DMRE REFERENCE:

(MP) 30/5/1/2/2/83 MR

2022

DRAFT ENVIRONMENTAL MANAGEMENT PROGRAMME AMENDMENT: TGME EXISTING UNDERGROUND MINE REDEVELOPMENT PROJECT NEAR PILGRIM'S REST

Powerful Solutions

OMI / Solutions

Gentle Delivery

mineral resources

Department:
Mineral Resources
REPUBLIC OF SOUTH AFRICA

DRAFT ENVIRONMENTAL MANAGEMENT PROGRAMME REPORT (EMPR)

TGME 83MR EMPR - EXISTING UNDERGROUND MINE REDEVELOPMENT PROJECT NEAR PILGRIMSREST

SUBMITTED FOR ENVIRONMENTAL AUTHORIZATIONS IN TERMS OF THE NATIONAL ENVIRONMENTAL MANAGEMENT ACT, 1998 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	**TRANSVAAL GOLD MINING ESTATES LIMITED (TGME)**
CONTACT PERSON	[redacted]
TEL NO	[redacted]
POSTAL ADDRESS	[redacted]
PHYSICAL ADDRESS	**Portion 1 of Grootfontein 562KT, Pilgrims Rest**
FILE REFERENCE NUMBER SAMRAD	**(MP) 30/5/1/2/2/83 MR**

DRAFT ENVIRONMENTAL MANAGEMENT PROGRAMME AMENDMENT

FOR

TGME EXISTING UNDERGROUND MINE REDEVELOPMENT PROJECT NEAR PILGRIMSREST

Conducted by

OMI SOLUTIONS (PTY) LTD

On behalf of

TRANSVAAL GOLD MINING ESTATES LIMITED

In respect of

DMRE REFERENCE: (MP) 30/5/1/2/2/83 MR

DATED:

APRIL 2022

OMI SOLUTIONS (PTY) LTD
Registration Number: 2018/343416/07
VAT Number: 4190288177
BBEE Level 4
Director: Robyn Sally Mellett

DOCUMENT PREPARED BY

OMI SOLUTIONS (Pty) Ltd
Registration Number 2018/343416/07
VAT: 4190288177
BBBEE Level 4

WISA Membership: 10615

P.O. Box 99
Lynn East
Pretoria
0039

Email: info@omisolutions.co.za

DOCUMENT CONTROL		
Document Title	EIA/EMPR: TGME Existing Underground Mine Redevelopment Project	
Report Number	OMI0005-2021-22-200184-EMP	
Client	Transvaal Gold Mining Estates Ltd (TGME)	
Submitted to	Suzette Hartzer-Marais	
Distribution	Registered Interested and Affected Parties	
AUTHORS		
Name	Reneé Kruger Pr.Sci.Nat. Reg. EAP	Annechris Sewards
Designation	Director of Environmental Licensing	Head of Project Management
Date	18 April 2022	18 April 2022
APPROVAL		
Name	Reneé Kruger Pr.Sci.Nat Reg. EAP	
Designation	Director of Environmental Licensing	
Date	19 April 2022	
CLIENT APPROVAL		
Name	Suzette Hartzer-Marais	
Designation	TGME – Environmental Permitting Project Manager	
Date	18 April 2022	

PLEASE NOTE:

The outline of this report was compiled in terms of the official EIA/EMP report template provided by the Department of Mineral Resources and Energy (DMRE). Where repetition occurs as a result of the template being used, the relevant information will be cross referenced. An executive summary of the most important aspects of the report is provided in order to assist the reader.

DISCLAIMER

Although OMI Solutions (Pty) Ltd. exercises due care and diligence in rendering services and preparing documents, the client, by receiving this document, indemnifies OMI Solutions (Pty) Ltd. and its directors, managers, agents, and employees against all actions, claims, demands, losses, liabilities, costs, damages and expenses arising from or in connection with services rendered, directly or indirectly by OMI Solutions (Pty) Ltd. and by the use of the information contained in this document.

The opinions expressed in this report are based on the information supplied to OMI Solutions (Pty) Ltd by Theta Gold SA (Pty) Ltd. OMI exercised all due care in reviewing the supplied information, but conclusions from the review are reliant on the accuracy and completeness of the supplied data. OMI 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. Opinions presented in this report apply to the site conditions and features as they existed at the time of OMI's investigations, and those reasonably foreseeable. These opinions do not necessarily apply to conditions and features that may arise after the date of this report, about which OMI had no prior knowledge nor had the opportunity to evaluate.

EXECUTIVE SUMMARY

INTRODUCTION

Transvaal Gold Mining Estates Limited (TGME), a subsidiary of Theta Gold Mines Limited, is the holder of an existing mining right with Department of Mineral Resources and Energy (DMRE) Reference Number: MP 30/5/1/2/2/83 MR (83MR) with effective date 16 October 2013.

The 83MR mining area comprises Portions 1, 2, 3, 4, 5 and the Remaining Extent of the farm Frankfort 509KT, the farm Krugers Hoop 527KT, Portion 1 and the Remaining Extent of the farm Van Der Merwes Reef 526KT, Portions 1, 2 and the Remaining Extent of Portions of the farm Morgenzon 525KT, the farm Peach Tree 544KT, and Portions 18, 42, 43, 44 and the Remaining Extent of the farm Ponieskrans 543KT (mining area).

TGME proposes to re-develop its historical underground mines within the 83MR mining area which includes Frankfort, Beta North, and the Clewer Dukes and Morgenzon (CDM) underground mines.

The proposed project will require additional surface infrastructure to support the underground working, the expansion of the current Tailings Storage Facility (TSF) and an upgrade of the old TGME process plant.

To mitigate the risk of loss of Critical Biodiversity Areas (CBAs), sensitive floral communities, threatened ecosystems and floral Species of Conservation Concern (SCCs) a biodiversity verification and pre-feasibility assessment was conducted in May 2021 to identify environmental buffer zones. The assessment informed the engineering concept designs to ensure that the surface infrastructure layout is limited to previously disturbed areas where possible.

Before TGME may commence with the proposed project the following environmental authorisation and licence applications must be approved in accordance with the relevant national legislation:

- An integrated application for Environmental Authorisation (EA) in terms of the National Environmental Management Act 1998 (Act 107 of 1998) (NEMA) and for a Waste Management Licence (WML) in terms of the National Environmental Management: Waste Act, 2008 (Act 59 of 2008) (NEMWA).
- Application for amendment to the current Environmental Management Programme (EMPR) approved by the DMRE in terms of the Mineral and Petroleum Resources Development Act, 2002 (Act 28 of 2002) (MPRDA) on 16 October 2013.
- An Integrated Water Use Licence Application (IWULA) under the National Water Act, 1998 (Act 36 of 1998 (NWA) will be submitted for approval to the Department of Water and Sanitation.
- Application for an Atmospheric Emission Licence (AEL) under the National Environmental Management: Air Quality Act (Act 39 of 2004) (NEMAQA), required to operate the upgraded process plant. This application will be submitted to the Ehlanzeni District Municipality.

This report is written in support of the application for an amendment to the current EMP.

SUMMARY OF THE PROJECT

TGME proposes to recommence mining in the historical underground mines within the 83MR mining area, which include Frankfort, Beta North, and the CDM underground mines.

The proposed project will require additional surface infrastructure to support the underground workings, the expansion of the current TSF and an upgrade of the old TGME process and beneficiation plant.

The planned infrastructure at each shaft includes (but is not limited to):

- TMM workshops;

- Fuel storage facilities;
- Oil storage facilities;
- Mining and engineering stores;
- First aid station;
- Mining waste sorting /management and salvage yard;
- Sewage handling facilities;
- Diesel generator sets;
- Power distribution transformers;
- Water supply and distribution infrastructure;
- Reservoir and water tanks;
- Surface water management infrastructure;
- Upgrading of river crossings and rehabilitation of Peach Tree stream;
- Site security and access control;
- Mining settling and collection dam (stormwater and pollution control);
- Emulsion storage tanks;
- Underground infrastructure;
- Offices – mobile/prefabricated offices;
- Surface ore handling and load-out facilities;
- Dense medium separation (DMS) plant;
- Mine residue facility (waste rock)
- Run of Mine (RoM) stockpile area
- Conveyor from Beta North to the plant
- Single drum winder
- Steel rope haulage system.

The following service provisions will be used:

- Power supply by Generator at the shaft;
- Water supply from underground dewatering, Molototse and the Blyde for top-up (Current Approved Permit);
- Ore handling infrastructure (Ore passes, conveyors, incline winder with required shaft equipment); and
- Dewatering system.

For detail on each shaft's infrastructure requirements as well as the conceptual drawings, refer to Section 4.4.3.

NEED AND DESIRABILITY

International conventions, national plans and programmes, as well as the relevant Integrated Development Plans (IDP) were taken into account in assessing the proposed development in a spatial context. Trends in the South African and international gold and associated minerals markets have also been taken into consideration in this assessment of the need and desirability of the project.

The project is aligned with the objectives of the MPRDA:

- To promote economic growth and mineral development in the Republic;
- To promote employment and advance the social and economic welfare of all South Africans;

- To ensure that the nation's mineral resources are developed in an orderly and ecologically sustainable manner while promoting justifiable social and economic development; and
- To ensure that holder of mining rights contribute towards the social-economic development of the area in which they are operating.

TGME is confident that the project will have a positive impact on the lives of their host communities by creating much needed jobs and downstream economic development, thereby assisting in accelerating the South African government's post-COVID economic recovery plan. Further, TGME's corporate presence in the region will result in a net positive benefit to the Blyde River catchment, safety and security of the host community and local tourism revenues; which would otherwise continue to deteriorate at the mercy of alien invasive vegetation and illegal miners.

ALTERNATIVES

The Department of Forestry, Fisheries and the Environment (DFFE)[1] guidelines for an Integrated Environmental Management (IEM) procedure requires that an environmental investigation considers feasible alternatives for any proposed development. Furthermore, the Environmental Impact Assessment (EIA) Regulations, 2014 (as amended)[2] require that a number of alternatives for accomplishing the same objectives shall be considered.

Each alternative is to be accompanied by a description and comparative assessment of the advantages and disadvantages that such development and activities will pose to the environment and socio-economy. Therefore, the EIA Regulations, 2014 (as amended) require that a number of possible proposals or alternatives for accomplishing the same objectives should be considered.

Various alternatives were assessed for the project at scoping level and again in the EIA phase. These were workshopped during specialist, applicant, and engineering team interactions. The alternatives were also influenced by the existing baseline environmental data and specialist inputs, and by discussions with authorities and with Interested and Affected Parties (I&APs).

Alternatives relevant to this development can be categorized into the following:

- Site location alternatives;
- Activity alternatives
- Layout alternatives;
  - Frankfort layout;
  - Reduced Footprints
    - Frankfort Layout
    - Dukes Layout
    - Beta layout;
- Technology alternatives;
  - Electrical supply;
- Mining method;
- The "no-go" alternative.

[1] At the time the Department of Environmental Affairs and Tourism (DEAT).

[2] GN R982 of 4 December 2014 as amended by GN R326 of 7 April 2017, GN 706 of 13 July 2018, GN 599 of 29 May 2020 and GN 517 of 11 June 2021.

PUBLIC PARTICIPATION

The Public Participation Process (PPP) is undertaken to ensure compliance with the requirements in terms of the MPRDA (as amended), EIA Regulations, 2014 (as amended), as well as the Integrated Water Use Licence Application (IWULA) requirements in terms of the NWA.

The PPP will be undertaken in line with the statutory requirements for public participation. The following legislation will be considered when developing and implementing the PPP:

- Public Participation guideline in terms of NEMA;
- The EIA Regulations, 2014 (as amended);
- The Constitution of the Republic of South Africa, 1996
- Protection of Personal Information Act, 2013 (Act 4 of 2013);
- Promotion of Access to Information Act, 2000 (Act 2 of 2000); and
- International good-practice guidelines for public participation and the Core Values of the International Association for Public Participation.

The PPP is facilitated by Kongiwe Environmental (Pty) Ltd an independent contractor.

The EIA Regulations, 2014 (as amended) specify that the Draft EMPR report must be subjected to a public participation review process of at least 30 days. The report will be made available for a period of 60 days public review and comment period from Tuesday, 19 April 2022 to Wednesday, 22 June 2022, and the draft Integrated Water and Waste Management Plan (IWWMP) will also be made available for a 60-day public review and comment period from Tuesday, 19 April 2022 to Wednesday, 22 June 2022.

The following is a list of the main comments and concerns raised as part of the public engagement:

- Allegations of providing misleading information;
- Clearance of vegetation to accommodate the redevelopment in sensitive environments;
- The cumulative effect of TGME operations in future;
- Historical management of TGME mines- historical mistrust and liabilities;
- Impact from atmospheric emissions;
- Impact on surrounding land uses including York Timbers (Pty) Ltd and the South African Forestry Company SOC Limited (SAFCOL) operations;
- Impacts on historical findings and provincial heritage sites;
- Impacts on the Blyde River system and streams running through the area - how this affects downstream users and tourism;
- Inability to access the annexure of the scoping report;
- Increased pressure on services (water, sewage, electricity);
- Increased traffic impact on the already degraded road network;
- The influx of job seekers;
- Job opportunities – Local employment;
- Landowner consent;
- Mining within a protected and sensitive environment;
- Status of previous application processes and approvals; and
- Water supply and demand.
- Alternative land uses

The full Comments and Response Report (CRR) has been included in Annexure E of this report.

BASELINE ENVIRONMENT

The area over which the existing TGME mining right (83MR) is located is currently facing two major threats causing deterioration to the area. It should be noted that TGME is not currently actively mining in the mining right areas. The following threats are currently noted in the mining area:

- Illegal mining leads to the following issues
    - Physical disturbance of vegetated areas;
    - Diversions of streams;
    - Contamination and sedimentation of the Blyde River, drainages, and streams;
    - Social disruptions in the communities (crime, child labour etc.); and
    - AIPs proliferated in the area.

Climate

The climatic conditions for this region are typical of the eastern Mpumalanga region, consisting of very hot summers and cool to cold winters. Rainfall occurs during summer thunderstorms, which are accompanied by lightning and occasional hail. Morning fog is common in summer but usually clears up by midday.

Climate change

Risks resulting from climate change impacts such as increasing land-surface temperatures, increasing rainfall variability, decreasing overall rainfall, as well as increasing frequency and intensity of extreme weather events relate to:

- Decreasing water availability and quality may negatively affect direct operations as well as the upstream and downstream value chain
- Damages to infrastructure can disrupt operations, transport of goods and lead to an increased risk of injury
- Labour productivity decrease due to excessive heat exposure
- The health of employees may be compromised due to rising food insecurity and an increased number of casualties as a result of heat effects
- Declining air quality in cities or city regions may impact the issuance or conditions of the issuance of the air quality license
- Disruption to commerce, critical infrastructure and developments, transport systems and traffic by extreme rainfall events and flooding could impact the project's ability to operate
- This also leads to an increased number of power outages, water supply and transport disruptions
- Increased risk of infectious, respiratory and skin diseases, water- and food-borne diseases.

Air quality

Mining and agriculture are the predominant land uses in the region. There are several historical underground and surface gold mining deposits, with disturbed areas as a remnant of these activities. Forestry is the main agricultural activity surrounding the three Project areas (WSP, 2019).

The main pollutant of concern would be particulate matter (TSP, PM10 and PM2.5) resulting from vehicle entrainment on the roads (paved, unpaved, and treated surfaces), windblown dust as well as mining and exploration activities. Gaseous pollutants such as sulphur dioxide (SO_2), oxides of nitrogen (NOx), carbon monoxide (CO) and carbon dioxide (CO_2) would result from vehicles and combustion sources, but these are expected to be at low concentrations as there are few combustion sources in the region.

Dust fall rates were low for the sampling period from February to June 2021 at all four locations and well within the dust fall limit of 600 mg/m²/day (adopted limit for residential areas) and 1 200 mg/m²/day (adopted limit for non-residential areas). From July to September 2021 dust fall rates increased significantly at three of the four sites, exceeding the NDCR for non-residential areas (1 200 mg/m²/day). The reasons for the increase in dust fall rates at TSF 1 South, TSF 3 North and TSF 4 East are not clear and could be due to activities at and around the TSF.

Geology

The Project Areas are situated within the Sabie-Pilgrim's Rest Goldfield, approximately 300 km northeast of the Witwatersrand Basin. This metallogenic province extends for approximately 140 km in a north-north-easterly direction, over a maximum width of 30 km along the Great Escarpment of southern Africa. Gold mineralisation occurs within shear zones located within the sedimentary host rocks of the Transvaal Supergroup. The orebodies considered for the underground operations may be described as thin, sheet-like near horizontal deposits. The reefs considered for extraction through the underground operations, namely the Beta Reef (Beta Mine), Bevetts Reef (Frankfort Mine) and Rho Reef (CDM) are all concordant reefs that dip shallowly westwards between 3°and 12°.

Topography and drainage

The project area is located in the midst of the Drakensberg mountain range, with Pilgrims Rest at an elevation of 1,300 m above sea level and the Lowveld stretching eastwards from the Great Escarpment with an elevation of under 750 metres above mean sea level (mamsl). The project area is dissected by river erosion, with the Blyde River Canyon reaching a depth of over 770m.

The project is located in the upper Blyde River catchment, within quaternary catchments B60A (Plant, TSF, Beta North and CDM), and B60B (Frankfort) in the Olifants Water Management Area (WMA). The project area is drained by a number of non-perennial drainage lines, which are tributaries of the Blyde River. The Blyde River has its source approximately 20 km southwest of the project and flows into the Blyderivierpoort Dam 40 km to the northeast of the project. From the Blyderivierpoort Dam, the Blyde River continues in a northerly direction for approximately 45 km, until its confluence with the Olifants River, near the town of Hoedspruit

Soil and land use

Scientific Aquatic Services (SAS) was commissioned to undertake a soil, land use and land capability verification and pre-feasibility assessment as part of the scoping and pre-feasibility studies to identify risks to the proposed project and to guide the development of a project layout for further assessment of risk.

Current land use activities associated with the investigation area and surrounding areas are mainly wilderness, forestry, and historic mining infrastructure. No large-scale commercial agricultural activities were observed (SAS, 2021 (a)).

It is evident that around the footprint areas the dominant land capability is Grazing VII, associated with the Mispah and Glenrosa soil forms. The identified Mispah/Glenrosa soil forms are of poor (Class VII) land capability and are not suitable for arable agricultural land use. These soils are, at best, suitable for natural pastures for light grazing. Therefore, these soils are not considered to make a substantial contribution to extensive subsistence farming on a local scale.

Areas along drainages and rivers are classified as Grazing V, associated with Alluvial soils. The footprint areas of the sites are classified as Wildlife Class VIII – Witbank soils - as these soils are associated with previous disturbance. These identified Witbank soils have very poor (class VIII) land capability attributed to forestry and mining activities. In addition, some of these soils have been subjected to long-term compaction and erosion.

Surface water

Analysis of the samples upstream of the plant generally shows a neutral pH (potential of hydrogen - a measure of how acidic/basic water), low salt load, and low concentrations of iron, manganese, and sulphates. These results indicate that the Blyde upstream of the TGME footprint is unimpacted by TGME's activities.

It is, however, known that illegal mining activities take place in the area, and illegal miners have often been seen washing ore in the Blyde upstream of the plant. The June 2020 results show a spike in Total Dissolved Solids (TDS), Sulphates, Magnesium, Sodium and Calcium, and a substantial drop in pH; this most likely resulted from artisanal mining, given that it is upstream of TGME.

The limited data on metal analysis is not conclusive. There are spikes in most concentrations in the September 2020 values, especially high up in Peach Tree and at the Beta North Decant. Both areas are known to be active illegal mining sites, which may explain the elevated concentrations. The points downstream show the same effects, but at lower concentrations, which would be a result of dissipation in the water's flow.

The overall surface water quality in the Morgenzon Creek upstream and downstream of Morgenzon/Clewer is generally good, with parameters within the IWUL limits. The water at the historically flooded Morgenzon adit shows the impact of previous mining activities, with elevated sulphates, calcium and magnesium, and thence high TDS values. Decant volumes were low when sampling was done and thus one would not expect much impact from this source on either surface or groundwater at that time. This is confirmed by analysis results at both the nearby borehole and the downstream sampling point.

The pH and the EC in the Molototse downstream of the old Frankfort hostel and near the Vaalhoek road have been fluctuating substantially since November 2020. The reason for these fluctuations is not clear. Of interest is the Nitrates which spiked at both Bevetts stream and the hostel measuring point in June 2020, indicating blasting activities in the area. There are known illegal miner activities in the area.

Groundwater

Groundwater boreholes in the region are scarce and mainly restricted to scattered mine investigative/monitoring boreholes. Boreholes drilled during previous investigations were used to form an understanding of the geohydrological regime of the study area. This understanding was supplemented by information obtained from exploration boreholes in the study area (MvB Consulting, 2021).

Groundwater occurrences in the study area are predominantly restricted to the following types of terrains.

- Primary aquifers consist of the quaternary sediments which are restricted to the river valleys;
- Weathered and fractured rock aquifer in the Timeball Hill formations;
- Dolomitic and karst aquifers.

Based on the criteria in Section 7 of GNR 635, the mineral waste classifies into the following types:

- Type 3: TGME "New" tailings, CDM and Frankfort waste rock.
- Type 2: DS01 Old tailings, DS02 Old tailings, DMS float.

The mineral waste contains sulphide minerals, which are unstable once exposed to the Earth's atmosphere. Most of the LCT and TCT exceedances are contained in sulphide minerals

A Risk assessment has been done by HydroScience CC which also showed that due to the low leachability of constituents in the new tailings, it is expected to react more like Type 4 waste than Type 3 waste and therefore the impact on the receiving environment is expected to be insignificant.

The following is observed regarding the groundwater quality:

- The groundwater quality is generally good and only a few parameters exceed the very stringent WUL limits.
- Most of the pH values are within the WUL limits and SANS 241 limits except for BGW 09 and the Frankfort Security borehole.
- Boreholes BGW9 and BGW10 at Morgenzon mining area have been monitored consistently and show that the groundwater conditions are good, with metal content below the detection limit. This suggests that water emanating from the adit is not seeping into surrounding groundwater (OMI, July 2020).
- Frankfort Security Borehole exceeded the WUL limit for Ammonium and Orthophosphate (SANS limits).
- The boreholes close to the TSF (BGW06 and BGW07) show some impact with elevated TDS (BGW06), Sulphate (BGW07), Ammonium (BGW06), Calcium, Sodium, Aluminium (BGW07) and Manganese (BGW06). Additional monitoring boreholes will be drilled to better understand the potential impact from the TSF.
- The borehole BGW04, which is down-gradient from the TSF and RWDs, shows no impact and none of the parameters exceed the guideline limits.
- Borehole BGW02, which is down-gradient from the plant, shows no impact and none of the parameters exceed the guideline limits.
- The water quality decanting from the Beta workings (BGW15) only exceeds the WUL limits for Sulphate, which indicates that water emanating from the historical mine workings does not pose a threat to the environment.

Generally, the groundwater quality is good and there are no parameters of concern in the groundwater which exceed the SANS 241 drinking water guidelines significantly.

Terrestrial Biodiversity

Scientific Terrestrial Services (STS) and SAS were commissioned to undertake the Terrestrial and Aquatic Ecological assessments respectively.

The studies aimed to identify preliminary areas of increased sensitivity or importance within the development areas that could place constraints on the planned underground mining activities, and on the associated surface infrastructure required to support underground mining, so as to determine if there are any major flaws with regards to sensitive habitat and SCC. The report includes a detailed desktop study highlighting the Ecological Importance and Sensitivity (EIS) of the areas based on all relevant national and provincial databases, including the Mpumalanga Biodiversity Sector Plan (2019) and all available biodiversity databases provided on the Biodiversity Geographic Information Systems (BGIS) website.

Four vegetation types are associated with the 83MR areas, however, the Northern Escarpment Dolomite Grassland and the Long Tom Pass Montane Grassland make up the largest of the vegetation types associated with the project. Smaller sections of Dukes, Frankfort and Morgenzon are traversed by the Northern Mistbelt Forest. More specifically, the following vegetation types are associated with each of the 83MR areas:

- Dukes: The western section of Dukes lies within both the Long Tom Pass Montane Grassland and the Northern Mistbelt Forest vegetation types, with the eastern section occurring within the Northern Escarpment Dolomite Grassland.
- Frankfort: A small section in the western section falls in the Long Tom Pass Montane Grassland, with a small portion of the northern section falling in the Northern Mistbelt Forest. The central and eastern sections lie in the Northern Escarpment Dolomite Grassland.
- Morgenzon: The western section is classified as Northern Mistbelt Forest, with the central sections lying in the Long Tom Pass Montane Grassland, and the eastern section within the Northern Escarpment Dolomite Grassland.

- Beta North: Most of the extent occurs within the Northern Escarpment Dolomite Grassland. A small section in its northern extent is in the Northern Mistbelt Forest.

The Northern Escarpment Dolomite Grassland and the Long Tom Pass Montane Grassland are endemic to South Africa, with the Northern Mistbelt Forest likely being endemic to South Africa, Lesotho and Eswatini.

Dukes is entirely located in an Irreplaceable CBA, with the southern section of Morgenzon and the northern section of Beta also within an Irreplaceable CBA. These are areas required to meet targets and with irreplaceability values of more than 80%; Critical linkages or pinch-points in the landscape that must remain natural; and often include Critically Endangered Ecosystems, or hosts species of conservation concern.

The north-western section of Frankfort is within an Optimal CBA. None of the other 83MR areas occur in these CBAs.

The CBA Optimal Areas (previously called 'important and necessary' in the Mpumalanga Biodiversity Conservation Plan - MBCP) are the areas optimally located to meet both the various biodiversity targets and other criteria defined in the analysis. Although these areas are not 'irreplaceable' they are the most efficient land configuration to meet all biodiversity targets and design criteria.

Various protected and sensitive environments have been identified in and around the 83MR area.

Aquatic Biodiversity

The various freshwater ecosystems were found to be of high ecological importance and sensitivity and to provide intermediate to moderately high levels of various ecological services such as biodiversity maintenance (especially in the upper reaches of systems [with special mention of the Blyde River] where disturbances were fewer), flood attenuation, assimilation of nutrients and toxicants and streamflow regulation. As a result of the increased ecological integrity and the degree to which ecoservices are provisioned, all systems were deemed to be of moderate to high ecological importance and sensitivity.

The aquatic assemblages of the various rivers and streams assessed (i.e. the Blyde River, Clewer Creek and the Molototse River) of the assessed sites can be defined as being extremely sensitive to water quality changes as well as changes in flow regimes and habitat integrity, with these three parameters also considered to be the most important ecological parameters in the Blyde River system (affected by both natural seasonal variation as well as existing anthropogenic impact) with more significant influence from the changes in flow regime.

The temporal and spatial results of the aquatic ecological assessment indicate that the integrity of the Blyde River, while still largely classified overall as an Ecological Category B along the entire portion of the Blyde River assessed, has begun to decline over time with a clear spatial decrease in integrity also observed.

This decline may be largely related to the surrounding land-use activities, including forestry, illegal artisanal mining activities, seepage and runoff from historical mining areas, increasing urbanization and proliferation of alien and invasive species (resulting in altered surface runoff into the river and changes to the stream bed characteristics), and the ingress of sewage related to the Pilgrims Rest WWTW.

The illegal artisanal mining activities observed have resulted in severe sedimentation in some areas and may potentially have contributed to the blanketing of benthos and algal proliferation, which has begun to compromise the habitat integrity and water clarity of the Blyde River in a downstream direction.

Land-use activities were largely to blame for the short-term variability in EC observed, as well as impacts to the habitat availability and suitability.

However, with some recovery of the aquatic assemblages further downstream it was concluded that the resilience of the Blyde River was such that the impact of the historical mining and ongoing illegal artisanal mining activities, forestry and altered surface runoff profiles still have the potential to be absorbed.

However, should the scale of impact increase, the cumulative land-use impacts would place the Blyde River under significant strain and a decline in Ecological Category would be inevitable. According to the "Classes and Resource Quality Objectives of Water Resources for the Olifants Catchment" (DWS, 2018), all efforts need to be made to prevent the proposed activities from impacting on the water quality and the integrity of the aquatic assemblage of this Class I, sensitive system.

It is important to note that it is unlikely that, should further impact on the Blyde River and its associated tributaries occur, that the river would have the potential to be restored to its original ecological state.

It is therefore considered critical that should the proposed mining project be authorised, very strict adherence to cogent, well-developed mitigation measures must take place throughout the life of the project, with specific mention of planning, separation of clean and dirty water, management of potential decant, dewatering and sedimentation of the receiving environment as well as, during the closure, rehabilitation of affected areas.

In addition, it is deemed essential that immediate control of the illegal artisanal mining takes place to prevent further significant impact.

Noise baseline

Baseline measurements were conducted on 3 October 2021 at three (3) localities. Measurements were analysed to compile a subjective and objective determination of the Rating levels (LReq) based on the LAIeq measurements (LAIeq: A-weighted, impulse, leq sound level).

The conclusions were drawn during analysis of the data, desktop information and onsite investigations

Receptor/Measuring Point	Conclusions
AB01 - dwellings [Min 10-minute measurement on outside boundary]	• Calculated LAIeq was 39,8 dBA - The measurements reflected a rural area (daytime) • The measurements were influenced by one vehicle passing along the R533 route
AB02 – Pilgrim's Rest	• Calculated LAIeq was 42,4 dBA – The measurements reflected a developed suburban area (daytime). There is moderately high confidence in this measurement (based on desktop assessment, onsite investigations and noises/sounds heard during measurements) • The measurements were influenced by some domestic sounds and local routes (namely R533)
AB03 - Pilgrim's Rest	• Calculated LAIeq was 38,8 dBA – The measurements reflected a rural area (daytime)

Visual landscape

The landscape quality associated with the 83MR Project Areas is considered high, due to the mountainous terrain forming part of the scenery of the greater region, the area being of national cultural and heritage importance, the town of Pilgrim's Rest being a tourist attraction, and the Blyde River being a dominant factor in the landscape.

The area can be described as calm, tranquil, peaceful and undeveloped, with a strong association to a semi-natural environment. The proposed large-scale mechanised mining infrastructure is likely to lower the landscape value of the area; however, the impact can be considered limited as the above-ground footprints will be limited.

The site has a moderate visual absorption capacity (VAC), indicating that the proposed mining activities will be partially absorbed in the area The vast mountainous backdrop of the larger region is the main contributing factor to the VAC, since the hills and mountains are unified, making it difficult to observe distinguishing features within the landscape from significant distances.

The town of Pilgrim's Rest is situated in a valley, thus the undulating landscape and local vegetation associated with the town will serve to somewhat limit the visual intrusion, especially central plant area, from certain receptor sites. The Dukes, Morgenzon and Beta Project Areas will be highly visible from the Mount Sheba hiking trail, especially from the S3 viewpoint of the Lost City Hiking Trail.

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. It is created by the land use, character, and quality of a landscape, as well as by the tangible and intangible value assigned thereto. The landscape character type is defined as a rural, mountainous area dominated by grassland, plantations and natural forests interspersed with watercourses, especially the Blyde River, villages, the town of Pilgrim's Rest and historic mining infrastructure.

Socio- Economic environment

The socio-economic study was done by Southern Economic Development (SED). The available Stats SA data regarding the population and infrastructure dates largely from 2011, with some data being available for 2016. However, as virtually no development has taken place in Pilgrim's Rest since 2016, these figures may be taken as valid for the baseline economic conditions.

The project is located in Ward 13 of the Thaba Chweu Local Municipality (TCLM) within the Ehlanzeni District Municipality (EDM) in Mpumalanga Province. The main socio-economic sensitive receptors in the local area close to the project include Pilgrim's Rest Town, Brown's Hill, Darks Gully, Newtown/Schoonplaas, and a number of rural tourist establishments in and around Pilgrim's Rest town.

The population of the larger Pilgrim's Rest area ranges from 1,700 to 2,500. The majority live in Newtown/Schoonplaas and Darks Gully close to the old town, while around 250 people live in the old historic part of the town. The population of the larger Pilgrim's Rest area represents less than 3% of the estimated 102,000 people living within the larger TCLM. The area is characterised by high historic (sporadic) in-migration to Newtown/Schoonplaas, resulting from periodic short-term construction works in the area.

Young people possibly leave Pilgrim's Rest for better job opportunities elsewhere, while illegal miners move into Pilgrim's Rest from areas as far afield as Free State, Lesotho, and Mozambique. In-migration of illegal miners has substantially increased in the last year. The illegal mining activities have significantly influenced the downstream biodiversity in and around the Blyde River, as well as the flow pattern of the Blyde River. Sedimentation from their activities is a further source of concern.

Pilgrim's Rest was sold to the government as a living national museum village in 1971 when mining activities in the town closed down. The town was declared a National Monument and became a provincial heritage site in 1986. The Mpumalanga Department of Public Works, Roads and Transport (DPWRT) is currently the custodian of the town on behalf of the government and is responsible for the maintenance and restoration of Pilgrim's Rest. The TCLM is responsible for basic service provision while the other provincial departments (e.g. health, education) are responsible for their respective mandates in Pilgrim's Rest.

Economic

The local economy experienced a sharp decline since its peak in the early 1990's due to the general decline in tourism to Mpumalanga Province, deteriorating safety and hygiene conditions in Pilgrim's Rest, factors related to illegal mining activities, increased vagrancies due to poverty and unemployment and lack of public facilities and municipal functions such as street cleaning. Another contributing factor was the closure of many businesses due to the provincial government not renewing existing business leases, with the subsequent tender processes allegedly being irregular (The Public Protector, 2014).

Since 2018, the allocation of leases to business owners has improved and a new local business forum was established. The provincial Department of Public Works has improved services such as cleaning, and - despite the Covid-19 pandemic which hampered tourism between March 2020 and September 2021 - there are positive revival signs in Pilgrim's Rest.

Only limited opportunities are provided for the tourism sector of Pilgrim's Rest, formal and informal. The unemployment and poverty rates were much higher than the provincial and municipal averages in South Africa, with an estimated 48% of Ward 13 households living below the lower bound poverty line. This emphasizes the pressing need to create job opportunities for the working-age group in the Pilgrim's Rest area.

Heritage and Palaeontological baseline

Heritage Management Consulting was commissioned to undertake the Heritage and Paleontological assessments as part of the scoping specialist studies. A notice of intent to develop (NID) was submitted to SAHRA in terms of section 38 of the NHRA.

The study area has evidence of occupation over an extensive period of time, spanning from the Stone Age through to the historical period. Briefly, the Stone Age is associated with the manipulation of lithics to create tools. These date from as many as 2.5 million years to less than 150 years ago. This period overlaps with the migration of Bantu speakers into southern Africa, bringing with them agricultural technologies, herding and a settled way of life manifested through stone walling. For the purposes of this study, the literature review was primarily focused on the historical period as activities associated with the project are planned within a predominantly Historical Period landscape.

The farm Ponieskrans, which would later become Pilgrim's Rest, was officially declared a gold field in September 1873, heralding the dawn of one of South Africa's largest and most significant gold rushes. Initially, alluvial gold was found where diggers were panning in the streams around Pilgrims Rest - some from as far away as California and Australia. Pilgrims Rest was declared a public digging in 1875 but gold panning declined in 1876 and subsequently, heavy equipment was employed to locate and mine subsurface reefs. Several smaller companies were formed which mined smaller claims, while larger conglomerates commenced mining in deeper gold-bearing ore. In 1895, several small mining companies amalgamated to form the TGME. This company was listed on the London Stock Exchange and became the first listed gold mining company in South Africa. As the volumes of gold ore increased, the engineers constructed small, local hydro-electric plants to generate electricity for the electric tramway and the ore crushers at the reduction works, which were constructed in 1897.

Mining in Pilgrim's Rest town ceased in 1971 and the village was acquired by the authorities for the formation of a National Museum and tourism destination.

The TGME Mine is situated within the larger Pilgrim's Rest heritage landscape, which is regarded as highly significant and of national significance. Pilgrim's Rest and the farm Ponieskrans were declared a Provincial Heritage Site in 1986 and an application for World Heritage Site status for the Reduction works was lodged in November 2006, but the declaration was never formalized.

The Pilgrim's Rest landscape represents a striking visual representation of mining, evoking images of time, place, and historical patterns associated with past mining epochs. The historical mining horizon provides clues to past activity and many historical layers form part of this significant landscape. However, the historical landscape is unfortunately highly compromised with vast site transformation in past decades - and in recent years in particular.

This assessment attempted to capture as much of the remaining mining heritage in the baseline environment and the project development areas within notable project constraints,

Cognizant of the above, the following observations and recommendations are made based on sites within the TGME Mining Project areas that risk direct impact from the project activities:

- In the proposed Beta North mining area, a number of features of significance were noted. These include Historical/extant adits and a Historical/extant drainage shaft (NH-TGME-2430DC-01 , NH-TGME-2430DC-02), the remains of the Historical tram line/cocopan line (NH-TGME-2430DC-03), the remains of a Historical concrete water furrow (NH-TGME-2430DC-04), Historical suspension bridge remains (NH-TGME-2430DC-06), the Historical Farmer's Race remains (NH-TGME-2430DC-08), Historical concrete structures (NH-TGME-2430DC-05, NH-TGME-2430DC-07) and a Historical concrete low-level bridge (NH-TGME-2430DC-09).
- In the CDM mining area, Historical/extant adits (NH-TGME-2430DC-14, NH-TGME-2430DC-15, NH-TGME-2430DC-16, NH-TGME-2430DC-17, NH-TGME-2430DC-18), the remains of the Historical tram line/cocopan line (NH-TGME-2430DC-12), a Historical/contemporary water furrow (NH-TGME-2430DC-13) and a burial site (NH-TGME-2430DC-19) were noted. In many instances, these features are poorly preserved or destroyed but the sites are nonetheless intrinsically linked to the highly significant Pilgrim's Rest Mining legacy thus bearing high heritage value. In addition, the sites and features are older than 60 years and are protected under the National Heritage Resource Act (NHRA 1999).
- In the proposed Frankfort mining area, the remains of the Historical MET plant building (NH-TGME-2430DC-10) and the remains of a Historical suspension bridge or pulley system (NH-TGME-2430DC-11) were noted.

Various mitigation measures and plans have been recommended by the specialist and will have to be implemented by TGME. Where sites cannot be avoided, the necessary permitting application process will have to be followed.

To comply with the National Heritage Resources Act (No 25 of 1999, section 38) (NHRA), this PDA is necessary to confirm if fossil material could potentially be present in the planned mining area and to evaluate the impact of the proposed development on the Palaeontological Heritage.

The proposed mining site is underlain by Quaternary alluvium and scree, diabase, and the Timeball Hill Formation (Pretoria Group, Transvaal Supergroup) as well as the Malmani Subgroup (Chuniespoort Group, Transvaal Supergroup). According to the PalaeoMap of South African Heritage Resources Information System, the Palaeontological Sensitivity of the Quaternary superficial sediments is low but locally High, the diabase is igneous in origin and has an insignificant Palaeontological Sensitivity while that of the Timeball Hill Formation is High and the Palaeontological Sensitivity of the Malmani Subgroup (Transvaal Supergroup) is Very High (Almond and Pether 2008, SAHRIS website).

IMPACT SIGNIFICANCE RATINGS

Impacts have been rated with the assistance of specialists and engineers. The following is a summary of the high impacts without mitigation (WoM) and With Mitigation (WM). The complete list of impacts is included in Section 13.

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance	
					Score	Magnitude
Soil and Land Capability Assessment						
Construction Phase						
Construction of the infrastructure	Soil Erosion	Loosening of soils due to removal of vegetation associated with the surface infrastructure. Leading to Increased runoff, erosion and consequent loss of land capability in cleared areas.	WOM	Negative	65	High
			WM	Negative	40	Low
	Soil Compaction	Potential frequent movement of digging machinery and construction vehicles within loose and exposed soils, leads to excessive soil compaction.	WOM	Negative	65	High
			WM	Negative	40	Low
	Soil Contamination	Spillage of petroleum hydrocarbons during construction of associated infrastructure. Disposal of hazardous and non-hazardous waste, including waste material, spills and refuse deposits into the soil.	WOM	Negative	52	Moderate
Biodiversity Assessment - Floral Assessment						
Beta North						
Closure and Post closure						

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance	
					Score	Magnitude
Rehabilitation and restoration activities	Floral Habitat and diversity	• Permanent loss of floral habitat, diversity and SCC, and a higher likelihood of edge effect impacts on adjacent and nearby natural vegetation of increased sensitivity due to potential failure to effectively implement and monitor rehabilitation efforts, leading to: a) Reintroduction and proliferation of alien and invasive plant species; b) Compacted soils limiting the re-establishment of natural vegetation; c) Increased risk of erosion in areas left disturbed and inadequately vegetated; d) Improper rehabilitation of disturbed areas leading to permanent floral habitat loss. Ultimately leading to a permanent loss of floral habitat, diversity and SCC, and a higher likelihood of edge effect impacts on adjacent and nearby natural vegetation of increased sensitivity.	WOM	Negative	75	High
			WM	Negative	24	Low
Dukes						

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance	
					Score	Magnitude
Construction of Linear Developments	Woody Communities	• Site clearing and the removal of vegetation along with continuous leading to fragmented habitat and a disturbance corridor along which AIPs can establish and spread to adjacent sites; and • Construction related activities within the recommended 30 m forest exclusion buffer, resulting in the potential loss or degradation of the zone buffering the forest from external impacts, e.g., degradation of habitat integrity of the 30 m buffer decreasing forest resilience, increasing the risk of AIP proliferation and native woody encroachers.	WOM	Negative	65	High
			WM	Negative	35	Low
Operational Phase						
All activities associated with mining and the movement of vehicles	Valley Habitat	• Further loss of floral habitat beyond the project footprint because of vegetation clearing related to operational-phase disturbances and	WOM	Negative	70	High

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance	
					Score	Magnitude
		expansion of stockpiles and waste rock dumps, on-going disturbance of soils due to operational activities, and edge effects associated with mining activities; • Potential trimming or slashing of vegetation associated with the Forest and Woodland habitat units, or wood collection from these habitat units, creating 'gaps' in the woody layer that will impact the dynamics of these systems (increased light and potential for increased fire frequency), ultimately resulting in potential alterations in species composition and ecological function; • Ongoing disturbances from operational activities resulting in increased or continued proliferation of AIPs; • Failure to concurrently rehabilitate bare areas or disturbed sites as soon as they become available, potentially resulting in loss of viable soils, increasing erosion risk and/or permitting the proliferation	WM	Negative	44	Moderate

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance	
					Score	Magnitude
		of AIPs; • Erosion as a result of mining development, stormwater runoff and ongoing disturbance of soils due to operational activities; • Risk of contamination from all operational facilities may pollute receiving environment; • Loss of floral SCC through ineffective monitoring of relocation success of rescued and relocated floral SCC (where applicable), and/or due to the harvesting of protected floral species by mining and operational personnel; and • Additional pressure on floral habitat by increased human populations associated with the proposed mining activities, contributing to increases in the collection of plant material for medicinal purposes and promoting the introduction and spread of AIPs that may displace habitat for SCCs.				
Closure and Post closure						

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance	
					Score	Magnitude
Rehabilitation and restoration activities	Floral Habitat and diversity	• Permanent loss of floral habitat, diversity, and SCC, and a higher likelihood of edge effect impacts on adjacent and nearby natural vegetation of increased sensitivity due to potential failure to effectively implement and monitor rehabilitation efforts, leading to: a) Reintroduction and proliferation of alien and invasive plant species; b) Compacted soils limiting the re-establishment of natural vegetation; c) Increased risk of erosion in areas left disturbed and inadequately vegetated; d) Improper rehabilitation of disturbed areas leading to permanent floral habitat loss. Ultimately leading to a permanent loss of floral habitat, diversity, and SCC, and a higher likelihood of edge effect impacts on adjacent and nearby natural vegetation of increased sensitivity.	WOM	Negative	64	High
			WM	Negative	24	Low

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance	
					Score	Magnitude
Rehabilitation and restoration activities	Floral Habitat and diversity	• Reinstatement of native floral communities due to rehabilitation of currently transformed and degraded habitat and AIP clearance within heavily infested areas. Return of ecological functioning that has been lost due to AIP proliferation and habitat transformation.	WOM	Positive	11	Negligible
			WM	Positive	70	High
Frankfort						
Construction Phase						
Construction of surface infrastructure associated with Operational Infrastructure, Supporting Infrastructure, WRDs and Stockpiles	Woody Communities	• Site preparation and clearing of indigenous vegetation for mine-related infrastructure; • Construction related activities within the recommended 30 m forest exclusion buffer, resulting in the potential loss or degradation of the zone buffering the forest from external impacts, e.g., degradation of habitat	WOM	Negative	70	High

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance	
					Score	Magnitude
		integrity of the 30 m buffer decreasing forest resilience, increasing the risk of AIP proliferation and native woody encroachment; • Dumping of cut vegetation, including AIPs, outside of already disturbed areas or outside of the authorised footprints, resulting in the loss of favourable habitat for the establishment of native species; • Impaired water quality and reduced flow of watercourses due to the accumulation of vegetation cuttings and debris within the Freshwater Habitat resulting from vegetation clearing; • Potential failure to have a stormwater management plan and erosion control plan in place during construction activities. The proposed activities will occur in mountainous terrain with watercourses (i.e., Riparian Forest and Riparian Woodland) downslope of these	WM	Negative	55	Moderate

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance	
					Score	Magnitude
		activities; • Potential inadequate stabilisation of steep slopes in the event that vegetation will be cleared along such slopes. Consequently, increased erosion will lead to the smothering of surrounding vegetation and larger disturbance footprints as slopes continue to erode; • Waste from construction material leading to disturbance of natural vegetation; • Increased personnel on site leading to loss of floral habitat through the potential for increased fire frequency and intensity (further promoting wattle thicket formation), as well as indiscriminate driving through natural veld; • Potential proliferation of AIP species that colonise areas of increased disturbances and that outcompetes native species, including the further transformation of adjacent or nearby natural, more sensitive habitat, such as downslope watercourses;				

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance	
					Score	Magnitude
		• Dust generated during construction activities accumulating on the surrounding floral individuals, altering the photosynthetic ability of plants, and potentially further decreasing optimal growing/re-establishing conditions; • Potential failure to concurrently rehabilitate bare areas or disturbed sites as soon as they become available, potentially resulting in loss of viable soils, increasing erosion risk and/or permitting the proliferation of AIPs; and • Potential failure to implement a BAP, including the auditing of the BAP, leads to a permanent transformation of floral habitats and long-term degradation of important floral habitats within the region.				
Construction of Linear Developments	Woody Communities	• Site clearing and the removal of vegetation along with continuous leading to fragmented habitat and a disturbance corridor along which AIPs	WOM	Negative	70	High

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance	
					Score	Magnitude
		can establish and spread to adjacent sites; • Potential failure to implement an Erosion Control Plan for construction of linear features occurring along mountain slopes, especially where areas are already disturbed and soils are less stable, leading to sedimentation of downslope watercourses and smothering of surrounding vegetation; • Construction related activities within the recommended 30 m forest exclusion buffer, resulting in the potential loss or degradation of the zone buffering the forest from external impacts, e.g., degradation of habitat integrity of the 30 m buffer decreasing forest resilience, increasing the risk of AIP proliferation and native woody encroachers; and • Potential slope failure during construction activities, directly affecting forest communities or resulting in gaps in the	WM	Negative	55	Moderate

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance	
					Score	Magnitude
		forest where increased light may open the potential for non-forest species to establish, thereby resulting in potential changes in forest dynamics in the long run.				
Operational Phase						
All activities associated with mining and the movement of vehicles	Woody Communities	• Further loss of floral habitat beyond the project footprint because of vegetation clearing related to operational-phase disturbances and expansion of stockpiles and waste rock dumps, on-going disturbance of soils due to operational activities, and edge effects associated with mining activities; • Potential trimming or slashing of vegetation associated with the Forest and Woodland habitat units, or wood collection from these habitat units, creating 'gaps' in the woody layer that will impact the dynamics of these systems (increased light and potential for increased fire frequency), leading to potential alterations in species composition and	WOM	Negative	70	High
			WM	Negative	44	Moderate

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance	
					Score	Magnitude
		ecological function; • Ongoing disturbances from operational activities resulting in increased or continued proliferation of AIPs; • Failure to concurrently rehabilitate bare areas or disturbed sites as soon as they become available, potentially resulting in loss of viable soils, increasing erosion risk and/or permitting the proliferation of AIPs; • Erosion as a result of mining development, stormwater runoff and on-going disturbance of soils due to operational activities; • Risk of contamination from all operational facilities may pollute receiving environment; • Loss of floral SCC through ineffective monitoring of relocation success of rescued and relocated floral SCC (where applicable), and/or due to the harvesting of protected floral species by mining and operational personnel; and • Additional pressure on				

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance	
					Score	Magnitude
		floral habitat by increased human populations associated with the proposed mining activities, contributing to increases in the collection of plant material for medicinal purposes and promoting the introduction and spread of AIPs that may displace habitat for SCCs.				
Closure and Post closure						
Rehabilitation and restoration activities	Floral Habitat and diversity	• Permanent loss of floral habitat, diversity and SCC, and a higher likelihood of edge effect impacts on adjacent and nearby natural vegetation of increased sensitivity due to potential failure to effectively implement and monitor rehabilitation efforts, leading to: a) Reintroduction and proliferation of alien and	WOM	Negative	75	High

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance	
					Score	Magnitude
		invasive plant species; b) Compacted soils limiting the re-establishment of natural vegetation; c) Increased risk of erosion in areas left disturbed and inadequately vegetated; d) Improper rehabilitation of disturbed areas leading to permanent floral habitat loss. Ultimately leading to a permanent loss of floral habitat, diversity and SCC, and a higher likelihood of edge effect impacts on adjacent and nearby natural vegetation of increased sensitivity.	WM	Negative	24	Low
Visual Impact Assessment						
Morgenzon, Dukes and Beta						
Site clearing of the project footprint areas associated with the shafts, WRDs, RoM Stockpiles, PCDs, DMS Plant, other supporting infrastructure, access roads and associated contractor laydown areas.	Visual	• Further removal of vegetation leads to visual contrast, potential loss of Visual Absorption Capacity of the landscape and visual intrusion on sensitive receptors especially the town of Pilgrim's Rest. • Erosion and loss of topsoil leading to visual contrast, and possible loss of Visual Absorption	WOM	Negative	65	High

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance	
					Score	Magnitude
		Capacity of the landscape. • Construction related earthworks activities resulting in increased dust suspension. • Increased vehicular movement in the vicinity of the study area. • Yellow construction vehicles are visible from the lush green background, increasing the likelihood of motorists observing the proposed construction activities.	WM	Negative	48	Moderate
Construction and excavation activities related to the shafts , PCDs, WRDs, RoM Stockpiles and access roads.	Visual	• Excavation during construction of mining infrastructure will lead to visual intrusion and visual exposure of receptors. • Mine infrastructure including buildings, stockpiles and dumps being visible and creating contrast with the surrounding landscape. • An increase in construction vehicular and	WOM	Negative	65	High

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance	
					Score	Magnitude
		human activity in the area, leading to an increase in dust. • Excavation resulting in increased dust suspension. • Use of security lighting.	WM	Negative	44	Moderate
Heritage Impact Assessment						
Construction Phase						
	Heritage	Damage/destruction of high significance heritage resources in the Beta North Mining Area, Frankfort Mining Area and CDM Mining Area.	WOM	Negative	64	High

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance	
					Score	Magnitude
			WM	Negative	40	Low
Operational Phase						
	Heritage	Damage/destruction of high significance heritage resources in the Beta North Mining Area, Frankfort Mining Area and CDM Mining Area.	WOM	Negative	64	High

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance	
					Score	Magnitude
			WM	Negative	30	Low
Socio-Economic Impact Assessment						
Closure and Decommissioning Phase					0	
Closure Activities	Socio-Economic	Job losses due to scaling down of mining activities and mine closure	WOM	Negative	65	High
			WM	Negative	52	Moderate
Closure Activities	Socio-Economic	Termination of local social funds	WOM	Negative	65	High
			WM	Negative	55	Moderate

REASONS WHY THE ACTIVITY SHOULD BE AUTHORIZED OR NOT

Please refer to Section 23. The findings of this EMPR conclude that, provided that the recommended mitigation and management measures are implemented, there are no environmental flaws that, post the recommended mitigation, should prevent the project from continuing.

TABLE OF CONTENTS

List of Annexures

LIST OF TABLES

LIST OF FIGURES

List of Abbreviations

ABBREVIATION	DESCRIPTION
AEL	Atmospheric Emission Licence
AIPs	Alien Invasive Plant species
Airshed	Airshed Planning Professionals (Pty) Ltd
AQSRs	Air Quality Sensitive Receptors
ASST	Applied Scientific Services and Technologies
BGIS	Biodiversity Geographic Information Systems
BoQ	Bill of Quantities
BPEO	Best Practicable Environmental Option
CDM	Clewer Dukes Morgenzon
CE	Control efficiencies
CIL	carbon-in-leach
CO	Carbon Monoxide
CO_2	Carbon Dioxide
CPA	Community Property Association
CRR	Comments and Response Report
CS	Community Survey
DARDLEA	Land Claims Commission, Mpumalanga Department: Agriculture, Rural Development, Land and Environmental Affairs
DEA	Department of Environmental Affairs
DEAT	Department of Environmental Affairs and Tourism
DFFE	Department of Forestry, Fisheries and the Environment
DMR	Department of Mineral Resources
DMRE	Department of Mineral Resources and Energy
DMS	Dense Medium Separation
DPWRT	Department of Public Works, Roads and Transport
DWS	Department of Water and Sanitation
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
EC	Electrical Conductivity
ECA	Environmental Conservation Act, 1989 (Act 73 of 1989)

ABBREVIATION	DESCRIPTION
ECO	Environmental Control Officer
EDM	Ehlanzeni District Municipality
EIA	Environmental Impact Assessment
EIR	Environmental Impact Report
EIS	Ecological Importance and Sensitivity
EMPR	Environmental Management Programme Report
FEL	Front-end-loaders
FMP	Fire Management Plan
GG	Government Gazette
GHG	Greenhouse Gas
GN	Government Notice
GN704	Government Notice 704 - GN 704 in GG 20119 of 4 June 1999
GNR	Government Notice Regulation
GVA	Gross Value Added
H_2SO_4	Sulphuric Acid
HCl	Hydrochloric Acid
HF	Hydrogen Fluoride
I&APs	Interested and Affected Parties
IDP	Integrated Development Plans
IEM	Integrated Environmental Management
IFC	International Finance Corporation
IHAS	Invertebrate Habitat Assessment System
IHC	Inherent Hazard Class
IHIA	Intermediate Habitat Assessment System
Infratrans	Infratrans Traffic and Transportation Engineering Consulting (Pty) Ltd
IPCC	Intergovernmental Panel on Climate Change
IWUL	Integrated Water Use Licence
IWULA	Integrated Water Use License Application
IWWMP	Integrated Water and Waste Management Plan
J&W	Jones & Wagener (Pty) Ltd
Kongiwe	Kongiwe Environmental (Pty) Ltd

ABBREVIATION	DESCRIPTION
LC	Least Concern
LHDs	Laud-Haul Dumpers
LoM	Life of Mine
MAP	Mean Annual Precipitation
Minxcon	Minxcon (Pty) Ltd
MNCA	Mpumalanga Nature Conservation Act, 1998 (Act 10 of 1998)
MPRDA	Mineral and Petroleum Resources Development Act, 2002 (Act 28 of 2002)
MR	Mining Right
MRA	Mining Right Application
MTPA	Mpumalanga Tourism and Parks Agency
MWP	Mining Work Programme
NAAQS	National Ambient Air Quality Standards
NAEIS	National Atmospheric Emissions Inventory System
NAERR	National Atmospheric Emission Reporting Regulations
NDCR	National Dust Control Regulations
NEMA	National Environmental Management Act, 1998 (Act 107 of 1998)
NEMAQA	National Environmental Management: Air Quality Act 2004 (Act 39 of 2004)
NEMBA	National Environmental Management: Biodiversity Act, 2004 (Act 10 of 2004)
NEMWA	National Environmental Management: Waste Act, 2008 (Act 59 of 2008)
NFA	National Forests Act, 1998 (Act 84 of 1998)
NHRA	National Heritage Resources Act, 1999 (Act 25 of 1999)
NWA	National Water Act, 1998 (Act 36 of 1998)
OMI	OMI Solutions (Pty) Ltd
PAIA	Promotion of Access to Information Act, 2000 (Act 2 of 2000)
PCD	Pollution Control Dam
PDA	Palaeontological Desktop Assessment
PES	Present Ecological State
PM10	Thoracic Particulate Matter
PM2.5	Inhalable Particulate Matter
POC	Probability of Occurrence
POIs	Points of Interests

ABBREVIATION	DESCRIPTION
PPP	Public Participation Process
ROD	Record of Decision
ROM	Run of Mine
RQOs	Resource Quality Objectives
RVI	Riparian Vegetation Index
RWD	Return Water Dam
SAHPRA	South African Health Products Regulatory Authority
SANAS	South African National Accreditation System
SANS	South African National Standard
SAS	Scientific Aquatic Services
SASS	South African Scoring System
SAWS	South African Weather Service
SCC	Species of Conservation Concern
SAHRA	South African Heritage Resources Agency
SAPS	South African Police Service
SHE	Safety, Health and Environmental
SHERQ	Safety, Health, Environmental, Risk and Quality
SLM	Sound Level Meter
SLP	Social and Labour Plan
SMP	Site Management Plan
S-Pan	Monthly Symon's Pan
SPL	Sound Power Level
STS	Scientific Terrestrial Services CC
SWSA	Strategic Water Source
TCLM	Thaba Chweu Local Municipality
TDS	Total Dissolved Solids
TPA	Tonnes Per Annum
TSF	Tailings Storage Facility
TSP	Total Suspended Particulates
VEGRAI	Riparian Vegetation Response Assessment Index
VOCs	Volatile Organic Compounds

ABBREVIATION	DESCRIPTION
WML	Waste Management Licence
WUL	Water Use License
WULA	Water Use License Application
WWTW	Waste Water Treatment Works

PART A

SCOPE OF ASSESSMENT AND ENVIRONMENTAL IMPACT ASSESSMENT REPORT

1 CONTACT PERSON AND CORRESPONDENCE ADDRESS

1.1 DETAILS OF THE ENVIRONMENTAL ASSESSMENT PRACTITIONER [3]

Name of the Practitioner: Reneé Kruger

E-mail address: **renee@omisolutions.co.za**

1.2 EXPERTISE OF THE ENVIRONMENTAL ASSESSMENT PRACTITIONER

1.2.1 THE QUALIFICATIONS OF THE ENVIRONMENTAL ASSESSMENT PRACTITIONER

Please also refer to **ANNEXURE A: EAP'S QUALIFICATIONS**.

Reneé Kruger has a master's degree in Environmental Management from North-West University. Preceding this Degree, she obtained a BSc Honours in Geography and Environmental Management and BSc in Geography and Zoology. She is registered as an Environmental Assessment Practitioner (EAP) at EAPASA and as a Professional Natural Scientist with SACNASP. Reneé is also a voluntary member of IAIAsa.

Annechris Sewards holds an MSc in Computer Science and a BSc in Metallurgical Engineering. She is a voluntary member of IAIAsa and of NICOLA.

1.2.2 SUMMARY OF THE ENVIRONMENTAL ASSESSMENT PRACTITIONER'S PAST EXPERIENCE

Please also refer to ANNEXURE A.

Reneé Kruger has over 14 years experience working as an EAP conducting and implementing the Environmental Impact Assessment Process throughout all phases – specializing in residential, mine, industrial and commercial developments. Her experience includes water and waste licence applications, integrated waste and water management plans, and assisting with air emissions licenses. She has extensive experience in conducting public participation processes and liaison with government departments. Furthermore, her experience is complemented by geographic information systems (GIS) skills and project management experience.

Annechris Sewards has 2½ years' experience as a candidate EAP, and more than 25 years experience in the mining industry - in operations and services. She has been involved in the implementation of ISO14001, ISO 9000, internal auditing - environmental and safety, and the implementation of EMPrs. Her operational experience has mostly been in smelters and acid plants, and she is fully conversant with mining processes and legal requirements. She has successfully managed projects of various sizes from scoping through implementation.

2 DESCRIPTION OF THE PROPERTY

[3] Environmental Assessment Practitioner, registered with Environmental Assessment Practitioners Association of South Africa (EAPASA)

2.1 LOCATION AND FARM PORTIONS

The proposed re-development is situated near Pilgrim's Rest in the Ehlanzeni District of Mpumalanga Province, South Africa. TGME's offices and processing plant are situated 2.5km southwest of the town of Pilgrim's Rest, 19km east of Graskop, 30km south-east of Sabie and 58km south west of Mashishing (previously known as Lydenburg). The shafts planned to be redeveloped lie to the north of the plant. The site can be accessed by the tarred R533 regional main access road between Pilgrim's Rest and Ohrigstad.

TGME has an existing and approved mining right over the area under application, with Department of Mineral Resources and Energy (DMRE) reference MP 30/5/1/2/2/83 MR (83MR). This right allows the mining of gold ore, silver ore, copper ore and stone aggregate. The total Mining Right (MR) area encompasses the farms listed in Table 1 and covers a total area of some 9,413.3366 ha.

Table 1: Property Details

Farm Name	• Portions 1, 2, 3, 4, 5 and the Remaining Extent of the farm Frankfort 509KT • The farm Krugers Hoop 527KT • Portion 1 and the Remaining Extent of the farm Van Der Merwes Reef 526KT • Portions 1, 2 and the Remaining Extent of Portions of the farm Morgenzon 525KT • The farm Peach Tree 544KT • Portions 18, 42, 43, 44 and the Remaining Extent of the farm Ponieskrans 543KT • Portion 1 of Grootfontein 562KT (Plant area)
Application area (Ha)	Total mining right area: 9,413.3366 ha. The footprint of the development proposed is over previously disturbed areas. The sizes below are the complete surface disturbance which includes the current footprint/infrastructure. The sizes of the areas can be divided and described as: • Clewer and Morgenzon – 4.5 ha • Dukes – 10 ha • Beta North – 10 ha • Frankfort- 6 ha • TSF and Plant area- 42 ha
Magisterial district	Ehlanzeni District Municipality (EDM) and the Local Municipality of Thaba Chweu (TCLM)
Distance and direction from nearest town	The existing plant area is located 2.5km southwest of the town of Pilgrim's Rest. The distance from the plant area to the neighbouring towns of Graskop to the east is 19km, Sabie to the southeast is 30km and Mashishing (previously known as Lydenburg) to the southwest is 58km.
21-digit Surveyor General Code for each farm portion	**Farm Frankfort 509KT:** • T0KT00000000050900000

	• T0KT00000000050900001 • T0KT00000000050900002 • T0KT00000000050900003 • T0KT00000000050900004 • T0KT00000000050900005 **Farm Krugers Hoop 527KT:** • T0KT00000000052700000 **Farm Van der Merwes Reef 526KT:** • T0KT00000000052600000 • T0KT00000000052600001 **Farm Morgenzon 525KT:** • T0KT00000000052500001 • T0KT00000000052500002 • T0KT00000000052500000 **Farm Peach Tree 544KT:** • T0KT00000000054400000 **Farm Ponieskrans 543KT:** • T0KT00000000054300000 • T0KT00000000054300018 • T0KT00000000054300042 • T0KT00000000054300043 • T0KT00000000054300044 **Portion 1 of Grootfontein 562KT** • T0KT00000000056200001

2.2 LOCALITY MAP

The regional locality is shown in Figure 1. The map clearly shows the small surface footprints relative to the overall 83MR area.

A land tenure map is shown in Figure 2.

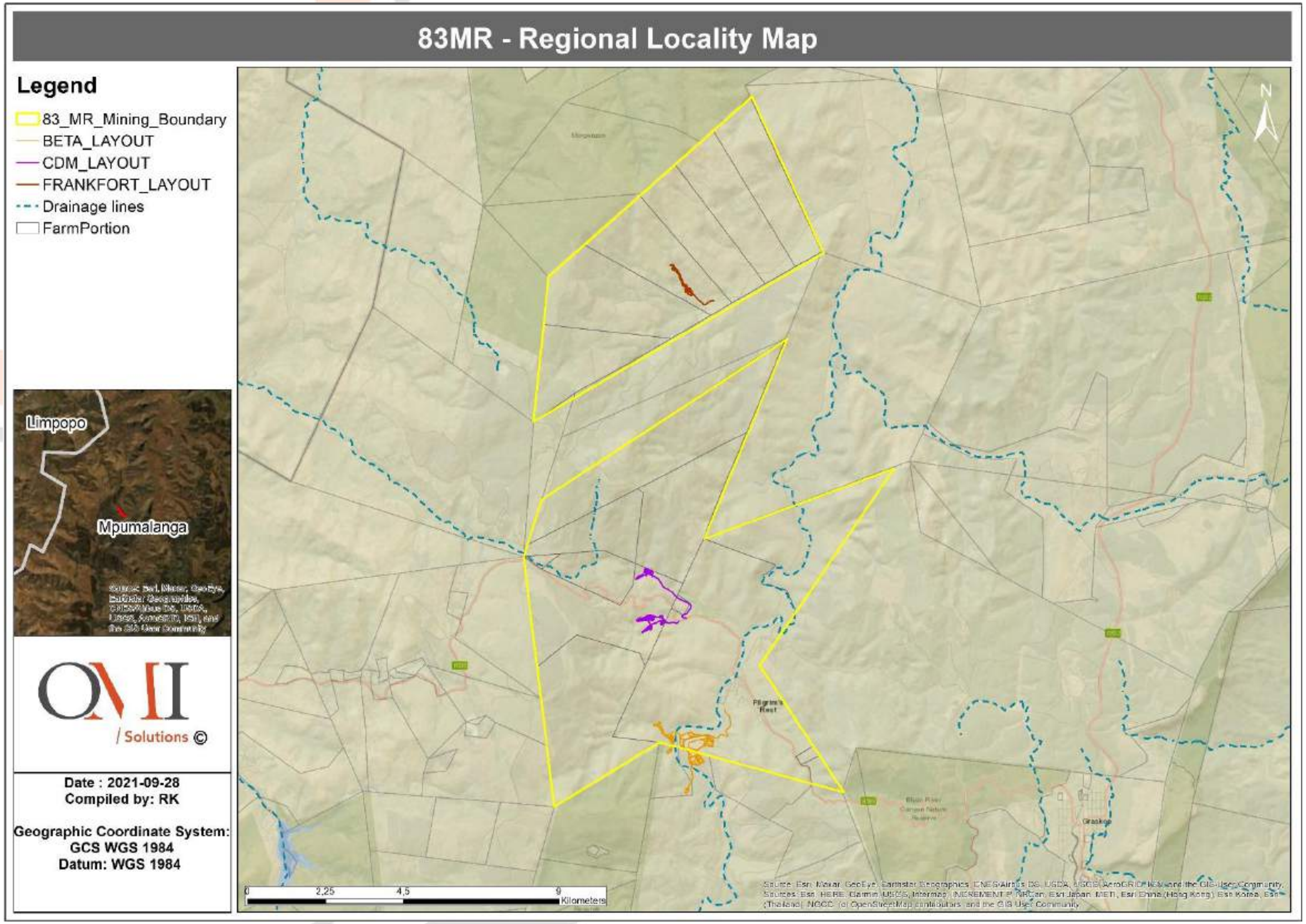


Figure 1: Regional Location of the Mining Right Area

Directly Affected Farm Portions			
Map ID	Parent Farm	Farm Portion	Landowner
1	Ponieskrans No.543-KT	0 (RE)	Maorabjang Communal Property Association
	Frankfort No. 509-KT	0 (RE)	
	Frankfort No. 509-KT	4	
	Frankfort No. 509-KT	5	
2	Frankfort No. 509-KT	1	Mpumalanga Department of Public Works, Roads and Transport: Leased by SAFCOL
	Frankfort No. 509-KT	3	
	Peach Tree No. 544-KT	0 (RE)	
	Morgenzon No. 525-KT	0 (RE)	
	Van Der Merwes Reef 526 KT	0 (RE)	
	Krugers Hoop 527 KT	0 (RE)	
	Frankfort No. 509-KT	2	
3	Ponieskrans No.543-KT	43	Mpumalanga Department of Public Works, Roads and Transport
	Ponieskrans No.543-KT	42	
	Ponieskrans No.543-KT	18	
	Ponieskrans No.543-KT	44	
4	Morgenzon No. 525-KT	A Part of RE	National Government of South Africa: The Department of Environment, Forestry and Fisheries
	Morgenzon No. 525-KT	A Part of Portion 3	
	Peach Tree No. 544-KT	1	
	Peach Tree No. 544-KT	A Part of RE	
5	Morgenzon No. 525-KT	1	Unregistered
	Morgenzon No. 525-KT	2	
	Van Der Merwes Reef 526 KT	1	
6	Grootfontein 562 KT	0 (RE)	York Timbers (Pty) Ltd
	Grootfontein 562 KT	Part A of Portion 1	

Indirectly Affected Farm Portions			
Map ID	Parent Farm	Farm Portion	Landowner
7	Vygeboom 512 KT	0 (RE)	Canyon Creek Prop Pty Ltd
8	Doornhoek 545 KT	12	Jacob Jacobus Johannes Diedericks
	Doornhoek 545 KT	14 (RE)	
9	Doornhoek 545 KT	8	Lachland Pty Ltd
10	Ledovine 507 KT	0 (RE)	Maorabjang Communal Prop Association
	Hermansburg 495 KT	0 (RE)	
11	Rotunda Greek 510 KT	0 (RE)	Mpumalanga Department of Public Works, Roads and Transport
	Magsville 489-KT	0 (RE)	
	Doornhoek 488 KT	1	
	Eldorado 490 KT	0 (RE)	
	Grootfonteinberg 561 KT	0 (RE)	
	Sacramento Creek 492 KT	0 (RE)	
	Blackhill 528 KT	0 (RE)	
	Desire 563 KT	0 (RE)	
	Lissabon 524 KT	0 (RE)	
12	Doornhoek 545 KT	10	Sappi Limited
	Breytenbachskraal 556 KT	3	
13	Vitown 511 KT	0 (RE)	Themeda Hill Inv Pty Ltd
14	Grootfontein 562 KT	0 (RE)	York Timbers (Pty) Ltd
	Grootfontein 562 KT	Part B of Portion 1	
	Grootfontein 562 KT	2	
	Driekop 546 KT	0 (RE)	

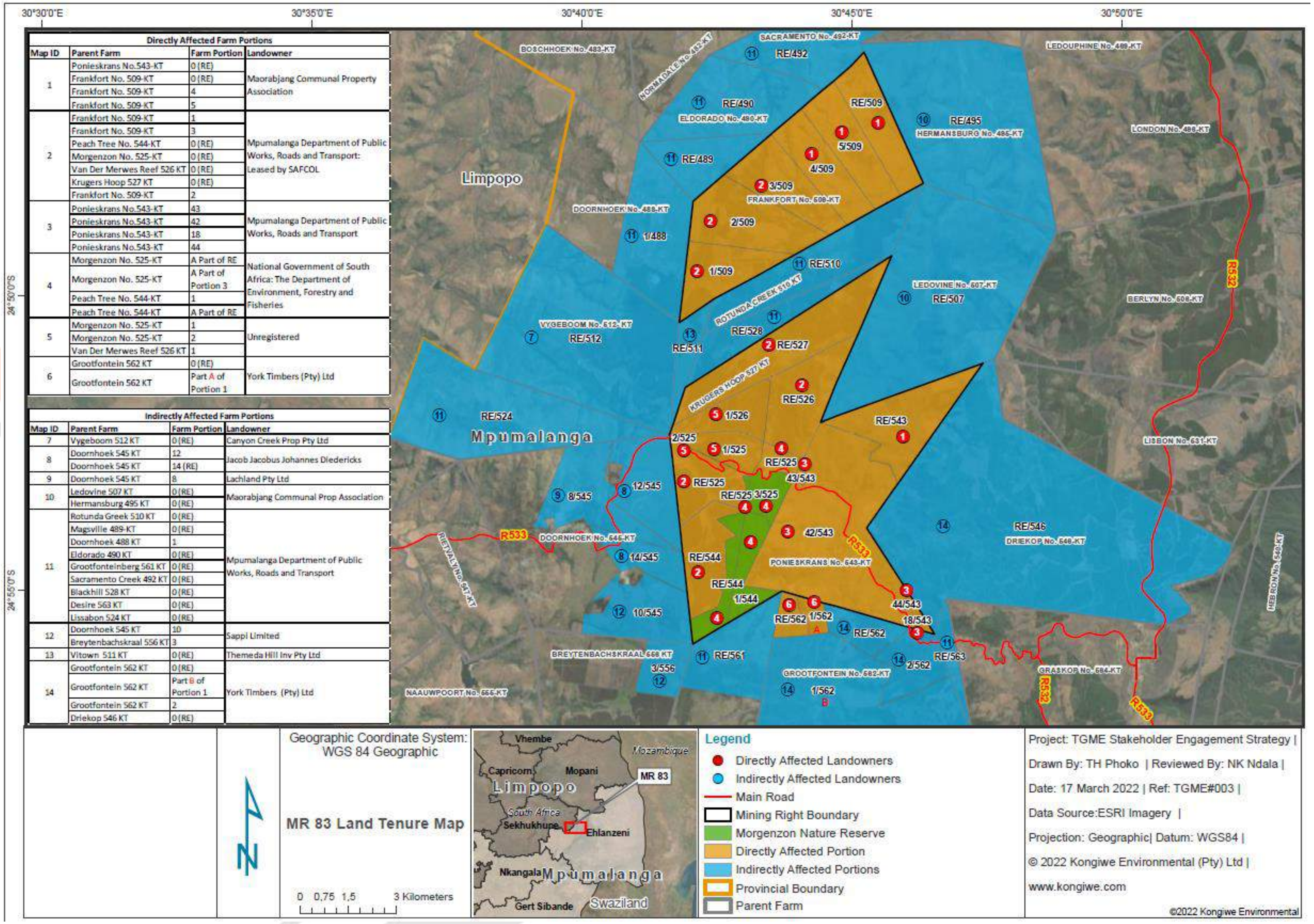


Figure 2: Land tenure map over Mining Right Area

3 DESCRIPTION OF THE SCOPE OF THE PROPOSED OVERALL ACTIVITY

An overview map of all the activities is provided in Section 4, with an A3 size being provided in ANNEXURE D.

Please note that more detailed maps are included for each of the various operational areas in the relevant sub-sections under Section 4. All the large-scale versions of these maps are included under ANNEXURE D.

3.1 EXISTING AUTHORISATIONS

TGME currently holds the following authorisations:

- Environmental Management Programme (EMPR) with DMRE REF: MP 30/5/1/2/3/2/1 (83) EM, dated October 2005 and approved by the DMRE on 16 October 2013 (hereafter "2013 approved EMPR").
- Integrated Water Use Licence: 24023343 (IWUL) with file number 27/2/2/B60A/021 was issued to TGME by the then Department of Water Affairs (now referred to as the Department of Water and Sanitation or "DWS") on 29 March 2011 for a period of 10 years. A renewal application is currently under review by DWS.
- Permit (Permit number: 1351N), referred to at the N-Permit, to abstract 456 250 m^3 per annum water from the Blyde River.

3.2 OTHER TGME AUTHORISATIONS

Table 2: Status and list of TGME Mining Rights in the area

Mining Right	Details	Status
Greater TGME 83 MR	Mining Right No: MP30/5/1/2/2/83MR Granted: 20 February 2008 Effective date on MR is 16 October 2013 Execution: 3 December 2013 Expiry: 15 October 2023	Currently Active
Hermansburg 340 MR	Mining Right: MP 30/5/1/2/3/2/1/340 MR Granted: 10 July 2013 Execution: 24 February 2015 Expiry: 9 July 2023	Currently Active
Beta South 341 MR	Mining Right No: MP30/5/1/2/2/341MR Granted: 24 July 2012 Execution: 25 September 2019 Expiry: 16 February 2022 Renewal submitted: 29 October 2021	Renewal pending
Elandsdrift 198 MR	Mining Right No: MP 30/5/1/2/3/2/1 (198) MR Granted: 20 February 2008 Execution: 18 March 2008 Expiry: 17 March 2009 Renewal submitted: 16 January 2009	Renewal pending
Rietfontein Underground Mine 358 MR	Mining Right No: MP 30/5/1/2/2/358MR Granted: 17 February 2012 Effective date: 5 June 2013 Execution: 5 December 2013 Expiry: 4 June 2028	Currently Active Section 102 application pending
Glynn's Lydenburg 433 MR	Mining Right No: MP 30/5/1/2/2/433 MR Granted: 23 March 2013	Currently Active

Mining Right	Details	Status
	Execution: 12 November 2013 Expiry: 11 November 2023	
Beta Central 330 MR	Mining Right No: MP 5/1/2/2/330 MR	Grant letter still pending
Pilgrims Rest 10167 MR	Mining Right: MP 30/5/1/3/3/2/1/10167 MR Granted: 17 March 2019	Not yet executed
Sabie 10161 MR	Mining Right: MP30/5/1/2/3/2/1/10161MR Granted: 17 March 2019	Not yet executed

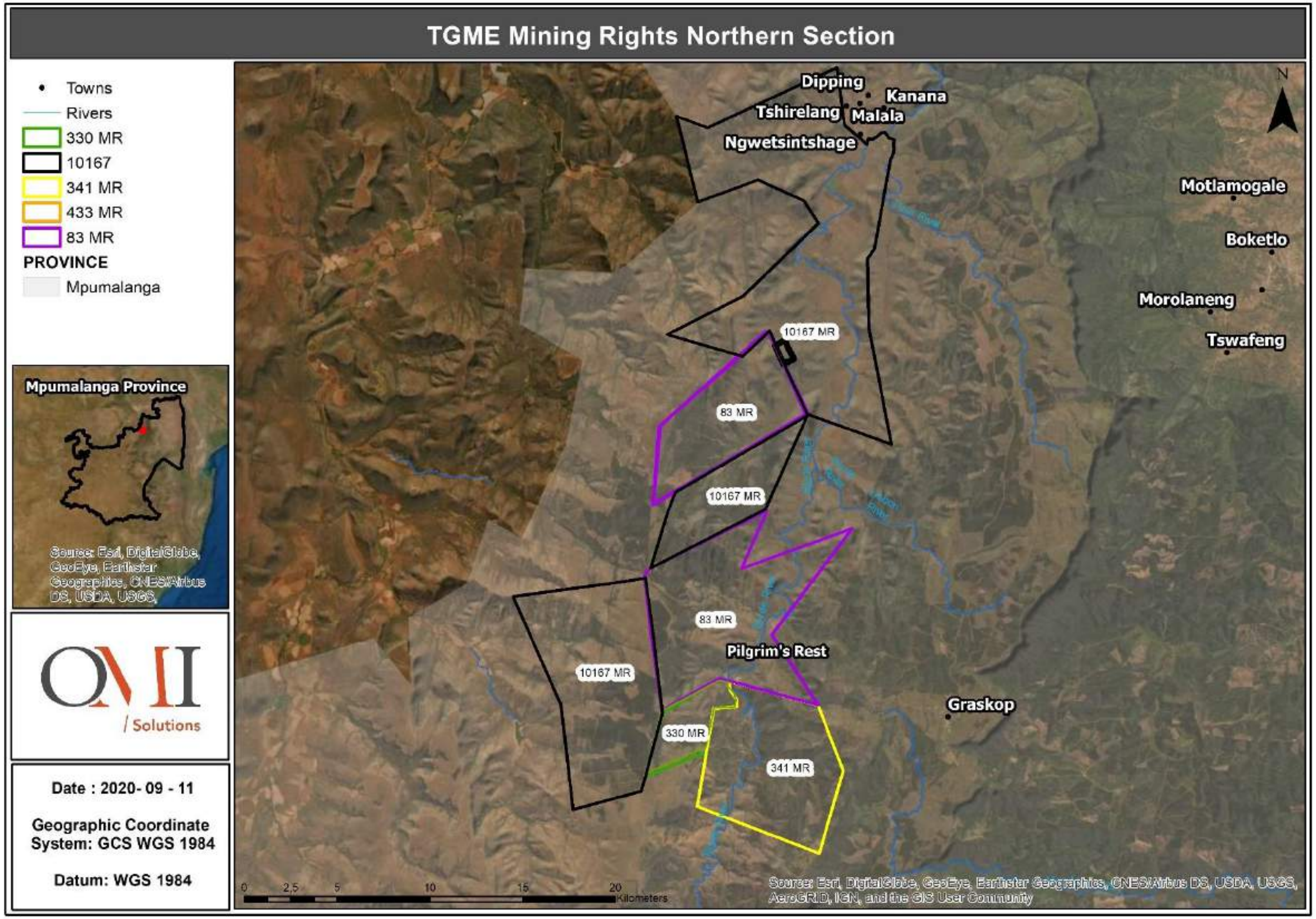


Figure 3: Regional Location of the Pilgrims Rest Associated Mining Rights

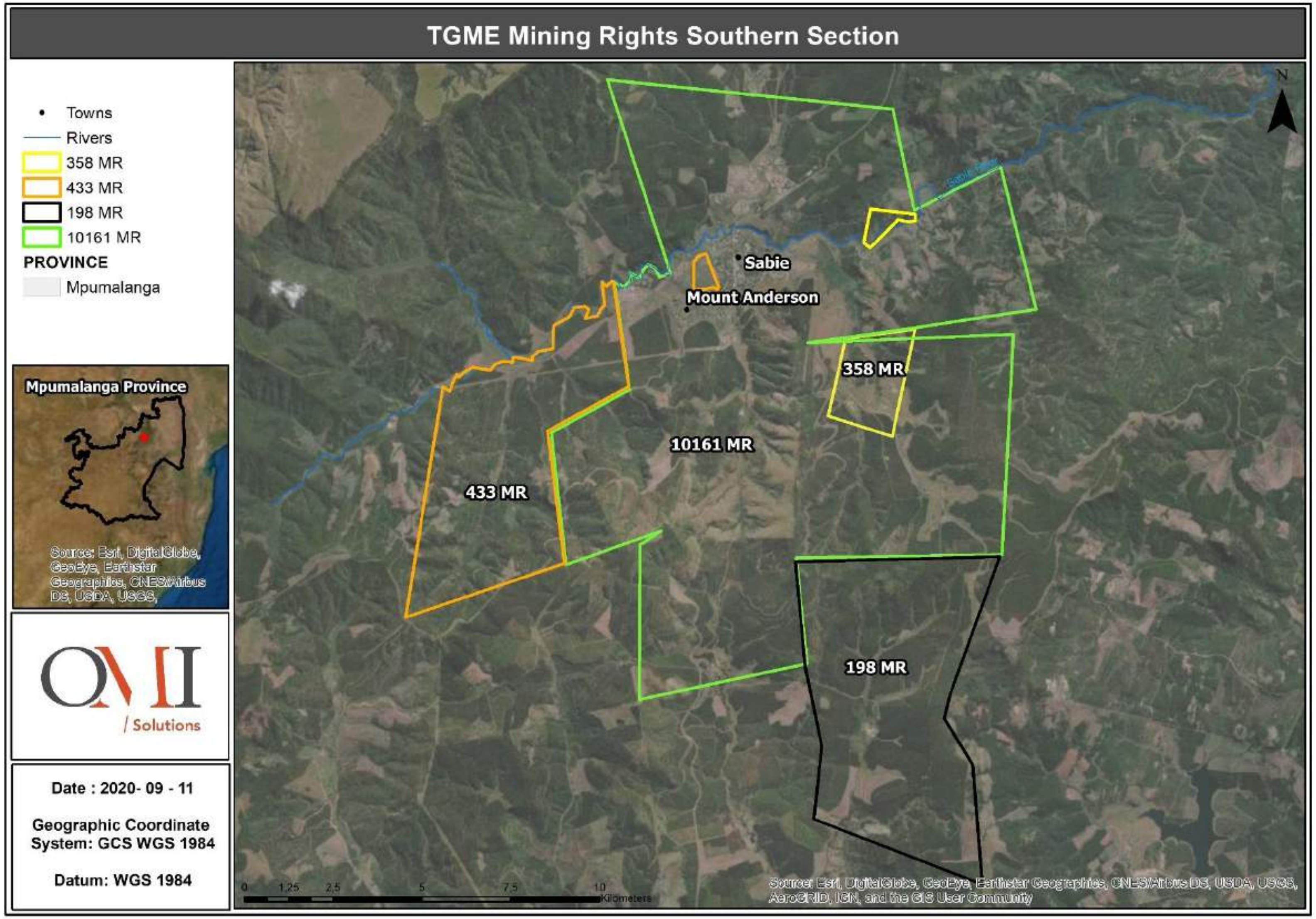


Figure 4: Regional Location of the Sabie Associated Mining Rights

3.3 REQUIRED AUTHORISATIONS

Before TGME may commence with the proposed project the following environmental authorisation and licence applications must be approved in accordance with the relevant national legislation:

- An integrated application for Environmental Authorisation (EA) in terms of the National Environmental Management Act 1998 (Act 107 of 1998) (NEMA) and for a Waste Management Licence (WML) in terms of the National Environmental Management: Waste Act, 2008 (Act 59 of 2008) (NEMWA).
- Application for amendment to the current Environmental Management Programme (EMPR) approved by the DMRE in terms of the Mineral and Petroleum Resources Development Act, 2002 (Act 28 of 2002) (MPRDA) on 16 October 2013.
- An Integrated Water Use Licence Application (IWULA) under the National Water Act, 1998 (Act 36 of 1998 (NWA) will be submitted for approval to the DWS.
- Application for an Atmospheric Emission Licence (AEL) under the National Environmental Management: Air Quality Act (Act 39 of 2004) (NEMAQA), is required to operate the upgraded process plant. This application will be submitted to the EDM.

3.4 LISTED AND SPECIFIED ACTIVITIES

Activities listed in the NEMA Environmental Impact Assessment (EIA) Regulations, 2014 (as amended)[4] Listing Notices 1-3,[5] NEMWA List of Waste Management Activities[6] (GN 921, as amended) and section 21 of the NWA requires authorisation prior to commencement of the activities.

The Listed Activities which will require authorisation for the proposed project are shown in **Table 3**. Environmental authorisations will therefore be required under the NEMA, the NEMWA and the NWA.

---

[4] GN R982 of 4 December 2014 as amended by GN R326 of 7 April 2017, GN 706 of 13 July 2018, GN 599 of 29 May 2020 and GN 517 of 11 June 2021.

[5] GN R983, GN R 984 and GN R985 in GG 38282 of 4 December 2014.

[6] List of waste management activities that have, or are likely to have, a detrimental effect on the environment published under GN 921 in GG 37083 of 29 November 2013 as amended by GN 332 in GG 37604 of 2 May 2014; GN R633 in GG 39020 of 24 July 2015; and GN 1094 in GG 41175 of 11 October 2017.

Table 3: Listed Activities to be Authorised under NEMA, NEMWA and NWA

Activity	Aerial Extent of Activity (ha or m²)	Listed Activity	Applicable Listing Notice	Waste Management Activity	Water use licence
Underground mining over three areas	MR area is 9,413 ha	Activity 17 Listing Notice 2	"Any activity including the operation of that activity which requires a mining right as contemplated in section 22 of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002), including - (a) associated infrastructure, structures, and earthworks, directly related to the extraction of a mineral resource; or (b) the primary processing of a mineral resource including winning, extraction, classifying, concentrating, crushing, screening, or washing; but excluding the secondary processing of a mineral resource, including the smelting, beneficiation, reduction, refining, calcining or gasification of the mineral resource in which case activity 6 in Listing Notice 2 applies."	None	Section 21 a and j – for dewatering water to be re-used underground
Section 102 amendment of the Mine Works Programme		Activity 21D Listing Notice 1	"Any activity including the operation of that activity which requires an amendment or variation to a right or permit in terms of section 102 of the Mineral and Petroleum Resources Development Act, as well as any other applicable activity contained in this Listing Notice or in Listing Notice 3 of 2014, required for such amendment." [Activity 21D inserted by GN 517/2021]	None	None
Reworking of old residue dumps	Various dumps in the Mining right area	Activity 21F	"Any activity including the operation of that activity required for the reclamation of a residue	Category B: Activity 11-	Section 21 g

Activity	Aerial Extent of Activity (ha or m²)	Listed Activity	Applicable Listing Notice	Waste Management Activity	Water use licence
(waste rock) to rehabilitate areas		Listing Notice 1	stockpile or a residue deposit as well as any other applicable activity as contained in this Listing Notice or in Listing Notice 3 of 2014, required for the reclamation of a residue stockpile or a residue deposit." [Activity 21F will be applicable from a date yet to be published][7]	"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)."	
Plant: Mine residue (waste rock dump (WRD)) and RoM stockpile	Mine residue: 9,500 m^2 RoM Stockpile: 1,100 m^2	Activity 6 Listing Notice 2	The development of facilities or infrastructure for any process or activity which requires a permit or licence or an amended permit or licence in terms of national or provincial legislation governing the generation or release of emissions, pollution, or effluent.	Category B: Activity 10 - "The construction of a facility for a waste management activity listed in Category B of this Schedule." 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

[7] This activity is included for completeness even though it is not yet in force.

Activity	Aerial Extent of Activity (ha or m²)	Listed Activity	Applicable Listing Notice	Waste Management Activity	Water use licence
Stormwater dams, Pollution Control Dams (PCD), silt traps and systems (previous dams to be upgraded)	PCD 1: 0.37 ha (upgrade on the previous footprint) PCD 2: 0.32 ha (upgrade on previous sump location) Plant make-up water dam: 0.4 ha (upgrade on the previous footprint)	Activity 6 Listing Notice 2	"The development of facilities or infrastructure for any process or activity which requires a permit or licence or an amended permit or licence in terms of national or provincial legislation governing the generation or release of emissions, pollution or effluent."	None	Section 21 g
		Activity 34 Listing Notice 1	"The expansion of existing facilities or infrastructure for any process or activity where such expansion will result in the need for a permit or licence, or for an amended permit or licence in terms of national or provincial legislation governing the release of emissions, effluent, or pollution, excluding- (i) where the facility, infrastructure, process, or activity is included in the list of waste management activities published in terms of section 19 of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) in which case the National Environmental Management: Waste Act, 2008 applies; (ii) the expansion of existing facilities or infrastructure for the treatment of effluent, wastewater, polluted water, or sewage where the capacity will be increased by less than 15,000 cubic meters per day; or (iii) the expansion is directly related to aquaculture facilities or infrastructure where the wastewater discharge capacity will be increased by 50 cubic meters or less per day."	None	Section 21 g

Activity	Aerial Extent of Activity (ha or m²)	Listed Activity	Applicable Listing Notice	Waste Management Activity	Water use licence
Upgrading of the plant requires Air Emissions licence[8] for the following activity: Subcategory 4.17: Precious and Base Metal Production and Refining	The current and upgraded plant area is located on 10 ha	Activity 17 Listing Notice 2	"Any activity including the operation of that activity which requires a mining right as contemplated in section 22 of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002), including - (a) associated infrastructure, structures, and earthworks, directly related to the extraction of a mineral resource; or (b) the primary processing of a mineral resource including winning, extraction, classifying, concentrating, crushing, screening, or washing; but excluding the secondary processing of a mineral resource, including the smelting, beneficiation, reduction, refining, calcining or gasification of the mineral resource in which case activity 6 in Listing Notice 2 applies."	None	None
		Activity 6 Listing Notice 2	"The development of facilities or infrastructure for any process or activity which requires a permit or licence, or an amended permit or licence in terms of national or provincial legislation governing the generation or release of emissions, pollution or effluent."		
		Activity 34 Listing Notice 1	"The expansion of existing facilities or infrastructure for any process or activity where such expansion will result in the need for a permit or licence or an amended permit or		

[8] The new electrical line that will feed to the plant is proposed to go up to 22kV: Activity 11 of listing notice 1 is not applicable as the trigger is 33kV.

Activity	Aerial Extent of Activity (ha or m²)	Listed Activity	Applicable Listing Notice	Waste Management Activity	Water use licence
			licence in terms of national or provincial legislation governing the release of emissions, effluent, or pollution, excluding- (i) where the facility, infrastructure, process, or activity is included in the list of waste management activities published in terms of section 19 of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) in which case the National Environmental Management: Waste Act, 2008 applies; (ii) the expansion of existing facilities or infrastructure for the treatment of effluent, wastewater, polluted water, or sewage where the capacity will be increased by less than 15,000 cubic meters per day; or (iii) the expansion is directly related to aquaculture facilities or infrastructure where the wastewater discharge capacity will be increased by 50 cubic meters or less per day.”		
TSF – upgrade of deposition rate and expansion	1.83 Mt deposition	Activity 6 Listing Notice 2	“The development of facilities or infrastructure for any process or activity which requires a permit or licence or an amended permit or licence in terms of national or provincial legislation governing the generation or release of emissions, pollution or effluent.”	Category B: Activity 10- “The construction of a facility for a waste management activity listed in Category B of this Schedule.” Activity 11 - “The establishment or reclamation of a residue stockpile or residue deposit resulting from activities which require a mining right,	Section 21 g
		Activity 34 Listing Notice 1	“The expansion of existing facilities or infrastructure for any process or activity where such expansion will result in the need for a permit or licence or an amended permit or licence in terms of national or provincial		

Activity	Aerial Extent of Activity (ha or m²)	Listed Activity	Applicable Listing Notice	Waste Management Activity	Water use licence
			legislation governing the release of emissions, effluent, or pollution, excluding- (i) where the facility, infrastructure, process, or activity is included in the list of waste management activities published in terms of section 19 of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) in which case the National Environmental Management: Waste Act, 2008 applies; (ii) the expansion of existing facilities or infrastructure for the treatment of effluent, wastewater, polluted water, or sewage where the capacity will be increased by less than 15,000 cubic meters per day; or (iii) the expansion is directly related to aquaculture facilities or infrastructure where the wastewater discharge capacity will be increased by 50 cubic meters or less per day."	exploration right or production right in terms of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002)."	
Upgraded TSF pipeline	200 m length pipe	Activity 10 Listing Notice 1	"The development and related operation of infrastructure exceeding 1,000 meters in length for the bulk transportation of sewage, effluent, process water, wastewater, return water, industrial discharge, or slimes- (i) with an internal diameter of 0.36 meters or more; or (ii) with a peak throughput of 120 liters per second or more; excluding where-	None	None

Activity	Aerial Extent of Activity (ha or m²)	Listed Activity	Applicable Listing Notice	Waste Management Activity	Water use licence
			(a) such infrastructure is for the bulk transportation of sewage, effluent, process water, wastewater, return water, industrial discharge, or slimes inside a road reserve or railway line reserve; or (b) where such development will occur within an urban area"		
DMS plant, crushing and screening at the shaft	Shaft areas complete footprint - DMS plants are replacing old DMS on shaft footprint: Clewer and Morgenzon – 4.5 ha Dukes – 10 ha Beta North – 10 ha Frankfort - 6 ha	Activity 17 Listing Notice 2	"Any activity including the operation of that activity which requires a mining right as contemplated in section 22 of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002), including— (a) associated infrastructure, structures, and earthworks, directly related to the extraction of a mineral resource; or (b) the primary processing of a mineral resource including winning, extraction, classifying, concentrating, crushing, screening, or washing. but excluding the secondary processing of a mineral resource, including the smelting, beneficiation, reduction, refining, calcining or gasification of the mineral resource in which case activity 6 in Listing Notice 2 applies."	None	None
Beta to plant and back pipelines: Dewatering water pipelines from underground	1km in road reserve	Activity 10 Listing Notice 1	"The development and related operation of infrastructure exceeding 1,000 meters in length for the bulk transportation of sewage, effluent, process water, wastewater, return water, industrial discharge, or slimes-	None	Section 21 c and i

Activity	Aerial Extent of Activity (ha or m²)	Listed Activity	Applicable Listing Notice	Waste Management Activity	Water use licence
Return water pipelines			(i) with an internal diameter of 0.36 meters or more; or (ii) with a peak throughput of 120 liters per second or more; excluding where- (a) such infrastructure is for the bulk transportation of sewage, effluent, process water, wastewater, return water, industrial discharge or slimes inside a road reserve or railway line reserve; or (b) where such development will occur within an urban area"		
Raw water pipeline from the plant to Beta crossing Blyde in road reserve	1km in road reserve	N/A	Throughput is below the thresholds. The Pipeline will cross the Blyde on the road and has been included there.		Section 21 c and i
Haul road and stormwater culvert - stream crossing upgrades	Crossing upgrade from Blyde to Beta North expanding more than 100 m^2 Duke existing diversions grading only Road to Frankfort grading only	Activity 23 Listing notice 3	"The expansion of- (i) dams or weirs where the dam or weir is expanded by 10 square meters or more; or (ii) infrastructure or structures where the physical footprint is expanded by 10 square meters or more; where such expansion occurs - (a) within a watercourse; (b) in front of a development setback adopted in the prescribed manner; or		Section 21 c and i

Activity	Aerial Extent of Activity (ha or m²)	Listed Activity	Applicable Listing Notice	Waste Management Activity	Water use licence
			(c) if no development setback has been adopted, within 32 meters of a watercourse, measured from the edge of a watercourse; excluding the expansion of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour.”		
		Activity 48 Listing notice 1	“The expansion of- (i) infrastructure or structures where the physical footprint is expanded by 100 square meters or more; or (ii) dams or weirs, where the dam or weir, including infrastructure and water surface area, is expanded by 100 square meters or more; where such expansion occurs- (a) within a watercourse; (b) in front of a development setback; or (c) if no development setback exists, within 32 meters of a watercourse, measured from the edge of a watercourse; excluding- (aa) the expansion of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour; (bb) where such expansion activities are related to the development of a port or harbour, in which		

Activity	Aerial Extent of Activity (ha or m²)	Listed Activity	Applicable Listing Notice	Waste Management Activity	Water use licence
			case activity 26 in Listing Notice 2 of 2014 applies; (cc) activities listed in Activity 14 in Listing Notice 2 of 2014 or activity 23 in Listing Notice 3 of 2014, in which case that activity applies; (dd) where such expansion occurs within an urban area; or (ee) where such expansion occurs within existing roads, road reserves or railway line reserves".		
		Activity 19 Listing notice 1	"The infilling or depositing of any material of more than 10 cubic meters into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 10 cubic meters from a watercourse; but excluding where such infilling, depositing, dredging, excavation, removal or moving- (a) will occur behind a development setback; (b) is for maintenance purposes undertaken in accordance with a maintenance management plan; (c) falls within the ambit of activity 21 in this Notice, in which case that activity applies; (d) occurs within existing ports or harbours that will not increase the development footprint of the port or harbour; or (e) where such development is related to the development of a port or harbour, in which case activity 26 in Listing Notice 2 of 2014 applies"		

Activity	Aerial Extent of Activity (ha or m²)	Listed Activity	Applicable Listing Notice	Waste Management Activity	Water use licence
Conveyor from Beta North to Plant to cross Blyde River	Approx. 900 m	Activity 14 Listing notice 3	"The development of- (i) dams or weirs, where the dam or weir, including infrastructure and water surface area exceeds 10 square meters; or (ii) infrastructure or structures with a physical footprint of 10 square meters or more; where such development occurs- (a) within a watercourse; (b) in front of a development setback; or (c) if no development setback has been adopted, within 32 meters of a watercourse, measured from the edge of a watercourse; excluding the development of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour. f. Mpumalanga i. Outside urban areas: (aa) A protected area identified in terms of NEMPAA, excluding conservancies; (bb) National Protected Area Expansion Strategy Focus areas; (cc) World Heritage Sites; (dd) Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority;	None	Section 21 c and i

Activity	Aerial Extent of Activity (ha or m²)	Listed Activity	Applicable Listing Notice	Waste Management Activity	Water use licence
			(ee) Sites or areas identified in terms of an international convention; (ff) Critical biodiversity areas or ecosystem service areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans; (gg) Core areas in biosphere reserves; or (hh) Areas within 10 kilometers from national parks or world heritage sites or 5 kilometers from any other protected area identified in terms of NEMPAA or from the core area of a biosphere reserve, where such areas comprise indigenous[9] vegetation; or ii. Inside urban areas: (aa) Areas zoned for use as public open spaces; or (bb) Areas designated for conservation use in Spatial Development Frameworks adopted by the competent authority, zoned for a conservation purpose."		

[9] Indigenous vegetation (as per the definition in NEMA) is: "*vegetation occurring naturally within a defined area, regardless of the level of alien infestation and where the topsoil has not been lawfully disturbed during the preceding ten years*".

Activity	Aerial Extent of Activity (ha or m²)	Listed Activity	Applicable Listing Notice	Waste Management Activity	Water use licence
Diesel generators on Shaft sites	Each site has a maximum 4 MW generation capacity smaller than 1 ha size generators. Shaft areas: Clewer and Morgenzon – 4 MW Dukes – 4 MW Beta North – 4 MW Frankfort – 4 MW Combined capacity over all sites is more than 10 MW	Activity 2 Listing Notice 1	"The development and related operation of facilities or infrastructure for the generation of electricity from a non-renewable resource where- (i) the electricity output is more than 10 megawatts but less than 20 megawatts; or (ii) the output is 10 megawatts or less, but the total extent of the facility covers an area in excess of 1 hectare."	None	None
Dangerous good storage – expansion of current approval tanks at shafts and plant area	Frankfort combined capacity: 80 m^3 Dukes combined capacity: 80 m^3 Morgenzon combined capacity: 80 m^3 Frankfort combined capacity: 80 m^3 Plant area combined capacity 200 m^3	Activity 22 Listing notice 3	"The expansion and related operation of facilities or infrastructure for the storage, or storage and handling of a dangerous good, where such storage facilities or infrastructure will be expanded by 30 cubic meters or more but no more than 80 cubic meters. f. Mpumalanga i. Outside urban areas: (aa) A protected area identified in terms of NEMPAA, excluding conservancies; (bb) National Protected Area Expansion Strategy Focus areas;	None	None

Activity	Aerial Extent of Activity (ha or m²)	Listed Activity	Applicable Listing Notice	Waste Management Activity	Water use licence
			(cc) Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority; (dd) Sites or areas identified in terms of an international convention; (ee) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans; (ff) Core areas in biosphere reserves; (gg) Areas within 10 kilometers from national parks or world heritage sites or 5 kilometers from any other protected area identified in terms of NEMPAA or from the core area of a biosphere reserve, where such areas comprise indigenous vegetation; or (hh) Areas within a watercourse or wetland, or within 100 meters of a watercourse or wetland."		
		Activity 14 of Listing notice 1	"The expansion and related operation of facilities for the storage, or storage and handling, of a dangerous good, where the capacity of such storage facility will be expanded by more than 80 cubic meters".	None	None
Establishment of shaft areas on previously disturbed areas- limited disturbance	Full shaft footprint on previously disturbed areas Clewer and Morgenzon – 4.5 ha	Activity 12 Listing Notice 3	"The clearance of an area of 300 square meters 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.	None	Section 21 c and i

Activity	Aerial Extent of Activity (ha or m²)	Listed Activity	Applicable Listing Notice	Waste Management Activity	Water use licence
outside of these footprints might take place	Dukes – 10 ha Beta North – 10 ha Frankfort - 6 ha		f. Mpumalanga i. Within any critically endangered or endangered ecosystem listed in terms of section 52 of the NEMBA or prior to the publication of such a list, within an area that has been identified as critically endangered in the National Spatial Biodiversity Assessment 2004; ii. Within critical biodiversity areas identified in bioregional plans; or iii. On land, where, at the time of the coming into effect of this Notice or thereafter such land was zoned open space, conservation or had an equivalent zoning or proclamation in terms of NEMPAA."		
Establishment of Residue deposits (WRD) at 3 shaft areas. Reclamation of old WRD. Beta dump to be reclaimed prior to building shaft. Other remaining Dumps are to be removed to allow rehabilitation outside shaft areas.	Clewer and Morgenzon – 0.6 ha Dukes – North 0.2 ha South 0.25 ha Beta North – 0.2 ha Frankfort - 0.3 ha	Activity 12 Listing Notice 3	"The clearance of an area of 300 square meters 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. f. Mpumalanga i. Within any critically endangered or endangered ecosystem listed in terms of section 52 of the NEMBA or prior to the publication of such a list, within an area that has been identified as critically endangered in the National Spatial Biodiversity Assessment 2004; ii. Within critical biodiversity areas identified in bioregional plans; or	Category B: Activity 10- "The construction of a facility for a waste management activity listed in Category B of this Schedule." 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	Section 21 g per dump

Activity	Aerial Extent of Activity (ha or m²)	Listed Activity	Applicable Listing Notice	Waste Management Activity	Water use licence
			iii. On land, where, at the time of the coming into effect of this Notice or thereafter such land was zoned open space, conservation or had an equivalent zoning or proclamation in terms of NEMPAA."	Resources Development Act, 2002 (Act No. 28 of 2002)."	
		Activity 21F Listing Notice 1	'Any activity including the operation of that activity required for the reclamation of a residue stockpile or a residue deposit as well as any other applicable activity as contained in this Listing Notice or in Listing Notice 3 of 2014, required for the reclamation of a residue stockpile or a residue deposit. [Activity 21F will be applicable from a date yet to be published] '		
		Activity 6 Listing Notice 2	"The development of facilities or infrastructure for any process or activity which requires a permit or licence or an amended permit or licence in terms of national or provincial legislation governing the generation or release of emissions, pollution or effluent."		
RoM Pad and DMS separation pads	Previously disturbed areas: Frankfort Ore tipper area 2,500 m^2 and DMS pads 800 m^2 Dukes RoM pad 3,800 m^2 DMS pads 800 m^2	Activity 6 Listing Notice 2	"The development of facilities or infrastructure for any process or activity which requires a permit or licence or an amended permit or licence in terms of national or provincial legislation governing the generation or release of emissions, pollution or effluent."	None	Section 21 g

Activity	Aerial Extent of Activity (ha or m²)	Listed Activity	Applicable Listing Notice	Waste Management Activity	Water use licence
Pollution control dams, silt traps and culverts at shafts	Frankfort PCD and silt trap: 0.5 ha- capacity 4,633m³ Morgenzon PCD and Silt trap 0.2 ha capacity 1,900 m³ Dukes North PCD 0.3 ha capacity 3,400 m³ Dukes North PCD 0.2 ha capacity 1,000 m³ Beta North PCD 0.4 ha Capacity 5,050 m³	Activity 6 Listing Notice 2	"The development of facilities or infrastructure for any process or activity which requires a permit or licence or an amended permit or licence in terms of national or provincial legislation governing the generation or release of emissions, pollution or effluent."	None	Section 21 g
		Activity 9 Listing notice 1	"The development of infrastructure exceeding 1,000 meters in length for the bulk transportation of water or stormwater- (i) with an internal diameter of 0.36 meters or more; or (ii) with a peak throughput of 120 liters per second or more; excluding where- (a) such infrastructure is for bulk transportation of water or stormwater or stormwater drainage inside a road reserve or railway line reserve; or (b) where such development will occur within an urban area"		
		Activity 10 Listing notice 1	"The development and related operation of infrastructure exceeding 1,000 meters in length for the bulk transportation of sewage, effluent, process water, wastewater, 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;		

Activity	Aerial Extent of Activity (ha or m²)	Listed Activity	Applicable Listing Notice	Waste Management Activity	Water use licence
			excluding where- (a) such infrastructure is for the bulk transportation of sewage, effluent, process water, wastewater, return water, industrial discharge or slimes inside a road reserve or railway line reserve; or (b) where such development will occur within an urban area"		
		Activity 12 Listing Notice 3	"The clearance of an area of 300 square meters 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. f. Mpumalanga i. Within any critically endangered or endangered ecosystem listed in terms of section 52 of the NEMBA or prior to the publication of such a list, within an area that has been identified as critically endangered in the National Spatial Biodiversity Assessment 2004; ii. Within critical biodiversity areas identified in bioregional plans; or iii. On land, where, at the time of the coming into effect of this Notice or thereafter such land was zoned open space, conservation or had an equivalent zoning or proclamation in terms of NEMPAA."		

