges of the WUL and/or DWS standards.	As required: • Increase monitoring frequency and detect point sources. • Optimise monitoring plan if needed.
Groundwater Quantity	• Sample and monitor groundwater levels in the vicinity of the mine.	Quarterly for at least 3 years post-closure.	• No evidence of dewatering and lowering of water tables within the vicinity of the mine.	As required: • Increase monitoring frequency and detect point sources. • Optimise monitoring plan if needed.

1.g Monitoring frequency and Responsible person

Please refer to Table 89 to Table 92 for the management actions required. Also refer to Section 1.f for the monitoring programme recommendations.

1.h Period for implementing actions

Please refer to Table 89 to Table 92 for the management actions required.

1.i Mechanisms for monitoring compliance

Please refer to Table 89 to Table 92 for the management actions required.

1.j Indicate the frequency of the submission of the performance assessment report.

1.j.i.1 Internal Audits and Reports

According to Appendix I, Condition 15 of the WUL, 2008, the Licensee shall conduct an annual internal audit on compliance with the conditions of the licence. A report on the audit shall be submitted to the Regional Head within one month of the finalisation of the audit. It is recommended that the annual internal audit, also be undertaken for the EMPr and be submitted to the DMRE.

1.j.i.2 External Audits and Reports

According to Appendix VI, Condition 9.2 of the WUL, 2008, the Licensee shall appoint an independent external auditor to conduct an annual audit on compliance with the conditions of the IWUL. The reports on the audit shall be submitted to the Regional Head within one month of finalisation of the report.

It is recommended that the annual external audit, also be undertaken for the EMPr in line with the NEMA, EIA Regulations and be submitted to the DMRE.

1.j.i.3 Financial Provision

Annual assessment and quantification of the required financial provision must be undertaken in line with the NEMA Financial Provision Regulation, 2015 (as amended).

1.k Environmental Awareness Plan

1.k.i Manner in which the applicant intends to inform his or her employees of any environmental risk which may result from their work

1.k.i.1 Education and Training

Dwarsrivier Mine is a Sector Education Training Authority's (SETA) accredited training facility. The primary objectives include:

- The availability, in terms of quality, quantity, and employment equity, of the range of skills required to access, extract and beneficiate the ore-body productively and safely, on a sustainable and environmentally responsible basis, inclusive of production, technical, support and administrative competencies
- The skilling of employees in portable competencies, which relate to existence outside the mining environment and which can be applied to sustain individuals and communities once mining careers, are ended
- Increasing the employability of selected people from the local community

1.k.i.2 Internal and External Communication and Awareness Raising

1.k.i.2.a Emergency Response Plan

Environmental emergencies occur over the short term and require an immediate response. A mine, as part of its management tools, especially if it is ISO 9000 and ISO 14001 compliant, should have an Emergency Response Plan.

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

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

Communication is vital in an emergency and thus communication devices, such as mobile phones, two-way radios, pagers or telephones, must be placed around the mine.

Dwarsrivier Mine has an Emergency Preparedness and Response Plan in place on site. This plan specifically addresses the following:

- Procedures applicable to all surface areas;
- Procedures applicable to veld fires;
- Procedures applicable to underground fires;
- Damage to a radioactive source;
- Radioactive source and fires;
- Major fall of ground accidents;
- Major power failure;
- Tailings Dam collapse;
- Flooding in the underground workings;
- Labour unrest;
- Handling petrochemical spills;
- Lightning detector warning alarm within the mining area, surface and underground;
- Safety harness fall rescue plan;
- Rescue and response capability; and
- Management of Emergencies.

1.k.i.2.b Purpose

The purpose of this procedure is to provide guidance to deal with emergencies efficiently and to:

- Ensure the health and safety of all personnel;
- Recover to normal operation as soon as possible;
- Co-ordinate evacuation; and
- Prevent, minimise damage to the environment.