Activity	Aerial Extent of Activity (ha or m²)	Listed Activity	Applicable Listing Notice	Waste Management Activity	Water use licence
Salvage yard within shaft areas	To be determined (TBD)	None	None	Category C: Activity 1- “The storage of general waste at a facility that has the capacity to store in excess of 100 m^3 of general waste at any one time, excluding the storage of waste in lagoons or temporary storage of such waste.” Activity 2- "The storage of hazardous waste at a facility that has the capacity to store in excess of 80 m^3 of hazardous waste at any one time, excluding the storage of hazardous waste in lagoons or temporary storage of such waste.”	
Reservoirs at the shafts	Capacity of the tanks at the shafts: Frankfort 1,000 m^3 Morgenzon- 1,000 m^3 Dukes – 1,000 m^3 Beta- 1,000 m^3	Activity 2 Listing notice 3	“The development of reservoirs, excluding dams, with a capacity of more than 250 cubic meters. f. Mpumalanga i. In a protected area identified in terms of NEMPAA, excluding conservancies; ii. Outside urban areas: (aa) National Protected Area Expansion Strategy Focus areas; (bb) Sensitive areas as identified in an environmental management framework as	None	Section 21 b

Activity	Aerial Extent of Activity (ha or m²)	Listed Activity	Applicable Listing Notice	Waste Management Activity	Water use licence
			contemplated in chapter 5 of the Act and as adopted by the competent authority; (cc) Sites or areas identified in terms of an international convention; (dd) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans; (ee) Core areas in biosphere reserves; or (ff) Areas within 10 kilometers from national parks or world heritage sites or 5 kilometers from any other protected area identified in terms of NEMPAA or from the core area of a biosphere reserve, where such areas comprise indigenous vegetation; or iii. Inside urban areas: (aa) Areas zoned for use as public open spaces; or (bb) Areas designated for conservation use in Spatial Development Frameworks adopted by the competent authority or zoned for a conservation purpose.”		

4 DESCRIPTION OF THE ACTIVITIES TO BE UNDERTAKEN

4.1 BACKGROUND

The Sabie-Pilgrims Rest goldfield is the oldest gold mining district in Mpumalanga, with historical production estimated at 200 tonnes of gold (7 million ounces), making it the third-largest producer in South Africa. Of the total historical production of 200 tonnes, TGME contributed 124 tonnes (4 million ounces) between 1885 and 1971, at an average recovered grade of 10.35 grams gold (Au) per tonne (g/t).

The Transvaal Gold Exploration Company was formed in 1883, but following a name change and a merger, the company was reconstituted as TGME on 16 May 1895. Mining in the area commenced in the late 19th century and continued into the mid-20th century and intermittently thereafter, with operations finally ceasing in 1971 at Beta Mine. In the late 1880's, a complex of small mining operations developed in the Central Area.

Historically, the central mines have produced 9 million tonnes of ore at an average head grade of 10 g/t Au. The Rho reef alone has produced 2,700,000 tonnes at a head grade of 7.7 g/t of Au. The Theta and Beta mines were the biggest producers in the district, but many of the smaller mines operated successfully until the 1950's.

Production from the Sabie area was principally from Glynn's Lydenburg, Elandsdrift Blows and Rietfontein Mines. In the Northern area, mining continued periodically until the 1950's with Vaalhoek, Hermansburg and Bourke's Luck mines being the main producers.

More recently, intermittent mining occurred at locations such as Clewer, Dukes & Morgenzon (CDM) and Frankfort Mines from the 1990's to 2008. Simmer and Jack Mines Limited operated as the owner of TGME until a share sale to Theta Gold Mines Limited (previously Stonewall Resources Limited) in 2010. TGME started mining again in 2010 until Operations were placed under care and maintenance due to a prolonged illegal strike in May 2015.

TGME is now held by Theta Gold Mines Limited, listed on the Australian Stock Exchange, with Chinese, German and American investors. Theta Gold Mines Limited currently holds the majority shares in TGME. Over the last two years, R58 million has been invested in exploration, environmental authorisations, community upliftment programs, and continuous Mine infrastructure maintenance. The re-development of the historical underground mines will provide TGME with the revenue to continue with this investment.

Theta Gold Mines Limited has a 74% shareholding in TGME. The balance of shareholding is held by Black Economic Empowerment ("BEE") entities. The South African Mining Charter requires a minimum of 26% meaningful economic participation by the historically disadvantaged South Africans (HDSAs). The BEE shareholding of TGME is a combination of local community trusts, an employees' trust and a strategic entrepreneurial partner.

The corporate structure for Theta Gold Mines Limited is presented in **Figure 5** below.

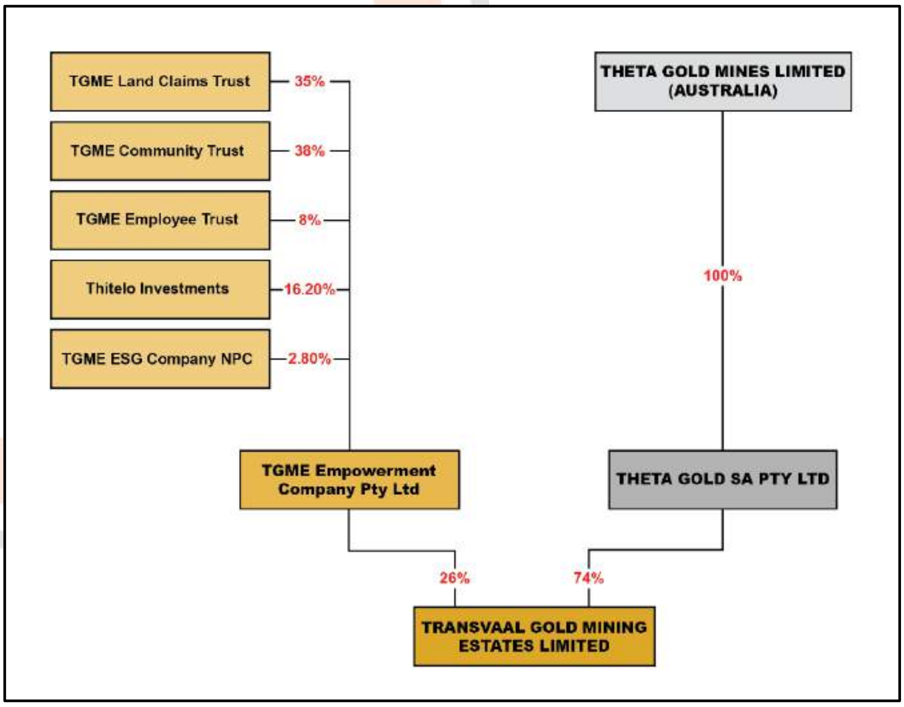


Figure 5: Theta Gold Mines Limited and TGME shareholding breakdown

In October 2020 a new TGME management team took over which re-evaluated the feasibility and approach to the project.

TGME currently holds a mining right, bearing DMRE reference number MP30/5/1/2/2/83MR (83MR), which was granted in terms of the MPRDA on 28 February 2008, which became effective on 16 October 2013 and was executed in December 2013. The 83MR mining area comprises Portions 1, 2, 3, 4, 5 and the Remaining Extent of the farm Frankfort 509KT, the farm Krugers Hoop 527KT, Portion 1 and the Remaining Extent of the farm Van Der Merwes Reef 526KT, Portions 1, 2 and the Remaining Extent of Portions of the farm Morgenzon 525KT, the farm Peach Tree 544KT, and Portions 18, 42, 43, 44 and the Remaining Extent of the farm Ponieskrans 543KT (mining area).

The existing TGME process plant is situated on the farm Grootfontein 562KT which falls under MR341, but it is included in the 2013 approved EMPR. TGME proposes to re-develop its historical CDM, Frankfort, and Beta North underground mines within the 83MR mining area.

The proposed project will require additional surface infrastructure to support the underground workings, the expansion of the current Tailings Storage Facility (TSF) on portion 42 of the farm Ponieskrans 543 KT and a retrofit and upgrade of the old TGME process plant located on the farm Grootfontein 562 KT.

To mitigate the risk of loss of Critical Biodiversity Areas (CBAs), sensitive floral communities, threatened ecosystems and floral Species of Conservation Concern (SCCs), a biodiversity verification and pre-feasibility assessment was conducted in May 2021 to identify environmental buffer zones. The assessment informed the engineering concept designs to ensure that the surface infrastructure layout is limited to previously disturbed areas where possible.

4.2 PURPOSE OF PROJECT

The project area consists of historical underground mining sections on the farms listed in Table 1, as well as an old TGME processing plant located on the farm Grootfontein 562KT. In order to re-develop the underground mining projects, additional infrastructure will have to be established to augment the existing authorised surface infrastructure. Additional processing capacity will be required, as well as changes to the current surface infrastructure layouts at the various shafts. The latter is necessitated by a combination of modernisation and a need to replace pilfered infrastructure.

The engineering work for the project will mainly consist of the establishment of surface infrastructure at the mining sites, the re-establishment of the underground workings, expansion of the TSF and increase the capacity of the processing plant (on the existing footprint). The purpose of the amendment is to identify new activities which require authorisation.

4.3 MINERAL AND SURFACE RIGHTS

The following is a summary of the mineral and surface rights applicable to redevelopment project.

Table 4: Mineral and Surface Rights Applicable to Greater TGME

Name and Reference	Minerals	Size (ha)
(MP) 30/5/1/2/2/83MR	Gold ore, silver ore, stone aggregate and copper ore	9,7143.3366

Table 5: Greater TGME 83MR Mining Right Area Surface Right Owners

Farm	Portion	Title deed	Surface Owner	Size (ha)
Frankfort 509KT	RE	T3313/2015	Maorabjang Communal Property Association	457.57
Frankfort 509KT	Ptn 1	T32393/1975	Republic of South Africa but leased by South African Forestry Company SOC Limited (SAFCOL)	445.58
Frankfort 509KT	Ptn 2	T32393/1975	Republic of South Africa but leased by SAFCOL	589.69
Frankfort 509KT	Ptn 3	T32393/1975	Republic of South Africa but leased by SAFCOL	463.88
Frankfort 509KT	Ptn 4	T3313/2015	Maorabjang Communal Property Association	429.33
Frankfort 509KT	Ptn 5	T3313/2015	Maorabjang Communal Property Association	454.05
Krugershoop 527KT	RE	T33148/2002	Republic of South Africa	855.55
Van der Merwes Reef 526KT	RE	T201/1906	Republic of South Africa but leased by SAFCOL	856.53
Van der Merwes Reef 526KT	Ptn 1	Unknown	Unknown	N/A
Morgenzon 525KT	RE	T201/1906	Unknown but Leased by SAFCOL	860.48
Morgenzon 525KT	Ptn 1			
Morgenzon 525KT	Ptn 2			
Peach Tree 544KT	Farm	T58018/2005	Republic of South Africa but leased by SAFCOL	843.15

Farm	Portion	Title deed	Surface Owner	Size (ha)
Ponieskrans 543KT	Ptn 18	T10772/2015	Republic of South Africa	42.90
Ponieskrans 543KT	Ptn 42	T6421/1984	Republic of South Africa	1840.38
Ponieskrans 543KT	Ptn 43	T9587/2015	Republic of South Africa	15.91
Ponieskrans 543KT	Ptn 44	T9587/2015	Republic of South Africa	15.91
Ponieskrans 543KT	RE	T3313/2015	Maorabjang Communal Property Association	612.11
Grootfontein 562KT	RE	T127464/2007	York Timbers (Pty) Ltd	NA
Grootfontein 562KT	Ptn 1	T127464/2007	York Timbers (Pty) Ltd	NA

4.4 EXISTING AND PROPOSED OPERATIONS

4.4.1 MINING METHOD

TGME's underground mines will all be mining narrow reef orebodies. The mining method selected is mechanised longhole drilling, which requires pre-development of a mining block in preparation for stoping operations. Resue mining will be applied to the development ends allowing separate extraction of the reef and waste cuts.

The Life of Mine (Eco Elementum, 2021) each area differs according to each management area except the Plant area where the material is screened and stockpiled which will be for a period of between 8 to 10 years.

- Beta :2023 -2030 (7 Years) + rehab (3 years) = 10 Years.
- Frankfort :2025 -2027 (2 Years) + rehab (3 years) = 5 Years.
- CDM :2025 -2030 (5 Years) + rehab (3 years) = 8 Years.

Figure 6: Examples of the longhole drilling mining

4.4.2 MINERALS PROCESSING

The processing of the ore will take place at the central TGME plant or the ore will be toll treated at a nearby facility until such time as the plant is redeveloped as described below.

The Process Flow Diagram of the plant is shown below in **Figure 7** and the conceptual layout is shown in ANNEXURE D.

The plant will be upgraded (replacement of old outdated infrastructure within the current plant footprint area) and the capacity increased to 100,000 tonnes per month (tpm), in line with the proposed underground mining activities. The proposed new plant will have different streams for the different ore types which will need to be processed, namely free-milling ore and refractory ore. Typically, over 90% of the gold in free-milling ore can be recovered by conventional cyanide leaching. Refractory ores, which are high in sulphides, require significant pre-processing to liberate the extremely small gold particles.

The majority of the ore types to be mined at TGME are free-milling ores[10] requiring simple crushing, milling and flotation, followed by a conventional carbon-in-leach (CIL) process to recover the gold. However, the deeper-lying ores consist of highly sulphidic, preg-robbing[11] constituents, which are not suitable for gold recovery via the conventional flotation process. These deposits are also associated with carbonaceous shale, which is a pre-robbing mineral that traps gold in the gangue. The plant will process the different ores through different circuits, which will join up towards the end of the process.

Crushing/screening and Dense Medium Separation (DMS) will be done at each underground shaft. The fines from the screens and the DMS sink fraction (sulphides) will be transported to the plant separately for processing, where they will be deposited onto Run of Mine (ROM) stockpiles according to ore type.

There will be three processing streams at the plant, namely the sulphide circuit with a 30,000 tpm capacity, and two free-milling circuits: one with a 20,000 tpm capacity, the other with 50,000 tpm. The two free-milling circuits will have the same configuration. The sulphide circuit is more complex. Both streams conclude with a CIL process in which the gold is adsorbed onto activated carbon.

The loaded carbon from all the CILs will be passed through the same elution columns – a process that removes the gold from the carbon into the solution. The gold in the pregnant solution is recovered via electrowinning. The cathodes thus obtained are smelted and poured into bars known as gold Dore bars, indicating that they are not 100% pure gold. This product is then despatched to Rand Refinery for final processing.

A simplified process flow is shown in Figure 7. The processes for the different ores are described in more detail below.

4.4.2.1 PROCESSING OF OXIDE MINERALS AT THE PLANT

Free milling/oxide ore will be transported directly to the plant and processed through the free-milling circuit. The material will first be milled. The milled product (80% -75 micron) will be fed to the flash flotation section to separate any sulphide minerals included in the feed. The sulphide-containing concentrate will be pumped into the same thickener as the tails from the sulphide flotation circuit, and the oxide-containing tails will proceed to the conventional CIL via a thickener.

The CIL tails will be pumped to cyanide detox and then to the TSF. The loaded carbon from the CIL will join the loaded carbon from the sulphide ore processing stream at the elution columns as detailed above.

4.4.2.2 PROCESSING OF CARBONACEOUS AND SULPHIDE MINERALS AT THE PLANT

There will be a DMS plant at each shaft, where the sulphide ore will be treated to separate the sulphide minerals, carbonaceous minerals and waste. The sulphide ore feed will first be crushed and screened; the -2mm fines fraction from screening, which contains the carbonaceous minerals, will go into the fines bin and the coarse fraction to the DMS. The sinks from the DMS will go into the sulphides bin and floats to the benign stockpile (waste). The fines and DMS sinks will be transported to the plant separately.

At the plant, the DMS sinks will be crushed finer. The crusher undersize containing the sulphide minerals and the carbonaceous minerals will be milled. The carbonaceous minerals will join the crusher

[10] Free milling ores encompass all ores that readily yield their gold by cyanidation, with no factors that complicate or reduce extraction efficiency

[11] Preg-robbing ores contain material capable of absorbing gold-cyanide complexes during leaching, This material tends to be carbonaceous matter, in this instance carbonaceous shale

fines at mill #1. The mill undersize will then be processed through a carbon flotation circuit to remove the naturally occurring carbonaceous shale.

The flotation concentrate will be thickened before further flotation in the carbon scavenger circuit, the concentrate of which will be processed in the carbon recovery CIL section. The tails from here will be pumped to the TSF.

The carbon flotation tails will be processed in a sulphide flotation circuit. The sulphide flotation concentrate will be ground much finer and then oxidised using a high-shear reactor. From there, the stream will pass through an intensive CIL. Pure oxygen is used in the intensive CIL, as opposed to the conventional CIL which uses ambient air.

The CIL tails will be pumped to cyanide detox and then to the TSF. The loaded carbon from the CIL will join the loaded carbon from the oxide ore processing stream at the elution columns as detailed above.

4.4.2.3 GRAVITY RECOVERY

Provision has been made – i.e. space reserved - to include a gravity recovery circuit for future ore types which will include coarse free gold, which is advantageous to recover during the milling process rather than via a CIL circuit. This facility will be operated when appropriate and aligned to ore types received from the mining operations. The circuit will include a primary centrifugal concentrator and a shaking table situated in the smelthouse, with the product being directly smelted and the tails returned to the mills.

The plant will require an Atmospheric Emissions Licence for operation under the following listed activities under the NEMAQA:

- Subcategory 4.1: Drying and calcining
- Subcategory 4.16: Smelting and Converting of Sulphide Ores
- Subcategory 4.17: Precious and Base Metal Production and Refining

4.4.3 TAILINGS STORAGE

It is anticipated that a total of 1.83 Mt will be deposited onto the TSF over a period of eight (8) years. To meet the deposition requirements of the Phase I mining development, the extension of the TSF will be undertaken in two stages. The first stage (Stage I) will consist of the vertical extension of the existing TSF up to the final design height. The second stage (Stage II) will entail extending the footprint to the open area, to the east of the existing TSF. The total capacity of the planned extensions will be approximately 2.09 Mt. The Stage 1 extension will have an approximate capacity of 0.79 Mt and the Stage II extension a capacity of 1.3 Mt (Refer to Figure 14).

The tailings from the CIL circuits will be processed in a cyanide detoxification circuit, consisting of three mechanically agitated tanks. Sodium metabisulphite, copper sulphate and oxygen will be added to react with the cyanide and render it non-toxic. After detoxification, the tailings material will be pumped to the TSF for deposition, using cyclones to manage deposition areas and thus maintain TSF stability. Excessive water on the TSF will be decanted to a return water dam (RWD) using a penstock system, prior to being pumped back to the plant.

TGME wishes to utilise the remaining storage space available on top of the existing TSF (Phase No.1) for the deposition of tailings generated, in the near future. The TSF is then to be expanded along the eastern and southern side of the exiting TSF (Phase No.2) as the operations continue.

Eco Elementum (Eco Elementum, 2021)) was appointed by TGME to develop detailed engineering designs, to allow for the continued deposition of gold tailings onto the existing TSF and the expansion portion. The designs are focussed to ensure compliance and consideration with the guidelines and requirements of current water and waste management legislation, international best practice approach and national standards. The detailed designs are required as part of this IWUL renewal application and will then further feed into the design for construction.

The detailed civil engineering designs also comply with the specified barrier requirements as stipulated under the national environmental management: waste act (NEMWA), read with the Regulations regarding the Planning and Management of Residue Stockpiles and Residue Deposits, 2015 (as recently amended in 2018). The Residue Regulations provide for, *inter alia*, the assessment, characterisation and classification of residue stockpiles, as well as compliance with the pollution control barrier systems contemplated in the National Norms and Standards for the Assessment of Waste for Landfill Disposal (GN R635)and the National Norms and Standards for Disposal of Waste to Landfill (GN R636).

The design objectives for the TSF (on top and expansion), return water dams (current two compartments refurbishment and a single lined compartment expansion) and associated, and appurtenant infrastructure are as follows[12]:

- Permanent and secure containment of all solid waste materials (the gold tailings).
- Removal and reuse of the supernatant and free water, emanating from the TSF operations.
- Control of the phreatic regime within the constructed TSF and the minimisation of seepage into the environment from the TSF and RWD compartments.
- Temporary containment of contaminated water from storm events on top of the TSF, while drained within 72hrs to the RWD and also surface runoff management within and around the immediate vicinity.
- Clean and dirty water separation and diversion of clean water around the TSF and RWD, emanating from within the upstream catchment of the TSF and RWD. The containment and storage of water, deemed as dirty water, through seepage collection drainage networks to lined conveyance systems and into the RWD.
- Creation and construction of a suitable foundation for new starter walls to be founded as an extension to the east, in line with the existing TSF.
- Installation of a drainage network system underneath the expansion portion of the TSF and RWD Cell No.3, consisting of a drainage network, collector systems and filters and outfall lines. These networks will tie in with the existing draining systems.
- The lining of the expanded basin with a designed Class-C Type Barrier that is of equivalent performance to the specified similar barrier in the regulations.
- Construction of starter and containment walls on the expanded footprint of the TSF. A new embankment wall is also to be constructed for RWD Cell No.3
- Construction of penstocks and penstock outfall lines for the collected supernatant and stormwater pool decanting of the expanded area of the TSF.
- Further installation of typical monitoring equipment to monitor the phreatic characteristics and movement behaviour of the TSF over time.
- Mitigate/prevent the effect of the increased elevation and expansion of the TSF in terms of driving head on the existing pollution plume.

[12] *Note: Tailings storage facility (TSF) refers to the existing TSF, the further development on top of the existing TSF and TSF expansion as a whole, unless stated otherwise.*

Return water dam (RWD) refers to the existing two RWD compartments (to be refurbished) and the third compartment (expansion) as a whole, unless stated otherwise.

- Optimum and reasonable ease of operations during the further development of the TSF.
- Rapid and effective rehabilitation for closure of the developed TSF.

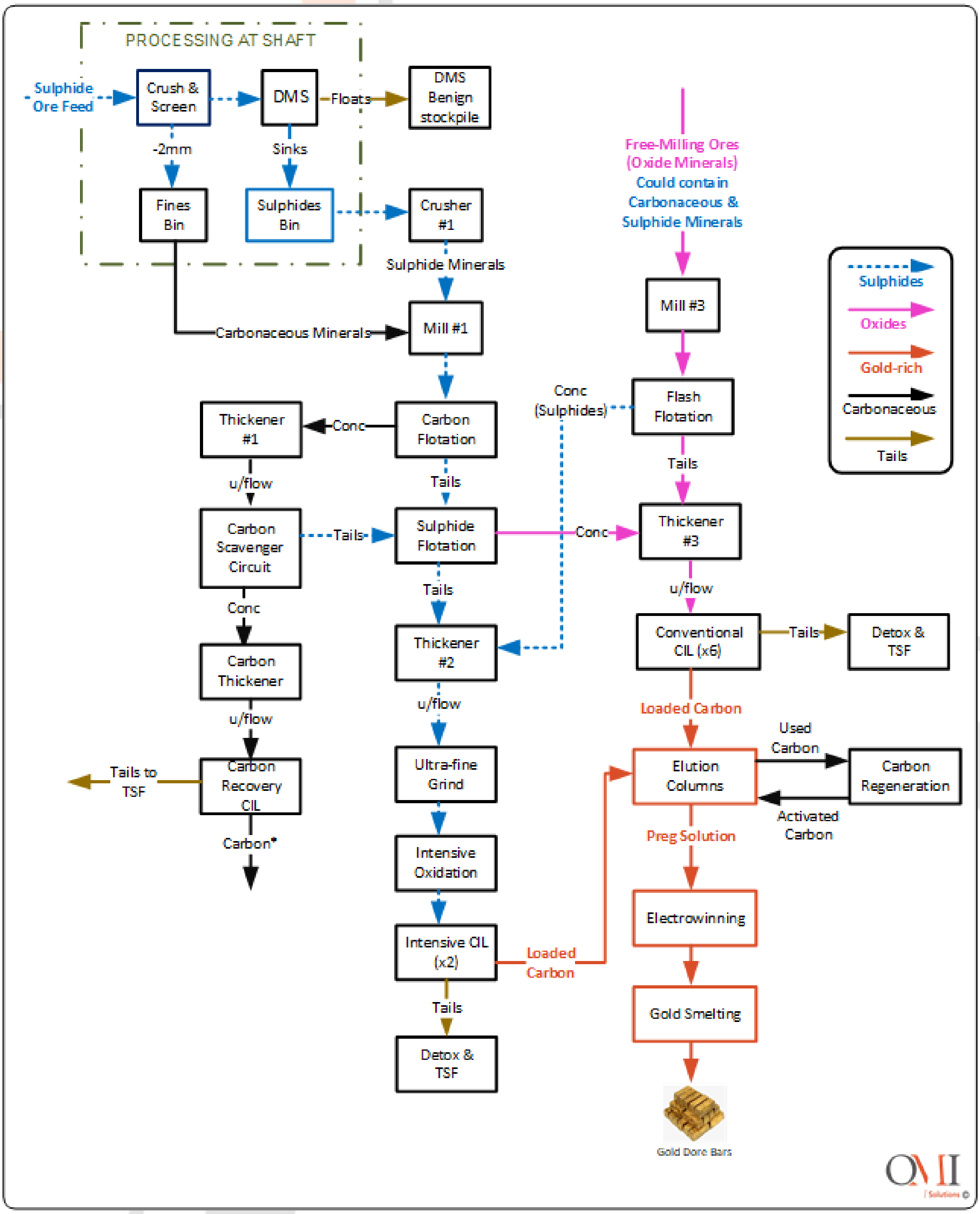


Figure 7: TGME Processing Plant Proposed Process Flow

4.5 EXISTING AND PROPOSED INFRASTRUCTURE

4.5.1 BETA NORTH SHAFT AREA

Available/existing infrastructure at the Beta North Underground Project area includes:

- Low-level river crossings (Towards Beta North from the plant); and

- Various portals and developments provide access to the Beta complex underground workings.

In order to effectively establish the underground mining operation, a number of infrastructure items will be required at the Beta North project. The required infrastructure will include:

- TMM workshops;
- Fuel storage facilities;
- Oil storage facilities;
- Mining and engineering stores;
- First aid station;
- Mining waste sorting/management and salvage yard;
- Sewage handling facilities;
- Diesel generator sets;
- Power distribution transformers;
- Water supply and distribution infrastructure;
- Reservoir and water tanks;
- Surface water management infrastructure;
- Upgrading of river crossings and rehabilitation of Peach Tree stream;
- Site security and access control;
- Mining settling and collection dam (stormwater and pollution control);
- Emulsion storage tanks;
- Underground infrastructure;
    - Power supply by the generator at the shaft;
    - Water supply from the Blyde (currently approved permit);
    - Ore handling infrastructure (ore passes, conveyors, incline winder with required shaft equipment); and
    - Dewatering system.
- Offices – mobile/prefabricated offices;
- Surface ore handling and load-out facilities;
- DMS plant;
- Mine residue facility (Waste Rock Dump (WRD));
- RoM stockpile area;
- Conveyor from Beta North to the plant;
- Single drum winder;
- Steel rope haulage system.

Refer to **Figure 10** for the conceptual layout of the Beta North Shaft.

4.5.2 CLEWER, DUKES AND MORGENZON SHAFT AREA

Available/existing infrastructure at the CDM Underground Project area includes:

- Tarred R533 regional main access road leading to Pilgrims Rest;
- Gravel site access road;
- Old DMS process plant site – all equipment and infrastructure removed/demolished;
- Old Office area – building ruins;

- Portal to underground operation;
- Mine residue facilities (waste rock);
- Stream diversions – Dukes Upper and Lower;
- Crossing of drainage at Morgenzon.

In order to effectively establish the CDM underground mining operation, several infrastructure items will be required. The required infrastructure will include, but is not limited to:

- Offices – mobile/prefabricated offices;
- TMM workshops;
- Fuel storage facilities;
- Oil storage facilities;
- Mining and engineering stores;
- First aid station;
- Mining waste sorting /management and salvage yard;
- Portable Sewage handling facilities;
- Diesel generator sets;
- Power distribution transformers;
- Water supply and distribution infrastructure;
- Reservoirs and water tanks;
- Surface water management infrastructure;
- Upgrading of drainage crossings;
- Site security and access control;
- Mining settling and collection dam (stormwater and pollution control);
- Emulsion storage tanks;
- Underground infrastructure;
    - power supply;
    - water supply;
    - ore handling infrastructure (Ore passes, rails and conveyors); and
    - dewatering system.
- DMS Plants (at Dukes);
- Surface ore handling and load-out infrastructure;
- Mine residue facilities (waste rock).

Refer to **Figure 11 and Figure 12** for the layouts of the CDM Shaft areas.

4.5.3 FRANKFORT SHAFT AREA

Available/existing infrastructure at the Frankfort Underground Project area includes:

- Tarred R533 regional main access road leading to Pilgrims rest;
- Gravel site access road;
- Old DMS process plant site – all equipment and infrastructure removed/demolished;
- Old sand/slimes dam area- removed;
- Settling dams;
- Portal to underground historical underground workings;

- Mine residue facilities (WRD).

In order to effectively establish the Frankfort underground mining operation, several infrastructure items will be required. The required infrastructure will include, but is not limited to:

- New DMS plant;
- Small office area for DMS operator;
- TMM workshops;
- Fuel storage facilities;
- Oil storage facilities;
- Mining and engineering stores;
- First aid station;
- Mining waste sorting /management and salvage yard;
- Portable Sewage handling facilities;
- Diesel generator sets;
- Water supply and distribution infrastructure;
- Reservoir and water tanks;
- Surface water management infrastructure;
- Site security and access control;
- Mining settling and collection dam (stormwater and pollution control);
- Emulsion storage tanks;
- Underground infrastructure:
    - power supply;
    - water supply;
    - ore handling infrastructure (Ore passes and conveyors); and
    - dewatering system.
- Surface ore handling and load-out infrastructure;
- Mine residue facilities (WRD).

Refer to **Figure 13** for the layout of the Frankfort Shaft area.

4.5.4 PROCESSING PLANT

The following existing infrastructure is located at the mineral processing plant, as per the 2013 approved EMPR:

- Processing plant;
- Smelting plant;
- Stores;
- Ore handling and ore feed infrastructure;
- Run of Mine (RoM) stockpile area;
- Heap Leach Pad;
- Stormwater management channels and dams;
- Administration offices;
- Engineering workshops;
- Two water reservoirs;

- Old water supply pumping system (drawing from Blyde River);
- Changehouse facility at the process plant;
- Stores and laydown yard;
- 6.6 kV line supplying power to the operation from the existing Eskom consumer substation;
- Site distribution substation;
- Power distribution transformers;
- Processing plant motor control centers;
- Processing plant PCD;
- Fuel storage tanks;
- Salvage and reclamation yard; and
- Access control fencing (mainly at the administration offices and old processing plant).

The plant will be upgraded (replacement of old outdated infrastructure) and the capacity increased to 100,000 tonnes per month, in line with the proposed underground mining activities. In general, the requirements for the operation at the plant will be:

- Upgrading of the process plant to the newest technology;
- Upgrading of smelting plant;
- Trackless mobile machinery (TMM) workshops;
- Mining and engineering stores;
- First aid station;
- Control room;
- Mining waste sorting/management and salvage yard;
- A new treatment plant and sewage reticulation system;
- Clean/Dirty change houses;
- Additional power supply and distribution infrastructure;
- RoM ore haul roads plus upgrades to the road access around Pilgrims Rest;
- Site security and access control;
- Upgrading of the stormwater management system to comply with the requirements of the *Regulation on use of water for Mining and related activities aimed at the protection of water resources*[13] published in terms of the NWA (GN 704) including:
    - Silt traps;
    - Two PCD dams;
    - Plant make-up dam (stormwater and pollution control);
    - Clean and dirty water channels.
- Potable water treatment plant;
- Re-instated Helipad;
- Mine residue facility (we) on the old Heap Leach Pad area (to be rehabilitated as part of the upgrade);
- Upgraded RoM area;
- Diesel storage;
- Oil storage area;

[13] Government Notice (GN) 704 in Government Gazette (GG) 20119 of 4 June 1999.

- Proto Room; and
- Central dense medium separation (DMS) plant.

For detail on the metallurgical plant processes, please refer to Section 4.4.2. It should be noted that all activities will take place in the previously disturbed footprint area of the approved plant.

4.5.5 TAILINGS STORAGE FACILITY

Existing infrastructure at the Tailings storage facility (TSF) includes:

- TSF
- RWD

Table 6: Continued Deposition onto Existing TSF and the expanded footprint area

Facility Description	Continued deposition of gold tailings onto the existing TSF and the expanded part. Refurbishment of the existing RWD with two compartments and building of a new compartment (approximately 21 Ha for Phase No.1 and 6 Ha for Phase No.2).
Fluid Management	• Subsoil drains below the barrier and a basin under the drainage system, above the barrier that reports (via gravity) into a collection sump and solution trench as appropriate. The solution trench is a lined conveyance system that leads to the refurbished RWD for return water re-use. • Decant intake structure for the removal of supernatant pool water via a concrete-encased pipeline into a dissipating structure and ultimately the RWD. • The drainage and conveyance systems, installed as part of the expansion will tie into the existing infrastructure where appropriate.
Clean and dirty water management	• The footprint area of the TSF, RWD and immediate infrastructure are viewed as a dirty water catchment area. The surrounding clean water run-off is diverted through stormwater diversion channels that lead from upstream, along the southern flank and then passing the eastern and western flanks and further downstream into designed dissipation structures. • The dirty water catchment is managed by lined collection channels that lead into the RWD.
Embankments	
Construction	• Diversion berms for the stormwater cut-off trenches, along the perimeter of the TSF for clean and dirty water separation. • Zoned Dump rock starter wall embankments and homogenous perimeter containment walls constructed from site mixed and local borrow material (sourced from within

	TSF basin and local where possible) with low permeability zone on the upstream face. 4 m typical crest width, with 1V:3H upstream slopes. • Considering that the TSF is located against a steep slope of a typical valley. The internal drainage structures will slope towards the north within the basin of the TSF expansion with a central drainage structure leading into the northern solution trench. Drainage features include toe drains against the main starter walls and blanket drains to selected confinement walls.
Construction Material	• Local material sourced will be used to construct the starter wall for the expanded portion of the TSF.
TSF Expanded Basin	
Tailings Facility Basin Expansion	• The design hydraulic head on the barrier is assumed to be less than 0.3 m and the potential leakage rate via the system has been inferred based on consideration of the principles and formulas documented by Giroud (1997) and Rowe (1998 & 2011). For the purpose of the concept approach, the inclusion of wrinkles was not done but the calculations will be developed more in detail during detail design once more parameter properties have been confirmed. • The leakage rate was calculated assuming good installation practices and therefore using a maximum estimate of 5 holes per ha of 2 mm diameter in size but remaining more conservative by considering good and poor interface contact. The permeability of the on-site compacted clay liner is likely to be an order of magnitude higher (based on preliminary materials analysis) than the target permeability (1x10-8 m/s) and therefore the potential leakage range is conservatively targeted to be between 28 to 38 l/p/h/d.
Underdrainage System	• The main collector drains, branch drains, and finger drains throughout the expanded TSF basin area, will collect seepage water from the tailings mass and discharge it into the northern solution trench and then further down into the conveyance channels and then the RWD. • Main Collector Drains – Welded HDPE PE100 PN16 pipe. • Branch Drains – Welded HDPE PE100 PN16 pipe (Slotted), surrounded by aggregate, and wrapped in a geotextile (continuously seamed or heat welded).
Operation	• Discharge from surrounding TSF embankment to form a supernatant pond centrally. • Recycle rate of supernatant water is subject to the water quality being suitable for plant operation. Excess supernatant water is to be evaporated within the TSF basin or used for other operational purposes where suitable.

	• Underdrainage recovery drained to RWD for reuse or operational purpose where suitable. The under drainage assists in the internal phreatic management and improves tailings consolidation.
Monitoring	• Monitoring boreholes downstream of the embankment to monitor groundwater level and quality. • Piezometers were installed in the embankment slopes and along identified areas along the outer perimeter of the TSF to monitor stability. • Monthly drain flow measurements from all the outlet drain to monitor the effective drawdown of the phreatic zone within the TSF.
Closure	• Tailings surface to be designed as store and release cover. • Embankments to be progressively rehabilitated. • Permanent structure designed to accommodate the Probable Maximum Precipitation (PMP) event.

4.5.6 ACCESS AND ROADS

The mining areas are located close to Pilgrims Rest, Mpumalanga. The Beta North underground mine is closest to the TGME processing plant, which is located just southwest of the town of Pilgrims Rest. CDM is located approximately 2.3 km west of the town and the Frankfort operation lies 9.3 km northwest of the town. The R533 serves as the main access route to all three mining operations. An additional provincial gravel road leads from the R553 to the Frankfort operation.

The Beta North Project is located 1 km southwest of the TGME process plant. The Beta North underground works will be accessed via the Beta North decline. The road to the site crosses the Blyde River. For the transporting of the Beta ore and waste, the haul road and crossing over the Blyde river will be upgraded. The haul road has been designed to service the ore, waste, people, and material logistics of Beta underground mining operations.

The designs for the Beta North area river crossings have been designed by Eco Elementum and are illustrated below.

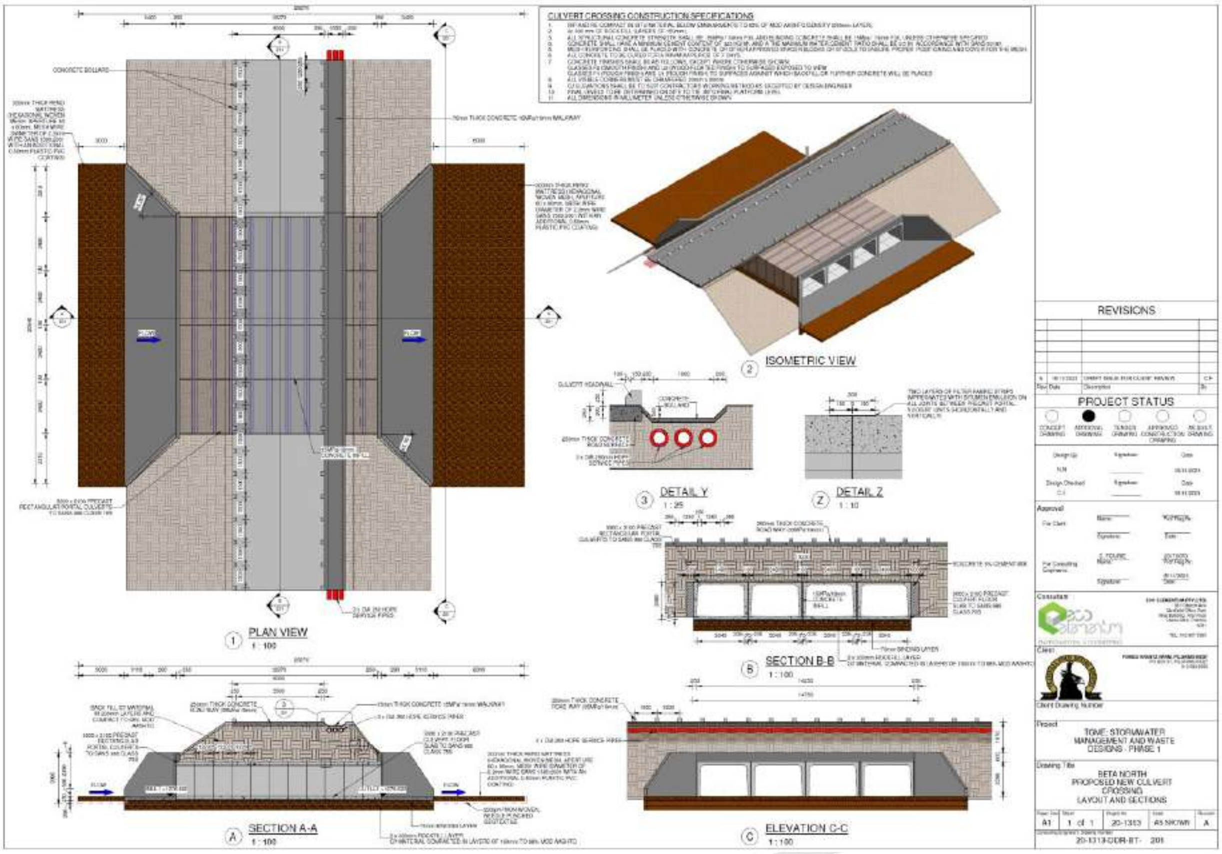


Figure 8: Proposed Upgraded Crossing over Blyde River

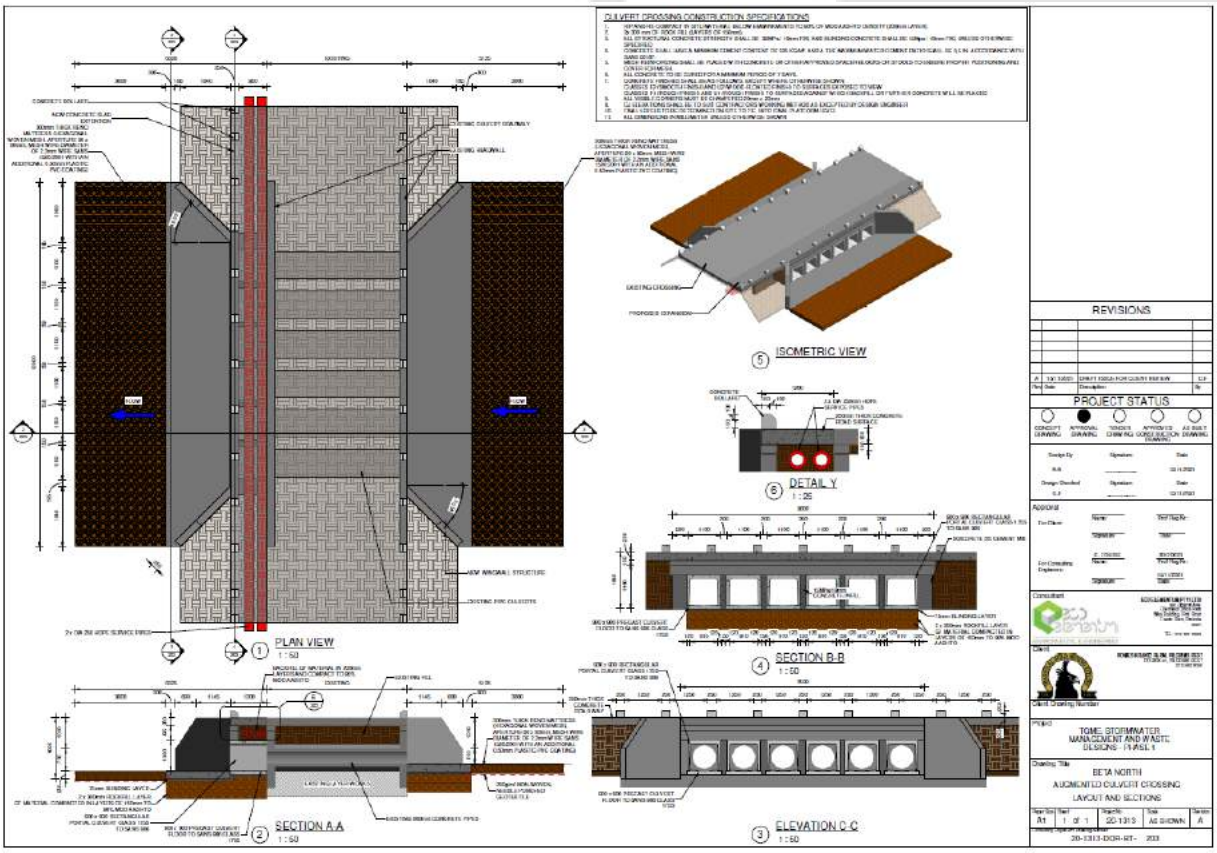


Figure 9: Proposed Upgraded Crossing over Peach tree stream

The Frankfort mine is located 26 km north of the plant area and is accessed via a dirt road off the R533.

CDM Project is located 3 km north of the plant area and is accessed via a dirt road. The CDM Project area is close to the R533 and does not require the construction of a haul road, as the existing dirt road (and the R533) has been deemed sufficient for the transporting of the CDM ore and waste.

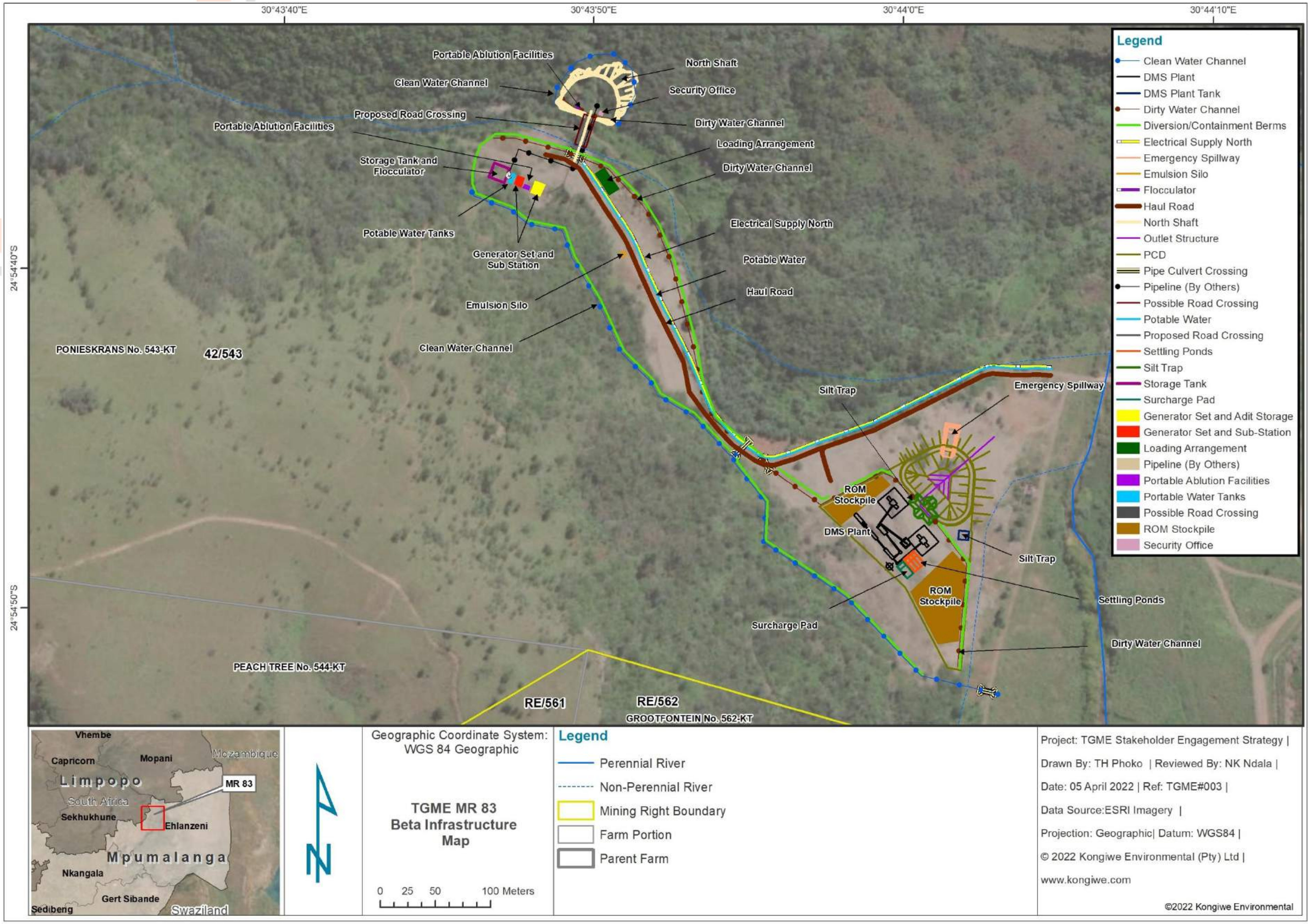


Figure 10: Proposed Layout Map of the Infrastructure – Beta North Shaft (Kongiwe, 2022)

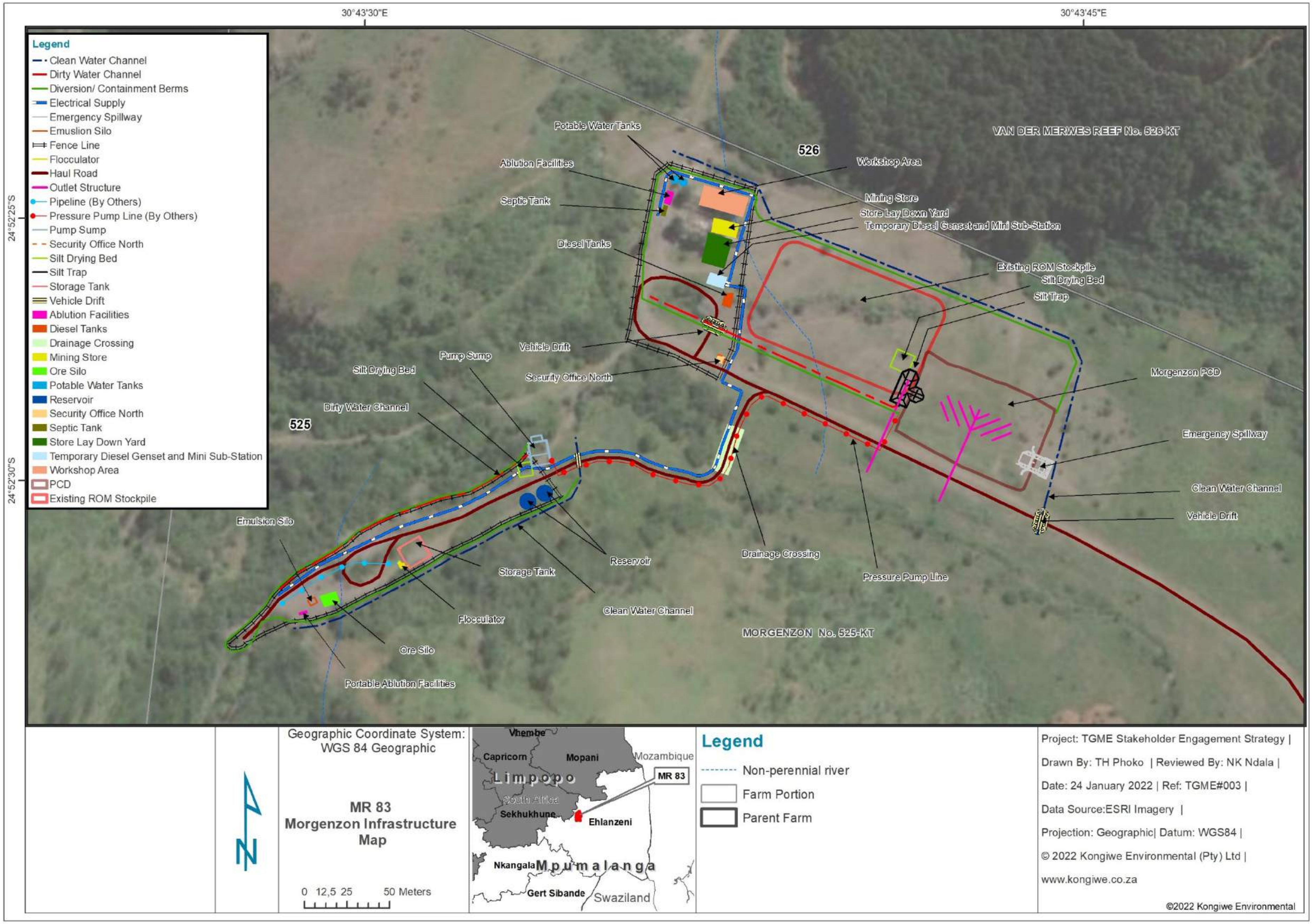


Figure 11: Proposed Layout Map of the Infrastructure – Morgenzon Shaft (Kongiwe, 2022)

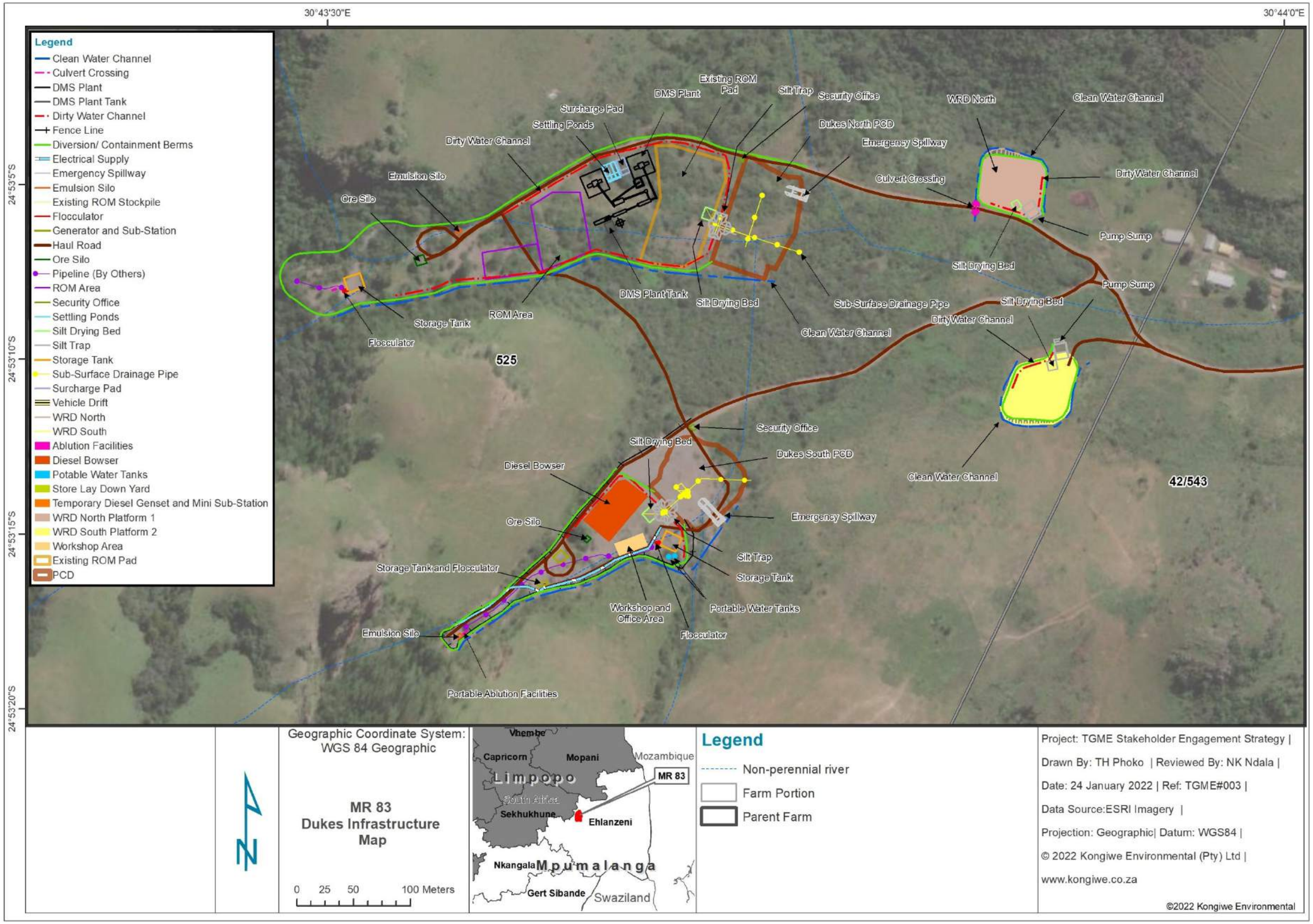


Figure 12: Proposed Layout Map of the Infrastructure – Dukes Shaft (Kongiwe, 2022)

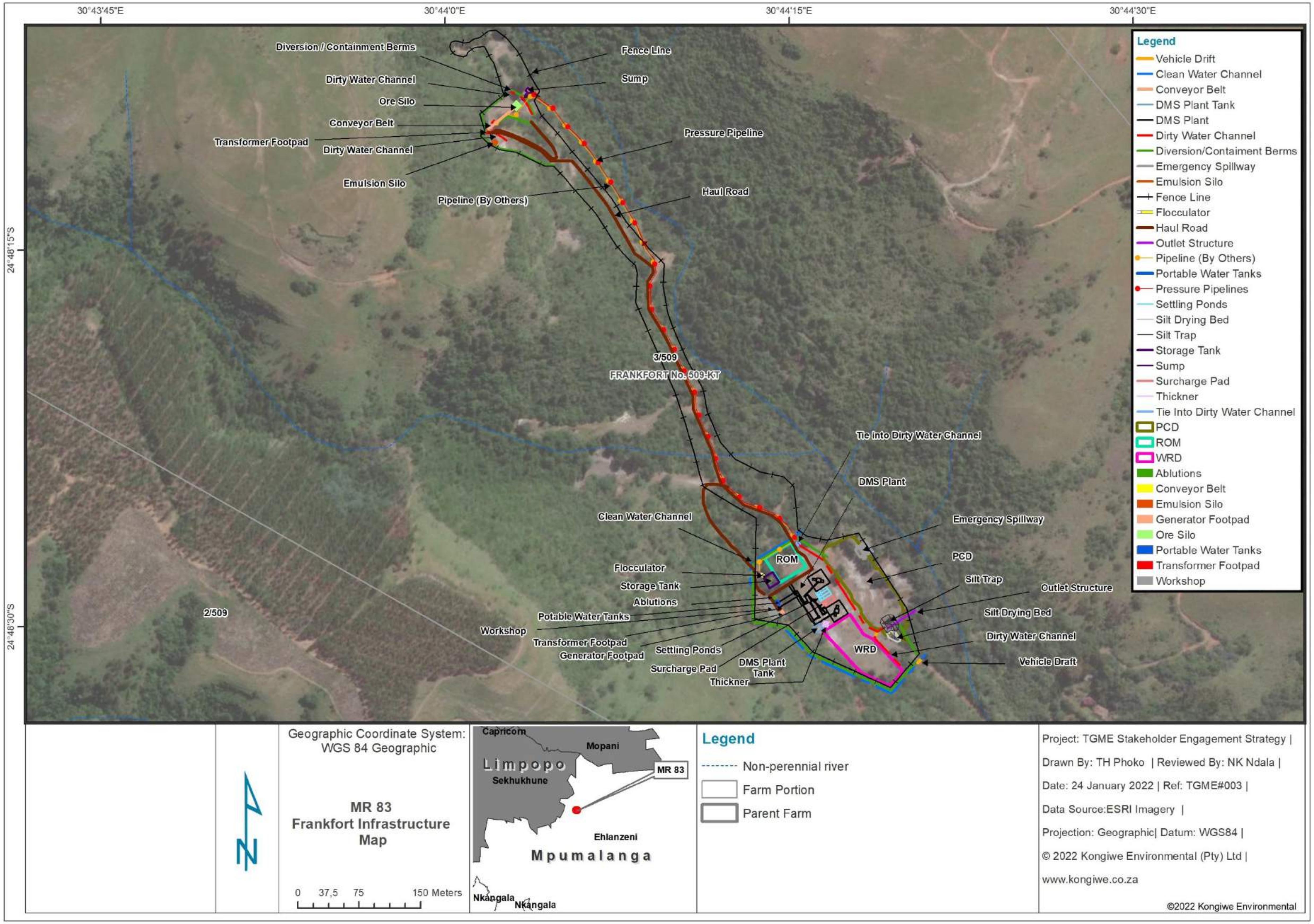


Figure 13: Proposed Layout Map of the Infrastructure – Frankfort Shaft – Adit area (Kongiwe, 2022)

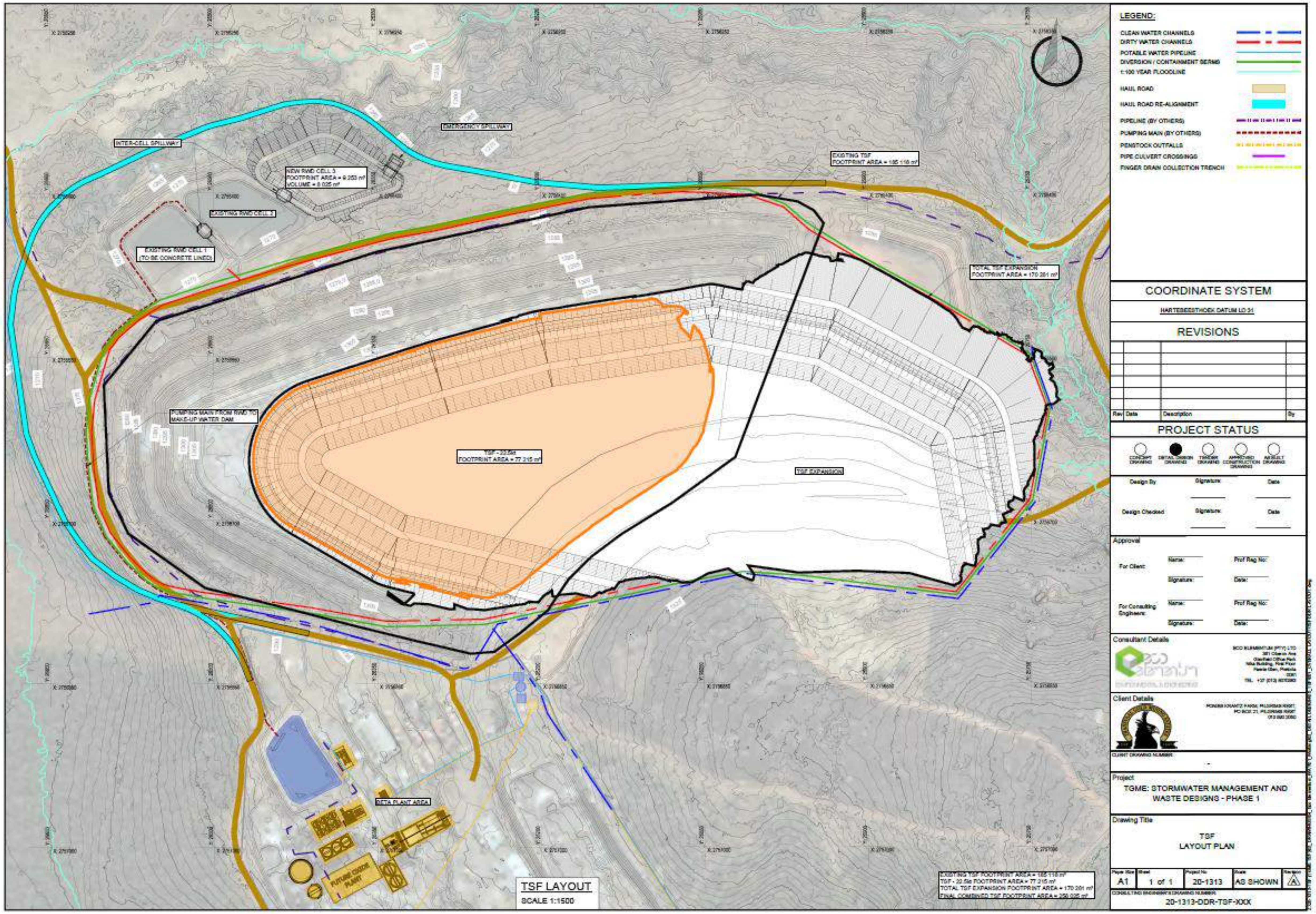


Figure 14: Proposed Layout Map of the Tailings storage facility (Phase 1 and 2) (EcoElementum, 2022)

4.5.7 POWER SUPPLY

An Eskom consumer substation located near the operations supplies 6.6 kV electricity via a single overhead line to the TGME processing plant. The current supply capacity for the operation is 2.5 MVA, which is supplied by a 2.5 MVA 22 kV/6.6 kV transformer; a second 2.5 MVA 22 kV/6.6 kV transformer is installed as a standby unit. The planned mining operations will necessitate an upgrade to the current supply. This would require an application for an upgrade to Eskom's supply capacity, which would necessitate the installation of larger transformers at the Eskom consumer substation.

The existing grid supply will initially service only the process plant area. Diesel generators will be required to supply power to the Beta North project until the grid power supply infrastructure has been upgraded and expanded. Once complete, overhead power lines will be installed to supply grid power to the Beta North project. This will form part of a separate authorisation process in consultation with Eskom.

The Frankfort and CDM projects currently have no access to grid power. These two operations will also require the use of diesel generators until the grid power supply infrastructure has been upgraded and expanded to these Mines.

4.5.8 WATER SUPPLY

Water supply is an essential service as various steps in the process plant and underground mining operations are heavily reliant on the usage of water. Apart from the mining and process requirements, water will also be required for use as potable water.

4.5.8.1 DOMESTIC WATER USE

According to the Water balance for the project, as contained in Annexure D of the Stormwater Management Plan Design Report (Eco Elementum, 2021) (refer to ANNEXURE G), the domestic water for the plant will be obtained from the Blyde River and then treated in an onsite water treatment plant before being stored in a conservancy tank for consumption. From there it will be distributed to the process plant, underground workings, and surface facilities such as the offices and changehouse facilities. The volume of water to be used at the plant is estimated at 25.8 m^3/day.

To supply Beta North, potable water will be pumped via a pipeline from the treatment plant to the conservancy tank located at the Beta North adit. The amount of water is estimated at 13.4 m^3/day.

Potable water for the CDM area will be trucked from the plant area to the four CDM conservancy tanks. The amount of water to be trucked is estimated at 22.7 m^3/day. This will mean for domestic use the amount of water to be abstracted from the Blyde River amounts to 22,036 m^3/annum for CDM.

Frankfort will obtain water from the Molototse River for domestic use. The water will be treated and pumped to two conservancy tanks. The amount of water is estimated at 24.4 m^3/day. It should be noted that the Molototse allocation is insufficient, and it is thus anticipated that it will need to be supplemented with treated dewatering water and/or delivery of potable water to Frankfort from the plant

4.5.8.2 BETA NORTH WATER SUPPLY

Service Water sources available to the Beta North area consist mainly of water sourced from the underground workings, surface water (dirty run-off rainwater) collected as part of the project water management activities, and abstraction of water from the Blyde River under an approved authorisation.

The water supply requirements for the project are based on the following parameters as presented in the Water balance as Appendix D of ANNEXURE G and illustrated in **Figure 15**:

- potable water 13.4 m^3/day;

- process make-up water – 0.9 m³/t of treated ore;
- dust suppression of roads from the PCD (1.5 m³/day);
- mining service water is required for the following:
    - 2 x development drill rigs per mining section;
    - 2 x long hole drill rigs per mining section;
    - 2 x roof bolters per mining section; and
    - 5 x water jets (stope cleaning) per mining section.
- Dewatering water is estimated at 262.3 m³/d.

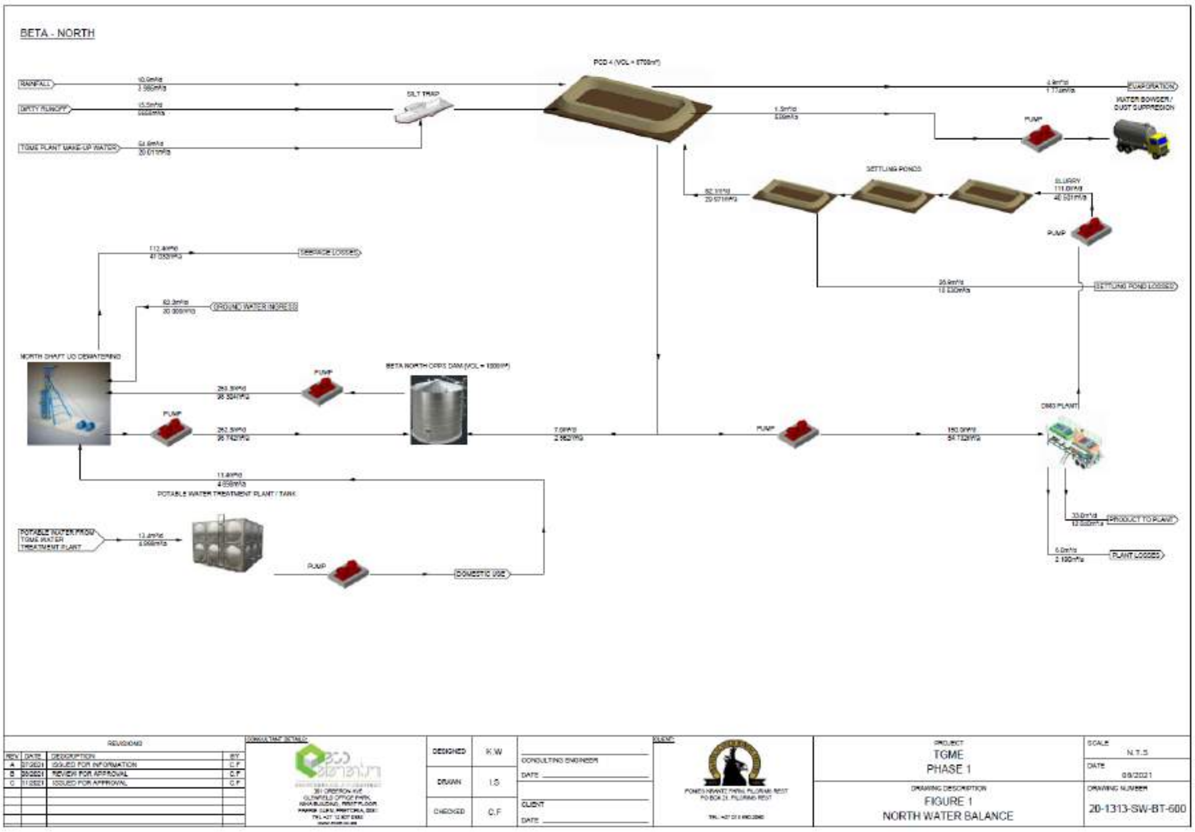


Figure 15: Water balance diagram for Beta North (Eco Elementum, 2021)

4.5.8.3 PLANT AND TSF

The plant make-up water will be obtained from the Blyde River, return water from the tailings, and run-off collection. The total make-up water from the Blyde is estimated at 405.9 m³/day (148 172 m³/a). A control philosophy was incorporated in the water balance model that the transfer of dirty water from the PCDs and return water from the RWDs is done in a timeous and efficient manner to ensure that no more than one environmental spill within a 1:50-year rainfall event would occur. This is to ensure that the make-up water requirement in the DMS plants can be met with as much dirty run-off water as possible to prevent excess abstraction of water for plant use. The control philosophy also manages the water volumes in the RWDs.

The water use philosophy is to re-use water as much as possible and only use river water when all re-used water has been depleted.

The water supply requirements for the plant and TSF are presented in the Water balance as Appendix D of ANNEXURE G and illustrated in **Figure 16** and **Figure 17.**

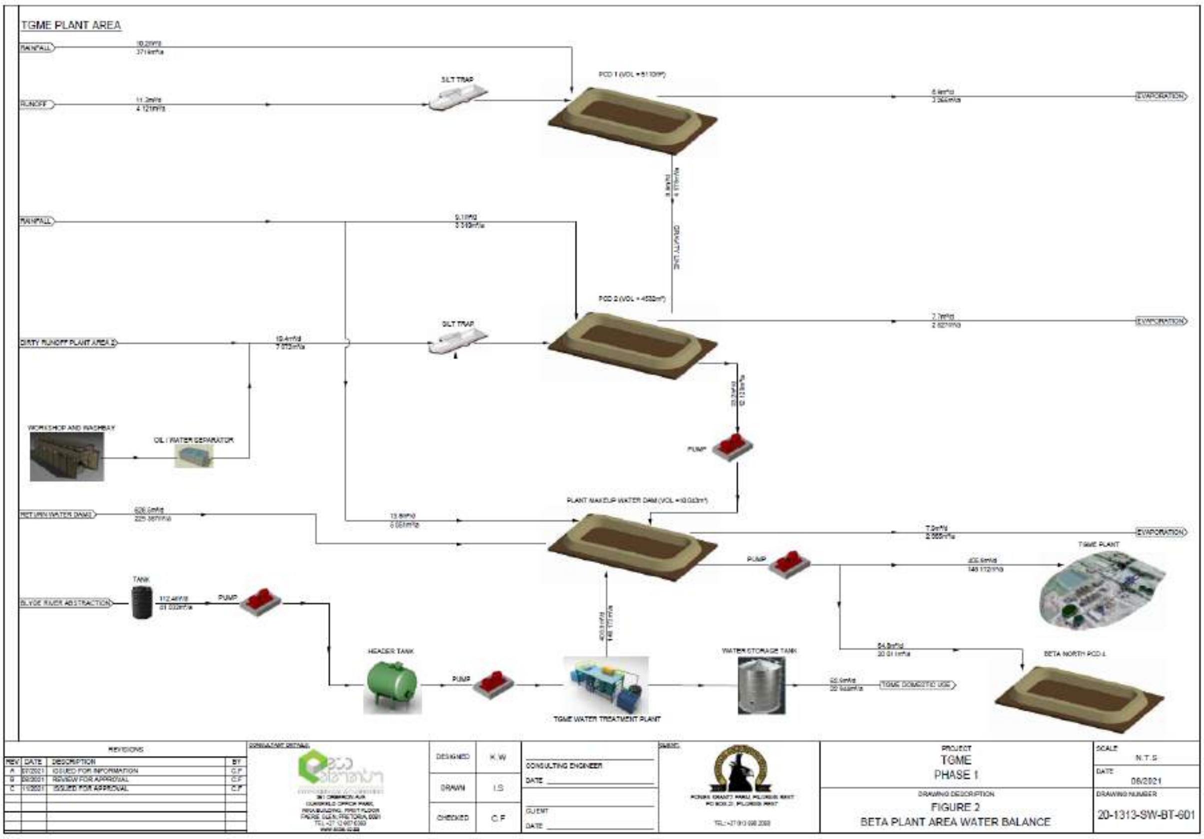


Figure 16: Water Balance Diagram for Processing Plant (Eco Elementum, 2021)

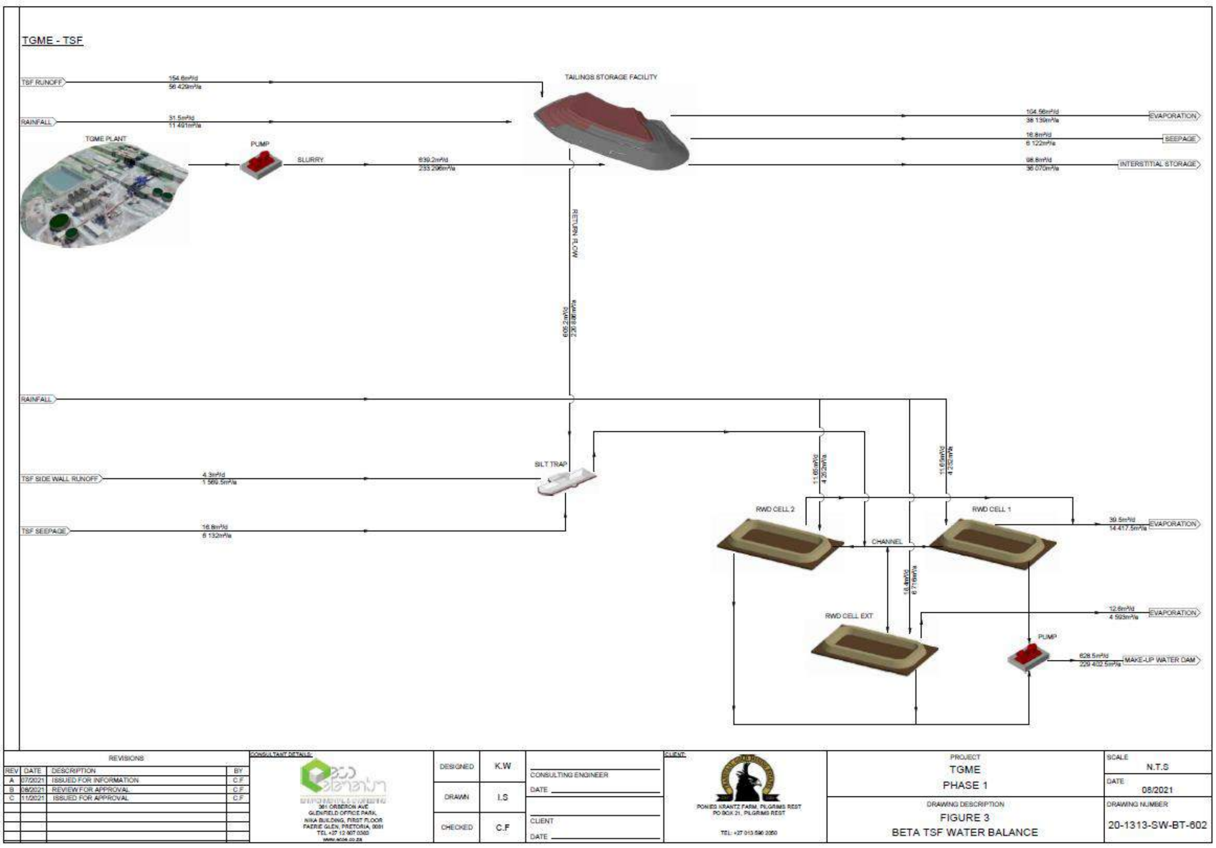


Figure 17: Water Balance Diagram for TSF (Eco Elementum, 2021)

4.5.8.4 FRANKFORT WATER SUPPLY

Service water sources available to the Frankfort underground mining area consist mainly of water sourced from the underground workings and surface water (dirty run-off rainwater) collected as part of the project water management activities. The Frankfort mine currently has an existing licenced allocation for water from the Molototse River (6022 m^3/a).

Potable water will be treated in a potable water treatment plant and distributed to the process plant, underground workings, and surface facilities such as the offices and portable toilets.

The water supply requirements for the project are based on the following parameters as presented in the Water balance as Appendix D of ANNEXURE G and illustrated in **Figure 18**:

- domestic water use for Frankfort is estimated at 28.4 m^3/day this will be obtained from the Molotose and supplemented with treated dewatering water and or delivery of potable water to Frankfort from the plant;
- process make-up water – 0.9 m^3t of treated ore;
- dust suppression of roads 4 m^3/day;
- mining service water is required for the following:
    - 2 x development drill rigs;
    - 2 x long-hole drill rigs;
    - 2 x roof bolters per mining section; and
    - 5 x water jets (stope cleaning) per mining section.
- Dewatering water is estimated at 327.3 m^3/day.

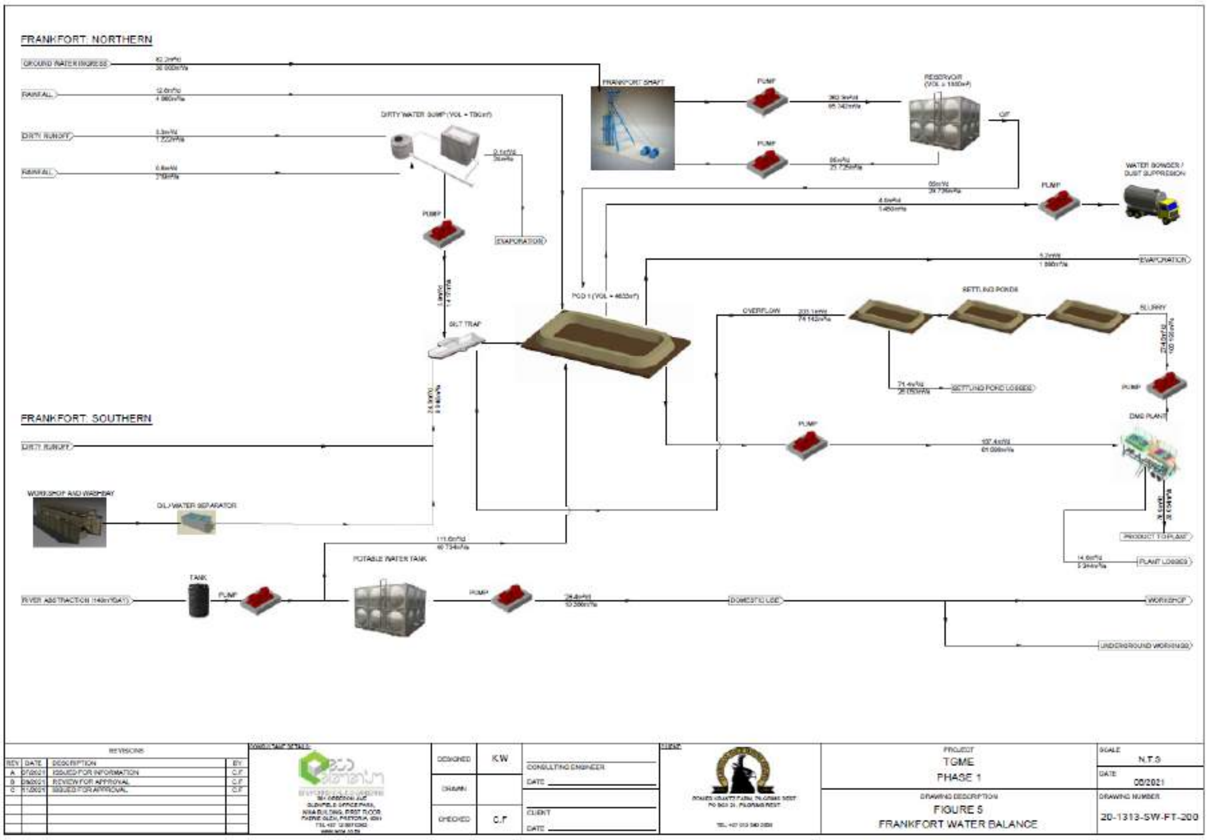


Figure 18: Water Balance Diagram for Frankfort (Eco Elementum, 2021)

4.5.8.5 CLEWER, DUKES AND MORGENZON WATER SUPPLY

Service water sources available to the CDM Underground Project consist mainly of water sourced from the underground workings, surface water collected (dirty run-off rainwater) as part of the project water management activities, and boreholes.

Potable water will be treated by a potable water treatment plant and distributed to the process plant, underground workings, and surface facilities such as the offices and changing facilities.

The water supply requirements for the project are based on the following parameters as presented in the Water balance as Appendix D of ANNEXURE G and illustrated in **Figure 19** and **Figure 20**:

- Potable water 22.7 m^3/day from the water treatment plant, designated as follows:
  - Dukes Upper and Dukes Lower 5.6 m^3/day each;
  - Morgenzon shaft 1.6 m^3/day;
  - Morgenzon offices and workshops 9.9 m^3/day.
- process make-up water – 0.9 m^3/t of treated ore;
- dust suppression of roads from the PCD (2.8 m^3/day) is divided into:
  - Dukes upper 0.4 m^3/day
  - Dukes lower 2.3 m^3/day and
  - Morgenzon 0.1 m^3/day;
- mining service water is required for the following:
  - 2 x development drill;
  - 2 x long-hole drill rigs;
  - 2 x roof bolters per mining section; and
  - 5 x water jets (Stope cleaning) per mining section.
- Dewatering water is divided into:
  - Dukes upper 262.3 m^3/day
  - Dukes lower 262.3 m^3/day and
  - Morgenzon 262.3 m^3/day;

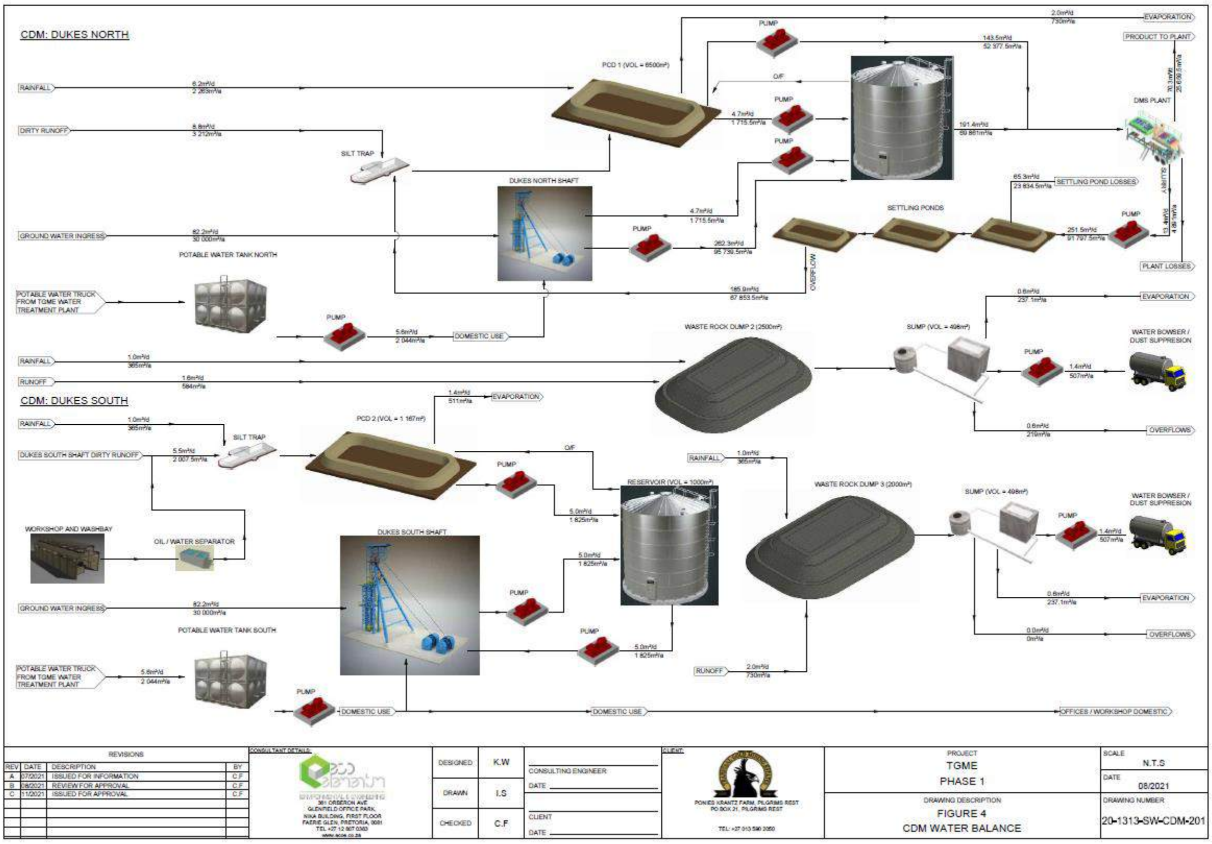


Figure 19: Water Balance Diagram for Dukes (Eco Elementum, 2021)

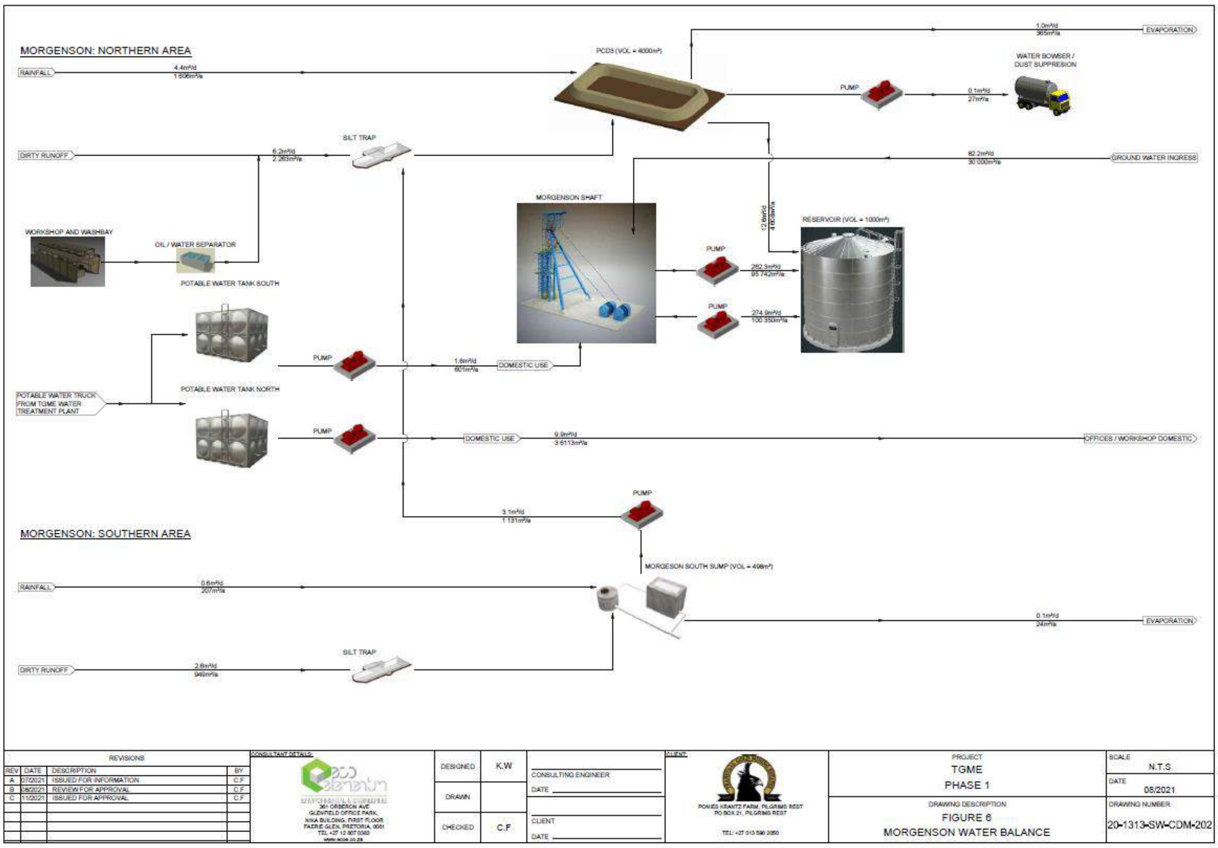


Figure 20: Water Balance Diagram for Morgenzon (Eco Elementum, 2021)

4.5.9 WATER MANAGEMENT

The site is situated in a freshwater sensitive area and therefore compliance with the provisions of GN 704 for the separation and containment of dirty and clean water is of utmost importance. All dirty rainfall run-off, process plant discharge, treated sewage and grey water shall be collected, stored, and recycled as far as possible. Should an excess of water exist in the operational areas, all effluent from the sites should be suitably treated and tested to ensure compliance with acceptable standards before being released into the environment. Collection and diversion trenches should be utilised to separately collect and divert dirty and clean run-off water. All clean rainfall run-off should be diverted away from dirty and contaminated areas to minimise the risk of environmental and water pollution.

Surface collection dams shall be constructed at all underground operations. These will serve as storage facilities for water pumped from underground, run-off water collected, and the main service water supply for the underground operations.

Water management at all the underground operations will be an important function of the operation. Water management will include:

- dewatering of underground workings;
- run-off water management;
- surface dams (storage); and
- sewage handling and management.

Pumping systems, clean water diversion trenches and dams forming part of the water management infrastructure will be designed based on the expected underground dewatering volumes and expected volumes of surface run-off water.

The design of the waste containment facilities was based on the following criteria:

- The Waste Containment Facilities must comply with the requirements of the NEMWA and the incorporated regulations listed below and be classified and designed based on these requirements:
    - National Norms and Standards for the Assessment of Waste for Landfill Disposal[14] (GN R 635)
    - National Norms and Standards for the Disposal of Waste to Landfill[15] (GN R636)
    - Regulations regarding the planning and management of residue stockpiles and residue deposits, 2015[16] (GN R632 or Residue Regulations); and
    - GN 921 ;
- Waste containment facilities are divided into the following:
    - ROM;
    - WRD;
    - Stockpile platforms;
    - Slurry settling ponds;
    - Surcharge pad;
    - Operational dam;

[14] GN R635 in GG 36784 of 23 August 2012.

[15] GN R636 in GG 36784 of 23 August 2012.

[16] GN R632 in GG 39020 of 24 July 2015 as amended by the Planning and Management of Residue Stockpiles and Residue Deposits Amendment Regulations, 2018 published under GN 990 in GG 41920 of 21 September 2018.

  - Process water tank; and
  - PCD's and related silt traps.
- The PCDs and related infrastructure must comply with the above as well as the requirements of GN704.
- PCD's have a freeboard of a minimum of 800 mm.
- Clean water channels earth lined and discharge to the environment via energy dissipating structure.
- Dirty Water Channels are concrete-lined and discharge into PCDs.
- Each PCD is equipped with a silt trap and slit drying bed.
- The PCD is sized to spill only once in fifty years.
- Stockpile and containment facilities are grouped together with a dedicated PCD.
- The Waste Containment Facilities and PCDs for each area must function in an integrated manner

4.5.10 WASTE MANAGEMENT

The NEMWA's objectives are structured around the waste management hierarchy, which is the general approach that informs waste management in South Africa (DEA, 2011). The aim of the waste management hierarchy is to achieve optimal environmental outcomes and is accepted nationally and internationally as a guide for prioritizing waste management practices. The purpose of the waste hierarchy is to generate the minimum amount of waste and extract maximum practical benefits from products.

The waste management hierarchy offers a systematic and holistic approach to waste management during the waste life cycle, which in turn addresses reduction, avoidance, reuse, recovery, treatment, recycling and safe disposal as a last option (DEA, 2011; DEA, 2012). It describes the preferred order of waste management practices, from most to least preferred. It can help reduce pollution, decrease greenhouse gas emissions, conserve energy, preserve resources, create job opportunities and stimulate the growth of green technology (DEA, 2017). This strategy will ensure that waste is controlled from its creation to its disposal (Cradle to Grave principle) (**Figure 21**).

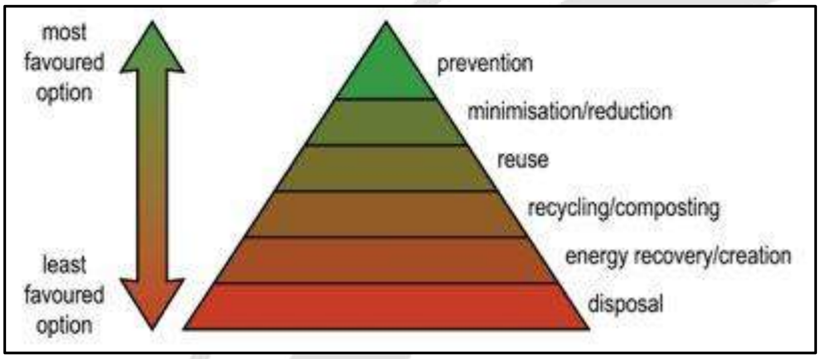


Figure 21: The Waste Management Hierarchy

Waste envisioned to be generated from the operations will include domestic, industrial, and hazardous waste.

- Domestic waste will consist of all waste material generated by the day-to-day running of offices, change houses and canteens. This will include food, paper, cardboard, plastic wrappers, tin cans, and plastic bottles.
- Industrial waste will consist of material discarded during the operation of workshops, mining machinery and process plant. This will include scrap metal, wood, tyres, metal and plastic drums, rubber materials and plastic components from engineering and mining equipment.

- Hazardous waste will include all discarded fuels, oils, lubricants, paints solvents and other chemicals. It will not be possible to dispose of these items on site, and thus these will have to be managed according to the norms and standards of storage of waste.
- Medical waste will be generated by the mine's first aid/medical stabilisation facility. Medical waste will include contaminated materials such as used syringes, surgical gloves and cotton wool, and empty medicine containers.
- Mine residue will consist of tailings from the plant to be deposited on the existing TSF and expansions presented for approval. The waste rock from underground will be stored on various WRDs around the shaft and plant areas.

The salvage yard area will comply with the requirements of the National Norms and Standards for the Storage of Waste (GN 926 of 29 November 2013). After which waste will be disposed of at a licensed waste site approved for the type of waste. A summary of the management of waste according to the aforementioned norms and standards is illustrated in **Figure 22**.

Management of Waste Storage Facilities

Access Control & Notices	Operation	General requirements of Waste Storage Containers	Minimum requirements for above ground waste storage facilities	Minimum requirements for underground waste storage containers
(1) A waste storage facility must have effective access control to prevent unauthorised entry. Weatherproof, durable and legible signs in at least 3 (three) official languages applicable in the area must be displayed at each entrance of the facility. The signs must indicate the risks involved in entering the site, hours of operation, the name, address, telephone number and the person responsible for the operation of the facility as a minimum. (2) Access to a hazardous waste storage facility must be limited to employees who have been trained with respect to the operation of the hazardous waste storage facility and emergency response procedures and any other person authorised by the owner of the hazardous waste storage facility.	(1) A waste storage facility must be free from odour or emissions at levels likely to cause annoyance. (2) Waste must be sorted at source into various categories (recyclables and non-recyclables) and a documented procedure must be implemented to prevent any mixing of hazardous and general waste integrated waste management plan and/or Industry Waste Management Plan, if any. (3) A waste storage facility mus the operated within its design capacity and the waste storage container must not be overfilled. (4) Liquid waste must be stored in leak resistant containers which must be inspected weekly for early detection of leaks.	(1) A liquid waste container must be sufficient strength and structural integrity to ensure that is unlikely to burst or leak in its ordinary use. (2) Waste that is spilled or blown by wind during opening, handling or storage must be contained. (3) Hazardous waste must be stored in covered containers and only open when waste is added or emptied. (4) Below-ground pipes connected to the container must be protected from physical damage (e.g. excessive surface loading, ground movement or disturbance). If mechanical joints have to be used, they must be readily accessible for inspection. (5) A hazardous waste storage container, associated piping and equipment must be of sufficient structural strength to withstand normal handling and installed on stable foundation. (6) The foundation of a hazardous waste storage container must be protected from, or resistant to all forms of internal and external wear, vibration, corrosion, fire, heat, vacuum and pressure which might cause the storage tank foundation to fail. (7) A leak monitoring device must be installed on an underground liquid waste storage container and piping to and from the container in order to keep operating personnel informed. (8) If a container is lined or internally coated, the coating must be compatible with the substance stored. Furthermore the coating specification must adhere to existing engineering practices and the applicable standards or requirements. (9) The waste storage tank be a closed system and pressure resistant. (10) In a case where a tank or vent pipe is not visible during the filling process an automatic overfill prevention device must be fitted onto the tank	(1) A hazardous waste container resting on the ground must be underlain by barriers, which will not deteriorate with permeability rate of the waste stored. (2) Bottoms of the container in contact with soil and are subject to corrosion must be protected from external corrosion by either ensuring that the container is made of corrosion resistant materials or the container have a cathodic protection system. (3) A waste storage tank must not have mechanical joints, except if it can be accessed for inspection. (4) The screw fitting or other fixed coupling fitted to the tank must be maintained in good condition and must only be used when filling the tank.	(1) Underground waste storage contained must have double walled and synthetic liners and underground vaults must be installed. (2) A steel underground tank and piping in contact with soil must be protected from corrosion using corrosion resistant materials or cathodic protection. (3) Container components that are placed underground and backfilled must be provided with a backfill material that is a non-corrosive, porous, homogeneous substance and that is installed so that the backfill is placed completely around the tank and compacted to ensure that the tank and piping are fully and uniformly supported. (4) If external coating is used to protect the tank from external corrosion, the coating must be fibreglass, reinforced, plastic, epoxy, or any other suitable dielectric material.

Figure 22: The waste management of storage facilities according to the National Norms and Standards for the Storage of Waste

5 POLICY AND LEGISLATIVE CONTEXT

The table below summarises some of the important legislative requirements for this assessment.

Table 7: Legislative and policy context

Applicable Legislation and Guidelines used to compile the Report	Reference Where Applied
Constitution of the Republic of South Africa, 1996	The report was accordingly prepared, submitted and considered within the constitutional framework set by *inter alia* sections 24, 32 and 33 of the Constitution.
Mineral and Petroleum Resources Development Act, 2002 (Act 28 of 2002) (MPRDA) Mineral and Petroleum Resources Development Regulations (GN R527 of 2004, as amended)[17]	The EIA/EMPR report and Section 102 of the MPRDA consent application for this project are based on the MPRDA and Regulations.
National Environmental Management Act, 1998 (Act 107 of 1998) (NEMA) • Environmental Impact Assessment (EIA) Regulations, 2014 (GN R982 of 2014, as amended in June 2021)[18] • EIA Regulations Listing Notice 1 of 2014 (GN R983 of 2014, as amended)[19] • EIA Regulations Listing Notice 2 of 2014 (GN R984 of 2014, as amended)[20] • EIA Regulations Listing Notice 3 of 2014 (GN R985 of 2014, as amended)[21]	The Environmental Impact Assessment (EIA) process was undertaken in respect of the authorisation process of the proposed mining operations, and is in compliance with the MPRDA, as well as the NEMA and NEMWA read with the Environmental Impact Assessment Regulations of 2014, as amended. The proposed development involves 'listed activities', as identified in terms of the NEMA. In terms of section 24(1) of the NEMA, the potential consequences for or impacts on the environment of inter alia listed activities must be considered, investigated, assessed and reported on to the Minister responsible for mineral resources, except in respect of those activities that may commence without having to obtain an environmental authorisation in terms of the NEMA. An application for Environmental Authorisation in line with the provisions contained in GNR 982 (as amended) was submitted to the Department of

[17] GN 527 in GG 26275 of 23 April 2004 as amended by GN R 1288 in GG 26942 of 29 October 2004; GN R 1203 in GG 29431 of 30 November 2006; GN R349 in GG 34225 of 18 April 2011; GN R466 in GG 38855 of 3 June 2015; and GN R420 in GG 43172 of 27 March 2020.

[18] GN R982 of 4 December 2014 as amended by GN R326 of 7 April 2017, GN 706 of 13 July 2018, GN 599 of 29 May 2020 and GN 517 of 11 June 2021.

[19] GN R983 in GG 38282 of 4 December 2014 as amended by GN R327 in GG 40772 of 7 April 2017, GN 706 in GG 41766 of 13 July 2018 and GN 517 in GG 44701 of 11 June 2021.

[20] GN R984 in GG 38282 of 4 December 2014, as amended by GN R325 in 40772 of 7 April 2017 and GN 517 in GG 44701 of 11 June 2021.

[21] GN R985 in GG 38282 of 4 December 2014, as amended by GN R324 in 40772 of 7 April 2017, GN 706 in GG 41766 of 13 July 2018 and GN 517 in GG 44701 of 11 June 2021.

Applicable Legislation and Guidelines used to compile the Report	Reference Where Applied
• Financial Provisioning Regulations, 2015 (GN R1147 of 2015 as amended)[22] • DEA (2017), Guideline on Need and Desirability, Department of Environmental Affairs	Mineral Resources and Energy: Limpopo Region (DMRE), in terms of section 24 of the NEMA for consideration (Application submitted to DMRE on 26 July 2019). The activities specified in Table 3 of the Scoping were identified as being applicable to the proposed mining operations. The Financial provision for the project will comply with the Financial Provisioning Regulations. The need and desirability of the project are addressed in Section 6.
Department of Environmental Affairs, Pretoria, South Africa. • Department of Environmental Affairs (2017), Public Participation guideline in terms of NEMA EIA Regulations, Department of Environmental Affairs, Pretoria, South Africa.	Public participation is conducted according to NEMA and the Public Participation guideline.
National Environmental Management: Air Quality Act, 2004 (Act 39 of 2004) • Listed Activities and Associated Minimum Emission Standards Identified in terms of section 21 of the National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) (GN R893 of 2013, as amended)[23] • National Dust Control Regulations, 2013 (R827 of 2013)[24] • National Atmospheric Emission Reporting Regulations, 2015 (GN R283 of 2015)[25] • National Greenhouse Gas Emission Reporting Regulations (GN 275 of 2017 as amended)[26]	The plant will require an Atmospheric Emissions License (AEL). The Air Quality study listed activities and AEL will be guided by the act and regulations.

[22] The *Regulations Pertaining to the Financial Provision for Prospecting, Exploration, Mining or Production Operations* published in GN R1147 in GG 39425 of 20 November 2015 as amended by GN 1314 in GG 40371 of 26 October 2016; GN R452 in GG 41584 of 20 April 2018; GN 991 in GG 41921 of 21 September 2018; GN 24 in GG 42956 of 17 January 2020; GN 495 in GG 44698 of 11 June 2021.

[23] GN R893 in GG 37054 of 22 November 2013, as amended by GN 551 in GG 38863 of 12 June 2015; GN 1207 in GG 42013 of 31 October 2018; GG 687 in GG 42472 of 22 May 2019; GN 421 in GG 43174 of 27 March 2020.

[24] R827 in GG 36974 of 1 November 2013.

[25] GN R283 in GG 38633 of 2 April 2015.

[26] GN R275 in GG 40762 of 3 April 2017 as amended by GN R994 in GG 43712 of 11 September 2020.

Applicable Legislation and Guidelines used to compile the Report	Reference Where Applied
• National Environmental Management: Biodiversity Act, 2004 (Act 39 of 2004) • Threatened or Protected Species Regulations, 2007 (GN R152 of 2007)[27] • Alien and Invasive Species Regulations (GN R1020 of 2020)[28] • Alien and Invasive Species Lists, 2020 (GN 1003 of 2020)[29] • National Environmental Management: Protected Areas Act, 2003 (Act 57 of 2003)	The Terrestrial and Aquatic specialist assessments will be guided by this act and regulations.
National Environmental Management: Waste Act, 2008 (Act 59 of 2008) • List of waste management activities that have, or are likely to have, a detrimental effect on the environment (GN 921 of 2013, as amended)[30] • National Waste Information Regulations, 2012 (GN R625 of 2012)[31] • Regulations regarding the planning and management of residue stockpiles and residue deposits, 2015 (GN R632 of 2015, as amended)[32] • Waste Classification and Management Regulations, 2013 (GN R634 of 2012)[33].	The EIA process was undertaken in respect of the authorisation process of the proposed mining operations, and is in compliance with the MPRDA, as well as the NEMA and NEMWA read with the list of waste management activities that have, or are likely to have, a detrimental effect on the environment, as amended. All residue designs will comply with the regulations and norms and standards.

[27] GN R152 in GG 29657 on 23 February 2007.

[28] GN R1020 in GG 43735 of 25 September 2020.

[29] GN 1003 in GG 43726 of 18 September 2020. Notice replaced the previous Alien and Invasive Species Lists (GN 864 in GG 40166 of 29 July 2016).

[30] GN 921 in GG 37083 of 29 November 2013 as amended by GN 332 in GG 37604 of 2 May 2014; GN R633 in GG 39020 of 24 July 2015; and GN 1094 in GG 41175 of 11 October 2017.

[31] GN R625 in GG 35583 of 13 August 2012.

[32] GN R632 in GG 39020 of 24 July 2015 as amended by the Planning and Management of Residue Stockpiles and Residue Deposits Amendment Regulations, 2018 published under GN 990 in GG 41920 of 21 September 2018.

[33] GN R634 in GG 36784 of 23 August 2012.

Applicable Legislation and Guidelines used to compile the Report	Reference Where Applied
• National Norms and Standards for the Assessment of Waste for Landfill Disposal (R635 of 2012)[34] • National Norms and Standards for the Disposal of Waste to Landfill (R636 of 2012)[35] • National Norms and Standards for the Storage of Waste (GN 926 of 2013)[36]	
National Forest Act, 1998 (Act 84 of 1998) • Regulations under the National Forests Act 84 of 1998 (GN R466 of 2009)[37]	The legislation will be heeded throughout the proposed mining operations and was considered in the Ecological Impact Assessment. Permits will be applied for where required.
• National Heritage Resources Act, 1999 (Act 25 of 1999) (NHRA) • The World Heritage Convention Act, 1999 (Act 49 of 1999)	An Archaeological Impact Assessment and Paleontological Impact Assessment were conducted for the project.
The Nuclear Energy Act, 1999 (Act 46 of 1999)	The legislation will be heeded throughout the proposed mining operations
Environment Conservation Act, 1989 (Act 73 of 1989) • Noise Control Regulation (GN R154 of 1992)[38]	The legislation will be heeded throughout the proposed mining operations and has been addressed in the Noise impact assessment
Explosives Act, 1956 (Act 26 of 1956)	The legislation will be heeded throughout the proposed mining operations
Mine Health and Safety Act, 1996 (Act 29 of 1996) • Mine Health and Safety Regulations (GNR 93 of 1997, as amended)[39] • Mines and Works Regulations (GN R992 of 1970, as amended)[40]	The legislation will be heeded throughout the proposed mining operations

[34] R635 in GG 36784 of 23 August 2012.

[35] R636 in GG 36784 of 23 August 2012.

[36] GN 926 in GG 37088 of 29 November 2013.

[37] GN R466 in GG 32185 of 29 April 2009.

[38] GN R154 of January 1992.

[39] GN R93 in GG 17725 of 15 January 1997.

[40] GN R992 in GG 2741 of 26 June 1970, was published under the Mines and Works Act, but remain in force in terms of Schedule 4 of the MHSA.

Applicable Legislation and Guidelines used to compile the Report	**Reference Where Applied**

National Water Act, 1998 (Act 36 of 1998)
• Regulations on the use of water for mining and related activities aimed at the protection of water resources (GN 704 of 1999)41
• Water Use Licence Application and Appeals Regulations, 2017 (GN R267 of 2017)42
• Regulations regarding the safety of dams in terms of section 123(1) of the National Water Act, 1998 (GN R139 of 2012)43
• Regulations in terms of section 26 read in conjunction with section 12A for the erection, enlargement, operation and registration of water care works (GN R 2834 of 1985)44
• General Authorisations
  ○ General Authorisation: 21(c) and (i) water use for the purpose of rehabilitating a wetland for conservation purposes (GN 1198 of 2009)45
  ○ General Authorisation: 21(c) and (i) water uses (GN 509 of 2016)46
  ○ Revision of General Authorisation for the Taking and Storing of Water (GN 538 of 2016)47
  ○ Revision of General Authorisation in terms of section 39 of the National
	Insofar as the undertaking of section 21 water uses is concerned, an application for a water use licence for the mining development will be submitted to the Department of Water and Sanitation (DWS) following the submission of the Final EIA/EMPR Report and the finalisation of the detail design, as per GNR 267 of 2017.
	The requirements of regulation GN704 will be adhered to. All clean and dirty water management structures will be designed in accordance with section 6 of GN704.

[41] GN 704 in GG 20119 of 4 June 1999.

[42] GN R267 in GG 40713 of 24 March 2017.

[43] GN R139 in GG 35062 of 24 February 2012.

[44] The regulations were published in GN R 2834 in GG 10048 of 27 December 1985 under the Water Act 54 of 1956 and are still applicable until such time as new regulations are promulgated under section 26 of the NWA.

[45] GN 1198 in GG 32805 of 18 December 2009.

[46] GN 509 in GG 40229 of 26 August 2016.

[47] GN 538 in GG 40243 of 2 September 2016.

Applicable Legislation and Guidelines used to compile the Report	Reference Where Applied
Water Act 36 of 1998 (GN 665 of 2013)[48]	
Conservation of Agricultural Resources Act, 1983 (Act 43 of 1983)	The legislation will be heeded throughout the proposed mining operations and was considered in the Soil and Ecological Impact Assessments.
Hazardous Substances Act, 1973 (Act 15 of 1973)	The legislation will be heeded throughout the proposed mining operations
Spatial Planning and Land Use Management Act 2013 (Act 16 of 2013)	The legislation will be heeded throughout the proposed mining operations

6 NEED AND DESIRABILITY OF THE PROPOSED ACTIVITIES.

International conventions, national plans and programmes, as well as the relevant Integrated Development Plans (IDP) were taken into account in assessing the proposed development in a spatial context. Trends in the South African and international gold and associated minerals markets have also been taken into consideration in this assessment of the need and desirability of the project.

The project is aligned with the objectives of the MPRDA:

- To promote economic growth and mineral development in South Africa;
- To promote employment and advance the social and economic welfare of all South Africans;
- To ensure that the nation's mineral resources are developed in an orderly and ecologically sustainable manner while promoting justifiable social and economic development; and
- To ensure those holders of mining rights contribute towards the social-economic development of the area in which they are operating.

The main benefits of the re-development of the underground mining sections are:

- Direct economic benefits will be derived from wages, taxes and profits;
- Indirect economic benefits will be derived from the procurement of goods and services and the spending power of employees;
- Increased job security for employees;
- The project will result in economic mining of a known resource and existing surface and underground infrastructure will be utilised for future re-development;
- 426 employees building up to 1500 direct jobs through future phases, and four times that in indirect jobs. 70% of unskilled labour will be sourced from the local community;
- TGME will contribute directly to the national fiscus by way of taxes and royalties paid, enabling the government to provide social infrastructure and services. Indirect contribution through the payment by employees of personal income tax and of municipal rates and taxes;
- Local South African procurement opportunities: 30% skilled labour from mining industry; and

[48] GN 665 in GG 36820 of 6 September 2013.

- With the formalisation of mining, the current illegal mining activities will be reduced in the area. This will also lead to reduced uncontrolled impacts on the Blyde River and sensitive biodiversity of the area.

The Department of Forestry, Fisheries and the Environment (DFFE)[49] published an updated Guideline on Need and Desirability (2017) in terms of the EIA Regulations, 2014 (as amended). The key components are listed and discussed below:

- Securing ecological sustainable development and use of natural resources;
- Promoting justifiable economic and social development.

TGME is confident that the project will have a positive impact on the lives of their host communities by creating much needed jobs and downstream economic development, thereby assisting in accelerating the South African government's post-COVID economic recovery plan. Further, TGME's corporate presence in the region will result in a net positive benefit to the Blyde River catchment, safety and security of the host community and local tourism revenues; which would otherwise continue to deteriorate at the mercy of alien invasive vegetation and illegal miners.

<table>
<tr><th>How will this development (and its separate elements/aspects) impact on the ecological integrity of the area?</th><th>Please explain</th></tr>
<tr><td colspan="2">Please refer to sections 9.10 of the EIA report.
Based on the outcomes of the initial biodiversity assessments, the proposed 83MR Underground Project will impact on Irreplaceable and Optimal Critical Biodiversity Areas (CBAs), as well as on threatened ecosystems The largest of the proposed footprint will be in the Transformed Habitat and AIP-dominated Vegetation which will not result in impacts on indigenous vegetation, nor will it result in the direct loss of habitat that is considered important for sustaining floral ecology in the area. Of concern regarding activities in these sub-units are the potential for edge effects on adjacent or nearby, natural habitat. Sensitive landscapes in the project area) are discussed in detail in Section 9. These include but are not limited to:
• Newly promulgated Morgenzon Forest Nature Reserve;
• Kruger to Canyons Biosphere Reserve;
• Mpumalanga Drakensberg Surface water Strategic Water Source Area;
• Critical Biodiversity Area;
• Provincial Heritage sites; and
• Dolomitic and karst aquifers.
Due to extensive historical development, as well as recent illegal mining activity, it seems possible to restart these mines without any new significant impacts on biodiversity, groundwater, or hydrological function. In fact, as explained below, it may well be that restarting the underground mines is beneficial for biodiversity protection and management, as well as river flow. For the purposes of this report, I must assume that there will not be any significant negative impacts on biodiversity and that mitigation, and the recommendations of the relevant specialists will be adhered to. The detailed specialist studies confirm this assumption and do not point to additional offset-type mitigation measures that need to be considered.
Morgenzon mine, while outside of the recently declared Forest Nature Reserve (FNR), has a relatively large existing disturbed footprint, and legacy buildings from which to redevelop the mine. Although the stream and forest are in proximity, the fact that the mine was able to operate until relatively recently without grave visible impacts on these systems implies that high significance negative impacts are unlikely.
Frankfort was one of the more recently operating mines, and while located in a relatively steep, well wooded valley, it seems that it should be possible to restart operations without any significant additional footprint impacts on biodiversity, especially of the indigenous forests or in the rivers.
Additional mitigation measures are required to ensure low to no impact, but it is not envisaged that any offset-type mitigation or removal of indigenous forest will be required. TGME has appointed Mark Botha (Conservation Strategy, Tactics and Insight) to develop a comprehensive ecological compensation programme. A mitigatory and rehabilitation offering is proposed for the area around the mining operations to allow continued mining in the sensitive and protected environments listed in the above sections</td></tr>
<tr><td colspan="2">How were the following ecological integrity considerations taken into account? :</td></tr>
</table>

[49] At the time of publication, the Department of Environmental Affairs (DEA).

Threatened Ecosystems	Please explain
Please refer to previous response as well as Section 9.10 of the EIA/EMPR. The proposed redevelopment project has been designed to be placed on previously disturbed areas to avoid further loss to the threatened ecosystems.	
Sensitive, vulnerable, highly dynamic or stressed ecosystems, such as coastal shores, estuaries, wetlands, and similar systems require specific attention in management and planning procedures, especially where they are subject to significant human resource usage and development pressure	Please explain
Please refer to previous response as well as Section 9.10 of the EIA/EMPR. The proposed redevelopment project has been designed to be placed on previously disturbed areas to avoid further loss to the threatened ecosystems.	
Critical Biodiversity Areas ("CBAs") and Ecological Support Areas ("ESAs")	Please explain
The proposed mining expansion areas are located in sensitive freshwater (Blyde River) and aquatic resources, and is largely described as Optimal and Irreplaceable Critical Biodiversity Area (CBA) by the Mpumalanga Biodiversity Sector Plan (MTPA, 2014). Also refer to previous response.	
Conservation targets	Please explain
The NPAES (2010)[50], SACAD[51] (2020, Q3), SAPAD [52](2020, Q3), Important Bird and Biodiversity Areas (IBA, 2015) and the Surface water Strategic Water Source Areas (SWSAs, 2017) databases indicate several protected and conservation areas within 10 km of the 83MRAreas. • NPAES (2010) Formal Protected Areas : i. Morgenzon Reserve; Motlatse Canyon Provincial Nature Reserve (NR), Ohrigstad Dam NR, and Tweefontein Reserve. • NPAES (2010) Informal Protected Areas: i. Mount Anderson Catchment NR • NPAES (2010) Focus Areas: i. Frankfort is within the **Northeast Escarpment Focus Area**, with Morgenzon within 5 km of this focus area and Dukes and Beta North within 10 km of this focus area. The Northeast Escarpment focus area is an extremely diverse area important for ecological processes and resilience to climate change. It is an important Grassland centre of endemism and includes opportunities for protecting intact river reaches with threatened river types. There are excellent opportunities for expanding the Lekgalameetse, Wolkberg and Blyde Canyon Reserves (National Protected Area Expansion Strategy document for South Africa 2008). • SAPAD (2020, Q3) Protected Areas : i. Blyderivierspoort NR; Henra Private NR; Mac Mac Reserve; Mount Anderson Catchment NR; Mount Sheba Private NR; Morgenzon Reserve; Ohrigstad Dam NR, and Tweefontein Reserve. • Newly promulgated Morgenzon Forest Nature Reserve (to be added to the SAPAD dataset with its next update) – GN 1062, Gazette number 45345, dated 19 October 2021 as it pertains to the National Forests Act, 1998 (Act 84 of1998): Declaration of certain State Forests Properties in Mpumalanga Province as Forest Nature Reserves under Sec 8(1) and 9. i. SACAD (2020, Q3) Conservation Areas • The entire extent of the 83MR area is in the Kruger to Canyons Biosphere Reserve.	

50 Protected areas are areas of land or sea that are formally protected by law and managed mainly for biodiversity conservation. Protected areas recognised in the National Environmental Management: Protected Areas Act (Act 57 of 2003) are considered formal protected areas in the NPAES. It is important to differentiate protected areas from conservation areas. Conservation areas are areas of land not formally protected by law but informally protected by the current owners and users and managed at least partly for biodiversity conservation. Because there is no long-term security associated with conservation areas, they are not considered a strong form of protection. Conservation areas are not a major focus of the NPAES.

51 SACAD (2020): The types of conservation areas that are currently included in the database are the following: 1. Biosphere reserves, 2. Ramsar sites, 3. Stewardship agreements (other than nature reserves and protected environments), 4. Botanical gardens, 5. Transfrontier conservation areas, 6. Transfrontier parks, 7. Military conservation areas and 8. Conservancies.

52 SAPAD (2020): The definition of protected areas follows the definition of a protected area as defined in the National Environmental Management: Protected Areas Act, (Act 57 of 2003). Chapter 2 of the National Environmental Management: Protected Areas Act, 2003 sets out the “System of Protected Areas”, which consists of the following kinds of protected areas - 1. Special nature reserves; 2. National parks; 3. Nature reserves; 4. Protected environments (1-4 declared in terms of the National Environmental Management: Protected Areas Act, 2003); 5. World heritage sites declared in terms of the World Heritage Convention Act; 6. Marine protected areas declared in terms of the Marine Living Resources Act; 7. Specially protected forest areas, forest nature reserves, and forest wilderness areas declared in terms of the National Forests Act, 1998 (Act No. 84 of 1998); and 8. Mountain catchment areas declared in terms of the Mountain Catchment Areas Act, 1970 (Act No. 63 of 1970).

i. SWSA (2017) • The entire extent of the 83MR areas is in the Mpumalanga Drakensberg SWSA. Surface water SWSAs are defined as areas of land that supply a disproportionate (i.e. relatively large) quantity of mean annual surface water runoff in relation to their size. They include transboundary areas that extend into Lesotho and Swaziland. The sub-national Water Source Areas (WSAs) are not nationally strategic as defined in the report but were included to provide a complete coverage. i. IBA (2015) • The 83MRareas are within 5 km of the **Blyde River Canyon IBA**. This is the only site in South Africa that supports breeding *Falco fasciinucha*. At least one pair inhabits the gorges and there is potential habitat for several more birds. The cliffs at Manoutsa hold over 660 pairs of *Gyps coprotheres*, making it the world's fourth-largest colony. The gorges also hold breeding *Ciconia nigra, Falco peregrinus* and *Bubo capensis*. The surrounding grassland supports *Turnix hottentotta, Sarothrura affinis, Saxicola bifasciata, Neotis denhami, Grus paradisea, Bucorvus cafer, Tyto capensis* and *Geronticus calvus*, which breed within the reserve along the cliff gorges. The proteoid hillslopes hold *Promerops gurneyi*. The forest and forest edge support *Stephanoaetus coronatus, Buteo oreophilus, Lioptilus nigricapillus, Tauraco corythaix, Bradypterus barratti, Telophorus olivaceus, Cossypha dichroa, Cercotrichas signata, Estrilda melanotis* and *Serinus scotops*. • Additionally, the Mpumalanga Tourism and Parks Agency (MTPA) provides a database with provincially protected areas, much of which overlap with areas identified in the SAPAD and NPAES databases. The list includes the following provincially protected areas: i. Blyde River Canyon NR ii. Graskop Grasslands Unique Community iii. Hartebeesvlakte Reserve iv. Henra Private NR v. Mac Mac Reserve vi. Mariepskop Conservation Area vii. Morgenzon Reserve viii. Mount Anderson Catchment NR ix. Mount Sheba Private NR x. Ohrigstad Dam NR xi. Tweefontein Reserve	
Ecological drivers of the ecosystem	Please explain
Please refer to section 9.10-13.5 of the EIA/EMPR report.	
Environmental Management Framework	Please explain
Please refer to previous response as well as Section 9.10 of the EIA/EMP. The proposed redevelopment project has been designed to be placed on previously disturbed areas..	
Spatial Development Framework (SDF)	Please explain
No SDF currently exist	
Global and international responsibilities relating to the environment (e.g. RAMSAR sites, Climate Change, etc.)	Please explain
According to the South African Conservation Areas Database (SACAD, 2018), the entire project area falls within the Kruger to Canyons Biosphere Reserve and, therefore, is recognised under the UNESCO (United Nations Educations, Scientific and Cultural Organisation) Man and the Biosphere Programme. Depending on the spatial zonation of a Biosphere Reserve (core area, buffer zone or transitional zone), these areas can be granted legal protection or can be used for sustainable developments. The greenhouse gas emission impacts of the mine are analysed in terms of both South Africa's national greenhouse gas (GHG) emission inventory and climate change, as well as the global inventory and climate change. The main sources of GHG due to the proposed operations are the mobile and stationary equipment consuming diesel and petrol. The proposed operations will likely result in an increase in Scope 1 emissions for the IPPU sector, changing the national inventory's total annual CO2-e emissions by between 2 091.45 tpa and 6 907.22 tpa during the operational phase, contributing between 0.01% and 0.02% to the total IPPU annual CO2-e emissions. The GHG emissions from the project will be relatively low and will not likely result in a noteworthy contribution to climate change on its own.	
How will this development disturb or enhance ecosystems and/or result in the loss or protection of biological diversity? What measures were explored to firstly avoid these negative impacts, and where these negative impacts could not be avoided altogether, what	Please explain

measures were explored to minimise and remedy (including offsetting) the impacts? What measures were explored to enhance positive impacts?	
According to the National Biodiversity Offset Guideline issued under section 24J of the National Environmental Management Act (First Edition (October 2021)): "A residual biodiversity impact is the impact of an activity, or activities, on biodiversity that remains after all efforts have been made to avoid and minimise the impacts of the activity, or activities, and to rehabilitate or restore the affected area to the fullest extent possible." As part assessing environmental impacts it is required by the EAP and specialist team to predict the possible negative impacts of an activity, or activities, on biodiversity, including direct impacts, indirect impacts, and cumulative impacts. After those impacts have been identified, the EAP or specialist must investigate alternative project locations, designs, technologies, scales and layouts to determine if and how potentially significant negative impacts on biodiversity could be avoided or minimised. The EAP or specialist must also determine if, and how successfully, impacted areas could be rehabilitated or restored. The mitigation hierarchy, as set out in section 2(4)(a)(i) of the NEMA, and applicable guidelines, should be followed to determine if there will likely be residual impacts. During the project the following steps have been taken as part of the mitigation hierarchy • Avoid of prevent the impact has been discussed in the No-go alternative in Section 7.7 • Minimise the impact- areas to be developed have been confined to previous disturbed areas. Further reduction in footprints evaluated during the alternatives with inputs from the specialist are discussed in Section 7.3. • Impacts caused by the proposed development will be rehabilitated as per the financial provision described in Section 25. In addition it is proposed that AIP's be removed around the sites to reduce the impact these infestations have on the Forest Nature Reserve. • As the development will take place with the newly proclaimed Morgenzon Forest Nature Reserve as well as various other identified sensitive environment (further discussion in Section 9.10), appropriate measures will have to be put into place to assist in protecting the environment the mine proposes to continue mining in. These have been described at in Section 9.10.29.10.2.1. The mitigation and management have been included in Specialist management measures as well as the significance of the impacts prior and post mitigation are provided in Section 13.5 and contained in the respective studies. If granted authorisation, TGME will be legally and financially bound to the mitigation measures included in the conditions of the environmental authorisations and water use licence. Compliance with the conditions of the authorisations will be verified through annual external compliance audits and consequences (including financial) would follow. With the intervention of legal, monitored mining in the area, funds would be made available to eradicate AIPs and secure the SWSA by facilitating the establishment of native grasslands and forests, ecological connectivity and optimize the hydrological functioning of the Blyde catchment leading to a reduced impact and restoration and rehabilitation of the environment. If TGME is not allowed to continue operating, the burden of controlling illegal mining, rehabilitating the broader catchment, protecting the Endangered Ecosystem and Class 1 Water Resource, and meeting the Resource Quality Objectives, would all fall on the state (as predominant landowner). Implementation of the conditions offerings will result a large nett benefit to the environment in the Blyde valley however they require financial, human and specialist resources to implement. The commencement of the 83MR Project will result in an operation that can generate the revenues needed to roll out these improvement strategies.	
How will this development pollute and/or degrade the biophysical environment? What measures were explored to firstly avoid these impacts, and where impacts could not be avoided altogether, what measures were explored to minimise and remedy (including offsetting) the impacts? What measures were explored to enhance positive impacts?	Please explain
Refer to previous response and also see section 7 on Alternatives, Section 9.10 on the conditions of mining and Section 13 of the EIA report where the impacts have been discussed.	
What waste will be generated by this development? What measures were explored to firstly avoid waste and where waste could not be avoided altogether, what measures were explored to minimise, reuse and/or recycle the waste? What measures have been explored to safely treat and/or dispose of unavoidable waste?	Please explain
Waste on the mine will be managed according to a waste management plan with a salvage yard located on site to enhance the reuse and/or recycle the waste. Awareness training is performed to emphasise the concepts of minimising, reuse and/or recycle.	
How will this development disturb or enhance landscapes and/or sites that constitute the nation's cultural heritage? What measures were explored to firstly avoid these impacts, and where impacts could not be avoided altogether, what measures were explored to minimise	Please explain

and remedy (including offsetting) the impacts? What measures were explored to enhance positive impacts?			
Refer to previous response and also see section 7 on Alternatives, Section 9.10 on the conditions of mining and Section 13 of the EIA report where the impacts have been discussed. The TGME project area is situated within the larger Pilgrim's Rest heritage landscape, which is regarded as highly significant and of national significance. Pilgrim's Rest and the farm Ponieskrans were declared a Provincial Heritage Site in 1986 and an application for World Heritage Site status for the Reduction works was lodged in November 2006, but the declaration was never formalized. The sites will be directly impacted on by the proposed project where the significance of the impact is essentially high. As the farm Ponieskrans is a declared Provincial Heritage site, retaining and conserving the sites would essentially be required but there remains little to conserve at most of the sites and uncontrolled destruction of the landscape by illegal miners is ongoing. For this reason, it is recommended that a comprehensive research-driven Phase 2 heritage mitigation plan is implemented to include all these sites, informed by a robust research framework. Any grave sites will be protected in situ. Refer to Section 9.13.1 and 19.13.2.			
How will this development use and/or impact on non-renewable natural resources? What measures were explored to ensure responsible and equitable use of the resources? How have the consequences of the depletion of the non-renewable natural resources been considered? What measures were explored to firstly avoid these impacts, and where impacts could not be avoided altogether, what measures were explored to minimise and remedy (including offsetting) the impacts? What measures were explored to enhance positive impacts?			Please explain
The project is the extension of underground mining and associated infrastructure. Please refer to the Section 7 alternatives considered for the proposed development which looked at the following to assist with minimising the impacts: Alternatives relevant to this development can be categorized into the following: • Site location alternatives; • Activity alternatives • Layout alternatives; • Frankfort layout; • Reduced Footprints: i. Frankfort Layout; ii. Dukes Layout; and iii. Beta layout; • Technology alternatives; • Electrical supply; • Mining method; and • The "no-go" alternative. This is discussed in more details in Section 20 as aspects to be included in the Environmental Authorisation. Please also refer to previous response regarding the condition for continued mining.			
How will this development use and/or impact on renewable natural resources and the ecosystem of which they are part? Will the use of the resources and/or impact on the ecosystem jeopardise the integrity of the resource and/or system taking into account carrying capacity restrictions, limits of acceptable change, and thresholds? What measures were explored to firstly avoid the use of resources, or if avoidance is not possible, to minimise the use of resources? What measures were taken to ensure responsible and equitable use of the resources? What measures were explored to enhance positive impacts?			Please explain
Please refer to previous response			
Does the proposed development exacerbate the increased dependency on increased use of resources to maintain economic growth or does it reduce resource dependency (i.e. de-materialised growth)?	**YES**	NO	Please explain
The natural resource dependency in terms of water and power will increase, however the proposed development will promote economic development and will therefore reduce the dependency upon natural resources like cutting down of forests for wood or for example the need for illegal mining due to lack of other income.			

<table>
<tr><td colspan="4">As included in the SIA attached to this EIA/EMPR: “Compared to other economic sectors, the mining sector is relatively water efficient, i.e. the production value of the sector is high relative to its water use[53].”</td></tr>
<tr><td>Does the proposed use of natural resources constitute the best use thereof? Is the use justifiable when considering intra- and intergenerational equity, and are there more important priorities for which the resources should be used (i.e. what are the opportunity costs of using these resources this proposed development alternative?)</td><td>YES</td><td>NO</td><td>Please explain</td></tr>
<tr><td colspan="4">Reuse of water on the mine from dewatering and recycling process water will be undertaken. The amount of water to be abstracted from other sources are therefore greatly reduced by this implementation.
As part of the conditions of mining plan the impact from other industries on the natural resources in the area could be reduced. The removal of AIP’s in the area can lead to replenishment of the water used by TGME into the Blyde.</td></tr>
<tr><td>Do the proposed location, type and scale of development promote a reduced dependency on resources?</td><td>YES</td><td>NO</td><td>Please explain</td></tr>
<tr><td colspan="4">The natural resource dependency in terms of water and power will increase, however the proposed development will promote economic development and will therefore reduce the dependency upon natural resources like cutting down of forests for wood or for example the need for illegal mining due to lack of other income.
Reuse of water on the mine from dewatering and recycling process water will be undertaken. The amount of water to be abstracted from other sources are therefore greatly reduced by this implementation.
As part of the conditions of mining plan the impact from other industries on the natural resources in the area could be reduced. The removal of AIP’s in the area can lead to replenishment of the water used by TGME into the Blyde..</td></tr>
<tr><td colspan="3">How were a risk-averse and cautious approach applied in terms of ecological impacts</td><td>Please explain</td></tr>
<tr><td colspan="4">A risk analyses of the impacts identified was conducted to determine the significance of the impacts on the fauna and flora of the study area.</td></tr>
<tr><td colspan="3">What are the limits of current knowledge (note: the gaps, uncertainties and assumptions must be clearly stated)?</td><td>Please explain</td></tr>
<tr><td colspan="4">Refer to Section 21 of the EIA/EMPR report.</td></tr>
<tr><td colspan="3">What is the level of risk associated with the limits of current knowledge?</td><td>Please explain</td></tr>
<tr><td colspan="4">Refer to Section 21 of the EIA report.</td></tr>
<tr><td colspan="3">Based on the limits of knowledge and the level of risk, how and to what extent was a risk-averse and cautious approach applied to the development?</td><td>Please explain</td></tr>
<tr><td colspan="4">A risk analyses of the impacts identified was conducted to determine the significance of the impacts on the fauna and flora of the study area.</td></tr>
<tr><td colspan="4">How will the ecological impacts resulting from this development impact on people's environmental right in terms following:</td></tr>
<tr><td colspan="3">Negative impacts: e.g. access to resources, opportunity costs, loss of amenity (e.g. open space), air and water quality impacts, nuisance (noise, odour, etc.), health impacts, visual impacts, etc. What measures were taken to firstly avoid negative impacts, but if avoidance is not possible, to minimise, manage and remedy negative impacts?</td><td>Please explain</td></tr>
<tr><td colspan="4">Impacts and risks identified including the nature, significance, consequence, extent, duration and probability as well as in Section13.</td></tr>
<tr><td colspan="3">Positive impacts: e.g. improved access to resources, improved amenity, improved air or water quality, etc. What measures were taken to enhance positive impacts?</td><td>Please explain</td></tr>
<tr><td colspan="4">Impacts and risks identified including the nature, significance, consequence, extent, duration and probability as well as in Section13 .</td></tr>
<tr><td colspan="3">Describe the linkages and dependencies between human wellbeing, livelihoods and ecosystem services applicable to the area in question and how the development's ecological impacts will result in socio-economic impacts (e.g. on livelihoods, loss of heritage site, opportunity costs, etc.)?</td><td>Please explain</td></tr>
<tr><td colspan="4">Please refer to section 13 of the EIA/EMPR report.</td></tr>
<tr><td colspan="3">Based on all of the above, how will this development positively or negatively impact on ecological integrity objectives/targets/considerations of the area?</td><td>Please explain</td></tr>
</table>

[53] Inglesi-Lotz R. and Blignaut J.N. 2011

Please refer to section 13 of the EIA/EMPR report.	
Considering the need to secure ecological integrity and a healthy biophysical environment, describe how the alternatives identified (in terms of all the different elements of the development and all the different impacts being proposed), resulted in the selection of the "best practicable environmental option (BPEO)" in terms of ecological considerations?	Please explain
Please refer to section 8 and Section 13 of the EIA/EMPR report.	
Describe the positive and negative cumulative ecological/biophysical impacts bearing in mind the size, scale, scope and nature of the project in relation to its location and existing and other planned developments in the area?	Please explain
Please refer to section 13 and also see Section 9.10 of the EIA/EMPR report.	

What is the socio-economic context of the area based on, amongst other considerations, the following considerations?	
• The IDP (and its sector plans' vision, objectives, strategies indicators and targets) and any other strategic plans, frameworks of policies applicable to the area,	Please explain
The IDP states that the following vision for Ehlanzeni District Municipality: • Creation of Jobs • Expanding Infrastructure • Transition to a low-carbon economy • Transformation of urban and rural spaces • Education and Training • Provision of quality Health Care • Building a capable State • Fighting corruption, and • Transformation and Unity The limited availability of skills in the district will require that the economy continue to leverage the natural resources endowed while we shift towards a knowledge-based economy. Therefore, agriculture, construction, mining and tourism must be further developed to provide employment opportunities for unskilled labourers. The IDP further states that opportunities exist within mining as follows: • Growing demand on the global market for commodities (platinum, gold, and chrome); • Beneficiation of minerals (e.g. Umjindi Jewellery making); • Platinum Group Metals mining along the eastern limb of the Bushveld Complex; • (Reef extents from Limpopo to Mpumalanga through Thaba Chweu); • Chrome: Ferrochrome for steel production as well as export; • New entrants to mainstream industry for Black Economic Empowerment (Mpumalanga Mining Energy Preferential Procurement Initiative); • Small Scale mining; • Strategic alliances for share acquisition through Broad Based Black Economic Empowerment. For these to be achievable, investment and skills development, technology and infrastructure, as well as broadening of the supplier base, will need to be considered. Due to the increased mechanization of mining activities, there has been an overall jobless growth within this sector. Rand volatility of late has not made things easier. The lack of diversification within the industry has led to a mainly commodity export driven industry. Thaba Chweu Local Municipality IDP (2017-2022). The main economic sectors are forestry, agriculture, mining, business services and tourism. The western half (Lydenburg Town) is dominated by agricultural and farming activities, while forestry is the main economic activity of the eastern half (Sabie and Graskop Towns). As part of the IDP various development objectives were provided such as: • Facilitate and coordinate monitoring and compliance to NEMA from mining community • To facilitate mining exploration and development in the municipality by 2022 TCLM has in the strategy identified LED projects that are in line with NGP job drivers which should create employment opportunities in these sectors. The job drivers should be tailor made for the Local Municipality to accommodate local resources. LED flagship projects: • Enhancement of the Blyde River Cable car and heritage visitor centre Bourke's Luck • Tourism Centre and 120 bed lodge • Pilgrim's Rest Historical Mining Town Rejuvenation • Possible integrated family resort/ relaxation spa at Pilgrim's rest and Sabie Major Adventure Centre	
• Spatial priorities and desired spatial patterns (e.g. need for integrated of segregated communities, need to upgrade informal settlements, need for densification, etc.),	Please explain
The area is still very rural and various plans are currently in place to alleviate backlogs on homes and services. Mining will be one of the main contributors to the economy in the area and assist with lowering the amount of unemployment in the area. With the mining input into the town of Pilgrims rest the basic functions could return. The mining could also be an assistant in driving the rejuvenation of the town.	
• Spatial characteristics (e.g. existing land uses, planned land uses, cultural landscapes, etc.), and	Please explain
The surrounding land uses comprise mostly of Forestry, mining and associated activities with some tourism and community settlements.	

• Municipal Economic Development Strategy ("LED Strategy").	Please explain

As part of the Local Economic Development (LED) strategy the TCLM indicated that mining exploration must be facilitated in support of development in the municipality by 2022.
TCLM will in the next coming years review its LED strategy aimed at revisiting key priority economic sectors and new pillars of economic growth in the medium to long terms. The prioritized sectors of tourism as the main key driver of LED still applies and other key drivers including Agriculture, Forestry, Manufacturing and Mining which is booming in the Lydenburg area. LED is an ongoing process which incorporates various stakeholders, identifying local resources and stimulating economic growth. The aim of the LED process is to create employment, alleviate poverty, redistribute resources and most importantly keep money generating in the Local Municipality.
The economy of TCLM is propelled by three main economic drivers:

- Agriculture and Forestry
- These includes: subtropical fruits, deciduous fruits, crop farming, livestock, game farming and plantation of timber.
- Mining
- There are currently a few mines operating in Lydenburg and more than 30 mines in both Lydenburg and Steelpoort. The mines range from: Glencore, Mototolo, Impala Platinum, Anglo Platinum, Aquarius, Dwarsriver, Everest Platinum, junior miners and quarries.
- Tourism
- The municipal area is home to and has close proximity to some of South Africa's prime natural tourist attractions such as: God's Window, Three Rondavels, Pot Holes, Blyde Canyon, Mac Mac Falls, Graskop, Sabie, Kruger National Park, Echo Caves and many more.

TCLM has in the strategy identified LED projects that are in line with NGP job drivers which should create employment opportunities in these sectors. The job drivers should be tailor made for the Local Municipality to accommodate local resources.

- LED flagship projects
- Enhancement of the Blyde River Cable car and heritage visitor centre
- Bourke's Luck Tourism Centre and 120 bed lodge
- Pilgrim's Rest Historical Mining Town Rejuvenation
- possible integrated family resort/ relaxation spa at Pilgrim's rest and Sabie
- Major Adventure Centre

Considering the socio-economic context, what will the socio-economic impacts be of the development (and its separate elements/aspects), and specifically also on the socio-economic objectives of the area?	Please explain

Please refer to section 13.

• Will the development complement the local socio-economic initiatives (such as local economic development (LED) initiatives), or skills development programs?	**YES**	NO	Please explain

The development could lead to realisation of one of the LED strategies regarding economic growth. It could also assist in the creation of jobs. The mine is also working on various upliftment projects as part of their Social and Labour Plan.

How will this development address the specific physical, psychological, developmental, cultural and social needs and interests of the relevant communities?	Please explain

This project may contribute with establishing some physical infrastructure that is needed in the community. It will create revenue via tax that may be utilised to address developmental needs and creating social infrastructure. It will assist with creating opportunities to develop skills and create a market for those skills. From a psychological perspective it will create hope for a better future by creating economic opportunities, much needed given the high unemployment and lack of opportunity in the area.

Given the long mining history in the area, there are many Pilgrims Rest residents that are up to third generation mining employees and therefore there is a clear understanding and acceptance of mining by the community.

Will the development result in equitable (intra- and inter-generational) impact distribution, in the short- and long-term? Will the impact be socially and economically sustainable in the short- and long-term?	**YES**	NO	Please explain

The natural resource dependency in terms of water and power will increase, however the proposed development will promote economic development and will therefore reduce the dependency upon natural resources like cutting down of forests for wood or for example the need for illegal mining due to lack of other income.

Reuse of water on the mine from dewatering and recycling process water will be undertaken. The amount of water to be abstracted from other sources are therefore greatly reduced by this implementation.
As part of the conditions of mining plan the impact from other industries on the natural resources in the area could be reduced. The removal of AIP's in the area can lead to replenishment of the water used by TGME into the Blyde..

How will the socio-economic impacts resulting from this development impact on people's environmental right in terms following:	
• Negative impacts: e.g. health (e.g. HIV-Aids), safety, social ills, etc. What measures were taken to firstly avoid negative impacts, but if avoidance is not possible, to minimise, manage and remedy negative impacts?	Please explain
To reduce or avoid negative impacts specialist studies have been conducted for the proposed development. The mine has an approved social and labour plan where these aspects are addressed.	
• Positive impacts. What measures were taken to enhance positive impacts?	Please explain

Positive impacts that have been identified include

- Socio/Economic- Increase in Public Revenues
- Rehabilitation and restoration activities
- Positive Impact on Local Income and Employment

The largest contributions in this area are

- Flow of money into the local, regional and national economy through expenditure such as salaries, procurement of goods, taxes and royalties
- Shares to local community members
- Job creation in an area that has nearly double the national average unemployment rate
- Reduction of illegal mining in the area and the associated secondary crime that comes with it. This will be achieved by employing specialist illegal mining prevention teams in the area that will initially remove the illegal miners and thereafter prevent the influx of illegal miners into the area.

Due to the overall decrease in tourism revenue and as a result of the mine no longer being operational, the town's is experiencing a generally poor socio-economic environment.
Mining companies are governed by:

- Social and Labour Plans (SLP's);
- General Corporate Social Responsibilities (CSR).

The company, as part of their Social and Labour Plans (SLP's) and Corporate Social Responsibilities (CSR), TGME has been supporting sponsoring 3 additional teachers and an assistant at the local schools. In addition, the company provides printing facilities at the school, and is also involved in a feeding scheme for junior school children and has also completed some renovation activities at the local primary school. All of these activities have been supported by shareholders, despite the fact that the company is not currently operational or generating operational revenues.
A revenue generating project will allow support for these activities to continue and will also enable TGME to expand its SLP and CSR initiatives, particularly with a view to completing projects that can continue beyond the mine's life. These projects are expected to focus on ultimately supporting the tourism or farming industries.
The general socio-economic landscape is also expected to improve through indirect spending by employees and others associated with the project. Such spending would include increased requirements for overnight accommodation and meals for visitors to the mine.

Considering the linkages and dependencies between human wellbeing, livelihoods and ecosystem services, describe the linkages and dependencies applicable to the area in question and how the development's socio-economic impacts will result in ecological impacts (e.g. over utilisation of natural resources, etc.)?	Please explain

The construction and operational phases stimulates economic activities of directly and indirectly affected businesses which translate into the creation of new employment opportunities and creation of businesses. These results in increased household income and subsequently increased household expenditure, through this, an additional round of value adding is created.
A mitigatory and rehabilitation offering is proposed for the area around the mining operations to allow continued mining in the sensitive and protected environments listed in the above sections. The proposed offering comprises the following:

- Rehabilitating the ecological and hydrological functioning of the upper portions of the Blyde River catchment, and replenishing the licensed extraction volume as provided for under the section 21(a) abstraction license of the NWA (Extraction permit reference 1351N) by inter alia funding the planning and coordination of alien invasive tree species control efforts and fire belt implementation.

- Provide funding to an appropriate non-profit organisation with the expertise and experience to develop and release an effective destructive biological control agent for the worst invasive species in the catchment, being Silver Wattle (Acacia dealbata) (amount to be determined in consultation with the appointed non-profit organisation).
- Control, in addition to the alien invasive tree species occurring around the mining operations, around 265 condensed hectares of alien invasive tree species located within and immediately adjacent to the Farms Driekop 546 KT, Graskop 564 KT (portion 25) and Desire 563 KT (known as the Graskop Grasslands unique community and managed by Mpumalanga Tourism and Parks Agency as part of the Blyde protected area), and Ponieskrans 543 KT and the immediate surrounding land parcels. This control will also be to a level of no seeding adult specimens present and canopy cover<1% within 7 years from commencement.
- Control, through regular and repeated reconnaissance and control measures, all alien invasive tree species within the riparian Zone of the Blyde River, from the Mine Water offtake point on the Farm Grootfontein 562 KT, down to the boundary of the Provincial Blyde River Nature Reserve at Bourke's Luck Potholes. Where there is doubt as to the boundary of the riparian zone, it can be defined as the land within 100m of the centre line of the Blyde River.
- Implement a fire belt and related control measures program, in conjunction with affected adjacent landowners and the Lowveld Escarpment Fire Protection Association, on the Morgenzon Forest Nature Reserve and the areas.
- Implement erosion and sediment control operations on all areas cleared of alien invasive tree species, rehabilitated roads, and other susceptible areas, with the objective of removing unnatural levels of sediment input into the Blyde River system. This revegetation will strive to create a basal cover of appropriate indigenous species of 15% within 5 years of initial establishment.
- Rehabilitation of diverted streams and drainages due to illegal mining activities.

If granted authorisation, TGME will be legally and financially bound to the mitigation measures included in the conditions of the environmental authorisations and NWA integrated water use licence. Compliance with the conditions of the authorisations will be verified through annual external compliance audits and consequences (including financial) would follow. With the intervention of legal, monitored mining in the area, funds would be made available to eradicate AIPs and secure the Strategic Water Source (SWSA) by facilitating the establishment of native grasslands and forests, ecological connectivity and optimize the hydrological functioning of the Blyde catchment.
If TGME is not allowed to continue operating, the burden of controlling illegal mining, rehabilitating the broader catchment, protecting the Endangered Ecosystem and Class 1 Water Resource, and meeting the Resource Quality Objectives, would all fall on the state (as predominant landowner). Currently, there is little to no evidence of available departmental budgets to pursue these imperatives.

What measures were taken to pursue the selection of the "best practicable environmental option" in terms of socio-economic considerations?	Please explain

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 as part of this EIA.

What measures were taken to pursue environmental justice so that adverse environmental impacts shall not be distributed in such a manner as to unfairly discriminate against any person, particularly vulnerable and disadvantaged persons (who are the beneficiaries and is the development located appropriately)? Considering the need for social equity and justice, do the alternatives identified, allow the "best practicable environmental option" to be selected, or is there a need for other alternatives to be considered?	Please explain

The mine has a social and labour plan that will form part of the requirements to be implemented.

What measures were taken to pursue equitable access to environmental resources, benefits and services to meet basic human needs and ensure human wellbeing, and what special measures were taken to ensure access thereto by categories of persons disadvantaged by unfair discrimination?	Please explain

The mine has a social and labour plan that will form part of the requirements to be implemented.

The applicants corporate and social responsibility activities are well documented including:
sponsoring 3 teachers and an assistant at a local school

- company providing printing facilities at the local schools
- renovation activities at the schools
- partnering in a feeding scheme for junior school children

• various local event sponsorships including annual National Gold Panning Championships A revenue generating project will allow ongoing support for these activities and will also enable TGME to expand its SLP and CSR initiatives, particularly with a view to completing projects that can continue beyond the mine's life. These projects are expected to focus on ultimately supporting the tourism and agricultural industries.	
What measures were taken to ensure that the responsibility for the environmental health and safety consequences of the development has been addressed throughout the development's life cycle?	Please explain
Mitigation measures have been proposed as part of the project. These measures would need to be implemented over all the phases of the mine.	
In terms of location, describe how the placement of the proposed development will:	
• result in the creation of residential and employment opportunities in close proximity to or integrated with each other,	Please explain
There are plans to employ local labour as far as is feasible and thus the place of work will be in close proximity to place of residence. TGME has commit that 70% of the workforce will be from the local community.	
• reduce the need for transport of people and goods,	Please explain
Considering that local employment will most probably be done by the retail segments there will be a reduced need to transport people.	
• result in access to public transport or enable non-motorised and pedestrian transport (e.g. will the development result in densification and the achievement of thresholds in terms public transport),	Please explain
Considering that local employment will most probably be done by the retail segments there will be a reduced need to transport people. TGME will have busses transporting personnel from the plant to the various mining operations.	
• compliment other uses in the area,	Please explain
The extension of the mine is located within the mining belt area where mining has been taking place for more than 146 years. The establishment of the Pilgrims rest town is based on the history of mining and therefore the mining is seen to complement the tourism in the area which is also based on mining and the whole town of Pilgrims Rest was built by mining. The mining sector is the single largest sector in the local economy contributing almost a quarter (24%) to total job opportunities created in the local area and about 45% towards output[54]. Thaba Chweu forms part of the Eastern Platinum Belt with more than 20 smelters and 30 platinum and other mineral resources mines operating in the Lydenburg and the adjacent Limpopo Steelpoort area, producing mainly platinum. The mines range from: Glencore, Mototolo, Impala Platinum, Anglo Platinum, Aquarius, Dwarsrivier, Everest Platinum, junior miners and quarries[55]. While the primary sector (agriculture, forestry and mining) dominates the local economy there is limited downstream beneficiation of these products and most products are exported in a raw form and processed elsewhere56. This situation is reflected in the relatively low contribution of the manufacturing sector in the local economy. While agriculture, forestry and tourism also play some role in the TCLM economy the local municipal economy is currently dominated by the mining sector in terms of output and employment. As was discussed under the economic structure above, the mining sector currently makes a major contribution (between 45% - 50%) towards local economic output. This situation potentially makes the local economy vulnerable to external factors such as fluctuations in commodity prices and changes in mining legislation with associated impact on investors. On the other hand, the more diversified the local economy in terms of economic activity, the more resilient the local economy will be. On a more localised level, the Pilgrim's Rest Economy is mainly reliant on the foreign tourism industry, also leaving the economy vulnerable to external factors. For future resilience the local economy needs to diversify away from the mining and foreign tourism sectors, i.e. sectors that render it more vulnerable to external factors such as foreign tourism numbers and mining commodity prices.	

[54] Ledger, 2015

[55] Thaba Chweu Local Municipality. 2016. Integrated Development Plan (IDP) 2016-2017

[56] Thaba Chweu Local Municipality. 2016. Integrated Development Plan (IDP) 2016-2017

• for urban related development, make use of underutilised land available with the urban edge,	Please explain
The area is located outside of the urban area in an area that has been used for mining since the late 1800s.	
• optimise the use of existing resources and infrastructure,	Please explain
The area is characterised by rich gold mineral deposits, therefore the project will serve to optimise the existing mineral resources. In addition, the applicant intends to make use of infrastructure (plant, power, tailings dam etc.) built in the 1980's by then owners Rand Mines	
• opportunity costs in terms of bulk infrastructure expansions in non-priority areas (e.g. not aligned with the bulk infrastructure planning for the settlement that reflects the spatial reconstruction priorities of the settlement),	Please explain
n/a	
• discourage "urban sprawl" and contribute to compaction/densification,	Please explain
The Mine will require approximately 426 full time equivalent employees once operational. Local labour would be sourced (70%) and will be dependent on skills and other personnel engagement requirements. No project or mine housing is expected to be provided during construction and operational phases. The mine will however once operational be in the position to assist the Municipality with a better suited site for the current Newtown/Schoonplaas. TGME would be able to manage the formal/structured in-migration through their employment and procurement strategies.	
• contribute to the correction of the historically distorted spatial patterns of settlements and to the optimum use of existing infrastructure in excess of current needs,	Please explain
The mine has an approved social and labour plan to deal with the upliftment of historical disadvantages persons.	
• encourage environmentally sustainable land development practices and processes,	Please explain
The impacts evident from the detailed impact assessment (Section 13) of the proposed project are both positive and negative in nature and incorporate all the pillars for sustainable development.	
• take into account special locational factors that might favour the specific location (e.g. the location of a strategic mineral resource, access to the port, access to rail, etc.),	Please explain
The location of the proposed project components is constrained to the location of the existing mineral resource. TGME, through an engineering scoping study and feasibility study, has identified the opportunity to mine gold bearing reefs be redeveloping existing underground mining areas. As such, no property alternatives were considered for the location of the underground mining areas.	
• the investment in the settlement or area in question will generate the highest socio-economic returns (i.e. an area with high economic potential),	Please explain.
The mine has an approved social and labour plan	
• impact on the sense of history, sense of place and heritage of the area and the socio-cultural and cultural-historic characteristics and sensitivities of the area, and	Please explain.
Refer to Section 9.13	
• in terms of the nature, scale and location of the development promote or act as a catalyst to create a more integrated settlement?	Please explain
The construction and operation could stimulate economic activities of directly and indirectly affected businesses, which subsequently leads to the creation of new business businesses.	
How were a risk-averse and cautious approach applied in terms of socio-economic impacts?	Please explain
Refer to point a), b) and c) below.	
• Based on the limits of knowledge and the level of risk, how and to what extent was a risk-averse and cautious approach applied to the development?	Please explain
Please refer to the Social impact assessment for details on the approach taken.	
• What are the limits of current knowledge (note: the gaps, uncertainties and assumptions must be clearly stated)?	Please explain
The assumptions and limitations are provided for in Section 21	
• What is the level of risk (note: related to inequality, social fabric, livelihoods, vulnerable communities, critical resources, economic vulnerability and sustainability) associated with the limits of current knowledge?	Please explain
The level of possible changes depends on the extent of deviation of the actual project's expenditure during both construction and operational phases from the estimated figures used in the modelling exercise.	
What measures were taken to:	

• Ensure the participation of all interested and affected parties?	Please explain
Kongiwe as the stakeholder engagement specialist on the project compiled the following methodology to be followed for the PPP. To ensure a proper representation of all stakeholders, the following identification methods are used as part of the stakeholder identification and analysis process: • WinDeed searches for the directly affected and adjacent farms; • Desktop and online research; • Developing a list of relevant community authorities; • Identifying the relevant ward councilors for the affected wards; • Consulting landowners and land occupiers; • Land claimants (if any); • Consulting government departments relevant to the project; • Stakeholders who respond to the publication of newspaper advertisements; • Stakeholders who respond to the distribution of project documentation; and • Updating the stakeholder database from attendance registers from meetings. All stakeholders are provided with sufficient and accurate project information. Project information will be made accessible as follows: • Presented in a language and style that stakeholders can understand, with simple explanations of complex concepts; Non technical summaries in various languages have been provided; Various meetings held in various languages. • Presented both in writing (letters, information sheets, non-technical summaries of the environmental reports, poster displays) and verbally (telephonic discussions, on-line engagements). • Easily obtainable, i.e. discussion documents will be mailed or emailed to individuals, and available on Kongiwe's website and on OMI's website. • The project team envisages that a number of methods to publish communication materials, including distribution of hard copy documents (Background information documents, notification letters, fact sheets). Refer to Annexure E for more information.	
• Provide all people with an opportunity to develop the understanding, skills and capacity necessary for achieving equitable and effective participation?	Please explain
Please refer to previous response. Refer to Annexure E for more information	
• Ensure participation by vulnerable and disadvantaged persons?	Please explain
Please refer to previous response Refer to Annexure E for more information	
• Promote community wellbeing and empowerment through environmental education, the raising of environmental awareness, the sharing of knowledge and experience and other appropriate means?	Please explain
Please refer to previous response Refer to Annexure E for more information. TGME also has a community forum in place and a stakeholder engagement plan	
• Ensure openness and transparency, and access to information in terms of the process?	Please explain
Please refer to previous response Refer to Annexure E for more information. TGME also has a community forum in place and a stakeholder engagement plan	
• Ensure that the interests, needs and values of all interested and affected parties were taken into account, and that adequate recognition were given to all forms of knowledge, including traditional and ordinary knowledge?	Please explain
Please refer to previous response. TGME and the various specialist have met and interviewed various people from the community. Refer to Annexure E for more information. TGME also has a community forum in place and a stakeholder engagement plan	
• Ensure that the vital role of women and youth in environmental management and development were recognised and their full participation therein were be promoted?	Please explain
Please refer to previous response	

Refer to Annexure E for more information. TGME also has a community forum in place and a stakeholder engagement plan	
Considering the interests, needs and values of all the interested and affected parties, describe how the development will allow for opportunities for all the segments of the community (e.g.. a mixture of low-, middle-, and high-income housing opportunities) that is consistent with the priority needs of the local area (or that is proportional to the needs of an area)?	Please explain
Please refer to mitigation measures as presented under the social in Section 13.	
What measures have been taken to ensure that current and/or future workers will be informed of work that potentially might be harmful to human health or the environment or of dangers associated with the work, and what measures have been taken to ensure that the right of workers to refuse such work will be respected and protected?	Please explain
Environmental and safety awareness plans and training takes part as part of the mining operations.	
Describe how the development will impact on job creation in terms of, amongst other aspects:	
• The number of temporary versus permanent jobs that will be created	Please explain
The operational phase related to the mining application is expected to last between 7 and 8 years. It is assumed that 426 direct employment opportunities	
• Whether the labour available in the area will be able to take up the job opportunities (i.e. do the required skills match the skills available in the area)	Please explain
Some of the people living in the local area have previously worked at TGME and these skills will be required again. Training and skills development will further form part of the SLP and CSR of TGME.	
• The distance from where labourers will have to travel	Please explain
70% of the workforce will be from the local community. The travel from the surrounding communities to the plant is 3km.	
• The location of jobs opportunities versus the location of impacts (i.e. equitable distribution of costs and benefits)	Please explain
70% of the workforce will be from the local community. According to the specialist studies no fatal flaws regarding impacts have been identified should the mitigation measures as presented be implemented.	
• The opportunity costs in terms of job creation (e.g. a mine might create 100 jobs, but impact on 1000 agricultural jobs, etc.)	Please explain
The operational phase related to the mining application is expected to last between 7 and 8 years. It is assumed that 426 direct employment opportunities. Future projects if realised could lead to over 1500 jobs being created in the larger area. It has been identified that should the impact on the Blyde river continue (by illegal miners) or there will be an impact on the river large amounts of downstream users will be negatively influenced.	
What measures were taken to ensure: • That there were intergovernmental coordination and harmonisation of policies, legislation and actions relating to the environment?	Please explain
Meetings and site visit was held with various government departments to ensure that all relevant government departments all understand the project as well as the conditions for continued mining. Please refer to Annexure E and Annexure V for the meetings held.	
• That actual or potential conflicts of interest between organs of state were resolved through conflict resolution procedures?	Please explain
N/A	
What measures were taken to ensure that the environment will be held in public trust for the people, that the beneficial use of environmental resources will serve the public interest, and that the environment will be protected as the people's common heritage?	Please explain
Are the mitigation measures proposed realistic and what long-term environmental legacy and managed burden will be left?	Please explain
Please refer to Section 13 for management measures that have been proposed and are based on realistic achievable goals.	
What measures were taken to ensure that he costs of remedying pollution, environmental degradation and consequent adverse health effects and of preventing, controlling or minimising further pollution, environmental damage or adverse health effects will be paid for by those responsible for harming the environment?	Please explain

As part of the project financial provision has been determined to allow for closure of the mine and remediation after the development has ceased. On top of this there is the investment of the continued mining plan which relates to approximately R58 million to be spend on rehabilitation of the catchment and surrounding areas.	
Considering the need to secure ecological integrity and a healthy bio-physical environment, describe how the alternatives identified (in terms of all the different elements of the development and all the different impacts being proposed), resulted in the selection of the best practicable environmental option in terms of socio-economic considerations?	Please explain
Please refer to the alternatives that have been discussed in Section 7 and mitigation hierarchy discussion in Section 13.	
Describe the positive and negative cumulative socio-economic impacts bearing in mind the size, scale, scope and nature of the project in relation to its location and other planned developments in the area?	Please explain
Please refer to section 13 for the cumulative impacts identified as well as mitigation proposed	

7 ALTERNATIVES ASSESSMENT

7.1 PROCESS TO ASSESS ALTERNATIVES

The DFFE[57] guidelines for an Integrated Environmental Management (IEM) procedure require that an environmental investigation considers feasible alternatives for any proposed development. Furthermore, the EIA Regulations, 2014 (as amended) require that a number of alternatives for accomplishing the same objectives shall be considered.

Each alternative is to be accompanied by a description and comparative assessment of the advantages and disadvantages that such development and activities will pose to the environment and socio-economy. Therefore, the EIA Regulations, 2014 (as amended) require that a number of possible proposals or alternatives for accomplishing the same objectives should be considered.

Various alternatives were assessed for the project at scoping level and again in the EIA phase. These were workshopped during specialist, applicant, and engineering team interactions. The alternatives were also influenced by the existing baseline environmental data and specialist inputs, and by discussions with authorities and with I&APs.

Alternatives relevant to this development can be categorized into the following:

- Site location alternatives;
- Activity alternatives;
- Layout alternatives;
    - Frankfort layout;
    - Reduced Footprints:
        - Frankfort Layout;
        - Dukes Layout; and
        - Beta layout;
- Technology alternatives;
    - Electrical supply;
- Mining method; and
- The “no-go” alternative.

[57] At the time of publication, the Department of Environmental Affairs and Tourism (DEAT).

Sustainable development is a resolution introduced by the World Commission on Environment and Development known as the Brundtland Commission in 1987 after the evidence showed that the economic growth that was taking place was degrading ecological systems and had failed to provide the benefits it was promising. People were starting to raise concerns in this regard since as early as 1960 (Gibson, 2015).

The most well-known definition of sustainable development is: "development which meets the needs of the present without compromising the ability of future generations to meet their own needs".

This is based on a model of balance between three concepts. These three pillars as they are also known are social, economic and environmental targets. The balance or midpoint between all is sustainability. This balance means that no one can take precedence above the other. With this in mind, we need to assure that the redevelopment, must not be to the detriment of the environment or the social needs of the people. Economic gain cannot on its own be the driving force for development.

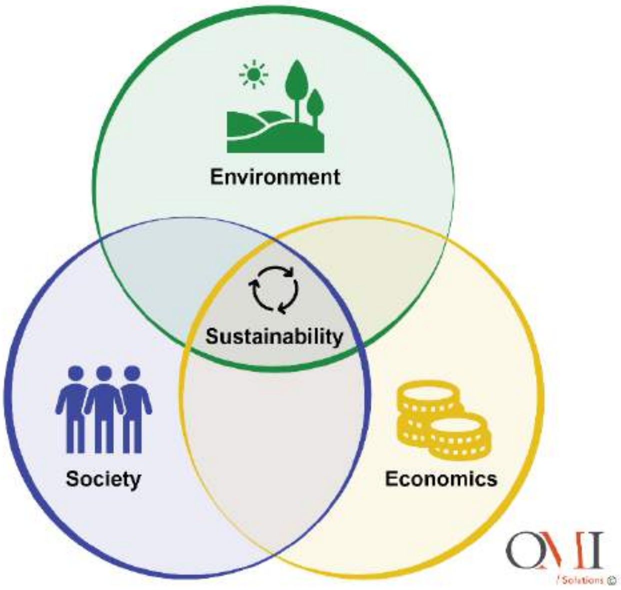


Figure 23: Sustainability illustration

Mining is an extractive industry and, by its very nature, can have significant direct and secondary environmental and social impacts. The negative legacy of past practices has created a deep level of mistrust of the industry in conservation circles and raised questions about the industry's role in society's transition to sustainable development.

It is well known that minerals are essential to modern life and important to the economic and social development of many countries. Assured supplies will be required to meet the needs of the world's growing population and to help fulfill expectations of improvement in quality of life, notably in developing countries. If properly integrated into regional development and biodiversity conservation strategies, mineral-related investment can help alleviate pressures from poverty in biodiversity-rich areas as well as foster sustainable improvements in the health, education and standard of living of national, local and indigenous communities.

Today, both onsite and offsite opportunities are being pursued by leading companies to enhance their contributions to biodiversity conservation. These include assessments and conservation of unique flora and fauna, research and development, support for protected area site management programmes and proactive community development programmes to provide sustainable economic and social benefits even after mine closure. A number of companies have also established partnerships with conservation groups, and these are beginning to deliver real on-the-ground conservation outcomes. With this said TGME aims to develop as part of a continued mining compensation plan (referred to in Section 9.10.2.1) exactly this approach to allow continued mining.

It should be noted that TGME's core business is mining and therefore will engage an implementer to assist with some of the actions to be undertaken. There will be a forum created comprising various authorities and conservation entities to keep TGME accountable for the actions as well as the cash inputs to reach the objectives of the continued mining commitments.

7.2 SITE LOCATION ALTERNATIVES

The sites are all previous underground mining areas, approved as part of the 2013 approved EMPr. As the cut-off grade required by modern processing technology is much lower than what was historically viable, the re-development and mining of these areas is now economically viable and can be done with minimal additional impact.

To mitigate the risk of loss of CBAs, sensitive floral communities, threatened ecosystems and floral SCCs a biodiversity verification and pre-feasibility assessment was conducted in May 2021 to identify environmental buffer zones. These assessments then informed the engineering designs to ensure that the surface infrastructure layout is limited to previously disturbed areas where possible. No other sites were therefore evaluated.

7.3 ACTIVITY ALTERNATIVE

In response to requests from DWS officials, activity alternatives should be investigated for the project. It should be mentioned that the development is in fact a redevelopment project. This means that mining has previously taken place in the proposed project areas and that the infrastructure will be placed on areas that were previously disturbed by infrastructure used to support mining. The Pilgrims Rest town was developed due to mining taking place.

Mining in the area commenced in the late 19th century and continued into the mid-20th century and intermittently thereafter, with operations finally ceasing in 1971 at Beta Mine. In the late 1880's, a complex of small mining operations developed in the Central Area (around CDM).

More recently, intermittent mining occurred at locations such as CDM and Frankfort Mines from the 1990's to 2008. Simmer and Jack operated as the owner of TGME until a share sale to Theta Gold Mines Limited (previously Stonewall Resources) in 2010. TGME started mining again in 2010 until Operations were placed under care and maintenance due to a prolonged illegal strike in May 2015. Mining is therefore not a new concept within this area to be redeveloped.

7.3.1 PROPOSED MINING VS SMALLER SCALE MINING

The mining plan has been reduced and minimised to be the smallest economically viable option. As this would be an important factor the alternative of smaller scale mining would not be viable and this will then activate the no-go alternative.

The feasibility analysis conducted by Minxcon (2021) calculated that the Project has an all-in sustaining cost of USD905/oz with an all-in cost of the Project being USD1,089/oz. It is therefore evident with the gold price over the past 5 years averaging USD1570/oz. Therefore, should this project reduce in volumes it will easily become unfeasible.

7.3.2 MINING AND TOURISM COMBINATION

According to the Socio-Economic Impact Assessment (SEIA), the economy of Pilgrim's Rest – both the historic town and Newtown/Schoonplaas - is dominated by tourism-related activities, including accommodation, restaurants/taverns and arts and craft shops. The Gross Value Added (GVA) of the local economy is thought to be in the region of R20 million (2019 prices), employing an estimated 250 people - including employment of unskilled and semi-skilled staff at formal businesses, managers/entrepreneurs, hawkers and informal traders. Currently, the Pilgrim's Rest economy is very small relative to the Thaba Chweu Local Municipality (TCLM) economy, contributing less than 1% towards municipal output and employment.

Local business sources agree that the economy of Pilgrim's Rest experienced a sharp decline since its peak in the early 1990's. The factors that are mentioned as the main reasons behind the decline in the local economy include the general decline in tourism to Mpumalanga Province due to the deteriorating road infrastructure and concerns around general safety, especially related to the sharp increase in civil protest actions in the region.

In the case of Pilgrim's rest tourism industry, deteriorating safety and hygiene conditions result from factors such as illegal mining activities, increased vagrancies due to poverty and unemployment, and a lack of public facilities and municipal functions such as street cleaning (de Villiers, 2016). According to local business sources, in addition to the challenges above, the public tender process to fill the public-owned business premises in town created challenges in terms of unsustainable business enterprises and the non-payment of rentals. In 2014, the Public Protector released a report related to the negative impacts related to alleged irregular tender processes in Pilgrim's Rest (The Public Protector, 2014).

TGME is working with Department of Public Works Roads and Transport Mpumalanga to uplift the town so that tourism can grow and the sector can regain what has been lost in the town. It has been suggested recently that tourism and mining could be combined in and around the town. However, the mining rights area is managed under the Mine Health and Safety Act, 1996 (Act 29 of 1996) which has stringent requirements for access to active mining areas. Combining tourism on and around mining activities can be challenging, as has been seen at various other mining sites, where it was found that such combinations have limited sustainability when there is a large overlap. It is therefore advisable to, as historically done in Pilgrims Rest, keep the two activities to separate areas as far as possible.

What could be done to improve integration, would be to extend the museum displays to include more modern mining activities and methods, and offer guided tours to areas where mining activities can be observed from a safe distance. The tourist panning site just outside Pilgrim's Rest could also be expanded to include interactive displays of current activities – akin to the journey from then to now.

7.4 LAYOUT ALTERNATIVES

7.4.1 FRANKFORT LAYOUT

Frankfort shaft area initially included two additional sections, namely Frankfort Central and Frankfort South 2. These areas were mainly required for additional stormwater management; however, due to the confinement of dirty areas to Frankfort North and Frankfort South 1, these options are no longer required. The proposed additional areas that have been cancelled are shown in **Figure 24** below.

Figure 24: Frankfort Alternative Layout Assessment Drawing (Eco Elementum, 2021)

The engineers refined the layouts for the EIA phase, to allow for final construction designs. Aspects that have been taken into account include dolomite stability, heritage and palaeontological findings, and the summer terrestrial and aquatic surveys.

7.4.2 REDUCTION OF FOOTPRINTS FROM SCOPING TO EIA LAYOUTS

As per the concerns from SAFCOL raised regarding the clearance of vegetation in the scoping the following additional reductions to layouts have been made drafted based on their concerns around vegetation clearance as presented in the scoping report conceptual designs. The EIA designs have led to a reduction in vegetation clearance, without compromising on the legislated requirements for safe and sufficient operational infrastructure for the underground mining at each shaft.

The approach was to reduce/limit any type of vegetation clearance. Below are the two layouts overlain scoping and EIA where the reductions can be seen. In summary the following has been provided by the Environmental and Engineering team around the rationale for the most current designs (as attached)- clear maps with sensitivity overlays will be presented after the summer fieldwork:

7.4.2.1 FRANKFORT DESIGN PHILOSOPHY

At Frankfort limited disturbance/clearance will be required as part of an effective stormwater run-off due to steep slopes from the adit to the pollution control facility located to the south of the adit. These areas have already been greatly reduced – refer to the layout alternatives as presented above in Section 7.4.1.

The DMS Plant and supporting infrastructure (platform area) for underground have been placed in the most disturbed and less sensitive area available to accommodate the infrastructure required. The workshop and portable toilet area initially was proposed on the North-eastern side of the platform area; however, this would have been located in close proximity to the floodline/drainage and placed within the sensitive areas identified by the biodiversity study. To comply with the requirements of GN704 it was decided to move the workshop and portable toilet facility to the northwestern side which would lead to minimal vegetation clearance. This will also reduce the risk of any possible spills entering the drainage area.

7.4.2.2 DUKES DESIGN PHILOSOPHY

Vegetation clearance will take place on patches where vegetation, of which mostly consists of alien invasive vegetation, has been established and plant growth have re-established within the previously disturbed area. These areas are required for effective water management in terms of GN704 as well as sufficient capacity for waste residue deposits (Waste rock dumps). The area has been designed in the least sensitive areas as identified by the ecologist through biodiversity surveys. Optimisations from the scoping include infrastructure being placed more condensed that previously presented as well as moving slightly into a more disturbed section. These small changes are optimised as far as reasonably possible.

7.4.2.3 BETA DESIGN PHILOSOPHY

The Beta layout presented in the scoping report had an extension area to the northwest stretching to the valley that included clean and dirty water separation. The area has however been optimised to follow the more detailed contouring done to comply with GN704 and therefore the clean and dirty water separation berms and channels have been moved from the scoping layout to the EIA layout.

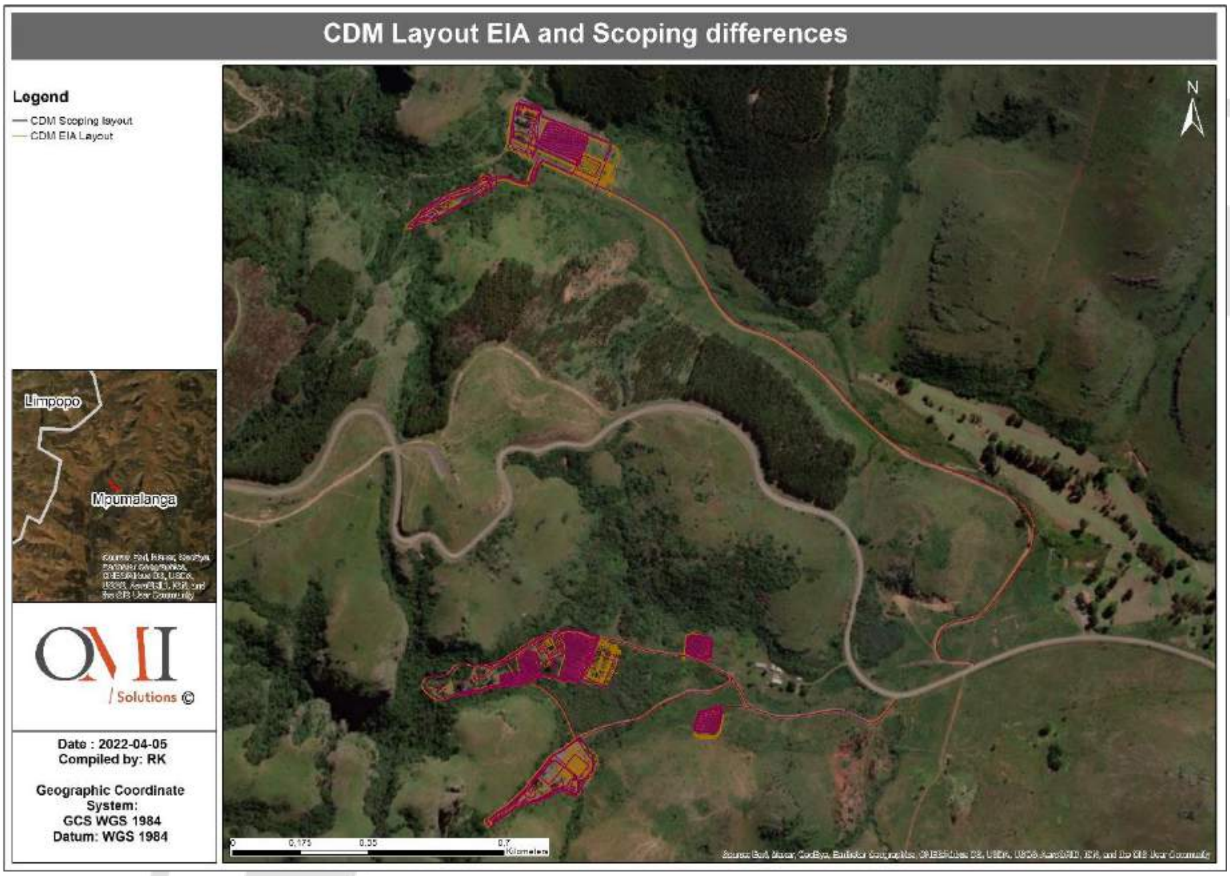


Figure 25: CDM Alternative Layout Assessment overlay

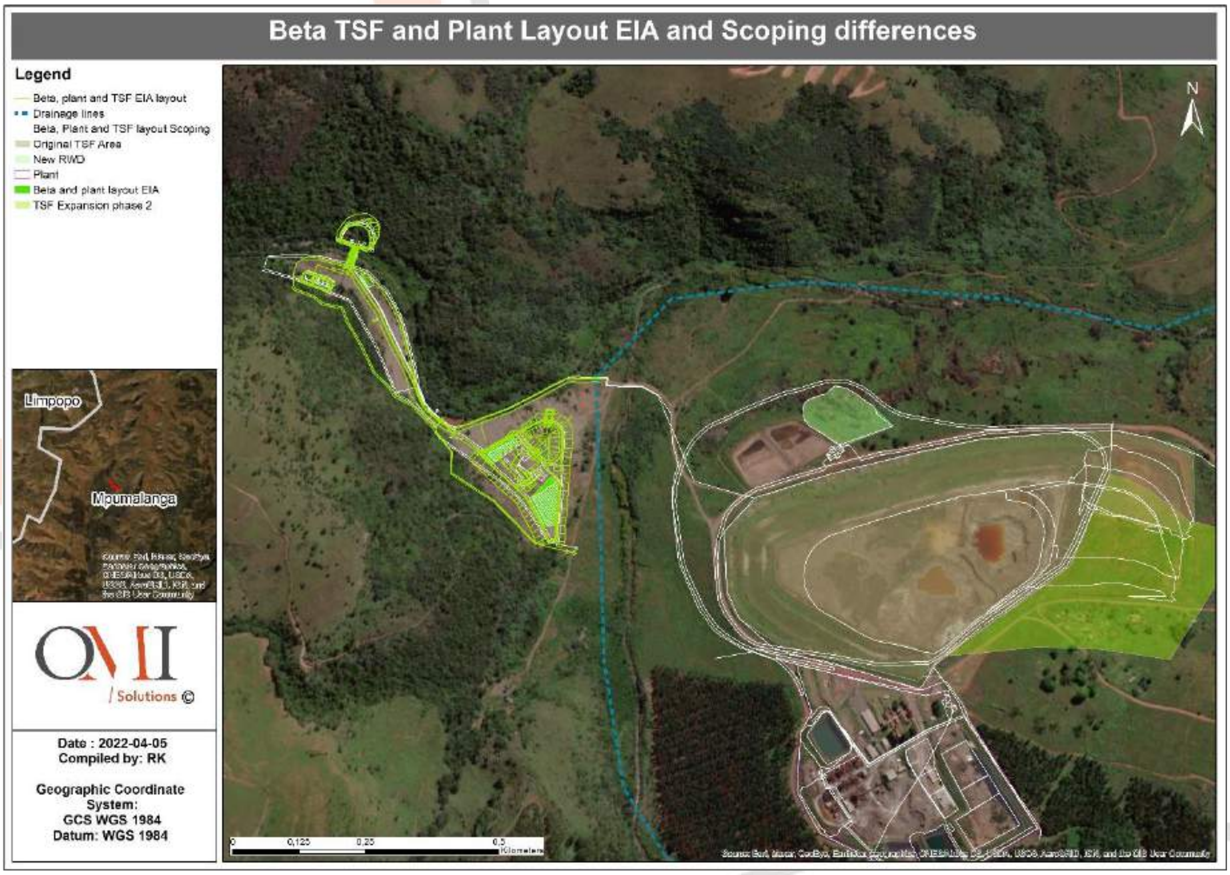


Figure 26: Beta, Plant and TSF Alternative Layout Assessment overlay

7.5 TECHNOLOGY ALTERNATIVES

7.5.1 ELECTRICITY SUPPLY OPTIONS TO FRANKFORT SHAFT

Various options for electricity have been weighed up during the planning and discussed with Eskom. However, due to the location of the shafts, it was decided that diesel-powered generators will initially be used instead of powerlines to various shaft areas. This will, however, change in the future if electricity lines and supply capacity become available to the area.

7.5.2 RENEWABLE ENERGY IN THE FORM OF SOLAR VS ESKOM ELECTRICITY AND/OR DIESEL GENERATORS.

The option of using renewable energy was investigated as part of the pre-feasibility studies. The following disadvantages however rendered the option unfeasible:

- Large areas will be required for sufficient generation capacity for each shaft and the plant area: this would lead to additional footprints in a critical biodiversity area to be disturbed. At the plant, Eskom's electricity and generators are already readily available.
- The area is known for fog and rain, which means fewer days of sun for optimal solar generation capacity
- Theft: Several of the shaft areas are remote and, without proper security, there is a substantial risk of theft of the solar panels. This might result in periods of little or no electricity supply to the site, which could result in production downtime.

From an environmental perspective, the benefit of using renewable energy would be a reduced carbon footprint for the project. However, due to the sensitive nature of the biodiversity around the site areas, it was decided to keep the footprint areas to a minimum (i.e. within previously disturbed areas), which would not provide the space required for a large enough solar panel farm to satisfy the operation's electricity requirements.

7.6 MINING METHOD ALTERNATIVES

Alternative mining methods were evaluated, including conventional, mechanised and hybrid methods. The shape and extent of the orebody is a key determinator in the choice of mining method.

In this case, open-pit mining was eliminated as an option, as the ore body stretches into the mountains. One area where opencast mining would work due to the proximity of the reef to the side of the hill was eliminated from the scope due to the potential environmental impact this would have.

Mechanised mining involves using diesel-powered drill-rigs for drilling and Laud-Haul Dumpers (LHDs) for lashing the broken rock. The LHDs then dump the broken rock into a ore pass which leads to a conveyor belt. Whilst fully mechanised mining could be employed on a vein-type deposit, the dip must be below 12 degrees for the equipment to function properly.

Stoping is practiced in underground mining when the surrounding rock is strong enough to permit the drilling, blasting, and removal of ore without caving. Additional support may be required to prevent the hanging wall and/or side walls from collapsing.

Resue mining is a method of stoping employed on narrow veins, which yields cleaner ore than when waste rock and ore are broken together. The ore is broken down first and then the waste or vice versa. The broken waste is left in the stope as back-fill, and the ore is broken down on flooring laid on the fill to prevent ore and waste mixing. Resuing is applicable where the ore will easily separate from the host rock, and is most effective when the hardness of the ore and of the host rocks differ considerably.

Long hole drilling involves, in simple terms, drilling deeper holes into the reef using a mechanised drilling machine. This is also known as production drilling, and the typical hole depth varies from 10 meters to 40 meters in extreme cases. The holes are charged with explosives and blasted as required. The drills use flushing - mainly with water - to get rid of the cuttings and other particles that accumulate in the hole during drilling.

TGME's underground mines will all be mining narrow reef orebodies. The mining method selected is mechanised longhole drilling, which requires pre-development of a mining block in preparation for stoping operations. Resue mining will be applied to the development ends allowing separate extraction of the reef and waste cuts.

The feasibility study identified the following advantages to this method:

- Maximum grade with reduced dilution can be achieved;
- Less waste will be produced which in turn also leads to smaller WRD footprints;
- This modern mining method can lead to optimised productivity.

This method, therefore, is preferred from both an environmental and an economic perspective.

7.7 "NO-GO" ALTERNATIVE

7.7.1 OVERVIEW

The assessment of the "no-go" alternative is a legal requirement according to NEMA and the EIA Regulations. In this scenario no development would take place, the original mining areas will be rehabilitated as per the commitments in the 2013 approved EMPr and the no further development will take place. The approved financial provision for the rehabilitation is R16,417,743.34, which would be deployed to rehabilitate the TGME mines workings as per the commitments in the 2013 approved EMPr. The environment would then be left as is (see below) and the applicant's impact on the area and the broader community potential benefits would remain unchanged.

The assessment of this option requires a comparison between the options of proceeding with the proposed project with that of not proceeding with the proposed project. Proceeding with the proposed project attracts potential economic and social benefits and potential (although likely manageable) negative environmental impacts.

Not proceeding with the proposed project leaves the status quo of a deteriorating environment:

- no additional social investment or job opportunities;
- expanding alien invasive plant infestations;
- increased wildfire frequency and intensity;
- unregulated grazing and resulting erosion;
- increased loss of riparian and river ecosystem integrity; and
- increasing siltation of the Blyde River.

The No-go alternative would also preclude any of the possible positive impacts of the project from being realised.

Not proceeding with the project is, moreover, expected to create further negative sentiment against investment in the area and particularly into mining investment opportunities in South Africa.

It will also allow the illegal mining[58] trade in the area to continue growing, as one of the only ways to keep the illegal mining at bay is by active formal mining in the old adits. The impacts of illegal mining on the Blyde River system would continue accumulating and potentially impact on the ecology of the whole catchment. This also includes the impact on farmers and other Blyde River water users downstream who rely on the water for citrus production for the export market. The water quality would have to be of sufficient standard to allow these exports. The current illegal mining activities could greatly negatively influence this.

Another negative effect of the project not proceeding would be the continued proliferation of Alien Invasive Plant species (AIPs) in the area. If AIPs are left uncontrolled, the problem is expected to double within the next 15 years (as observed from analysis of aerial and satellite imagery since 1937). The current state of AIPs within the area poses a very high risk to the local biodiversity and surrounding plantations and infrastructure. The most at-risk areas include the riparian zone of the Blyde River and the immediate surrounding Malmani Karstlands – a listed Endangered Ecosystem. AIPs consume a significant amount of water; reduce the ability to farm; intensify flooding and fires; cause erosion; cause destruction of rivers and may cause a local extinction of indigenous plants (including in indigenous forests) and animals.

The Blyde River tributary is key to ensuring the attainment of Resource Quality Objectives (RQOs) and maintaining the Ecological Reserve in the entire Lower Olifants River during most dry seasons and certainly during droughts. Any deterioration of the catchment or water quality, or reduction in dry season runoff (due to AIPs spread) may jeopardise the constitutional imperative to have the environment protected and provide for the reserve, provide sufficient water for downstream users (particular in

[58] Illegal miners (also known as Zama Zama's) refer to the unauthorised mining activities taking place, by mostly foreign nationals, on the surface and underground areas in Pilgrims Rest. These are not the activities referred to in the Artisanal and Small-Scale Mining Policy, 2022 that was published for implementation on 30 March 2022.

Hoedspruit and Phalaborwa), as well as the country's obligations to the Kruger National Park and Mozambique.

If granted authorisation, TGME will be legally and financially bound to the mitigation measures included in the conditions of the environmental authorisations and NWA integrated water use licence. Compliance with the conditions of the authorisations will be verified through annual external compliance audits and consequences (including financial) would follow. With the intervention of legal, monitored mining in the area, funds would be made available to eradicate AIPs and secure the Strategic Water Source (SWSA) by facilitating the establishment of native grasslands and forests, ecological connectivity and optimize the hydrological functioning of the Blyde catchment.

If TGME is not allowed to continue operating, the burden of controlling illegal mining, rehabilitating the broader catchment, protecting the Endangered Ecosystem and Class 1 Water Resource, and meeting the Resource Quality Objectives, would all fall on the state (as predominant landowner). Currently, there is little to no evidence of available departmental budgets to pursue these imperatives.

The no-go alternative was also further investigated in the EIA Phase through the specialist input fields.

7.7.2 SPECIALIST EVALUATION OF NO-GO ALTERNATIVE

The following section presents the outcome and discussion of anticipated impacts on the freshwater and aquatic ecology, based on several scenarios surrounding the No-go alternative vs if the proposed project (Redevelopment project as described in Section 4) is authorised. For the proposed project, four scenarios were identified, and their anticipated impacts on the freshwater and aquatic ecology for the focus area and larger region (where applicable), were assessed below:

- No-go with no management from relevant stakeholders;
- No-go with management from relevant stakeholders;
- Authorised mining in an ideal scenario; and
- Authorised mining practically achievable.

The Blyde River and its tributaries are subject to several ongoing threats and the immediate threat of loss of water quality, habitat and biodiversity if the No-go Alternative is pursued.

These threats include but are not limited to the illegal mining activities observed along the length of the Blyde River at the time of the January 2022 assessment (and noted by Clean Stream in 2021), seepage and impacts on the Electrical Conductivity (EC) of the river due to historical mining activities and historical mining infrastructures, ongoing forestry activities and the proliferation of alien and invasive species, which have resulted in moderate to critical changes to the surface water runoff patterns and flow regimes of the river, cumulative impacts related to increasing urbanisation such as surface hardening and the creation and treatment of sewage. This is not to say that the ongoing land-use activities which currently threaten the Blyde River will be solved should the proposed mining activities be approved, however the investment by the mine into protecting the resource will most likely mean that illegal artisanal mining is, as a minimum significantly reduced.

Both the development of the proposed mine as well as the threat of illegal mining activities have the potential to result in an influx of people to the area, which has the potential to escalate urbanisation and impacts to the surrounding landscape, which in turn, has the potential to further impact the instream integrity of the Blyde River. It is estimated that there are already around 3000 illegal miners (mostly foreign nationals) resident in the areas around Pilgrims Rest, and this number is increasing.

The possible presence of several critically endangered and near threatened species inclusive of the Treur River Barb (*Enteromius cf treurensis*) (CR) and the Marico Barb (*Enteromius motebensis*) (NT), as well as several other fish species requiring clear, fast flowing and well oxygenated rivers with good cobble and stones habitat for their survival are of critical concern. The Treur River Barb is not a migratory fish and is isolated to a single population in the upper reaches of the Blyde River and its tributary the Treur River. However, with the No-go Alternative, the existing threats to biodiversity remain. The alien Rainbow Trout (*Oncorhynchus mykiss*) was sampled along the length of this section of the Blyde River (Clean Stream, 2021) and preys on the Treur River Barb, posing a threat to the natural populations present. To prevent negative impacts on the freshwater and aquatic resources, there would need to be agreement from all relevant government agencies to manage the current risks posed by illegal mining and the proliferation of alien and invasive species. For example, controlling illegal mining activities will assist in the prevention of altered habitat and the associated sedimentation of the river and would allow for recovery of water clarity and quality of the Blyde River as well as ensuring the long-term health of both instream and riparian habitat within the focus area and downstream.

Pursuing the no-go alternative will most likely result in a further influx of uncontrolled illegal artisanal miners to the area (i.e. no management from the government) and the relatively small-scale activities observed along the Blyde River, which included washing of fines and a partial river diversion, would likely increase exponentially as has already occurred over the past two years. Should the 83MR project not be approved, the necessary funding and resources required to control illegal miners will not be available, resulting in the ongoing pollution and sedimentation of the Blyde River and tributaries. Immediate impacts will include habitat being directly destroyed or fragmented by modifying riverbanks, channelizing and diverting flows, creating ponds, and through increased erosion, turbidity and sediment composition. Water quality is also impacted through contaminants contained in the soil becoming bioavailable in the system. In addition, the use of mercury to abstract the gold from the processed ore has the potential to critically impact on water quality and the associated support of the sensitive biota in the rivers. The anticipated long-term impacts include the ongoing degradation and die-back of riparian habitat, severe sedimentation and loss of habitat of the downstream aquatic resources and loss of water clarity and quality, with significant further impacts on downstream instream and riparian habitat also anticipated.

The current state of AIP's within the proposed project area and beyond already poses an unacceptable risk to the local biodiversity. Of increased concern is the presence of wattle and gum species along with the freshwater ecosystems. For example, wattle spreads quickly and invades stream banks where it clogs rivers and causes soil erosion. Without adequate resources, managing the existing, vast population of the alien and invasive species associated with the proposed project area will not yield positive results.

The proposed project, if authorised, has the likelihood of resulting in the potential to compromise the water quality of the Blyde River and impact downstream users of this important resource. The creation of dirty water and the release of treated mine effluent and other pollutants to the freshwater ecosystems can result in the following:

- Gradual deterioration of the overall EcoStatus Category of the Blyde River and poses the risk that the river may no longer comply with the RQIS PES (DWS, 2014) classification of Category C conditions for this section of the Blyde River over time;
- Impact on the water quality and the integrity of the aquatic assemblage of this Class I, sensitive system; and
- That the Blyde River is thus unlikely to be managed appropriately as a Class 1 water resource, as set out in "Classes and Resource Quality Objectives of Water Resources for the Olifants Catchment." (DWS, 2018).

The greatest future threat to the freshwater ecosystems of this region is the ongoing, unmanaged and uncontrolled illegal artisanal mining activities. The greatest current threats are associated with the surrounding land uses such as forestry, the ongoing spread of alien and invasive species, increasing urbanisation and the influx of people to the area without appropriate water supply and treatment of waste (thus making use of the river to service their basic domestic needs such as washing and sanitation). The financial requirements to control and manage the existing, vast population of AIP's in the area, supply of municipal services to the surrounding communities, and the policing and management of illegal artisanal miners are undoubtably high and will realistically only be adequately managed should the project be approved and once the mine is in operation.

With authorisation comes the inclusion of mitigation measures that the mine would be obligated to implement, adhere to and be audited on. The strict control of mining activities, along with sound engineering designs, where no mine-related activities result in pollution or sedimentation of the Blyde River and downstream habitat, should be the goal. However, accidental discharge or spills are always a possibility, and this emphasises the necessity for strict adherence to cogent, well-conceived and ecologically sensitive mitigation measures along with readily available emergency action plans (discharge, fires, spillages etc.). Even isolated failures and incidents to comply with and manage the appropriate mitigation measures have the potential to destroy isolated fish populations. Once in operation, and as resources become available, the mine will be able to implement the necessary security measures to control illegal mining activities as well as eradicate the alien invasive proliferation. This will have an immediate positive impact on the water quality of the Blyde with the subsequent long-term improvement of the riparian habitat.

Large mining operations can have greater potential for impact than small-scale mining, but they also have a greater capacity to minimise damage whereas illegal mining practices do not take responsibility for environmental damage. It is a well-known fact that illegal mining does not have the means or financial guarantees to be able to rehabilitate after the widespread impacts caused by these mining practices. In contrary to this legally mining have the necessary means and guarantees that are kept in place to be able to rehabilitate post-closure impacts. TGME currently holds a guarantee aligned with the previously approved impacts as per the 2013 approved EMPr and this will be added on with regards to the proposed project, if approved, whereas the liability that comes from the illegal mining cannot fall on TGME to bare as they are not responsible for these actions taking place. This will also mean that should TGME not be allowed to operate, the illegal mining will further expand and lead to further degradation and rehabilitation required, laying the burden on the government as landowner of the property and therefore the taxpayer.

8 DETAILS OF THE PUBLIC PARTICIPATION PROCESS FOLLOWED

This section describes the Public Participation Process (PPP) to be undertaken in line with Chapter 6 of the EIA Regulations, 2014 (as amended). The process is undertaken to ensure compliance with the requirements in terms of the MPRDA, EIA Regulations, 2014 (as amended), as well as the NWA and GN R267 requirements for the IWULA.

The PPP will be undertaken in line with the statutory requirements for public participation. The following legislation will be considered when developing and implementing the PPP:

- Public Participation guideline in terms of NEMA;
- The EIA Regulations, 2014 (as amended);
- The Constitution of the Republic of South Africa, 1996;
- Protection of Personal Information Act, 2013 (Act 4 of 2013);
- Promotion of Access to Information Act, 2000 (Act 2 of 2000); and
- International good-practice guidelines for public participation and the Core Values of the International Association for Public Participation.

The stakeholder engagement is facilitated by Kongiwe Environmental (Pty) Ltd (Kongiwe) an independent contractor.

8.1 APPROACH AND METHODOLOGY

Kongiwe as the stakeholder engagement specialist on the project compiled the following methodology to be followed for the PPP.

To ensure a proper representation of all stakeholders, the following identification methods will be used as part of the stakeholder identification and analysis process:

- WinDeed searches for the directly affected and adjacent farms;
- Desktop and online research;
- Developing a list of relevant community authorities;
- Identifying the relevant ward councilors for the affected wards;
- Consulting landowners and land occupiers;
- Land claimants (if any);
- Consulting government departments relevant to the project;
- Stakeholders who respond to the publication of newspaper advertisements;
- Stakeholders who respond to the distribution of project documentation; and
- Updating the stakeholder database from attendance registers from meetings.

Stakeholders who will be identified for the Proposed Project are grouped into the following broad categories:

- Landowners: Directly or indirectly affected and adjacent;
- Land occupiers: Directly or indirectly affected and adjacent;
- Host communities;
- Government: National, Provincial, District and Local Authorities;
- Parastatals: Various semi-Government entities, Organs of State;
- Agriculture, Forestry, Tourism and Water: Farmers' associations, entities responsible for water management and/or regulation;
- Nature Reserves;
- Environmental Forums;
- Non-Governmental Organisations (NGOs): Environmental organisations, community-based organisations (CBOs); and
- Business and industry: Small, Medium and Micro Enterprises (SMMEs), mines, industrial and large business organisations.

A stakeholder database has been compiled and will be updated throughout the environmental regulatory process.

8.1.1 LANDOWNER ENGAGEMENT/CONSENT

Engagement activities were undertaken with the directly affected landowners and land occupiers (hereafter landowners) for the proposed 83MR Project environmental authorisation application. Comprehensive engagement activities were undertaken with the landowners to provide them with sufficient understanding of the project before submission of the environmental authorisation application. Please refer to the Comments and Response Report (CRR) for more details (Appendix E9 of Annexure E).

The following meetings have been held with landowners to discuss the proposed project and to obtain comments:

- Mpumalanga Department of Public Works, Roads and Transport (DPWRT): on the 1st of October 2021 via virtual meeting. Written landowner consent has been received from DPWRT for the project.
- SAFCOL: on the 1st of October 2021 via virtual meeting. A follow-up presentation on the layouts was done in person on the 23rd of February 2022.
- York Timbers (Pty) Ltd on the 21st of October 2021 in person at the York Timbers Offices in Sabie. Negotiations on the sale of the property are underway.
- Maorabjang Community Property Association (CPA) on 2 October 2021. Landowner consent was signed on the 8th of October 2021.

8.1.2 LAND CLAIMS ENQUIRY

A formal Letter of enquiry was compiled and sent to the Land Claims Commission, Mpumalanga Department: Agriculture, Rural Development, Land and Environmental Affairs (DARDLEA) Office of the Regional Land Claims Commissioner: Mpumalanga Province on 28 September 2021. The letter contained a list of all the directly affected properties for the project. Should DARDLEA confirm that there are land claims on the affected project areas, our project team will consult with the relevant parties. A formal Letter of enquiry was compiled and sent to the DARDLEA Office of the Regional Land Claims Commissioner: Mpumalanga Province on Tuesday, 28 September 2021. The letter contained a list of all the directly affected properties for the project. Should DARDLEA confirm that there are land claims on the affected project areas, the project team will consult with the relevant parties (Annexure E). A follow-up email was sent to DARDLEA on Tuesday, 23 November 2021. Feedback was received by means of letters dated Monday, 24 January 2022 (Annexure E) indicating that there are no land claims on the directly affected properties.

8.1.3 COMMUNICATION AND ENGAGEMENT

All stakeholders will be provided with sufficient and accurate project information. Project information will be made accessible as follows:

- Presented in a language and style that stakeholders can understand, with simple explanations of complex concepts;
- Presented both in writing (letters, information sheets, non-technical summaries of the environmental reports, poster displays) and verbally (telephonic discussions, on-line engagements).
- Easily obtainable, i.e. discussion documents will be mailed or emailed to individuals, and available on Kongiwe's website and on OMI's website.

The project team envisages that a number of methods to publish communication materials, including distribution of hard copy documents (Background information documents, notification letters, fact sheets).

Table 8 below provides an overview of communication and engagement tools that will support the implementation of this Plan.

Table 8: Communication and Engagement Tools (Kongiwe, 2022)

Engagement tool	Description
Background Information Document (BID)	The BID will be emailed to all stakeholders on the database. The BID will be hand delivered to stakeholders who have no internet access. The BID will be available on Kongiwe's website (under public documents) and OMI's website.

Engagement tool	Description
	The Registration and Comment sheet will be attached to the BID, stakeholders will be requested to complete the registration form and include their comments/ concerns and preferred method of engagement. Stakeholders who do not have access to the internet will be provided with hard copies of the BID. BIDs will be printed and distributed through community representatives, and all measures to prevent and avoid the spread of COVID-19 will be strictly adhered to. Logistics of delivering the BID will be discussed with the relevant Ward Councilors or community representatives.
Newspaper advertisements	Newspaper advert will be placed in local or regional newspaper.
Notification Letter with a Comment and Registration Form	A notification letter will be sent to all stakeholders informing them about the availability of the environmental reports for public review and comment.
Telephonic discussions	Telephonic discussions will be held with key stakeholders to give an overview of the project, make sure they have received the information and to set up meetings for online discussions. Follow-up written correspondence will be sent to stakeholders to confirm the points discussed during the telephonic discussions.
SMS Broadcasting	Stakeholders will also be notified by SMS of the proposed project and given an invitation to arrange a telephonic or online engagement sessions (Zoom/Microsoft teams/telephonic) meeting.
Regular emails	Stakeholders will also be consulted by means of regular email updates.
Online engagement sessions	Online meetings will be held with key stakeholders via virtual platforms such as Microsoft Teams and Zoom. These meetings will be seen as formal consultations. This will be done by means of a PowerPoint Presentation which will be shared and discussed online.
Site Visit	Site Visit with Key Stakeholders to tour TGME's mining right areas.
Focus Group Meetings	These meetings will be held with Key Stakeholders.
On-on-One Consultation Meetings	It is anticipated will be held with the directly affected/vulnerable groups.
Open day	All sectors of society/the broader public.
Delivery of notices	Consultation with the relevant Ward Councillor and seek advice on the best and practicable way to distribute notices in their wards to inform representatives of the communities of the proposed project.
All proof of correspondence with stakeholders has been recorded and included as ANNEXURE E.	

The abovementioned methods of engagement will ensure that project information is disseminated to all stakeholders, the key message to be communicated will include:

- Brief project description;
- Applicable listed activities;
- Information about the availability of the Environmental Reports for public review and comment;
- How stakeholders can send their comments/concerns;

- An invitation to arrange telephonic or online engagement sessions (Zoom/ Microsoft teams) or One-on-one consultation meetings;
- Registration as I&APs; and
- Contact details of the public participation team.

8.1.4 PROTECTION OF PERSONAL INFORMATION ACT 4 OF 2013

In compliance with the POPIA, any personal information provided to OMI and Kongiwe will be exclusively used as part of the PPP and will therefore not be utilised for any other purpose, other than that for which it was provided. No additional copies will be made of documents containing personal information unless consent has been obtained from the owner of said information. Records of personal information will be retained no longer than reasonably required for lawful purposes. OMI's privacy statement is available to view on www.omisolutions.co.za.

8.2 SITE NOTICES

The site notice provided an overview of the project and highlights the applicable legislation, environmental authorisation/ permits applicable to the project. It also outlined the stakeholder engagement process to be followed and where relevant information could be obtained from. A locality map of the project site was included in the site notice. Details of the open day and how stakeholders can register as I&APS were included in the site notice. Pictures and co-ordinates of where the site notices were placed were also recorded in the site notice report and a site notice map was developed (Appendix E5 of ANNEXURE E).

8.3 NEWSPAPER ADVERTISEMENT

Newspaper adverts (Appendix E4 of ANNEXURE E) were placed in The Steelburger, on Thursday, 2 December 2021 and The Lowvelder, on Thursday, 2 December 2021. The advert included the following details:

- Brief project description.
- Legal framework, the competent authorities.
- How stakeholders can access the Draft Scoping report for public review and comment.
- The details of the open day.
- Registration as stakeholders.
- The contact details of the stakeholder engagement consultants.

8.4 DRAFT REPORT FOR REVIEW

The EIA Regulations, 2014 (as amended) specify that the Draft EIA/EMPR report must be subjected to a public participation review process of at least 30 days. The report will be made available for a period of 60 days public review and comment period from Tuesday, 19 April 2022 to Wednesday, 22 June 2022 and the draft Integrated Water and Waste Management Plan (IWWMP) report will also be made available for a 60-day public review and comment period from Tuesday, 19 April 2022 to Wednesday, 22 June 2022.

- Copies of the abovementioned reports will be available on the following websites:
    - Kongiwe's website: http://www.kongiwe.co.za/publications-view/public-documents/
    - OMI's website: https://omisolutions.co.za/public-review-projects/
- A hard copy of the aforementioned reports and copies of the non-technical summary in English, SiSwati and Sepedi will be made available for public review and comment at the following public place:
    - Location:

Pilgrims Rest Museum Information Centre

Physical Address: Main St, Pilgrims Rest, 1290

- Electronic copies of the reports will be made available on request.

8.5 WAY FORWARD

All comments received from I&APs and organs of state and responses will be included in the final EIA/EMPR report to be submitted to the Competent Authority (CA). Any additional comments received will be forwarded to the DMRE (if received after the commenting period).

8.6 SUMMARY OF ISSUES RAISED BY I&APS

The issues raised by I&APs during the PPP are summarised in **Table 9**.

Table 9: Comments and Response Table[59]

Interested and Affected Parties	Contact Details/Person	Consulted	Interest/ Capacity	Notification/ Consultation	Issues raised	EAPs response to issues as mandated by the applicant	Consultation Status (consensus, dispute, ongoing etc.)
Please refer to Annexure E1 for the Comments and Responses.							

The following is a list of the main comments and concerns raised as part of the public engagement:

- Allegations of providing misleading information;
- Clearance of vegetation to accommodate the redevelopment in sensitive environments;
- The cumulative effect of TGME operations in future;
- Historical management of TGME mines- historical mistrust and liabilities;
- Impact from atmospheric emissions;
- Impact on surrounding land uses including York Timbers (Pty) Ltd and the South African Forestry Company SOC Limited (SAFCOL) operations;
- Impacts on historical findings and provincial heritage sites;
- Impacts on the Blyde River system and streams running through the area- how this affects downstream users and tourism;
- Inability to access the annexure of the scoping report;
- Increased pressure on services (water, sewage, electricity);
- Increased traffic impact on the already degraded road network;
- The influx of job seekers;

[59] Please note that the table will be completed after the public review of the report.

Interested and Affected Parties	Contact Details/Person	Consulted	Interest/ Capacity	Notification/ Consultation	Issues raised	EAPs response to issues as mandated by the applicant	Consultation Status (consensus, dispute, ongoing etc.)
• Job opportunities – Local employment; • Landowner consent; • Mining within a protected and sensitive environment; • Status of previous application processes and approvals; and • Water supply and demand. • Alternative land uses The full CRR has been included in Annexure E of this report.							

9 THE ENVIRONMENTAL ATTRIBUTES ASSOCIATED WITH THE DEVELOPMENT FOOTPRINT ALTERNATIVES[60]

9.1 OVERVIEW OF THE CURRENT STATE OF THREATS TO THE MINING RIGHT ENVIRONMENT

The area over which the existing TGME mining right (83MR) is located is currently facing two major threats causing deterioration to the area. It should be noted that TGME is not currently actively mining in the mining right areas. The following threats are currently noted in the mining area:

- Illegal mining leads to the following issues (**Figure 27** and **Figure 28**):
    - Physical disturbance of vegetated areas;
    - Diversions of streams;
    - Contamination and sedimentation of the Blyde River, drainages, and streams;
    - Social disruptions in the communities (crime, child labour etc.); and
    - AIPs proliferated in the area (**Figure 29**).

Figure 27: Impacts of Illegal Mining on the Banks of the Blyde River and Other Streams

Figure 28: Diversions and Impedances caused by the Illegal Mining Activities

[60] Required as per the Appendix 2 (g) of the EIA Regulations, 2014 (as amended) a full description of the process followed to reach the proposed preferred activity, site and location of the development footprint within the site, including (iv) the environmental attributes associated with the alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects.

Figure 29: AIP Proliferation Around the Larger Mining Right Area

9.2 CLIMATE

The climatic conditions for this region are typical of the eastern Mpumalanga region, consisting of very hot summers and cool to cold winters. Rainfall occurs during summer thunderstorms, which are accompanied by lightning and occasional hail. Morning fog is common in summer but usually clears up by midday (Glynn's Lydenburg EMP, 2009).

9.2.1 RAINFALL AND EVAPORATION

The Mean Annual Precipitation (MAP) for the region varies between 2,000 mm on the escarpment to around 600 mm in the Lowveld (Glynn's Lydenburg EMP, 2009). Most of the rainfall occurs between November and March, in the form of tropical storms. The highest annual rainfall recorded occurred in the hydrological year 1987/88 when a depth of 1,283.3 mm was recorded. The lowest annual rainfall recorded occurred during the hydrological year 1991/92 when a depth of 560.5 mm was recorded.

The closest rainfall stations to the project with long-term rainfall data are the Pilgrims Rest and Morgenzon stations. Monthly patched rainfall was downloaded from the WR2012 study website, which has rainfall data up to September 2010. The Pilgrims Rest station has been decommissioned. However, rainfall from the Morgenzon station, which is still in operation, was purchased from the South African Weather Service (SAWS) for the period of October 2010 to September 2019.

The project is located in a high rainfall area, with a MAP of 948 mm. Rainfall is highest over the summer months of October to March, with January and February being the wettest months. Rainfall is lowest over the months of April to September, with June and July being the driest months.