Emergencies Include:

- Environmental Emergencies:
  - Spillages/ Uncontrolled Release over 1000 litre; and
  - Flooding (underground flooding, storm water flooding, overflow of PCDs, break TSF wall).
- Other Emergencies:
  - Uncontrolled fires, which cannot be extinguished by portable extinguishers;
  - Flooding (underground flooding, storm water flooding, overflow of PCDs, break TSF wall);
  - Bomb threats;
  - Strikes;
  - Total power failure;
  - Explosions;
  - Radio Active Sources; and
  - Assaults/ violence.
- Safety and Health Emergencies:
  - Personal injuries;
  - Property damage;

- Dangerous occurrences; and
- Diseases.

1.k.i.3 Communication

1.k.i.3.a Internal and External Communication Systems

A system of information sharing with regulatory authorities and Interested and Affected Parties (I&APs) was developed with the following objectives-

- Keep them updated on environmental management progress at the operations;
- Inform them about new developments at the operation and provide them with an opportunity to express their concerns about these;
- Provide them with a means to discuss environmental matters with the operation whenever necessary;
- Simplify involvement in the processes of updating existing and obtaining new permissions; and
- Provide a forum for detailed discussion of issues when necessary.

Basic public involvement principles that need to be applied are as follows-

- Involvement of all I&APs;
- Respect for the opinions of all I&APs;
- True two-way exchange of information, with listening on both sides;
- Follow-up on commitments made;
- Feedback on how concerns expressed by I&APs have been or are being addressed;
- Clear channels of communication;
- Accurate records of every interaction with I&APs, including names and contact details of people involved;
- Accurate records of information exchanged with I&APs – including letters, reports and other documents that were exchanged; and
- Records of meetings circulated to I&APs so that they can check that the record of information shared is correct.

For public meetings, the following principles should be applied-

- Advance notice of any meetings (at least 21 days) to allow people sufficient time to attend the meetings; and
- Scheduling of meetings with consideration of people's time constraints.

1.k.i.3.b Identification of Stakeholders

Parties that have been involved in information sharing and other types of communication include the following-

- Local residents;
- Business / Industry / Other Mines;
- Community / Development;
- Environmental Services;
- National Authorities-
  - DMRE;
  - DWS;
  - LDEDET;
  - Department of Agriculture.
- Provincial authorities include:
  - Olifants River CMA;
  - Department of Agriculture and Land Administration;
  - Provincial Heritage Resources Agency;
  - Department of Public Works;
  - Provincial Administration;
  - Department of Economic Planning and Development;
  - Department of Health and Social Services;
  - Department of Local Government and Housing;
  - Department of Roads and Transport; and
  - Local and District Municipalities.

1.k.i.3.c Public liaison and forum participation

No formal public liaison or forum participation exists currently. The Constitutions for water forums in this area have been drawn up during 2005, and are awaiting approval by the Minister of the DWS. The Olifants River CMA was established on 27 February 2015 and the mine is activity involved in consultation with the DWS with the last site visit conducted on 1 November 2017 by the DWS officials. A meeting was also held with the DWS regarding this project on 19 July 2018.

1.k.i.3.d Distribution of information

All information which is required for distribution is being placed on the internet site of Assmang Ltd.

An effective internal communication strategy will be implemented to inform:

- employees of possible retrenchments;
- other affected parties (sending areas, municipalities, etc.) of the possible retrenchments at the operation; and
- Outside parties of the possible retrenchments at the operation.

1.k.ii Manner in which risks will be dealt with in order to avoid pollution or the degradation of the environment

The following protocols must be developed by the mine, in parallel to the actions recommended in Table 89 to Table 92:

- Task/ Issue Based Risk Assessments must be undertaken with all workers involved in the specific task in order to establish an understanding of the risks associated with a specific task and the required mitigation and management measures.
- Environmental emergencies occur over the short term and require an immediate response. A mine, as part of its management tools, especially if it is ISO 9000 and ISO 14001 compliant, should have an Emergency Response Plan. This plan should be placed around the mine where it will be easily viewed. The plan should contain a list of procedures, evacuation routes and a list of emergency contact numbers. It is advisable that the mine tests the emergency response plan in order to identify any areas for improvement.
- If the emergency has the potential to affect surrounding communities, they should be alerted via alarm signals or contacted in person. The surrounding community will be informed, prior to mining taking place, of the potential dangers and emergencies that exist, and the actions to be taken in such emergencies.
- Communication is vital in an emergency and thus communication devices, such as mobile phones, two-way radios, pagers or telephones, must be placed around the mine.
- Protocols to be developed should include:
  - Waste Management Procedure;
  - Emergency Preparedness' Procedure;
  - Hydrocarbon Spill Management Procedure;
  - Monitoring Protocol; and
  - AIP Management and Monitoring Procedure.