Rainfall data were obtained from TGME, recorded at the plant since 2018, which is compared to the regional rainfall figures in Table 10 and Figure 30. The rainfall recorded at the TGME plant is slightly lower than the regional average, but the general trends coincide.

Table 10: Average Monthly and Annual Rainfall

Month	Regional Average 2010-2019	TGME Plant Average 2018-2021
January	184	219
February	162	161
March	115	98
April	58	63
May	20	16
June	10	5
July	10	2
August	12	5
September	27	9
October	71	53
November	130	63
December	149	84
Annual Total	**948**	**735**

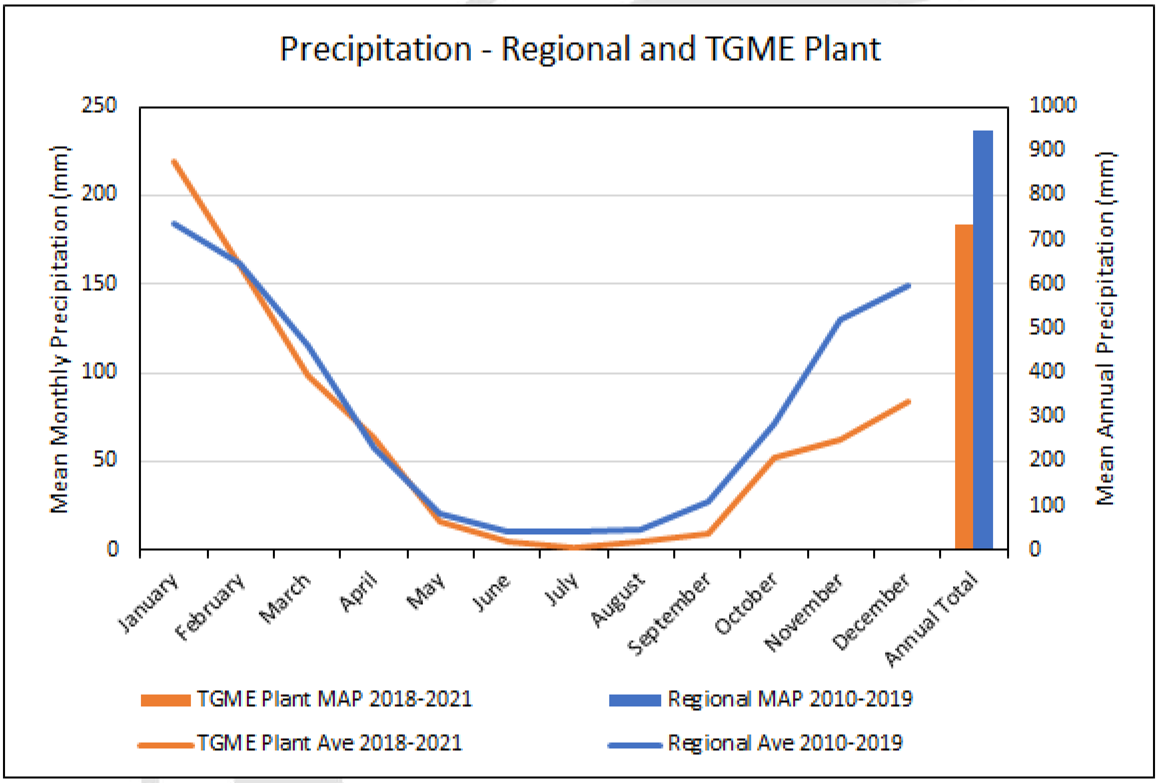


Figure 30: Comparison of Regional Rainfall vs Rainfall at TGME Plant

Monthly Symon's Pan (S-Pan) evaporation was obtained from the WR2012 study for quaternary catchment B60A. S-Pan evaporation measurements are not a true reflection of evaporation from natural open water bodies, as the water temperatures in the S-Pan are higher, resulting in higher evaporation rates. In order to convert S-Pan measurements to open water evaporation, monthly open water evaporation conversion factors were used, which were obtained from the WR2012 study. Evaporation is highest over the months of October to March, and lowest over the cooler months of May to August.

Evaporation exceeds the rainfall in the region and averages 1,179 mm/annum, compared to the average rainfall of 948 mm/annum. The adopted monthly evaporation for the project is presented in Table 11 (Pirie, 2020).

Table 11: Monthly Evaporation (Pirie, 2020)

Month	Symon's Pan Evaporation (mm)	Open Water Evaporation Factor	Open Water Evaporation (mm)
January	158	0.84	133
February	135	0.88	119
March	133	0.88	117
April	101	0.88	89
May	88	0.87	77
June	72	0.85	61
July	78	0.83	65
August	99	0.81	80
September	120	0.81	97
October	133	0.81	108
November	133	0.82	109
December	151	0.83	125
Total	**1 401**	**N/A**	**1 179**

9.2.2 WIND

The wind speed and location for the area were sourced from the Airshed Planning Professional (Pty) Ltd's (Airshed) scoping level air quality baseline report (Airshed, 2021).

In the absence of on-site meteorological data (which is required for atmospheric dispersion modelling), use was made of SAWS meteorological data for Graskop for the period 2016-2018. The SAWS Graskop station is located approximately 9.5 km to the east of the Plant area.

During the 2016 to 2018 period, the wind field was dominated by winds from the north and east with less frequent winds from the northwest, northeast and southeast and very little from the southwest. An average wind speed of 2.14 m/s was measured over the period, with a maximum of 9.2 m/s recorded (Figure 31). During the daytime (06:00 to 18:00) there was a decrease in winds from the north and an increase in winds from the east, with an average wind speed of 2.44 m/s. An increase in dominant winds from the north occurred at night (18:00 to 06:00).

Seasonal wind fields do not vary significantly – during spring and summer the most dominant winds are from the east with a second major component from the north, whereas the autumn and winter seasons are dominated by northerly winds with a reduced easterly component.

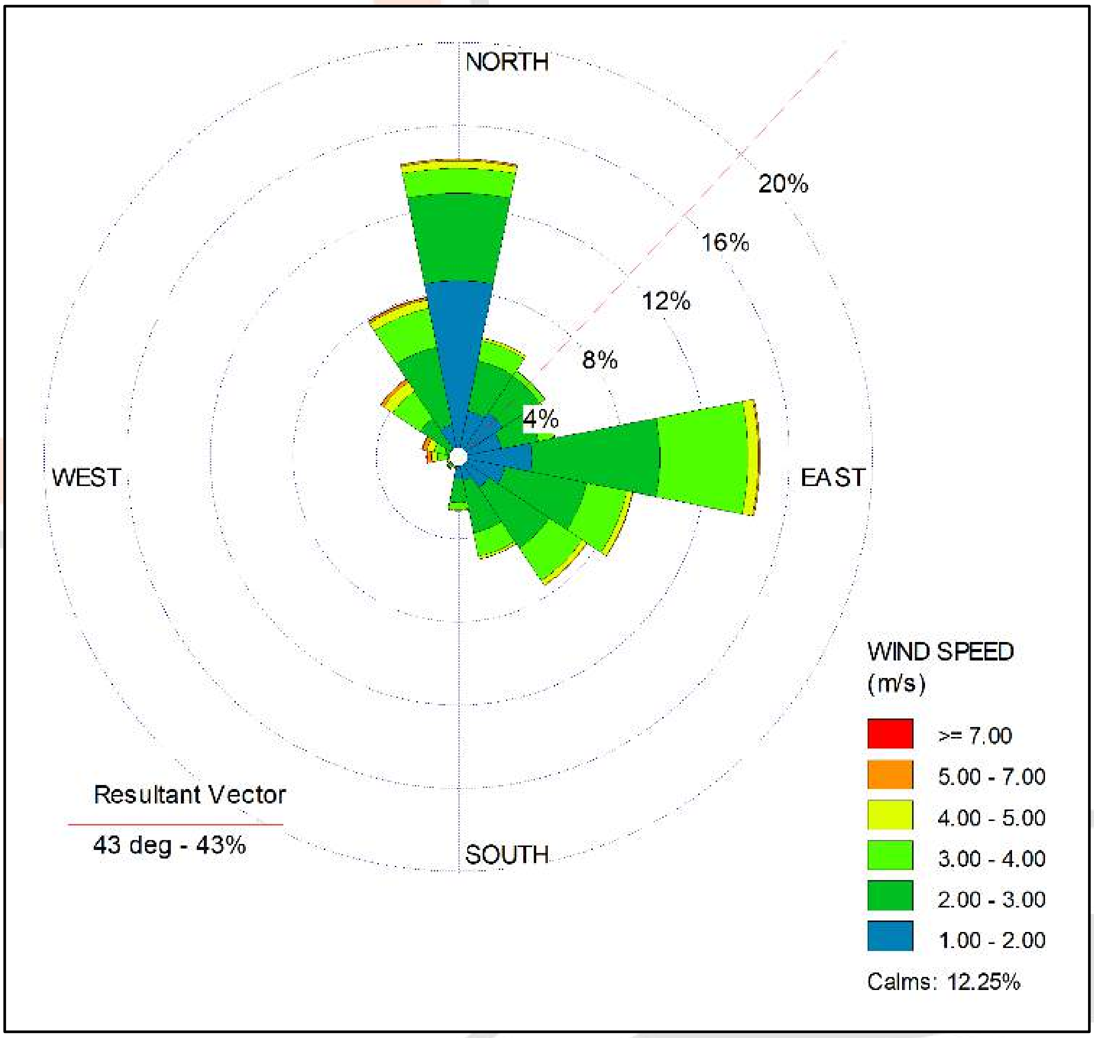


Figure 31: Period Average Wind Rose for Graskop (SAWS data, 2016 to 2018) (Airshed, 2022)

9.2.3 CLIMATE CHANGE MODELLING

As part of the previously proposed Theta opencast project (which since has been withdrawn to prioritise the current proposed project) a climate change study was done for the area under investigation. The study by Prometium Carbon (2019) was for the area around the Pilgrims rest and therefore still be applicable to determine the risks and vulnerabilities faced by the project as a result of climate change. The Air quality study conducted by Airshed includes the Greenhouse Gas (GHGs) such as carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O) for the project.

9.2.3.1 OBSERVED AND PROJECTED TRENDS OF CLIMATE CHANGE

The impacts of climate change on South Africa have been summarised in the Long Term Adaptation Scenarios (LTAS) study which was executed by the Department of Environmental Affairs in 2012. However, significant progress has been made in South Africa since the LTAS in terms of the local generation of detailed regional climate futures for the country. The most recent modelling was conducted for South Africa's Third National Communication (TNC) (Department of Environmental Affairs, 2017).

Risks resulting from climate change impacts such as increasing land-surface temperatures, increasing rainfall variability, decreasing overall rainfall, as well as increasing frequency and intensity of extreme weather events related to:

- Decreasing water availability and quality may negatively affect direct operations as well as the upstream and downstream value chain

- Damages to infrastructure can disrupt operations, transport of goods and lead to an increased risk of injury
- Labour productivity decrease due to excessive heat exposure
- The health of employees may be compromised due to rising food insecurity and an increased number of casualties as a result of heat effects
- Declining air quality in cities or city regions may impact on the issuance or conditions of the issuance of the air quality license
- Disruption to commerce, critical infrastructure and developments, transport systems and traffic by extreme rainfall events and flooding could impact the project's ability to operate
- This also leads to an increased number of power outages, water supply and transport disruptions
- Increased risk of infectious, respiratory and skin diseases, water- and food-borne diseases.

The Ehlanzeni district is characterised by Lowveld escarpments, with altitudes ranging between 600m to 2 100m. The sub-tropical climate is prevailing, which is characterised by summer rainfall between October and March. The higher-lying regions such as Pilgrim's Rest receive around 1 000mm per year. Temperatures in the area of Pilgrim's Rest range from 10°C to 23°C, while average temperatures are around 16°C.

As part of the District Municipality's SWOT Analysis, climate change has been identified as one of the threat factors. Overall, the climate in EDM is projected to become warmer with increased rainfall. Although rainfall is expected to increase in the future the variability and unpredictability will also rise, leading to potential drought periods, followed by heavy rainfall events and flash floods (Ehlanzeni District Municipality, 2016a). The EDM is already experiencing risks related to water quality and availability. Climate change, particularly impacts such as increased flooding, evaporation, droughts and reduced run-off, will only aggravate the area's existing challenges (Ehlanzeni District Municipality, 2016b). Similarly, to the EDM, TCLM is projected to experience hotter and drier conditions in the near-term, but wetter conditions towards the end of the century.

Provincial temperatures may increase by at least 2°C by 2035, or may even rise by 4°C to 6.5°C in extreme scenarios (Department of Environmental Affairs, 2016). Pilgrim's Rest and surrounding areas are expected to see a temperature rise on average by 2-2.5°C. In line with temperature increases, drought and heat stress are also likely to rise. The area is currently experiencing less than two extreme heat waves per year of 35°C or more on three or more consecutive days, but the area is projected to experience approximately 16 very hot days and 8-9 heatwave days per year.

Although the average amount of rainfall in the area surrounding Pilgrim's Rest may stay the same or decrease slightly (100mm per year) in the short-term according to the Green Book (Greenbook, accesed 2019), precipitation patterns are projected to shift: while TCLM experiences rainfall mainly between October and March, and receives reduced amounts of rainfall during the winter months, evaporation rates will increase in future (due to increasing temperatures), reducing both the amount of run-off and rainfall received during the various months of the year by 2050. Rainfall, precipitation and evaporation rates currently follow the same pattern throughout the year – higher in the rainy season, lower in the dry season. This pattern is projected to change significantly and highlights the increasing unpredictability around rainfall and thus water availability (Greenbook, accesed 2019). The impacts associated with the changes on the project are further discussed in Section 0.

9.3 AIR QUALITY

The air quality assessment was done by Airshed and is summarised below. The study is attached as ANNEXURE I. The baseline conditions are described below.

9.3.1 EXISTING SOURCES OF ATMOSPHERIC EMISSIONS IN THE AREA

Mining and agriculture are the predominant land uses in the region. There are several historical underground and surface gold mining deposits, with disturbed areas as a remnant of these activities. Forestry is the main agricultural activity surrounding the three Project areas (WSP, 2019).

The main pollutant of concern would be particulate matter (TSP, PM10 and PM2.5) resulting from vehicle entrainment on the roads (paved, unpaved, and treated surfaces), windblown dust as well as mining and exploration activities. Gaseous pollutants such as sulphur dioxide (SO_2), oxides of nitrogen (NOx), carbon monoxide (CO) and carbon dioxide (CO_2) would result from vehicles and combustion sources, but these are expected to be at low concentrations as there are few combustion sources in the region.

9.3.2 ROAD EMISSIONS

The national road connecting the Project areas, namely the R533, is a paved road. Aside from light-duty vehicles the road is also likely to be used by forestry trucks (heavy-duty vehicles) transporting wood.

Dust emissions from paved and unpaved roads vary linearly with the volume of traffic. In addition, a number of parameters influence the surface condition of a particular road, such as average vehicle speed, mean vehicle weight, silt content of road material, and road surface moisture, and these will thus impact dust emissions (U.S. EPA, 2006).

Vehicle tailpipe exhaust gases are a significant source of CO, NOx, total organic compounds (TOC), non-methane total organic compounds (NMTOC), benzene, lead, acetaldehyde, formaldehyde and 1.3 butadiene emissions. The significance of vehicle emissions in terms of their contribution to air pollutant concentrations and health risks are directly related to the level at which the emissions occur, and the proximity of such releases to high exposure areas. Vehicle emissions also tend to peak in the early morning and evening, at which time atmospheric dispersion potentials are reduced.

9.3.3 WINDBLOWN DUST

Windblown particulates from natural exposed surfaces, mine waste facilities, and product stockpiles can result in significant dust emissions with high particulate concentrations near the source locations, potentially affecting both the environment and human health.

Wind erosion is a complex process, including three different phases of particle entrainment, transport, and deposition. For wind erosion to occur, the wind speed needs to exceed a certain threshold, called the friction velocity. This relates to gravity and the inter-particle cohesion that resists removal. Surface properties such as soil texture, soil moisture and vegetation cover influence the removal potential.

Windblown dust is likely to result from old mined-out areas and disturbed land surfaces, as well as old stockpiles and dumps.

9.3.4 MINES AND EXPLORATION OPERATIONS

Pollutants typically emitted from mining and quarrying activities are particulates, with smaller quantities associated with vehicle exhaust emissions. Mining and quarrying activities, especially open-cast mining methods, as well as exploration activities, emit pollutants near ground-level over (potentially) large areas. Source activities resulting in significant dust emissions include:

- drilling and blasting;
- materials handling (loading, unloading, and tipping);
- crushing and screening;
- windblown dust (from the sources as described above);
- access roads; and
- plant stack emissions.

There are no known active mines in proximity to the proposed TGME Project; only historical mining remnants are visible in the area.

9.3.5 AGRICULTURAL ACTIVITIES

Particulate matter from agricultural activities is the main pollutant of concern, as particulate emissions derive from windblown dust, crop burning residue, and dust entrainment as a result of vehicles travelling along dirt roads. In addition, pollen grains, mould spores and plant and insect parts from agricultural activities all contribute to the particulate load. Chemicals associated with crop spraying and odiferous emissions resulting from manure, fertilizer and crop residue have been identified as the main concern. Spray drift due to aerial crop spraying can distribute organo-chemicals in the nearby vicinity or even further afield (WCP, 2010). Crop residue burning and burning for frost prevention are additional sources of particulate emissions and other toxins.

The agricultural activity surrounding the TGME Project areas is mostly forestry.

9.3.6 SAWMILL AND TIMBER TREATMENT

Pollutants of concern include PM (PM_{10} and $PM_{2.5}$) from wood dust and VOCs from boilers and treatment of wood. Treatment often includes heat and the application of chemicals.

The closest sawmill is located near Graskop, approximately 9 km east of the Beta North Project area, and thus unlikely to influence the air quality at the TGME sites.

9.3.7 BIOMASS BURNING

Crop-residue burning and general wildfires (veld fires) represent significant sources of combustion-related emissions associated with agricultural areas.

The concern with biomass burning is the high potential of secondary anthropogenic $PM_{2.5}$ formation due to incomplete combustion of organic matter. It is expected that the amount of PM_{10} and $PM_{2.5}$ resulting from biomass burning is underestimated and hence so is the potential health risk associated with it. This also directly relates to the underestimation of the effect on atmospheric chemistry such as photochemistry. Aerosols, black carbon, and hydrocarbons are also associated with biomass burning. Furthermore, it is a significant source of greenhouse gases, especially CO_2, black carbon, and photochemical gases (NOx, CO, and hydrocarbons), which lead to the production of tropospheric ozone (O_3).

9.3.8 REGIONAL TRANSPORTATION OF POLLUTANTS

Another source of air pollution is aerosols originating from regional-scale transport of mineral dust and ozone (due to vegetation burning). Biomass burning is an incomplete combustion process (Cachier, 1992), with CO, methane and NOx gasses being emitted. Approximately 40% of the nitrogen in biomass is emitted as nitrogen, 10% is left in the ashes, and it may be assumed that 20% of the nitrogen is emitted as higher molecular weight nitrogen compounds (Held, et al., 1996). The visibility of the smoke plumes is attributed to the aerosol (particulate matter) content.

9.3.9 EXISTING AMBIENT AIR POLLUTANT CONCENTRATIONS IN THE PROJECT AREA

There is a dust fall monitoring network in place at the TSF, located at the Plant area. No ambient PM (PM10 and PM2.5) monitoring data exist. The location of the dust fall-out monitoring is shown in **Figure 32**.

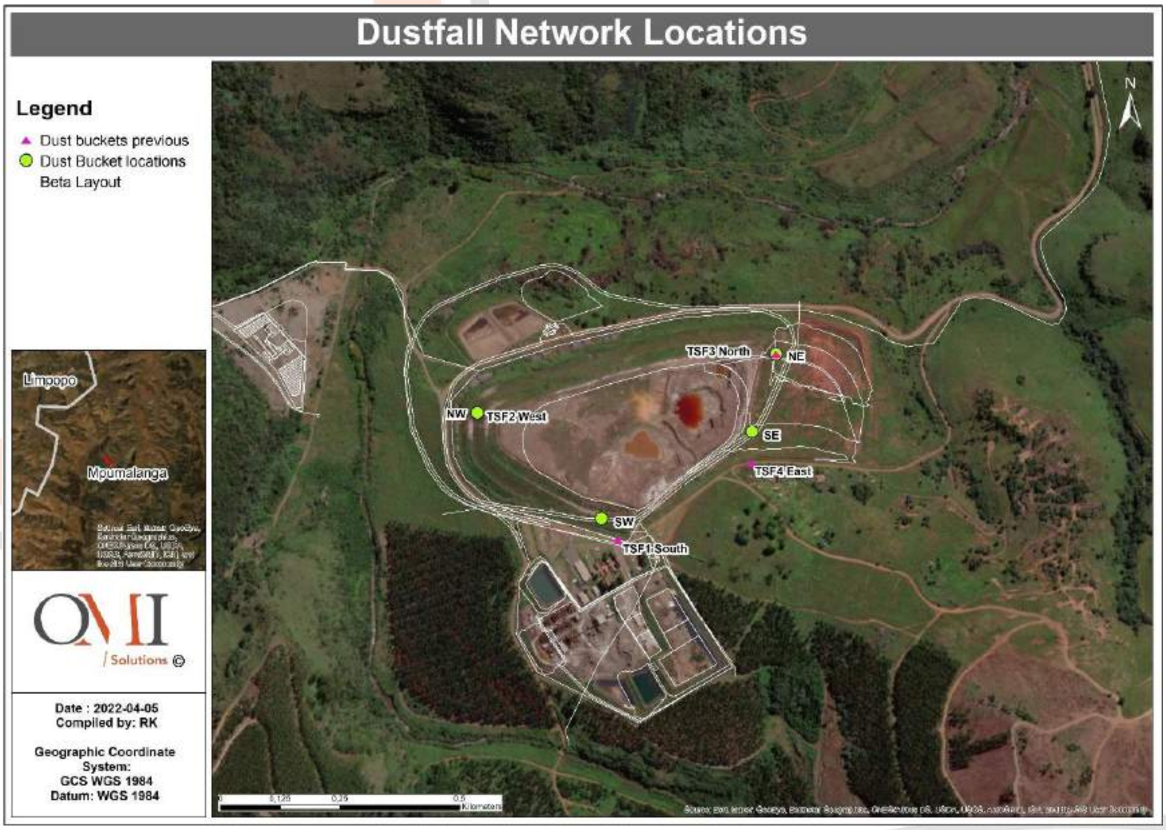


Figure 32: Dust Fall Monitoring Network (Compiled with Data from Airshed, 2022)

Dustfall deposition rates from the TGME monitoring network for the period ending January 2021 to the end of January 2022 are presented in **Table 12**.

Dustfall rates were low for the sampling period from February to June 2021 at all four locations and well within the dust fall limit of 600 mg/m²/day (the adopted limit for residential areas) and 1 200 mg/m²/day (the adopted limit for non-residential areas). From July to September 2021 dust fall rates increased significantly at three of the four sites, exceeding the NDCR for non-residential areas (1 200 mg/m²/day). The reasons for the increase in dust fall rates at TSF 1 South, TSF 3 North and TSF 4 East are not clear and could be due to activities at and around the TSF (Airshed, 2022).

Table 12: Record of Dust Fall Rates at TGME Project Monitoring (Airshed, 2022)

Dust Fall Rates (mg/m²/day)												
Site	Feb-21	Mar-21	Apr-21	May-21	Jun-21	Jul-21	Aug-21	Sep-21	Oct-21	Nov-21	Dec-21	Jan-22
TSF 1 South	46	170	107	163	168	2,989	2,730	1,225	1,320	X	68	50
TSF 2 West	58	240	90	115	128	212	328	180	226	X	51	77
TSF 3 North	38	164	139	124	172	2,900	196	246	413	X	95	80
TSF 4 East	58	131	107	114	118	7,659	4,630	142	326	X	53	52

Status Indicator: *Exceeds NDC limit for residential areas* | *Exceeds NDC limit for non-residential areas*

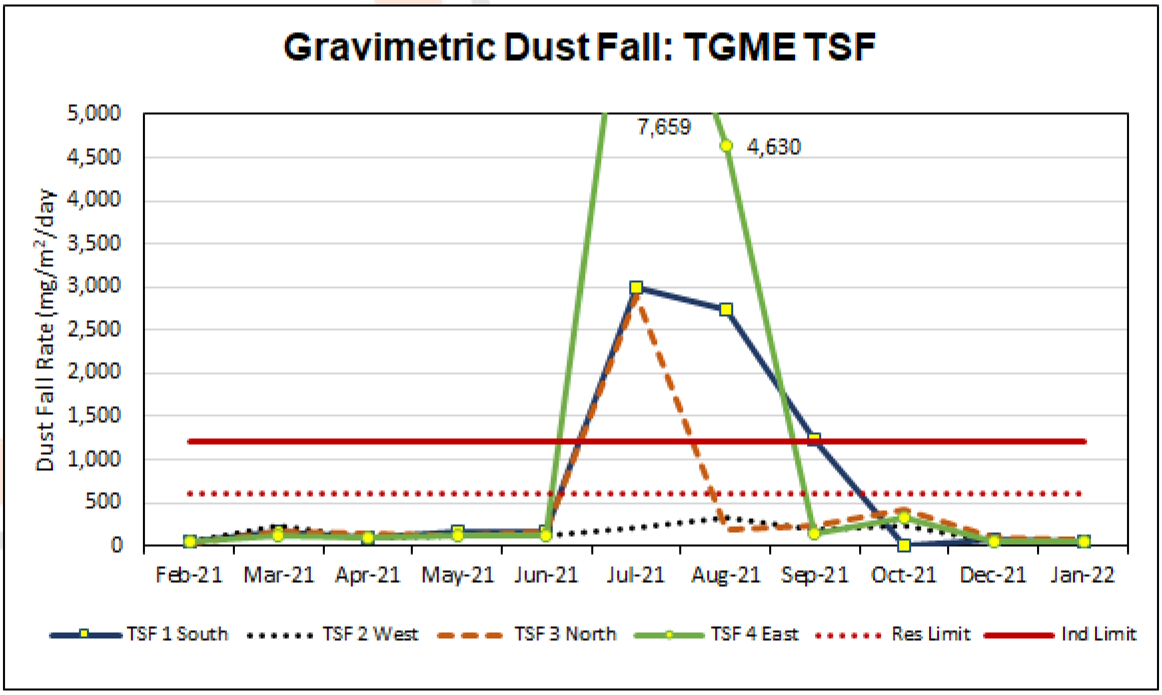


Figure 33: Gravimetric Dust Fall Results for TGME TSF

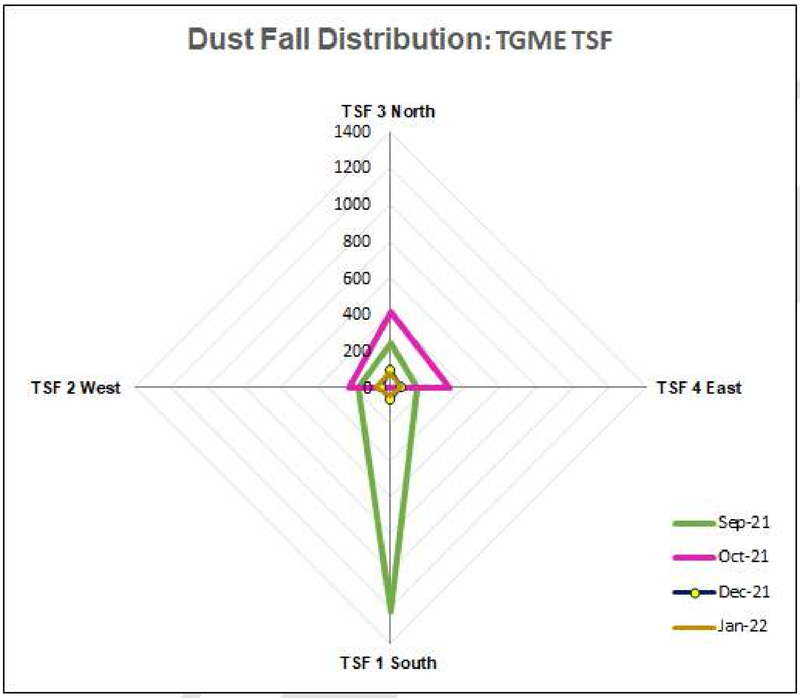


Figure 34: Dustfall Distribution TGME TSF – September 2021 to January 2022

9.4 GEOLOGY

The Project Areas are situated within the Sabie-Pilgrim's Rest Goldfield, approximately 300 km northeast of the Witwatersrand Basin. This metallogenic province extends for approximately 140 km in a north-north-easterly direction, over a maximum width of 30 km along the Great Escarpment of southern Africa. Gold mineralisation occurs within shear zones located within the sedimentary host rocks of the Transvaal Supergroup. The orebodies considered for the underground operations may be described as thin, sheet-like near horizontal deposits. The reefs considered for extraction through the underground operations, namely the Beta Reef (Beta Mine), Bevetts Reef (Frankfort Mine) and Rho Reef (CDM) are all concordant reefs which dip shallowly westwards between 3°and 12°.

Numerous dykes and sills, principally of pre- and post-Bushveld Igneous Complex (BIC) age have intruded into the Transvaal Supergroup. Some dykes that pre-date the Bushveld Complex were recognized, related to gold mineralisation. The BIC and the Transvaal Supergroup do not outcrop in the Pilgrim's Rest area.

Epigenetic gold mineralisation is present in three main types of ore body. Stratiform quartz-sulphide gold veins, termed flat reefs, are the dominant, most productive style of mineralisation in this goldfield. Steeply eastward-dipping, transgressive vertical reefs and smaller, sub-vertical to inclined lensoidal leader reefs are also present. The former originates in the Archaean granitoid basement beneath the shallowly dipping Transvaal Sequence and may pierce the overlying sedimentary pile. The latter frequently branches off flat reef lodes and is exclusively developed in the Transvaal sedimentary rocks.

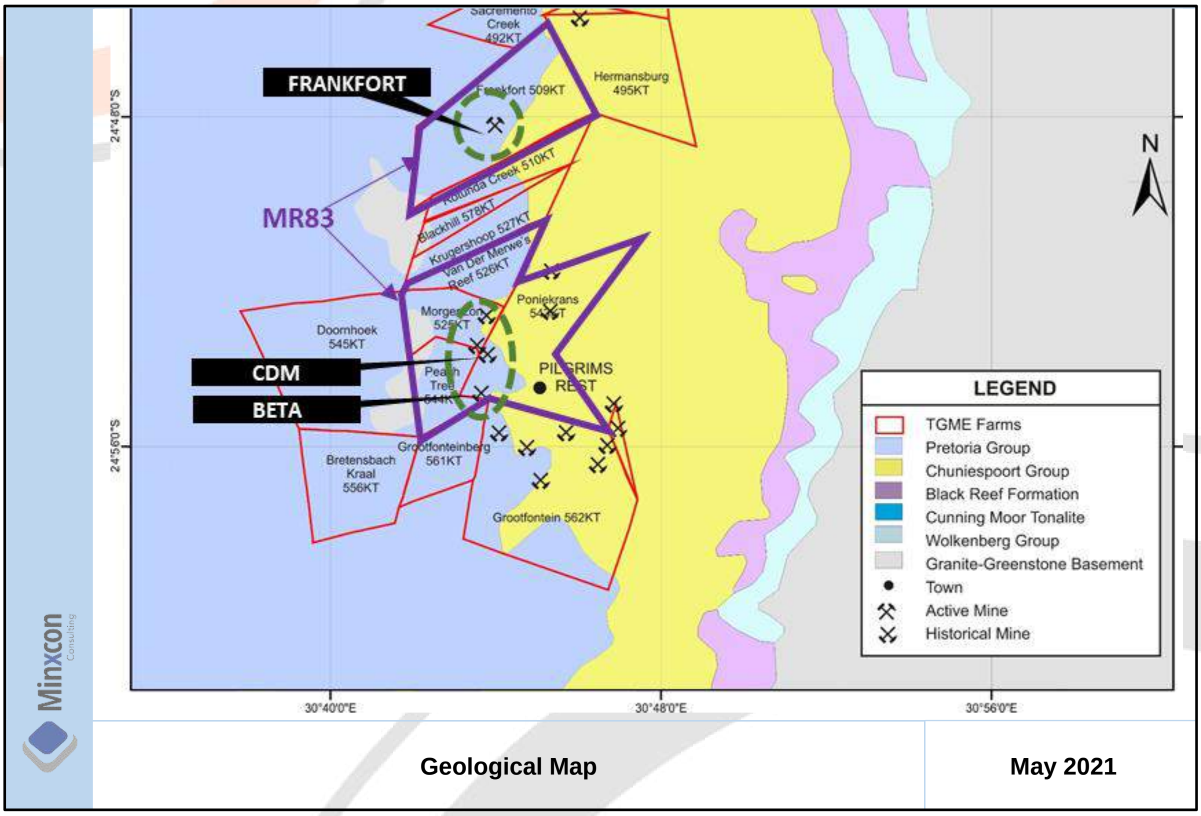


Figure 35: Geological Map of the Area (Minxcon, 2021)

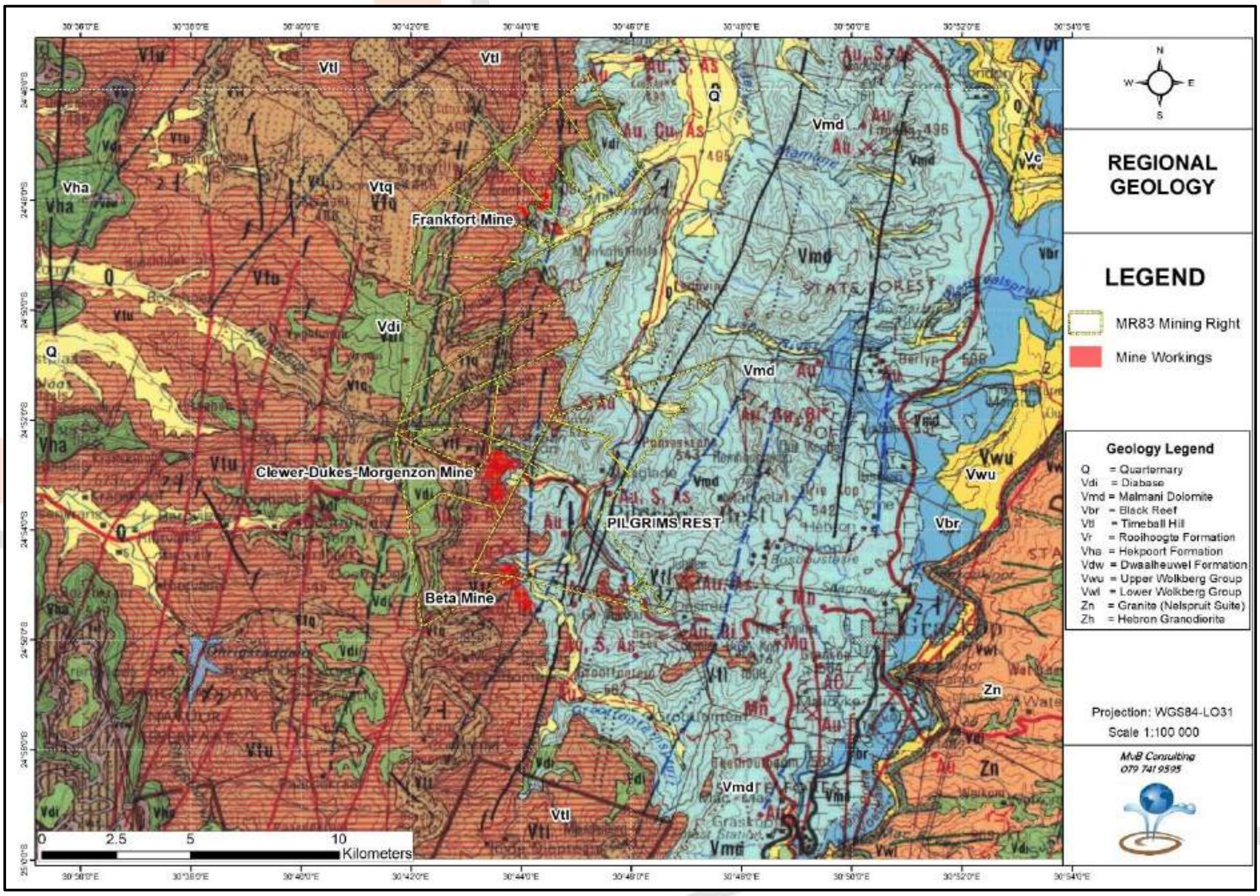


Figure 36: Regional Surface Geology – Pilgrims Rest Region (MvB Consulting, 2022)

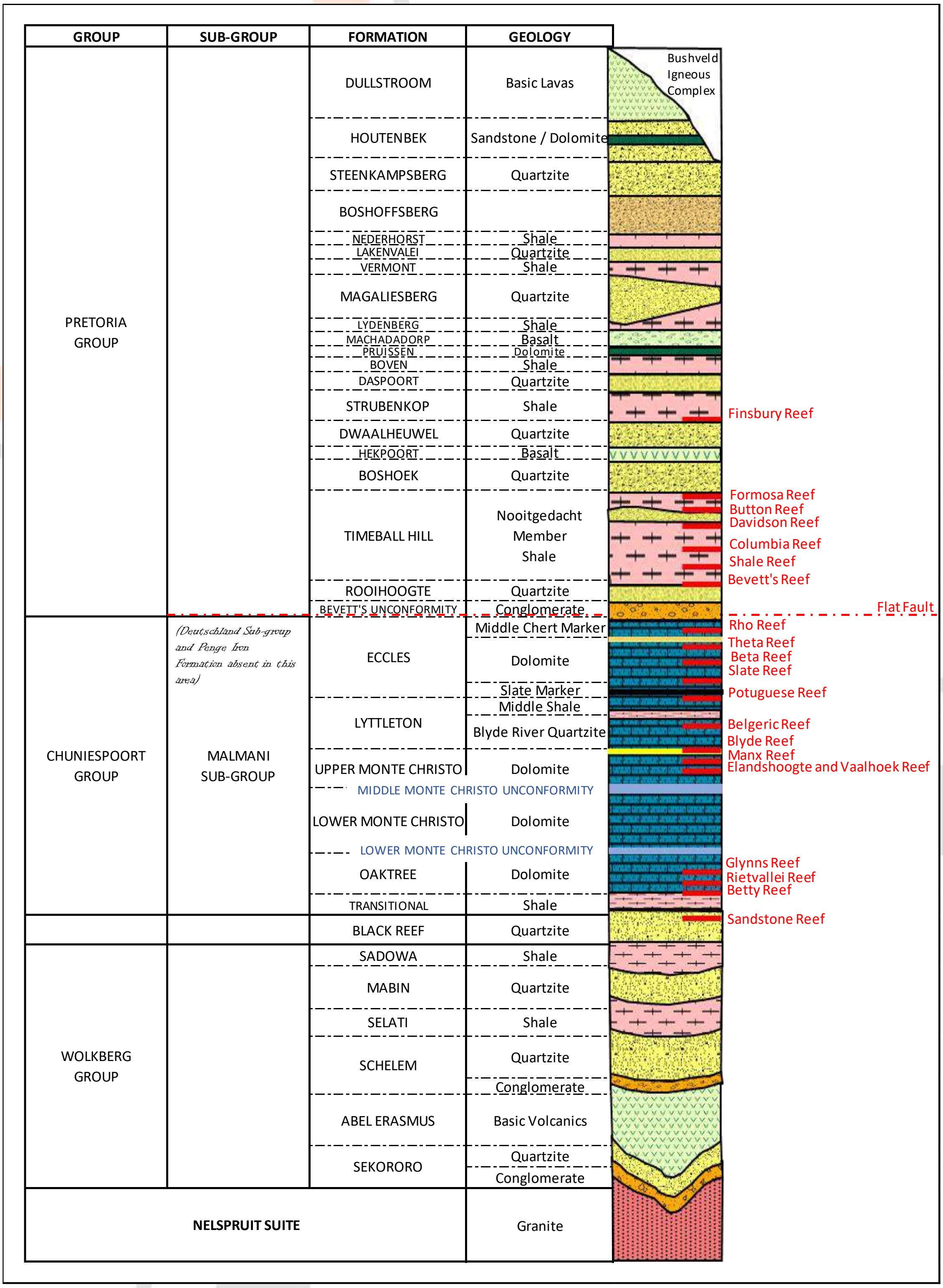


Figure 37: Stratigraphy in the Sabie – Pilgrims Rest goldfields (MvB Consulting, 2022)

9.5 DOLOMITE STABILITY ASSESSMENT

The dolomite stability assessment comprised a desktop study, a comprehensive gravity survey by Applied Scientific Services and Technologies (ASST) and the drilling of thirty three (33) percussion boreholes of which twenty nine (29) are applicable to this project. The boreholes were drilled by JK Drilling and profiled by an engineering geologist from Jones and Wagner (Pty) Ltd (J&W).

Comprehensive gravity surveys were undertaken at four areas:-

- Frankfort
- TSF
- CDM
- Beta North

The gravity surveys were carried out, generally, on a 10m by 10m grid. Where access allowed, the surveys were extended on a 40m grid to provide additional coverage. The percussion boreholes were drilled, as indicated in **Table 13**, in accordance with South African National Standards (SANS) 1936-2.

Table 13: Location of the percussion boreholes applicable to the project

LOCATION		BH NUMBER	STRUCTURE
Frankfort	Frankfort South	FS01	Collection dam
		FS02	Collection dam
		FS03	Reservoir
		FS04	Ablution Block
		FS05	Plant
	Frankfort North	FS06	Ore Silo and haul road
		FS07	Pipeline
CDM	Northern Area (Morgenzon)	CDM01	Morgenzon South Reservoir
		CDM02	PCD
		CDM03	Water tanks and ablution facilities
	Southern Area (Dukes)	CDM04	PCD
		CDM05	PCD
		CDM06	WRD and Road
		CDM07	Reservoir and water tanks
Beta North		BN01	Operations dam. Close to shaft
		BN02	PCD
		BN03	Haul road and bridge
TSF		TSF01	Proposed RWD
		TSF02	
		TSF03	Northern flank
		TSF04	
		TSF05	TSF extension
		TSF06	
		TSF07	
		TSF08	

LOCATION	BH NUMBER	STRUCTURE
	TSF09	
	TSF10	
	TSF11	
	TSF12	

Chip samples were taken at 1.0m intervals and logged by a qualified engineering geologist, in accordance with the current standard procedures proposed by Brink and Bruin (2002). The boreholes were left open for approximately 24 hours to monitor the groundwater level.

According to SANS 1936 Part 1, the appropriate dolomite area designation shall be determined based on the type of development and the adjudged Inherent Hazard Class (IHC). The requirements for each dolomite area designation are as follows:

- Dolomite area designation D1
    - No precautionary measures required
- Dolomite area designation D2
    - General precautionary measures, in accordance with the requirements of SANS1936-3, that are intended to prevent the concentrated ingress of water into the ground are required.
- Dolomite area designation D3
    - Precautionary measures in addition to those pertaining to the prevention of concentrated ingress of water into the ground, in accordance with the relevant requirements of SANS 1936-3, are required.
- Dolomite area designation D4
    - Additional site-specific precautionary measures are required.

At the Beta North Mine the locations of boreholes shown in **Figure 38** a thick fill was encountered in boreholes BN01 and BN02 from surface to a depth of between 5m and 6m. This is, generally, underlain by dolomitic residuum. In the case of boreholes BN03, dolomitic residuum is present from surface and in BN01 shale is interlayered with dolomitic residuum. The residuum is fairly thickly developed and comprises chert gravel, wad and wad interlayered with chert. Dolomite was present in BN01 and BN02 from a depth of 16m and 23m, respectively. In BN03, chert was present from a depth of 28m to termination of the borehole at 42m. The three boreholes drilled at the Beta North site are all adjudged IHC6 indicating a D3 dolomite area designation with D4 for reservoirs, dams, slimes dams, fuel depots etc.

Most of the twelve boreholes drilled in the TSF (**Figure 38**) area have a layer of transported material or fill from surface to a depth of between 1m and 9m but generally between 1m and 4m. no thicker than 4m. This is often underlain by residual shale and thereafter dolomitic residuum or directly by dolomitic residuum. The dolomitic residuum comprises clay, chert and wad. Dolomite floaters were, also, evident in the profile. Shale, dolerite and syenite are often above and below the residuum and, also, interbedded with the dolomitic residuum. Where present, dolomite was encountered at a depth of between 14m and 50m but was not always encountered. The adjudged IHC for the borehole drilled across the TSF area varies from IHC1 to IHC7.

- North west Boreholes TSF01 and TSF04 - IHC2, IHC6 and IHC7
- East Boreholes TSF06 to TSF124 - IHC1, IHC2, IHC3 and IHC7

Conditions, therefore, vary considerably across the existing TSF and the proposed extension of the TSF to the east. All design would need to take full cognisance of the dolomitic and near surface conditions with the

TSF being considered D4. Other infrastructure to be constructed in the area may fall within the D2 or D3 designation.

At the Frankfort South site the profile generally comprises dolomitic residuum underlain by shale, dolomite or dolerite. Refer to **Figure 39** for the locations of the boreholes. In two boreholes, FS02 and FS05 a layer of fill is present from surface to a depth of 8m and 2m respectively. The fill, where present, is underlain by dolomitic residuum or dolomitic residuum is present from surface. The dolomitic residuum is between 8m and 25m thick.

In the north-west of the Frankfort South site, boreholes FS03 and FS05, the residuum is thickly developed and is between 22m an 25m thick. In the south east, the residuum is more thinly developed, 8m to 17m thick. The dolomitic residuum comprises chert gravel, clay, wad and chert. In Borehole FS01 wad was encountered between 10m and 12m and again between 14m and 17m. In Boreholes FS05 wad was present at a depth of 18m to 22m. Wad was, also, encountered interbedded with chert in Boreholes FS01, FS04 and FS05. Rock was encountered at a depth of between 8m and 25m and comprises shale, dolerite, dolomite and chert. Frankfort South site is characterised by two distinct areas:

- North west Boreholes FS01, FS03 and FS05 - IHC 4 and IHC6 - D3 dolomite area designation with D4 for reservoirs, dams, slimes dams, fuel depots etc.
- South east Boreholes FS02 and FS04 - IHC2 - D3 dolomite area designation with the exception of dams and slimes dams which would be a D4 dolomite area designation.

Two boreholes were drilled at the Frankfort North site, FS06 and FS07 (**Figure 40**). In Borehole FS06 a 1m thick layer of fill was encountered at surface which was underlain by residual shale and residual dolerite. Hard rock dolerite was present from a depth of 18m to termination of the borehole at 25m. In Borehole FS07, very soft rock shale was present from surface to a depth of 7m and then interbedded shale and dolerite was present to a depth of 25m. Dolomite was present at depth. The two boreholes, FS06 and FS07, are adjudged to be IHC1 with a low susceptibility for the subsidence of the formation of sinkholes.

Refer to **Figure 41** for location of the Dukes Boreholes. With the exception of Borehole CDM05, shale is present from surface in the CDM Dukes Area boreholes to a depth of between 14m and 20m. Thereafter residual shale and dolerite, comprising gravelly/sandy clay, and dolomitic residuum, is present. This residual material is interlayered with rock. In CDM05 residual shale is present from surface and there is no “cap” of rock. The dolomite residuum comprises wad and chert and/or clay and chert. This was only encountered in boreholes CDM04 and CDM06 which were drilled in the south of the CDM Dukes Area. The shale at the top of the profile is very soft to medium hard rock with the rock further down in the profile comprising baked shale, dolerite and dolomite. The boreholes drilled across the Dukes area range from IHC1 to IHC4 indicating that the dolomite are designation is generally D3 with D2 being applicable to some developments in the area underlain by IHC1 conditions and D4 appropriate for dams, slimes dams and fuel depots.

In all three boreholes, drilled at the CDM Morgenzon Area (**Figure 42**), shale or shale and chert is present from surface to a depth of between 6m and 27m. Residual shale or dolomitic residuum underlies this cap of rock. A 3 m thick layer of residual shale, comprising clay, was encountered in CDM03 from a depth of 27m to 30m. In the remainder of the boreholes, the dolomitic residuum comprises wad, clay or wad interbedded with chert. Due to collapse, Borehole CDM01 was terminated at a depth of 37m without dolomite bedrock being proven. In boreholes CDM02 and CDM03 dolomitic residuum extends to a depth of 47m or 51m at which depth dolomite bedrock was encountered. The two westerly boreholes, CDM01 and CDM03 are adjudged as IHC 7 with the borehole further to the east, CDM02, considered IHC2. The IHC 7 designation indicates that a D4 dolomite area designation is appropriate with only a few exceptions to this, for example outdoor facilities. The IHC2 designation indicates a D3 scenario with the exception of dams and slimes dams which would be considered D4.

Designs from the civil engineers have taken these areas into consideration:

- the findings of the near surface investigation,

- the IHC as indicated by the dolomite stability assessment
- the requirements for the dolomite area designation, D2/D3/D4.

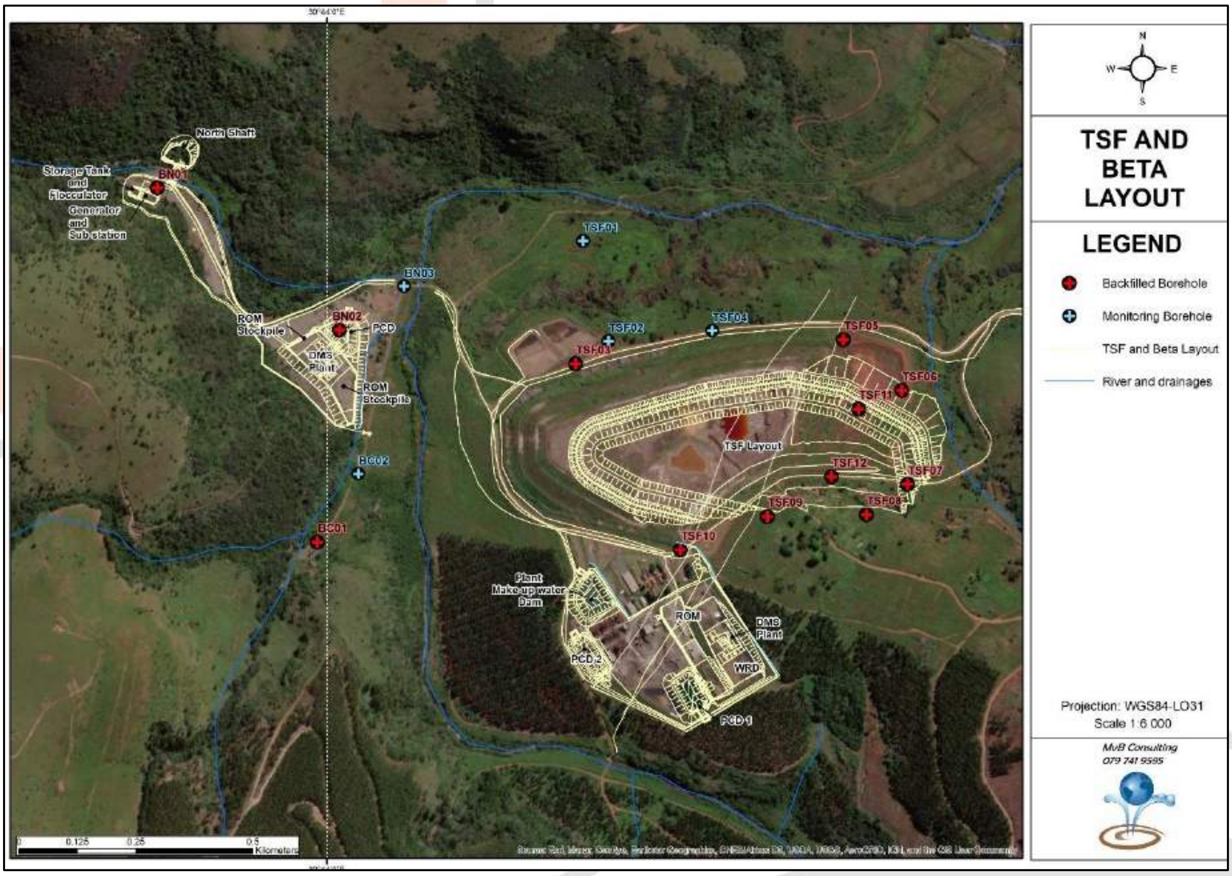


Figure 38: TSF and Beta North area drilled boreholes (MvB Consulting, 2022)

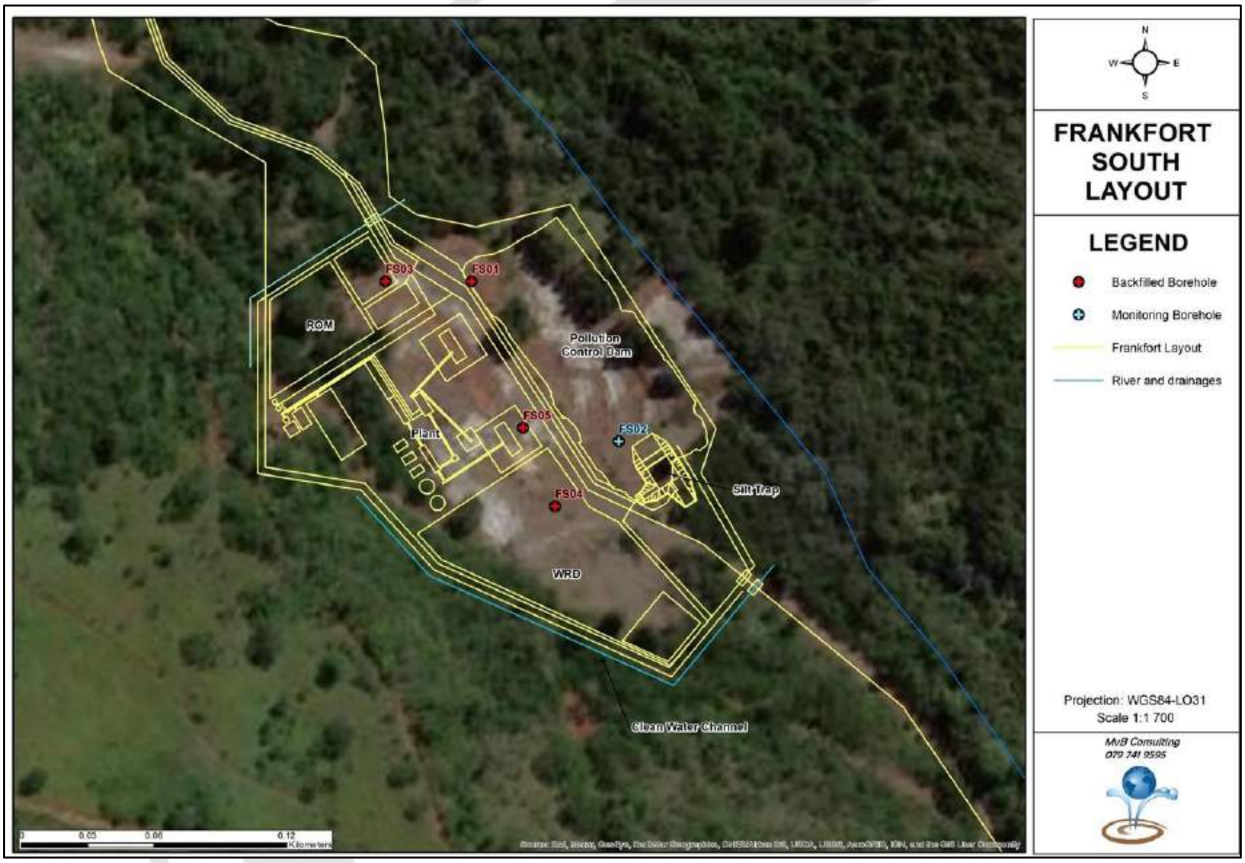


Figure 39: Frankfort South area drilled boreholes (MvB Consulting, 2022)

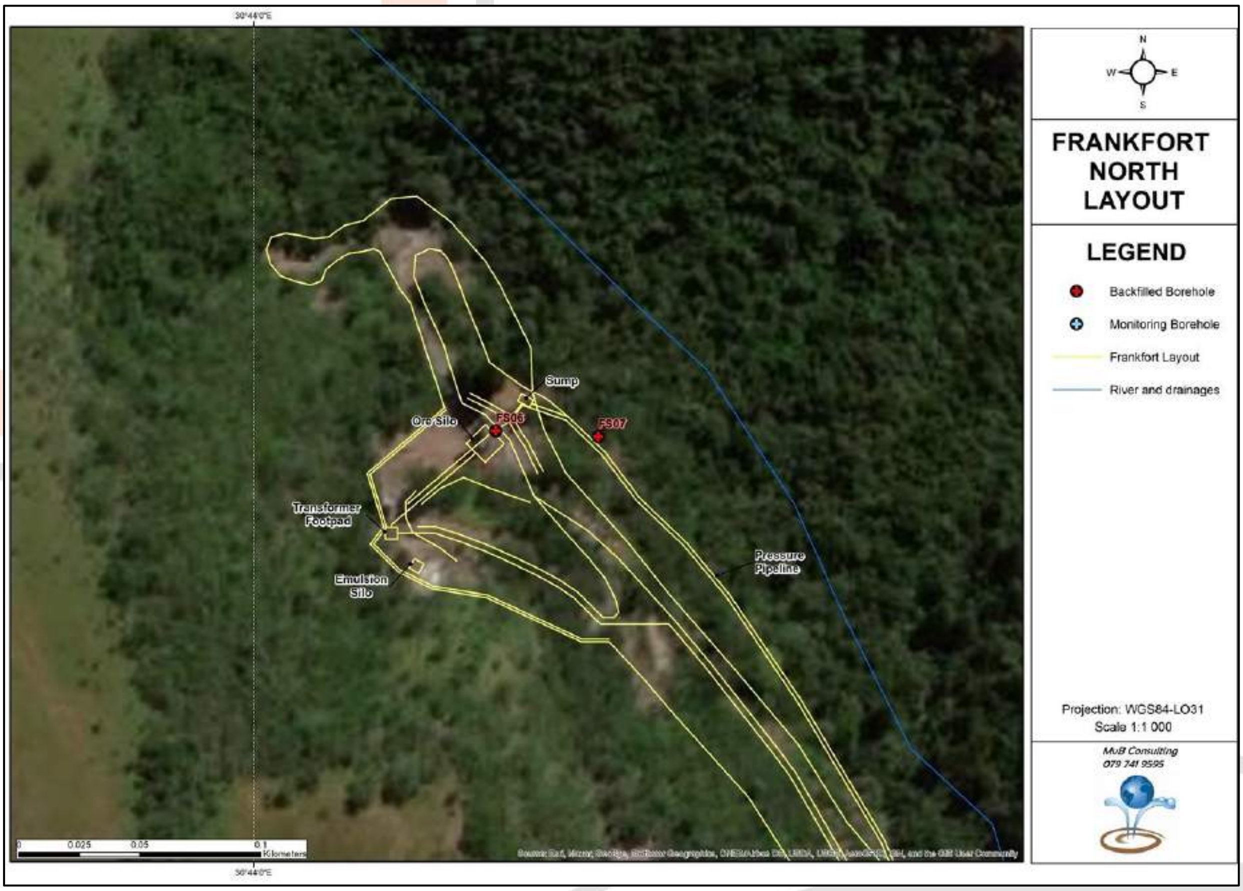


Figure 40: Frankfort North area drilled boreholes (MvB Consulting, 2022)

Figure 41: Dukes area drilled boreholes (MvB Consulting, 2022)

Figure 42: Morgenzon area drilled boreholes (MvB Consulting, 2022)

9.6 TOPOGRAPHY AND DRAINAGE

The project area is located in the midst of the Drakensberg mountain range, with Pilgrims Rest at an elevation of 1,300 m above sea level and the Lowveld stretching eastwards from the Great Escarpment with an elevation of under 750 metres above mean sea level (mamsl). The project area is dissected by river erosion, with the Blyde River Canyon reaching a depth of over 770 m (GCS, 2005).

Figure 43 shows the regional topography, as well as the drainage system within the study area and environs. The Blyde River is the primary drainage feature in the study area.

The project is located in the upper Blyde River catchment, within quaternary catchments B60A (Plant, TSF, Beta North and CDM), and B60B (Frankfort) in the Olifants Water Management Area (WMA) (**Figure 44**). The project area is drained by a number of non-perennial drainage lines, which are tributaries of the Blyde River. The Blyde River has its source approximately 20 km southwest of the project and flows into the Blyderivierpoort Dam 40 km to the northeast of the project. From the Blyderivierpoort Dam, the Blyde River continues in a northerly direction for approximately 45 km, until its confluence with the Olifants River, near the town of Hoedspruit (Hydrospatial, 2020).

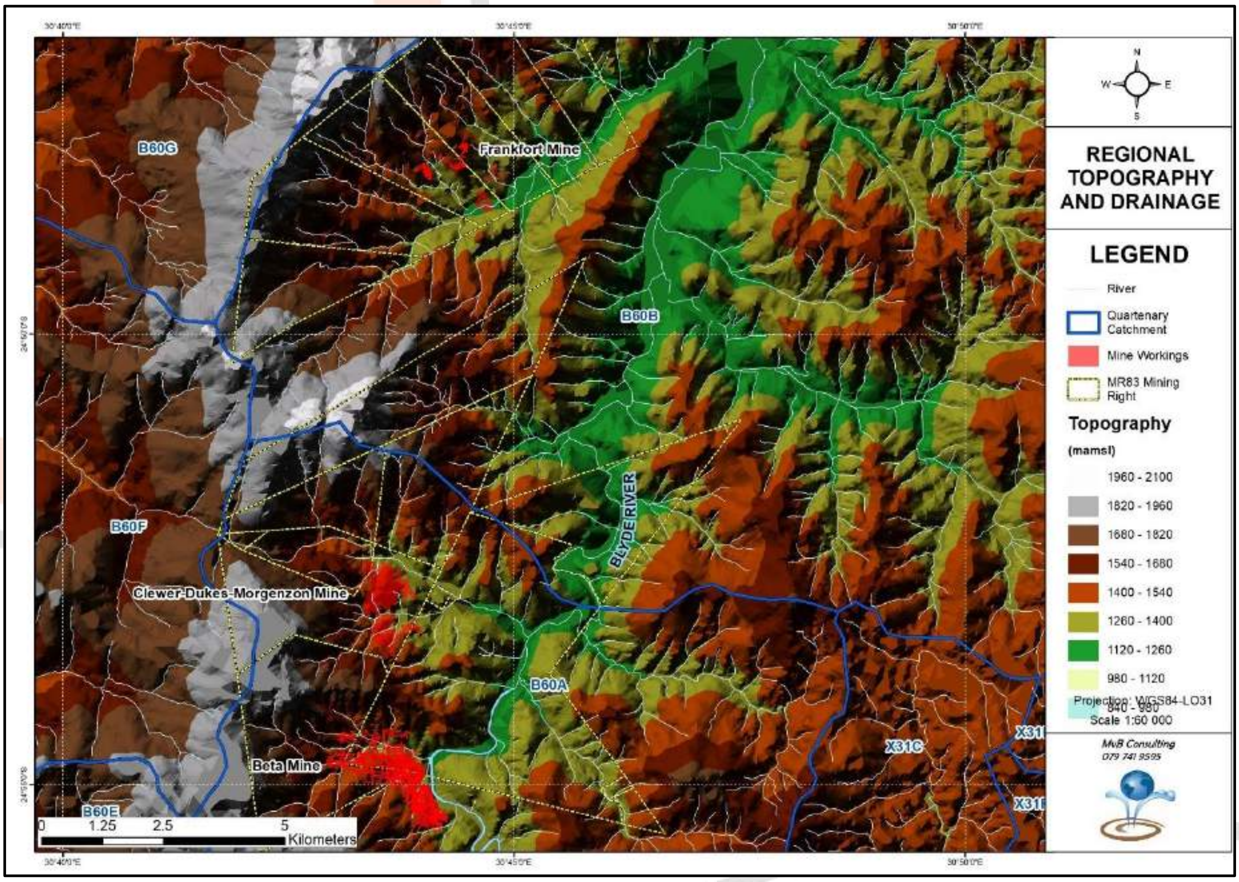


Figure 43: Regional Topography and Drainage (MvB Consulting, 2022)

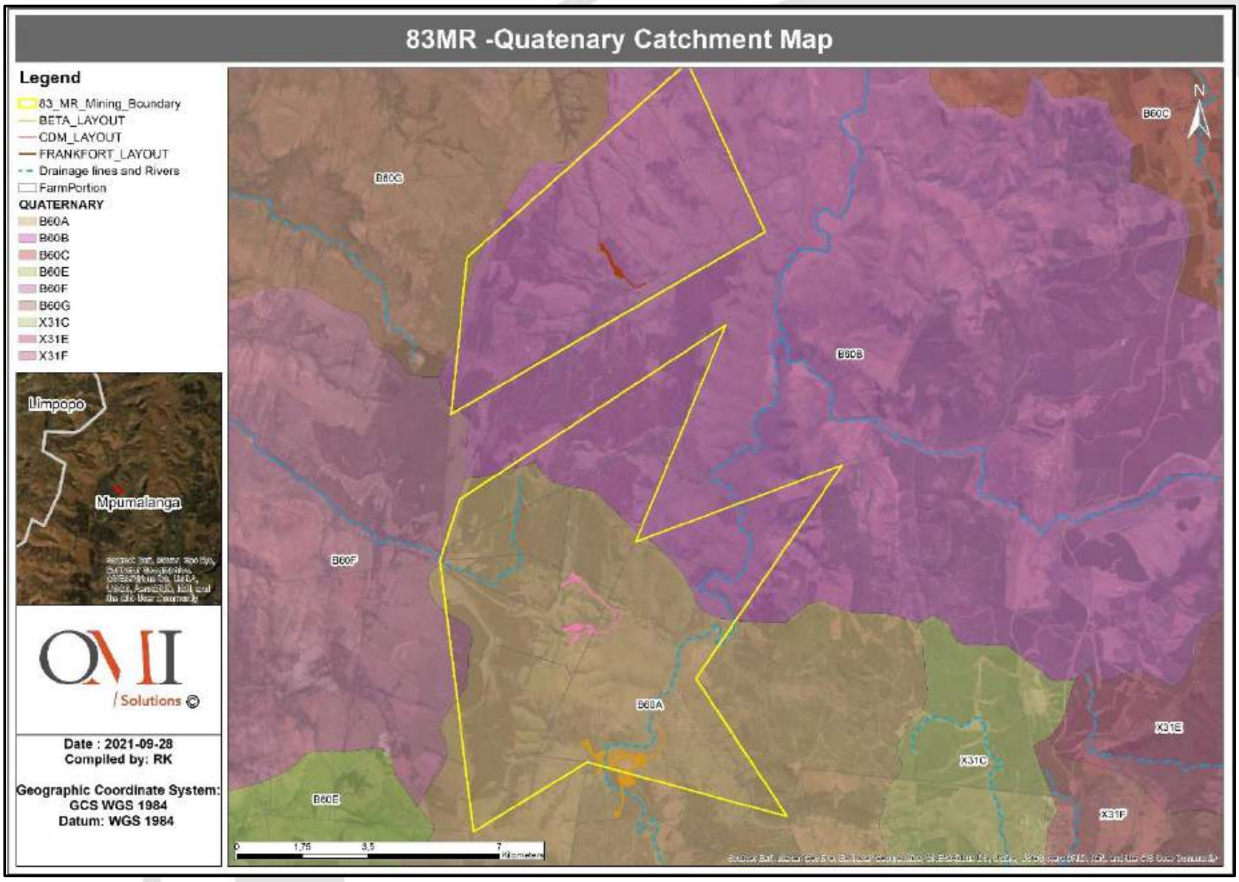


Figure 44: Quaternary Catchment Map

9.7 SOIL AND LANDUSE CAPABILITY

Scientific Terrestrial Services CC (STS) was commissioned to undertake a soil, land use and land capability assessment as part of the studies to identify risks to the proposed project. The report is attached as ANNEXURE J of this report.

A high-level site visit was undertaken from 19 to 22 April 2021, with further detailed verification conducted in January 2022, on the soil, land use and land capability of the various sites. Subsurface soil observations were made using a manual hand auger in order to assess individual soil profiles, which entailed evaluating physical soil properties and prevailing limitations to various land uses. The results of the survey are presented below.

Current land use activities associated with the investigation area and surrounding areas are mainly wilderness, forestry, and historic mining infrastructure. No large-scale commercial agricultural activities were observed (STS (d), 2022)

In South Africa, agricultural land capability is usually restricted by climatic conditions, especially water availability (rainfall). Even within similar climatic zones, different soil types typically have different land use capabilities attributed to their inherent characteristics. High-potential agricultural land is defined as having the soil and terrain quality, growing season and adequate available moisture supply needed to produce sustained economically high crops yields when treated and managed according to the best possible farming practices (Scotney et al., 1987). For this assessment, the land capability was inferred in consideration of observed limitations to land use due to physical soil properties and prevailing climatic conditions. Climate Capability (measured on a scale of 1 to 8) was therefore considered in the agricultural potential classification.

The investigation area falls into Climate Capability Class 2, with local climate that is suitable for good yield for a wide range of adapted crops throughout the year. The identified soils were classified into land capability classes using the Scotney et. al. Land Capability Classification system (Scotney et al, 1987). **Table 14** presents the dominant soil forms and their respective diagnostic horizon sequence which is illustrated in **Figure 45**.

The area is comprised of 4 soil forms namely, the Mispah/Glenrosa, Nkonkoni/Vaalbos, Dundee associated with the watercourses and Witbank soil forms. Based on the inherent soil properties the agricultural potential is considered to be of moderate, restricted to a very low agricultural potential for the Nkonkoni/Vaalbos, Mispah/Glenrosa and Witbank soil forms respectively.

The soils of Nkonkoni and Vaalbos formation were identified within the Beta and Dukes areas. These soils are characterised by development in well-drained oxidising environmental conditions (warm and moist) which allows for iron oxide (hematite) coating on soil particles thus resulting in the dominating red colours of the soils. In some instances, the red colour can be as a result of the iron-rich parent material. Besides depth limitations these soils can be considered marginally suitable for cultivation due their well-drained conditions, good aeration and sandy to loam textural class.

Lithic soils such as the Mispah/Glenrosa are typically shallow in nature. The shallow depth can be attributed to limited rock weathering and convex topographical conditions at the crest or scarp of a hillslope resulting in removal of soil and in some instance leaving rocky outcrops behind. Based on the degree of weathering some lithic material of varying sizes can be mixed intimately with soil material. These types of soils are usually avoided for intensive use and thus left for grazing, forestry, and wildlife land uses. Refer to **Figure 46** for photos of the dominant soils.

The Dundee soils form is associated with watercourses due to the unconsolidated soil material as a result of deposition by water. These soils are characterised by little evidence of pedogenic horizonation and may contain weathered hard rock fragments sometimes identified as pebbles. These soils typically occur on low lying terrain positions.

The Witbank (Anthrosols) soil forms are soils which have been subjected to physical disturbance because of human interventions. Such interventions include transportation and deposition of the earth material containing soil. As a result, these soils are not ideal for agricultural cultivation.

It is evident from **Figure 45** that around the footprint areas the dominant land capability is Grazing VII, associated with the Mispah and Glenrosa soil forms. The identified Mispah/Glenrosa soil forms are of poor (Class VII) land capability and are not suitable for arable agricultural land use. These soils are, at best, suitable for natural pastures for light grazing. Therefore, these soils are not considered to make a substantial contribution to extensive subsistence farming on a local scale.

Areas along drainages and rivers are classified as Grazing V, associated with Alluvial soils. The footprint areas of the sites are classified as Wildlife Class VIII – Witbank soils - as these soils are associated with previous disturbance. These identified Witbank soils have very poor (class VIII) land capability attributed to forestry and mining activities. In addition, some of these soils have been subjected to long term compaction and erosion. This land capability class also includes areas where the original soil has been buried and/or extensively modified by anthropogenic activities. These soils are not considered to make a significant contribution to agricultural productivity even on a local scale (STS (d), 2022).

Table 14: Land Capability Classes for Soils within the Investigation Area[61]

Soil Form	Land Capability	Land Potential	Area (ha)	Percentage (%)
Nkonkoni/Vaalbos	Arable (Class III)	High potential (L2)	24.20	13.5
Dundee/Blyde River	Watercourse (Class V)	Good Potential (L3)	13.14	7.4
Mispah /Glenrosa	Grazing (Class VI)	Moderate potential (L4)	63.96	35.8
Witbank	Wildlife (Class VIII)	Very restricted potential (L6)	76.75	42.9
Total Enclosed Area			**178.75**	**100**

[61] *Residential areas of 0.71 ha (8.1%) areas were not included in the table above since they not considered in the land capability ratings.

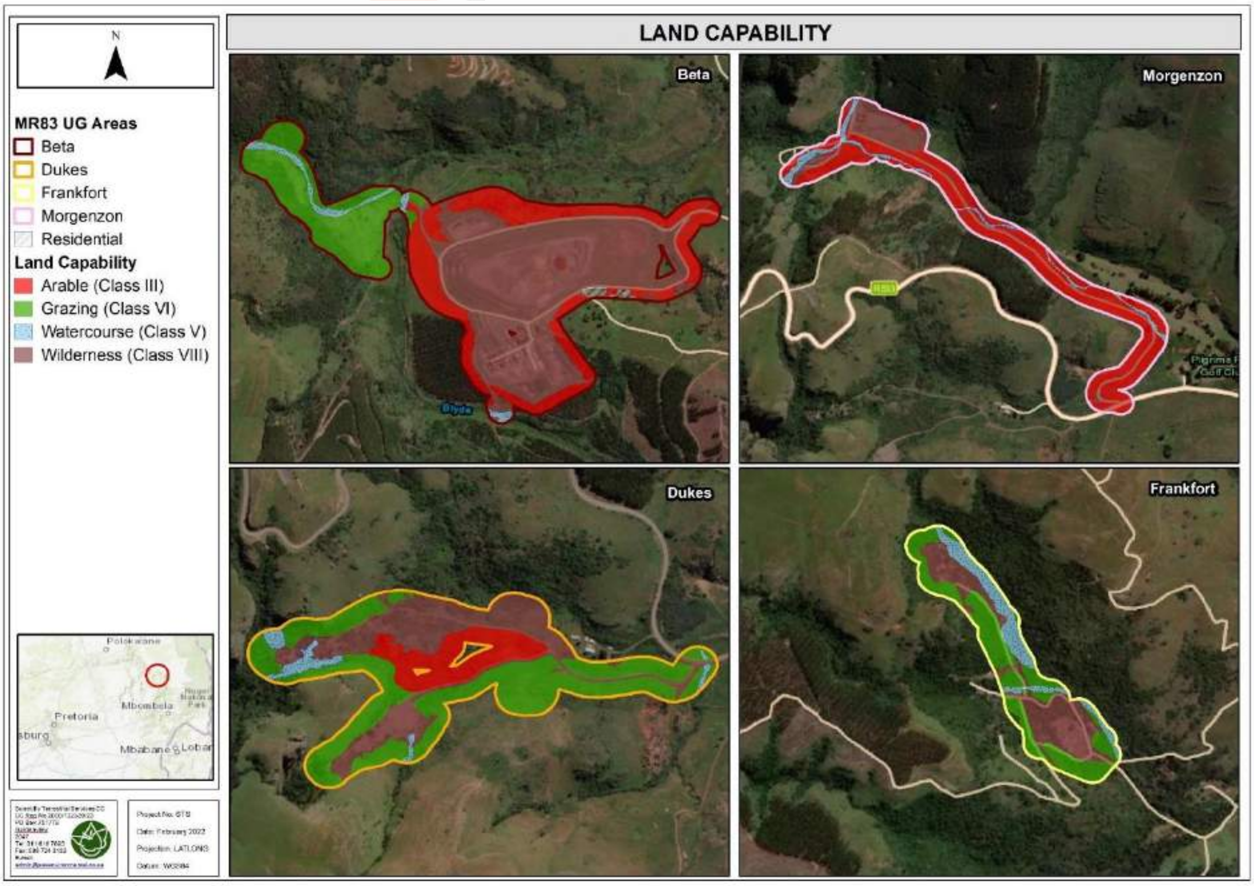


Figure 45: Map of Land Capability Classes of Soils within the Investigation Area (STS (d), 2022)

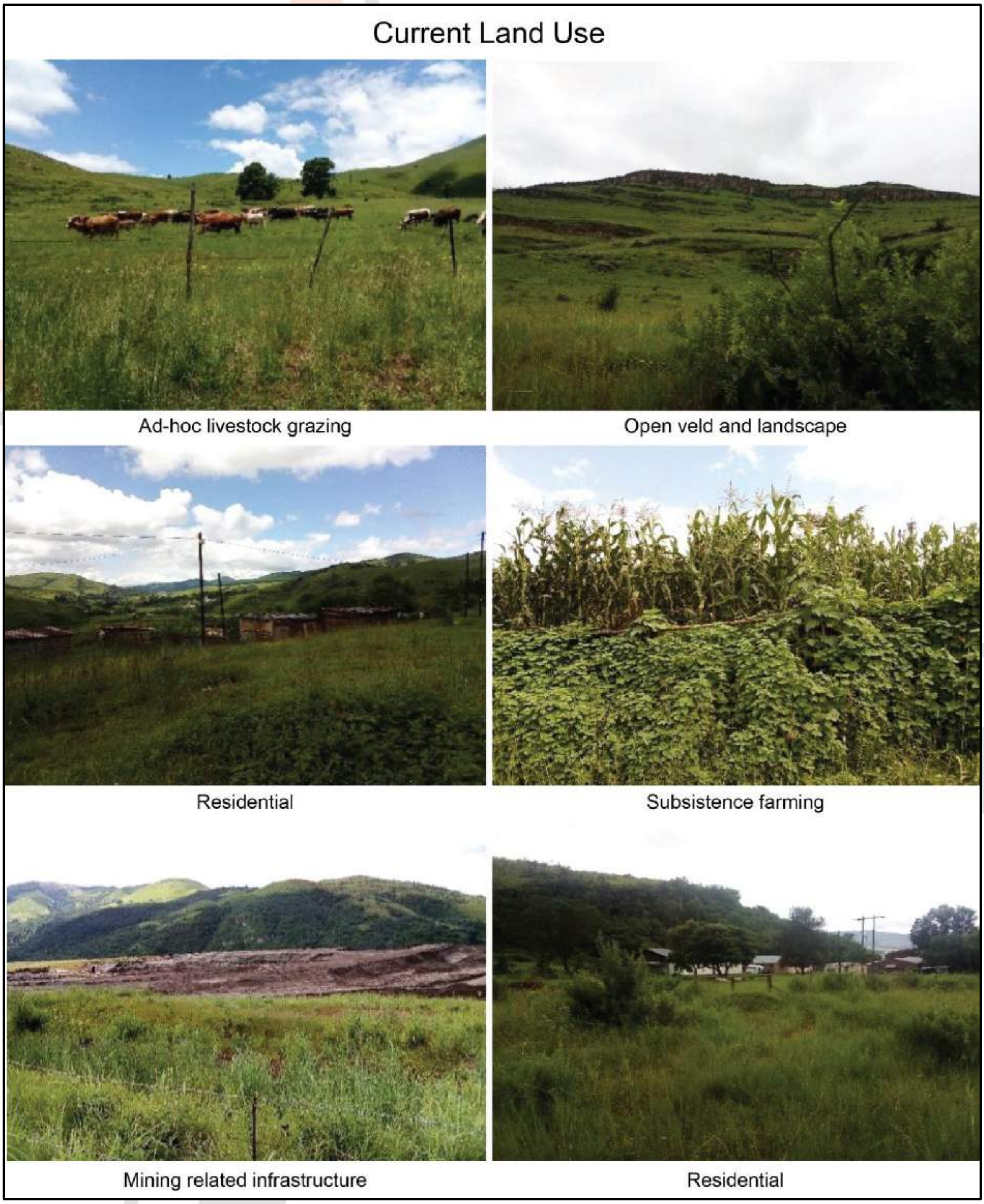


Figure 46: Photographic Presentation of the Dominant Land Uses Associated with the 83MRAreas

9.8 SURFACE WATER BASELINE

This section describes the surface water quality baseline as assessed by OMI (2022). The report is attached as ANNEXURE K, and outlines the surface water conditions across the project area. The scoping level report was based on sampling results from May 2020 to September 2021. For the EIA, the results were extended to include sampling results from October 2021 to February 2022. To provide a longer-term overview, the available historical results, dating back to April 2012, were used.

Historic data was obtained from TGME for the period April 2012 to April 2020. A detailed sampling campaign, during which samples were analysed in a South African National Accreditation System (SANAS)-accredited laboratory for an extensive range of variables, was conducted by OMI from May to September 2020. For subsequent months, TGME's sampling results were used.

There are gaps in the historical data. Furthermore, as none of the sites are currently operational and access to some areas is often prohibited by illegal miners, the more recent data sets are not complete. The available data is, however, sufficient for assessing the baseline conditions, and for drawing conclusions as to the current status of the area's surface water.

9.8.1 BASELINE QUALITY AROUND METALLURGICAL PLANT AREA

Sampling points are located above and below the plant in the Blyde River, and above and below Beta North adit in Peach Tree stream and the Blyde River. The sampling points are indicated in **Figure 49**.

Analysis of the samples upstream of the plant generally shows a neutral pH, low salt load, and low concentrations of iron, manganese, and sulphates. These results indicate that the Blyde upstream of the TGME footprint is unimpacted by TGME's activities.

It is, however, known that illegal mining activities take place in the area, and illegal miners have often been seen washing ore in the Blyde upstream of the plant. The June 2020 results show a spike in Total Dissolved Solids (TDS), Sulphates, Magnesium, Sodium and Calcium, and a substantial drop in pH (potential of hydrogen - a measure of how acidic/basic water); this most likely resulted from artisanal mining, given that it is upstream of TGME.

Comparing upstream to downstream (relative to the plant), the downstream results do not show the same spikes in values in June 2020. This suggests that the activities causing the variations were localised around point S3 (in the Blyde river upstream of the plant), and not propagated downstream towards S5 (in the Blyde river downstream of the plant). This supports the notion that the water quality was affected by illegal mining activities above S3.

The high concentrations of Nitrates indicate illegal blasting is taking place upstream of TGME's footprint. It could also indicate organic material and sewage entering the stream; however, there was no evidence of sewage generating sources above S3. The cause could also be organic matter although there was little to no evidence of major cow grazing around this point. Looking at the other variables, the spikes all indicate possible mining activity – which aligns with the visible sites of illegal mining activity observed.

Historical data is available for pH, Electrical Conductivity (EC) and TDS. Plotting these values shows how variable values started fluctuating in early 2017, which is when illegal mining activities started escalating (**Figure 50)**. This is particularly noticeable in the pH, especially at Beta causeway (S5), there is more illegal mining activity in that area than in the Blyde above the plant (S3). Apart from the spike in June 2020, EC and TDS values have remained stable in the Blyde above and immediately below the plant.

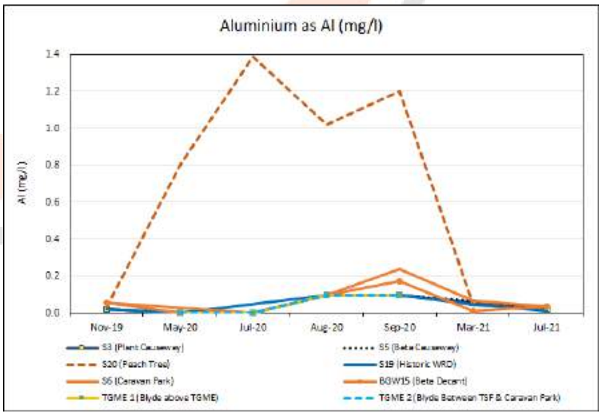
9.8.1.1 ANALYSIS OF METALS IN BLYDE RIVER

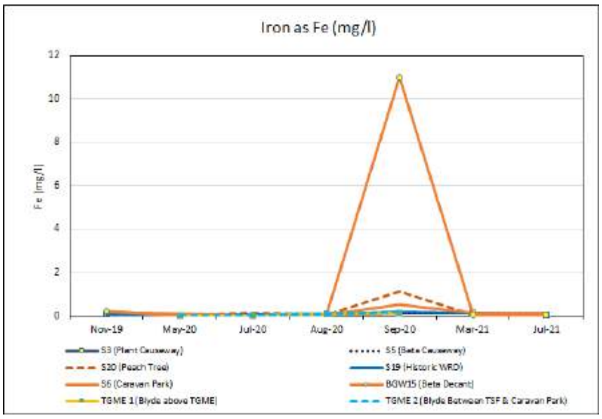
As part of the May to September 2020 sampling run, the metal content was analysed in the Blyde River above and below the plant, and in streams which flow into the Blyde in that area; notably Peach Tree and the Beta North adit.

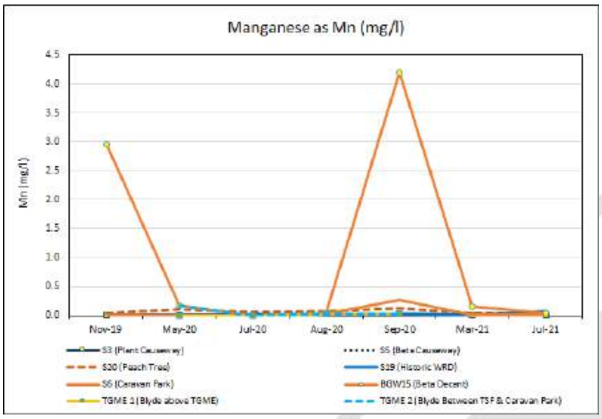
TGME's quarterly monitoring include Aluminium, Iron and Manganese, in line with the approved WUL. There are gaps in the data before November 2019, hence the graphs in **Figure 47** focus on the available, contiguous data, which is mostly obtained from the OMI sampling campaign in 2020.

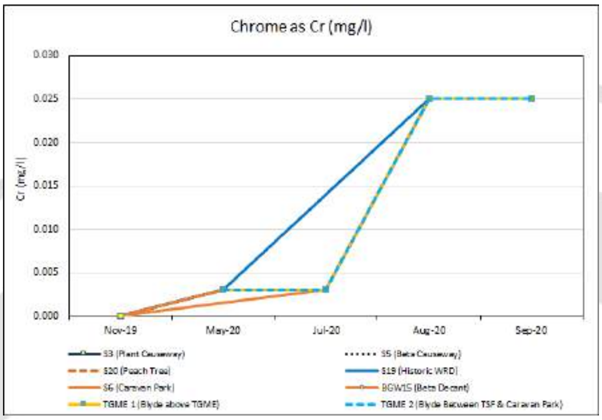
The TGME analyses exclude Chrome, Copper, Nickel, Zinc and Lead. The groundwater study conducted for the EIA (MvB Consulting, 2022) recommends these be included, due to the potential for these metals leaching into the Blyde river system and the resulting risk of contamination downstream.

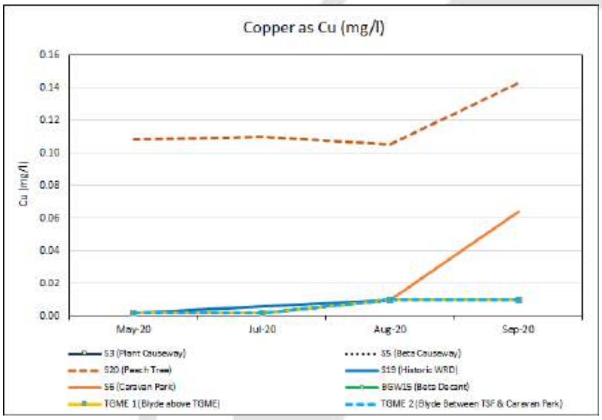
The limited data is not conclusive. There are spikes in most concentrations in the September 2020 values, especially high up in Peach Tree and at the Beta North Decant. Both areas are known to be active illegal mining sites, which may explain the elevated concentrations. The points downstream show the same effects, but at lower concentrations, which would be a result of dissipation in the water's flow.

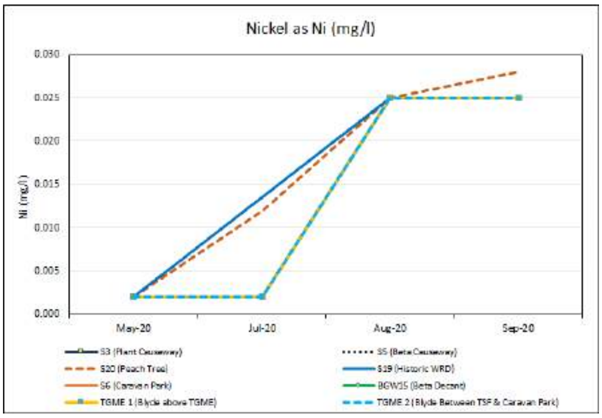












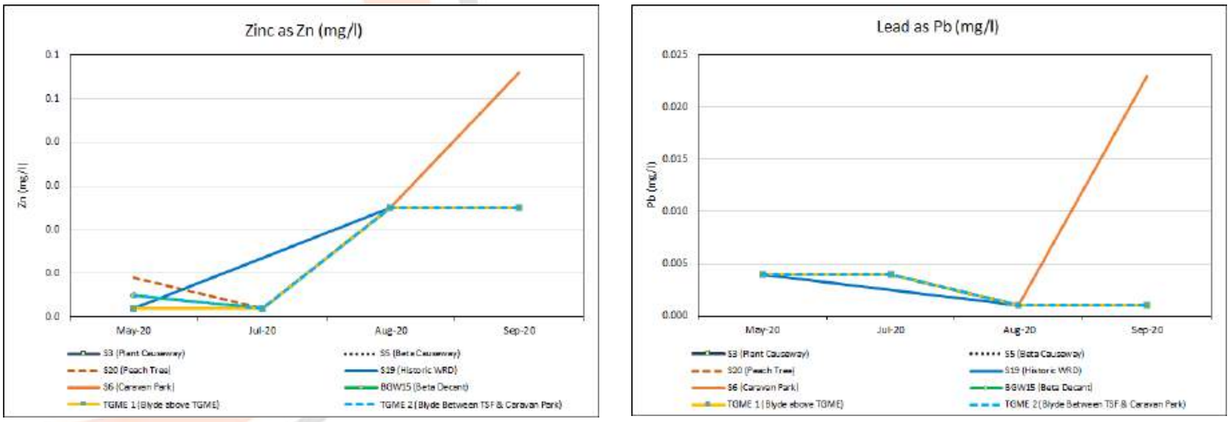


Figure 47: Analysis of Metals Present in the Blyde River and Peach Tree Stream

There is likely that leaching of metalliferous minerals into the surface water occurs in the right conditions, given that the mineral deposits in the area are often close to the surface.

9.8.2 BASELINE QUALITY AROUND BETA AND TSF

Samples were taken in Peach Tree stream upstream and downstream of the visible illegal mining activities, upstream and downstream of the inflow from Beta North adit's decant, and in the Blyde River at the Peach Tree confluence and beyond (**Figure 49**).

It is important to note that there is confirmed illegal mining activity at Beta North. These operations source gold bearing ore from multiple locations and do crushing and washing for gold recovery in Peach Tree stream. The products of the liberation process include acidity, sulphates, and oxidised metals. The volumes of ore being processed by these illegal activities varies but the effects have been seen downstream in the Blyde river and will accumulate over time. **Figure 48** shows a washing station in Peach Tree and visible residue in the Blyde River at the river crossing behind the caravan park.

Slow upward trends in the TDS values were observed at all the points upstream and downstream of the Beta adit. Although there is limited data for sulphates, this concentration does also appear to be steadily increasing. The pH vacillates but remains above the IWUL minimum everywhere except at Peach Tree inflow - the point in Peach Tree above the visible workings. Other variables, including EC, TDS, and sulphates, also spike in June 2020 and again in July 2021, which suggests that ore washing was being done around the time the samples were taken. These spikes are mirrored at all the downstream points.

Figure 48: Effects of Illegal Mining Activity in Peach Tree Stream & Blyde River October 2021

The huge variations in pH in Peach Tree stream can only be explained by the illegal mining activities; there is clear evidence of ore washing in the stream, which is due to the dump next to the stream is being steadily reworked. Tunnels are also visible under the historical mine dump. The build-up of Nitrates downstream in the Blyde River indicates that illegal blasting is taking place.

When plotting the historical data, the change in data stability from early 2017 are again noticeable – this was when illegal mining became rife in the area. This is especially visible in the pH of the streams, which are sensitive to the artisanal mining activities such as washing of ore from underground. Refer to **Figure 51**.

9.8.3 BASELINE QUALITY AROUND CDM

9.8.3.1 MORGENZON

The sampling points are shown in **Figure 52**. The overall surface water quality in the Morgenzon Creek upstream and downstream of Morgenzon/Clewer is generally good, with parameters within the IWUL limits. The water at the historically flooded Morgenzon adit shows the impact of previous mining activities, with elevated sulphates, calcium and magnesium, and thence high TDS values. Decant volumes were low when sampling was done and thus one would not expect much impact from this source on either surface or groundwater at that time. This is confirmed by analysis results at both the nearby borehole and the downstream sampling point.

Illegal miners are known to be active in this area, and the results of their activities can be seen in some of the other elements analysed. For example, the pH at all three monitoring points is very variable. The peaks and troughs correspond to the peaks and troughs in the TDS values and in the EC values. The nitrates show similar troughs, but also show an upward trend. These results point to blasting activity as well as for ore washing.

As with the other shaft areas, there is a shift in the data trends during 2016. pH fluctuations are around lower (more acidic) values, with most streams showing a very slight downward trend. The general trends for EC and TDS follow rainfall patterns, with increased TDS during winter months, and lower values in the summer rainfall months, indicating that the rainwater clears the dry season build-up in the streams. Refer to **Figure 53**.

TGME is not undertaking any mining activities in this area, and therefore the current conditions do represent the baseline before mining commences according to the proposed Mining Work Programme.

9.8.3.2 DUKES

It should be noted that no sampling has been possible around Dukes Upper and Dukes Lower during the period under review, due to aggressive behaviour from illegal miners exploiting the area.

9.8.4 BASELINE QUALITY AROUND FRANKFORT

Surface water quality around Frankfort is generally good. The monitoring points are shown in **Figure 54**.

The EC in the water samples taken near the TGME shafts - from the waterfall, Theta stream and Bevetts stream - are consistently low. The same trends are seen in TDS and sulphates. The pH is generally below the IWUL limit. These points are located in tributaries that join the Molototse before the hostel monitoring point, and thus are not causing the values seen in the Molototse itself. This suggests that another tributary is causing the contamination, which manifests as increased conductivity and sulphate contamination.

The pH and the EC in the Molototse downstream of the old Frankfort hostel and near the Vaalhoek road have been fluctuating substantially since November 2020. The reason for these fluctuations is not clear. Of interest is the Nitrates which spiked at both Bevetts stream and the hostel measuring point in June 2020, indicating blasting activities in the area. There is known illegal miner activity in the area.

The pH of all the streams significantly change from late 2016, the spike in early 2017, and then fluctuate around lower values. All of the streams show a downward trend in pH values which could be associated with the washing of gold-bearing minerals in the streams, releasing acidic compounds into the water (Figure 55). TDS and EC fluctuations are larger than before approximately mid-2016, and the streams most affected by illegal mining (Molototse River and Bevetts Stream) show upward trends in both EC and TDS (as is to be expected due to the largely linear relationship between the two variables).

As with the other sites, TGME has not conducted any mining activities here, hence the current conditions can be taken as the baseline conditions pre-TGME proposed activity.

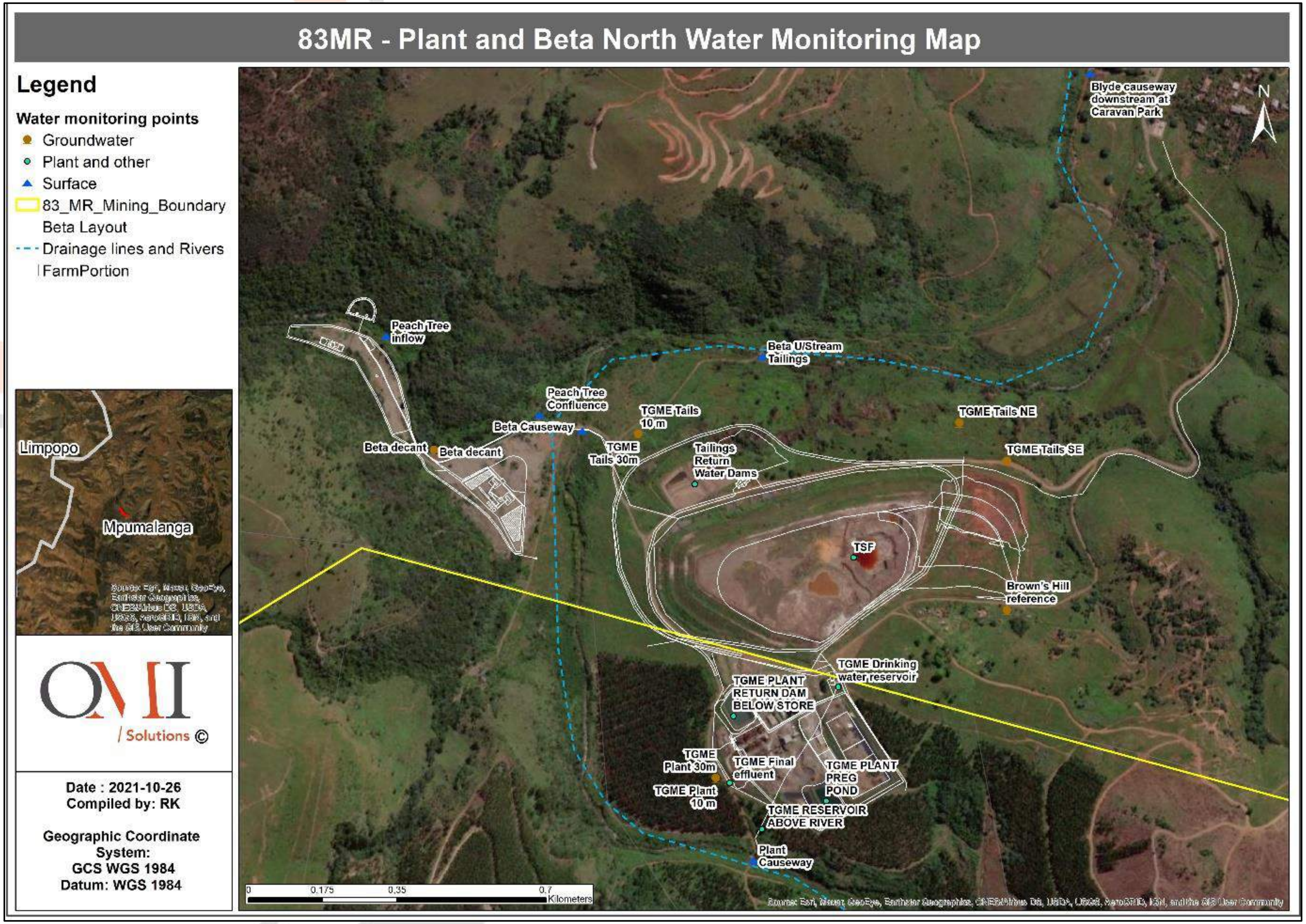


Figure 49: Water Monitoring Points: Plant Area, TSF & Beta North

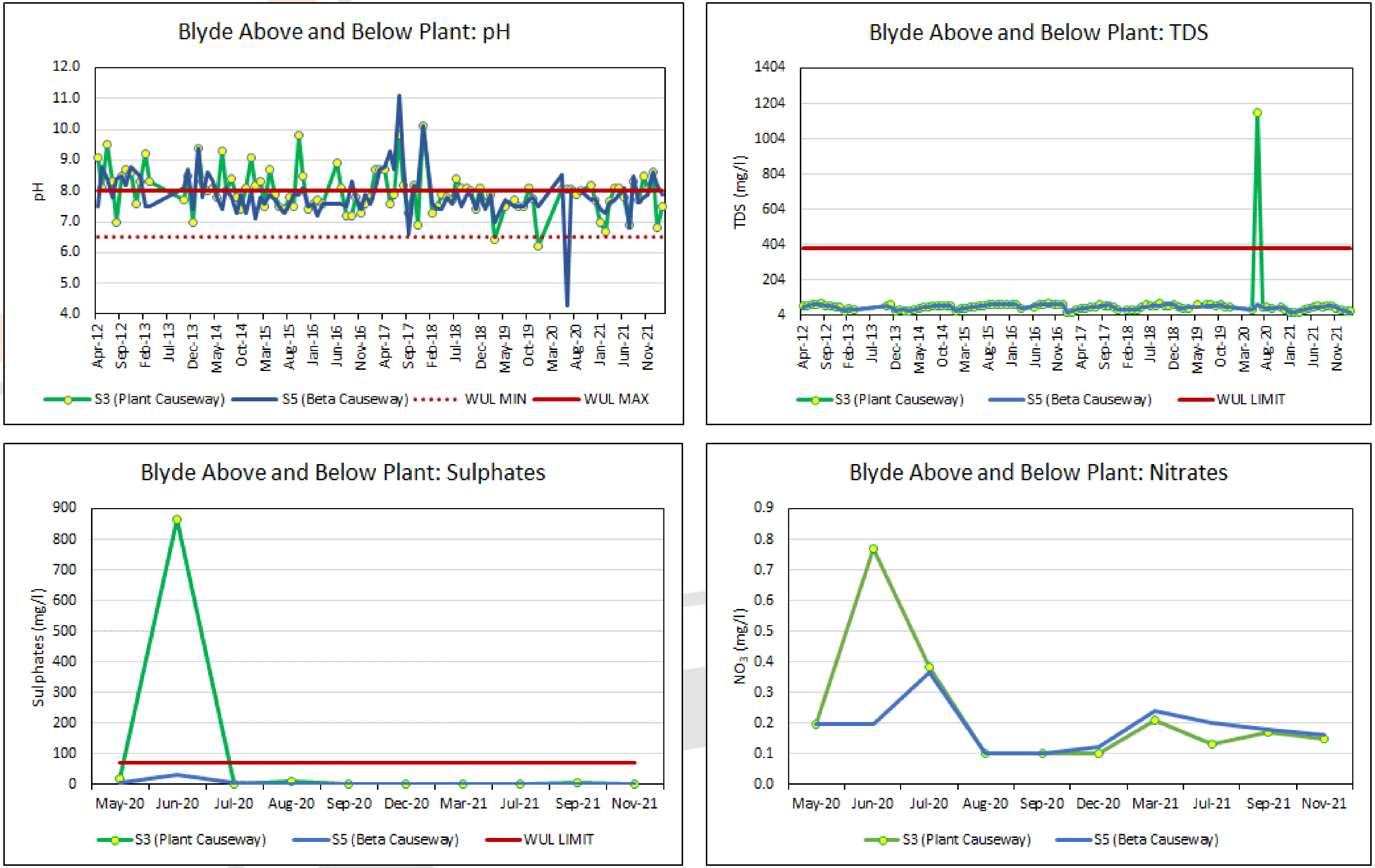


Figure 50: Blyde River Quality Upstream and Downstream of Metallurgical Plant

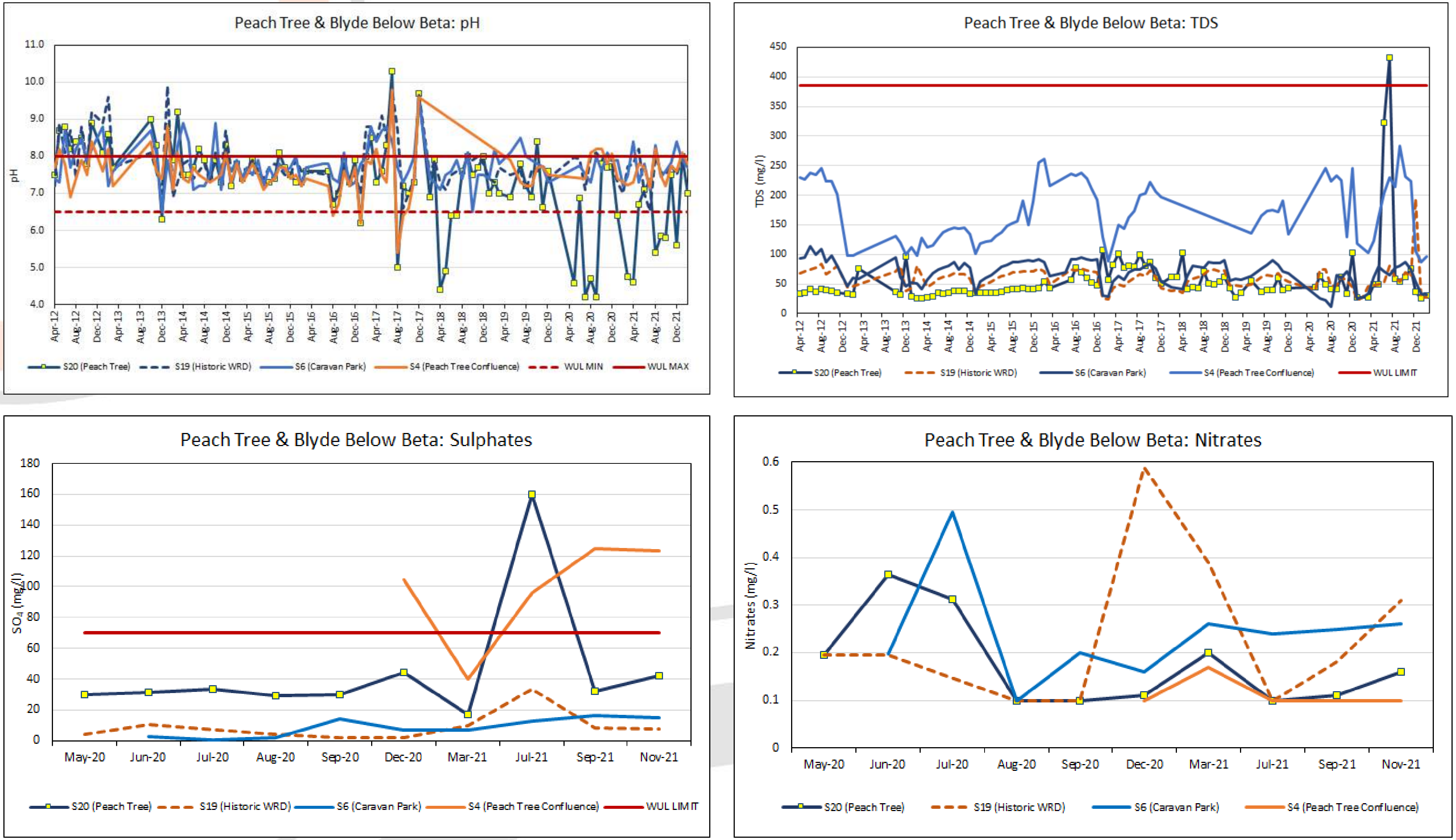


Figure 51: Surface Water Quality - Peach Tree & Blyde River

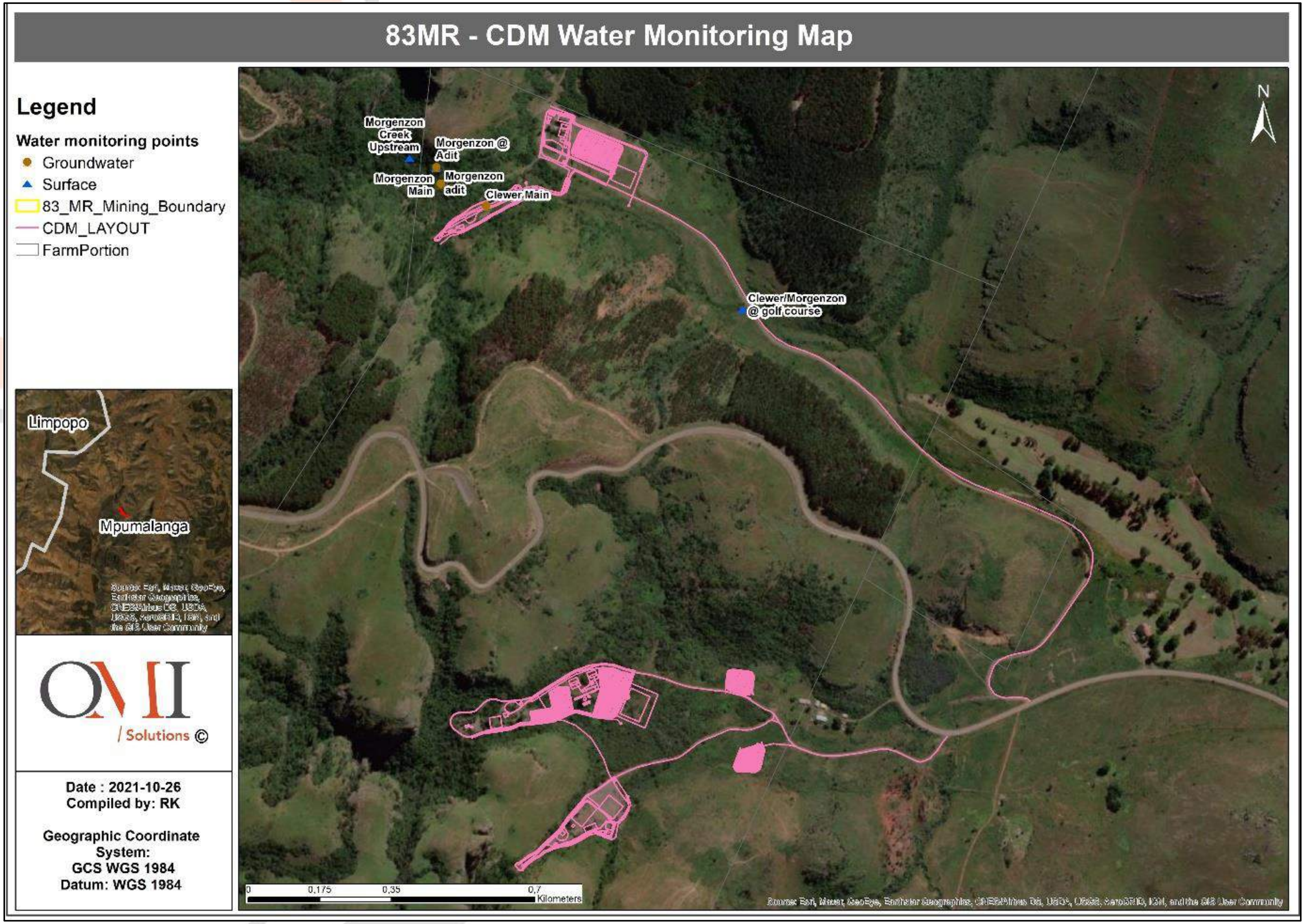


Figure 52: Water Monitoring Points: Morgenzon

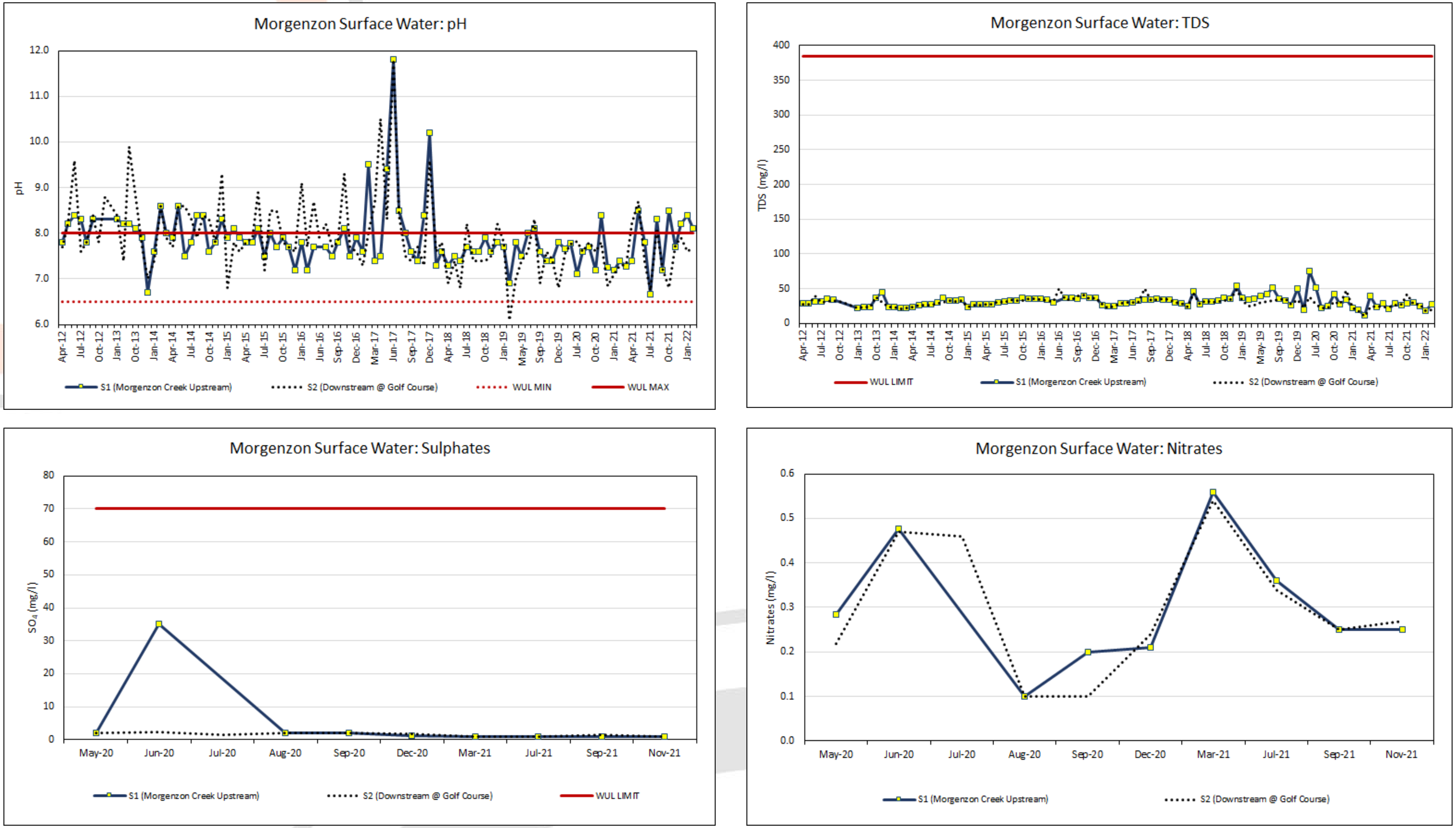


Figure 53: Morgenzon Surface Water Quality

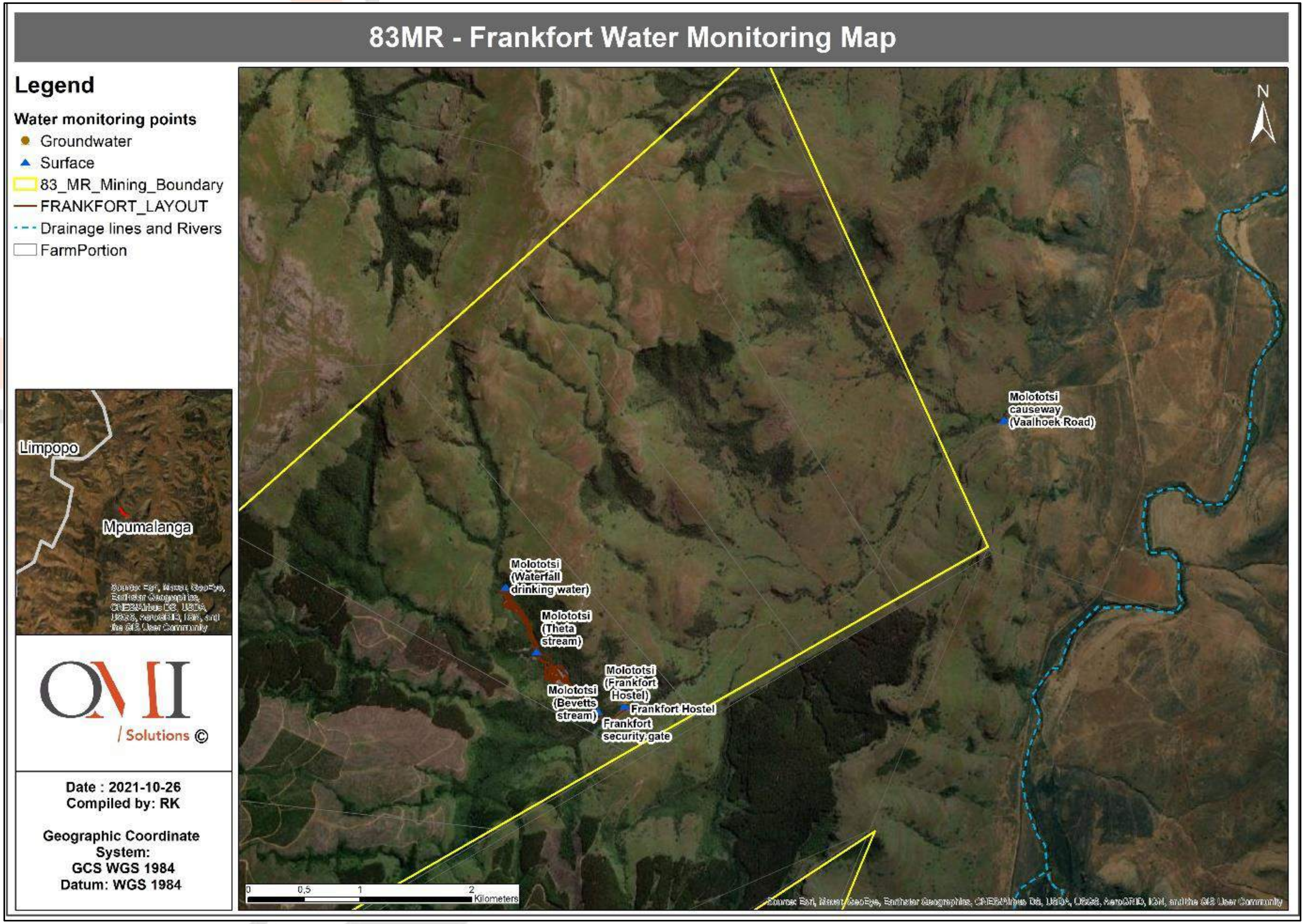


Figure 54: Water Monitoring Points: Frankfort

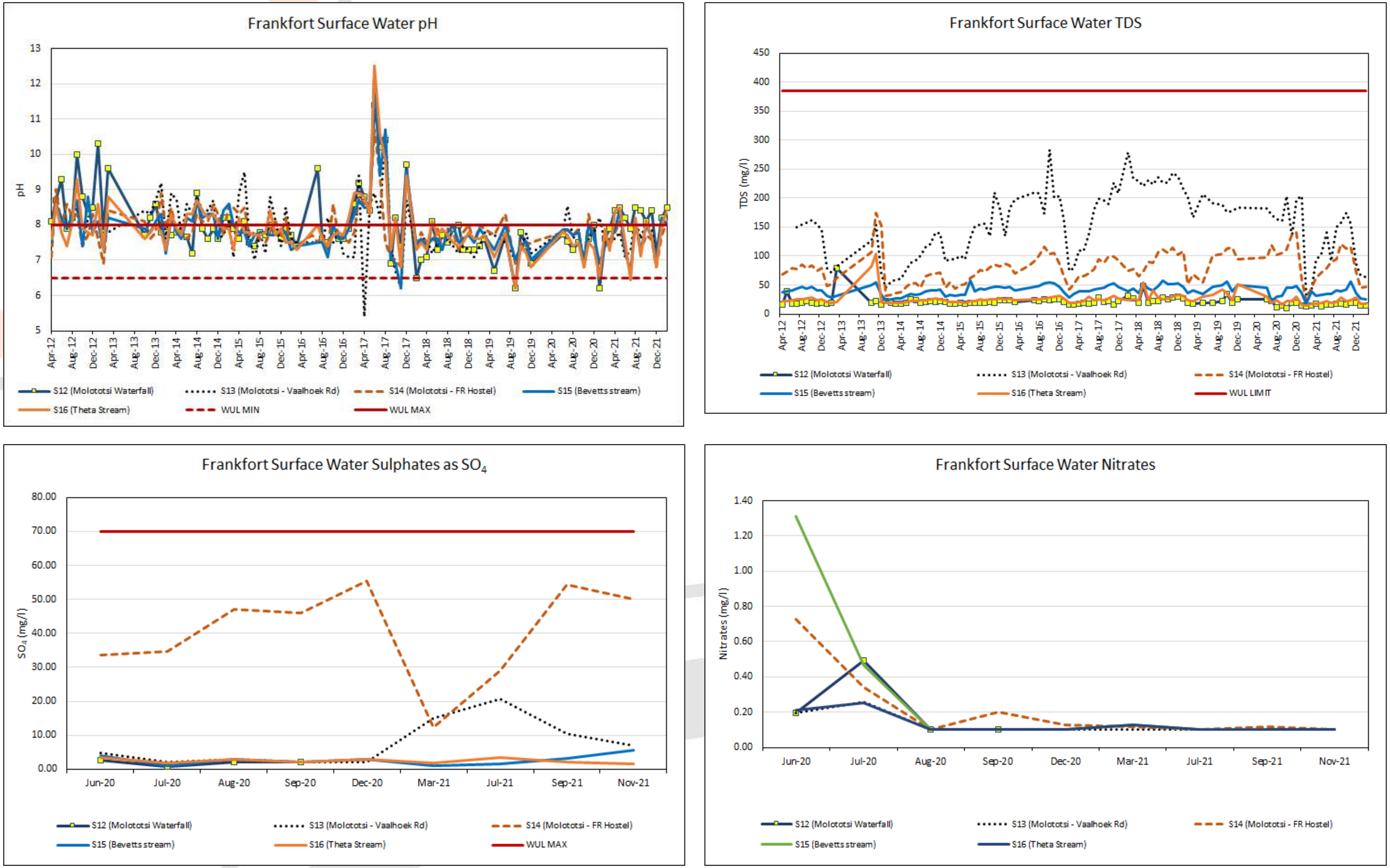


Figure 55: Surface Water Quality around Frankfort

9.9 GEOHYDROLOGY

The following section describes the methodology and findings of the geohydrological EIA assessment done by MvB Consulting (2022). The report is attached as ANNEXURE L.

9.9.1 HYDROSENSUS

Groundwater boreholes in the region are scarce and mainly restricted to scattered mine investigative/monitoring boreholes. Boreholes drilled during previous investigations were used to form an understanding of the geohydrological regime of the study area. This understanding was supplemented by information obtained from exploration boreholes in the study area (MvB Consulting, 2022).

The localities of the available boreholes are shown in **Figure 56** and the geohydrological borehole information is summarised in **Table 15**.

Table 15: Hydrosensus Borehole Information (MvB Consulting, 2022)

Borehole ID	Locality	Coordinates			Depth	Groundwater Level	
		Longitude	Latitude	Collar	(m)	(mbs)[62]	(mamsl)
BGW1	TGME Plant	30.7381	-24.9187	1280.00	10	Dry	Dry
BGW2	TGME Plant	30.7381	-24.9187	1280.00	Unknown	28.00	1252.00
BGW3	TGME TSF	30.7364	-24.9120	1260.00	Unknown	8.00	1252.00
BGW4	TGME TSF	30.7364	-24.9120	1260.00	Unknown	8.00	1252.00
BGW5	Brown Hill	30.7448	-24.9153	1314.57	Unknown	Dry	Dry
BGW6	TGME TST SE	30.7441	-24.9125	1279.10	Unknown	46.00	1233.10
BGW7	TGME TSF NE	30.7438	-24.9119	1268.84	38	35.00	1233.84
BGW9	Clewer Main	30.7258	-24.8749	1320.00	Unknown	5.00	1315.00
BGW10	Morgenzon Main	30.7245	-24.8747	1320.00	Unknown	5.00	1315.00
BGW16	Frankfort	30.7430	-24.8097	1260.00	Unknown	6.52	1253.48
TG2	TGME Plant	30.7401	-24.9198	1286.84	30	25.57	1261.27
TG1	TGME Plant	30.7363	-24.9124	1262.05	30	8.70	1253.35
TG1-SM	TGME Plant	30.7361	-24.9125	1260.80	10	8.85	1251.95
HMB1	Hermansburg	30.7455	-24.7750	1654.36	117	73.00	1581.36
HMB2	Hermansburg	30.7515	-24.7789	1580.00	60	Dry	Dry
HMB3	Hermansburg	30.7641	-24.7737	1480.90	133	117.00	1363.90
BH3	TGME TSF	30.7400	-24.9128	1279.95	Unknown	Dry	Dry
DG1-BH1	Trend deposits	30.7660	-24.9238	1465.51	Unknown	Dry	Dry
DG2-BH1	Trend deposits	30.7660	-24.9238	1465.51	Unknown	Dry	Dry

[62] mbs = metres below surface

Borehole ID	Locality	Coordinates			Depth	Groundwater Level	
		Longitude	Latitude	Collar	(m)	(mbs)[62]	(mamsl)
BH North	Bourke's Luck	30.8084	-24.6819	1152.25	Unknown	45.00	1107.25
Vaalhoek 2#	Vaalhoek Shaft	30.7681	-24.7599	1263.26	Unknown	137.00	1126.26
Frankfort BH	Frankfort	30.7432	-24.8096	1260.00	Unknown	6.52	1253.48
Fountain	Vaalhoek	30.7718	-24.7501	1307.86	Unknown	0.00	1307.86
Forestry BH	Golf Course	30.7447	-24.8856	1269.05	Unknown	Locked	Locked

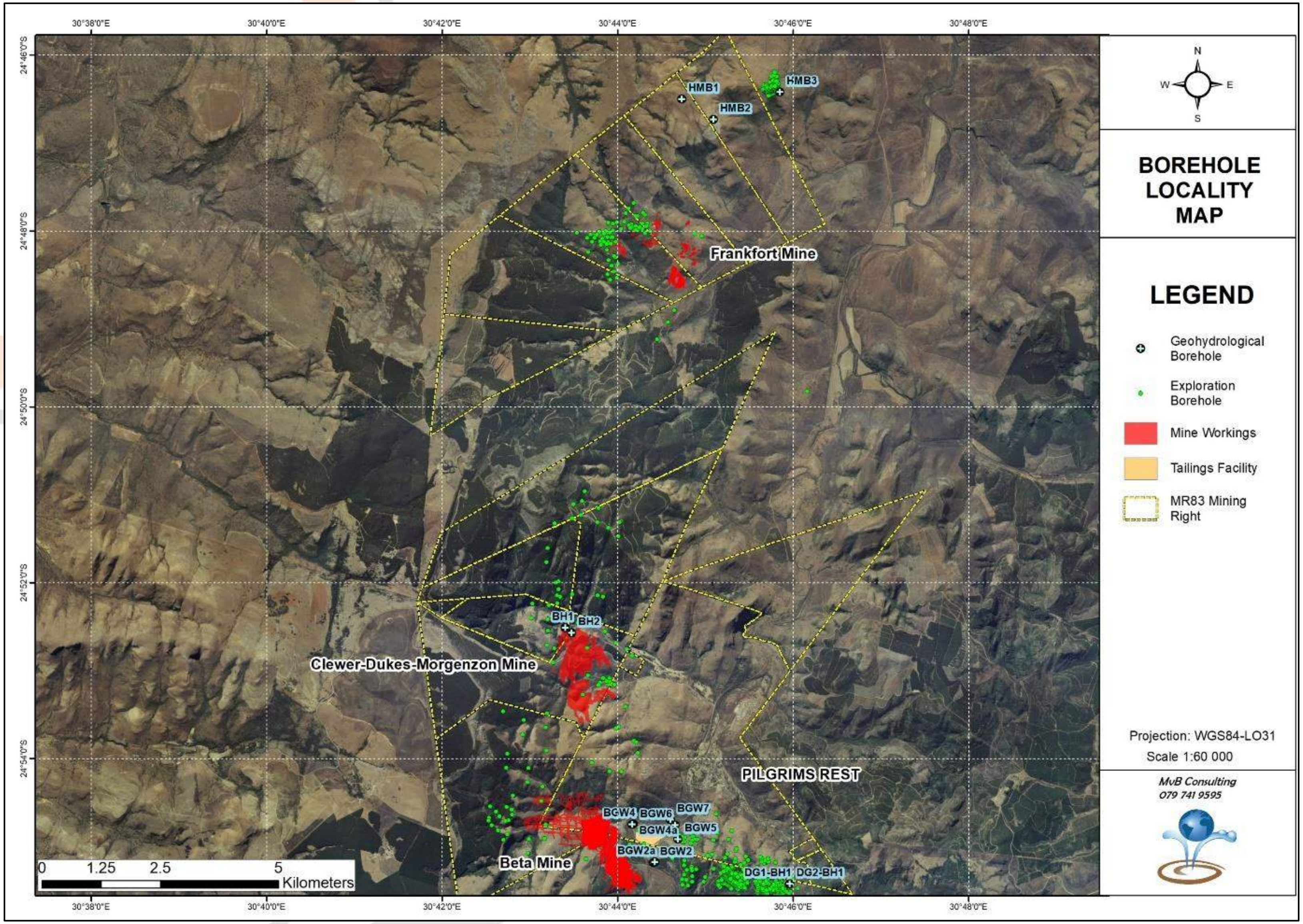


Figure 56: Regional Borehole Locality Plan (MvB Consulting, 2022)

9.9.2 BOREHOLE DRILLING

A detailed geophysical survey was conducted as part of the dolomite stability assessment for the proposed project. Thirty-one percussion boreholes were drilled in accordance with SANS 1936-2. The boreholes were drilled to a depth of 60m, or to where 6m of competent rock had been proven or to where drilling had to be terminated due to drilling rods becoming stuck. Chip samples were taken at 1.0 m intervals and logged by a qualified engineering geologist, in accordance with standard procedures.

Seven of these boreholes were constructed to act as groundwater monitoring boreholes for the proposed infrastructure expansion. The remaining boreholes were backfilled according to SANS guidelines.

The moisture condition, as encountered in the boreholes was dry to wet. Where encountered, water strikes occurred at a depth between 3 m and 24 m and were present in the residual shale, shale rock, dolerite rock, dolomitic residuum and dolomite. These strikes may represent perched water tables (J& W, 2022).

Many boreholes were dry when drilled. However, where present the water rest level lies at a depth of between 2.4m and 45.5m within the fill, residual shale, residual dolerite, dolomitic residuum, syenite and dolomite rock. Refer to **Table 16** for boreholes levels at the boreholes. The locations of these have been presented in **Figure 38** to **Figure 42**.

Table 16: Percussion boreholes as part of the geophysics study (MvB Consulting, 2022)

ID	Longitude	Latitude	Depth	Comment	Groundwater Level (mbgl)
TSF01	30.73824	-24.91113	30	Monitoring Borehole	3.5
TSF02	30.73873°	-24.91287°	60	Monitoring Borehole	27
TSF03	30.73810°	-24.91327°	38	Backfilled	Dry
TSF04	30.74072°	-24.91269°	39	Monitoring Borehole	32
TSF05	30.74324°	-24.91285°	36	Backfilled	31.6
TSF06	30.74436	-24.91373	26	Backfilled	Dry
TSF07	30.74447	-24.91536	38	Backfilled	Dry
TSF08	30.74368	-24.91589	60	Backfilled	Dry
TSF09	30.74178	-24.91592	30	Backfilled	Dry
TSF10	30.74011°	-24.91650°	32	Drilling was stopped at 32m due to adverse drilling conditions.	Dry

ID	Longitude	Latitude	Depth	Comment	Groundwater Level (mbgl)
TSF11	30.74353	-24.91405	27	Backfilled	Dry
TSF 12	30.74301	-24.91523	35	Backfilled	Dry
BN01	30.73008	-24.91021	29	Backfilled	Dry
BN02	30.73357	-24.91268	30	Backfilled	Collapsed
BN03	30.73481	-24.91192	42	Monitoring Borehole	2.5
BC01	30.73315	-24.91637	38	Backfilled	Muddy
BC02	30.73393	-24.91518	24	Monitoring Borehole	12
FS01	30.73798	-24.0744	30	Backfilled	6
FS02	30.73858	-24.80803	30	Monitoring Borehole	6
FS03	30.73763	-24.80744	32	Backfilled	12
FS04	30.73832	-24.80827	24	Backfilled	Dry
FS05	30.73819	-24.80798	29	Backfilled	Dry
FS06	30.73423	-24.80241	25	Backfilled	16
FS07	30.73461	-24.80243	40	Backfilled	Dry
CDM01	30.72617	-24.87477	37	Backfilled	3
CDM02	30.72837	-24.87453	53	Backfilled	Dry
CDM03	30.72685	-24.87336	60	Backfilled	Dry
CDM04	30.72821	-24.88663	19	Backfilled	Collapsed
CDM04a	30.72821	-24.88663	36	Backfilled	Dry
CDM05	30.72864	-24.88439	60	Monitoring Borehole	45.5
DM06	30.73152	-24.88588	40	Backfilled	Dry
CDM07	30.72511	-24.88547	60	Backfilled	13.5

9.9.3 AQUIFER TYPES

Groundwater occurrences in the study area are predominantly restricted to the following types of terrains.

- Primary aquifers consisting of the quaternary sediments which are restricted to the river valleys;
- Weathered and fractured rock aquifer in the Timeball Hill formations; and
- Dolomitic and karst aquifers.

9.9.3.1 WEATHERED AND FRACTURED TRANSVAAL AQUIFER

Groundwater occurs in the weathered sedimentary deposits (quartzite and shale) of the Timeball Hill Formation. These formations are not considered to contain economic and sustainable aquifers. However, localised high yielding boreholes may exist where significant fractures are intersected. Groundwater occurrences are mainly restricted to the weathered formations, although fractures in the underlying “fresh” bedrock may also contain water. The base of the aquifer is the non-fractured quartzite and shale formations, whereas the top of the aquifer would be the surface topography. The groundwater table is affected by seasonal and atmospheric variations and generally mimics the topography. These aquifers are classified as semi-confined.

The two aquifers (weathered and fractured) are mostly hydraulically connected, but confining layers such as clay and shale may separate the two. In the latter instance the fractured aquifer is classified as confined. The aquifer parameters, which include transmissivity and storativity, are generally low and groundwater movement through this aquifer is therefore slow.

According to GCS (2008), the deeper fractured aquifer of the Timeball Hill formation is recharged by the overlying Bevett’s conglomerate aquifer at the Beta Mine. Recharge occurs via vertical flow along with fractures and fissures.

9.9.3.2 DOLOMITE (KARST) AQUIFER

Dolomite aquifers are known to contain large quantities of groundwater and are commonly associated with sustainable groundwater abstraction. The water that poses a risk to the underground mining is primarily derived from the karst aquifer in the Malmani dolomite. This is a risk to all the mining within the Malmani dolomite as most of the reef horizons are situated with the dolomite. According to GCS (2009) a hydro-census was conducted at the Pilgrims Rest Trend Deposits where two boreholes were drilled downgradient of the existing DG sites. According to the report (GCS, 2009) DG1-BH1 intersected a prominent shale layer approximately 14 meters overlying the dolomites of the Chuniespoort Group. Dissolution cavities in the dolomites were encountered at a depth of 52 to 59 meters below ground level. The cavity was measured dry during the water level measurement and indicates that no perched of elevated water levels exist below the site.

Borehole DG2- BH1, intersected overburden of 6 meters and a dolomite thickness of 72 meters. The drilling was abandoned at a depth of 78 metres below ground level as it was measured dry which also would indicate that no perched aquifer conditions and elevated groundwater level exist below the site (GCS, 2009).

The dolomite or karst aquifer may have transmissivity values of up to 1,000 m^2/day in exceptional instances such as boreholes into cavities. The boreholes in the Pilgrims Rest region are lower but considered representative of the dolomite aquifer.

9.9.3.3 AQUIFER TESTING

Aquifer testing was performed on three of the newly drilled boreholes to determine the aquifers response to abstraction and to determine the aquifer parameters. The parameters are show in **Table 17**.

Table 17: Aquifer parameters (MVB Consulting, 2022)

Borehole	Transmissivity (m^2/d)			Hydraulic Conductivity (m/d)		
	Constant Rate	Recovery	Average	Constant Rate	Recovery	Average
BN03	22.4	24.6	23.5	0.561	0.61	0.58
TSF01	144	117	130.5	5.53	4.50	5
TSF04	23.2	10.8	17	4.65	2.16	3.4

The depth of the highest yielding borehole, TSF01 is approximately 30m, while the static water level is 3.5 m below ground level. Borehole logs indicate that the material found at this water level is residual shale. The evaluation of the aquifer test indicated an average saturated transmissivity of 130 m^2/day.

The dolomite or karst aquifer may have transmissivity values of up to 1 000 m^2/day in exceptional instances such as boreholes into cavities. The boreholes in the Pilgrims Rest region are lower but considered representative of the dolomite aquifer.

The results from the aquifer testing were incorporated into the numerical groundwater model.

9.9.4 HYDROCHEMISTRY

Groundwater samples were collected from the existing as well as the newly drilled groundwater monitoring boreholes. The samples were submitted to Waterlab (Pty) Ltd, a SANAS accredited laboratory.[63]

The water chemistry is compared to the limits specified in the TGME IWUL as well as the SANS 241 (2015). Furthermore, the chemistry is compared to background groundwater quality, which is represented by the chemistry of a natural spring near Pilgrims Rest which supplies potable water to the town. The IWUL guideline limits refer to the in-stream or resource quality limits, but in the absence of specific groundwater quality limits, these are used. Water qualities are monitored monthly (pH, EC, TDS, and alkalinity) and a full analysis is done quarterly.

The latest full chemical analysis of the groundwater quality in the current monitoring boreholes is presented in **Table 18** (see **Figure 49** to **Figure 54** for localities of the sampling points). Concentrations

[63] SANAS Accreditation T0391

that exceed the WUL guideline limits are highlighted in red. In the absence of IWUL limits the parameters that exceed the SANS 241 guidelines are highlighted in blue.

With reference to **Table 18** the following is observed regarding the groundwater quality:

- Although some parameters exceed the very stringent IWUL limits, the groundwater quality is good. The exception is borehole FS02, which indicates impacted water.
- The groundwater in the vicinity of the historically flooded adit (FS02) shows impact of previous mining activities with elevated sulphate, calcium and magnesium and hence the high TDS values. This is common where mine water is in contact with dolomitic water which attempts to neutralize the pH, but dissolves calcium and magnesium in the process. There are also metal exceedances such as aluminium, arsenic, iron, manganese, and nickel exceeding the SANS 241 drinking water guidelines.
- Newly drilled boreholes at the TSF show some impact. Exceedances of the drinking water guidelines include nitrate (TSF04), ammonium (TSF01, TSF02 and TSF04), calcium and magnesium (TSF04) and manganese (TSF01 and TSF02). All three boreholes exceed the IWUL limits for sulphate and sodium. Other than these minor exceedances, the metals are below guideline limits or below the detection limit.
- The older boreholes close to the TSF (BGW06 and BGW07) show similar exceedances to the aforementioned. These exceedances include elevated Sulphate (BGW07), Ammonium (BGW06), Calcium, Sodium, Aluminium (BGW07) and Manganese (BGW07).
- The borehole BGW04, which is down-gradient from the TSF and closest to the Blyde River, shows no impact, and a marginal exceedance of aluminium is recorded. None of the other parameters exceed the guideline limits. This suggests that the plume migration from the TSF has not reached this point.
- Borehole BGW02, which is down-gradient from the plant exceed the SANS 241 guidelines for arsenic, iron, manganese, and mercury.
- Boreholes BC02 and BN03 are near the proposed Beta North area. Borehole BC02 is down gradient of the plant and TSF area, but opposite side of the Blyde River. Exceedances include calcium, magnesium, aluminium, arsenic, iron, and manganese. When screened against the IWUL limits, the exceedances include TDS and sulphate.
- Borehole BN03 exceed IWUL limits for calcium, aluminium, and manganese.

The presence of aluminium, iron, mercury, arsenic and manganese in the groundwater can be attributed to the geological composition of the host rock. Borehole BC02 for example is not within the flow path of any potential mine contaminant source, yet it also has elevated concentrations of these parameters.

It is nevertheless important to monitor these parameters over time.

Generally, the groundwater quality is good and there are no parameters of concern in the groundwater which exceed the SANS 241 drinking water guidelines significantly.

Table 18: Recent Groundwater Quality Parameters (MVB Consulting, 2022)

ID	Unit	Guidelines		BC02	BN03	BGW2	BGW4	BGW6	BGW7
Determinant		WUL Limit	SANS 241	2022-01-13	2022/01/13	2022-01-13	2022-01-13	2022-01-13	2022-01-13
pH	pH Units	6.5-8.0	≤5 - ≥9.7	6.6	7.4	7.1	7.5	7.0	7.6
Electrical Conductivity	mS/m	NG	≤170	51.6	31.8	23.8	23.5	126	57.3
TDS	mg/ℓ	≤ 385	≤1200	462	306	222	220	496	504
Total Alkalinity	mg CaCO3/ℓ	NG	NG	120	104	88	64	640	180
Chloride	mg/ℓ	≤ 200	≤ 300	7	3	3	3	29	18
Sulphate	mg/ℓ	≤ 70	≤ 500	140	59	28	42	3	100
Fluoride	mg/ℓ	NG	≤ 1.5	0.2	<0.2	<0.2	<0.2	0.3	0.2
Nitrate as N	mg/ℓ	NG	≤ 11	1.9	0.3	2	0.8	0.9	2.2
Orthophosphate	mg/ℓ	≤ 0.04	NG	<0.1	0.1	<0.1	<0.1	<0.1	<0.1
Ammonium as N	mg/ℓ	NG	≤ 1.5	<0.1	<0.1	0.1	0.1	73	0.1
Sodium	mg/ℓ	≤ 6	≤ 200	8	2	3	3	12	12
Potassium	mg/ℓ	NG	50	0.6	<0.5	<0.5	0.6	13.7	0.7
Calcium	mg/ℓ	≤ 32	≤ 507	43	35	22	22	64	62
Magnesium	mg/ℓ	≤ 27	30	35	20	17	15	39	32
Aluminium	mg/ℓ	NG	≤ 0.3	13	0.332	0.191	0.349	0.249	0.342
Arsenic	mg/ℓ	NG	≤ 0.01	0.017	<0.001	0.031	<0.001	0.001	<0.001
Barium	mg/ℓ	NG	NG	1.4	0.045	0.006	0.014	0.309	0.068

ID	Unit	Guidelines		BC02	BN03	BGW2	BGW4	BGW6	BGW7
Determinant		WUL Limit	SANS 241	2022-01-13	2022/01/13	2022-01-13	2022-01-13	2022-01-13	2022-01-13
Beryllium	mg/ℓ	NG	NG	0.002	<0.001	<0.001	<0.001	<0.001	<0.001
Chromium	mg/ℓ	NG	≤ 0.05	0.002	0.001	0.001	<0.001	<0.001	0.001
Copper	mg/ℓ	NG	≤ 2	0.151	0.01	0.017	<0.001	<0.001	<0.001
Iron	mg/ℓ	NG	≤ 2	7.24	0.978	2.14	0.258	13	3.31
Lead	mg/ℓ	NG	≤ 0.01	0.005	<0.001	0.01	<0.001	0.004	0.009
Manganese	mg/ℓ	NG	≤ 0.4	1.01	0.463	0.343	0.116	1.32	4.9
Mercury	mg/ℓ	NG	≤ 0.006	0.001	<0.001	0.006	0.003	0.002	0.001
Nickel	mg/ℓ	NG	≤ 0.07	0.024	0.004	0.002	<0.001	0.002	0.013
Total Cyanide	mg/ℓ	NG	0.2	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07
Zinc	mg/ℓ	NG	≤ 5	0.758	<0.001	<0.001	<0.001	<0.001	<0.001
Silicon	mg/ℓ	NG	NG	18.8	6.4	7	4.7	16.6	8.4
Uranium	mg/ℓ	NG	≤ 0.03	0.002	<0.001	<0.001	<0.001	0.001	<0.001

9.9.5 WASTE CLASSIFICATION

Rock samples from Beta North and Frankfort mine were sent to a laboratory for processing through a miniature plant to produce material that would be representative of the waste material that would be produced via the DMS plant as well as tailings material that would be produced by the plant. This process was completed, and the resulting water and waste were analysed and classified. Samples were also collected and analysed from the existing tailings material.

GeoDyn Systems (2022) conducted a Waste Classification and Risk Assessment of the mineral waste material from TGME with added samples in 2022. The key objectives of the geochemical assessment were to conduct a waste classification of the mineral waste material in accordance with NEMWA GNR 635, and to conduct a risk assessment of the mineral waste to inform the final classification.

Table 19 provides a description of the various samples that were analysed.

Table 19: Waste Classification Samples (GeoDyn Systems, 2022)

Sample Name	Description
DS01	Existing TSF (8m below surface)
DS02	Existing TSF (8m below surface)
DMS Float	DMS Float waste material
TGME New	New tailings material – Tailings that will be produced by the redevelopment
Frankfort	Frankfort mine old waste rock material
CDM	Clewer-Dukes-Morgenzon old waste rock material

The materials were evaluated according to GNR 635. The classification of mineral waste according to GNR 635 requires following the methodology in the regulations and integrating the regulatory classification with a risk assessment of the waste material. Integrating the regulatory classification and risk assessment allows recommendations for the risk type according to GNR 635, for which an engineered barrier system design is required, according to GNR 636 of NEMWA.

Table 20: GNR 635 Stipulation of Criteria to Evaluate Waste for Landfill Disposal

Stipulated by GNR 635	Criteria	Waste Type
Compare Total Concentration (TC) and Leachable Concentration (LC) of the waste sample to the total concentration thresholds (TCT) and Leachable concentration thresholds (LCT) limits	LC > LCT3, or TC > TCT2	0
	LCT2 < LC ≤ LCT3 or TCT1< TC ≤ TCT2	1
	LCT1 < LC ≤ LCT2 or TC ≤ TCT1	2
	LCT0 < LC ≤ LCT1 and TC ≤ TCT1	3
	LC≤ LCT0 and TC < TCT0	4

In **Table 20**, TC refers to total concentration and LC to the leachable concentration of the chemical substances in the waste. LCT refers to the leachable concentration threshold limit of the element or chemical substance in the waste. The unit of LC is mg/l, and TC is mg/kg.

Geochemical modelling has been used for decades internationally to aid in regulatory decision making, especially in relation to environmental risk determination for mine and other industry mineral waste.

Geochemical modelling uses chemical reactions and associated thermodynamic and kinetic data to model the rate at which pollutant source minerals break down and thus release contaminants into the natural environment. It also accounts for other geochemical processes, e.g. precipitation of secondary minerals, the formation of complexes in the water solutions and sorption of chemical constituents to mineral surfaces. All these factors contribute to the method in which a potential contaminant will be released into the pore water of the mineral waste material. It also accounts for the response of the contaminants when they interact with the minerals of the waste material and the constituents dissolved in the water solution between the mineral waste pores.

The regulatory classification according to NEMWA in combination with the assessment of the geochemical system of the mineral waste facility is used to derive recommendations for the class of waste depending on the risks it poses to the natural environment.

9.9.5.1 LEACHATE ANALYSIS

The leachate assessment data is shown in **Table 21**. The data indicates that none of the lowest regulatory values (LCT0) are exceeded for the TGME New tailings material. The LCT0 values are exceeded for arsenic for the DS01 and DS02 old tailings as well as the DMS float material. The LCT0 value for sulphate is exceeded for the DS01 and DS02 old tailings material.

The NEMWA GNR 635 LCT0 value for mercury is exceeded in the CDM waste rock material. No other parameters are exceeded and none of the LCT0 values are exceeded for the Frankfort waste rock material.

9.9.5.2 TOTAL CONCENTRATION ANALYSIS

The total concentration assessment data is shown in Table 22. The lowest total concentration threshold values for copper and manganese are exceeded for all wastes. The TCT1 value for arsenic is exceeded for the DS01 and DS02 old tailings as well as for the DMS Float waste material. In addition, the TCT0 values for barium, lead and antimony are exceeded in the DS01 waste, while the TCT0 values for lead and antimony are exceeded for the DS02 old tailings waste. The TCT0 values for barium and antimony are also exceeded in the DMS Float waste. In addition to copper and manganese, arsenic exceeded the TCT0 value in the new tailings material – the other parameters were within the limits.

In the new WRD material, the TCT0 values for manganese and nickel are exceeded.

The NEMWA GNR 635 TCT0 values for arsenic and manganese are exceeded for the CDM and Frankfort waste rock. The TCT0 value for copper is exceeded for the CDM waste rock.

9.9.5.3 WASTE CLASSIFICATION RESULTS

Based on the criteria in Section 7 of GNR 635, the mineral waste classifies into the following types:

- Type 3: TGME “New” tailings, CDM and Frankfort waste rock.
- Type 2: DS01 Old tailings, DS02 Old tailings, DMS float.

The mineral waste contains sulphide minerals, which are unstable once exposed to the Earth’s atmosphere. Most of the LCT and TCT exceedances are contained in sulphide minerals.

Table 21: Leach Concentration Threshold Assessment Results (Geodyn Consulting, 2022)

Inorganic Waste constituents	Abbreviation	R635 Leach Concentration Threshold Values				TGME Pilgrim's Rest Mineral Waste Material			
		LCT0 mg/L	LCT1 mg/L	LCT2 mg/L	LCT3 mg/L	DS01 *old tailings*	DS02 *old tailings*	DMS Float *DMS plant*	TGME New *new tailings*
						mg/L			
Metal Ions									
Arsenic	As	0.01	0.5	1	4	0.027	0.040	0.020	0.001
Boron	B	0.5	25	50	200	b.d.	b.d.	b.d.	b.d.
Barium	Ba	0.7	35	70	280	0.036	0.028	0.002	0.001
Cadmium	Cd	0.003	0.15	0.3	1.2	b.d.	b.d.	b.d.	b.d.
Cobalt	Co	0.5	25	50	200	0.007	0.005	<0.001	0.005
Chromium (Total)	Cr(Total)	0.1	5	10	40	b.d.	b.d.	b.d.	b.d.
Chromium (VI)	Cr(VI)	0.05	2.5	5	20	b.d.	b.d.	b.d.	b.d.
Copper	Cu	2.0	100	200	800	b.d.	b.d.	b.d.	b.d.
Mercury	Hg	0.006	0.3	0.6	2.4	0.002	0.001	b.d.	b.d.
Manganese	Mn	0.5	25	50	200	0.256	0.098	b.d.	b.d.
Molybdenum	Mo	0.07	3.5	7	28	0.002	0.001	0.003	b.d.
Nickel	Ni	0.07	3.5	7	28	b.d.	b.d.	b.d.	0.005
Lead	Pb	0.01	0.5	1	4	b.d.	b.d.	b.d.	b.d.
Antimony	Sb	0.02	1.0	2	8	0.001	0.009	0.006	b.d.
Selenium	Se	0.01	0.5	1	4	b.d.	b.d.	b.d.	b.d.
Vanadium	V	0.2	10	20	80	b.d.	b.d.	b.d.	b.d.
Zinc	Zn	5.0	250	500	2 000	b.d.	b.d.	b.d.	b.d.
Inorganic Anions									
Total Dissolved Solids	TDS	1 000	12 500	25 000	100 000	396	436	60	38
Chloride	Cl	300	15 000	30 000	120 000	8	6	b.d.	b.d.
Sulphate	SO_4	250	12 500	25 000	100 000	265	279	19	<2
Nitrate as Nitrogen	NO_3-N	11	550	1 100	4 400	b.d.	b.d.	b.d.	b.d.
Fluoride	F	2	75	150	600	b.d.	b.d.	b.d.	b.d.
Cyanide (Total)	CN^-(Total)	0	4	7	28	b.d.	b.d.	b.d.	b.d.

Inorganic Waste constituents	Abbreviation	R635 Leach Concentration Threshold Values				TGME Mineral Waste Rock Material	
		LCT0 mg/L	LCT1 mg/L	LCT2 mg/L	LCT3 mg/L	Frankfort mg/kg	CDM mg/kg
Metal Ions							
Arsenic	As	0.01	0.5	1	4	0.007	0.006
Boron	B	0.5	25	50	200	b.d.	b.d.
Barium	Ba	0.7	35	70	280	0.001	0.002
Cadmium	Cd	0.003	0.15	0.3	1.2	b.d.	b.d.
Cobalt	Co	0.5	25	50	200	b.d.	b.d.
Chromium (Total)	Cr(Total)	0.1	5	10	40	b.d.	b.d.
Chromium (VI)	Cr(VI)	0.05	2.5	5	20	b.d.	b.d.
Copper	Cu	2.0	100	200	800	b.d.	b.d.
Mercury	Hg	0.006	0.3	0.6	2.4	0.003	0.019
Manganese	Mn	0.5	25	50	200	b.d.	0.071
Molybdenum	Mo	0.07	3.5	7	28	b.d.	b.d.
Nickel	Ni	0.07	3.5	7	28	b.d.	b.d.
Lead	Pb	0.01	0.5	1	4	b.d.	b.d.
Antimony	Sb	0.02	1.0	2	8	b.d.	0.004
Selenium	Se	0.01	0.5	1	4	b.d.	0.003
Vanadium	V	0.2	10	20	80	b.d.	b.d.
Zinc	Zn	5.0	250	500	2 000	b.d.	b.d.
Inorganic Anions							
Total Dissolved Solids	TDS	1 000	12 500	25 000	100 000	66	104
Chloride	Cl	300	15 000	30 000	120 000	b.d.	3
Sulphate	SO_4	250	12 500	25 000	100 000	2	33
Nitrate as Nitrogen	NO_3-N	11.0	550	1 100	4 400	0.1	b.d.
Fluoride	F	1.5	75	150	600	0.2	0.2
Cyanide (Total)	CN^-(Total)	0.1	3.5	7	28	b.d.	b.d.

Table 22: Total Concentration Threshold Assessment Results (Geodyn Consulting, 2022)

Waste constituents	Abbreviation	R635 Total Concentration Threshold Values			TGME Pilgrim's Rest Mineral Waste Material			
		TCT0 mg/kg	TCT1 mg/kg	TCT2 mg/kg	DS01 old tailings	DS02 old tailings	DMS Float DMS plant	TGME New new tailings
					mg/kg			
Metal Ions								
Arsenic	As	5.8	500	2 000	1 528	1 808	568	31.6
Boron	B	150	15 000	60 000	b.d.	b.d.	b.d.	b.d.
Barium	Ba	62.5	6 250	25 000	223.6	59.2	169.6	1.2
Cadmium	Cd	7.5	260	1 040	0.8	0.4	b.d.	b.d.
Cobalt	Co	50	5 000	20 000	18.4	8.4	5.2	5.2
Chromium (Total)	Cr(Total)	46 000	800 000	n.a	215.2	150.4	71.2	16.8
Chromium (VI)	Cr(VI)	6.5	500	2 000	b.d.	b.d.	b.d.	b.d.
Copper	Cu	16.0	19 500	78 000	1 228	1 128	167.6	16.4
Mercury	Hg	0.93	160	640	b.d.	b.d.	b.d.	b.d.
Manganese	Mn	1 000	25 000	100 000	6 400	2 412	4 400	3 316
Molybdenum	Mo	40	1 000	4 000	2	2	4.4	b.d.
Nickel	Ni	91	10 600	42 400	81.6	38	24	14.8
Lead	Pb	20	1 900	7 600	256.4	31.2	2.8	3.2
Antimony	Sb	10	75	300	88	78	32	b.d.
Selenium	Se	10	50	200	0.4	b.d.	b.d.	b.d.
Vanadium	V	150	2 680	10 720	60.8	28.8	32.4	11.6
Zinc	Zn	240.0	160 000	640 000	171.6	106.8	30.8	18.4
Inorganic Anions								
Fluoride	F	100	10 000	40 000	b.d.	b.d.	2.96	6.03
Cyanide (Total)	CN^-(Total)	14	10 500	42 000	b.d.	b.d.	b.d.	b.d.

Waste constituents	Abbreviation	R635 Total Concentration Threshold Values			TGME Mineral Waste Rock Material	
		TCT0 mg/kg	TCT1 mg/kg	TCT2 mg/kg	Frankfort mg/kg	CDM mg/kg
Metal Ions						
Arsenic	As	5.8	500	2 000	7.20	76.80
Boron	B	150	15 000	60 000	b.d.	b.d.
Barium	Ba	62.5	6 250	25 000	22.8	59.2
Cadmium	Cd	7.5	260	1 040	b.d.	b.d.
Cobalt	Co	50	5 000	20 000	b.d.	1.2
Chromium (Total)	Cr(Total)	46 000	800 000	n.a	1.6	4.4
Chromium (VI)	Cr(VI)	6.5	500	2 000	b.d.	b.d.
Copper	Cu	16.0	19 500	78 000	15.6	34.8
Mercury	Hg	0.93	160	640	b.d.	b.d.
Manganese	Mn	1 000	25 000	100 000	3 136	2 896
Molybdenum	Mo	40	1 000	4 000	b.d.	b.d.
Nickel	Ni	91	10 600	42 400	2.0	4.8
Lead	Pb	20	1 900	7 600	0.8	0.4
Antimony	Sb	10	75	300	b.d.	1.2
Selenium	Se	10	50	200	b.d.	b.d.
Vanadium	V	150	2 680	10 720	1.6	4.0
Zinc	Zn	240.0	160 000	640 000	1.6	5.6
Inorganic Anions						
Fluoride	F	100	10 000	40 000	3.75	19.3
Cyanide (Total)	CN^-(Total)	14	10 500	42 000	b.d.	b.d.

* b.d. - below detection

9.9.5.4 WASTE RISK ASSESSMENT

Geochemical modelling was used to conduct a risk assessment of the TGME Pilgrims Rest mineral waste materials. Geochemical modelling is useful in assessing the risk of leaching of contaminants from mineral waste, as it takes the rates at which contaminant source minerals break down into account. The GNR 635 waste classification methodology does not consider time and thus has the potential to under assess as well as over assess the concentration of contaminants that may leach from the mineral waste material.

The mineralogy of the various mineral wastes as well as the waste classification results were used to develop the geochemical models and to identify processes related to the release of contaminants into mineral waste leachate as well as its response given the environmental conditions in which the effluent will occur. These conditions include environments in contact with the Earth's or isolated from the Earth's atmosphere and thus containing limited oxygen to react with the source minerals. The results of these models are discussed below.

9.9.5.4.1 TGME TAILINGS

A kinetic geochemical model was developed for the TGME "new" tailings mineral waste material.

The geochemical model results indicate that the tailings leachate is likely to remain alkaline, mostly due to the low concentration of sulphide minerals in the material (**Table 23**). The metal and metalloid concentrations, specifically arsenic, copper, manganese and iron, in the leachate is likely to be low, i.e. lower than the LCT0 values for these elements. This implies that the risk for metal and metalloid contamination from the new tailings material is negligible. The model sulphate concentration is likely to be lower than the LCT0, implying that the risk of elevated sulphate concentrations in the natural environment due to the new tailings material is negligible.

Table 23: Geochemical Model Results of the New Tailings Material (GeoDyn Systems, 2021)

Parameter	Abbreviation	*Units*	Value
pH	pH	pH units	8.2
Total dissolved solids	TDS	mg/l	105
Bicarbonate	HCO_3		59
Sulphate	SO_4		19
Aluminium	Al		0.003
Arsenic	As		<0.001
Calcium	Ca		25
Copper	Cu		<0.001
Iron	Fe		<0.001
Magnesium	Mg		1.1
Manganese	Mn		<0.001
Silicon	Si		1.2

Overall, addition of the rate at which geochemical reactions take place in the new tailings material indicates that the material is unlikely to present an environmental risk and can be classified as Type 4, i.e. inert.

9.9.5.4.2 Old (Historic) Tailings Material and DMS Float

A kinetic geochemical model was developed for the TGME historic tailings material and for the DMS Float waste material. The model for these material types was combined due to the similarity of the materials' chemical and mineral compositions.

The geochemical model indicates that the pH of leachate from the DMS Float and old tailings material is likely to be alkaline. This is due to the neutralisation capacity of the carbonate minerals, i.e. dolomite [$CaMg(CO_3)_2$] and calcite [$CaCO_3$], in the waste material being sufficient. The model indicates that the sulphate and TDS concentrations are likely to exceed the LCT0 regulatory value, but not the LCT1 value. Similarly, arsenic is likely to exceed the LCT0 value, but not the LCT1 value. Manganese is unlikely to be present in detectable quantities due to the precipitation of pyrolusite [MnO_2], which forms when water is in contact with oxygen in the Earth's atmosphere. Copper is also likely to occur in the leachate of the DMS Float and historic tailings material in concentrations not exceeding the LCT0 value.

Table 24: Geochemical Model Results of the Old Tailings Material and DMS Float

Parameter	Abbreviation	*Units*	Value
pH	pH	pH units	7.6
Total dissolved solids	TDS	mg/l	2,299
Bicarbonate	HCO_3		29
Sulphate	SO_4		1 547
Aluminium	Al		0.001
Arsenic	As		0.17
Calcium	Ca		683
Copper	Cu		1.6
Iron	Fe		<0.001
Magnesium	Mg		32
Manganese	Mn		<0.001
Potassium	K		0.2
Silicon	Si		6.3

The geochemical model results indicate that, although the leachate concentration of arsenic and sulphate are likely to exceed the LCT0 values for these elements, they are not likely to exceed the LCT1 values. Therefore, this waste material should be classified as Type 3, i.e. low risk.

9.9.6 GROUNDWATER GRADIENTS AND FLOW

Groundwater gradients, taking into consideration fluid pressure, are used to determine the hydraulic head which is the driving force behind groundwater flow. The flow also governs the migration of contaminants, and an assessment of the flow was required to determine sub-surface flow directions from the potential contaminant sources.

Groundwater levels were measured during the hydrosensus, but only limited measurements could be taken. The levels are presented in **Table 25.**

Table 25: Groundwater levels measured during the hydrosensus (MvB Consulting, 2022)

Borehole ID	Locality	Coordinates			Depth	Groundwater Level	
		Longitude	Latitude	Collar	(m)	(mbs)	(mamsl)
BGW2	TGME Plant	30.7381	-24.9187	1280.00	Unknown	28.00	1252.00
BGW3	TGME TSF	30.7364	-24.9120	1260.00	Unknown	8.00	1252.00
BGW4	TGME TSF	30.7364	-24.9120	1260.00	Unknown	8.00	1252.00
BGW6	TGME TST SE	30.7441	-24.9125	1279.10	Unknown	46.00	1233.10
BGW7	TGME TSF NE	30.7438	-24.9119	1268.84	38	35.00	1233.84
BGW9	Clewer Main	30.7258	-24.8749	1320.00	Unknown	5.00	1315.00
BGW10	Morgenzon Main	30.7245	-24.8747	1320.00	Unknown	5.00	1315.00
BGW16	Frankfort	30.7430	-24.8097	1260.00	Unknown	6.52	1253.48
TG2	TGME Plant	30.7401	-24.9198	1286.84	30	25.57	1261.27
TG1	TGME Plant	30.7363	-24.9124	1262.05	30	8.70	1253.35
TG1-SM	TGME Plant	30.7361	-24.9125	1260.80	10	8.85	1251.95
HMB1	Hermansburg	30.7455	-24.7750	1654.36	117	73.00	1581.36
HMB3	Hermansburg	30.7641	-24.7737	1480.90	133	117.00	1363.90
BH North	Bourke’s Luck	30.8084	-24.6819	1152.25	Unknown	45.00	1107.25
Vaalhoek 2#	Vaalhoek Shaft	30.7681	-24.7599	1263.26	Unknown	137.00	1126.26
Frankfort BH	Frankfort	30.7432	-24.8096	1260.00	Unknown	6.52	1253.48
Fountain	Vaalhoek	30.7718	-24.7501	1307.86	Unknown	0.00	1307.86

There is a good correlation (92%) between the topography and the groundwater level in the area. This is an indication that the regional groundwater flow follows the topographical gradient.

The groundwater in dolomite aquifers does not typically follow this trend due to the high transmissivity that is found in dolomite aquifers. The apparent relationship between the topography and groundwater levels in the Pilgrims Rest dolomite aquifer may indicate that this aquifer approximates a typically fractured aquifer and that the dolomite is not extensively karstified and the high water yielding dolomite aquifer is not well developed. This is not to say that the dolomite in this region is a minor aquifer and is likely a reflection of the distribution of the current boreholes that may not have specifically targeted karst areas. Karst zones with a potential for high yielding boreholes do in all likelihood exists.

This relationship between topography and groundwater level is known as the Bayesian relationship, and where this exists, the regional topography can be used to interpolate (Bayesian interpolation) a regional groundwater gradient map. In the absence of an evenly distributed borehole network, it is assumed that for the most part of the study area the groundwater mimics the topography.

Groundwater flow is perpendicular to the groundwater contours and is predominantly towards the surface streams.

According to GCS (2009), however, it is reasonable to assume that the groundwater flow is from surface streams to the lithology (negative base flow) considering that the groundwater level in the area is lower than the surface water elevation. Another confirmation is the difference in the groundwater level in a borehole pair represented by boreholes TG1-SM and TG1. Borehole TG 1-SM is a shallow borehole, drilled to a depth of 10m, while borehole TG1 was drilled to a depth of 30 m. These boreholes are approximately 8 m apart but the groundwater level in borehole TG 1-SM is higher than in borehole TG1. The higher groundwater level in the shallower borehole indicates infiltration of the surface water into the groundwater system.

The difference between elevations of the groundwater and surface water decreases as one moves along the Blyde River in a downstream direction. The observation suggests that negative baseflow may be localised in certain areas along the river (GCS, 2009).

The dolomite stability study provided valuable groundwater level information around the TSF, which is considered the biggest risk to groundwater contamination for this project. Thirty-one boreholes were drilled as part of this study, many of which were dry. All the boreholes that were drilled along the southern side of the TSF were dry. These borehole depths ranged between 26 – 60m, which is an indication that the groundwater levels are probably deeper than 60m in this area.

Based on the stability and monitoring boreholes in the area the groundwater level varies between 2.93 - >60 mbs (1 230 – 1265 mamsl). On a local scale at the plant the information, however, contradicted the believe in that it appears to not correlate with the topography. There is <10% correlation and the groundwater level are relatively flat. The important aspect to point out is that based on the groundwater levels the Blyde River is a losing stream. In other words, the groundwater does not contribute to the baseflow of the Blyde River, but water from the river could potentially seep into the groundwater system.

9.9.7 BASELINE GROUNDWATER MODEL

The calibrated numerical model was used to assess the potential impacts from the TSF on the groundwater and the potential impact on the Blyde River. The current impact is illustrated in **Figure 57.**

Groundwater flow appears most prominent along the dyke that was identified during the geophysical study and subsequent drilling. Typically, a river would act as a groundwater flow barrier, but it was established in this instance that the Blyde River is a losing river. As a result, the “contaminant” plume continues to migrate past the river as indicated in **Figure 57**. The term “contaminant plume” is loosely used to illustrate leachate seepage from the TSF. The potential contaminant concentrations in the source are very low based on the waste assessment and geochemical assessment. Therefore, there is currently no impact on the Blyde River. Previous assessments of the water quality in the Blyde River confirm this finding.

.

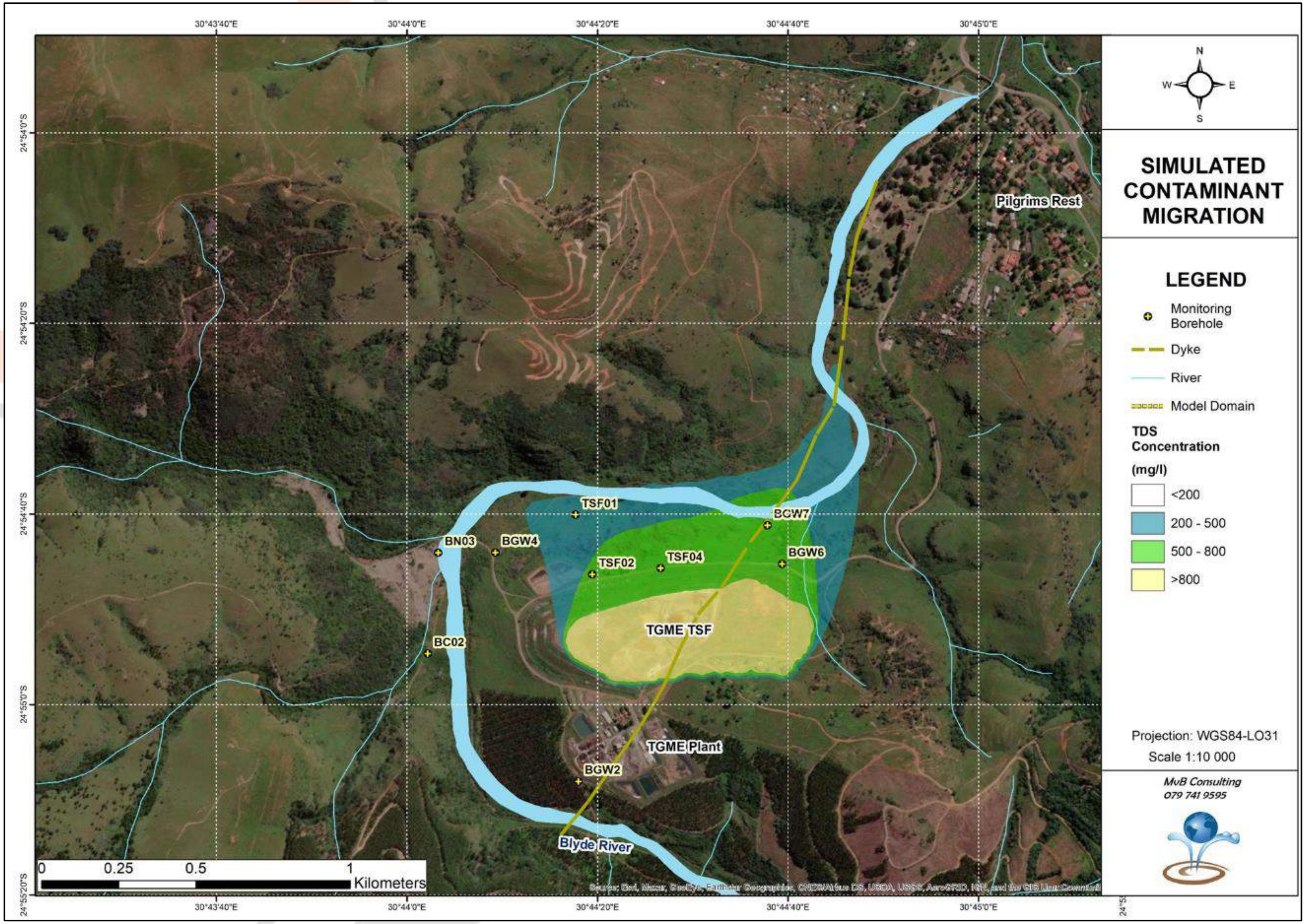


Figure 57: Simulated Current Impact from the TSF (MvB Consulting, 2022)

9.9.8 ACID GENERATION CAPACITY

Sulphide minerals are formed and stable under reducing conditions (Dold, 2017). Acid mine drainage commonly occurs when sulphide minerals (pyrite, chalcopyrite, galena, covellite and sphalerite) are exposed to oxidizing conditions. The oxidizing conditions are created by exposure to moisture and oxygen. The oxidation process results in the release of dissolved Fe^{2+}, SO_4^{2-} and H^+ (ABA, 2001). The oxidation of sulphide-minerals containing iron produce net acidity via its oxidation, except for common sulphides such as molybdenite, enargite and stibnite (Dold, 2017).

The rate of pyrite oxidation depends on a number of factors, the main factors being reactive surface area of pyrite, oxygen concentration and solution pH, presence of bacteria and catalytic agents (Skousen J., Sextone A. and Ziemkiewics, 2000).

Where mine-water pumping is constant and the mine water level is stable, little pyrite oxidation occurs below the water level and few metals are leached, resulting in a relatively non-environmentally aggressive mine water. Active pyrite oxidation will, however, continue to occur in the unsaturated zone and, if pumps are turned off, the rising water level will leach out heavy metals, resulting in a highly acid and contaminating solution (Banks et al., 1996)

In some geological settings the alkaline content of surrounding lithologies could act as buffering systems, countering the acid produced from pyrite oxidation. Carbonates and Clays have proven to sufficiently neutralize acid rock drainage (Skousen J., Sextone A. and Ziemkiewics, 2000). The balance between acid-producing potential and neutralizing capacity should provide reasonable indication of the potential acidity or alkalinity that may occur from the weathering of mined material.

The geochemical model indicates that the pH of leachate from the new tailings, DMS Float and old tailings material is likely to be alkaline. This is due to sufficient neutralisation capacity of the carbonate minerals, i.e. dolomite [$CaMg(CO_3)_2$] and calcite [$CaCO_3$], in the waste material.

9.10 BIODIVERSITY

STS and Scientific Aquatic Services (SAS) were commissioned to undertake the Terrestrial and Aquatic Ecological assessments respectively. These reports are attached to this report as ANNEXURE M and ANNEXURE N, respectively.

The aim of the studies was to identify preliminary areas of increased sensitivity or importance within the development areas that could place constraints on the planned underground mining activities, and on the associated surface infrastructure required to support underground mining, so as to determine if there are any major flaws with regards to sensitive habitat and SCC. The report includes a detailed desktop study highlighting the Ecological Importance and Sensitivity (EIS) of the areas based on all relevant national and provincial databases, including the Mpumalanga Biodiversity Sector Plan (2019) and all available biodiversity databases provided on the Biodiversity Geographic Information Systems (BGIS) website (STS, 2022).

The layout and sensitivity maps for the various sites are shown in **Figure 58** to **Figure 73**.

Several field assessments were undertaken to determine the ecological status of the 83MRAreas and to “ground-truth” the results of the updated desktop databases:

- Site screening (high level assessments of Beta, Morgenzon and Frankfort): 19th – 22nd April 2021;
- Site screening (high level assessment of Dukes): 27th – 28th October 2021; and
- Complete Site Assessments (all 83MR Areas): 17th – 19th January 2022.

9.10.1 TERRESTRIAL ECOLOGY

The following section contains data accessed as part of the desktop assessment and is presented as a "dashboard" report. Taken from the STS Biodiversity report (2022).

Note that the maps in this section were taken from the STS biodiversity report (2022).

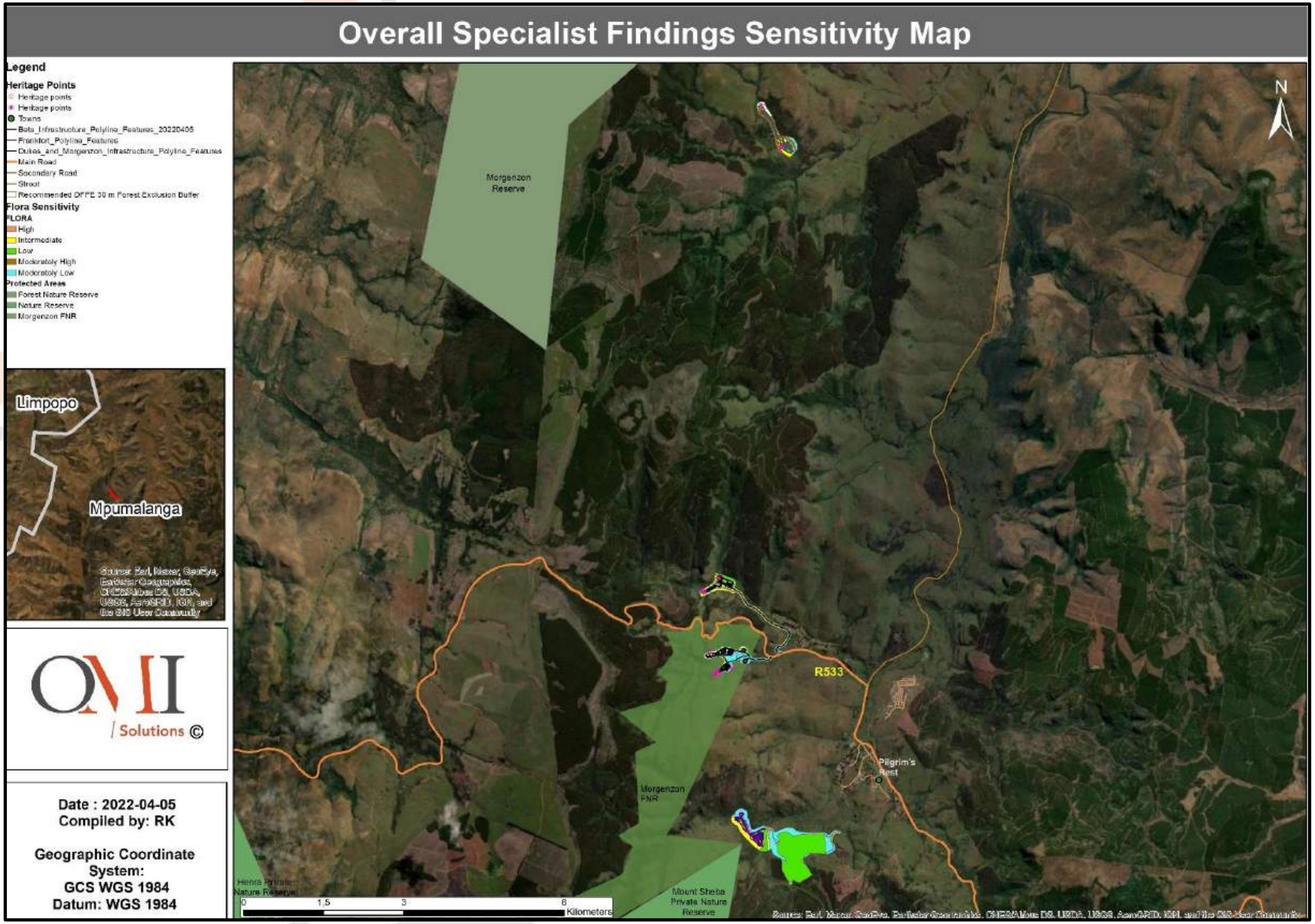


Figure 58: Overall Layout and Sensitivity Map

Table 26: Summary of the Vegetation Characteristics Associated with the 83MRAreas (QDS 2430DC) [64]

DETAILS OF THE 83MRAREAS IN TERMS OF MUCINA & RUTHERFORD (SANBI, 2018c)			
Biome(s) and Bioregion(s) **(Figure 4)**	The biome associated with the 83MR project areas is the Grassland Biome (corresponding with the Mesic Highveld Grassland Bioregion), with small sections of Dukes, Frankfort and Morgenzon traversed by the Forest Biome (corresponding to the Zonal and Interzonal Forests Bioregion).		
Vegetation Type(s)	Four vegetation types are associated with the 83MRareas; however, the **Northern Escarpment Dolomite Grassland** and the **Long Tom Pass Montane Grassland** make up the largest of the vegetation types associated with the project. Smaller sections of Dukes, Frankfort and Morgenzon are traversed by the **Northern Mistbelt Forest** (**Figure 59**). More specifically, the following vegetation types are associated with each of the 83MRareas: • Dukes: The western section of Dukes lies within both the Long Tom Pass Montane Grassland and the Northern Mistbelt Forest vegetation types, with the eastern section occurring within the Northern Escarpment Dolomite Grassland. • Frankfort: A small section in the western section falls in the Long Tom Pass Montane Grassland, with a small portion of the northern section falling in Northern Mistbelt Forest. The central and eastern sections lie in the Northern Escarpment Dolomite Grassland. • Morgenzon: The western section is classified as Northern Mistbelt Forest, with the central sections lying in the Long Tom Pass Montane Grassland, and the eastern section within the Northern Escarpment Dolomite Grassland. • Beta North: Most of the extent occurs within the Northern Escarpment Dolomite Grassland. A small section in its northern extent is in the Northern Mistbelt Forest.. The **Northern Escarpment Dolomite Grassland** and the **Long Tom Pass Montane Grassland** are endemic to South Africa, with the **Northern Mistbelt Forest** likely being endemic to South Africa, Lesotho and Eswatini.		
DESCRIPTION OF THE VEGETATION TYPE(S) RELEVANT TO THE 83MRAREAS (MUCINA & RUTHERFORD 2006)			
Vegetation Type	Gm 31 Long Tom Pass Montane Grassland	Gm 22 Northern Escarpment Dolomite Grassland	FOz 4 Northern Mistbelt Forest
Altitude (m)	1,500 m – 1,650 m	1,000–1,620 m	1,050 to1,650 m

[64] Adapted from STS, 2022

Distribution	Occurs along the escarpment east of Lydenburg, from Morgenzon Reserve just north of Crystal Springs Mountain Lodge, Pilgrim's Rest, southwards to Schoemanskloof.	Mpumalanga Province: From the high-lying dolomite grasslands of the Abel Erasmus Pass and Motlatse (Blyde) River (Vaalhoek) areas in the north, it extends southwards in a broad dolomite band along the Northern Escarpment, to as far south as the vicinity of Kaapsehoop.	Limpopo and Mpumalanga as well as in Swaziland: Occurring along the Soutpansberg from Blouberg in the northwest to the Samandou Plateau in the northeast and further southwards (along the Northern Escarpment) from Abel Erasmus Pass (Olifants River) to the surroundings of Badplaas and Barberton.
Geology, Soils & Hydrology	The geology forms part of the Pretoria Group, which predominantly consists of shale and quartzite in the Rooihoogte, Timeball Hill and Boshoek Formations, and the distinctive volcanic elements of the Hekpoort Andesite Formations which are on the summits of the highest lying areas.	Malmani dolomites of the Chuniespoort Group (Transvaal Supergroup) which overlies the Black Reef Quartzite Formation. Soils usually have a high pH, are rich in calcium and magnesium, and with low phosphorus status. Deep Hutton and Griffin soil forms are common.	Highly weathered, clayey soils mainly of Avalon and Hutton soil forms, derived from shales (Pretoria Group), quartzite (Black Reef Formation), dolomite (Chuniespoort Group), granite (Nelspruit Basement) and diabase (Mokolian intrusives).
Conservation	Listed as Vulnerable (VU) in Mucina and Rutherford (2006) but listed as Near Threatened (NT) in the updated 2018 Final Vegetation Map of South Africa, Lesotho, and Swaziland. As much as 60.1% of this unit is still natural whilst a large proportion of it has been afforested (39%) or cultivated (0.6%). This unit is well protected and its target of 27% has been met in the current reserve network. However gold mining is still a threat as this unit contains a few current gold mines and many abandoned shafts and mine dumps.	Listed as Endangered (EN) in Mucina and Rutherford (2006) but listed as Vulnerable (VU) in the updated 2018 Final Vegetation Map of South Africa, Lesotho, and Swaziland. Conservation target 27%. Only 2% is protected within the Blyde River Canyon National Park, but larger portion protected in private Driekop Caves and London heritage sites in the north and in the Mooifontein and Mondi Cycad Reserve heritage sites in the south. More than half of this unit has been transformed (52%), mainly by plantations (47%) and cultivated lands (5%). Erosion potential very low (17%), low (51%) and moderate (28%).	Least threatened (LC). Conservation target 30%. About 10% statutorily conserved in Blyde River Canyon, Lekgalameetse, Songimvelo, Makobulaan, Malalotja, Nelshoogte, Barberton, and Starvation Creek Nature Reserves. More than 25% enjoys protection in privately owned nature reserves, including for instance Wolkberg Wilderness Area, In-De-Diepte, Sudwala, Mac, Buffelskloof, Mount Sheba etc. Below the escarpment between Mariepskop and Graskop, the natural forest has expanded into former grassland areas due to the protection of the timber plantations against fire.
Vegetation & landscape features	The landscape has a diverse physiography, which includes subalpine peaks, level terraces and rolling plains in the higher lying	Very species-rich grasslands that occur along the Escarpment dolomite belt. The grasslands are characterised by a very	Tall, evergreen afrotemperate mistbelt forests occurring primarily in east-facing fire refugia such as subridge scarps and moist

	areas with steep mountain slopes. The highest point is Mount Anderson (2280 m), occurring just north of Long Tom Pass.	diverse shrub layer which varies in height and density. The herbaceous component becomes more dense northwards as the climate becomes drier.	sheltered kloofs where they form small, fragmented patches.

Table 27: Summary of the Terrestrial Conservation Characteristics for the 83MR Areas (QDS 2430DC) [65]

CONSERVATION DETAILS PERTAINING TO THE 83MRAREAS (VARIOUS DATABASES)			
National Biodiversity Assessment **(NBA, 2018)** **(Figure 60)**	Three Vegetation type remnants are associated with the 83MR areas. Dukes, Frankfort and Morgenzon all lie within the remaining extents of the Long Tom Pass Montane Grassland (NT; well protected), Northern Escarpment Dolomite Grassland (VU; poorly protected), and the Northern Mistbelt Forest (LC; well protected). Beta North only lies in the remaining extent of the Northern Escarpment Dolomite Grassland. 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 Protected Areas Act, 2003 (Act No. 57 of 2003), and compared with the biodiversity target for that ecosystem type. The ecosystem protection level status is assigned using the following criteria: i. If an ecosystem type has more than 100% of its biodiversity target protected in a formal protected area either A or B, it is classified as Well Protected;	**National Threatened Ecosystems (2011) (GN 1002)** **(Figure 61)**	All three 83MR areas partially occur within the **Endangered Malmani Kartslands** threatened ecosystem. The Malmani Karstlands endangered ecosystem (GN 1002 of the 9th of December 2011) is gazetted based on **Criterion F,** which identifies priority areas for meeting explicit biodiversity targets as defined by a systematic biodiversity plan. This ecosystem is associated with mountainous karstlands of the Malmanl subgroup, together with the presence of karstland endemic taxa and threatened species. Key biodiversity features associated with this ecosystem include: • **Five mammal species**, namely the Rough-haired Golden Mole, Meester's Golden Mole, Short-eared Trident Bat, Natal Long-fingered Bat and Oribi; • **Six bird species** including Blue Crane, Blue Swallow, Grey Crowned Crane, Striped Flufftail, Southern Ground Hornbill and Wattled Crane;

[65] Adapted from STS, 2022

	ii. When less than 100% of the biodiversity target is met in formal A or B protected areas it is classified it as Moderately Protected; iii. If less than 50% of the biodiversity target is met, it is classified it as Poorly Protected; and iv. If less than 5% of the target, it is Hardly Protected.		• **Three reptile species** for example Bradypodion transvaalense and Lamprophis swazicus; • **Seven vegetation types**, namely the Northern Escarpment Dolomite Grassland, Poung Dolomite Mountain Bushveld, Ohrigstad Mountain Bushveld, Long Tom Pass Montane Grassland, Lydenburg Thornveld, Mpumalanga Afromontane Forest and Northern Escarpment Quartzite Sourveld; and • **Five plant species**, namely Aloe fouriei, Gladiolus vernus, Gladiolus macneilii, Ocotea kenyensis, Sensitive species 738.
SAPAD (2020, Q3); SACAD (2020, Q3); NPAES (2010); **IBA (2015); and** **SWSA (2017).**	The NPAES (2010)[66], SACAD[67] (2020, Q3), SAPAD [68](2020, Q3), Important Bird and Biodiversity Areas (IBA, 2015) and the Surface water Strategic Water Source Areas (SWSAs, 2017) databases indicate several protected and conservation areas within 10 km of the 83MRAreas. • NPAES (2010) Formal Protected Areas (**Figure 62**): o Morgenzon Reserve; Motlatse Canyon Provincial Nature Reserve (NR), Ohrigstad Dam NR, and Tweefontein Reserve. • NPAES (2010) Informal Protected Areas (**Figure 62**): o Mount Anderson Catchment NR • NPAES (2010) Focus Areas (**Figure 63**):		

66 Protected areas are areas of land or sea that are formally protected by law and managed mainly for biodiversity conservation. Protected areas recognised in the National Environmental Management: Protected Areas Act (Act 57 of 2003) are considered formal protected areas in the NPAES. It is important to differentiate protected areas from conservation areas. Conservation areas are areas of land not formally protected by law but informally protected by the current owners and users and managed at least partly for biodiversity conservation. Because there is no long-term security associated with conservation areas, they are not considered a strong form of protection. Conservation areas are not a major focus of the NPAES.

67 SACAD (2020): The types of conservation areas that are currently included in the database are the following: 1. Biosphere reserves, 2. Ramsar sites, 3. Stewardship agreements (other than nature reserves and protected environments), 4. Botanical gardens, 5. Transfrontier conservation areas, 6. Transfrontier parks, 7. Military conservation areas and 8. Conservancies.

68 SAPAD (2020): The definition of protected areas follows the definition of a protected area as defined in the National Environmental Management: Protected Areas Act, (Act 57 of 2003). Chapter 2 of the National Environmental Management: Protected Areas Act, 2003 sets out the “System of Protected Areas”, which consists of the following kinds of protected areas - 1. Special nature reserves; 2. National parks; 3. Nature reserves; 4. Protected environments (1-4 declared in terms of the National Environmental Management: Protected Areas Act, 2003); 5. World heritage sites declared in terms of the World Heritage Convention Act; 6. Marine protected areas declared in terms of the Marine Living Resources Act; 7. Specially protected forest areas, forest nature reserves, and forest wilderness areas declared in terms of the National Forests Act, 1998 (Act No. 84 of 1998); and 8. Mountain catchment areas declared in terms of the Mountain Catchment Areas Act, 1970 (Act No. 63 of 1970).

	o Frankfort is within the **Northeast Escarpment Focus Area**, with Morgenzon within 5 km of this focus area and Dukes and Beta North within 10 km of this focus area. The Northeast Escarpment focus area is an extremely diverse area important for ecological processes and resilience to climate change. It is an important Grassland centre of endemism and includes opportunities for protecting intact river reaches with threatened river types. There are excellent opportunities for expanding the Lekgalameetse, Wolkberg and Blyde Canyon Reserves (National Protected Area Expansion Strategy document for South Africa 2008). • SAPAD (2020, Q3) Protected Areas (**Figure 62**): o Blyderivierspoort NR; Henra Private NR; Mac Mac Reserve; Mount Anderson Catchment NR; Mount Sheba Private NR; Morgenzon Reserve; Ohrigstad Dam NR, and Tweefontein Reserve. • **Newly promulgated Morgenzon Forest Nature Reserve** (to be added to the SAPAD dataset with its next update) – GN 1062, Gazette number 45345, dated 19 October 2021 as it pertains to the National Forests Act, 1998 (Act 84 of1998): Declaration of certain State Forests Properties in Mpumalanga Province as Forest Nature Reserves under Sec 8(1) and 9. • SACAD (2020, Q3) Conservation Areas (**Figure 63**): o The entire extent of the 83MRarea is in the Kruger to Canyons Biosphere Reserve. • SWSA (2017) (**Figure 64**): o The entire extent of the 83MRareas is in the Mpumalanga Drakensberg SWSA. Surface water SWSAs are defined as areas of land that supply a disproportionate (i.e. relatively large) quantity of mean annual surface water runoff in relation to their size. They include transboundary areas that extend into Lesotho and Swaziland. The sub-national Water Source Areas (WSAs) are not nationally strategic as defined in the report but were included to provide a complete coverage. • IBA (2015) (**Figure 64**): o The 83MRareas are within 5 km of the **Blyde River Canyon IBA**. This is the only site in South Africa that supports breeding *Falco fasciinucha*. At least one pair inhabits the gorges and there is potential habitat for several more birds. The cliffs at Manoutsa hold over 660 pairs of *Gyps coprotheres*, making it the world's fourth-largest colony. The gorges also hold breeding *Ciconia nigra, Falco peregrinus* and *Bubo capensis*. The surrounding grassland supports *Turnix hottentotta, Sarothrura affinis, Saxicola bifasciata, Neotis denhami, Grus paradisea, Bucorvus cafer, Tyto capensis* and *Geronticus calvus*, which breed within the reserve along the cliff gorges. The proteoid hillslopes hold *Promerops gurneyi*. The forest and forest edge support *Stephanoaetus coronatus, Buteo oreophilus, Lioptilus nigricapillus, Tauraco corythaix, Bradypterus barratti, Telophorus olivaceus, Cossypha dichroa, Cercotrichas signata, Estrilda melanotis* and *Serinus scotops*. • Additionally, the Mpumalanga Tourism and Parks Agency (MTPA) provides a database with provincially protected areas, much of which overlap with areas identified in the SAPAD and NPAES databases. The list includes the following provincially protected areas (**Figure 65**): o Blyde River Canyon NR

	o Graskop Grasslands Unique Community o Hartebeesvlakte Reserve o Henra Private NR o Mac Mac Reserve o Mariepskop Conservation Area o Morgenzon Reserve o Mount Anderson Catchment NR o Mount Sheba Private NR o Ohrigstad Dam NR o Tweefontein Reserve		
MPUMALANGA BIODIVERSITY SECTOR PLAN (2019) TERRESTRIAL DATABASE			
CBA Irreplaceable **(Figure 66)**	Dukes is entirely located in an I**rreplaceable CBA**, with the southern section of Morgenzon and the northern section of Beta also within an Irreplaceable CBA. These are areas required to meet targets and with irreplaceability values of more than 80%; Critical linkages or pinch-points in the landscape that **must remain natural**; and often include Critically Endangered Ecosystems, or hosts species of conservation concern. Primary Objective: Maintain in a natural state with no loss of ecosystems, functionality, or species; no flexibility in land-use options.	**CBA Optimal** **(Figure 66)**	The north-western section of Frankfort is within an **Optimal CBA**. None of the other 83MRareas occur in these CBAs. The CBA Optimal Areas (previously called 'important and necessary' in the Mpumalanga Biodiversity Conservation Plan - MBCP) are the areas optimally located to meet both the various biodiversity targets and other criteria defined in the analysis. Although these areas are not 'irreplaceable' they are the most efficient land configuration to meet all biodiversity targets and design criteria. Primary Objective: Maintain in a natural state with no loss of ecosystems, functionality, or species; some flexibility in land-use options.

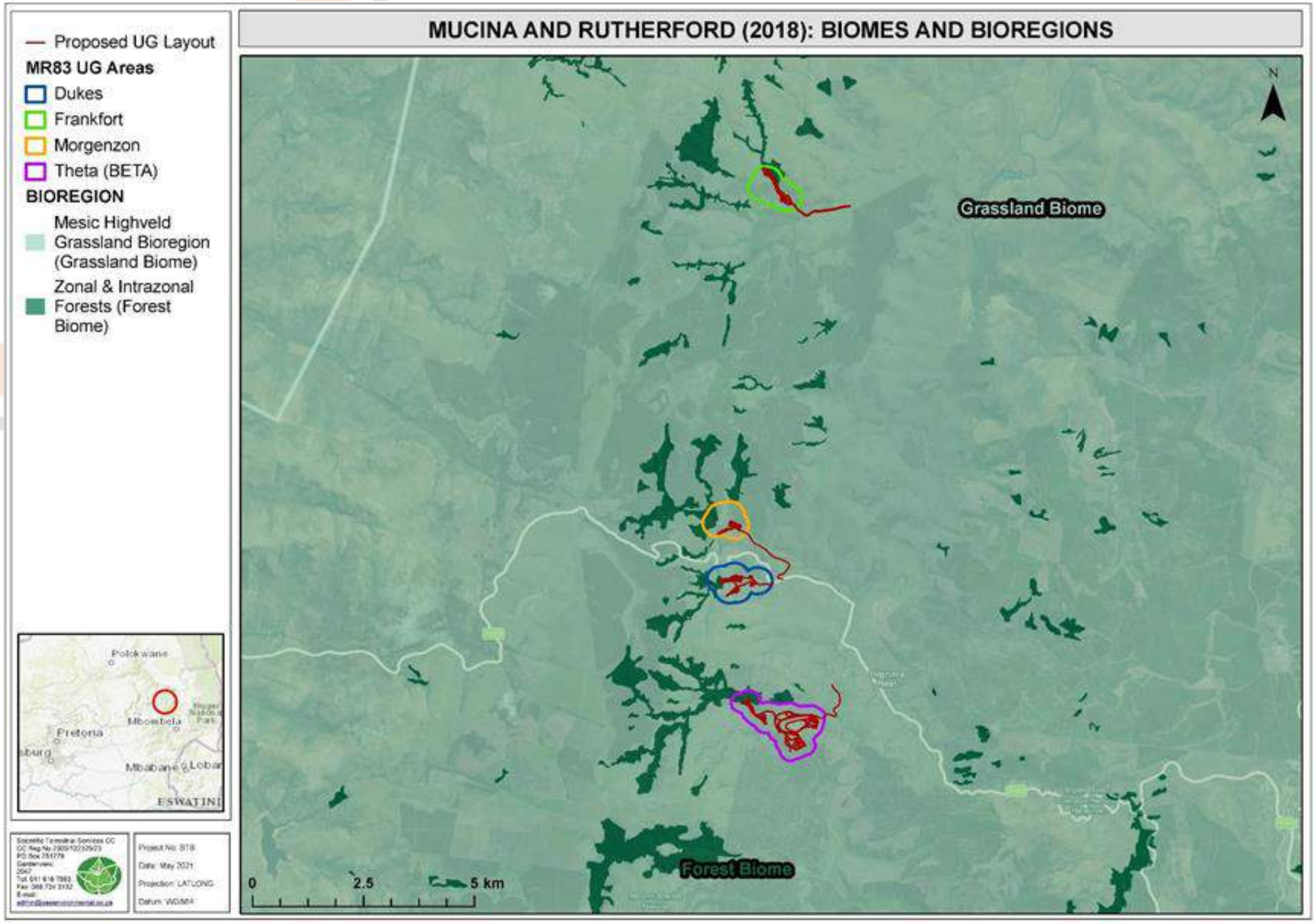


Figure 59: Biomes and Bioregions Associated with 83MRAreas (Mucina and Rutherford, 2018 Database)

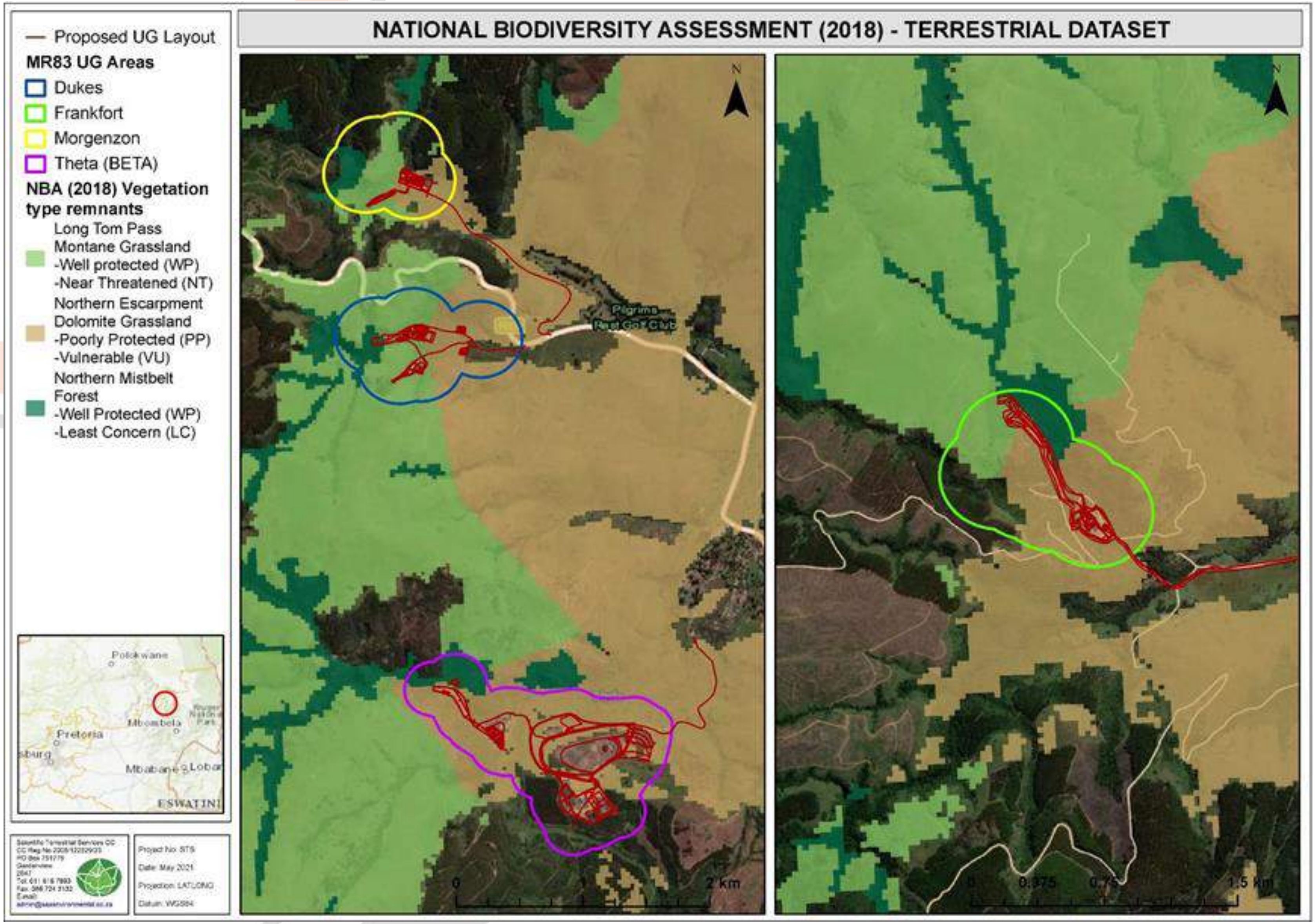


Figure 60: Remaining Extent of Ecosystems Associated with 83MRAreas (NBA, 2018)

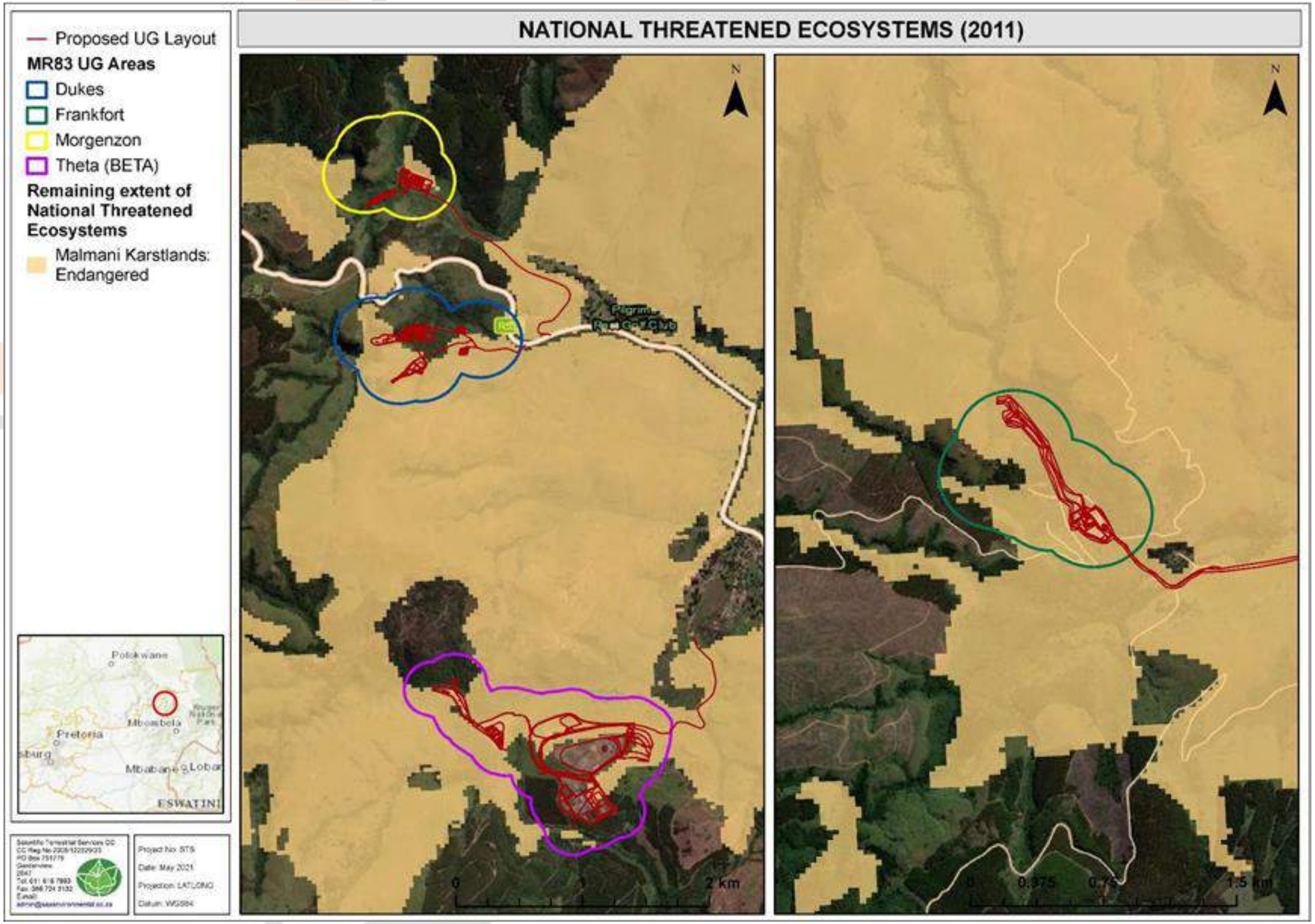


Figure 61: Remaining Extent of Threatened Ecosystems Associated with 83MRAreas - National Threatened Ecosystems Database (2011)

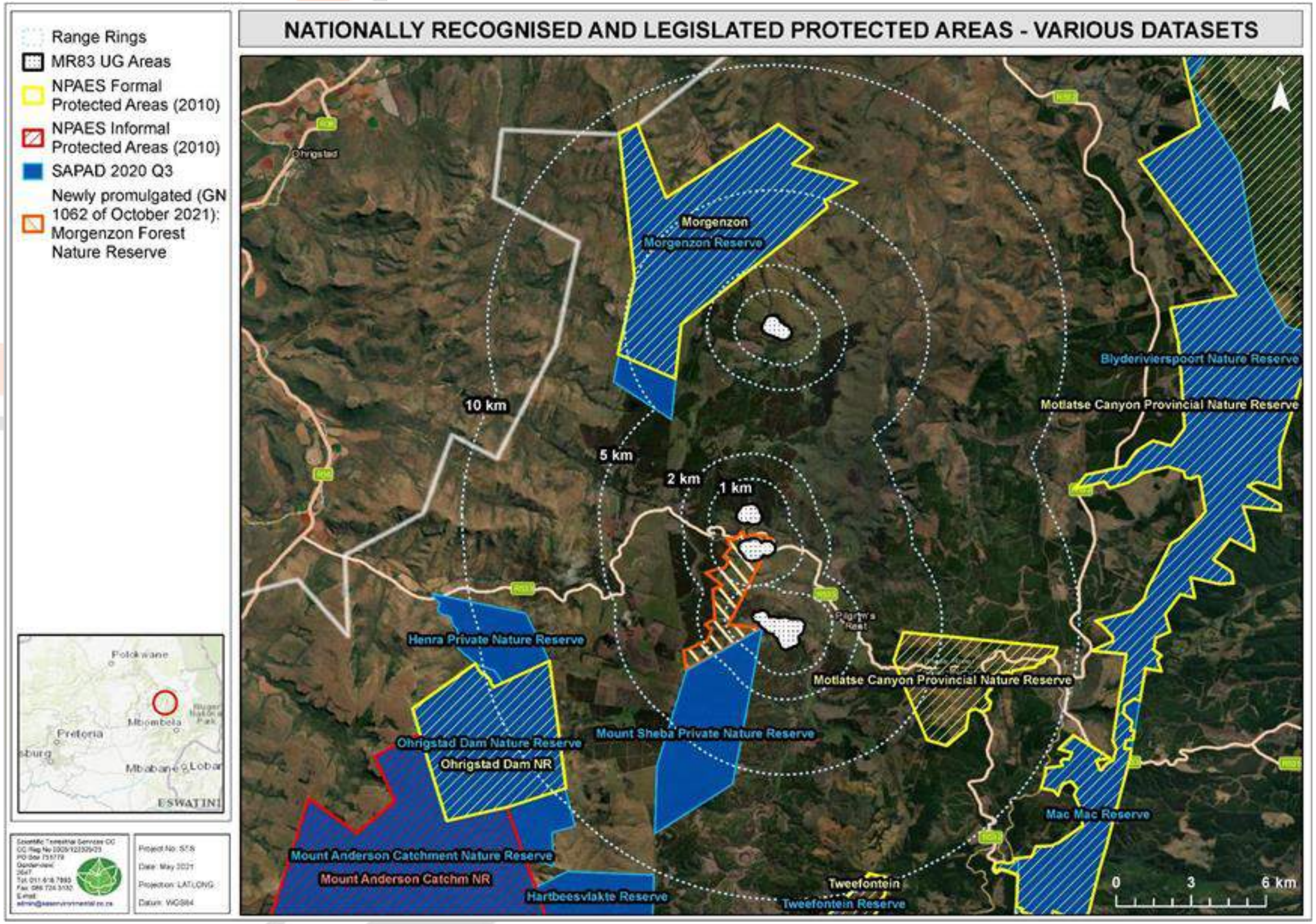


Figure 62: National Protected Areas in Close Proximity (within 10 km) to 83MRAreas (SAPAD, 2020 and NPAES, 2010)

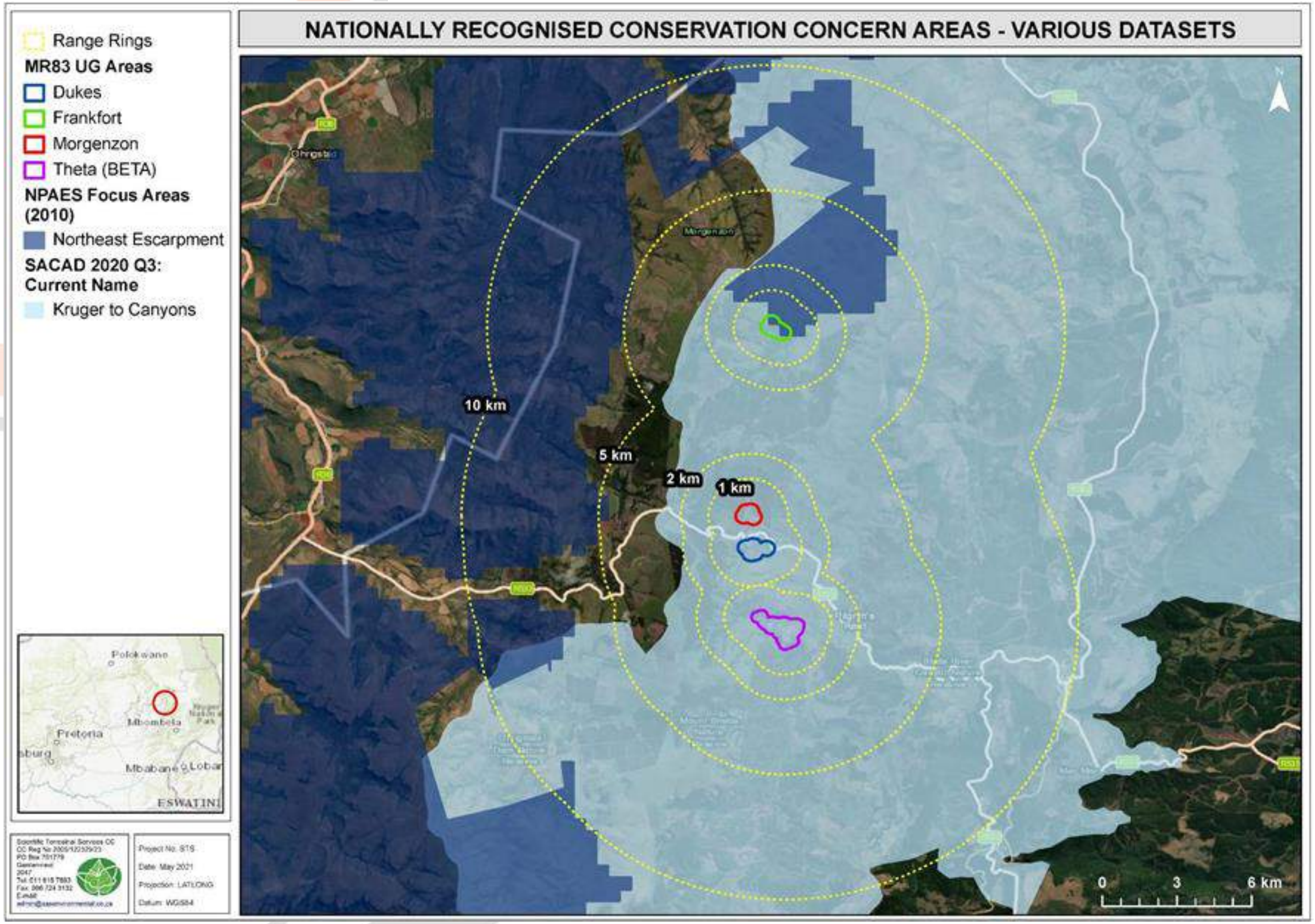


Figure 63: National Conservation Areas in Close Proximity (within 10 km) to 83MRAreas (NPAES, 2010 SACAD, 2020)

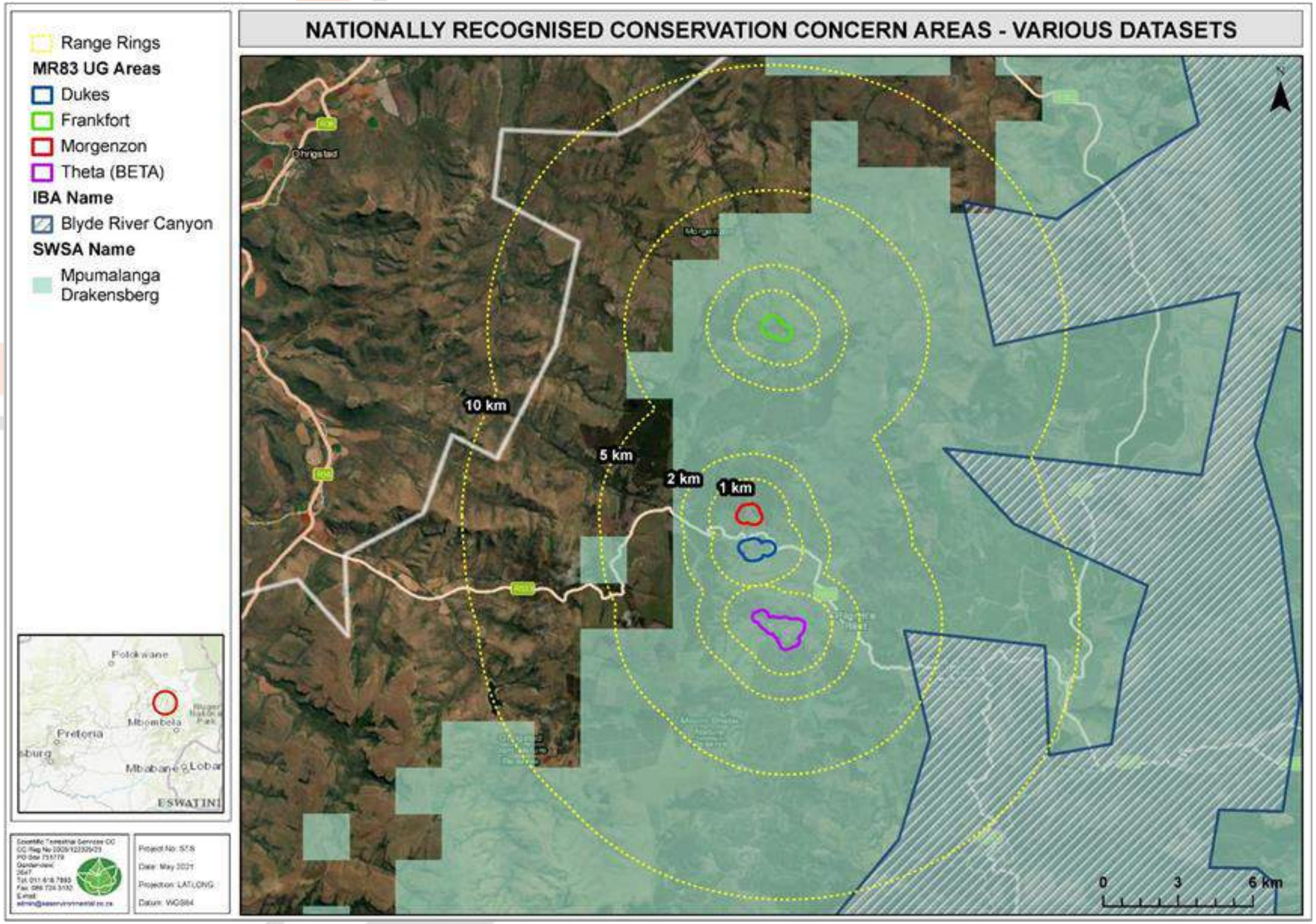


Figure 64: National Conservation Areas in Close Proximity (within 10 km) to 83MRAreas (IBA, 2015 and SWSA, 2017)

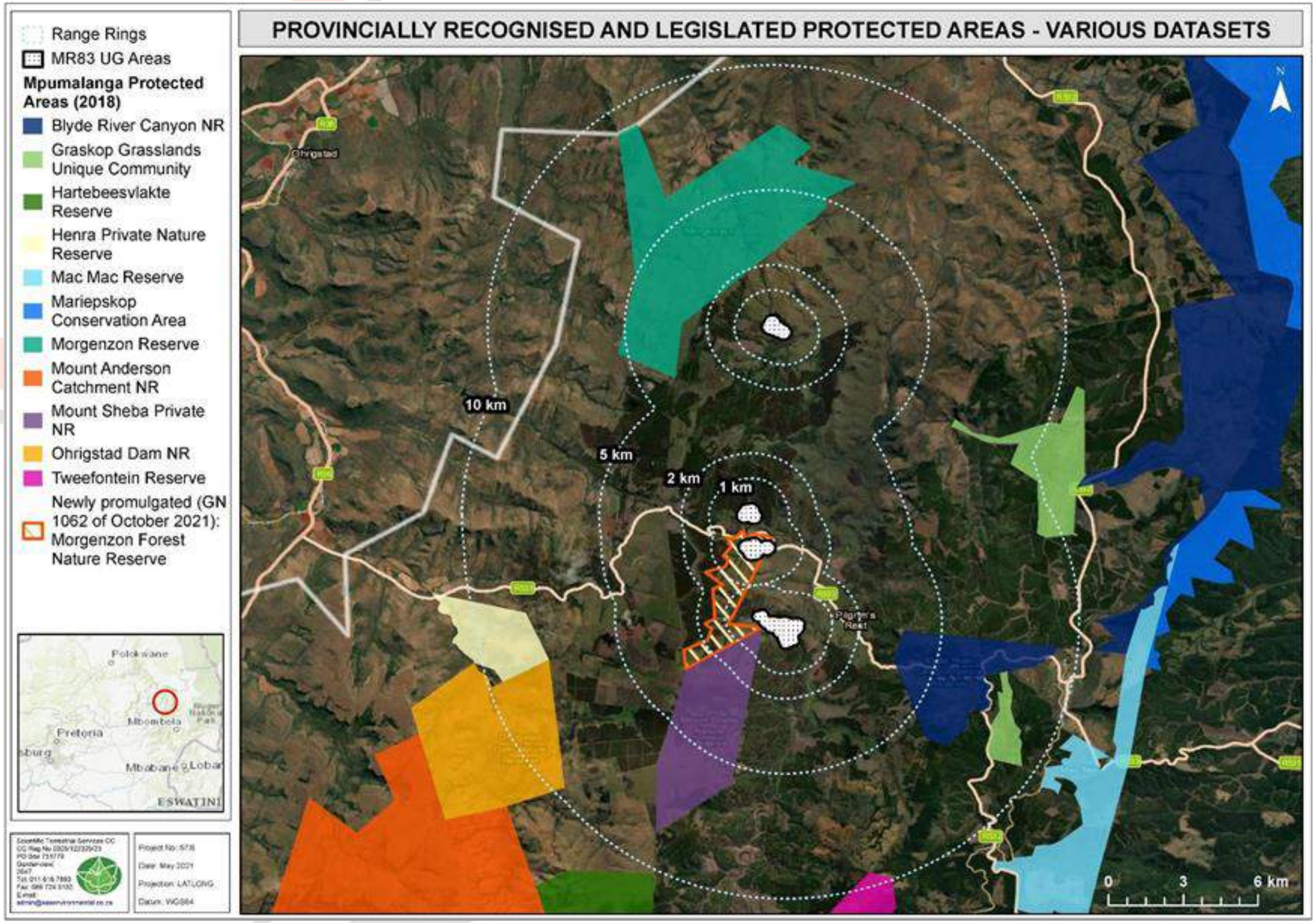


Figure 65: Provincial Protected Areas in Relation to 83MRAreas (MTPA, 2018)

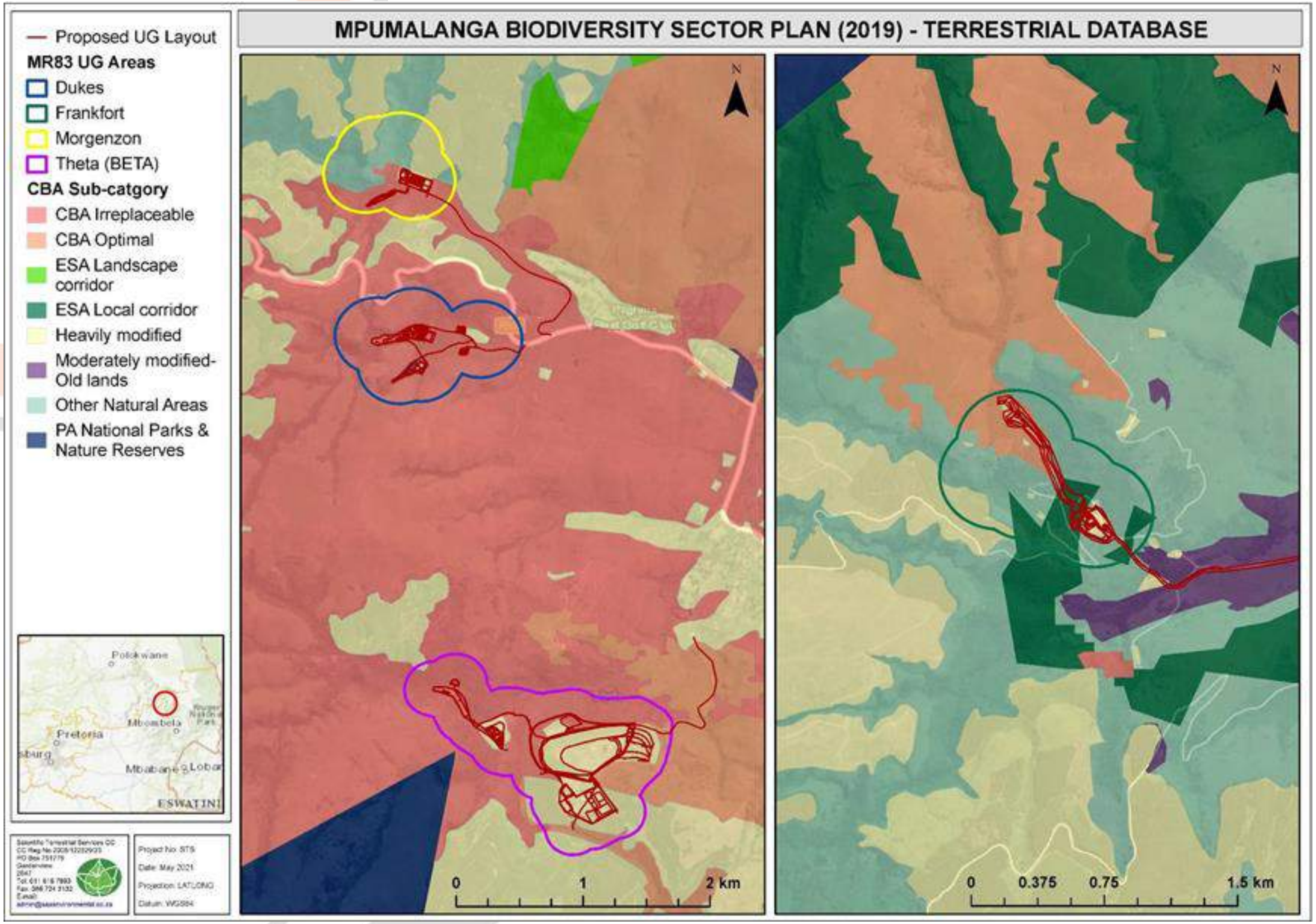


Figure 66: The 83MRAreas in relation to CBAs (CBA Irreplaceable and Optimal) (Mpumalanga Biodiversity Sector Plan, 2019)

9.10.1.1 HABITAT UNITS

Across the target areas, four broad habitat units could be distinguished as described below and shown in **Figure 68**:

- Degraded Habitat– encompassing Alien and Invasive Plant (AIP)-dominated Habitat and areas entirely transformed by mining (illegal and approved) and/or forestry practices;
- Freshwater Habitat– encompassing Riparian Forest, Riparian Woodland, and Watercourse Habitat;
- Terrestrial Woody Communities– encompassing Indigenous Forests and Woodlands (intact and degraded); and
- Valley Habitat and Rocky Outcrops– encompassing a variety of habitat types occurring along the mountain footslopes and along rivers and streams, including stretches of grass and herb dominated veld, as well as a short stretch of Rocky Outcrops.