1.l Specific information required by the Competent Authority

Dwarsrivier Mine is required to make financial provision for final rehabilitation activities on the site. The Regulations for Financial Provision states in Regulation 8 the following:

8. (1) an applicant or holder of a right or permit must make financial provision by one or a combination of a—

(a) Financial guarantee from a bank registered in terms of the Banks Act, 1990 (Act No. 94 of 1990) or from a financial institution registered by the Financial Services Board as an insurer or underwriter;

(b) Deposit into an account administered by the Minister responsible for mineral resources; or

(c) Contribution to a trust fund established in terms of applicable legislation, on condition that—

(i) this may not be used for the financial provision required in terms of regulations 6(a) or (b) or regulation 11(1)(a) or (b); and

(ii) This may not be used by an applicant for, or holder of, a mining permit in terms of the Mineral and Petroleum Resources Development Act, 2002.

Dwarsrivier Mine will provide for the closure liability through a Bank Guarantee as allowed by NEMA.

2 UNDERTAKING REGARDING CORRECTNESS OF INFORMATION

The EAP herewith confirms:

2.a The correctness of the Information provided in the Reports

2.b The inclusion of Comments and Inputs from Stakeholders and I&APs

2.c The inclusion of Inputs and Recommendations from the Specialist Reports where relevant

2.d That the Information provided by the EAP to I&APs and any Responses by the EAP to Comments and Inputs made by I&AP are correctly reflected herein

____

Signature of the Environmental Assessment Practitioner

EnviroGistics (Pty) Ltd

Name of company

____

Date

3 UNDERTAKING REGARDING LEVEL OF AGREEMENT (TO BE SIGNED ON FINAL REPORT)

Undertaking by the client:

Herewith I, the person whose name and identity number is stated below, confirm that I am the person authorised to act as representative of the applicant, and confirm that the above report comprises EIA and EMP compiled in accordance with the guideline on the Departments official website and the directive in terms of sections 29 and 39 (5) in that regard, and the applicant undertakes to execute the Environmental management plan as proposed.

____

Full Names and Surname

____

Identity Number

____

Designation

____

Signature

____

Date

Annexures

Annexure 1: DMRE Acknowledgment of Receipt

Annexure 2: EAP Curriculum Vitae

Annexure 3: Land Claims

Annexure 4: Design Report

Annexure 5: Site Selection Report

Annexure 6: Stakeholder Consultation

Background Information Document

Adverts

Stakeholder Database (not included into Stakeholder Draft Report)

Comments received

Minutes of meetings

Proof of submission to commenting authorities

Annexure 7: Soils and Land Use Assessment

Annexure 8: Ecology Assessment

Annexure 9: Freshwater Ecosystem Assessment

Annexure 10: Hydrology Assessment

Annexure 11: Hydrogeology Assessment

Annexure 12: Heritage Assessment

Annexure 13: Air Quality Assessment

Annexure 14: Visual Assessment

Annexure 15: Socio-Economic Assessment

Annexure 16: A3 Figures

Annexure 17: Waste Classification

Annexure 1: DMRE Acknowledgement of Receipt

Annexure 2: EAP Curriculum Vitae

Annexure 3: Land Claims

Annexure 4: Design report

Annexure 5: Site Selection Report

Annexure 6: Stakeholder Consultation Report

Background Information Document

Adverts

Stakeholder Database
(not included into Draft Report)

Comments received

Adverts

Minutes

Proof of Submission

Annexure 7: Soils and Land Capability

Annexure 8: Ecology

Annexure 9: Freshwater Ecosystems

Annexure 10: Hydrology

Annexure 11: Hydrogeology

Annexure 12: Heritage

Annexure 13: Air Quality

Annexure 13: Air Quality

Annexure 14: Visual

Annexure 15: Socio-Economic

Annexure 16: A3 Figures

Annexure 17: Waste Classification