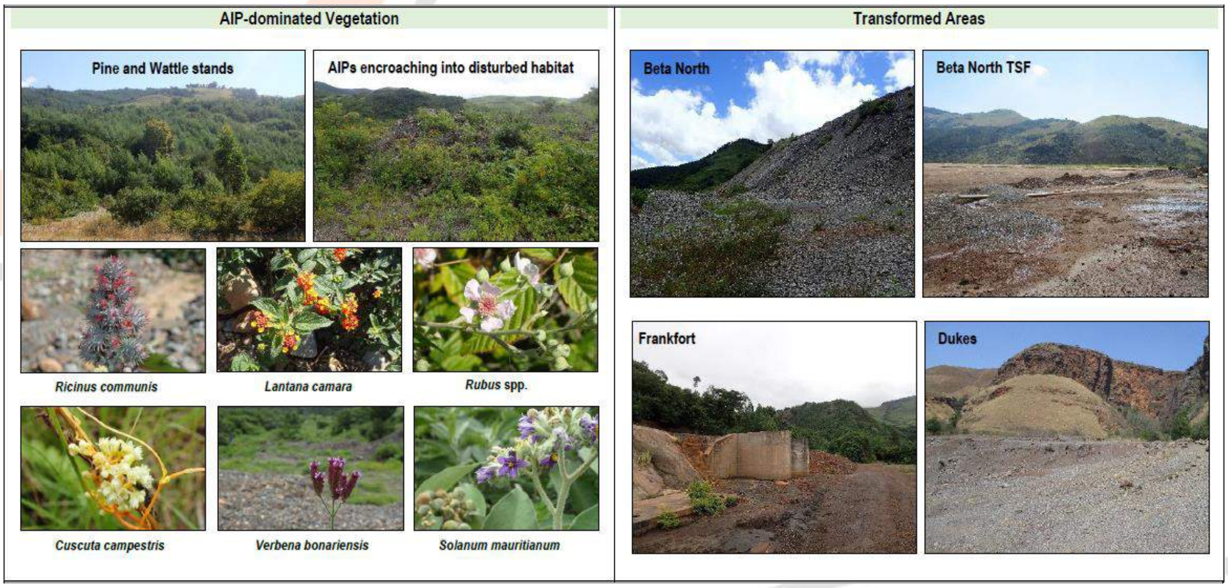
The above listed habitat units are not all represented in all four of the 83MRAreas Where floral composition, vegetation structure and/or habitat sensitivities differ for these units within the various 83MRAreas, these differences were highlighted.

Table 28: Guide to floral communities within the 83MRAreas

HABITAT UNIT / SUB-UNITS	BETA NORTH	DUKES	MORGENZON	FRANKFORT
DEGRADED HABITAT				
AIP-dominated Vegetation	x	x	x	
Transformed Habitat	x	x	x	x
FRESHWATER HABITAT				
Riparian Forest		x	x	x
Riparian Thicket	x	x	x	x
Woodlands	x	x	x	x
TERRESTRIAL WOODY COMMUNITIES				
Indigenous Forests		x	x	x
Watercourse Habitat	x	x	x	
VALLEY HABITAT				
Valley Habitat	x	x	x	
Rocky Habitat			x	

The following section summarises the findings of each of the habitat units found on the site.

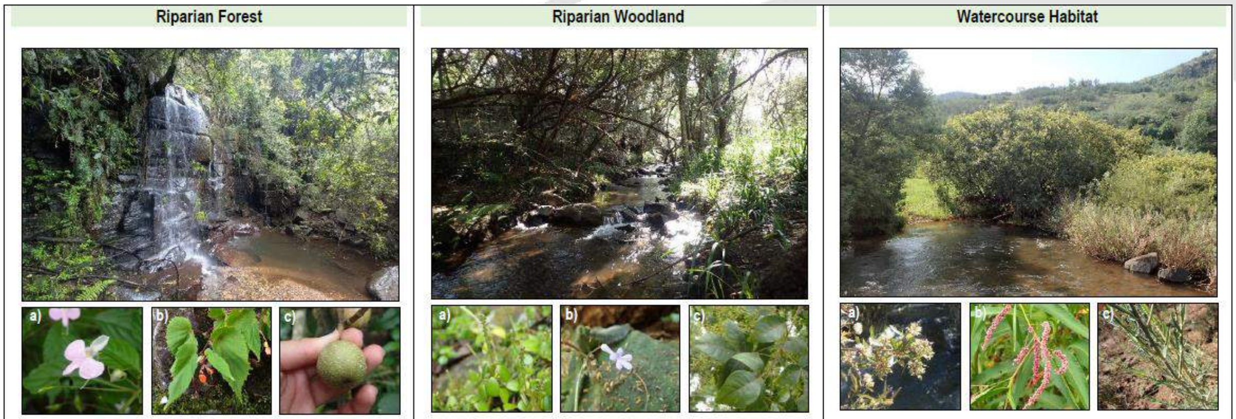
Table 29: Summary of the Degraded Habitat

Degraded Habitat overview
Reference Habitat

Habitat Overview
The Degraded Habitat is associated with all four 83MRAreas and represents the largest areas to be impacted by the proposed underground mining activities (with regards to surface impacts). This habitat unit is characterised by extensive sections where the natural vegetation has been heavily modified to such a degree that native vegetation is poorly represented, or where no vegetation remains at all. Within areas where historic or current anthropogenic disturbances have resulted in the proliferation of AIPs, native species have been displaced and the vegetation has largely lost its integrity. Two main habitat types can be distinguished, namely the AIP-dominated Habitat and the Transformed Areas. Both these habitat sub-units are not considered important for contributing toward native floral ecology in the area, nor is it anticipated to contribute favourably towards achieving conservation and provincial biodiversity targets.
Species Overview
The Degraded Habitat unit was species poor in the Transformed Areas. The AIP-dominated Habitat was species rich due to the abundance and often high diversity of AIPs; however, the sub-unit had a low native floral representation. None of the vegetation communities associated with the Transformed Areas and the AIP-dominated Habitat are representative of the reference vegetation types, nor is indigenous vegetation associated with these sub-units. A total of 111 plant taxa were recorded within the Degraded Habitat, 37% of which were represented by woody species, 44% by forbs, and 19% by graminoid species. AIPs contributed toward 44% of all floral species recorded within this habitat unit. Within this Degraded Habitat Unit, very little native vegetation remains. The only native species that manage to become abundant in these sub-units include pioneer grass species such as *Andropogon eucomis, Cynodon dactylon* and *Melinis repens*. Several AIP forb species thrive in the Degraded Habitat

Unit, e.g., *Bidens pilosa, Conyza bonariensis, Tagetes minuta* and *Verbena bonariensis* (to name a few). Abundant and more frequently occurring species within this Habitat Unit included several woody species that are listed in the NEMBA Alien and Invasive Species List (2020): Eucalyptus grandis, Lantana camara, Rubus species (*R. cuneifolius & R. niveus*), *Senna septemtrionalis*, and *Solanum mauritianum*.

Due to the extent to which native floral community structure and composition have been altered by anthropogenic activities, floral SCC are highly unlikely to establish viable populations (if any), especially not within the Transformed Areas. Some Aloe species, Habenaria species, Kniphofia species and Scadoxus species have been recorded in the AIP-dominated Habitat and these are protected under Schedule 11 (Section 69(1)(a)) of the Mpumalanga Nature Conservation Act, 1998 (Act No. 10 of 1998) (MNCA). One species protected under the National Forests Act, 1998 (Act 84 of 1998]) (NFA) was recorded in Transformed Areas where it was likely planted as an ornamental in the past, namely Podocarpus (=now Afrocarpus) falcatus. Permits from the relevant authorities, i.e., MTPA and Department of Forestry, Fisheries and the Environment (DFFE), should be obtained before removal, cutting or destruction of protected species or floral SCC may take place.

Table 30: Summary of the Freshwater Habitat

Freshwater Habitat overview
Reference Habitat
 The Riparian Forest sub-unit occurs within indigenous forest (refer to section 3.3) but is associated with the presence of regularly (to permanently) flowing water. Species such as a) *Impatiens hochstetteri,* b) *Begonia sutherlandii,* and c) *Ficus sur* were typically observed within this sub-unit. The Riparian Woodland sub-unit was not associated with indigenous forest; however, this sub-unit was associated with a well-developed, woody riparian zone. Selected species often recorded in this sub-unit included a) *Peperomia retusa* (fern species), b) *Streptocarpus cf. wilmsii,* and c) *Searsia chirindensis.* The Watercourse Habitat had a weaker association with woody species and a stronger association with graminoid species. Selected species often recorded in this sub-unit included a) *Salix mucronata,* b) *Persicaria* species (various), and c) *Phragmites australis.*
Habitat Overview
The Freshwater Habitat encompasses true watercourses as delineated by a freshwater ecologist (refer to Section 9.10.2), which has been arranged into three vegetation types for this report. For the hydrogeomorphic watercourse types, please refer to the freshwater report. The Freshwater Habitat is represented in all four 83MRAreas and based on vegetation characteristics and position in the landscape, three sub-units were distinguished, namely the Riparian Forest (associated with

Dukes, Frankfort and Morgenzon), Riparian Woodland (associated with all four 83MRAreas), and Watercourse Habitat (associated with Beta North, Dukes and Morgenzon). The definition of “riparian” as per the National Water Act, 1998 (Act 36 of 1998) (NWA) is applicable to this habitat unit. The sub-units are described in more detail below.
The Riparian Forest forms part of the Indigenous Forest sub-unit that is described in section 33 and, as such, this sub-unit also aligns with the NFA definition of “natural forest”. The Riparian Woodland, however, occurs outside of the Indigenous Forest sub-unit and therefore only includes riparian habitat and not forest as well. Both these sub-units have a similar vegetation structure, i.e., tall, closed woodland, which typically blends in well with the surrounding forest and woodland communities. The habitat integrity for these sub-units varied within the different 83MRAreas. Within Frankfort, the Riparian Forest was intact and habitat disturbances low (well sheltered from the surrounding disturbances due to its location within the dense Indigenous Forest sub-unit), whereas the habitat integrity of the Riparian Woodland within Frankfort was moderately to largely intact depending on AIP infestation. However, even when surrounded by AIP-dominated Vegetation, the Riparian Woodland in Frankfort tended to have limited disturbances – often in contrast with the surrounding habitat. The Riparian Forest in Dukes was moderately intact adjacent to the historic footprint areas and several AIPs have encroached along these systems deeper into the forested areas. Further away from the historically mined areas, habitat integrity increased. Riparian Woodlands within Dukes and Morgenzon both have lowered habitat integrity since these systems have experienced either diversions in the past or are invaded by AIPs due to their proximity to historic mined areas. No Riparian Forest is associated with Beta North, but the Riparian Woodland associated with Beta North (i.e., the Peach Tree Stream) is significantly degraded. The presence of remnant indigenous vegetation is sub-optimal, and alien species such as *Acacia dealbata*, Eucalyptus species and *Solanum mauritianum* (among many other AIPs) are the dominant vegetation along the stream. The Riparian Woodland (i.e., the Peach Tree Stream) has also experienced significant, direct impacts from illegal mining activities and have been diverted along several sections of its reach.
The Watercourse Habitat include streams and rivers (Blyde River and tributaries) where riparian habitat is present, but the woody component is not as well-developed as within the Riparian Forest and Riparian Woodland. These systems are associated with permanent waterflow and typically have a better representation of grasses and sedges; whereas the woody component is not continuous along these systems. Vegetation structure can be described as tall-to-high, closed grassland along much of its extent, interspersed with stretches of short-to-tall, open woodland. The integrity of these systems also varied across the different 83MRAreas. In Dukes only a small section of the Freshwater Habitat has been categorised as Watercourse Habitat. This is a very secluded piece that is surrounded by a historic mining footprint and consequently, the Watercourse Habitat was overrun by AIPs. Within Morgenzon, the tributary of the Blyde was moderately degraded closer to the historic mining footprint, but improved habitat becomes more evident moving eastwards towards the golf course. The Blyde River running between Beta North has been degraded in its woody compliment from a floral perspective, with the woody component characterised by several AIP trees. The graminoid and the forb component was less invaded in most sections, yet often less diverse than what was observed in sections of the Blyde River where fewer AIPs have encroached.
Species Overview

Floral diversity for the Riparian Forest and the Riparian Woodland was moderately high to intermediate, with floral diversity associated with the Watercourse Habitat intermediate. A total of 106 plant taxa were recorded within the Freshwater Habitat, 47% of which were represented by woody species, 36% by forbs, and 17% by graminoid species. AIPs contributed toward 22% of floral species richness recorded within this habitat unit.

The floral communities associated with the Riparian Forest and Riparian Woodland included several species from the surrounding Indigenous Forest and Woodland sub-units, however, species with a higher affinity for saturated soils were noticeably more abundant than in the surrounding terrestrial habitat. The Watercourse Habitat is moderately representative of what is expected for the river habitat. The presence of AIPs has replaced native species in several sections and is a contributing factor to loss of native species diversity along these systems.

Dominant and/or commonly occurring species within this unit is listed below. Please refer to ANNEXURE M for a comprehensive list of species recorded on site.

- Woody species: *Artemisia afra, Buddleja auriculata, Buddleja salviifolia, Celtis africana, Combretum erythrophyllum, Euryops chrysanthemoides, Ficus sur, Ilex mitis, Kiggelaria africana, Leucosidea sericea, Rhamnus prinoides, Salix mucronata, Ziziphus mucronata*.

- Herbaceous species: *Agrimonia procera, Begonia sutherlandii, Blechnum tabulare (fern), Chlorophytum bowkeri, Crocosmia paniculata, Desmodium uncinatum, Geranium wakkerstroomianum, Hypoestes triflora, Impatiens hochstetteri, Persicaria attenuata, Pteridium aquilinum (fern), Senecio polyanthemoides, Vigna vexillata.*

- Graminoid species: *Carex mossii, Carex spicatopaniculata, Cyperus albostriatus, Panicum deustum, Phragmites australis, Setaria megaphylla*.

- AIP species: *Acacia melanoxylon, Acer negundo, Centella aristata, Cirsium vulgare, Lantana camara, Oenothera rosea, Paspalum dilatatum, Paspalum urvillei, Rubus niveus, Verbena bonariensis, Verbena officinalis.*

Floral Species of Conservation Concern

This habitat unit is associated with floral SCC of a varying threat status6 and/or protection status. Three floral SCC groups were confirmed within this habitat unit, two of which are provincially protected under the MNCA, and one of which is nationally protected under the NFA. Two of the sensitive species triggered by the Screening Tool obtained a high Probability of Occurrence (POC) within this habitat unit and therefore the medium sensitivity for the Plant Species Theme is supported. Refer to the below table for SCC that were confirmed or obtained a High POC for this habitat unit. Refer to ANNEXURE M for all the results of the POC assessment.

From a floral SCC perspective, this habitat unit (especially the Riparian Forest and Riparian Woodlands) either host or provide suitable habitat for Red Data Listed (RDL) species. However, most of the SCC likely to occur within this habitat unit are of LC in terms of their threat status but are protected nationally and/or provincially and will require permit applications from MTPA and DFFE if any form of damage to these species will occur as a result of mining activities.

Scientific Name	POC	Status	Scientific Name	POC	Status
Adenia gummifera var. *gummifera*	High	LC. MNCA-protected	*Podocarpus (=Afrocarpus) falcatus*	**Confirmed**	LC. NFA-protected. MNCA-protected
Cyathea dregei	**Confirmed**	LC. MNCA-protected	*Prunus africana*	High	VU. NFA-protected
Hesperantha bulbifera	High	LC. Rare provincially	*Zantedescia* sp.	**Confirmed**	LC. MNCA-protected
Hesperantha coccinea	High	LC. MNCA-protected	*Scabiosa transvaalensis*	High	VU
Huperzia ophioglossoides	High	LC. Rare provincially	Sensitive species 880	High	VU
Orchidaceae species	**Confirmed**	LC. MNCA-protected	Sensitive species 1252	High	VU

Table 31: Summary of the Terrestrial Woody Community

Terrestrial Woody Community overview

Reference Habitat

Indigenous Forest

The indigenous forest vegetation is associated with a group of trees where the canopy was largely closed. The understory vegetation included several forb, fern, and shrub species, some of the more striking being (from left to right): ***Disperis fanniniae*** (orchid), ***Hylodesmum repandum*** (typical understory forb), ***Liparis bowkeri*** (orchid), and ***Sclerochiton harveyanus*** (understory shrub).

Woodland

The Woodland largely comprised of a tree-dominated habitat, but the tree layer was not always continuous, and the tree canopy not always closed. Graminoids were also a more important component in this sub-unit. Selected examples of tree species typically found in this habitat sub-unit included (photos left to right): ***Bowkeria cymosa, Grewia occidentalis, Rhamnus prinoides***, and the indigenous ***Rubus pinnatus***.

Habitat Overview

Much of the 83MRAreas are associated with floral communities dominated by a woody component. To distinguish between the various woody communities, two characteristics were used to describe key

Terrestrial Woody Community overview	
differences between the sub-units, namely physiognomy[69] (growth form, structure, and cover) and floristics (species composition and abundance). Based on these characteristics, the two different woody communities (Indigenous Forest and Woodland) were characterised.	
Species Overview	
Indigenous Forest Two recognised definitions of "forest" are used in this report: 1. The NFA's definition of natural forest: "...a group of indigenous trees- (a) whose crowns are largely contiguous; or (b) which have been declared by the Minister to be a natural forest under section 7(2)." 2. The definition provided by Mucina et al. (2021): "Forest is a vegetation-physiognomic and ecosystem-functional tree-dominated formation often containing several sub-canopy shrub layers, with the tree canopy having crowns overlapping or touching, covering at least 40% of projected cover, and lacking continuous grassy undergrowth." Taking the above definitions into account, natural forest was confirmed for this habitat sub-unit within Dukes and Frankfort – albeit only small sections within the assessment areas. The Indigenous Forest can be characterised – physiognomically – as tall forest with a tree dominated formation where tree crowns largely overlap, and the understorey consists of both a shrub and an herbaceous understory. The graminoid component is represented mainly by sedges, whereas the occurrence of grasses was sparse to lacking. As is typical for the Mpumalanga Mistbelt Forests (Mucina et al. 2003), the Indigenous Forest sub-unit occurs along south-east facing slopes confined to fire refugia. The integrity of the Indigenous Forest sections was mostly intact, especially with reference to Frankfort. Legacy impacts and the presence of illegal mining has, however, resulted in AIPs encroaching into the	**Woodland** Woodlands bare some physiognomic similarities to Forests in that the woody component is well-developed and dominated by trees in the upper stratum – as opposed to "thickets" that are better described as dense shrublands. The main difference between forests and woodlands, however, stems from the presence of a prominent grass layer in woodlands. The Woodland sub-unit has been subjected to various direct and indirect impacts within the different 83MRAreas. Habitat integrity was most intact for the Woodland associated with Frankfort, i.e., mapped as "Woodland - intact". The Frankfort Woodland is, in many aspects, represented largely by an indigenous compliment with AIP trees such as *Acacia dealbata, Acacia decurrens, Lantana camara, Pinus pinaster and Senna septemtrionalis* only prevalent along the Woodland edges and along the existing haul road. Within Beta North, Dukes and Morgenzon, the Woodland is associated with impaired habitat integrity as the woody compliment is either moderately homogenous (dominated by species such as *Bowkeria cymosa, Diospyros lycioides subsp. lycioides, Leucosidea sericea, Rhamnus prinoides, and Senegalia ataxacantha*) an/or have a prominent presence of AIPs (including several serious invaders such as Lantana camara and various Rubus species). These woodlands are referred to as "Woodland - degraded" on the habitat unit maps and have formed in response to historic disturbances (i.e., most of the degraded Woodlands were historically grasslands). From a vegetation structure perspective, the Woodland sub-unit did not fully represent any

[69] Physiognomy refers to overall structure or physical appearance-what the community and its dominant species look like, their height and spacing (height and canopy cover), and shape

Terrestrial Woody Community overview

Dukes forest, with indigenous woody encroachers such as Senegalia ataxacantha and AIPs such as Lantana camara (amongst others) both evidently increasingly encroaching into the forest margins of Frankfort.

The Indigenous Forest sub-unit was considered species rich and representative of the reference vegetation type. Compositional characteristics were therefore in alignment with the Mucina and Rutherford (2006) habitat description of the Northern Mistbelt Forest, but further shared several characteristics of the Mucina *et al.* (2003) classification of Mpumalanga Mistbelt Forest, and to a lesser degree the Lötter *et al.* (2014) Long Tom Mistbelt Forest sub-type.

Species recorded within the Indigenous Forest are listed below. For a more comprehensive list of species associated with this sub-unit, please refer to ANNEXURE M:

- **The graminoid layer** was not well-represented, as is characteristic of the forest type. Species included: *Carex spicatopaniculata, Cyperus albostriatus, Cyperus distans, Cyperus glaucophyllus, Oplismenus hirtellus, Setaria megaphylla.*

- **Forbs and ferns** included: *Abrus laevigatus, Asplenium aethiopicum, Begonia sutherlandii, Cheilanthes viridis, Chlorophytum bowkeri, Crocosmia aurea* subsp. *aurea, Dicliptera clinopodia, Dietes iridioides, Hypoestes triflora, Impatiens hochstetteri, Peperomia retusa, Plectranthus* cf. *fruticosus, Pteridium aquilinum, Pteris catoptera, Streptocarpus confusus* subsp. *confusus*.

- **The woody layer** was well developed and diverse. The canopy and emergent component included *Afrocarpus falcatus, Apodytes dimidiata, Brachylaena transvaalensis, Celtis africana, Combretum kraussii, Cussonia spicata, Ficus sur, Kiggelaria africana, Searsia chirindensis, Xymalos monospora*. The intermediate and shrub layer included *Asparagus setaceus, Behnia reticulata, Carissa bispinosa* subsp.

reference vegetation type. Overall structure can be described as tall, closed woodland Only the Frankfort Woodland included a decent representation of species that were representative of a transitional community between the Northern Mistbelt Forest vegetation type and the Northern Escarpment Dolomite Grassland vegetation type. The Woodland associated with Beta North, Dukes, and Morgenzon are not representative of the reference states.

The Frankfort Woodland was associated with a moderately high species richness, however, where AIPs started to encroach into the sub-unit, the indigenous species compliment was less species rich. The homogenous and often AIP-dominated Woodland associated with Beta North, Dukes and Morgenzon were, at best, associated with a moderate species richness.

Species recorded within the Woodland sub-unit are listed below. For a more comprehensive list of species associated with this sub-unit, please refer to ANNEXURE M:

- **The graminoid layer** was typically well-represented, especially within the Frankfort Woodland. Species included: *Cynodon dactylon, Cyperus distans, Cyperus glaucophyllus, Digitaria eriantha, Melinis repens, Panicum deustum, Panicum maximum, Setaria megaphylla, Urochloa mosambicensis.*

- **Forbs and ferns** included: *Clematis brachiata, Commelina africana, Conostomium natalense, Gerbera jamesonii, Ipomoea obscura, Macledium zeyheri, Momordica foetida, Pearsonia sessilifolia, Scabiosa columbaria, Senecio oxyriifolius, Zornia capensis*.

- **The woody layer** was well developed for Frankfort, less so in Beta North, Dukes and Morgenzon. Species included *Albizia versicolor, Athrixia elata, Bowkeria cymosa, Buddleja salviifolia, Cephalanthus natalensis, Combretum molle, Crotalaria doidgeae, Dombeya burgessiae, Euclea crispa, Faurea galpinii, Grewia occidentalis, Morella pilulifera, Pittosporum cf viridiflorum,*

Terrestrial Woody Community overview	
zambesiensis, Cassinopsis ilicifolia, Dalbergia armata, Diospyros whyteana, Myrsine africana, Piper capense, Psychotria zombamontana, Sclerochiton harveyanus. • **Succulent species** recorded included only a *Cotyledon* sp.; however, *Aloe* species are anticipated to occur deeper into the forests*; and* • **AIPs** were not prominent within the habitat sub-unit. The forest fringes, however, included an intermediate representation of AIPs, e.g., *Lantana camara.* Often common in the understorey *Bidens pilosa, Conyza canadensis,* and *Galinsoga quadriradiata*.	*Rhamnus prinoides, Senegalia ataxacantha, Vachellia karoo*. • **Succulent species** recorded included mainly *Aloe* species*; and* • **AIPs** comprised of *Lantana camara, Acacia dealbata, Acacia decurrens,* and *Pinus pinaster* in the tree component, whereas the herbaceous component includes *Bidens pilosa, Conyza canadensis, Phytolacca octandra, Tagetes minuta, Verbena bonariensis, Zinnia peruviana*.

Floral Species of Conservation Concern
This habitat unit is associated with national and provincial SCC and provides suitable habitat to support additional SCC not recorded during the field assessment. Please refer to ANNEXURE M for the complete outcome of the POC assessment. From a floral SCC perspective, the Indigenous Forest sub-unit and the intact Woodland sub-unit either host or provide suitable habitat for RDL species. The degraded Woodland has a low probability to host SCCs. The SCCs that were confirmed present within the Indigenous Forest sub-unit and the intact Woodland sub-unit are all of LC conservation status but are either nationally or provincially protected. Several of the RDL species triggered by the screening tool obtained a high to medium POC for the Indigenous Forest sub-unit and the intact Woodland sub-unit and the medium sensitivity outcome of the screening tool for the Plant Species theme is thus supported. The Indigenous Forest sub-unit and to a lesser degree the Woodland sub-unit are important for floral SCC. It is highly recommended that where these species may be impacted by the proposed mining activities, the footprint layouts be realigned / adjusted to prevent loss of these species. If impacts to species are unavoidable, permit applications from MTPA and DFFE will be required.

Terrestrial Woody Community overview

Scientific Name	POC	Suitable habitat on site	Status	Scientific Name	POC	Suitable habitat on site	Status
Adenia gummifera var. *gummifera*	High	Indigenous Forest sub-unit, Riparian Forest sub-unit, and the Riparian Woodland sub-unit.	LC. MNCA-protected	**Orchidacaee species**	Confirmed	Indigenous Forest sub-unit	LC. MNCA-protected
Adenia wilmsii	Medium	Woodlands (where more grassy and along rocky slopes)	EN TOPS. MNCA-protected	*Pentatrichia alata*	Medium	Frankfort Woodlands (west of the footprint).	Data deficient
Aloe nubigena	Medium	Woodland associated with Frankfort.	Rare	***Pittosporum viridiflorum***	**Confirmed**	**Indigenous Forest of Frankfort and Morgenzon.**	**LC. NFA-protected**
***Aloe* spp.**	**Confirmed**	**Woodlands**	**LC. MNCA-protected**	***Podocarpus (=Afrocarpus) falcatus***	**Confirmed**	**Indigenous Forest of Frankfort and Morgenzon**	**LC. NFA-protected. MNCA-protected**
Callilepis leptophylla	Medium	Woodland associated with Frankfort.	LC. Important provincially	***Podocarpus latifolius***	**Confirmed**	**Indigenous Forests and Woodlands**	**LC. NFA-protected. MNCA-protected**
Catha edulis	High	Indigenous Forests and Woodland sub-units	LC. NFA-protected	**Proteaceae species**	**Confirmed**	**Indigenous Forests and Woodlands**	**LC. MNCA-protected**
Ceropegia spp.	Medium	Indigenous Forests and Woodland sub-units	LC. MNCA-protected	*Prunus africana*	High	Indigenous Forest of Frankfort and Morgenzon, as well as Riparian Forest.	VU. NFA-protected
Clivia caulescens	High	Indigenous Forest sub-unit.	NT. MNCA-protected	*Scabiosa transvaalensis*	High	Indigenous Forest of Frankfort and Morgenzon, as well as Riparian Forest.	VU
Cryptocarya transvaalensis	High	Indigenous Forest sub-unit.	LC. Important provincially	*Scadoxis* spp.	High	Indigenous Forests and Woodlands	LC. MNCA-protected
Curtisia dentata	High	Indigenous Forest sub-unit.	NT. NFA-protected. MNCA-protected	*Siphonochilus aethiopicus*	Medium	Woodlands	CR. TOPS
Faurea macnaughtonii	High	Indigenous Forest associated with Frankfort and Morgenzon, but nowhere close to the proposed footprints.	Rare	*Streptocarpus actinoflorus*	Medium	Ecotone between the Frankfort and Morgenzon Indigenous Forests and adjacent Montane Grasslands (not within the footprint areas).	EN
Hesperantha bulbifera	High	Indigenous Forest and especially the Riparian Forest.	LC. Rare provincially	*Streptocarpus fenestra-dei*	Medium	Frankfort and Morgenzon Indigenous Forests.	VU
Huperzia ophioglossoides	High	Indigenous Forest and Riparian Forest.	LC. Rare provincially	***Zantedeschia* spp**	**Confirmed**	**Indigenous Forest sub-unit of Morgenzon**	**LC. MNCA-protected**
Merwilla plumbea	High	Rock outcrops in grassy Woodland	NT. TOPS. MNCA-protected	Sensitive species 1252	High	Indigenous Forest sub-unit, Riparian Forest and Riparian Woodland sub-units.	VU
Monopsis kowynensis	Medium	Margins of Indigenous Forest and Woodland.	VU	Sensitive species 738	High	Indigenous Forests of Frankfort and Mprgenzon, as well as Woodland of Frankfort.	EN. TOPS. NFA-protected. MNCA-protected
Ocotea bullata	Medium	Indigenous Forest of Frankfort and Morgenzon, but likely deeper into the forests.	EN. NFA-protected. MNCA-protected	Sensitive species 880	High	Indigenous Forest sub-unit, Riparian Forest and Riparian Woodland sub-units.	VU
Ocotea kenyensis	Medium	Indigenous Forest of Frankfort and Morgenzon, but likely deeper into the forests.	VU. MNCA-protected	Sensitive species 998	Medium	Woodland associated with Frankfort – west of the proposed footprint.	EN
Olinia huillensis subsp. *burttdavii*	Medium	South African endemic Indigenous Forest	VU	Sensitive species 1248	Medium	Woodland associated with Frankfort.	VU. MNCA-protected

Table 32: Summary of the Valley Habitat

Valley Habitat overview

Reference Habitat




Representative photos of the Valley Habitat that was recorded within Beta North, Dukes and Morgenzon. This habitat unit was not represented in Frankfort.

Valley Habitat overview

Habitat Overview

The Valley Habitat occurs along the mountain footslopes of Beta North, Dukes, and Morgenzon. This habitat unit varied in habitat integrity across the different 83MRAreas, ranging from sections where AIP species to areas where native grasses, forbs and ferns were more prevalent (typically **short-to-tall, closed herbland**). A small stretch along the Morgenzon Haul Road includes Rocky Outcrops; however, important to note is that the Rocky Outcrops are not represented anywhere else in the 83MRAreas apart from this small stretch. Since there will be no changes to the existing Haul Roads (i.e., the only infrastructure associated with the Rocky Outcrops), this habitat sub-unit will not be impacted by the proposed 83MRproject. As such, this habitat unit will not be discussed further.

The vegetation communities associated with the Valley Habitat are not representative of any of the reference vegetation types (neither corresponding to the grassland nor the forest types for the area), which can be attributed to the vegetation's response to two main landscape drivers, namely 1) position in the landscape and 2) exposure to historic (and/or current) disturbances. Since this habitat unit occurs along the mountain foothills, sediment and water often accumulate in this habitat, i.e., the habitat is exposed to increased natural disturbances that result in a landscape dominated by forbs and low shrubs (e.g., *Helichrysum mimetes, Helichrysum splendidum, Phymaspermum acerosum*) as opposed to the typical species-rich grassland communities expected from the reference Long Tom Pass Montane Grassland and Northern Escarpment Dolomite Grassland vegetation types.

Within areas where more disturbances were present, be it historic or more current, the vegetation communities were characterised by a high abundance of AIPs and the encroaching *Artemisia afra* and *Pteridium aquilinum* (common bracken fern). The lack of typical grassland communities can further be explained by the alteration of important grassland drivers such as high natural incidence of fire and grazing by wildlife within the 83MRAreas. This is especially relevant within Beta North, Dukes and Morgenzon where mining practices (illegal and organised) have changed natural fire regimes and have driven out larger herbivores (replacing these with domestic livestock that increase grazing pressures).

The habitat integrity of this habitat unit is of moderately low to intermediate importance for floral ecology associated with the 83MRAreas and surrounding landscapes.

Species Overview

A low to moderately-low native species diversity was present within the Valley Habitat of Beta North, Dukes and sections of Morgenzon. Healthier vegetation communities – that support intermediate floristic diversity with increased heterogeneity – were mostly recorded along the proposed Haul Road associated with Morgenzon A total of 58 plant taxa were recorded within the Valley Habitat, 24% of which were represented by woody species, 59% by herbaceous species, and 17% by graminoid species. AIPs contributed toward 24% of all floral species recorded within this habitat unit.

From a species composition perspective, the floral communities within this habitat unit are not representative of the reference vegetation types. Dominant and/or commonly occurring species within this unit is listed below. Please refer to ANNEXURE M for a comprehensive list of species recorded on site.

- **Woody species**: *Artemisia afra* var. *afra, Diospyros lycioides* subsp*. lycioides, Eriosema psoraleoides, Helichrysum mimetes, Leucosidea sericea, Phymaspermum acerosum.*
- **Herbaceous species**: *Agrimonia procera, Crocosmia paniculata, Crotalaria pallida, Nidorella auriculata, Oxalis obliquifolia, Pelargonium luridum, Senecio microglossus.*
- **Graminoid species**: *Andropogon eucomus, Cynodon dactylon, Cyperus cyperoides, Eragrostis capensis, Eragrostis plana, Setaria sphacelata, Sporobolus centrifugus.*

Valley Habitat overview
• **AIP species**: *Lantana camara, Melilotus albus, Melilotus indicus, Oenothera rosea, Oenothera tetraptera, Schkuhria pinnata, Tagetes minuta, Verbena bonariensis*.
Floral Species of Conservation Concern
This habitat unit was not found to be important for RDL species and none of the triggered sensitive species from the Screening Tool outcome are likely to establish in this habitat unit. The medium sensitivity for the Plant Species Theme is thus not supported. Provincially protected species such as *Eucomis autumnalis, Scadoxus* species and species in the Orchidaceae family are likely to be present in this habitat unit; however, these are all LC species and not in threat of extinction at this stage. Loss of these species or their habitat would still require permit applications from the MTPA. Please refer to ANNEXURE M for the outcome of the POC assessment. The NT *Merwilla plumbea* is likely present within the rocky outcrops of this habitat unit; however, the proposed footprint will not impact on this species' habitat. Since this is a species of medicinal importance, the mine should take the necessary measures to ensure workers do not harvest the remaining sub-populations.

The following figure (**Figure 67**) shows the indigenous vegetation of importance as per the NEMA definition.

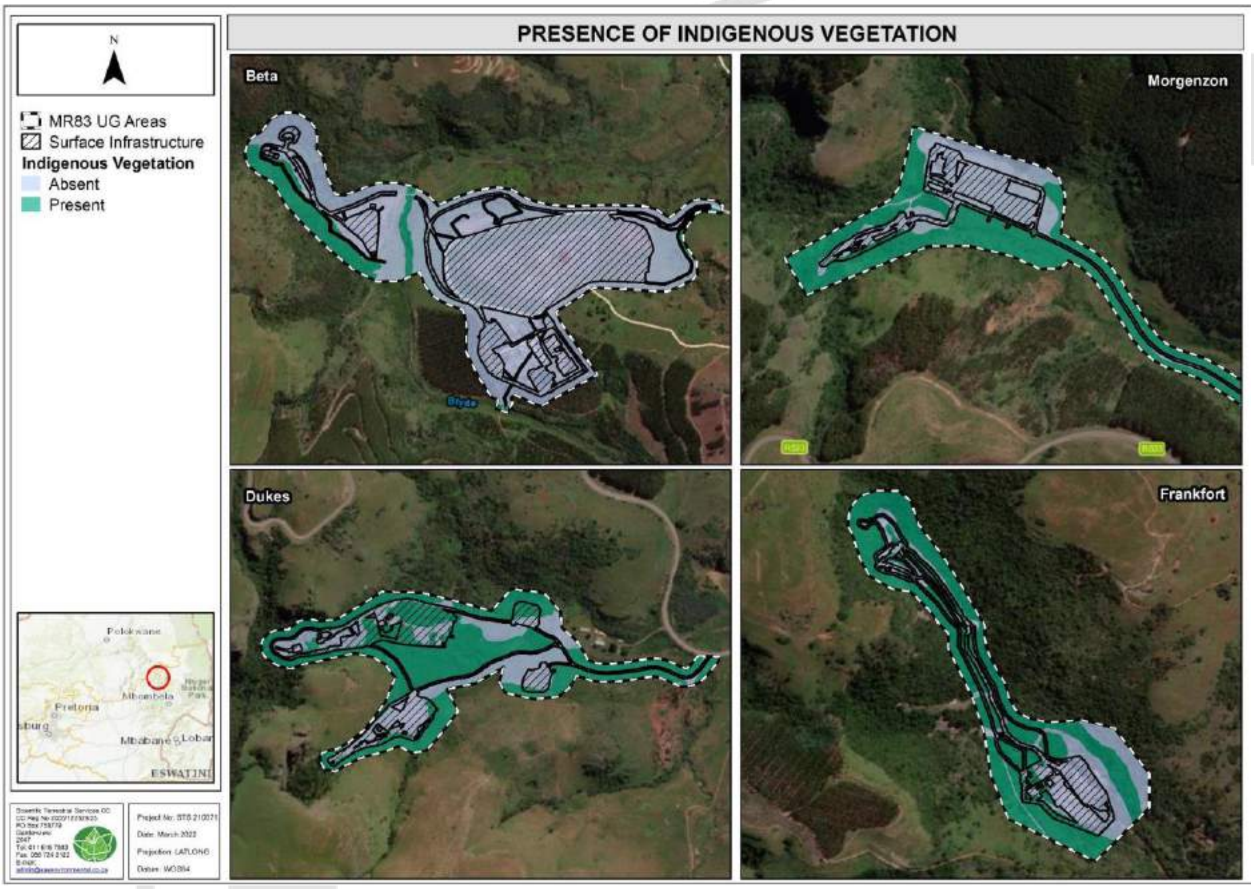


Figure 67: Areas of importance for indigenous vegetation within the 83MRAreas

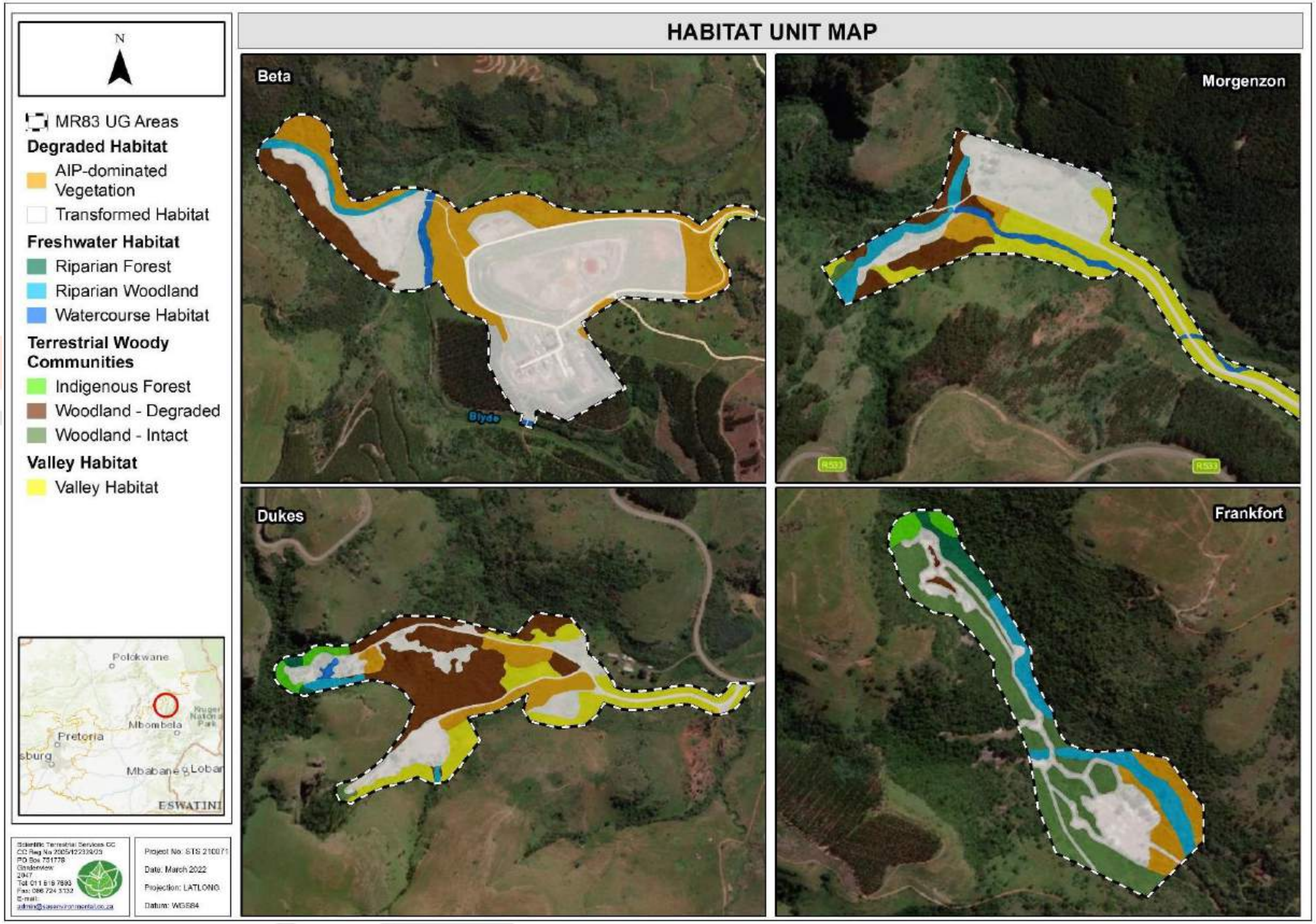


Figure 68: Habitat units associated with the 83MRAreas

9.10.1.2 TERRESTRIAL SENSITIVITY

The DEA Screening Tool identified the 83MRAreas to be in a Medium Sensitivity area for the Plant Species Theme and a Very High Sensitivity for the Terrestrial Biodiversity Theme.

Figure 69 to **Figure 74** conceptually illustrate the areas considered to be of varying ecological sensitivity and how they will be impacted by the proposed infrastructure development. The areas are depicted according to their sensitivity in terms of the presence or potential for floral SCC, habitat integrity and levels of disturbance, threat status of the habitat type, the presence of unique landscapes and overall levels of diversity (compared to a reference type).

9.10.1.3 FAUNAL BASELINE

The results of the field assessment agree with the Mpumalanga Biodiversity Sector Plan (2019) that indicates that most (± 408 of 528 Ha or 77 %) of the 83MRAreas occurs within “Heavily Modified” areas. The 83MRAreas has been historically transformed by subsistence farming and heavy livestock grazing, and as such, no longer contains high conservation value.

Table 33: Summary of the Mammal findings

MAMMALS
Representative Photographs of Species Recorded

a) Rhinolophus blasii (Blasius's Horseshoe Bat), b) Atilax paludinosus (Water Mongoose), c) Chlorocebus pygerythrus (Vervet Monkey) spoor.

Mammal Habitat and Diversity Overview

The site assessment focused on the areas that will be disturbed by the proposed mining activities at each 83MRAreas, as well as the surrounding habitat and the impact the activities may have on faunal species and habitat connectivity. Mammal diversity and abundance at all the sites was considered low, most notably at Beta North and Dukes where anthropogenic activities (illegal miners) are very high. The habitat within Beta North and Dukes has further been notably impacted upon as a result of AIP's proliferation, historic mining disturbances, earth moving activities and stream diversions by the illegal miners. Though the habitats within the Dukes and Beta North footprints could potentially host several common species and possibly SCC, the current state of these sites and the continued expansion of illegal mining activities precludes this from happening. As such, mammal species for the most part appear to avoid these areas due to these impacts, the lack of useable habitat and the increased presence of people.

At Morgenzon, mammal activity was marginally higher although historic and current disturbances and the presence of illegal miners is impacting on the overall diversity, notably as the illegal miners are utilising the old buildings on site as a base of operations. Habitat and habitat connectivity at Morgenzon is, however higher allowing for mammal species to move more freely through the mining area, though such movement is likely to be sporadic and comprising only a small number of mammal species. The more open valley bushveld and vegetation along the freshwater system provides suitable food resources to the small number of common mammal species herein. The presence of surface water will further likely act as an attractant to mammal

MAMMALS			
species. An individual *Redunca fulvorufula* (Mountain Reedbuck) was observed coming down to the stream along the haul road at Morgenzon to drink following which it then moved off back into the mountainous terrain to the south of the road. Illegal mining at Frankfort in the past and now low intensity sampling activities, has resulted in increased anthropogenic disturbances in the mining site as well as the surroundings, however, these levels are notably lower than that of the other three sites. Although these disturbances are lower, mammal diversity and abundance were still noted to be low, which is likely attributed to the locality of the mine in the valley and the mountainous terrain which limits faunal species movement. The steeper slopes and denser woody component associated with Frankfort makes this site more suitable to arboreal mammals as well as small mammals who require less space and can more easily maneuver in the steeper terrain. The presence of the freshwater system does, however provide an invaluable source of surface water for any mammals in the footprint and surrounding areas.			
Mammal SCC			
The databases for the region indicate that several mammal SCC are associated with the various mining sites from a desktop perspective. Taking into consideration that the majority of the proposed mining infrastructure within the 83MRAreas are located within existing transformed habitats, the possible impact to mammal SCC is notably reduced. There are, however, a few stand out examples where SCC may make use of the habitats within or immediately adjacent the mining sites, either permanently or temporarily. These species have been listed and briefly discussed below.			
Species	**Discussion**	**Status**	**POC**
Rhinolophus cohenae (Cohen's Horseshoe Bat)	All three of these species are known from the region and have previously been recorded according to the MTPA database. These bat species may occupy the old, abandoned, non-active mine shafts within and surrounding the proposed mining areas. These bats, however, are unlikely to occur in shafts that are more regularly utilised by illegal miners. Bats in general are tolerant to anthropogenic influence and are known to also make use of buildings to roost. During the assessment of the sites, a single individual *Rhinolophus blasii* was observed in an old shaft near the Morgenzon footprint area, though, it must be noted that this shaft is located outside of the proposed mining footprint and will not be impacted upon by the proposed mining activities. At Frankfort, two other *Rhinolophus sp* individuals were observed in an old shaft located outside of the proposed footprint, unfortunately, they flew deeper into the mineshaft before detailed photographs could be taken. This shaft does, however, not form part of the proposed Frankfort mining activities.	VU	High
Rhinolophus blasii (Blasius's Horseshoe Bat)		NT	Confirmed
Rhinolophus swinnyi (Swinny's Horseshoe Bat)		VU	High
Panthera pardus (Leopard)	This species is adept at surviving within a variety of habitats. The mining areas and surrounding habitat are likely inhabited by this species, albeit at a low density. Individuals have been seen in the past near the Beta mine and it is likely that Morgenzon and Frankfort would fall within a leopard's home range. It is, however, considered unlikely that an individual would be wholly reliant on the mining areas for survival, nor would they breed in these specific areas due to the increased	VU	Medium

MAMMALS			
	presence of people herein. Mining activities are unlikely to have any negative impact on this species and may actually have a positive one. Formal mining will lead to a controlled and reduced presence of illegal miners. This may possibly result in an increase of larger mammals (prey items) due to a decrease in snaring activities, resulting in a possible increase in leopard abundance in the region, although likely marginal.		
Cercopithecus albogularis schwarzi (Samango Monkey)	Restricted to forest habitats, this species may inhabit the forested areas surrounding Frankfort. This species is unlikely to occur at any of the other sites due to the increased presence of illegal miners and habitat disturbances. Mining activities at Frankfort are, however, unlikely to impact on this species, as the proposed infrastructure is not expected to impact upon the Forest habitat.	EN	Medium
Concluding Remarks			
The proposed mining sites are located predominantly within existing disturbance and / or transformed areas. The mammal assemblages within these disturbed areas are not well represented, with the majority of the species observed being located in the adjacent habitats, outside of the proposed disturbance footprint. The additional pressure of the illegal mining activities and human movement in the areas further reduces mammal abundances, notably larger mammals. The only significant concern pertaining to mammals in the region with regards to the current proposed mining activities would be the potential impacts on bats, notably the three species listed above. This concern, however, is largely mitigated as the proposed adit access points will be the same adits currently utilised by the illegal miners and as such, it is unlikely that the bats will be present therein.			

Table 34: Summary of the Avifauna findings

AVIFAUNA
Representative Photographs of Species Recorded

AVIFAUNA

a) Estrilda astrild (Common Waxbill), b) Apalis thoracica (Bar-throated Apalis) and c) Zosterops virens (Cape White-eye).

Avifaunal Habitat and Diversity Overview

Due to their increased mobility (flight), avifaunal species are far less location restricted than other species, easily able to overcome structures and elevated terrain. Avifauna are better able to make use of all habitats associated with the various mining areas, predominantly driven by food availability and suitable nesting habitat during breeding seasons. The Transformed habitat in which the majority of the mining infrastructure is proposed is largely considered unsuitable even for avifauna, providing limited foraging grounds and no suitable areas for refuge or nesting.

The Woodlands, Forests and Freshwater habitats provide the highest degree of suitable habitat for avifauna, notable insectivores who will actively search out insects within these habitats as a readily available food resource. These habitats also provide suitable areas of refuge and nesting owing to the increased abundance of woody species. Larger avifauna, notably raptors and owls will likely favour the Forest habitat owing to the larger trees growing herein. Forage availability for granivores is relatively abundant within all the mining areas, whilst fruiting and flowering plants provide additional seasonal food resources. Limited evidence and no direct observations of ground-dwelling birds such as *Numida meleagris* (Helmeted Guineafowl) and *Pternistis natalensis* (Natal Spurfowl) were made. It is likely that snaring activities by the illegal miners in the mining sites have resulted in a decrease in abundance, as well as possible area avoidance by the remaining species.

Very few avifauna were observed at Dukes, though this is likely attributed to the short duration of the assessment due to safety concerns. Given the habitat component associated with Dukes, it is unlikely that a high diversity of avifauna will occur therein, with many species being common and widespread species readily observed in other areas. The habitats within the Morgenzon assessment were more intact than that of Dukes and consequently, a greater abundance of avifauna was observed. These species were, however still considered to be common and widespread species, many of which also appeared at Dukes. Beta was very similar in terms of avifaunal diversity in the footprint areas as Morgenzon and Dukes. The proliferation of AIPs and the disturbances as a result of illegal mining have led to a decrease in suitable avifaunal habitat. Common species were observed although in a low abundance, however low observation rates can also be attributed to the limited time available on site due to safety concerns.

AVIFAUNA			
Frankfort is considered to be the most intact area in terms of avifaunal habitat provisioning, predominantly due to the Woodlands, Freshwater systems and Forests associated with Frankfort. The dense vegetation made direct observations more difficult, but it was evident from vocalisations that Frankfort has a higher diversity of avifauna in comparison to the other site.			
Avifaunal SCC			
The databases for the region indicates that several avifaunal SCC are associated with the various mining sites from a desktop perspective. Taking into consideration that the majority of the proposed mining infrastructure areas are located within existing transformed habitat, the likelihood that avifaunal SCC will occur in these direct footprint areas is considered small. There are, however, a few SCC that may make use of the habitats adjacent the mining sites, either permanently or temporarily. These species have been listed and briefly discussed below.			
Species	**Discussion**	**Status**	**POC**
Eupodotis senegalensis (White-bellied Korhaan)	Known from several records in the region, this species is likely to make use of the open woodland areas and valley habitat where is can easily move about on the ground foraging for prey items. Such foraging activity is likely to be undertaken at a lower frequency in the areas where there is an increased presence of illegal miners. Due to its ground foraging habits, this species is also at increased risk of being caught in wire snares set between shrubs and taller stands of grass. The proposed areas of development associated with the various mining activities are unlikely to pose any significant risk to this species, whilst the formal and controlled activities in the mining sites will likely lead to a decrease in snaring activities which may be potentially beneficial to the species over the long term.	VU	Medium
Geronticus calvus (Southern Bald Ibis)	Much like the above korhaan species, this species opts to forage in open grasslands, particularly those that have been grazed where a short grass layer is present. Although informal grazing does occur within the various mining sites, the grazing intensity does not create short grassland areas and as such, decreases the favourability of these areas for G. calvus. Mining activities should they be authorised are unlikely to impact upon this species in terms of loss of foraging or breeding habitat.	VU	Medium
Hirundo atrocaerulea (Blue Swallow)	A small swallow whose breeding habitat is under threat from agriculture and continued human developments in suitable areas of habitat. This species is a specialist in terms of nest construction, opting to nest in underground sinkholes, old adits and aardvark burrows. The proposed mining activities are not located in any such localities that may be considered important breeding areas of this species. The proposed mining localities are further unlikely to impact on the preferred foraging ground of *H. atrocaerulea*, which is often seen foraging over wetlands and streams, catching insects mid-flight.	CR	Medium

AVIFAUNA			
Stephanoaetus coronatus (African Crowned Eagle)	This species has been previously recorded in the areas surrounding the proposed mining areas. Owing to the large home range of this species, it will likely forage over extensive distances in search of prey and will not be reliant upon, nor likely hunt within, the proposed areas earmarked for mining development. This species is, however, reliant on large trees in the forest habitat for nesting and as such, it is important that minimal disturbances to this habitat occur. During the site assessments, no nests in the forest habitat were observed nor were any individuals seen flying over or in close proximity to the sites.	VU	High
Concluding Remarks			
The proposed mining footprints are all located in areas that have already been transformed / notably disturbed. These areas are noted to provide limited habitat and resource provisioning to avifauna and as such are not considered important from an avifaunal importance perspective. Following the site assessment, it is considered unlikely that the proposed mining footprints and activities will have a notable impact on common species and avifaunal SCC in the immediate and surrounding areas.			

Table 35: Summary of the Herpetofauna findings

HERPETOFAUNA
Representative Photographs of Species Recorded


HERPETOFAUNA

a) Sclerophrys gutturalis (Guttural Toad), b) Amietia delalandii (Common River Frog), c) Lycodonomorphus rufulus (Common Brown Water Snake) and d) Lygodactylus capensis (Common Dwarf Gecko)

Herpetofauna Habitat and Diversity Overview

Amphibians and reptiles are notoriously difficult to sample due to their secretive natures, habitual avoidance of predators and in the case of amphibians, various stages of metamorphosis. This is further compounded when undertaking surveys of short duration. However, given that the planned mining areas are predominantly located in already transformed and disturbed areas and that there is significant background info for the region, these limitations are not considered detrimental to this study.

Only two amphibian species were observed (as photographed above), both of which are considered to be common and widespread species. Both these species were readily observed at Morgenzon and Frankfort along with the freshwater systems and in the adjacent vegetation where soil moisture was higher. No amphibians were observed at Dukes, though there was surface water in areas. Both of the observed amphibian species have previously been observed at Beta, notably along the peach tree stream, however, following the significant impacts that the illegal miners have had on this system, the abundances of these species appear to have been reduced, with no individuals being observed during the assessment. Food resources for amphibians in the form of insects are not considered a limiting factor in the sites, nor is habitat quality where no illegal mining activities are taking place. With the exception of stream crossings to access the adits, impacts to the freshwater systems and as such amphibian species is unlikely to be significant, and will likely be less than the current level of impacts resulting from illegal mining activities.

Reptiles species were not readily observed within the proposed mining sites, with only the two species listed observed (as photographed above). Previous site visit observations for the local area have included species such as Chamaeleo dilepis (Common Flap-necked Chameleon), Agama aculeata distanti (Eastern Ground Agama), Pseudocordylus melanotus (Drakensburg Crag Lizard), Trachylepis varia (Variable Skink) Panaspis wahlbergi (Wahlberg's Snake-eyed Skink) and Philothamnus natalensis occidentalis (Western Natal Green Snake). Reptiles are inherently adept at inhabiting a range of habitats, including disturbed and transformed sites. Skinks and geckos were readily observed in the transformed areas whilst it is considered likely that reptiles such as those previously recorded will inhabit the areas surrounding the proposed mining sites. Insects, small mammals, amphibians and even small reptiles will form the primary prey base of many reptile species, with some of the skinks and agamas also ingesting suitable plant material. Given the adaptability of reptiles, it is unlikely that any reptiles species associated with the sites will be significantly impacted. In contrast, some

HERPETOFAUNA			
of the species may thrive, given that the buildings will provide suitable areas of refuge as well as new potential foraging grounds. Insects will likely be attracted to the mining sites at night due to lights, resulting in an increase in prey abundance for small reptiles.			
Herpetofauna SCC			
The databases for the region indicate that several herpetofaunal SCC are associated with the various mining sites from a desktop perspective. Taking into consideration that the majority of the proposed mining infrastructure areas are located within existing transformed habitats, the likelihood that herpetofauna SCC will occur in these direct footprint areas is considered limited. There are, however, a few SCC that may make use of the habitats adjacent to the mining sites, either permanently or temporarily. These species have been listed and briefly discussed below.			
Species	**Discussion**	**Status**	**POC**
Hadromophryne natalensis (Natal ghost frog)	H. natalensis inhabits clear, swift-flowing streams located in mountainous terrain where these waters flow through forests and wooded areas. This rather niche habitat requirement precludes the Dukes and Morgenzon mining areas. The Peach Tree stream that flows through Beta may have once provided habitat for this species, however, stream diversions by illegal miners as well as significant sediment deposition and water pollution from these mining activities have likely rendered the Peach Tree stream redundant in terms of habitat provisioning for this species. The freshwater system flowing through the Frankfort site is, however, considered suitable for this species, being largely unimpacted, clear and fast flowing through a well-wooded area. Though sections of the stream were searched for this species, no individuals were observed, however, this could be a result of the limited sampling time as well as the varying metamorphic phases of the frogs. Any disturbance to this stream system may place individuals at increased risk.	VU	Medium
Bradypodion transvaalensis (Transvaal Dwarf Chameleon)	This species is generally associated with dense moist forest and thick vegetation associated with heavy mist but has also been recorded in the grassland areas adjacent to plantations. This species may occur in the Forest and Wooded habitats associated with Frankfort, and to a lesser extent, this species may occur at Morgenzon. This species is unlikely to be associated with the footprint areas at Dukes or Beta due to habitat disturbance.	VU	Medium
Chamaesaura anguina anguina (Cape Grass Lizard)	This species inhabits grassland areas and as such may inhabit the more open areas of the Valley Habitat. Since the proposed mine development areas are predominantly located outside of potentially suitable habitat areas for this species, mining activities are unlikely to pose any significant threat to any individuals should they occur at the various sites.	NT	Medium
Homoroselaps lacteus (Spotted Harlequin Snake)	This species shows a preference for fynbos, lowland forests, moist savannas and grasslands, preying upon small lizards and other small snakes, notably legless skinks and blind snakes.	NT	Medium

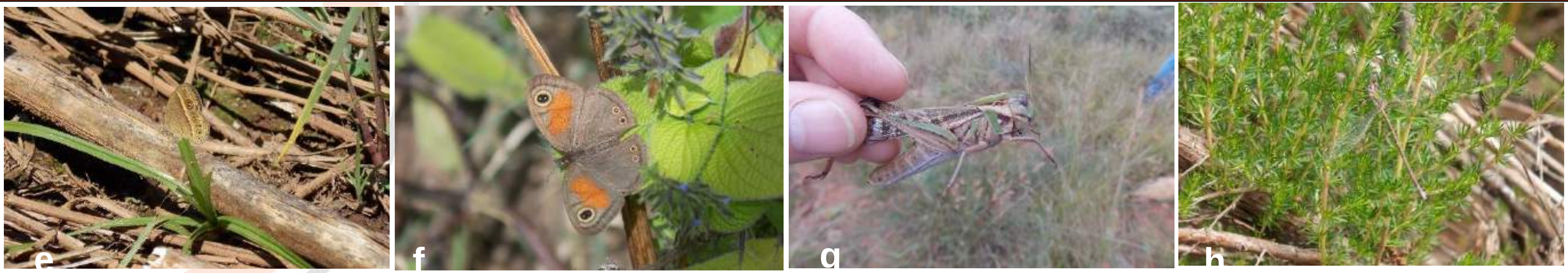
HERPETOFAUNA			
	Habitat disturbances around Beta and Dukes have likely resulted in the creation of unsuitable habitat for not only this species but its prey items. Morgenzon and Frankfort may however support a local population of this snake species.		
Concluding Remarks			
A low diversity of herpetofauna were observed, although the species that were observed appeared to be fairly abundant. The low observed diversity is not considered representative of the true diversity of the areas as food resources and habitat availability will likely support a far higher diversity of reptiles and amphibians. Much of the mining infrastructure is planned to be developed in already disturbed areas and as such, the natural habitat for amphibians and reptiles is unlikely to be disturbed, ensuring that the proposed mining activities are unlikely to impact herpetofauna abundance and diversity in the region.			

Table 36: Summary of the Invertebrates findings

INVERTEBRATES (INSECTS AND ARACHNIDS)
Representative Photographs of Species Recorded

a) Acraea nohara nohara (Light Red Acraea), b) Trithemis furva (Navy Dropwing), c) Precis archesia (Garden Commodore) and d) Platypleura sp (Cicada).

INVERTEBRATES (INSECTS AND ARACHNIDS)



e) Brakefieldia perspicua perspicua (Marsh Patroller), f) Cassionympha cassius (Rainforest Brown), g) Gastrimargus sp (Grasshopper) and h) Chlorolestes fasciatus (Mountain Malachite).

i) Trichonephila fenestrata (Hairy Golden Orb-weaving Spider), j) Cheloctonus intermedius (Intermediate Creeper Scorpion), k) Genus Leucauge (Orchid Spiders) and l) Caerostris sp (Bark Spider).

Invertebrate Habitat and Diversity Overview
Invertebrate species were the most common faunal class encountered within the various mining sites and were readily observed in the Morgenzon and Frakfort sites whilst a lower abundance and diversity of invertebrates was observed in the Dukes and Beta sites. Morgenzon and Frankfort provide better habitat opportunities for invertebrates in comparison to Dukes and Beta, with Dukes and Beta being more impacted upon and more active in terms of illegal mining activities. Insect species are considered a vital and important link in the ecosystem, fulfilling many ecological roles, including pollination, removal of dead animal and plant material, pest predation and parasitism and clearing of dung and scat from larger mammals. The Transformed habitat provided limited habitat for insects, though, individuals belonging to the Orthoptera Family (Crickets and Grasshoppers) were observed herein. Lepidopterans (Butterflies) were prevalent throughout all the sites, with the highest abundances and diversity being observed in Frankfort and Morgenzon in the Woodland and Valley Habitats. Flowering plants, including AIPs provide an important and seasonal food resource for many insects, whilst these insects also serve an

INVERTEBRATES (INSECTS AND ARACHNIDS)			
important function as pollinators of these species. Herbivorous insects' species are not limited in terms of food resources given the diversity of herbaceous and woody species present within the various mining sites. Insect species provide a vital food resource for many of the other faunal species in the region. As such impacts that lead to the loss of insect abundance and diversity will have a negative cascading effect on other faunal species in the 83MRAreas. Arachnid species were readily observed within Frankfort and Morgenzon, and to a lesser extent in Beta and Dukes. Arachnid abundances appeared to be comparative with insect abundances, as to be expected, as insects serve as a primary food resource for arachnid species. Web building and plant dwelling spiders were abundant, whilst a lower abundance of ground dwelling and active hunting spiders such as those of the family Lycosidae (Wolf Spiders) were also observed. As many arachnids are crepuscular or nocturnal, it is likely that many arachnid's species were not observed during the site assessment. Though this is a limitation to the study, the presence of suitable habitat and food resources in the non-transformed habitats allows for the inference that the mining site likely comprise of a diversity of arachnids, notably given the variations in vegetation structure which provides unique habitat and hunting opportunities to arachnids. The majority of the proposed mining infrastructure is located in the Transformed habitat and as such, little impact and or disturbances to arachnids are expected.			
Invertebrate SCC			
The database for the region indicates that several invertebrate SCC are associated with the various mining sites from a desktop perspective. Taking into consideration that the majority of the proposed mining infrastructure areas are located within existing transformed habitat, the likelihood that invertebrate SCC will occur in these direct footprint areas is small. There is, however one SCC that may make use of the habitats adjacent the mining sites, either permanently or temporarily. This species has been listed and briefly discussed below.			
Species	**Discussion**	**Status**	**POC**
Pseudagrion newtoni (Harlequin Sprite)	This species is known form the region where it favours grass-lined or sedge-lined streams in hilly or mountainous country. Many such streams in the region have been subjected to trampling by livestock and the proliferation of woody species along the banks, creating unfavourable habitat for this species. The freshwater system associated with the Morgenzon haul road may provide suitable habitat for this species (grass lined stream banks), though, even here the impacts of trampling by cattle and increased woody cover along the banks is evident, leaving only small areas that may be considered suitable for this species. The proposed mining footprint are unlikely to impact on the integrity of the stream, though, continued cattle grazing, and woody encroachment will likely do so.	VU	Medium
Concluding Remarks			
Mining processes have the potential to impact on invertebrate species in the mining site, however, since much of the operations are located within the existing transformed footprints, direct impacts from habitat loss are likely to be limited. Of concern will be the introduction of artificial lighting to these			

INVERTEBRATES (INSECTS AND ARACHNIDS)
areas for the purpose of operations and health and safety. This lighting will likely lead to the attraction of insects to these areas, disrupting their natural cycles / movement patterns. It is imperative that all external lighting be downward facing, and that yellow/warm lighting is used instead of LED white lights in order to decrease insect attraction.

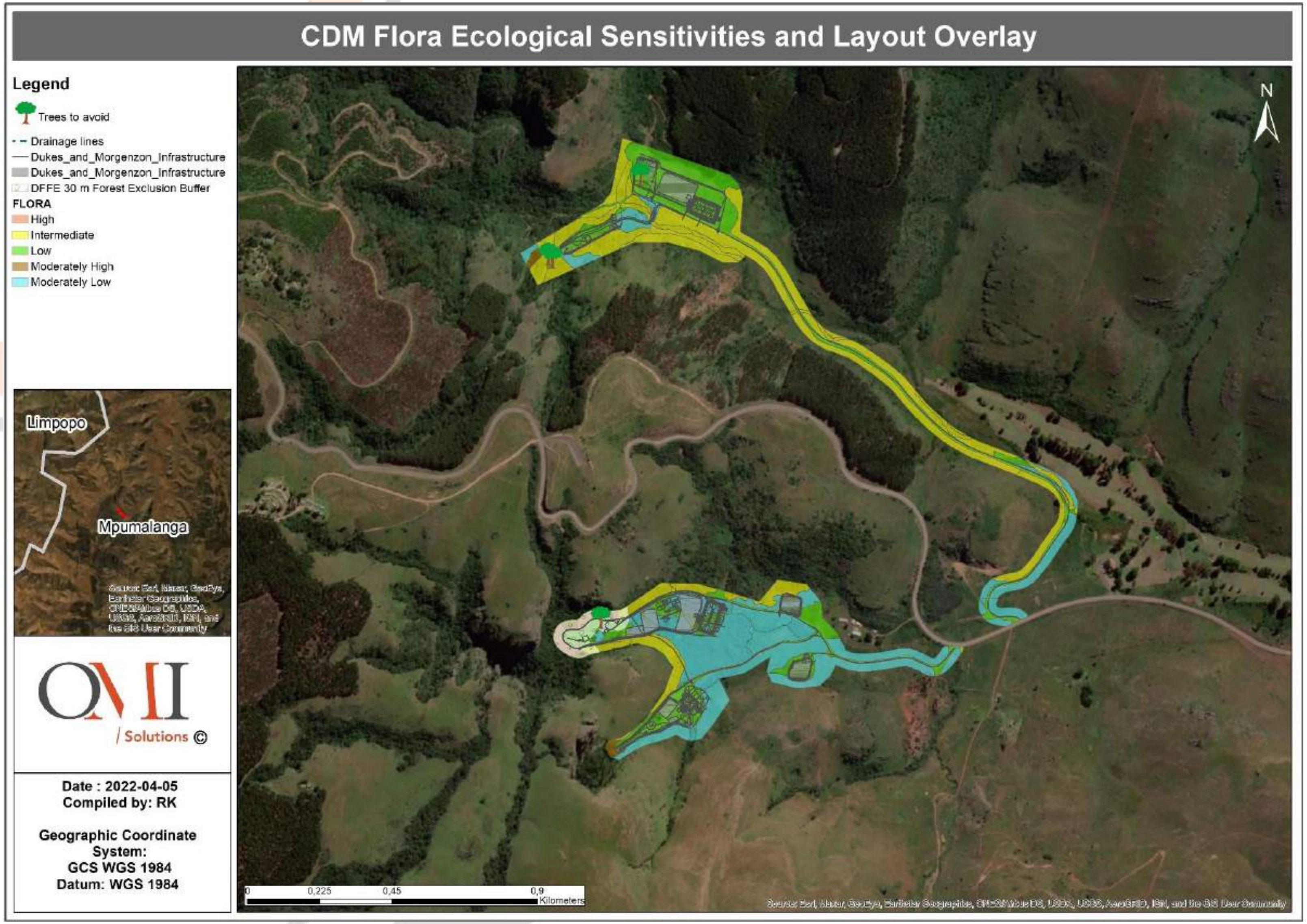


Figure 69: Layout and Floral Sensitivity Map CDM

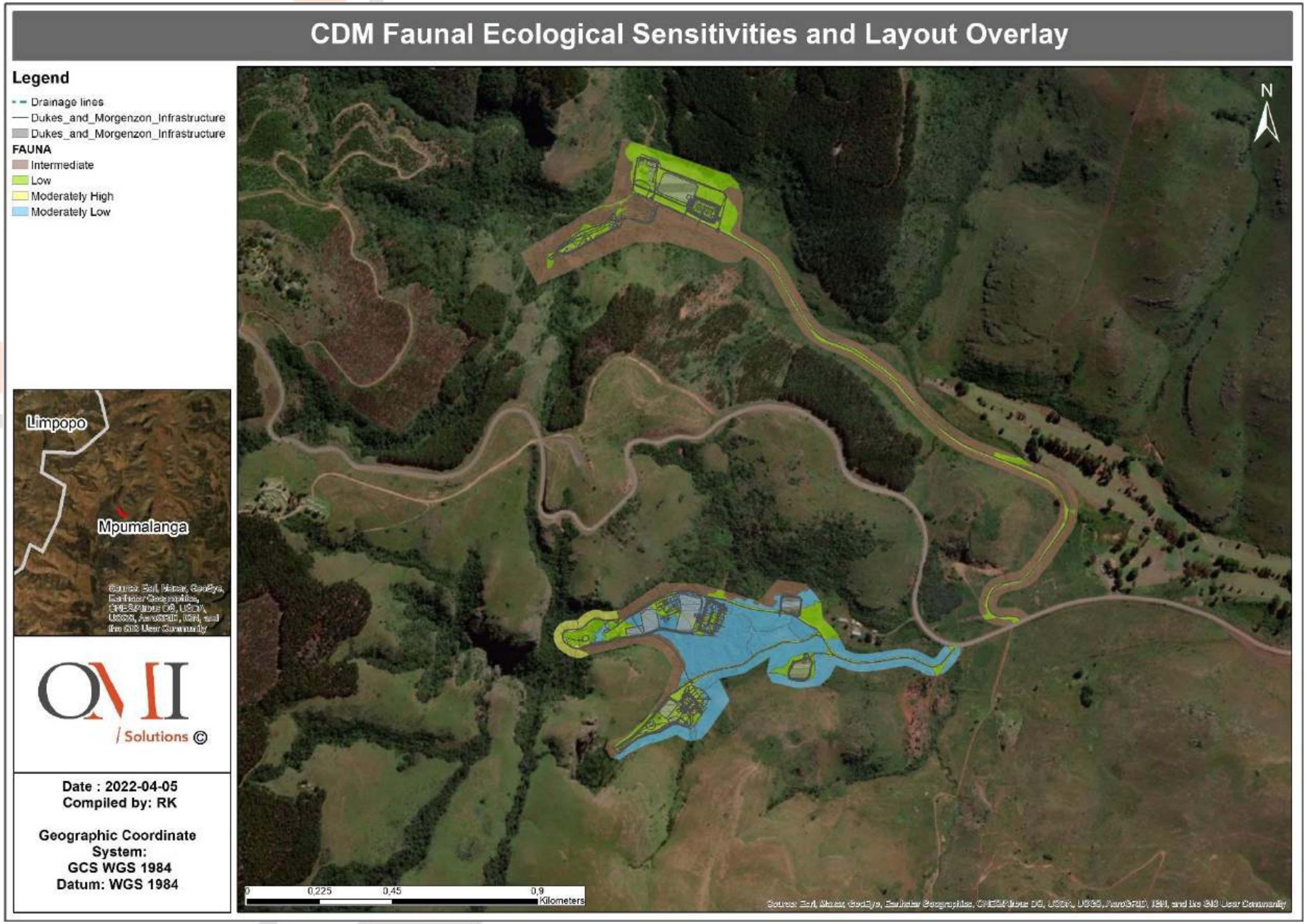


Figure 70: Layout and Faunal Sensitivity Map CDM

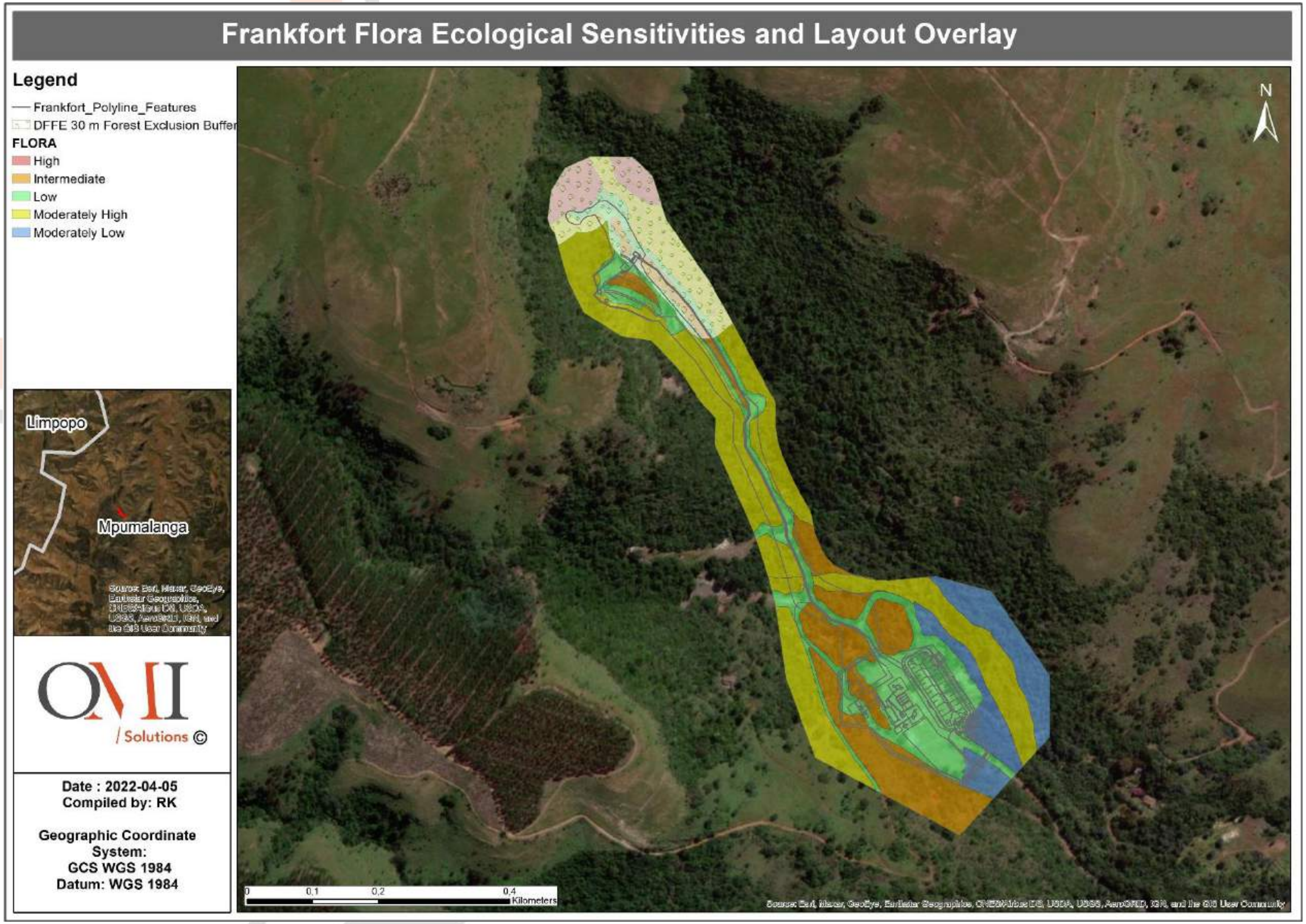


Figure 71: Layout and Floral Sensitivity Map Frankfort

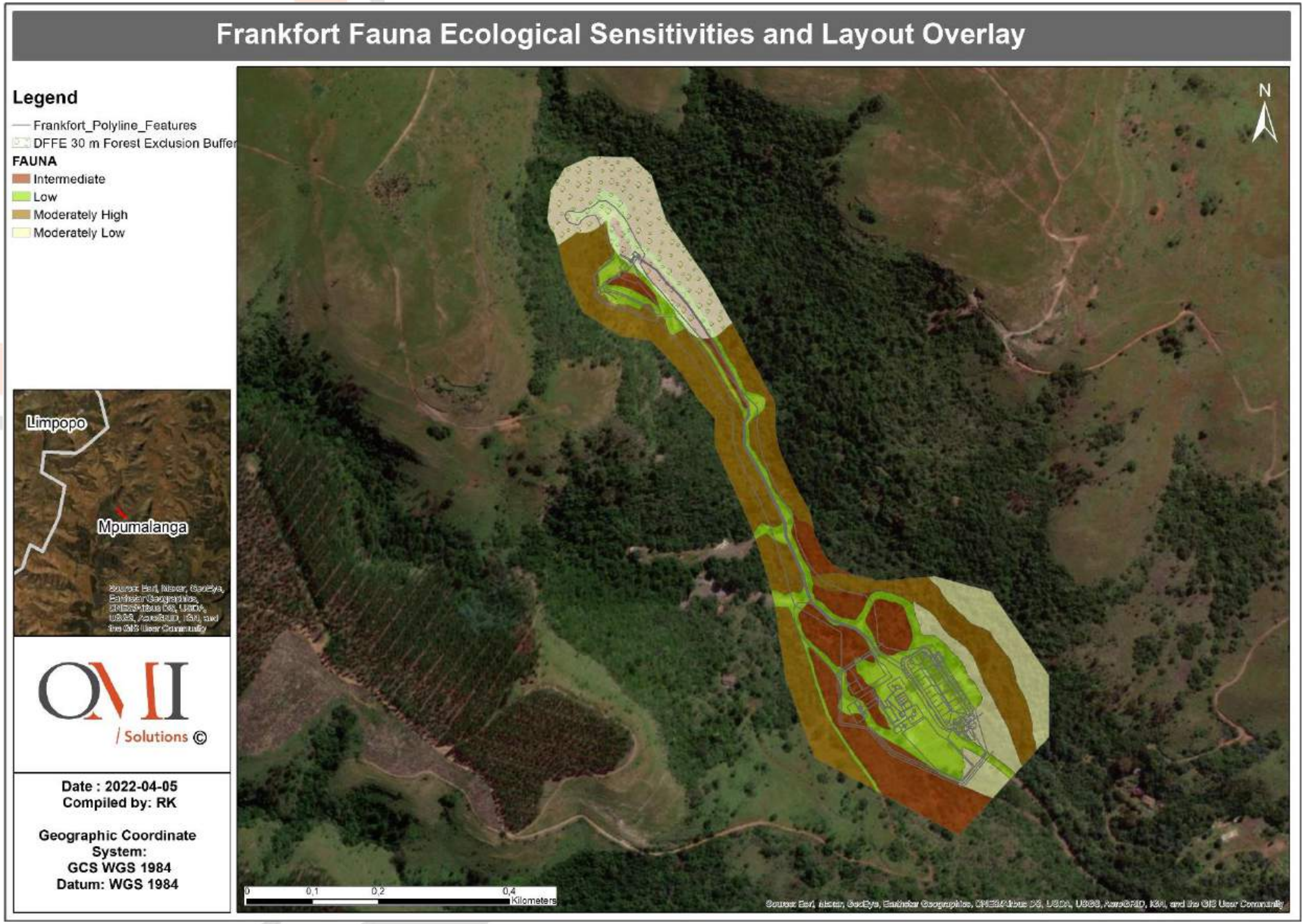


Figure 72: Layout and Faunal Sensitivity Map Frankfort

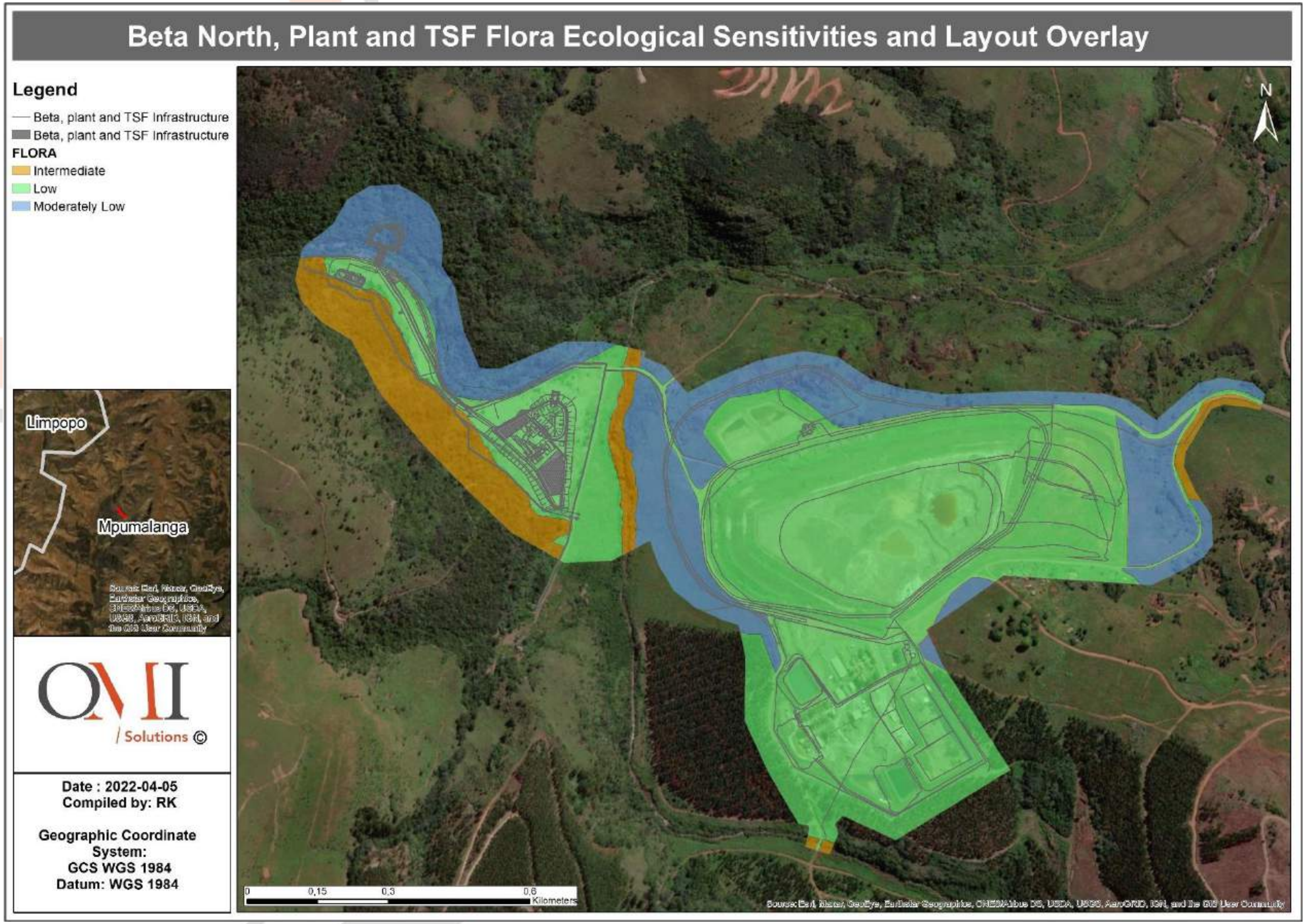


Figure 73: Layout and Floral Sensitivity Map Beta, Plant and TSF

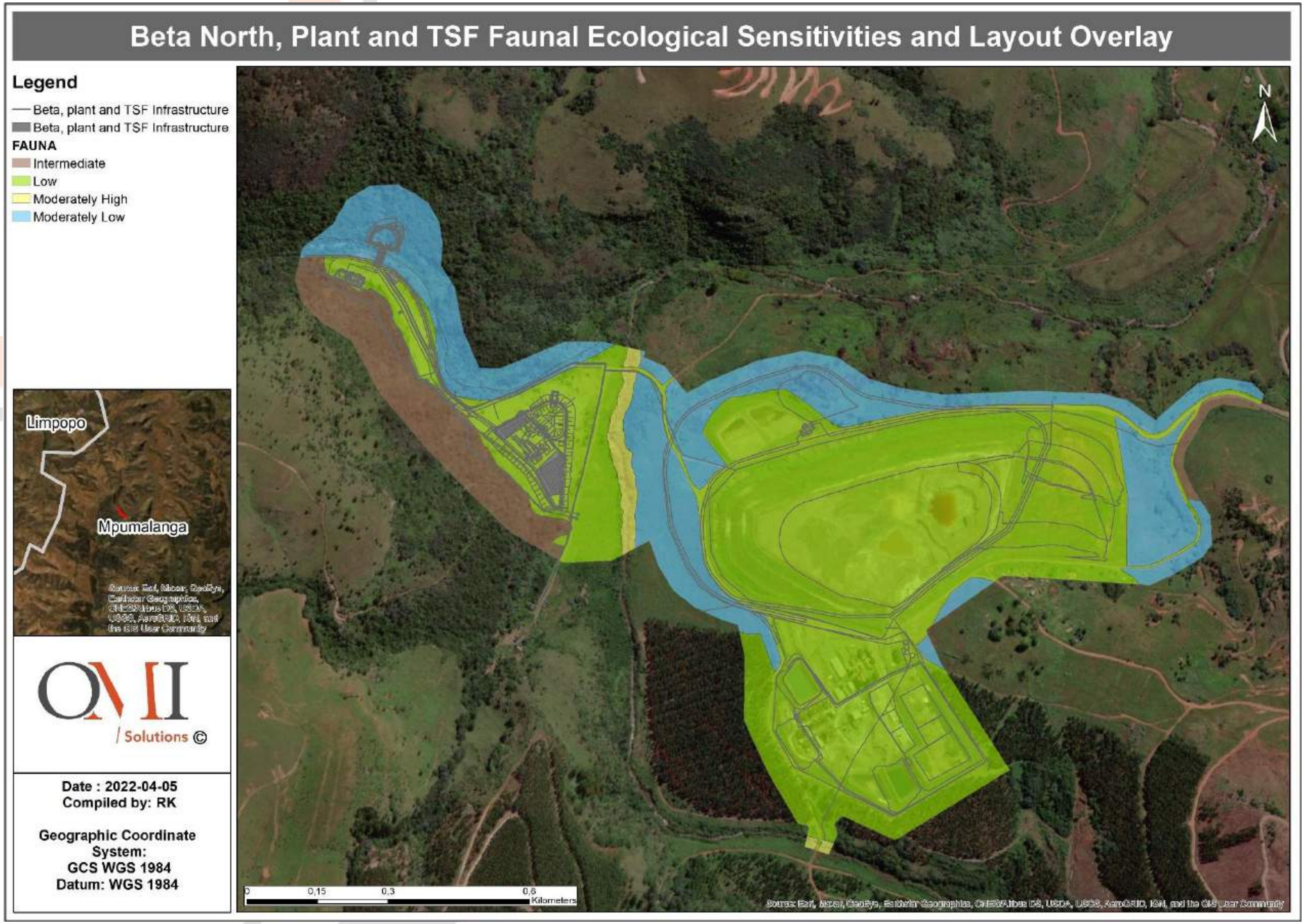


Figure 74: Layout and Faunal Sensitivity Map Beta, Plant and TSF

9.10.2 AQUATIC ECOLOGY[70]

SAS concluded in their desktop assessment of the aquatic ecology of the project area (SAS, 2022 (b)), the following as presented in **Table 37** (adapted from SAS, 2022 (b)).

Table 37: Aquatic Database Review

Aquatic Ecoregion and Sub-regions in which the Study Areas are Located	
Ecoregion	Northern Escarpment Mountains
Catchment	Olifants North
Quaternary Catchment	B60A (Dukes, Morgenzon & Beta), B60B (Frankfort)
WMA	Olifants
SubWMA	Lower Olifants
Dominant characteristics of the Northern Escarpment Mountains Qauatic Ecoregion Level II (10.01) (Kleynhans et al., 2007)	
Dominant primary terrain morphology	Closed hills, mountains; moderate and high relief
Dominant primary vegetation types	Patches Afromontane Forest, North Eastern Mountain Grassland, Sour Lowveld Bushveld.
Altitude (mamsl)	500 to 2100
MAP (mm)	500 to 1000
Coefficient of Variation (% of MAP)	<20 to 29
Rainfall concentration index	55 to 64
Rainfall seasonality	Early to mid-summer
Mean annual temp. (°C)	10 to 22
Winter temperature (July)	0 – 24 °C
Summer temperature (Feb)	8 – 30 °C
Median annual simulated runoff (mm)	40 to 150; 200 to >250
Detail of Study Area in terms of the National Freshwater Ecosystem Priority Area (NFEPA) (2011) Database	
FEPACODE	The study areas are located within a subWMA currently defined as FEPA catchment. River Freshwater Ecosystem Priority Area (FEPA) achieve biodiversity targets for river ecosystems and threatened fish species and

[70] Maps and data shown in this section were taken from the SAS Freshwater Resource Study (2022) (SAS, 2022 (b)).

	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, shading of the whole sub-quaternary catchment reach indicates that the surrounding land and smaller stream network need to be managed in a way that maintains the good condition of the river reach. Furthermore, the river systems are important for *Enteromius treurensis* (synonym *Barbus treurensis*) (EN), *Amphilius natalensis* (DD), Amphilius sp. 'natalensis cf. treur' (DD)
NFEPA Wetlands	According to the NFEPA database there are no wetland features situated within the Dukes and Morgenzon areas, however there is an artificial unchanneled valley bottom wetland located within the Beta area and a natural channelled valley bottom wetland located in the southern portion of the Frankfort area. The channelled valley bottom wetland is considered moderately modified (Class C), and it is classified as a FEPA wetland* considered important for the crane species: Wattled cranes (Bugeranus carunculatus), Grey Crowned cranes (Balearica regulorum) and Blue cranes (Anthropoides paradiseus). The artificial unchanneled valley bottom wetland associated with the Beta area is considered heavily to critically modified (Class Z2).
Wetland Vegetation Type (Figure 75)	The entire Beta area falls within the Mesic Highveld Grassland Group 9 (Least Threatened), while the Frankfort, Dukes and Morgenzon areas fall within both the Mesic Highveld Grassland Group 9 and Mesic Highveld Grassland Group 6 (Least Threatened) (conservation statuses taken from Mbona et al., 2014).
NFEPA Rivers	The Blyde River traverses the Beta area, and is situated approximately 1.9 km, 2.7 km, and 3.6 km east of Dukes, Morgenzon and Frankfort areas respectively. According to the PES 1999 Classification, the Blyde River is moderately modified (Class C), while the NFEPA database classifies the Blyde River as largely natural with few modifications (Class B). The Blyde River is considered a FEPA River, and therefore in terms of the NFEPA Implementation Manual (2011), mining (and/or prospecting) is not considered a compatible land use within 1 km (1000 m) of a riverine buffer around a river FEPA.
Detail of Study Area in terms of the Mpumalanga Biodiversity Sector Plan (MBSP, 2019)	
Critical Biodiversity Area (CBA) Rivers	The Blyde River is considered a CBA FEPA River according to the MBSP Database. The MBSP Handbook (2014) stipulates a 1000 m (1 km) buffer for CBA Rivers, which needs to be maintained in a good ecological condition in order to meet biodiversity targets for freshwater ecosystems and threatened invertebrate and fish species. Mining and/or prospecting is not considered a compatible land use within this buffer zone according to the MBSP Handbook (2014). CBA Rivers have a 100 m buffer that needs to be maintained in a good ecological condition in order to meet biodiversity targets for freshwater ecosystems and threatened fish species. According to the Mpumalanga Tourism and Parks Agency, the Blyde River, and specifically the reach which flows through the farm Ponieskrans, is designated as a CBA Aquatic Species due to the occurrence of a Vulnerable damselfly species (order Odonata) as well as various fish species (mentioned above under NFEPA).

Ecological Support Area (ESA): SWSA	The study areas are situated within an ESA considered a SWSA. These areas have high rainfall that produce 50% of Mpumalanga's runoff in only 10% of the surface area, thus supporting biodiversity and underpinning regional water security. According to MTPA – Mining in this area is not a supported land-use in these areas.
ESA: Wetlands	The wetland located within the Frankfort Area identified by the NFEPA Database as a FEPA wetland is identified as an ESA Wetland according to the MBSP, and portions of the Blyde River that traverses the Beta area are also classified as ESA Wetlands. These wetlands support the hydrological functioning of rivers, water tables and freshwater biodiversity, as well as providing a host of ecosystem services through the ecological infrastructure that they provide.
ESA: Important Sub-catchments	The majority of the study areas fall within an area considered ESA: Important Sub-catchments, that are associated with river FEPAs and/or Fish Support Areas.
Heavily Modified	The remaining portions of the study areas are considered to be heavily modified. These include all areas currently modified to such an extent that any valuable biodiversity and ecological function has been lost.
National Biodiversity Assessment (2018): South African Inventory of Inland Aquatic Ecosystems (SAIIAE)	
According to the NBA 2018: SAIIAE the artificial unchanneled valley bottom wetland located within the Beta area as identified NFEPA Database, is classified as a dam according to the NBA. The NBA Dataset also identified the natural channelled valley bottom wetland in the Frankfort area. The channelled valley bottom wetland is currently affected by mining activities as such the wetland is heavily to critically modified (Class D/E/F). The portion of the Blyde River traversing the Beta area has an associated floodplain wetland, according to the NBA Dataset, which is currently affected by mining activities and roads, as such it is heavily to critically modified. Since both wetland features are currently affected it indicated that these wetlands are not protected (Ecosystem Protection Level (EPL)) and are therefore considered critically endangered (Ecosystem Threat Status (ETS)). According to the NBA Dataset the Blyde River is moderately modified (Class C), poorly protected (EPL) and Endangered (ETS).	
National Web Based Environmental Screening Tool (2020)	
The screening Tool is intended to allow for pre-screening of sensitivities in the landscape to be assessed within the EIA process. This assists with implementing the mitigation hierarchy by allowing developers to adjust their proposed development footprint to avoid sensitivity areas.	
According to the Screening tool the Dukes and Morgenzon areas have an overall aquatic biodiversity sensitivity of Very High, due to the area being classified as a SWSA and the area being identified as a FEPA catchment. The Beta and Frankfort areas also have a Very High aquatic sensitivity, due to aquatic CBAs, SWSAs, Wetlands and Estuaries and FEPA Catchments. According to the MBSP the study areas fall within an ESA: SWSA, and the Beta area is associated within the Aquatic CBA rivers and ESA Wetlands. Furthermore, the MBSP indicates that the Frankfort area is associated with an ESA Wetland. According to the SWSA Database (2017) the study area falls within the Northern Lowveld Escarpment Surface Water SWSA and the Mpumalanga Drakensberg Groundwater SWSA. Surface water SWSA's are found in areas with high rainfall and produce most of the runoff. The SWSA-sw study identified 22 areas that were significant at the national level and a further nine that are significant at a sub-national level. They are important because they contribute considerably to the overall water supply of the country. These multi-purpose landscapes are key ecological infrastructure assets for South Africa, supporting growth and development needs. The effective protection of	

surface water SWSA's areas is vital for national security because a lack of water security will compromise national security and human well-being. The SWSAs for groundwater (SWSA-gw) reflect areas that have high groundwater recharge and where the groundwater forms a nationally important resource. The areas are delineated for the purpose of research, and the outcomes are useful to national level planners and decision makers as an indication of the location of strategic groundwater sources and resources. Sub-national WSAs for groundwater were also identified.		
Importance According to the Mining and Biodiversity Guidelines (2013) (Figure 77)		
The entire Beta and Frankfort areas, as well as the majority (95%) of the Dukes areas and small portions of the Morgenzon area fall within areas considered of Highest Biodiversity Importance. The remaining portions of the Dukes and Morgenzon areas fall within the High Biodiversity Important Areas. Highest Biodiversity Importance Areas: These areas include critically endangered and endangered ecosystems, CBA's, river and wetland FEPA's and a 1 km buffer around these FEPA's and Ramsar sites. When applying for mining authorisation within highest biodiversity importance areas, environmental screening, environmental impact assessment (EIA and their associated specialist studies should focus on confirming the presence and significance of the abovementioned biodiversity features, and to provide site-specific basis on which to apply the mitigation hierarchy to inform regulatory decision-making for mining, water use licences, and environmental authorisations. If they are confirmed, the likelihood of a fatal flaw for new mining projects is very high because of the significance of the biodiversity features in these area and the associated ecosystem services. High Biodiversity Importance Areas: These areas included protected area buffers (including buffers around National Parks, World Heritage Site and Nature Reserves), Transfrontier Conservation Areas (remaining areas outside of formally proclaimed protected areas), other identified priorities from provincial spatial biodiversity plans and high water yield areas, amongst others. These areas are important for conserving biodiversity, for supporting of buffering other biodiversity priority areas, for maintaining important ecosystem services for particular communities or the country as a whole. An environmental impact assessment should include an assessment of optimum, sustainable land use for a particular area and will determine the significance of the impact on biodiversity. Mining options may be limited in these areas, and red flags for mining projects are possible. Authorisations may set limits and specify biodiversity offsets that would be written into licence agreements and/or authorisations.		
Ecological Status of the most Proximal Sub-quaternary Reach (DWS, 2014)		
Sub-quaternary Reach	B60A – 00653 (Blyde River)	B60B – 00566 (Blyde River)
Proximity to study areas	Traverses Beta area	Portion of the Blyde River closest to Frankfort area
Assessed by expert?	Yes	Yes
PES Category Median	Moderately Modified (Class C)	High (Class B)
Mean Ecological Importance (EI) Class	High	High
Mean Ecological Sensitivity (ES) Class	Very High	Very High
Stream Order	1	2

Default Ecological Class (based on median PES and highest EI or ES mean)	Very High (Class A)	Very High (Class A)

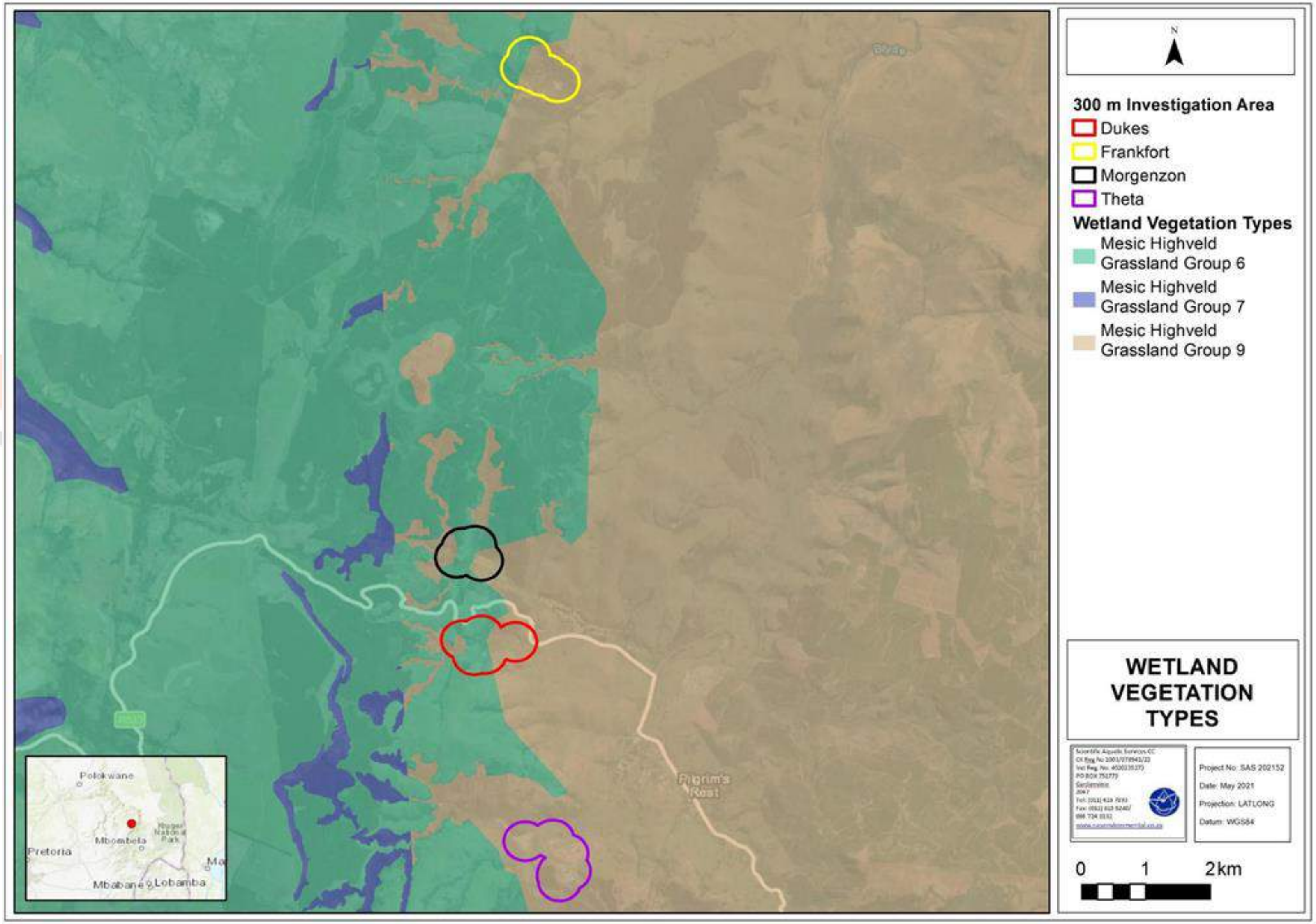


Figure 75: Wetland Vegetation Types

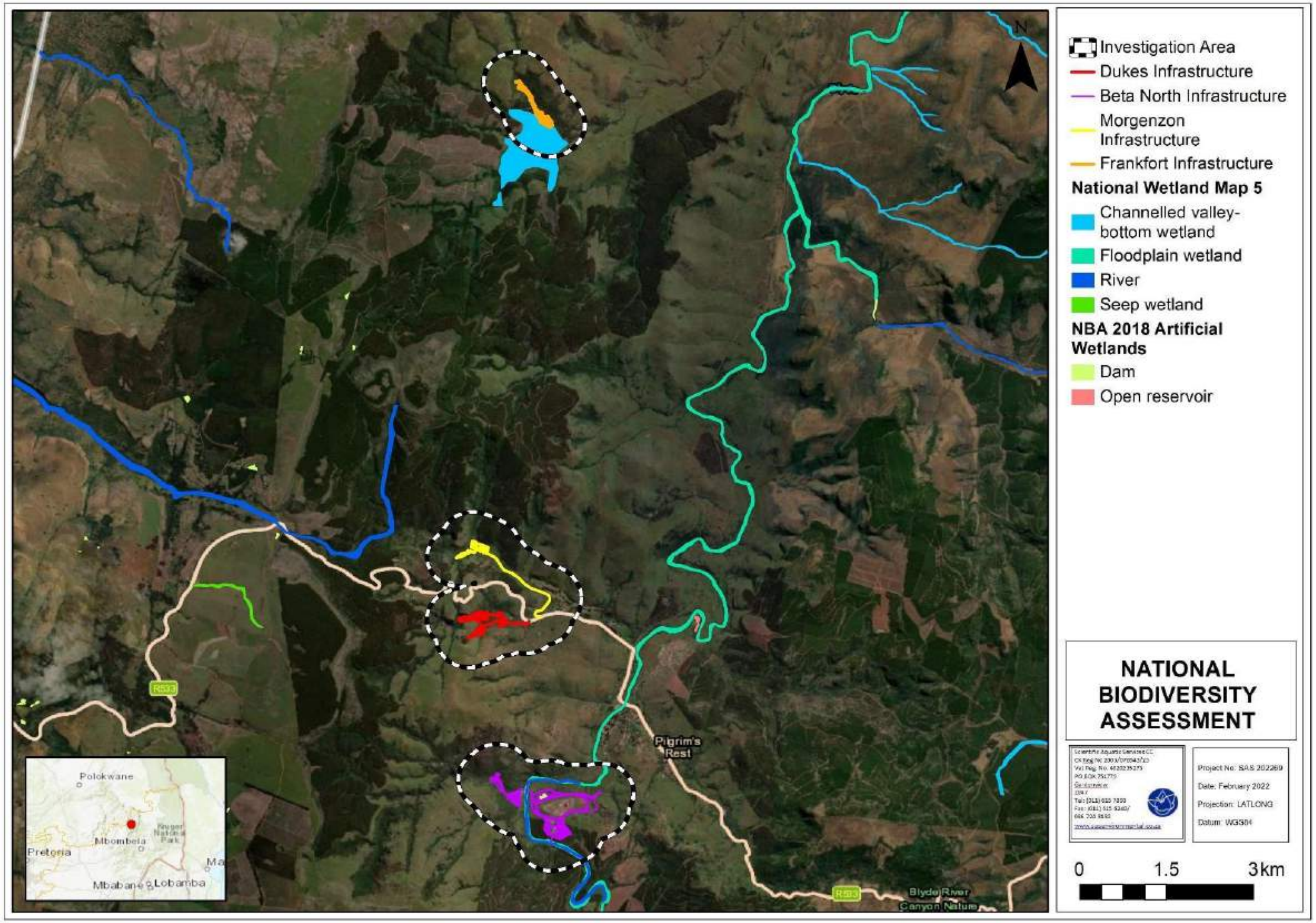


Figure 76: Rivers and wetlands associated with the 83MR UG areas according to the NBA (2018) database

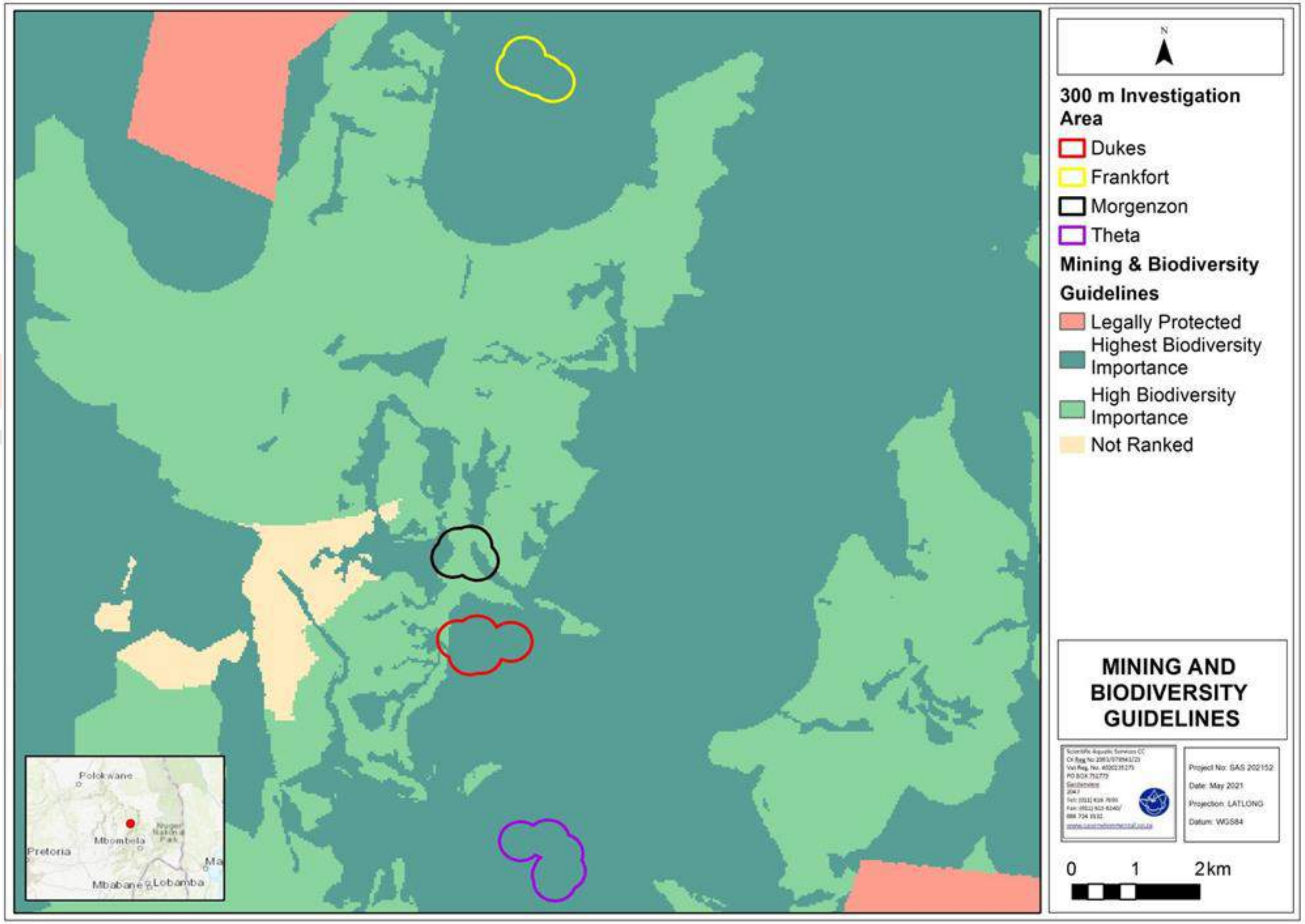


Figure 77: Mining and Biodiversity Guidelines

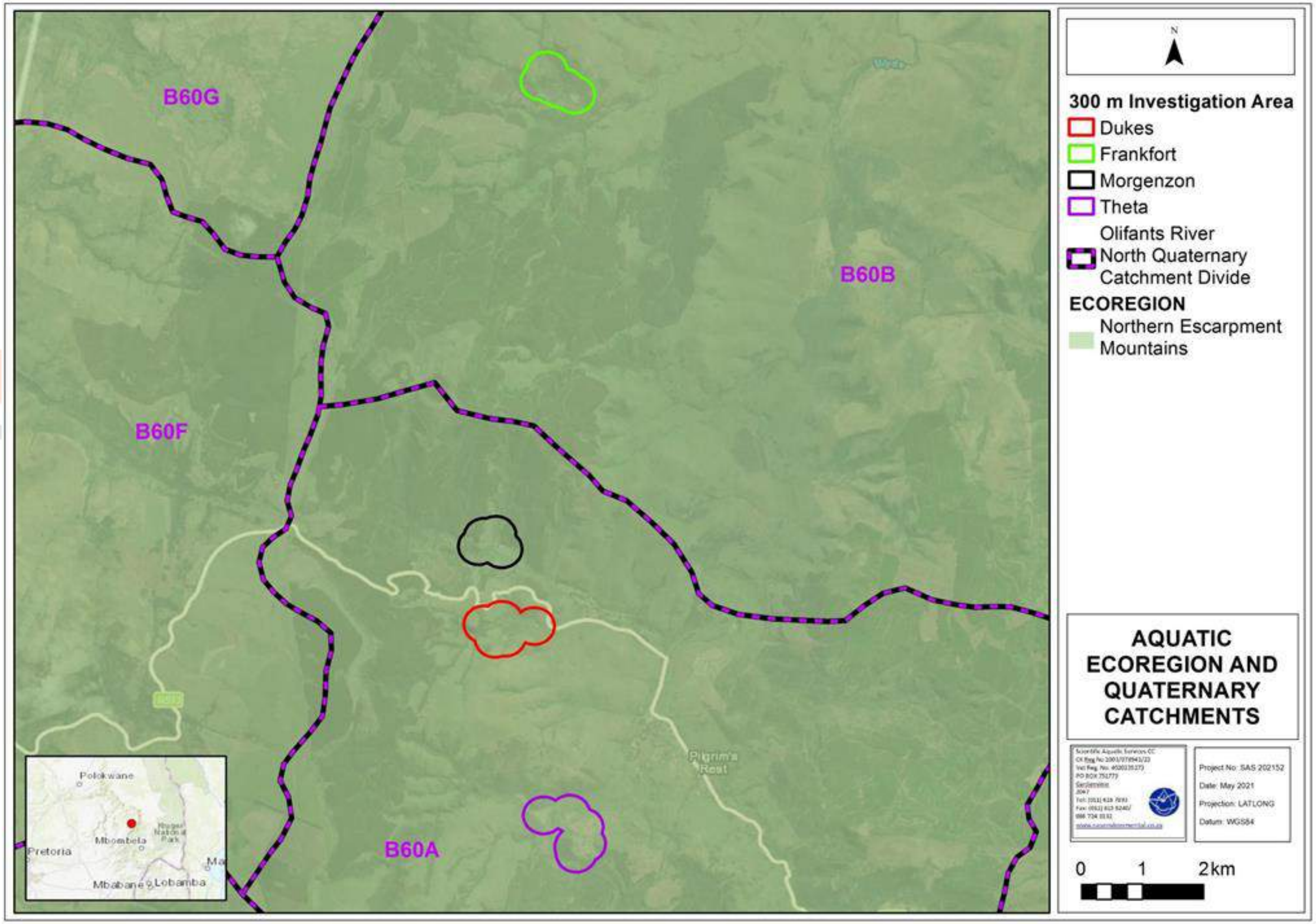


Figure 78: Aquatic Ecoregion and Quaternary Catchments

9.10.2.1 AQUATIC DELINEATION

Due to some access limitations experienced during the site assessment as previously discussed, the freshwater ecosystems were partially delineated in the field, and the delineations subsequently refined with the use of aerial photographs, digital satellite imagery and topographical maps. The delineations as presented in this report are thus regarded as a best estimate of the riparian zone boundaries based on the site conditions present at the time of assessment.

During the October 2021 and January 2022 assessments, the following indicators were used to delineate the boundaries of the riparian zones of the freshwater ecosystems:

- Terrain units were utilised as the primary determinant to ascertain in which parts of the landscape freshwater ecosystems would be likely to occur, since clear and discernible landscape units were present;
- The vegetation indicator was utilised as the secondary indicator, and was considered to be a useful guide as to the boundaries of the various freshwater ecosystems;
- The soil form indicator was considered, however, due to changed soil profiles as a result of historical mining and agricultural activities, this indicator was not considered useful throughout all areas as the soil profiles did not necessarily show the typical mottling or gleying that can be expected in wetland areas, nor did the soils display signs of wetness; and
- Due to the degree and nature of disturbances and access limitations within some portions of the 83MRareas particularly Dukes, historical and current digital satellite imagery, as well as historical aerial photographs were also utilised to aid in the delineation.

9.10.2.2 FRESHWATER ECOSYSTEM ANALYSIS

Prior to the field survey, aerial photographs, digital satellite imagery as well as provincial and national wetland databases were used to identify areas of interest at a desktop level. Thereafter, the identified points of interest and any additional potential freshwater ecosystems noted during the field survey were also assessed.

Numerous smaller ephemeral drainage features, episodic preferential surface flow paths and erosion gullies associated with the larger freshwater ecosystems within the various areas were also identified These features do not receive and retain sufficient water to support wetland or riparian characteristics (such as facultative or obligate wetland vegetation; soils with prolonged and frequent saturation; indication of a saturated soil zone within 50cm of the soil surface and no significant change in structure and composition of bankside vegetation due to hydromorphological drivers). However, in certain areas, vegetation growth was more prominent, mainly due to ideal microclimatic conditions, protection from fires, frost etc. that these ravine areas provide. Although these flow paths cannot be classified as riparian resources in the ecological sense thereof due to the lack of saturated soils and wetland/riparian vegetation (and were therefore not assessed), they do still function as a waterway, through episodic conveyance of water, and therefore potentially enjoy protection in terms of the NWA, if the features are large enough to possess a 1:100 floodline.

The emphasis of the aquatic study is on true watercourses which are perceived to have an increased likelihood of being impacted to varying degrees by the proposed mining activities. This includes freshwater ecosystems which are not necessarily located within the infrastructure areas but are located downgradient thereof. Resources located outside of these key focus areas, i.e. those within the zone of regulation - within the 500m investigation area, but not within the same catchment - of the proposed infrastructure areas, were delineated using digital satellite imagery, with limited or no field verification. However, when field verification of features which were delineated using desktop techniques took place, delineations proved to be sufficiently accurate to allow for informed decision making. It should also be noted that although the freshwater ecosystems identified may extend beyond the boundaries of the 83MRareas, only portions located within the 83MRareas were assessed and ground truthed where feasible and safe.

Nonetheless, the potential impacts of activities such as mining, forestry, agriculture, erosion and clearing of natural vegetation within the greater catchment were taken into consideration during the assessment.

The freshwater ecosystems which were identified within the 83MRareas were classified according to the Classification System (Ollis, 2013), as Inland Systems, falling within the Northern Escarpment Mountains Aquatic Ecoregions and predominantly within the Mesic Highveld Grassland Group 9 WetVeg group (all 83MRareas), and within the Mesic Highveld Grassland Group 6 WetVeg group (Dukes, Morgenzon and Frankfort), both of which are classified as 'Least Threatened'.

For ease of reference, the identified freshwater ecosystems are discussed in relation to the applicable 83MRarea. The classification of these freshwater ecosystems is summarised in **Table 38**, whilst **Figure 80** to **Figure 85** depicts the locality of these freshwater ecosystems in relation to the 83MRareas.

Table 38: Characterisation of the freshwater ecosystems identified, associated with various study areas according to the Classification System

<table>
<tr><th>Freshwater ecosystem (in relation to the applicable study area)</th><th>Level 3: Landscape unit</th><th>Level 4: HGM Type</th></tr>
<tr><td rowspan="2">Beta North</td><td rowspan="4">Valley floor: The base of a valley, situated between two distinct valley side-slopes</td><td>River: a linear landform with clearly discernible bed and banks, which permanently or periodically carries a concentrated flow of water.</td></tr>
<tr><td>Ephemeral Drainage Line (EDL) with riparian vegetation. A description for these is not contained in (Ollis, 2013), thus the following definition is utilised:

River: a linear landform with clearly discernible bed and banks, which permanently or periodically carries a concentrated flow of water.</td></tr>
<tr><td>Morgenzon and Frankfort</td><td>River (mountain streams).</td></tr>
<tr><td>Dukes</td><td>Ephemeral Drainage Line (EDL) with riparian vegetation.</td></tr>
</table>

9.10.2.3 FIELD VERIFICATION RESULTS

Table 39 to **Table 43** is summarised versions of the information presented in the aquatic assessment findings of the field verification in terms of relevant aspects (hydrology, geomorphology and vegetation components) of freshwater ecology of the identified freshwater ecosystems. The freshwater ecosystems were assessed and are discussed on a system level in relation to the applicable 83MRareas as dashboard style reports. More details of the site verifications can be found in ANNEXURE N.

The details pertaining to the methods of assessment used to assess the various freshwater ecosystems is contained in ANNEXURE N. The results of the PES and EIS assessments are conceptually presented in the figures following the dashboard results which contain summaries of the findings of the study.

9.10.2.4 REPERCUSSIONS OF UNAUTHORISED ARTISANAL MINING ACTIVITIES ON THE BLYDE RIVER AND PEACH TREE STREAM

During previous site assessments undertaken in July 2020 and during the assessment undertaken in January 2022, the impacts of illegal mining on the various freshwater ecosystems were apparent. Portions of both the Blyde River and the Peach Tree Stream have been partially diverted by artisanal miners, for purposes of washing fines. Although the Blyde River was in high flow during the January 2022 assessment and was thus naturally transporting an elevated sediment load as a result, the photographs taken during July 2020 (low flow) (**Figure 86**) indicate that the artisanal mining leads to significantly increased volume of sediment entering the river.

Being unregulated, these activities are likely to impact significantly on the receiving freshwater environment, particularly as the artisanal miners wash their fines and process product directly within the rivers. **Figure 87** illustrate the nature of the illegal activities within the Peach Tree Stream and Blyde River in the vicinity of the Beta north area.

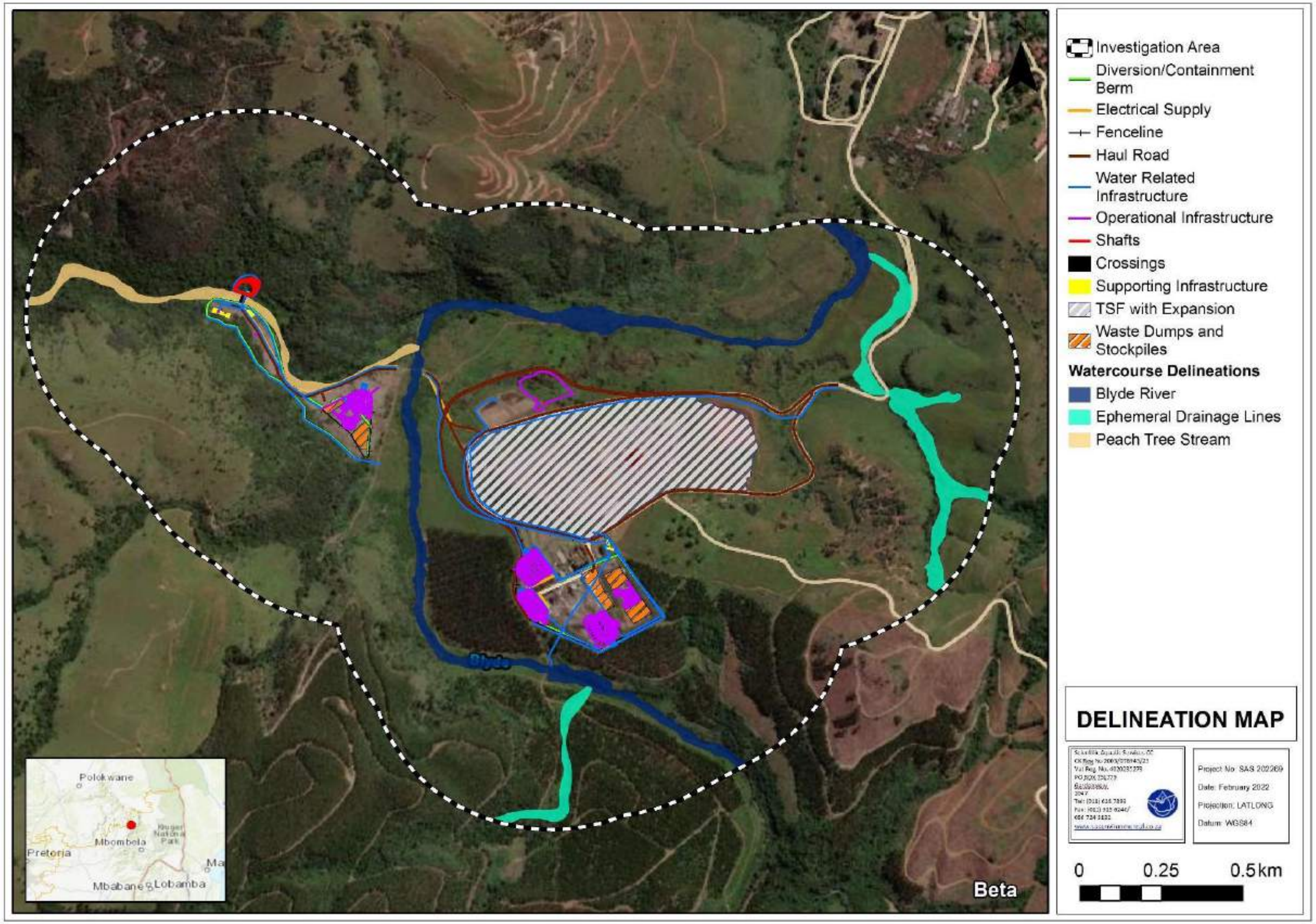


Figure 79: Identified freshwater ecosystems within the Beta north and south UG areas and associated investigation area, in relation to the surrounding landscape

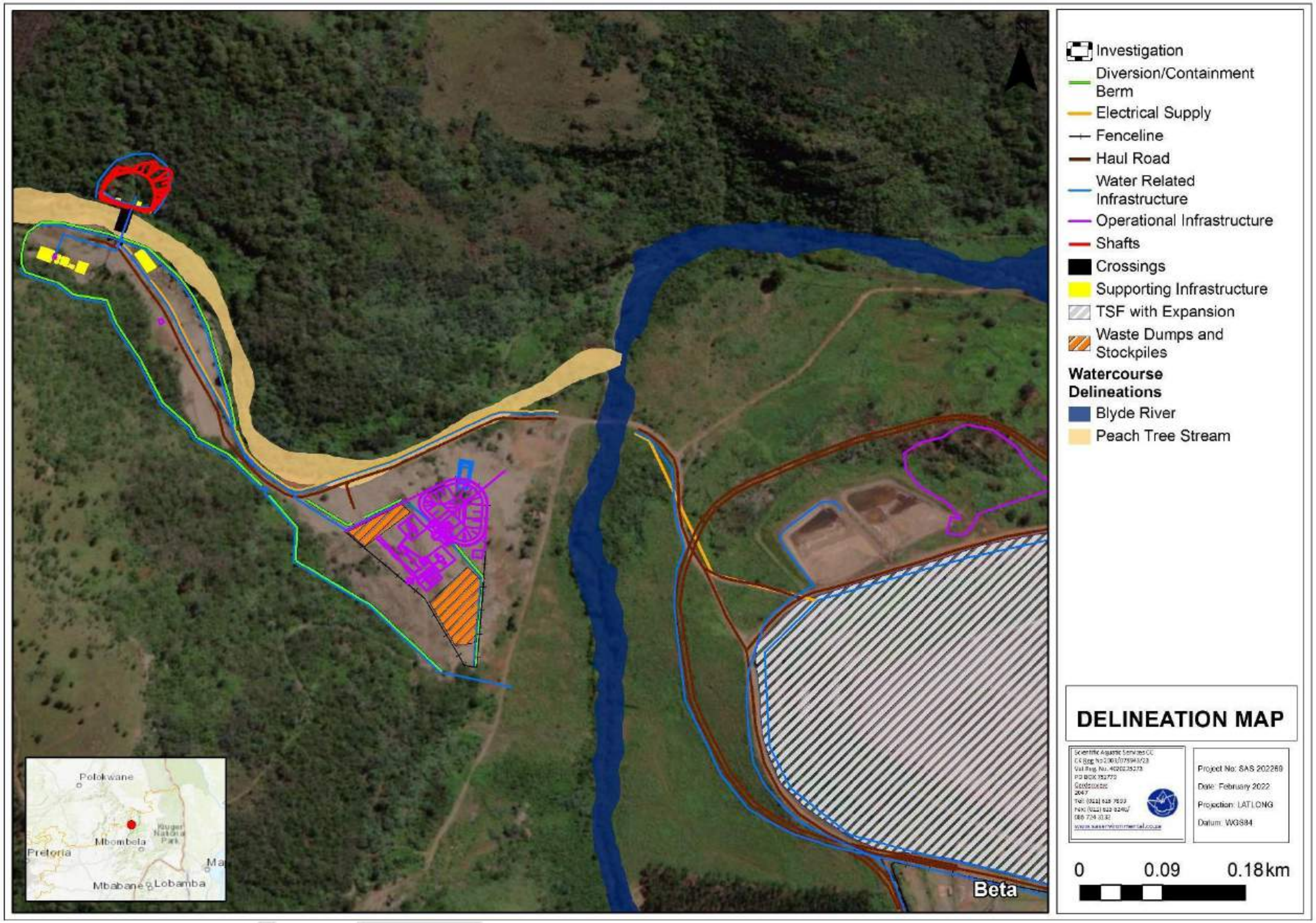


Figure 80: Identified freshwater ecosystems within the Beta north area and associated investigation area, in relation to the surrounding landscape

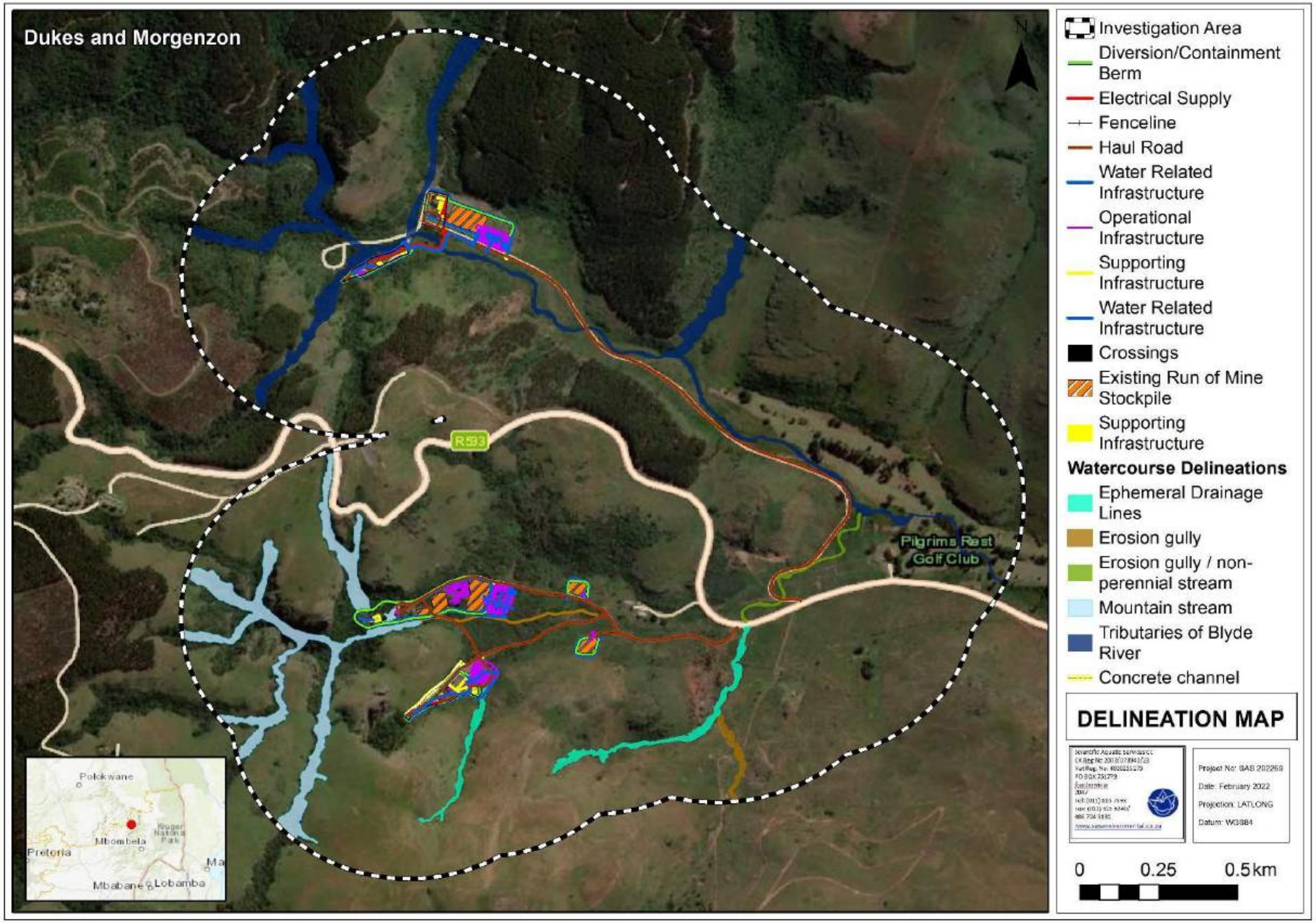


Figure 81: Identified freshwater ecosystems within the CDM and associated investigation area, in relation to the surrounding landscape

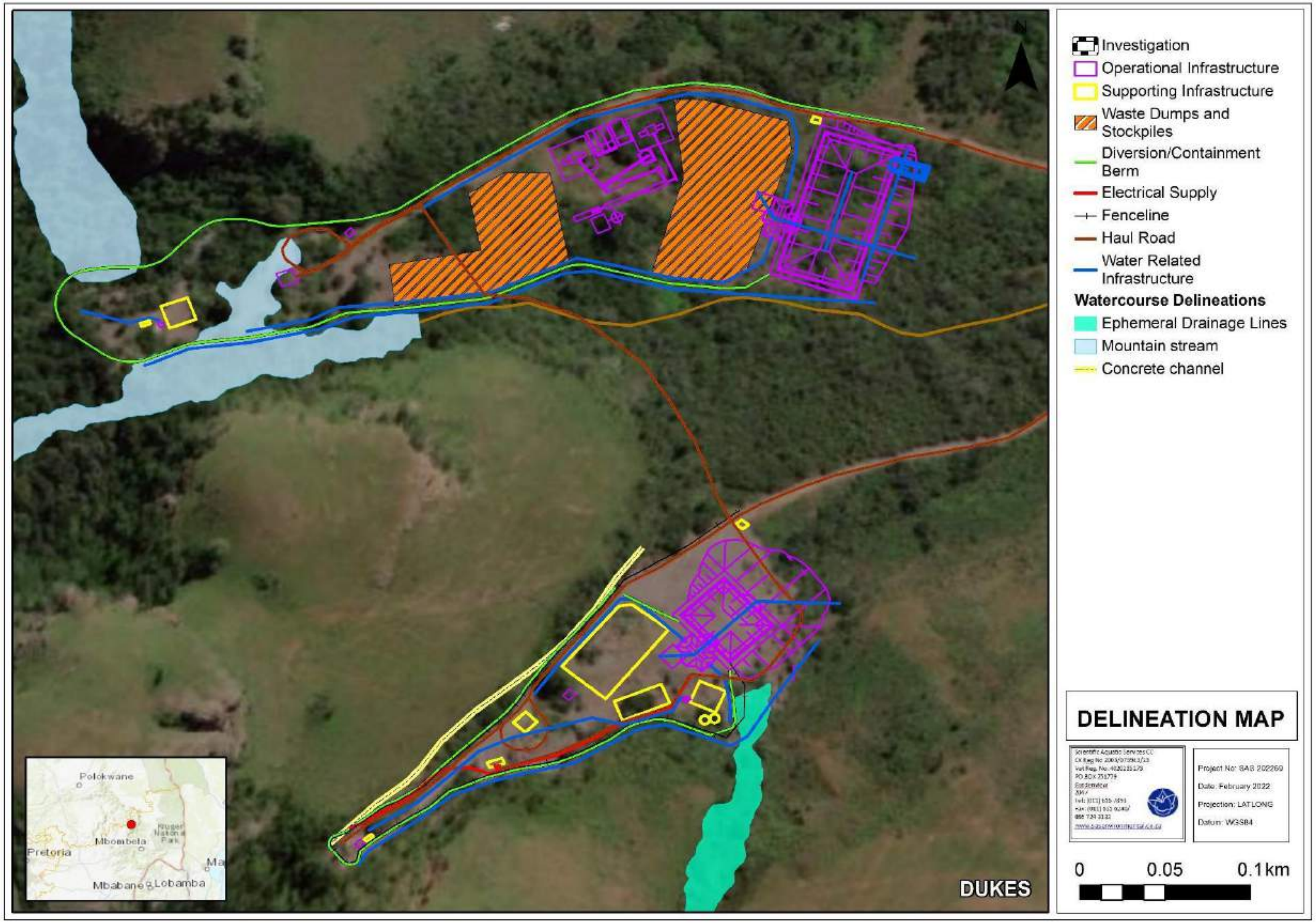


Figure 82: Identified freshwater ecosystems within the Dukes UG area and associated investigation area, in relation to the surrounding landscape

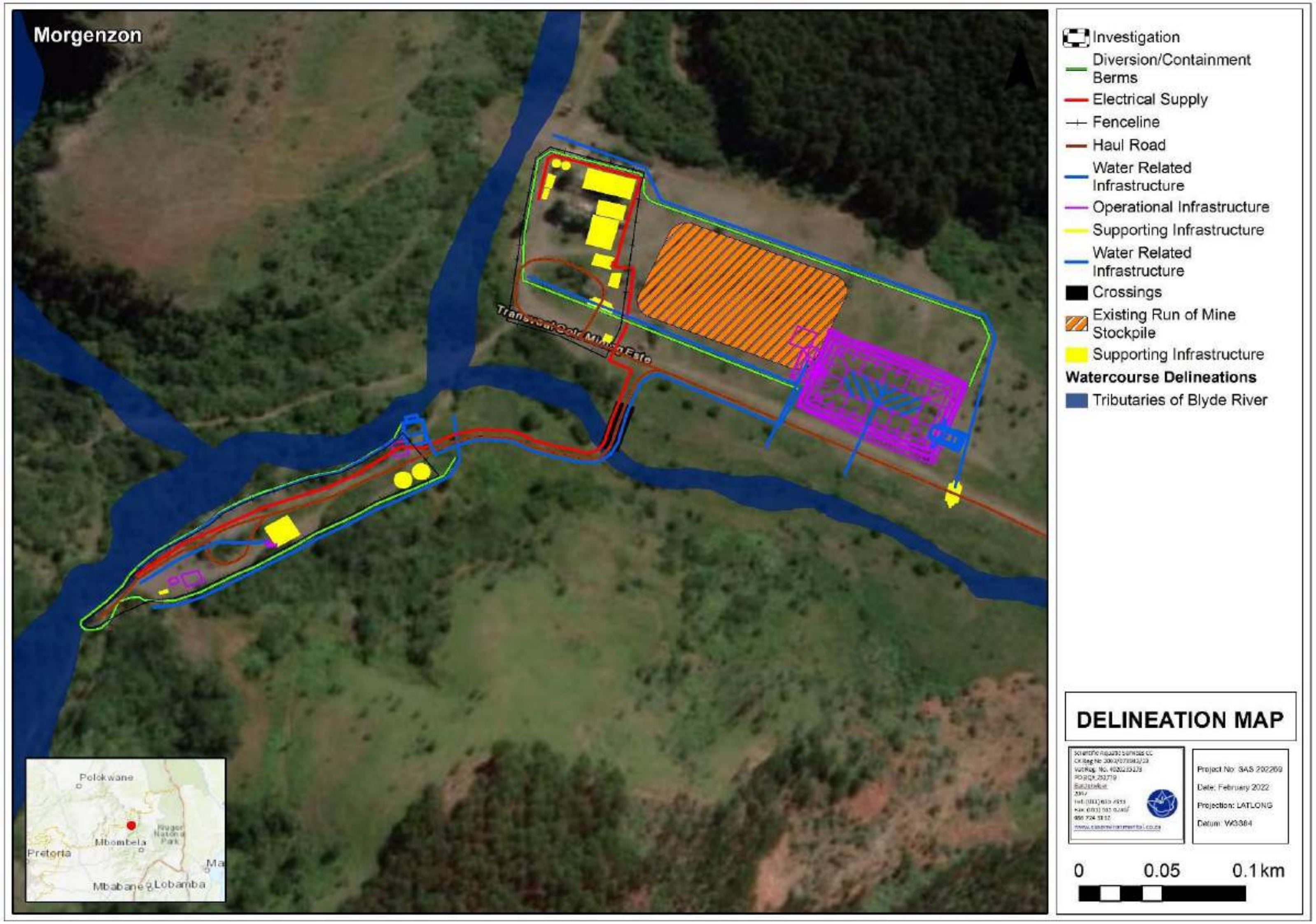


Figure 83: Identified freshwater ecosystems within the Morgenzon UG areas and associated investigation area, in relation to the surrounding landscape

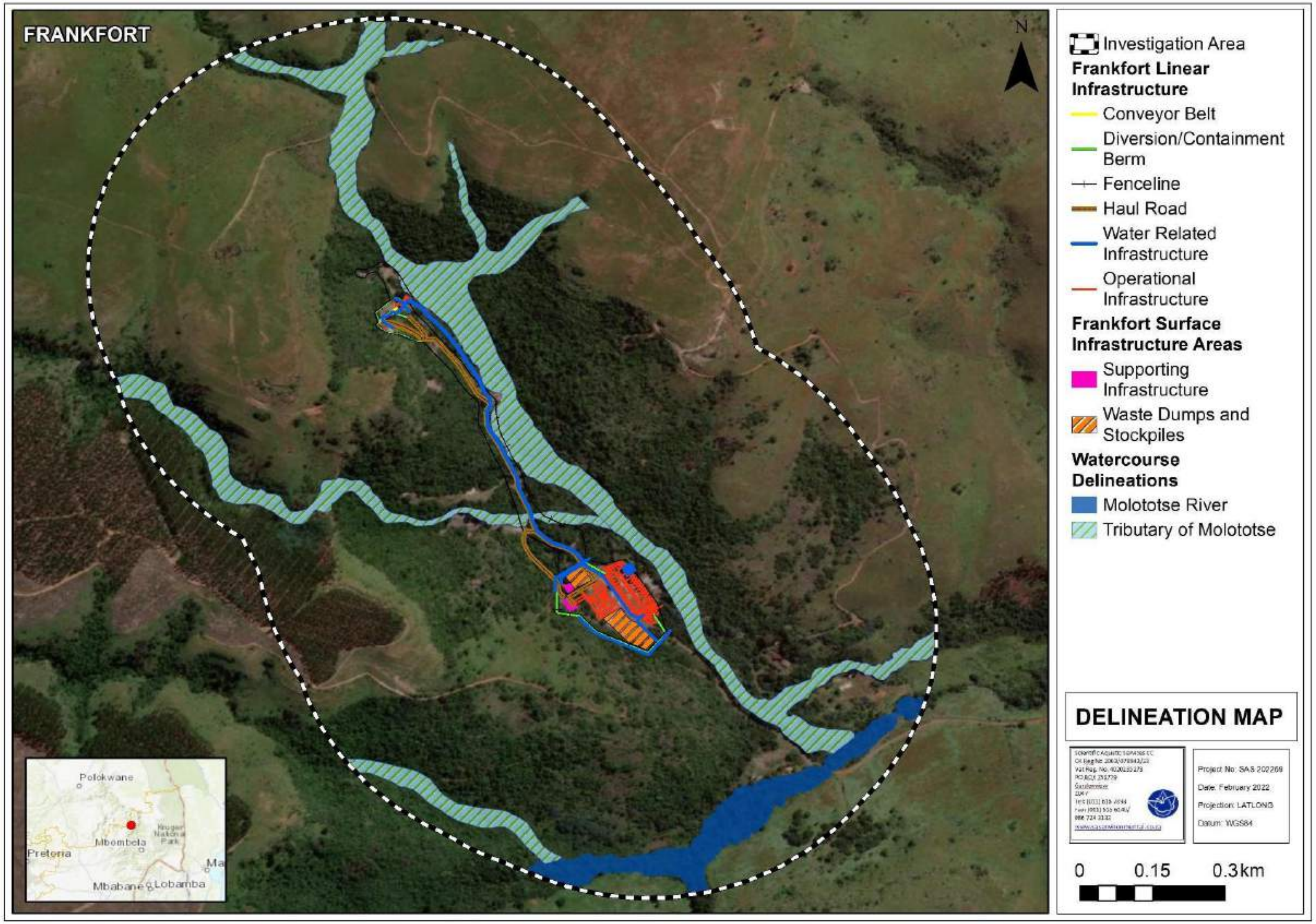


Figure 84: Identified freshwater ecosystems within the Frankfort UG areas and associated investigation area, in relation to the surrounding landscape

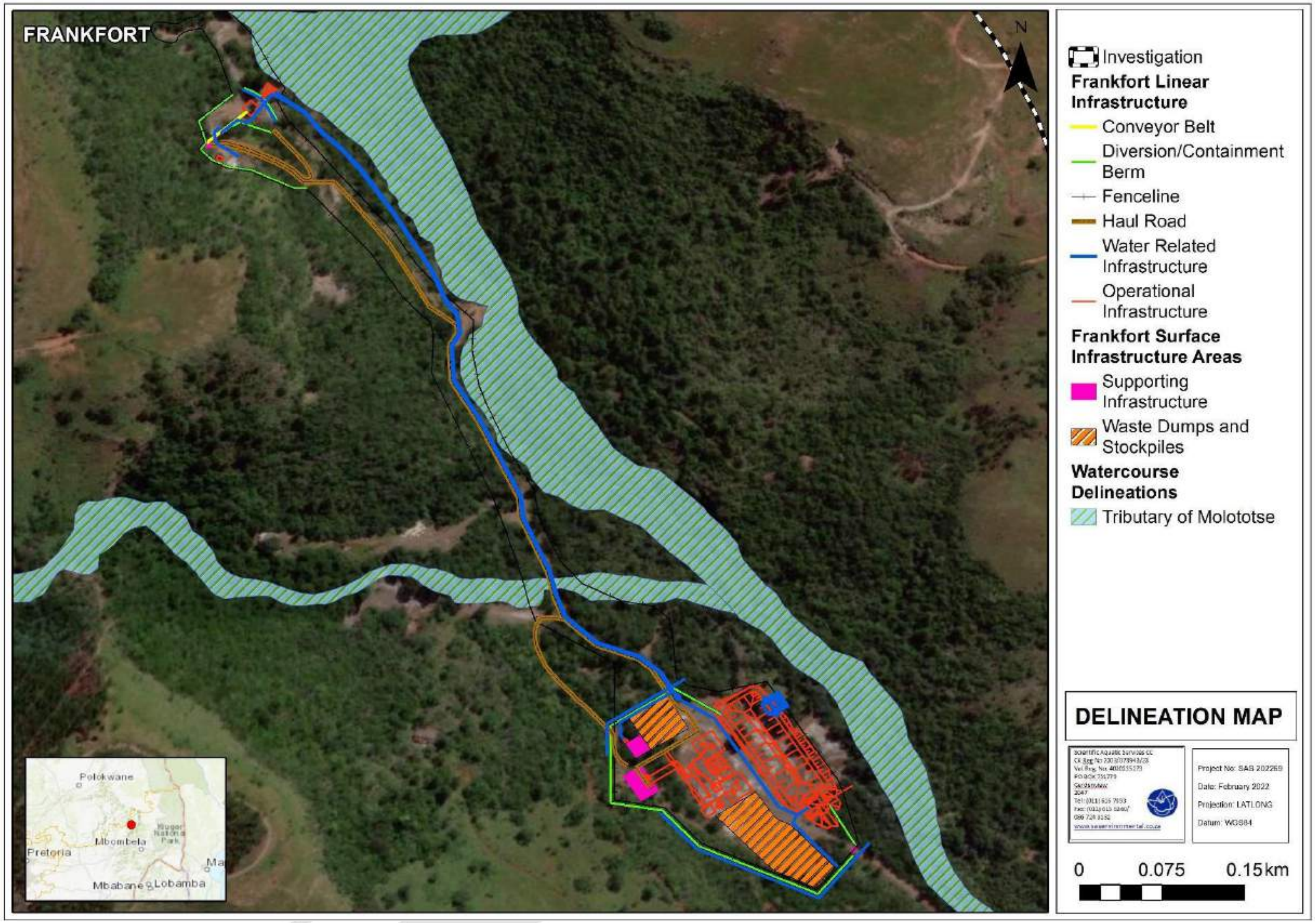


Figure 85: Identified freshwater ecosystems within the Frankfort UG areas and associated investigation area, in relation to the surrounding landscape

Figure 79: Illegal artisanal mining activities within the Peach Tree Stream, upstream of the Clean Stream toxicity sampling point, PT-DS (BM)

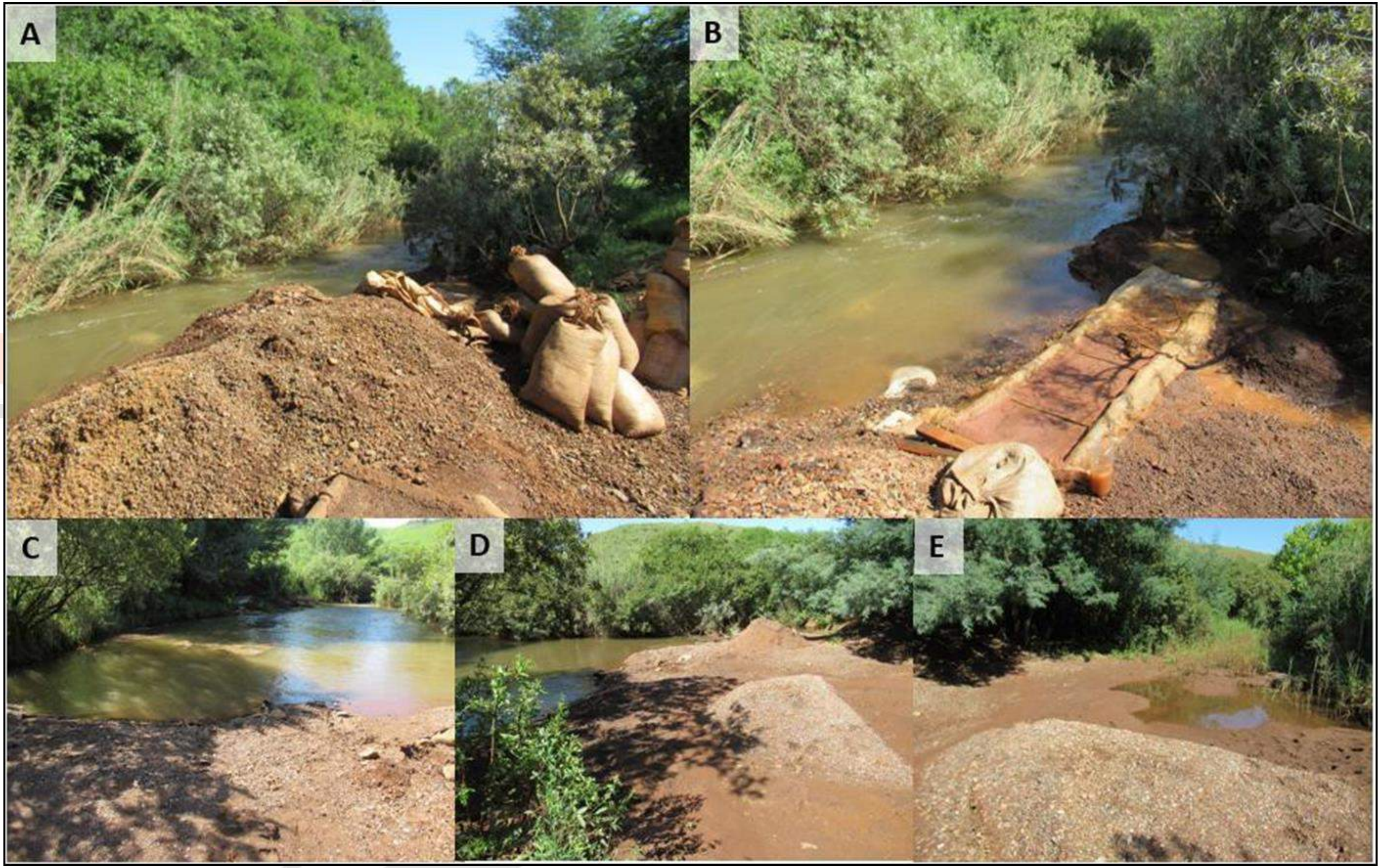


Figure 86: Illegal mining activities taking place upstream of site BR-DS (BM). A and B: washing of fines; C, D and E: partial diversion of the Blyde River

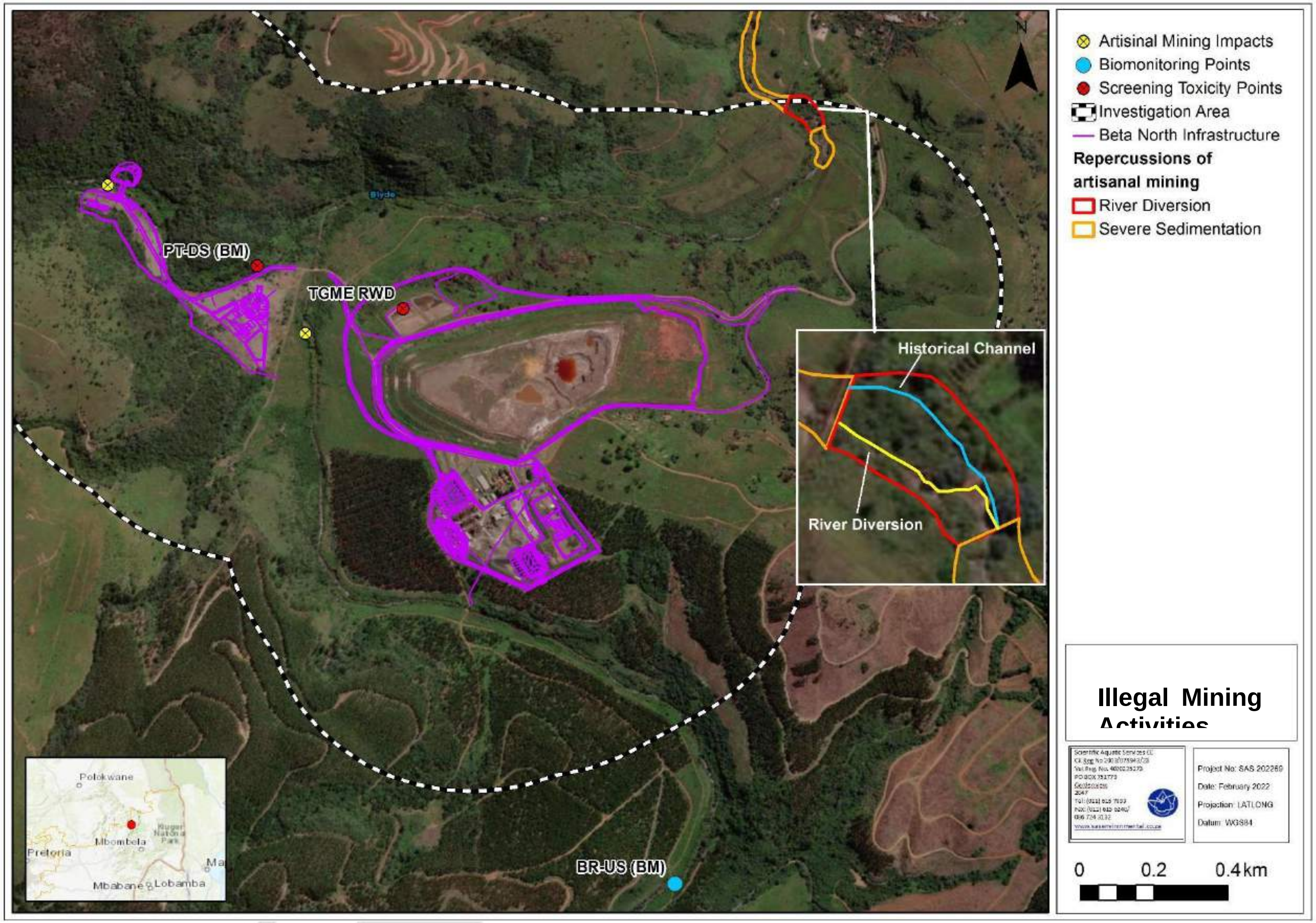
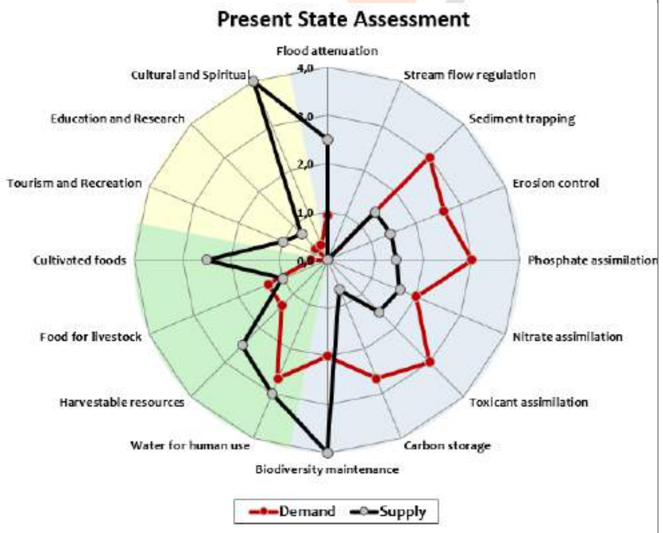


Figure 87: The location of direct impacts of illegal mining impacts on the Blyde River and Peach Tree Stream observed by SAS during various site assessments in 2020, 2021, and 2022

Table 39: Blyde River summarised aquatic findings

BLYDE RIVER:



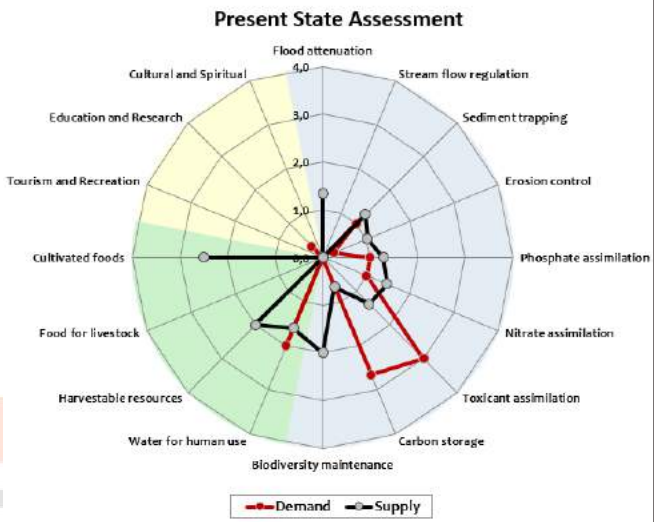
Photograph notes: The low level bridge crossing approximately 200 m north-west of the existing TGME Return Water Dam, flooded at the time of the January 2022 assessment (left) and unauthorised artisanal mining activities directly within the Blyde River approximately 75 m west of the proposed Beta north surface infrastructure footprint**.**

Present Ecological State (PES) (Index of Habitat Integrity (IHI) / Riparian Vegetation Response Assessment Index VEGRAI))	**B / C.** Threats include illegal mining, agriculture, forestry, discharge of domestic effluent within the upper catchment.
Ecoservice Provision	**Moderately High**. Important for ecological service provision, intermediate to moderately low importance for socio-cultural benefits.

Ecological Importance and Sensitivity (EIS)	**High.** Habitat provision for various endemic / threatened species including *Enteromius cf treurensis*, (Critically Endangered) and *Enteromius motebensis* (Near Threatened), *Hadromophryne natalensis* (Natal Ghost Frog), *Pseudagrion newtoni* (damselfly; Vulnerable).
Recommended Ecological Category (REC) / Recommended Management Objective (RMO) / Best Attainable State (BAS)	**B / Maintain / B** Due to the increased ecological integrity and sensitivity, impacts on the Blyde River and its associated riparian zone as a result of the proposed mining activities must not be permitted, and strict adherence to cogent, well-planned mitigation measures must be enforced throughout all phases of the proposed project if it is authorised in order to ensure that the ecological integrity of the riparian zone and aquatic habitat associated with the Blyde River is maintained. It is the opinion of the ecologists that with strict mitigation and appropriate management of the proposed mining activities, the Best Attainable State (BAS) is a Category B. However, it is important to note that illegal mining activities may have an impact on the Blyde River which is beyond the control of TGME.

Table 40: Peach Tree Stream summarised aquatic findings

PEACH TREE STREAM



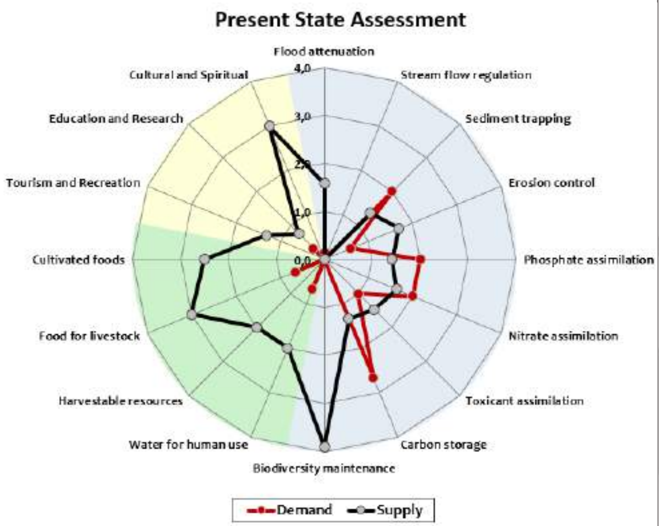
Photograph notes: The reach of the Peach Tree Stream located immediately adjacent to the proposed Beta north shaft, approximately 30 m upstream of the proposed road crossing. The stream has been diverted by artisanal miners and the historical diversion canal which previously existed has become buried under rubble from the historical waste rock dump.

PES (IHI / VEGRAI)	**C / C.** Threats: illegal mining, proliferation of alien vegetation (especially *A. mearnsii*)
Ecoservice Provision	**Intermediate.** Important primarily for sediment trapping, nutrient and toxicant assimilation (albeit threatened by inputs thereof by illegal miners), biodiversity support.
EIS	**High.** Primarily biodiversity support. Although the ecological integrity of the system has been compromised to some extent, due to the intermediate levels of ecosystem services provisioned in particular those related to hydraulic functions, and the degree to which the system contributes to sustaining biodiversity in the vicinity, the Peach Tree Stream is considered to be of high Ecological Importance and Sensitivity.

REC / RMO / BAS	**B/C / Improve / B/C.** Further impacts to the system as a result of the proposed mining activities, in particular impaired water quality and sedimentation of the receiving environment must be prevented. Although water quality does not appear to have been significantly impaired by the observed artisanal mining activities yet, long-term impacts may manifest in due course. Rehabilitation measures such as clearing of alien vegetation, reinstating the flow path of the river and correct management of the existing WRD and planned surface infrastructure will aid in improving the overall ecological condition. It is the opinion of the ecologists that the BAS is a Category B/C, should suitable mitigation and management of impacts, along with cogent, well-developed rehabilitation measures, be implemented

Table 41: Clewer Creek summarised aquatic findings

CLEWER CREEK (MORGENZON)

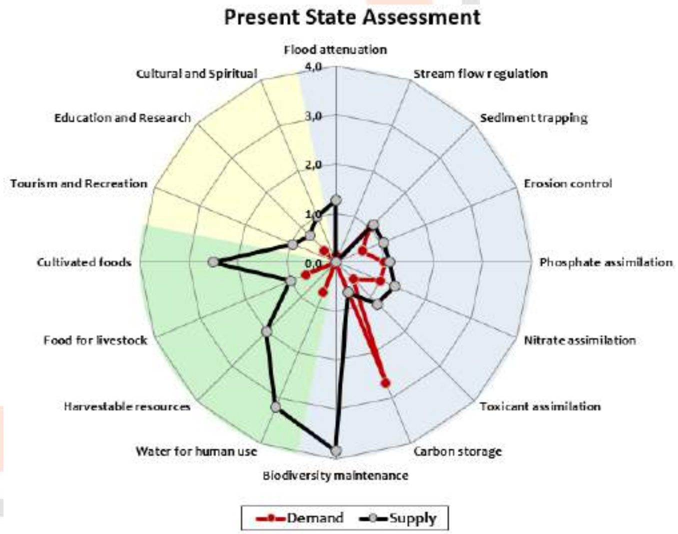


Photograph notes: Representative photographs of Clewer Creek upstream (left) and downstream (right) of the proposed Morgenzon UG surface infrastructure footprint.

PES (IHI / VEGRAI)	**A/B / B.** Largely intact, particularly in upper reaches (upstream of proposed infrastructure). Threats: increased nutrient loads from return water flows from Pilgrims Rest Golf Course, encroachment of alien vegetation particularly in lower reaches, albeit not yet serious.
Ecoservice Provision	**Moderately high to low**. NB for flood attenuation, erosion control, sediment trapping, nutrient assimilation. High potential for education / recreation and tourism especially upper reaches. Used for spiritual rituals.
EIS	**High**. Biodiversity support, cultural service provision.
REC / RMO / BAS	**B / Maintain / B.** Clewer Creek is in a largely natural state. Historical impacts are not of a significant extent, nor are they considered to have altered the ecology of the system greatly. The area is considered of high ecological importance and sensitivity, and therefore further impacts due to the proposed mining activities must not be permitted. Appropriate mitigation measures must be implemented to prevent impacts associated with the proposed surface infrastructure footprint.

Table 42: Molototse summarised aquatic findings

MOLOTOTSE RIVER (FRANKFORT)

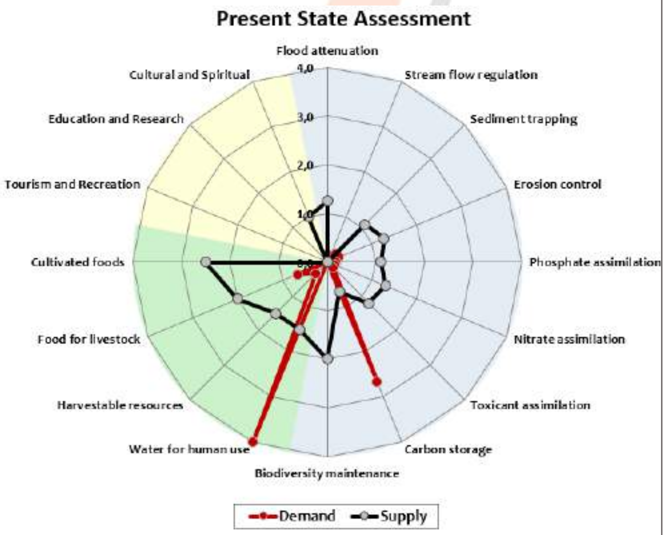


Photograph notes: Representative photographs of the Molototse River. Left: the waterfall situated approximately 140 m north of the existing Frankfort shaft and right: a reach of the river approximately 900 m downstream of the proposed surface infrastructure footprint.

PES (IHI / VEGRAI)	**A/B / B/C**. Largely unimpacted, with the exception of encroachment of alien vegetation especially in lower reaches. Threats: forestry, potential abstraction, decant from historical mine shafts located upgradient of river.
Ecoservice Provision	**Moderately high to low**. NB predominantly for biodiversity support. Provision of ecoservices limited by absence of short, robust vegetation to trap sediment, attenuate flooding etc, except in lower reaches.
EIS	**High.** Primarily for biodiversity support.
REC / RMO / BAS	**B / Maintain / B.** The river is located downgradient of the proposed Frankfort surface infrastructure footprint, and of the existing shaft which is planned to be recommissioned. Several historical shafts are also located upgradient of the river, and these must be monitored or preferably suitably sealed to prevent future decant which may reach the river. Provided that appropriate mitigation measures are implemented throughout the life of mine, indirect impacts which may occur can be prevented or minimised, and this is deemed essential to maintain the PES and ensure that further degradation does not occur.

Table 43: Unnamed Mountain Stream summarised aquatic findings

UNNAMED MOUNTAIN STREAM (DUKES)



Photograph notes: the upper reaches of an accessible stream within the Dukes UG area (left) and a section of the lower reach which was historically diverted (right). The remains of the diversion canal are visible in the photograph.

The freshwater ecosystems associated with the Dukes 83MRarea have been extensively and severely altered as a result of historical mining practices, and were therefore difficult to characterise, delineate and assess. Additionally, at the time of the October 2021 and January 2022 site assessments, only a very small area was safely accessible, due to the presence of numerous artisinal miners. Results presented are for the remaining extent of the mountain stream.

PES (IHI / VEGRAI)	**A/B / B/C**. Threats and modifiers: illegal mining, encroachment of alien vegetation, loss of hydraulic connectivity, trampling and grazing by domestic livestock.
Ecoservice Provision	**Low to moderately low**. Stream is ephemeral, thus ecoservice provision reduced accordingly. Degree of importance for seasonal provision of water for human use.

EIS	**Moderate**. Remaining extent provides faunal migratory corridor and biodiversity support.
REC / RMO / BAS	**A/B / Maintain / B** The assessed reach of the mountain stream is situated upgradient of the proposed surface infrastructure and therefore is very unlikely to be directly impacted by the construction and operation thereof. Indirect impacts are also unlikely given the gradient of the topography. Nevertheless, increased activity in the catchment may lead to impacts such as increased proliferation of alien vegetation which may disperse to the upgradient areas via wind or fauna. Therefore, although the system may not be directly impacted by the proposed activities, it is nevertheless important to ensure that the stream is monitored for possible indirect impacts.

9.10.2.5 TOXICITY SAMPLING

Monitoring of toxicity is undertaken at four sites: the existing TGME Return Water Dam (RWD), at Peach Tree Stream downstream of the artisanal mining impacts, at a decant point unrelated to TGME impacts on the Clewer Creek downstream of the Pilgrims Rest Golf Club, and on Theta Stream. The site localities are summarized in the table below:

Table 44: Unnamed Mountain Stream summarised aquatic findings

Site	UG Area / River system	Description	GPS co-ordinates	
			South	East
TGME RWD	Beta / N/A	Final RWD	24°54'46.25"S	30°44'14.00"E
PTS-DS (BM)	Beta / Peach Tree Stream	Peach Tree Stream downstream of potential TGME activities associated with Peach Tree Stream. Downstream of current artisanal mining impacts.	24°54'42.52"S	30°44'1.26"E
CC Decant	Morgenzon / Clewer Creek	Water from pump station (drinking water) flowing into Clewer Creek (non TGME impact). Site is the same as CC-DS (MZ).	24°53'7.50"S	30°44'55.80"E

A summary of the results obtained during the September 2021 survey undertaken by Clean Stream is presented below.

Table 45: Summary of the results of the toxicity monitoring obtained during the September 2021 survey (Clean Stream, 2021)

Site	Results (Clean Stream, September 2021)
TGME RWD	Sample TGME-RWD showed a “high acute/short-chronic environmental toxicity hazard” (Class IV) during April 2021, but it was promising to note that “no acute/short-chronic environmental toxicity hazard” (Class I) was detected in September 2021. Although a notable temporal improvement was observed, the April 2021 result indicate that the water in the final RWD at TGME Beta and Met

Site	Results (Clean Stream, September 2021)
	Plant should not be released or allowed to seep into the receiving natural environment, as it could negatively affect the biota in the receiving water body.
PTS-DS (BM)	An acute toxicity hazard (Class III) was detected for sample PT-DS (BM) from the lower Peach Tree Creek during the April 2021 survey, decreasing to a promising Class I (no acute/short chronic) hazard in September 2021. Although it was promising to note that the toxicity decreased, the April 2021 result confirmed that deteriorated water quality occurs in this stream, at times, and may be of concern to the aquatic biota. Very turbid water, which was a direct result of extensive illegal mining activities in this river reach, was observed at this site. Although it is evident that these illegal mining and other activities may currently be responsible for the observed toxicity effect, TGME should ensure that they are not contributing to the scenario. The detailed surface water quality monitoring by Regen Waters (June 2021) highlighted some variables of concern (above RQO limit) for the Peach Tree Creek downstream site (Peach Tree confluent), with calcium and sulphate exceeding the RQO limits.
CC-Decant	The sample collected from the Stables Overflow into the Clewer Creek at site CC-DS (MZ) showed a “slight short-chronic toxicity hazard” (Class II) during April 2021 and improved to a Class I (no acute/short chronic toxicity hazard) during September 2021. Although only a slight toxicity hazard (Class II) was observed during April 2021, it indicated that this water may, at times, have an effect on the receiving environment.
TS-DS (FF)	Sample TS-DS (FF) showed a “slight acute/short-chronic toxicity hazard” (Class II) during both the April and September 2021 surveys, indicating a potential toxicity hazard flowing towards the Molototsi River via the Theta Stream. Although this is only a slight hazard, it could be indicative of potential water quality variables of concern. The surface water monitoring report by Regen Waters (2021) only highlighted slightly low pH as a potential variable of concern, and continued monitoring (water quality and toxicity testing) is essential. Should the toxicity hazard increase, more detailed analyses (such as a toxicity identification evaluation) may be required to identify the variable/s of concern.

9.10.2.6 LEGISLATIVE REQUIREMENTS, NATIONAL AND PROVINCIAL GUIDELINES PERTAINING TO THE APPLICATION OF BUFFER ZONES

The definition and motivation for a regulated zone of activity for the protection of the freshwater ecosystems are summarised in

Table 46.

Table 46: Legislation and the relevant zones of regulation applicable

Regulatory authorisation required	Zone of applicability
Water Use License Application in terms of the NWA	In accordance with GN509 of 2016 as it relates to the NWA, a regulated area of a watercourse for section 21c and 21i of the NWA is defined as: • the outer edge of the 1 in 100-year flood line and/or delineated riparian habitat, whichever is the greatest distance, measured from the middle of the watercourse of a river, spring, natural channel, lake or dam; • in the absence of a determined 1 in 100-year flood line or riparian area the area within 100 m from the edge of a watercourse where the edge of the watercourse is the first identifiable annual bank fill flood bench; or • a 500 m radius from the delineated boundary (extent) of any wetland or pan in terms of this regulation.
GN704;	For all activities within a watercourse or within 100m of a watercourse
EIA Regulations, 2014 (as Amended) Listing Notices	32m from the edge of a watercourse
Buffer guidelines according to the National Freshwater Ecosystem Priority Areas (NFEPA) Implementation Manual (2011) and the Mpumalanga Biodiversity Sector Plan (MBSP) Handbook (2014)	
NFEPA (2011) and MBSP Handbook (2014)	Although these are not legislated zones of regulation the recommended buffer for the Blyde River, in accordance with both guidelines, is 1000m (1km).

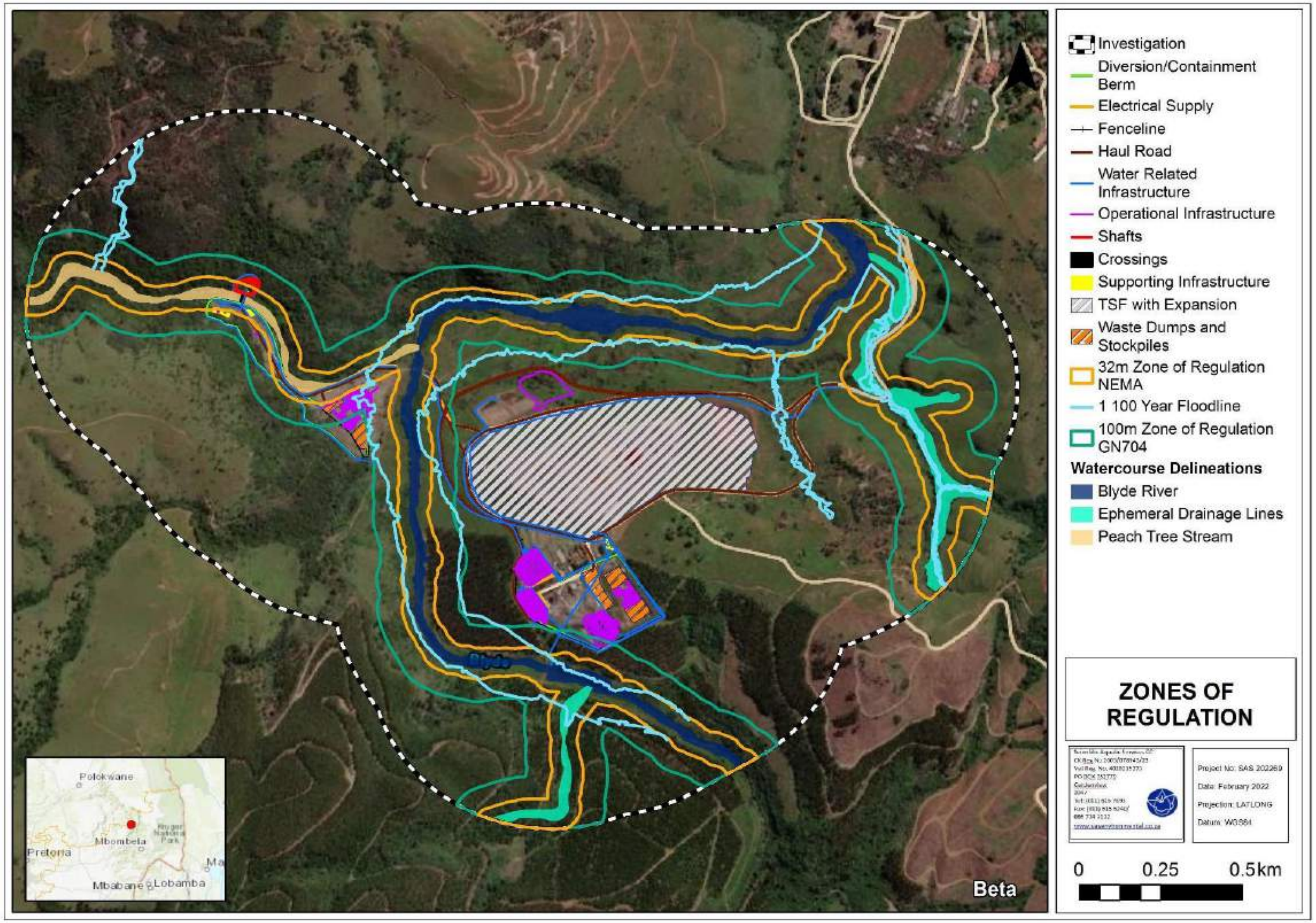


Figure 88: Conceptual presentation of the zones of regulation in terms of NEMA, GN509 and GN704 as they relate to the National WaterAct, 1998, (Act No. 36 of 1998), in relation to the Beta north TSF and Plant areas and watercourse delineations

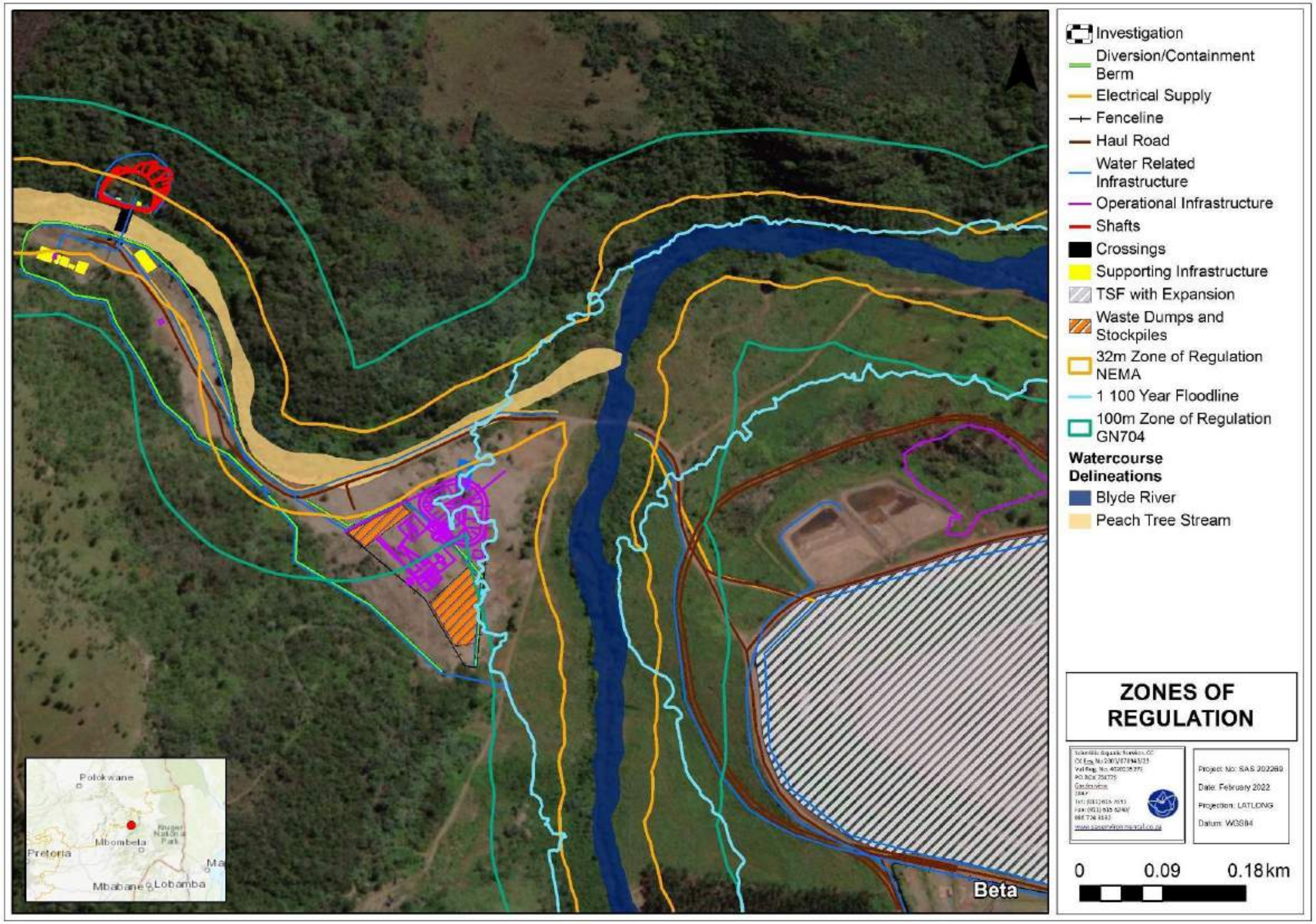


Figure 89: Zoomed in Conceptual presentation of the zones of regulation in terms of NEMA, GN509 and GN704 as they relate to the National Water Act, 1998, (Act No. 36 of 1998), in relation to the Beta north TSF and Plant areas and watercourse delineations

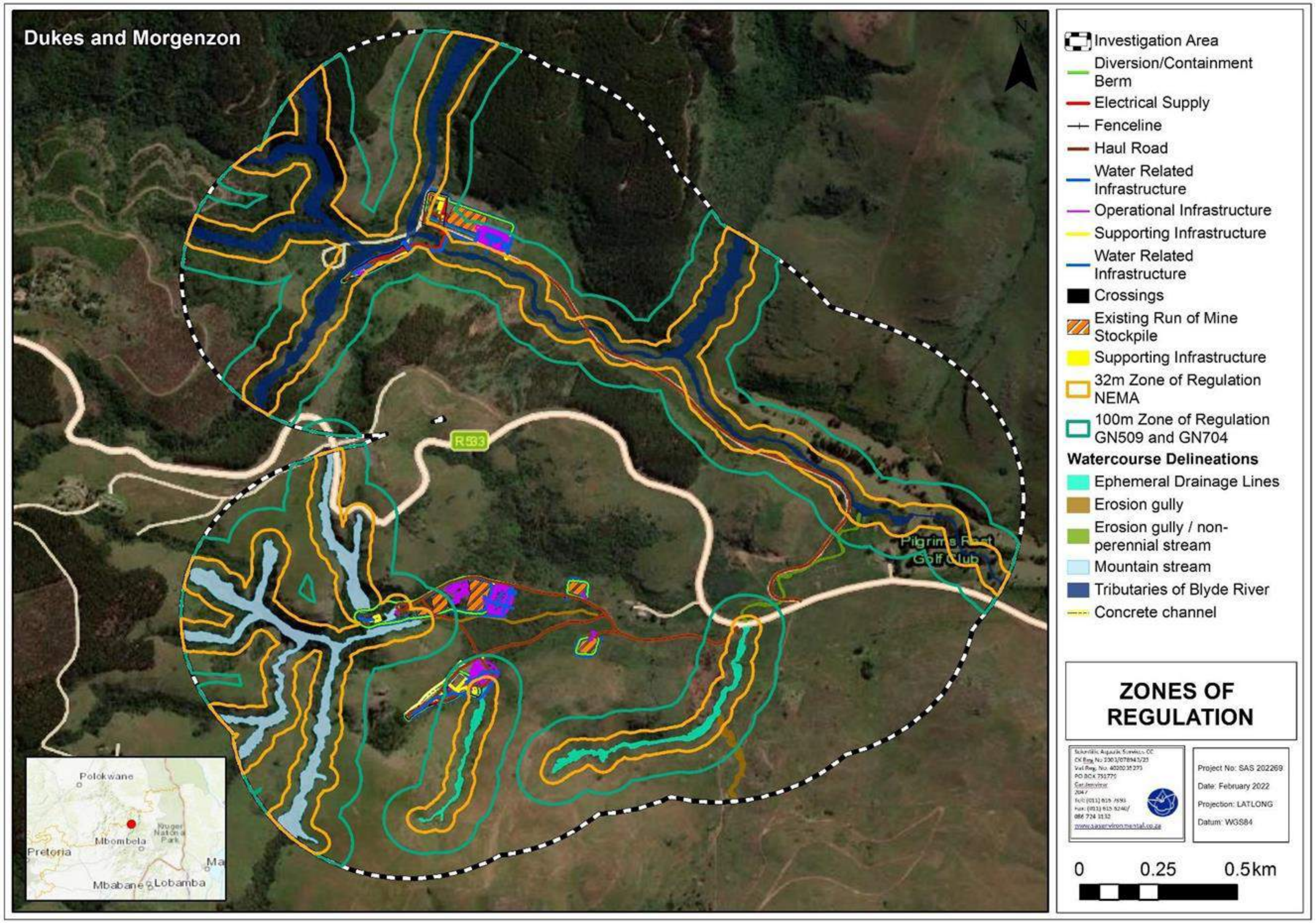


Figure 90: Conceptual presentation of the zones of regulation in terms of NEMA, GN509 and GN704 as they relate to the National WaterAct, 1998, (Act No. 36 of 1998), in relation to the CDM areas and watercourse delineations

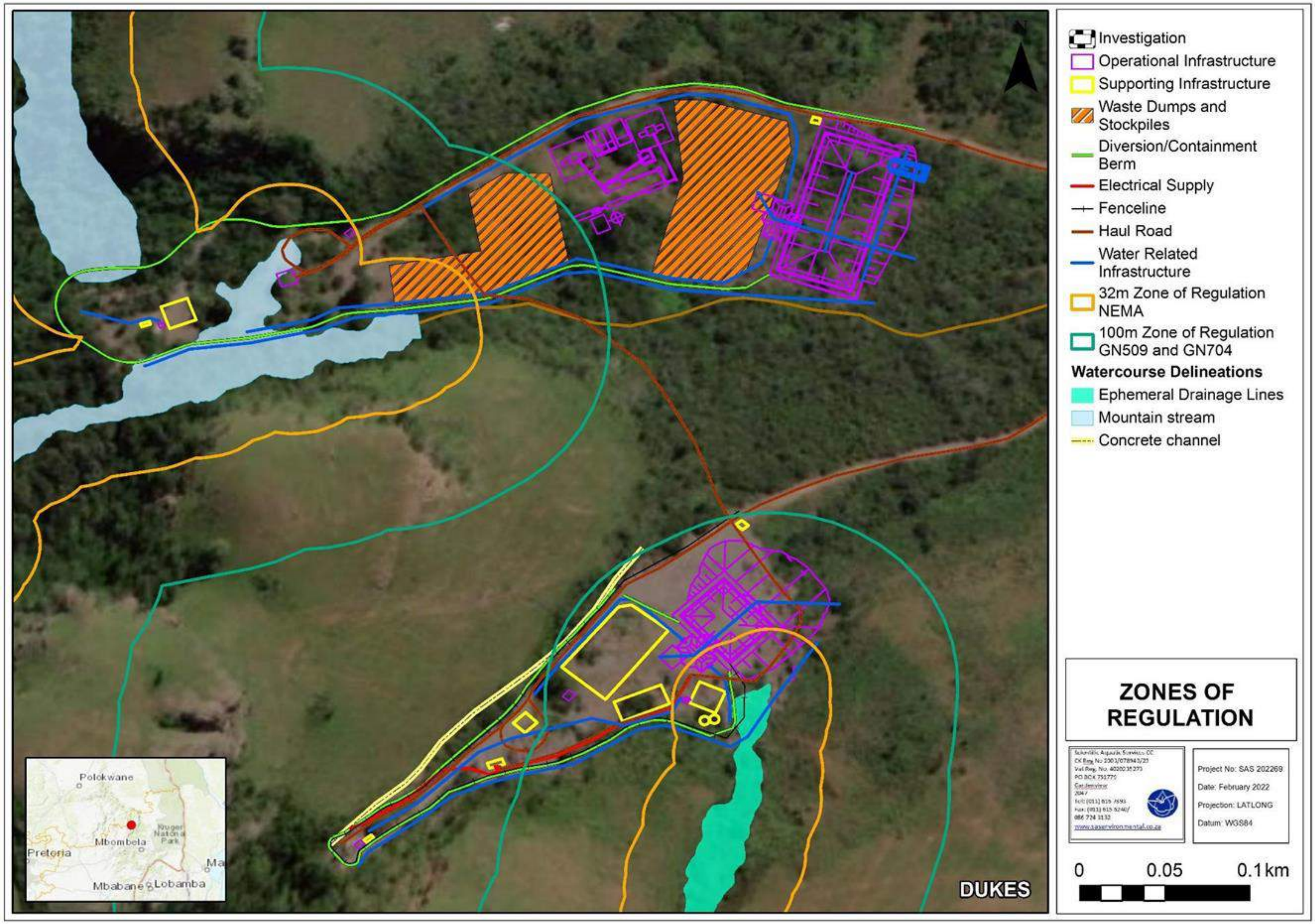


Figure 91: Zoomed in Conceptual presentation of the zones of regulation in terms of NEMA, GN509 and GN704 as they relate to the National Water Act, 1998, (Act No. 36 of 1998), in relation to the Dukes areas and watercourse delineations

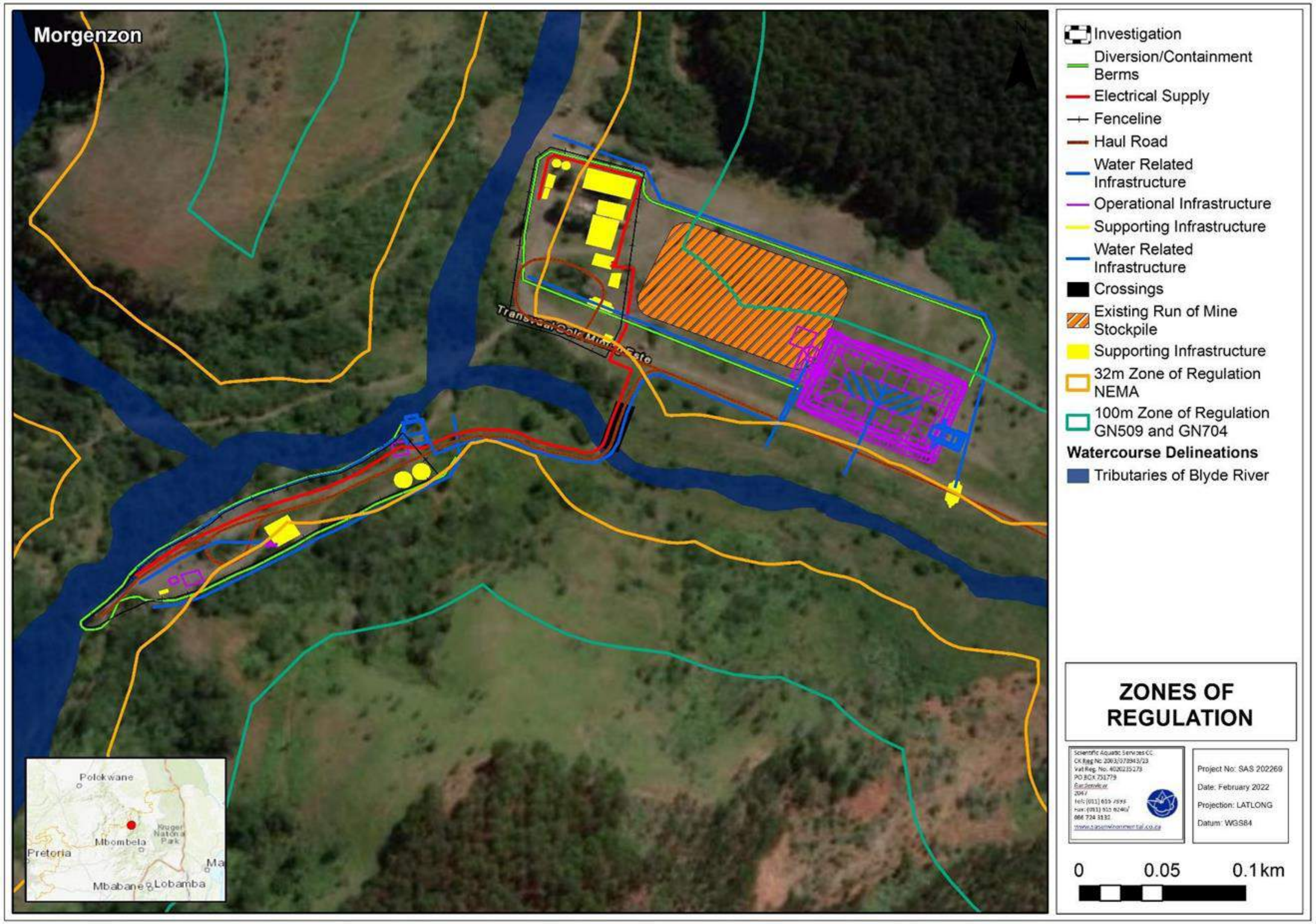


Figure 92: Zoomed in Conceptual presentation of the zones of regulation in terms of NEMA, GN509 and GN704 as they relate to the National Water Act, 1998, (Act No. 36 of 1998), in relation to the Morgenzon area and watercourse delineations

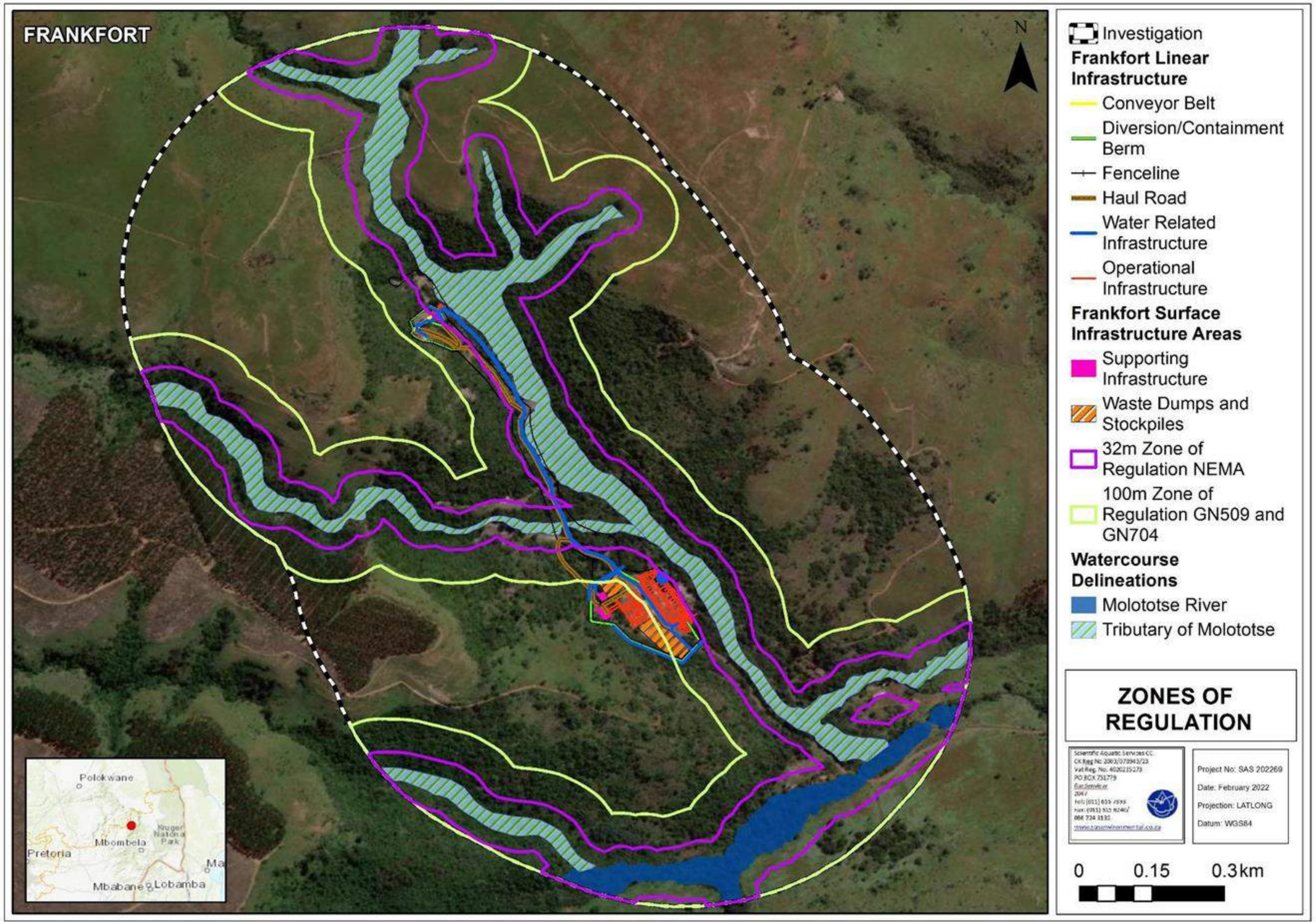


Figure 93: Conceptual presentation of the zones of regulation in terms of NEMA, GN509 and GN704 as they relate to the National WaterAct, 1998, (Act No. 36 of 1998), in relation to the Frankfort area and watercourse delineations

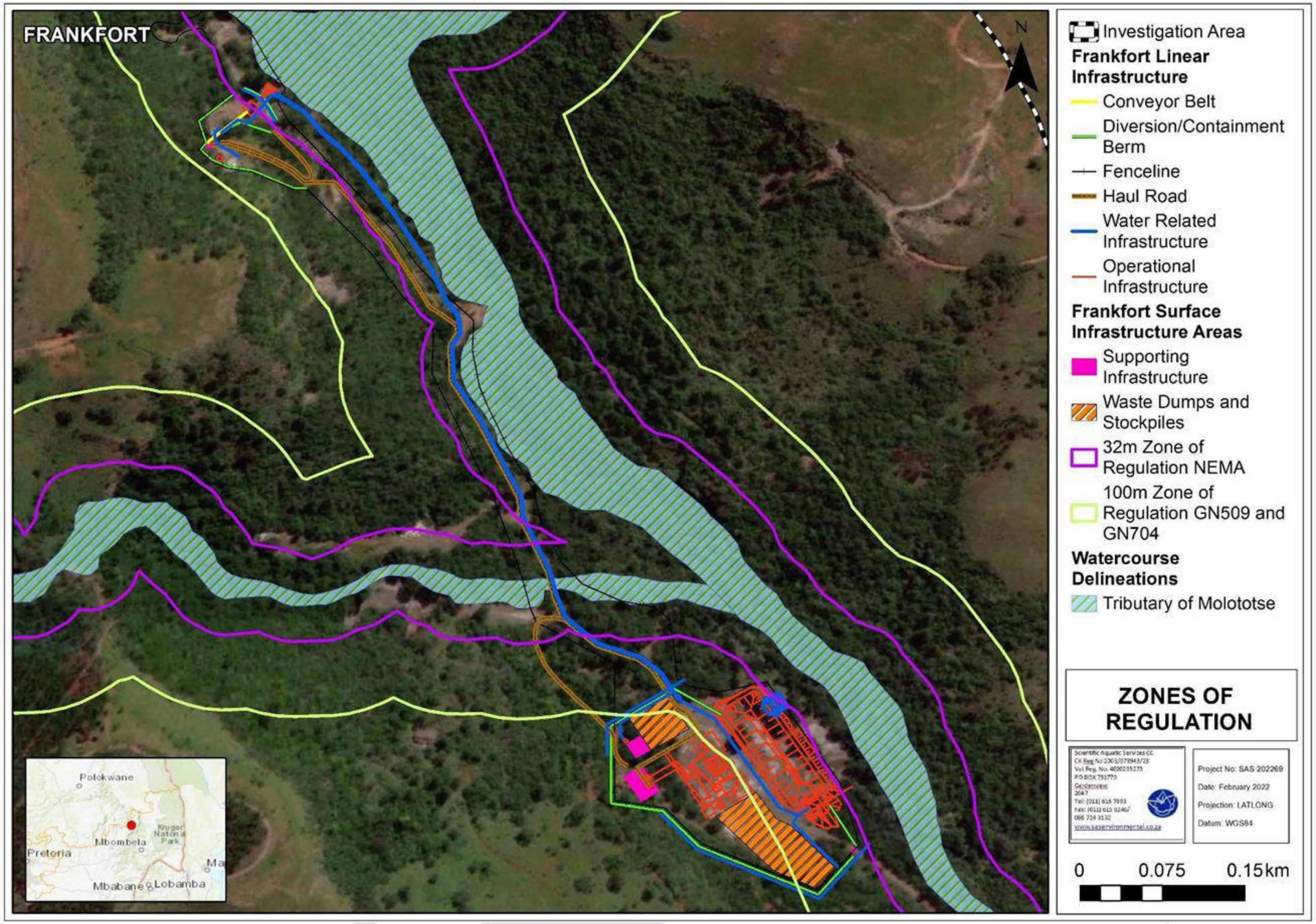


Figure 94: Zoom in Conceptual presentation of the zones of regulation in terms of NEMA, GN509 and GN704 as they relate to the National Water Act, 1998, (Act No. 36 of 1998), in relation to the Frankfort area and watercourse delineations

9.10.3 CONDITIONS FOR CONTINUED MINING

TGME has appointed Mark Botha (Conservation Strategy, Tactics and Insight) to develop a comprehensive ecological compensation programme. A mitigatory and rehabilitation offering is proposed for the area around the mining operations to allow continued mining in the sensitive and protected environments listed in the above sections. The proposed offering comprises the following:

- Rehabilitating the ecological and hydrological functioning of the upper portions of the Blyde River catchment, and replenishing the licensed extraction volume as provided for under the section 21(a) abstraction license of the NWA (Extraction permit reference 1351N) by inter alia funding the planning and coordination of alien invasive tree species control efforts and fire belt implementation.
- Provide funding to an appropriate non-profit organisation with the expertise and experience to develop and release an effective destructive biological control agent for the worst invasive species in the catchment, being Silver Wattle (Acacia dealbata) (amount to be determined in consultation with the appointed non-profit organisation).
- Control, in addition to the alien invasive tree species occurring around the mining operations, around 265 condensed hectares of alien invasive tree species located within and immediately adjacent to the Farms Driekop 546 KT, Graskop 564 KT (portion 25) and Desire 563 KT (known as the Graskop Grasslands unique community and managed by Mpumalanga Tourism and Parks Agency as part of the Blyde protected area), and Ponieskrans 543 KT and the immediate surrounding land parcels. This control will also be to a level of no seeding adult specimens present and canopy cover<1% within 7 years from commencement.
- Control, through regular and repeated reconnaissance and control measures, all alien invasive tree species within the riparian Zone of the Blyde River, from the Mine Water offtake point on the Farm Grootfontein 562 KT, down to the boundary of the Provincial Blyde River Nature Reserve at Bourke's Luck Potholes. Where there is doubt as to the boundary of the riparian zone, it can be defined as the land within 100m of the centre line of the Blyde River.
- Implement a fire belt and related control measures program, in conjunction with affected adjacent landowners and the Lowveld Escarpment Fire Protection Association, on the Morgenzon Forest Nature Reserve and the areas.
- Implement erosion and sediment control operations on all areas cleared of alien invasive tree species, rehabilitated roads, and other susceptible areas, with the objective of removing unnatural levels of sediment input into the Blyde River system. This revegetation will strive to create a basal cover of appropriate indigenous species of 15% within 5 years of initial establishment.
- Rehabilitation of diverted streams and drainages due to illegal mining activities.

The initial strategy has been presented to the DFFE for inputs and will further be discussed with the stakeholders involved in the management of these environments.

9.11 NOISE BASELINE

EnviroRoots Pty (Ltd) was commissioned to undertake the Noise Impact Assessments as part of the project to determine the baseline noise environment around the mining areas. The baseline report is attached as ANNEXURE P of this report.

Five (5) receptors within proximity (±1,000 m) of the infrastructure footprint were identified, which comprised mostly singular dwellings, homesteads, and communities. Based on the measurements and site observations, the following rating levels were proposed for receptors:

- Suburban rating for all receptors that are based in communities;
- Rural rating for all receptors based on singular homesteads.

Field assessments in and around the sites were undertaken. This included the identification of the noise sensitive stakeholders, existing noise sources and other baseline noise contributors. Viable and alternative measurement localities at the identified monitoring localities were further investigated to ensure measurements were not influenced by extraneous noise sources (e.g. an air-conditioning condenser unit near a measured locality).

9.11.1 BASELINE NOISE ASSESSMENT

Baseline measurements were conducted on 3 October 2021 at three (3) localities (refer to **Figure 95**). Measurements were analysed to compile a subjective and objective determination of the Rating levels (LReq) based on the LAIeq measurements (LAIeq: A-weighted, impulse, leq sound level).

Ten-minute LAIeq (SANS 10103:2008) measurements were conducted during the daytime (22:00 – 06:00)[71] safe periods within the study area.

A SANAS calibrated type 1 Noise Sound Level Meter (SLM), set to A-weighting and with impulse settings applied, was used at each measurement point. The SLM are laboratory calibrated and the calibration certificates for the SLM as well as the sound calibrator are available on request. Using a SANAS-calibrated sound calibrator, the acoustic sensitivity of the SLMs was checked immediately before and after each of the sound level measurements, and the results coincided within 2.0 dB. Furthermore, certain statistical values and variables such as the LA90 LAMax, LAmin, and (fast) third octave data (dBZ) were logged and considered.

The conclusions drawn during analysis of the data, desktop information and onsite investigations are summarised in **Table 47.**

Table 47: Baseline Sound Pressure Measurement Conclusions

Receptor/Measuring Point	Conclusions
AB01 - dwellings [Min 10-minute measurement on outside boundary]	• Calculated LAIeq was 39,8 dBA – The measurements reflected a rural area (daytime) • The measurements were influenced by one vehicle passing along the R533 route
AB02 – Pilgrim's Rest	• Calculated LAIeq was 42,4 dBA – The measurements reflected a developed suburban area (daytime). There is moderately high confidence in this measurement (based on desktop assessment, onsite investigations and noises/sounds heard during measurements) • The measurements were influenced by some domestic sounds and local routes (namely R533)
AB03 - Pilgrim's Rest	• Calculated LAIeq was 38,8 dBA – The measurements reflected a rural area (daytime)

[71] SANS 10103:2008 criterion

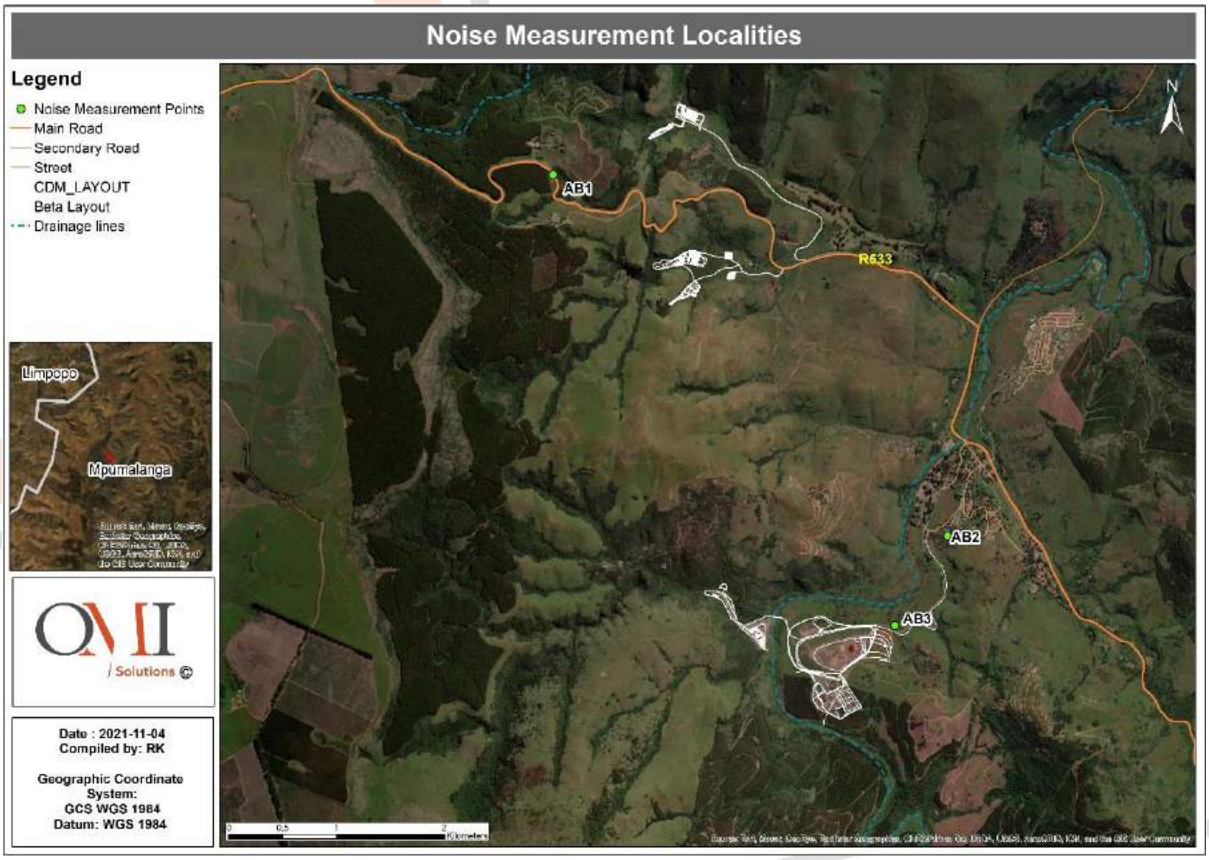


Figure 95: Noise Measurement Localities[72]

9.11.2 NOISE ASSESSMENT

The noise assessment for the construction and operational phases used one moderately high Sound Power Level (SPL) apparatus, operating at maximum capacity. The noise source was assessed in a linear fashion at the closest point of any footprint boundaries (or fixed infrastructure locality) in relation to the receptors.

A moderately high SPL (see max operations of Jaw crusher diesel ca 250 kW or Pneumatic breaker) was operated over a day period at the project footprint. The linear regression was applied to the distance of the receivers from the project footprint. The linear noise representation for the night-time period is presented below in **Figure 96.**

A linear regression measured from receptors in relation to the project footprint was also used for a prediction and measurement relating to road traffic noise (**Figure 97**).

[72] Adapted from Enviroroots, 2022

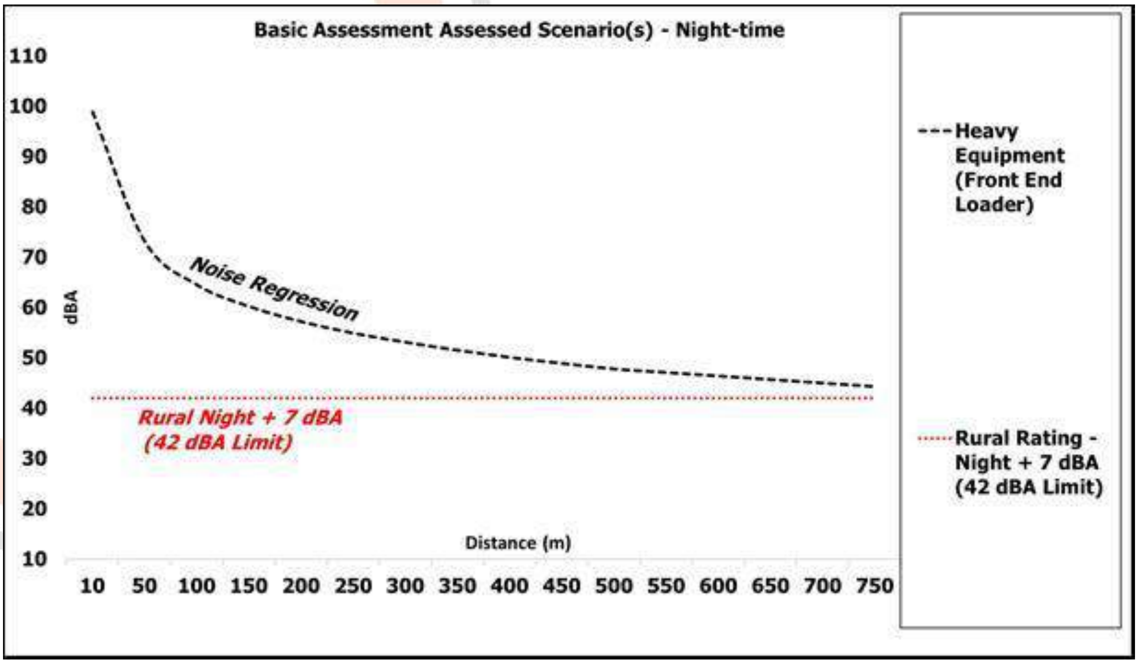


Figure 96: Construction/Operational Noise Levels

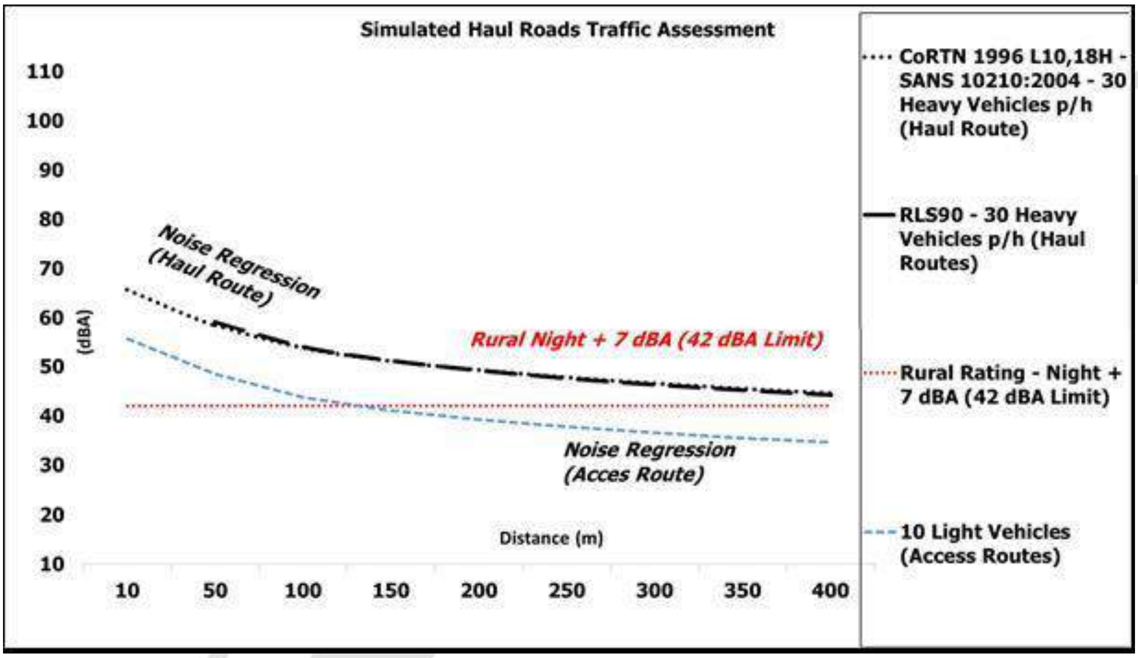


Figure 97: Haul Route Noise Levels - Linear Representation of Road Traffic

A full noise impact assessment is included in Section 13.3.8.

9.12 VISUAL LANDSCAPE

SAS was commissioned to undertake a pre-feasibility visual assessment as part of the studies to identify risks to the proposed project. The baseline report is attached as ANNEXURE O of this report.

Based on the findings from both the desktop and the field assessments it is evident that the 83MRAreas is located within a semi-rural and rural (Frankfort Area) mountainous area, with gentle to steep undulating terrain, which form distinguishing topographical features in the form of prominent hills, outcrops and steep cliffs that are interspersed with thicketed valleys where the Blyde River, streams (Peach Tree Stream) and ephemeral drainage lines are situated. The topography of the area is considered an important ecotourism attraction as tourists traveling on the scenic routes and passes within the area have a pleasant viewing experience (SAS, 2022 (c)).

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. It is created by the land use, character, and quality of a landscape, as well as by the tangible and intangible value assigned thereto. The landscape character type is defined as rural, mountainous area dominated by grassland, plantations and natural forests interspersed with watercourses, especially the Blyde River, villages, the town of Pilgrim's Rest and historic mining infrastructure.

Viewshed analysis was done for each of the sites. A maximum height of 10 m for the proposed mining infrastructure was used for all sites during the viewshed analyses. It is important to note that the viewshed analysis does not take into account the vegetation and existing anthropogenic structures of the area.

In order to holistically describe the receiving environment, the visual assessment report aims to determine the intrinsic value of the receiving landscape including aspects of the natural, cultural and scenic landscape, taking both tangible and intangible factors into consideration.

It may be concluded that the landscape in its current state providesa positive viewing experience, with panoramic mountainous views, and that the proposed mining development may result in a reduction of this landscape character type within the localarea, mostly to tourists driving along the paths. Visual observations of the 83MRAreas however requires knowledge of the exact locations of the proposed 83MRAreas, as suchmotorists will not directly observe the proposed mining activities in the landscape. Furthermore, the Mpumalanga Province is associated with existing mining activities, which already negatively affects the landscape character of the region on a provincial level. The Pilgrim's Rest area, however, has fewer mining activities and more commercial forestry plantations which are periodically harvested, resulting in negative viewing experiences of bareground, logs and tree stumps at various times throughout the year. Viewshed analysis of various infrastructure is shown in **Figure 98** to **Figure 100.**

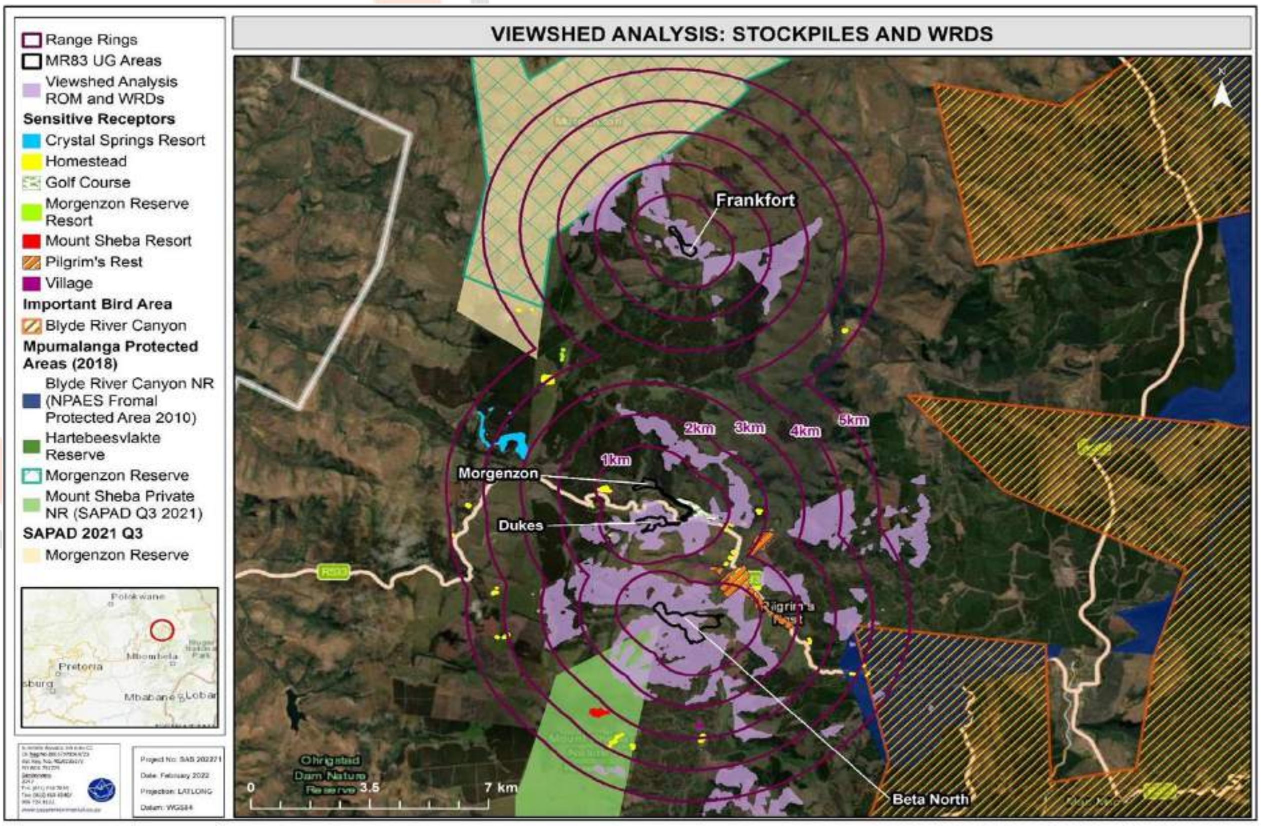


Figure 98: Viewshed Analysis for Stockpiles and WRDs

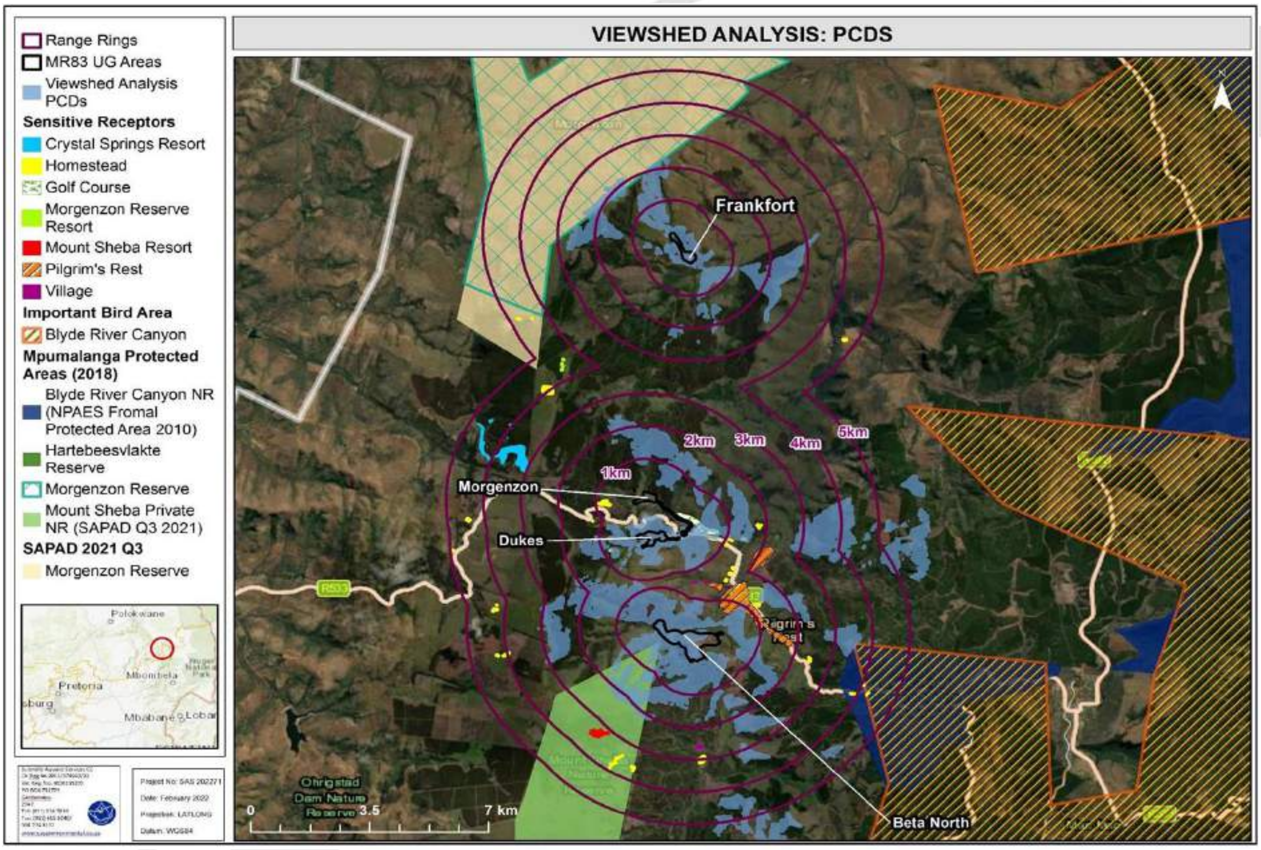


Figure 99: Viewshed Analysis for Pollution Control Dams

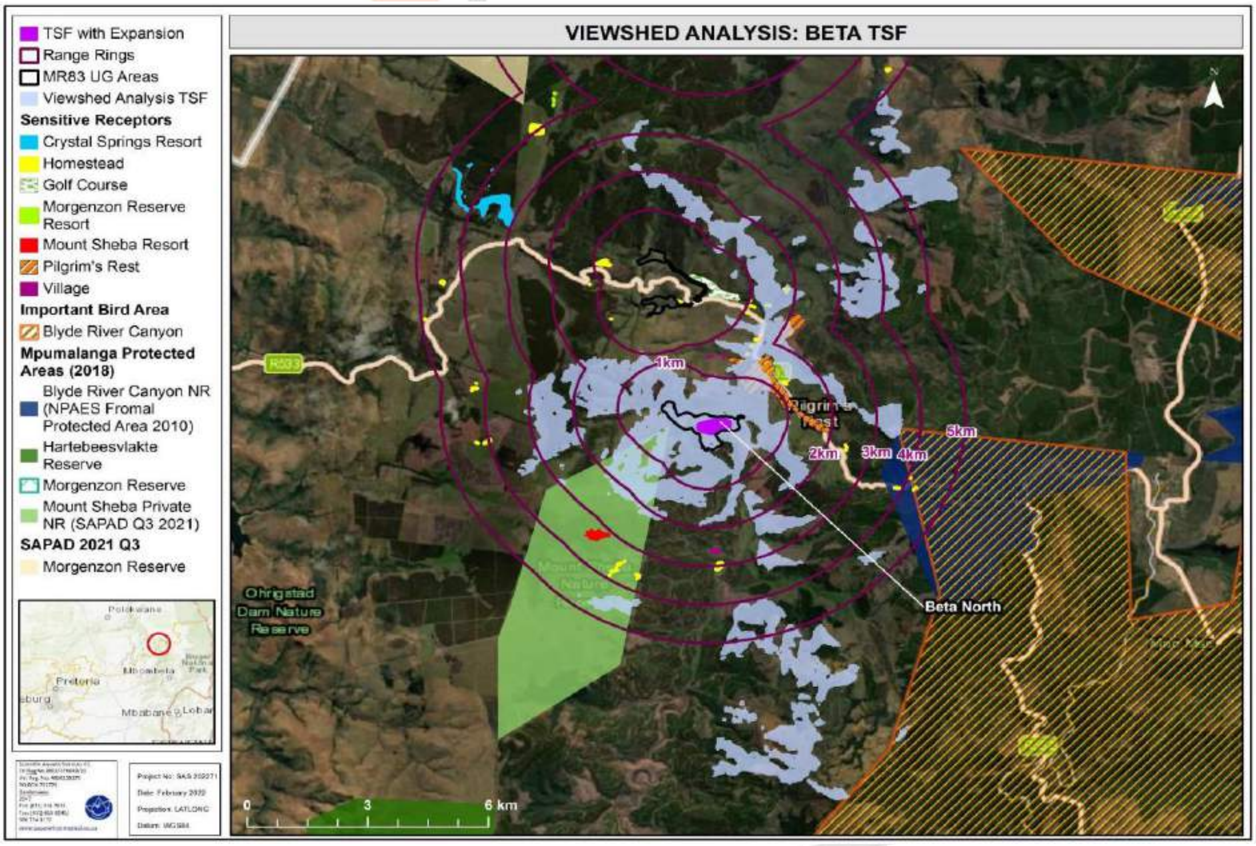


Figure 100: Viewshed Analysis for Beta, TSF and Plant

9.13 SOCIO ECONOMIC AND CULTURAL ENVIRONMENT

9.13.1 HERITAGE ASSESSMENT

Heritage Management Consulting was commissioned to undertake the Heritage and Paleontological assessments. The reports are attached as ANNEXURE Q of this report.

The study area has evidence for occupation over an extensive period of time, spanning from the Stone Age through to the historical period. Briefly, the Stone Age is associated with the manipulation of lithics to create tools. These date from as many as 2.5 million years to less than 150 years ago. This period overlaps with the migration of Bantu speakers into southern Africa, bringing with them agricultural technologies, herding and a settled way of life manifested through stone walling. For the purposes of this study, the literature review was primarily focused on the historical period as activities associated with the project are planned within a predominantly Historical Period landscape.

The farm Ponieskrans, which would later become Pilgrim's Rest, was officially declared a gold field in September 1873, heralding the dawn of one of South Africa's largest and most significant gold rushes. Initially, alluvial gold was found where diggers were panning in the streams around Pilgrims Rest - some from as far away as California and Australia. Pilgrims Rest was declared a public digging in 1875 but gold panning declined in 1876 and subsequently, heavy equipment was employed to locate and mine subsurface reefs. Several smaller companies were formed which mined smaller claims, while larger conglomerates commenced with mining in deeper gold-bearing ore. In 1895, several small mining companies amalgamated to form the TGME. This company was listed on the London Stock Exchange and became the first listed gold mining company in South Africa. As the volumes of gold ore increased, the engineers constructed small, local hydro-electric plants to generate electricity for the electric tramway and the ore crushers at the reduction works, which was constructed in 1897.

Pilgrim's Rest was southern Africa's second town with street electricity, the first being Kimberley. Mining in Pilgrim's Rest town ceased in 1971 and the village was acquired by the authorities for the formation of a National Museum and tourism destination.

The TGME project area is situated within the larger Pilgrim's Rest heritage landscape, which is regarded as highly significant and of national significance. Pilgrim's Rest and the farm Ponieskrans were declared a Provincial Heritage Site in 1986 and an application for World Heritage Site status for the Reduction works was lodged in November 2006, but the declaration was never formalized.

Ponieskrans and the Pilgrim's Rest region encompass a rich and significant historic landscape with regards to Section 3(3) of the NHRA in particular, as a result of:

- its importance in the community, or pattern of South Africa's history;
- its possession of uncommon, rare or endangered aspects of South Africa's natural or cultural heritage;
- its potential to yield information that will contribute to an understanding of South Africa's natural or cultural heritage;
- its importance in demonstrating the principal characteristics of a particular class of South Africa's natural or cultural places or objects; and
- its importance in demonstrating a high degree of creative or technical achievement at a particular period.

It is therefore abundantly clear that the Pilgrim's Rest landscape represents a striking visual representation of mining, evoking images of time, place, and historical patterns associated with past mining epochs. The historical mining horizon provides clues to past activity and many historical layers form part of this significant landscape. However, the historical landscape is unfortunately highly compromised with vast site transformation in past decades - and in recent years in particular – evident as a result of the following:

- In this landscape, it is a common occurrence that newer mining infrastructure replace older heritage sites where mining continues. For example it has been noted that some of TGME's current portals may have been superimposed on old mining adits. An obvious consequence is that historical layering of mine features become intertwined and indistinct which also makes the accurate dating and sequencing of mining remains in the project areas challenging.
- Natural processes such as surface wash, erosion and changes in vegetation have inevitably impacted on heritage features and the heritage landscape.
- Large-scale illegal informal mining activities by so-called “Zama Zamas” in the landscape and areas subject to this assessment have resulted in an almost complete destruction of infrastructure associated with historical and recent mining. This includes heritage resources and features which, until relatively recently, remained in a well-preserved state of preservation. In addition, natural resources such as vegetation, geomorphological stability and water courses are also affected by illegal mining, which has sterilized large portions of the landscape from heritage remnants.

This assessment attempted to capture as much of the remaining mining heritage in the baseline environment and the project development areas within notable project constraints, including site safety, restricted site movement during surveys, visibility constraints and a rapidly disintegrating heritage horizon. The assessment relied heavily on previously work conducted on the Pilgrim's Rest heritage landscape in order to compliment potential limitations in the assessment.

Cognizant of the above, the following observations and recommendations are made based on sites within the TGME Mining Project areas that risk direct impact from the project activities:

- In the proposed Beta North mining area, a number of features of significance were noted. These include Historical/extant adits and a Historical/extant drainage shaft (NH-TGME-2430DC-01 , NH-TGME-2430DC-02), the remains of the Historical tram line/cocopan line (NH-TGME-2430DC-03), the remains of a Historical concrete water furrow (NH-TGME-2430DC-04), Historical suspension bridge remains (NH-TGME-2430DC-06), the Historical Farmer's Race remains (NH-TGME-2430DC-08), Historical concrete structures (NH-TGME-2430DC-05, NH-TGME-2430DC-07) and a Historical concrete low-level bridge (NH-TGME-2430DC-09). Please refer to **Figure 101**.
- In the CDM mining area, Historical/extant adits (NH-TGME-2430DC-14, NH-TGME-2430DC-15, NH-TGME-2430DC-16, NH-TGME-2430DC-17, NH-TGME-2430DC-18), the remains of the Historical tram line/cocopan line (NH-TGME-2430DC-12) a Historical/contemporary water furrow (NH-TGME-2430DC-13) and a burial site (NH-TGME-2430DC-19) were noted. In many instances, these features are poorly preserved or destroyed but the sites are nonetheless intrinsically linked to the highly significant Pilgrim's Rest Mining legacy thus bearing high heritage value. In addition, the sites and features are older than 60 years and protected under the National Heritage Resource Act (NHRA 1999). Please refer to **Figure 102**.
- In the proposed Frankfort mining area, the remains of the Historical MET plant building (NH-TGME-2430DC-10) and the remains of a Historical suspension bridge or pulley system (NH-TGME-2430DC-11) were noted. Please refer to **Figure 103**.

The sites will be directly impacted on by the proposed project where the significance of the impact is essentially high. As the farm Ponieskrans is a declared Provincial Heritage site, retaining and conserving the sites would essentially be required but there remains little to conserve at most of the sites and uncontrolled destruction of the landscape by illegal miners is ongoing. For this reason, it is recommended that a comprehensive research-driven Phase 2 heritage mitigation plan is implemented to include all these sites, informed by a robust research framework.

Various mitigation measures and plans have been recommended by the specialist and will have to be implemented by TGME. Where sites cannot be avoided, the necessary permitting application process will have to be followed.

The mining landscape around the project areas holds countless traces of historical mining, settlement, and industrial expansion. These include mining heritage remains associated with gold mining, many cemeteries and burial sites, mining settlement remains and the remains of individual historical period pioneer houses. In addition, the hills surrounding Pilgrim's Rest are littered with mine adits, ventilation shafts and underground drainage channels.

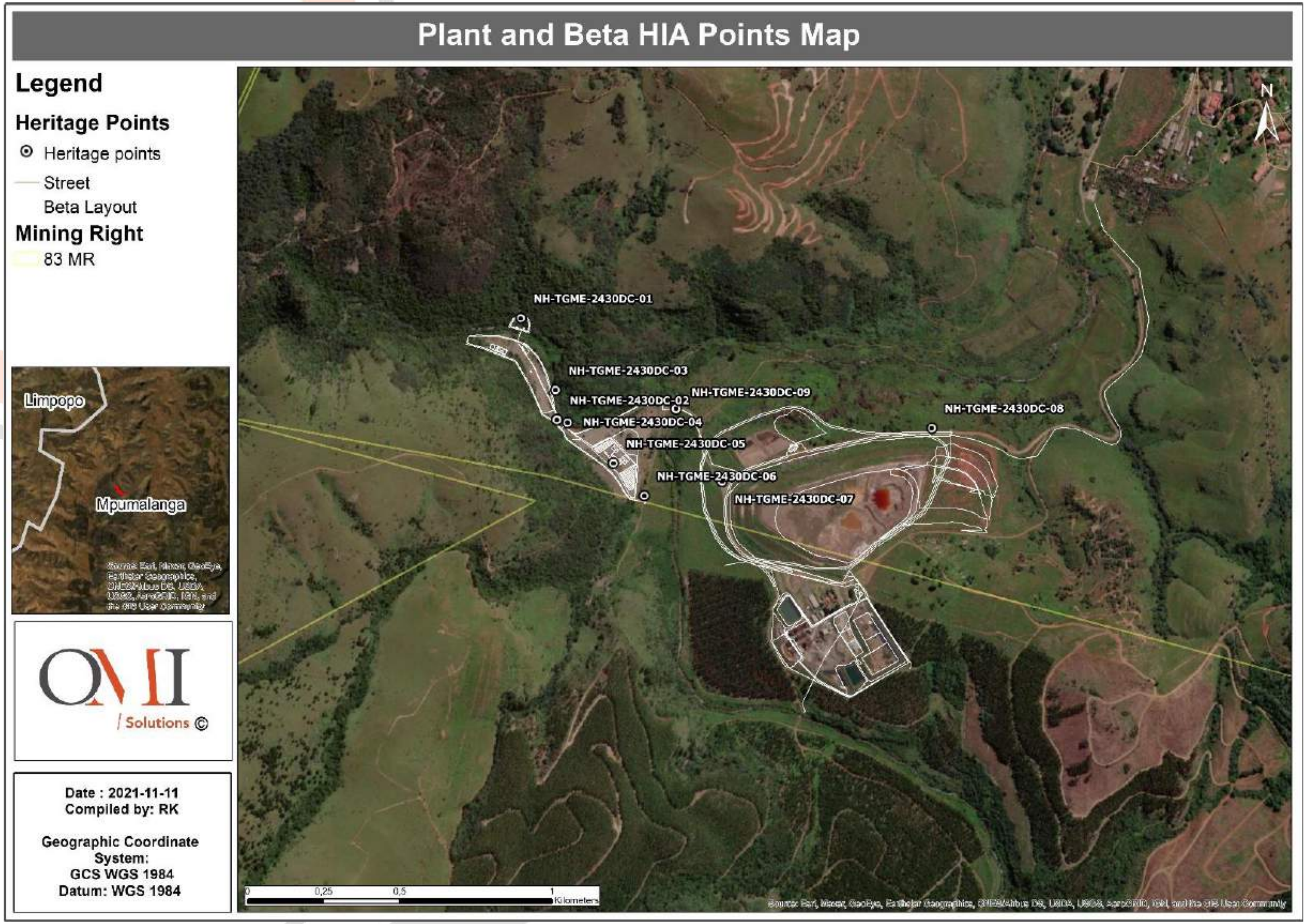


Figure 101: Beta North and Plant HIA Localities

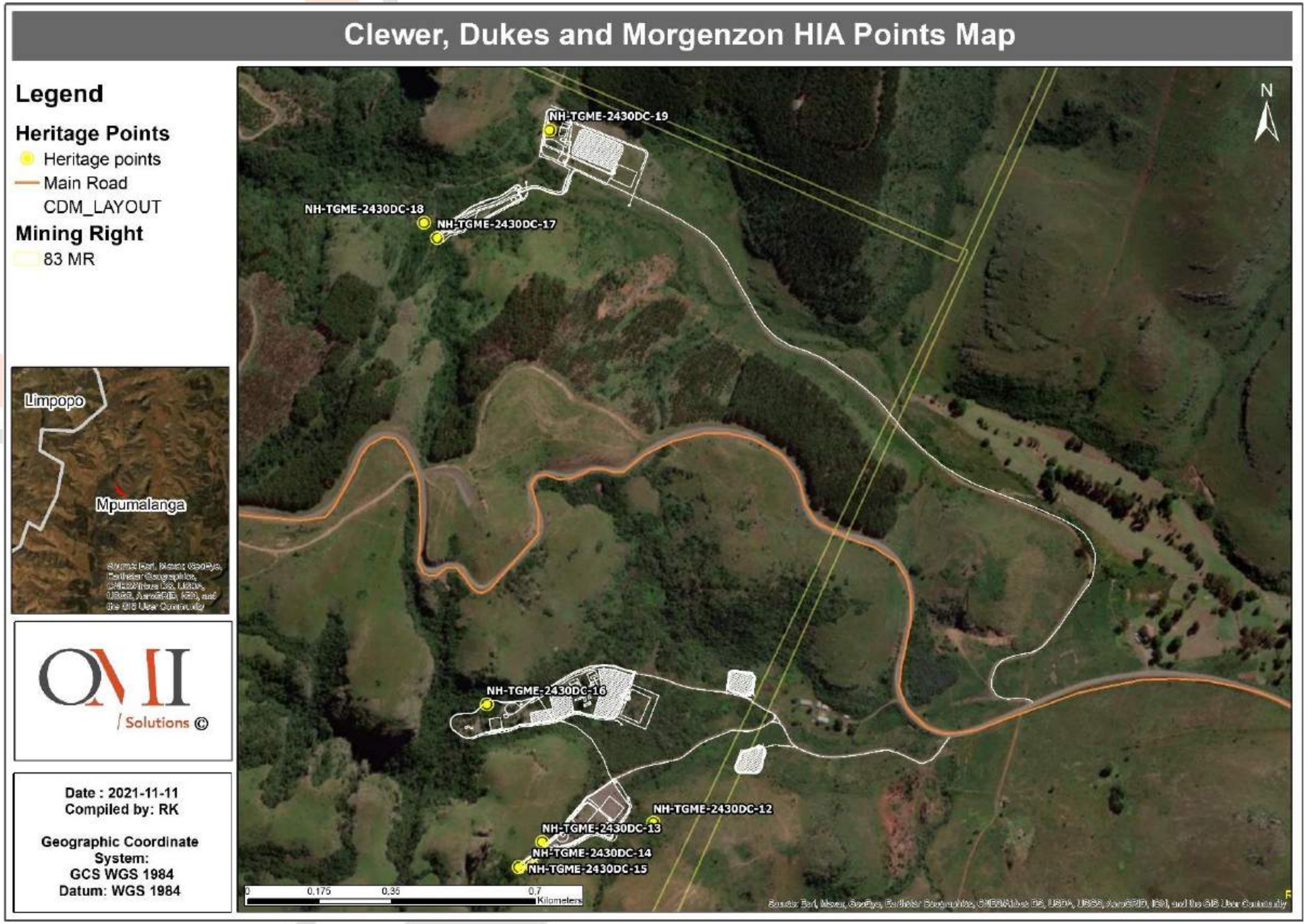


Figure 102: CDM HIA Localities

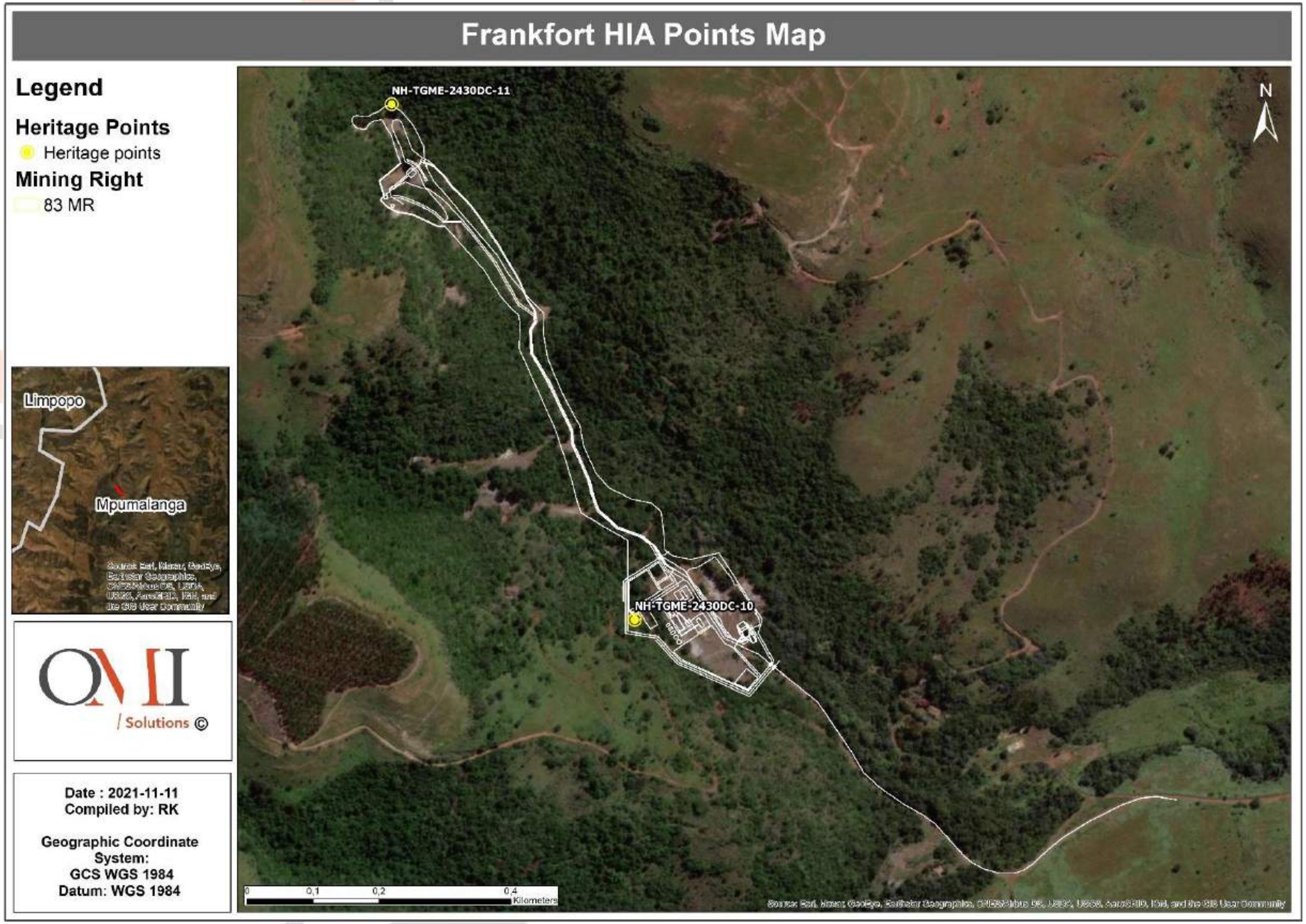


Figure 103: Frankfort HIA Localities

9.13.2 PALAEONTOLOGICAL BASELINE

A Palaeontological Desktop Assessment (PDA) was undertaken by Banzai Environmental.

To comply with the requirements of section 38 of the NHRA, this PDA is necessary to confirm if fossil material could potentially be present in the planned mining area and to evaluate the impact of the proposed development on the Palaeontological Heritage.

The proposed mining site is underlain by Quaternary alluvium and scree, diabase, and the Timeball Hill Formation (Pretoria Group, Transvaal Supergroup) as well as the Malmani Subgroup (Chuniespoort Group, Transvaal Supergroup). According to the PalaeoMap of South African Heritage Resources Information System the Palaeontological Sensitivity of the Quaternary superficial sediments is low but locally High, the diabase is igneous in origin and has an insignificant Palaeontological Sensitivity while that of the Timeball Hill Formation is High and the Palaeontological Sensitivity of the Malmani Subgroup (Transvaal Supergroup) is Very High (Almond and Pether 2008, SAHRIS website). Table 48 shows the geology (in bold) associated with the developments as well as the associated fossil occurrences normally found within this geological type.

Table 48: Geology of Development Footprint and Possible Fossil Heritage Occurrences (Banzai Environmental, 2021)[73]

Supergroup/Group/Suite	Formation/ Subgroup	Lithology	Fossil Heritage
Quaternary sediments	Surface deposits including alluvium and scree		Mammalian teeth, bones, horn corns, reptile skeletons, ostrich egg fragments. Microfossils, non-marine mollusc shells, foliage, wood, pollens, peats, trace fossils e.g. vertebrate tracks, burrows, termitaria and rhizoliths (root casts)
Diabase	Unfossiliferous		
Transvaal Supergroup; Pretoria Group	Magaliesberg Fm	Sandstones and mudstones of coastal origin	Microbial mat structures/trace fossils
Silverton Fm	Volcanic rocks, marine mudrocks with carbonates		Stromatolites
Daspoort	Fluvial and Alluvial, deltaic sandstones and mudrocks, in east is marine sediments		Stromatolites
Transvaal Supergroup; Pretoria Group	Timeball Hill Formation	Quartzite, siltstone, shale, conglomerate, Fluvio-deltaic and lacustrine mudrocks	Stromatolites

73 Sediments present in the development is indicated in bold.

Supergroup/Group/Suite	Formation/ Subgroup	Lithology	Fossil Heritage
		with diamictite, quartzite, minor lavas.	
Transvaal Supergroup; Chuniespoort Group, Malmani Subgroup	Minor secondary mudrocks, cherts, containing carbonaceous shale, stromatolitic carbonates (limestones/dolomites),		Stromatolites: Shallow marine to intertidal stromatolites organic-walled microfossils

A two (2) day site-specific field survey of the development footprint was conducted on foot and by a motor vehicle on 24 to 25 February 2022. No visible evidence of fossiliferous outcrops was found in the development footprint and thus an overall medium palaeontological significance is allocated to the development footprint. It is therefore considered that the proposed development will not lead to detrimental impacts on the palaeontological reserves of the area and construction of the development may be authorised in its whole extent.

9.13.3 REGIONAL ECONOMIC CONTEXT

The socio-economic baseline was determined by Southern Economic Development. The available Stats SA data regarding the population and infrastructure dates largely from 2011, with some data being available for 2016. However, as virtually no development has taken place in Pilgrim's Rest since 2016, these figures may be taken as valid for the baseline economic conditions. The field verification around some of the has been done during the EIA level study.

The project is located in Ward 13 of the TCLM within the EDM in Mpumalanga Province. Land use in the area is dominated by forestry, old mining shafts, agriculture areas (mainly grazing areas), tourism-related activities and residential areas. The main socio-economic sensitive receptors in the local area close to the project include Pilgrim's Rest Town, Brown's Hill, Darks Gully, Newtown/Schoonplaas, and a number of rural tourist establishments in and around Pilgrim's Rest town.

The population of the larger Pilgrim's Rest area ranges between 1,700 to 2,500. The majority lives in Newtown/Schoonplaas and Darks Gully close to the old town, while around 250 people live in the old historic part of the town. The population of the larger Pilgrim's Rest area represents less than 3% of the estimated 102,000 people living within the larger TCLM. The area is characterised by high historic (sporadic) in-migration to Newtown/Schoonplaas, resulting from periodic short-term construction works in the area.

It must be noted that Sub-municipal data was only available for 2011. Recent trends, as well as information on a sub-municipal level, were also based on quantitative and qualitative information received from local representatives with local knowledge. The lack of more recent official socio-economic data is therefore seen as a limiting factor, although it is not anticipated to influence the outcome of the Socio Economic Impact report.

Young people possibly leave Pilgrim's Rest for better job opportunities elsewhere, while illegal miners move into Pilgrim's Rest from areas as far afield as Free State, Lesotho, and Mozambique. In-migration of illegal miners has substantially increased in the last year. The illegal mining activities have significantly influenced the downstream biodiversity in and around the Blyde River, as well as the flow pattern of the Blyde River. Sedimentation from their activities is a further source of concern.

9.13.4 DEMOGRAPHICS AND POPULATION STATISTICS

Table 49 below shows the total population of the TCLM grew from 98 387 in 2011 to 101 895 in 2016, i.e. at an average annual rate of less than 1% per annum (Stats SA, 2016). The population growth of the municipality as a whole is lower than the national population growth rate of 1,5% for the same period thus indicating some out-migration from TCLM mainly.

Table 49: Main Demographic Characteristics of the Local Area

Demographic indicator	year	ward 13	ward 10	ward 9	ward 8	TCLM	South Africa
Population	2011	2 584	6 371	7 528	7 367	98 387	51 770 560
Population density (people per square km)	2011	2,4	5,8	40,0	37,7	17,2	45,3
Population growth	2011-2016	na	na	Na	na	0,7%	1,5%
Population estimates 1)[74]	2021	2 771	6 831	8 072	7 899	105 495	60 081 848
Households	2011	1 200	2 682	2136	2201	35 109	15 054 254
Average household size	2011	2,2	2,4	3,5	3,3	2,8	3,4
Household growth	2011-2016	1,1%	1,1%	1,1%	1,1%	1,1%	2,4%
% of population in working age (18-64)	2011	70%	72%	53%	51%	70%	66%
Male share in population %	2011	53%	54%	45%	45%	33%	49%
Main towns (population size)	2011	Pilgrim's Rest (1,721)	Graskop (3,996)	Moremela (5,112), Leroro (4,165)	Leroro (4,165), Mathibidi (6,476)	-	-

9.13.5 SERVICES AVAILABLE AND DELIVERY

In 1974 an agreement was reached between the then Transvaal Provincial Administration (TPA) and Rand Mine Properties, whereby the TPA obtained ownership of the historical village of Pilgrims Rest, with the aim of developing it into a holiday resort. The town was declared a National Monument and became a provincial heritage site in 1986. The DPWRT is currently custodian of the town on behalf of the government and is responsible for the maintenance and restoration of Pilgrim's Rest. The TCLM is responsible for basic service provision while the other provincial departments (e.g. health, education) are responsible for their respective mandates in Pilgrim's Rest.

[74] Source: Stats SA (2011 and 2016) 1) Based on population growth rates between 2011 and 2016.

TCLM has a huge housing backlog, with only 70% of its population living in formal dwellings in 2016. The lack of available land as well as capacity constraints in terms of water, sanitation and energy provision are challenges that TLCM have been struggling to overcome.

Table 50 shows that a relatively lower percentage of households in Ward 13 (Pilgrim's Rest area) that had access to formal housing in 2011 (60%) compared to the national average (62%) as well as the other wards relevant to the project area. The informal dwellings are mainly situated in Newtown/Schoonplaas just outside the historic old town. According to local sources there is furthermore dolomite in the vicinity of the old town that could pose challenges in terms of the safety of structures in that area as well as further development of the area. There have been discussions with some local farmers and the Maroabjang CPA related to the availability of land to expand/relocate 'Newtown' in future.

The table also shows the pressure that the growing population has placed on the municipality to continue to provide basic services and infrastructure. As is the case nationally, water and sanitation services have specifically lagged behind household growth in TCLM between 2011 and 2016 while refuse collection just managed to keep up with population growth. Wards 9 and 8 in particular have very low levels of water, sanitation, and refuse collection service levels although access to electricity is higher in these wards than in Wards 13 and 10.

Table 50: Access to Housing and Basic Services 2011 and 2016

AREA		Ward 13	Ward 10	Ward 9	Ward 8	TCLM	South Africa
% Households in formal dwellings	2011	60%	70%	83%	88%	65%	62%
	2016	n.a.	n.a.	n.a.	n.a.	70%	77%
% Households with tap inside dwelling	2011	60%	48%	12%	8%	39%	46%
	2016	n.a.	n.a.	n.a.	n.a.	33%	42%
%Households with flush toilets	2011	61%	62%	6%	9%	68%	60%
	2016	n.a.	n.a.	n.a.	n.a.	66%	58%
%Households with access to electricity	2011	75%	61%	97%	97%	84%	85%
	2016	n.a.	n.a.	n.a.	n.a.	90%	93%
% Households with regular waste collection services	2011	68%	57%	1%	3%	57%	58%
	2016	n.a.	n.a.	n.a.	n.a.	58%	57%

9.13.5.1 WATER PROVISION

Pilgrim's Rest rural area basically has two water supply schemes, the Matibidi scheme and the Pilgrim's Rest scheme. Only two surface water resources are currently being utilized for primary water use in the Pilgrim's Rest area. One source is called the Moremela spring that feeds the Moremela stream. Water is withdrawn from the spring. Detailed investigations are required to augment supply to the Matibidi scheme.

The Blyde River, which passes south east of Moremela, is not currently utilized as a bulk water source. Various options such as a bulk water pipeline, water treatment plant and reservoirs, as well as the refurbishment of the current reservoirs and reticulation lines are being investigated.

9.13.5.2 ELECTRICITY INFRASTRUCTURE

The electricity provision backlog in TCLM is huge. In 2016, more than 3,200 households still required electricity connections. A new substation (Duma) is planned in the Mashishing area. Furthermore, the maintenance of electrical infrastructure such as switchgears, transformers, streetlights, high mast lights and overhead lines is behind in most areas of the district municipality (TCLM, 2017).

The high contribution of the mining sector to the TCLM economy furthermore implies relative high energy use within the economy. Compared to other economic sectors, the mining sector is relatively energy inefficient, i.e. the production value of the sector is low relative to its energy use (EDM, 2017).

9.13.5.3 ROAD INFRASTRUCTURE

The TLCM does not have a road maintenance plan in place. However, various municipal roads within the towns of Sabie, Simile, Graskop and the Harmony Hill area have been identified as being in need of refurbishment, patching and/or reconstruction. Small sections of new municipal roads would also be required within these urban areas.

9.13.6 ECONOMIC ASPECTS

While mining dominates the larger TCLM economy, the economy of Pilgrim's Rest town is dominated by tourism-related activities such as accommodation, restaurants/taverns and arts and craft shops. The Gross Value Added (GVA)[75] of the local economy could be in the region of R20 million (2019 prices). An estimated 250 people are employed between formal businesses, entrepreneurships, hawkers and informal traders. The Pilgrim's Rest economy is very small relative to the TCLM economy, contributing less than 1% towards municipal output and employment.

The MDPWRT is currently custodian of the town on behalf of the government and is responsible for the maintenance and restoration of Pilgrim's Rest. The TCLM is responsible for basic service provision while the other provincial departments (e.g. health, education) are responsible for their respective mandates in Pilgrim's Rest. In terms of public services, the local area is characterised by large housing backlogs, the need for road upgrading and maintenance, distance from healthcare services and the lack of sufficient clinics and emergency medical services as part of the primary health care services.

As is the case in the larger TCLM, Pilgrim's Rest saw more protest action in the past few years as a result of the high housing backlogs in Newtown/Schoonplaas. While absolute crime levels are low in Pilgrim's Rest, the crimes per capita is high. Illegal miners currently also pose a significant security threat in the Pilgrim's Rest area.

The local economy experienced a sharp decline since its peak in the early 1990's due to the general deteriorating safety and hygiene conditions in Pilgrim's Rest, factors related to illegal mining activities, increased vagrancies due to poverty and unemployment and lack of public facilities and municipal functions such as street cleaning. Another contributing factor was the closure of many businesses due to the provincial government not renewing existing business leases, with the subsequent tender processes allegedly being irregular (The Public Protector, 2014).

Since 2018, the allocation of leases to business owners has improved and a new local business forum was established. The MDPWRT has improved services such as cleaning, and - despite the Covid-19 pandemic which hampered tourism between March 2020 and September 2021 - there are positive revival signs in Pilgrim's Rest.

Only limited opportunities are provided for the tourism sector of Pilgrim's Rest, formal and informal. The unemployment and poverty rates were much higher than the provincial and municipal averages in South Africa, with an estimated 48% of Ward 13 households living below the lower bound poverty line. This

[75] GVA is an economic measure of output that includes only income generated for labour, entrepreneurs, property and owners of other assets. It excludes intermediary inputs and is therefore not the same as turnover. Turnover would include costs related to primary as well as intermediary inputs.

emphasizes the pressing need to create job opportunities for the working age group in the Pilgrim's Rest area.

9.13.7 TRAFFIC

A traffic impact assessment was done by Infratrans Traffic and Transportation Engineering Consulting (Pty) Ltd (Infratrans) and is attached as ANNEXURE S.

As part of the scope of work a site visit was conducted on Thursday 21 October 2021. All relevant developments, points of interests, transport facilities and infrastructure, roads and road intersections were visited, observed and noted.

By considering these guidelines as well as the expected number of vehicle trips to be generated as a result of the proposed activity the following intersections were deemed relevant for investigation:

- R533/Morgenzon Access/Dukes Access;
- R533/R533/Road D1056;
- R533/Theta Access; and
- Road D1056/Frankfort Access.

Traffic counts were conducted during the site visit. From this survey it was determined that the common peak traffic hours occurred between 08:00-09:00 for the AM peak hour and between 15:15-16:15 for the PM peak hour. These existing 2021 peak hour traffic volumes are shown in **Figure 104.**

The following access positions and configurations are proposed:

- Frankfort: The existing access to the Frankfort mine area will be used which is off Road D1056. Due to the short duration of the production phase the access area should be treated as a construction area with all associated road signs installed in accordance with the relevant requirements of the Department of Public Roads and Transport (DPWRT);
- CDM: The existing access position to the Morgenzon mine area off the R533 will be used as a proposed new access position for the Dukes mining area as well. This is due to insufficient sight distances available at the existing access to the Dukes mining area off the R533. Due to the short duration of the production phase the access area should be treated as a construction area with all associated road signs installed in accordance with the relevant requirements of the DPWRT;
- Beta North, TSF and Plant area: A new access position off the R533 is proposed to the TGME mining area. The old access off the R533 just to the east of the old bridge had sight distance problems as well as various concerns from the residents of Pilgrims Rest. The proposed access position will be on the outside of the bend in the R533 just to the west of the old bridge. There is an existing intersection at that point, however, this intersection is not located optimally for sight distance requirements. Due to the short duration of the production phase the access area should be treated as a construction area with all associated road signs installed in accordance with the relevant requirements of the DPWRT.

It is confirmed that these access positions are in line with the TRH 26, South African Road Classification and Access Management Manual (2) and is therefore supported from a traffic engineering and transport planning viewpoint.

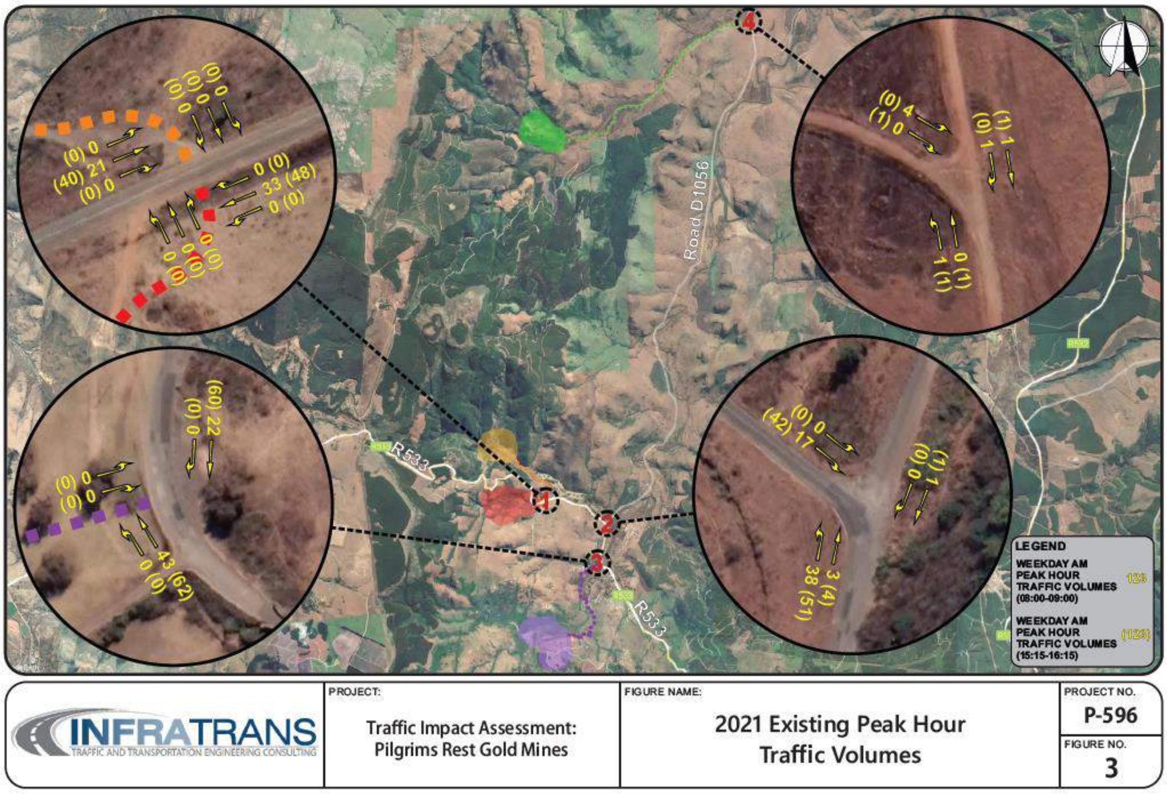


Figure 104: Existing Peak Hour Traffic Volumes

9.13.8 BLASTING

A blasting and vibration study was conducted to determine the impacts of blasting on the areas surrounding the redevelopment. The study was conducted by Blast Management and Consulting (Pty) Ltd and is attached as ANNEXURE T. As no blasting is taking place no baseline measurements could be taken however, all possible structures in a possible influence area have been identified. A list was prepared of all structures in the vicinity of the project area. The list includes structures and Points of Interests (POIs) within the 100 m boundary.

Review of each mining area indicated only one (1) POI. This POI was identified as a ruin at the CDM shaft area. This ruin is part of original mining structures. As understood there are no specific value connected to this structure. It will probably be rebuilt or destroyed with the new development of the CDM shaft area. All areas directly above and immediately next to the footprint of the different underground areas showed only forestry plantations. No other points of concern were identified that requires consideration in analysis.

Table 51: List of points of interest identified

Description	Classification	Y	X
Ruins	4	27601.29	2752073.24

10 DESCRIPTION OF THE CURRENT LAND USES

Current land use activities associated with the investigation area and surrounding areas are largely dominated by wilderness, forestry, and historic mining infrastructure. No large scale commercial agricultural activities were observed to be occurring within the investigation area and the immediate surrounding areas (SAS, 2022).

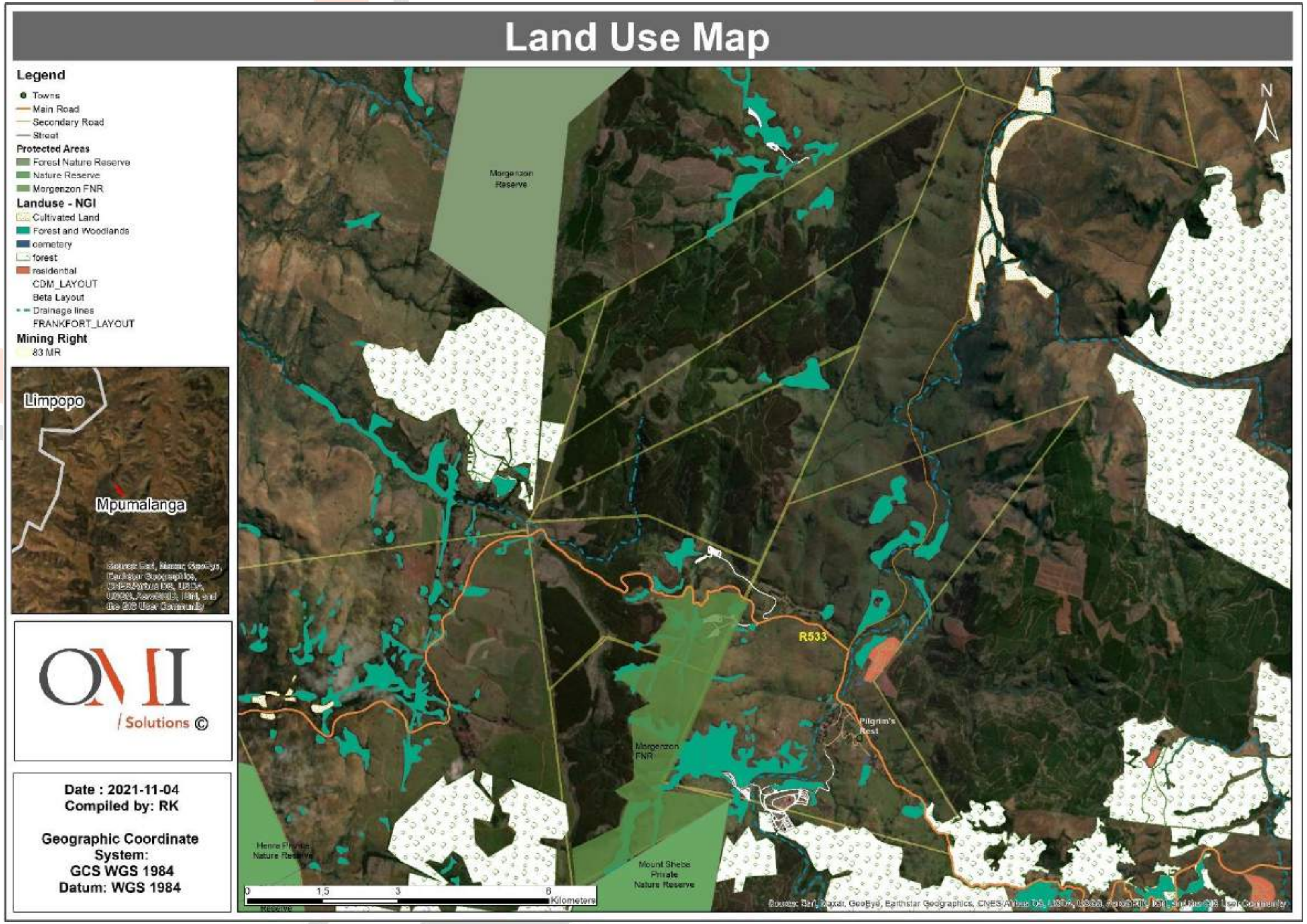


Figure 105: Surface Land Uses Identified in the Area from the National Geo-spatial Information System

11 DESCRIPTION OF SPECIFIC ENVIRONMENTAL FEATURES AND INFRASTRUCTURE ON THE SITE[76]

In terms of the DFFE[77] guidelines for Integrated Environmental Management (IEM), "sensitive landscapes" is a broad term applying to:

- Nature conservation or ecologically sensitive areas – indigenous plant communities (particularly rare communities or forests), wetlands, rivers, river banks, lakes, islands, lagoons, estuaries, reefs, inter-tidal zones, beaches and habitats of rare animal species;
- Unstable physical environments, such as unstable soil and geo-technically unstable areas;
- Important nature reserves – river systems, groundwater systems, high potential agricultural land;
- Sites of special scientific interest;
- Sites of social significance or interest – including sites of archaeological, historic, cultural spiritual or religious importance and burial sites; and
- Green belts or public open space in municipal areas.

Sensitive landscapes in the project area (in terms of the above definition) are discussed in detail in Section 9. These include but are not limited to:

- Newly promulgated Morgenzon Forest Nature Reserve;
- Kruger to Canyons Biosphere Reserve;
- Mpumalanga Drakensberg Surface water SWSA;
- Critical Biodiversity Area;
- Provincial Heritage sites; and
- Dolomitic and karst aquifers.

The maps below show overlays of the heritage and ecological findings as well as the protected areas in proximity to the mining areas. It should be re-iterated that the shaft areas are located on previously disturbed areas and that the proposed mining is redevelopment of existing underground mining areas.

[76] Required as per the Appendix 2 (g) of the EIA Regulations, 2014 (as amended): a full description of the process followed to reach the proposed preferred activity, site, and location of the development footprint within the site, including (iv) the environmental attributes associated with the alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects;

[77] At the time the Department of Environmental Affairs and Tourism (DEAT).

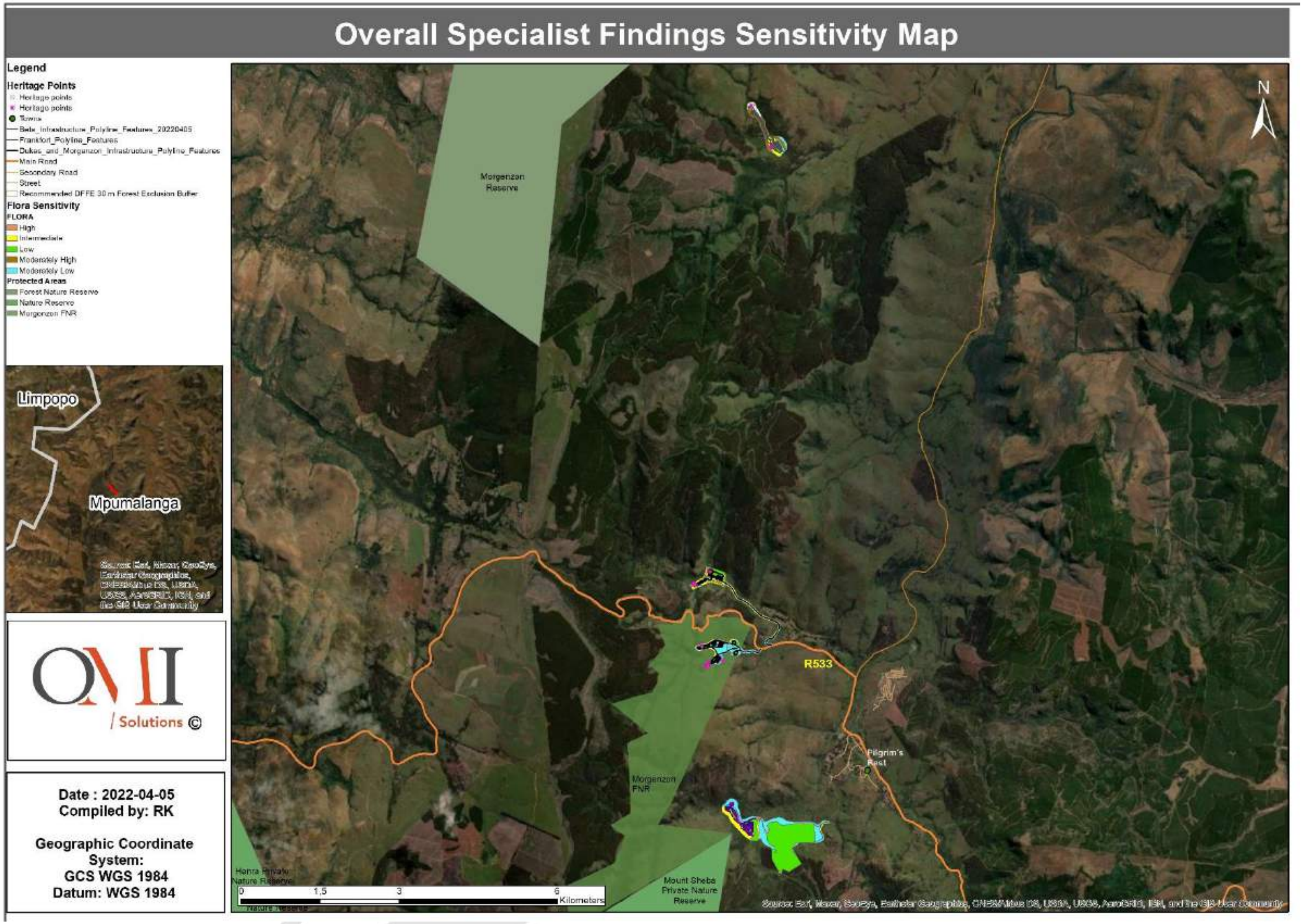


Figure 106: Overlay of Protected Areas, Layouts, and HIA and Ecological sensitivities of the various sites.

12 ENVIRONMENTAL AND CURRENT LAND USE MAP

Current land use activities associated with the investigation area and surrounding areas are largely dominated by wilderness, forestry, and historic mining infrastructure and is shown in **Figure 107**. No large scale commercial agricultural activities were observed to be occurring within the investigation area and the immediate surrounding areas (SAS, 2022).

The map shows both the proposed areas as well as the current landuses and underground mining operations relevant to the proposed project.

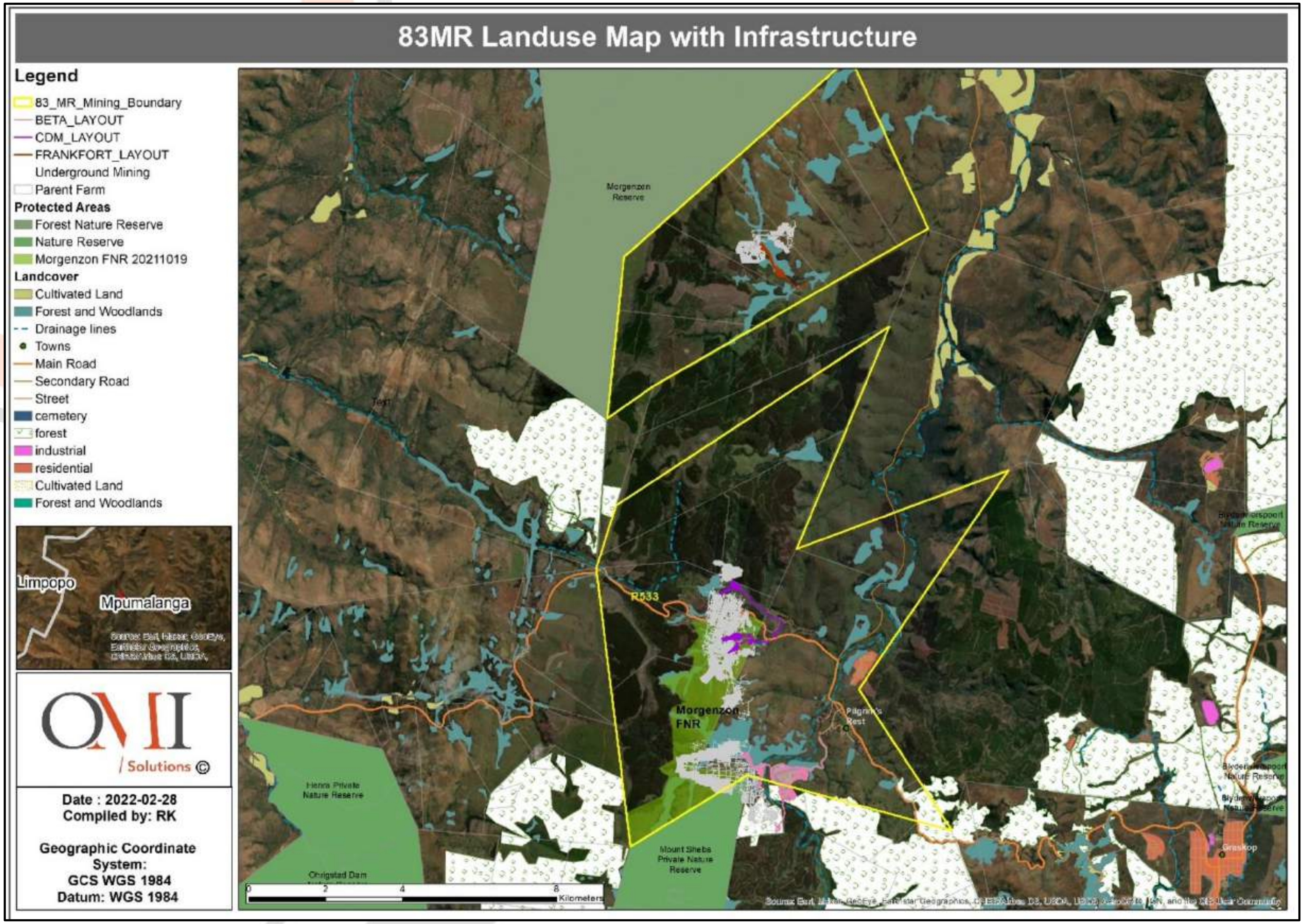


Figure 107: Landuse map with infrastructure as identified in the Area from the National Geo-spatial Information

13 IMPACTS AND RISKS IDENTIFIED

Preliminary impacts and risks associated with the proposed project were identified during the scoping phase. During the EIA phase, the assessment was revisited and expanded in the light of the additional studies conducted and taking into account responses from I&APs during the scoping phase. The assessment covers the nature, significance, consequence, extent, duration and probability of the impacts, including the degree to which these impacts can be reversed, the extent to which they may cause irreplaceable loss of resources, and can be avoided, managed or mitigated.

13.1 METHODOLOGY USED IN DETERMINING THE SIGNIFICANCE OF ENVIRONMENTAL IMPACTS

The EIA Regulations, 2014 (as amended) promulgated in terms of Sections 24 (5), 24(m) and 44 of the NEMA, require that all identified potential impacts associated with the project be assessed in terms of their overall potential significance on the natural, social and economic environments. The criteria identified in the EIA Regulations, 2014 (as amended) include the following:

- Nature of the impact;
- Extent of the impact;
- Duration of the impact
- Probability of the impact occurring;
- Degree to which impact can be reversed;
- Degree to which impact may cause irreplaceable loss of resources;
- Degree to which the impact can be mitigated; and
- Cumulative impacts.

The significance of the aspects/impacts of the process will be rated by using a matrix derived from Plomp (2004) and adapted to some extent to fit this process. These matrices use the consequence and the likelihood of the different aspects and associated impacts to determine the significance of the impacts.

Table 52: Definitions of Factors Used to Determine Impact Significance

Aspect	Description	Weight
Probability: This describes the likelihood of the impact actually occurring.		
Improbable	The possibility of the impact occurring is very low, due to the circumstances, design or experience.	1
Probable	There is a probability that the impact will occur to the extent that provision must be made therefore.	2
Highly Probable	It is most likely that the impact will occur at some stage of the development.	4
Definite	The impact will take place regardless of any prevention plans, and there can only be relied on mitigatory actions or contingency plans to contain the effect.	5
Duration: The lifetime of the impact		
Short term	The impact will either disappear with mitigation or will be mitigated through natural processes in a time span shorter than any of the phases.	1

Aspect	Description	Weight
Medium term	The impact will last up to the end of the phases, where after it will be negated.	3
Long term	The impact will last for the entire operational phase of the project but will be mitigated by direct human action or by natural processes thereafter.	4
Permanent	Impact that will be non-transitory. Mitigation either by man or natural processes will not occur in such a way or in such a time span that the impact can be considered transient.	5
Scale: The physical and spatial size of the impact		
Local	The impacted area extends only as far as the activity, e.g. footprint	1
Site	The impact could affect the whole, or a measurable portion of the above-mentioned properties.	2
Regional	The impact could affect the area including the neighbouring residential areas.	3
Magnitude/Severity: Does the impact destroy the environment or alter its function.		
Low	The impact alters the affected environment in such a way that natural processes are not affected.	2
Medium	The affected environment is altered, but functions and processes continue in a modified way.	6
High	Function or process of the affected environment is disturbed to the extent where it temporarily or permanently ceases.	8
Significance: This is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required. ***Calculated as = Sum (Duration, Scale, Magnitude) x Probability***		
Negligible	The impact is non-existent or unsubstantial and is of no or little importance to any stakeholder and can be ignored.	<20
Low	The impact is limited in extent, has low to medium intensity; whatever its probability of occurrence is, the impact will not have a material effect on the decision and is likely to require management intervention with increased costs.	<40
Moderate	The impact is of importance to one or more stakeholders, and its intensity will be medium or high; therefore, the impact may materially affect the decision, and management intervention will be required.	<60
High	The impact could render development options controversial or the project unacceptable if it cannot be reduced to acceptable levels; and/or the cost of management intervention will be a significant factor in mitigation.	>60

13.2 MITIGATION HIERACHY

According to the National Biodiversity Offset Guideline issued under section 24J of the National Environmental Management Act (First Edition (October 2021)): “A residual biodiversity impact is the impact of an activity, or activities, on biodiversity that remains after all efforts have been made to avoid and minimise the impacts of the activity, or activities, and to rehabilitate or restore the affected area to the fullest extent possible.”

As part assessing environmental impacts it is required by the EAP and specialist team to predict the possible negative impacts of an activity, or activities, on biodiversity, including direct impacts, indirect impacts, and cumulative impacts. After those impacts have been identified, the EAP or specialist must investigate alternative project locations, designs, technologies, scales and layouts to determine if and how potentially significant negative impacts on biodiversity could be avoided or minimised. The EAP or specialist must also determine if, and how successfully, impacted areas could be rehabilitated or restored.

The mitigation hierarchy, as set out in section 2(4)(a)(i) of the NEMA, and applicable guidelines, should be followed to determine if there will likely be residual impacts. During the project the following steps have been taken as part of the mitigation hierarchy (presented in **Figure 108**):

- Avoid of prevent the impact has been discussed in the No-go alternative in Section 7.7
- Minimise the impact- areas to be developed have been confined to previous disturbed areas. Further reduction in footprints evaluated during the alternatives with inputs from the specialist are discussed in Section 7.3.
- Impacts caused by the proposed development will be rehabilitated as per the financial provision described in Section 25. In addition it is proposed that AIP's be removed around the sites to reduce the impact these infestations have on the Forest Nature Reserve.
- As the development will take place with the newly proclaimed Morgenzon Forest Nature Reserve as well as various other identified sensitive environment (further discussion in Section 9.10), appropriate measures will have to be put into place to assist in protecting the environment the mine proposes to continue mining in. These have been described at in Section 9.10.2.1.
- The mitigation and management have been included in Specialist management measures as well as the significance of the impacts prior and post mitigation are provided in 13.5 and contained in the respective studies.

If granted authorisation, TGME will be legally and financially bound to the mitigation measures included in the conditions of the environmental authorisations and water use licence. Compliance with the conditions of the authorisations will be verified through annual external compliance audits and consequences (including financial) would follow. With the intervention of legal, monitored mining in the area, funds would be made available to eradicate AIPs and secure the SWSA by facilitating the establishment of native grasslands and forests, ecological connectivity and optimize the hydrological functioning of the Blyde catchment leading to a reduced impact and restoration and rehabilitation of the environment.

If TGME is not allowed to continue operating, the burden of controlling illegal mining, rehabilitating the broader catchment, protecting the Endangered Ecosystem and Class 1 Water Resource, and meeting the Resource Quality Objectives, would all fall on the state (as predominant landowner).

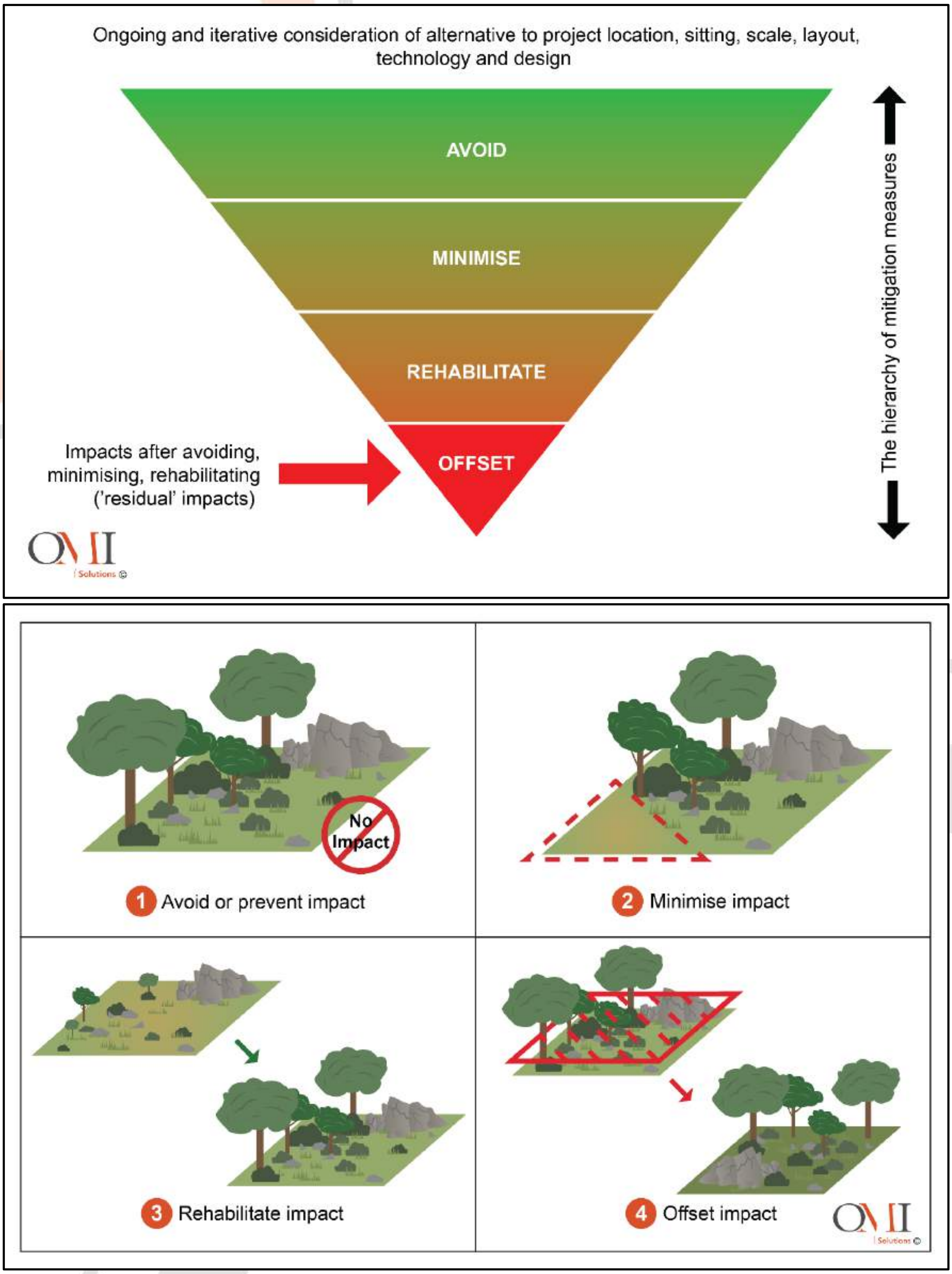


Figure 108: Illustration of the various actions as per the mitigation hierarchy

13.3 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

13.3.1 IMPACT ON AIR QUALITY

To assess (model) the impact on air quality on human health and biota resulting from the operations, the following was specifically with reference looked at:

- total particulate matter (TSP),
- particulate matter with an aerodynamic dimeter less than 10 µm (PM_{10}),
- particulate matter with an aerodynamic dimeter less than 2.5 µm ($PM_{2.5}$),
- sulfur dioxide (SO_2),
- oxides of nitrogen (NOx) expressed as nitrogen dioxide (NO_2),
- carbon monoxide (CO),
- chlorine (Cl_2),
- hydrogen chloride (HCl),
- hydrogen fluoride (HF),
- ammonia (NH_3),

Construction normally comprises a series of different operations including land clearing, topsoil removal, material loading and hauling, stockpiling, grading, bulldozing, compaction, etc. Some of the infrastructure such as surface water management plan and stockpiles required for the mining development will be constructed prior to and during the first year of mining. The main pollutant of concern from construction operations is particulate matter, including PM_{10}, $PM_{2.5}$ and total particulate matter (TSP)[78].

Each of the operations has their own duration and potential for dust generation. It is therefore often necessary to estimate area wide construction emissions, without regard to the actual plans of any individual construction process. Quantified construction emissions are usually lower than operational phase emissions and due to their temporary nature and duration, and the likelihood that these activities will not occur concurrently at all portions of the site; dispersion simulation was not undertaken for construction emissions.

The environmental risk rating of proposed project due to unmitigated construction activities related to inhalation health, nuisance and vegetation impacts is likely to be “low”, “moderate”, and “negligible”, respectively. With mitigation measures in place, the “moderate” significance will reduce to “low”.

Particulates are the main pollutant of concern from mining operations. Gaseous emissions (i.e. SO_2, NOx, CO and Volatile Organic Compounds (VOC)) will primarily result from diesel combustion, both from mobile and stationary sources. Point-source releases will be limited to the Carbon regeneration kiln, concentrate dryer, smelter, ventilation vents and the backup emergency generators. Fuel usage and some design parameters (stack height and stack diameter) were available while some parameters (exit temperature, volumetric flow rates, etc.) were estimated. The generators are intermittent sources and are therefore expected not to result in significant impacts.

Three mining scenarios were selected to be assessed to determine the worst-case impacts, based on the mining areas. The three scenarios assessed are:

[78] PM10 and PM2.5 concentrations are associated with potential health impacts due to the size of the particulates being small enough to be inhaled.

- Beta North and Plant (Scenario 1) – representative of a maximum throughput from the Beta North shaft of 148 ktpa of ore and 449 ktpa of waste rock. Refer to **Table 55**
- CDM (Scenario 2) – representative of a maximum throughput from the Morgenzon, Dukes Upper and Dukes Lower shafts of 116 ktpa of ore and 389 ktpa of waste rock. Refer to **Table 56**
- Frankfort (Scenario 3) – representative of a maximum throughput from the Frankfort shaft of 137 ktpa of ore and 238 ktpa of waste rock. Refer to **Table 57**.

For each scenario, both unmitigated and mitigated activities were assessed.

Dispersion modelling was undertaken to determine highest hourly, highest daily and annual average ground level concentrations as well as dustfall rates for each of the pollutants considered in the study. Averaging periods were selected to facilitate the comparison of predicted pollutant concentrations to relevant ambient air quality and inhalation health criteria as well as dustfall regulations.

Impact of the Operational Phase of the mine was simulated using the parameters and emission rates given in **Table 53**. Short-term (hourly or daily) concentrations were extracted at the 99th percentile, to account for the number of exceedances allowed by the recommended and prescribed guidelines and targets. A visual reference of the Air Quality Sensitive Receptors (AQSRs) taken into account in this study and their proximity to the site is shown in the subsequent isopleth plots that represent pollutant dispersion.

Isopleth plots reflect the incremental ground level concentrations (GLCs) for SO_2, NO_2, CO, VOC's, $PM_{2.5}$ and PM_{10}, as well as dustfall rates for TSP. Due to the absence of ambient baseline concentrations, cumulative pollutant concentrations could not be determined but qualitative commentary is provided in the discussion of impact significance.

Table 53: Emission estimation techniques and parameters

<table>
<tr><th>Activity</th><th>Emission Equation</th><th>Information assumed/provided</th></tr>
<tr>
<td>Materials handling</td>
<td>

$$E = k.0.0016\frac{\left(U/2.2\right)^{1.3}}{\left(M/2\right)^{1.4}}$$

Where,
E = Emission factor (kg dust/t transferred)
K = Particle size multiplier (dimensionless)
U = Mean wind speed (m/s)
M = Material moisture content (%)

The $PM_{2.5}$, PM_{10} and TSP fraction of the emission factor is
<table>
<tr><th></th><th>TSP</th><th>PM_{10}</th><th>$PM_{2.5}$</th></tr>
<tr><td>k</td><td>0.740</td><td>0.350</td><td>0.053</td></tr>
</table>
.
</td>
<td>
The moisture content of materials are as follows:
<table>
<tr><th></th><th>Beta</th><th>CDM</th><th>Frankfort</th></tr>
<tr><td>Moisture % Ore</td><td>15.1</td><td>10.6</td><td>15.3</td></tr>
<tr><td>Moisture % WRD</td><td>4.7</td><td>5.0</td><td>4.5</td></tr>
</table>
The respective throughput of materials during the operational phase was calculated as:
<table>
<tr><th>Scenario</th><th>Ore (tpa)</th><th>Waste (tpa)</th></tr>
<tr><td>1 (Beta North & Plant)</td><td>147,600</td><td>448,933</td></tr>
<tr><td>2 (CDM)</td><td>115,745</td><td>385,319</td></tr>
<tr><td>3 (Frankfort)</td><td>137,200</td><td>238,400</td></tr>
</table>
Operational hours: 4428 hours per year (6 days per week, 18 hours per day)

Average wind speed of 2.14 m/s, from Graskop weather data (period Jan 2016 to Dec 2018).
</td>
</tr>
<tr>
<td>Vehicle entrainment on unpaved surfaces (mine roads)</td>
<td>

$$E = k\left(\frac{s}{12}\right)^{a}\left(\frac{W}{3}\right)^{b} \cdot 281.9$$

Where,
E = particulate emission factor in grams per vehicle km travelled (g/VKT)
k = basic emission factor for particle size range and units of interest
</td>
<td>
Truck/ vehicle information:
<table>
<tr><th>Information</th><th>Unit</th><th>Scenario 1</th><th>Scenario 2</th><th>Scenario 3</th></tr>
<tr><td>No. of Trucks</td><td></td><td>3</td><td>1</td><td>1</td></tr>
</table>
</td>
</tr>
</table>

Activity	Emission Equation	Information assumed/provided
	s = road surface silt content (%) W = average weight (tonnes) of the vehicles travelling the road The particle size multiplier (k) is given as 0.15 for $PM_{2.5}$ and 1.5 for PM_{10}, and as 4.9 for TSP The empirical constant (a) is given as 0.9 for $PM_{2.5}$ and PM_{10}, and 4.9 for TSP The empirical constant (b) is given as 0.45 for $PM_{2.5}$, PM_{10} and TSP	(see below)

Onsite truck Payload	ton	177	59	59
Average weight	ton	35	45	42
Average weight on road [(a)]	ton	**59**	**59**	**59**
Average speed [(b)]	km/hr	40	40	40

Notes: [(a)] equation requires average weight of all vehicles on road section

[(b)] assumed

Vehicle kilometer travelled (VKT) were calculated from road lengths, truck capacities and the number of trips required for transporting materials.

Scenario 1 (Beta North and Plant)

Road Description	Material	Length (m)	Trips/day		VKT/day
			Haul Truck	Water Tanker	
Shaft to Beta North RoM	ore + waste	441	36	2	16
Beta North DMS to Plant	ore	1190	12	2	14
R533 to Plant	ore	2990	94	2	281

Activity	Emission Equation	Information assumed/provided

Scenario 2 (CDM)

Road Description	Material	Length (m)	Trips/day		VKT/day
			Haul Truck	Water Tanker	
Morgenzon to R533	ore	2267	10	1	23
Dukes Upper to R533	ore	1015	10	1	10
Dukes Upper to Dukes Upper WRD	waste	500	30	1	12
Dukes Lower to R533	Ore	880	10	1	9
Dukes Lower to Dukes Upper WRD	waste	400	30	1	12

Scenario 3 (Frankfort)

Road Description	Material	Length (m)	Trips/day		VKT/day
			Haul Truck	Water Tanker	
Frankfort to R533	ore	6214	32	1	199
R533 to Plant (Paved)	ore	14321	32	1	458

<table>
<tr><th>Activity</th><th>Emission Equation</th><th>Information assumed/provided</th></tr>
<tr><td></td><td></td><td>
<table>
<tr><td>Frankfort shaft to WRD</td><td>waste</td><td>850</td><td>56</td><td>1</td><td>48</td></tr>
</table>
Hours of operation: 18 hours (two 9-hour shifts hrs per day), 6 days per week
Silt content (Peregrine Geoconsultants (Pty) Ltd, 2021):
Surface haul roads: Beta -17%, CDM -13%, Frankfort – 16%.
</td></tr>
<tr><td>Crushing and Screening</td><td>Emission factors
<table>
<tr><th>Crushing</th><th>TSP</th><th>PM_{10}</th><th>$PM_{2.5}$ [a]</th><th>Unit</th></tr>
<tr><td>Primary</td><td>0.01</td><td>0.004</td><td>0.0006</td><td>kg/tonne</td></tr>
<tr><td>Secondary</td><td>0.03</td><td>0.012</td><td>0.00018</td><td>kg/tonne</td></tr>
</table>
Notes: [a] Fraction of $PM_{2.5}$ taken from US-EPA AP-42 Table 11.24.2: Primary & Secondary Crushing(High Moisture Ore ≥ 4%) (Uncontrolled) PM2.5 = PM_{10}*(0.053/0.35)
Where,
E = Default emission factor for high moisture content ore (moisture > 4%)
</td><td>
The throughput of the ROM material was provided as 691.1 tonnes per hour (t/hr) for Scenario 1 operations and 868.5 (t/hr) for Scenario 2 operations.
Hours of operation were given as 24 hrs per day, 7 days per week.
15.3% < ROM moisture: > 10.6%
Tertiary crushing by a mill upstream of the secondary one is a wet process hence no emissions are likely to be released.
Primary crushing assumed to be located near ROM pad at each mining area.
Secondary assumed to be between the ROM pad and the DMS plant.
</td></tr>
<tr><td>Wind Erosion</td><td>For

$$EF_{TSP} = 1.9\left[\frac{S_{\%}}{1.5}\right] \times 365 \times \left(\frac{365-\mathrm{p}}{235}\right)\left(\frac{\mathrm{F}_{\%}}{15}\right)$$

where,
$E_{(i)}$ = emission factor (kg/ha/hr) for particle size class TSP
$S_{\%}$= Silt content (% by weight)
$F_{\%}$ = percentage of time that wind speed is greater than 5.4 m/s at the mean height of the stockpile
</td><td>
Layout of ROM stockpiles and subsequent moisture content was provided, with areas estimated using satellite imagery:
<table>
<tr><th></th><th>Dump/ Stockpile</th><th>Erodible Area (ha)</th><th>Moisture content (%)</th></tr>
<tr><td>Scenario 1</td><td>Beta North RoM Stockpile</td><td>0.0872</td><td>15.1</td></tr>
<tr><td></td><td>Beta Plant RoM Stockpile</td><td>0.2681</td><td>15.1</td></tr>
</table>
</td></tr>
</table>

Activity	Emission Equation	Information assumed/provided
	Default values: EF_{TSP} = 0.4 kg/ha/hr EF_{PM10} = 0.2 kg/ha/hr	(see tables below)

Scenario 2	Morgenzon RoM Stockpile	0.007	10.6
	Dukes' North RoM Stockpile	0.008	10.6
	Dukes Lower RoM Stockpile	0.006	10.6
Scenario 3	Frankfort RoM Stockpile	0.4604	15.3

Layout of WRDs and the TSF stockpiles and subsequent moisture content was provided, with areas estimated using satellite imagery

Dump/ Stockpile	Erodible Area (ha)	Moisture content (%)	PSD
Beta North WRD	0.2	4.5	425,250,150,75,60,50,35,20,6,2 FRACTION (or %),.17,.15,.14,.11,.10,.09,.08,.07,.04,.05
Beta Plant WRD	0.3	4.7	425,250,150,75,60,50,35,20,6,2 FRACTION (or %),.17,.15,.14,.11,.10,.09,.08,.07,.05,.04
Beta Plant TSF	17.6	0.2[a]	477,165,100,75,20,10,2.5 FRACTION (or %),.11,.12,.18,.26,.08,.18,.07

<table>
<tr><th>Activity</th><th>Emission Equation</th><th>Information assumed/provided</th></tr>
<tr><td></td><td></td><td>
<table>
<tr><td>Morgenzon WRD</td><td>0.6</td><td>5</td><td>425,300,150,75,60,20,6,2
FRACTION (or %),.232,.192,.152,.12,.108,.084,.064,.048</td></tr>
<tr><td>Dukes’ North RoM WRD</td><td>0.3</td><td>5</td><td>425,250,150,75,60,50,35,20,6,2
FRACTION (or %),.20,.17,.15,.12,.09,.08,.07,.06,.03,.03</td></tr>
<tr><td>Dukes Lower RoM WRD</td><td>0.3</td><td>5</td><td>425,250,150,75,60,50,35,20,6,2
FRACTION (or %),.19,.17,.15,.11,.09,.09,.08,.06,.04,.02</td></tr>
<tr><td>Frankfort WRD</td><td>0.5</td><td>4.5</td><td>425,300,150,75,60,20,6,2
FRACTION (or %),.296,.250,.146,.104,.096,.050,.033,.025</td></tr>
</table>
Note: (a) Applicable only on the dry beaches of TSF
Threshold friction velocity (u^*) for the TSF was estimated at 7.7 m/s, and at 6.6 m/s for the WRDs and ROM stockpile.
</td></tr>
<tr><td>Gaseous Emissions from vehicle Exhausts</td><td>NPI emission factors for industrial vehicle reference Table 26 – Table 38. (NPI, 2008). An example of assigned emission factors is that for a haul truck (Table 33)
CO – 4.7E-03 kg/kWh
$PM_{2.5}$ – 6.19E-03 kg/kWh
PM_{10} – 6.73E-03 kg/kWh
SO_2 – 7.73E-06 kg/kWh (estimated based on 50 ppm sulphur)
VOC – 5.0E-04 kg/kWh</td><td>
<table>
<tr><th>Mining Area</th><th>Type</th><th>Selected Machines</th><th>Amount</th></tr>
<tr><td>Beta</td><td>Long Hole drill rig</td><td>DL230L</td><td>4</td></tr>
<tr><td>Beta</td><td>Drill rig</td><td>LP Production Drill</td><td>4</td></tr>
<tr><td>Beta</td><td>Load Haul Dumper</td><td>LHD 115 L</td><td>4</td></tr>
</table>
</td></tr>
</table>

Activity	Emission Equation	Information assumed/provided			
	NOx – 1.09E-02 kg/kWh	Beta	Mobile Charging Unit	Land Cruiser	2
		Frankfort	Long Hole drill rig	DL230L	2
		Frankfort	Drill rig	LP Production Drill	2
		Frankfort	Load Haul Dumper	LHD 115 L	2
		Frankfort	Mobile Charging Unit	Land Cruiser	1
		CDM	Long Hole drill rig	DL230L	2
		CDM	Drill rig	LP Production Drill	2
		CDM	Load Haul Dumper	LHD 115 L	2
		CDM	Mobile Charging Unit	Land Cruiser	2
		A list of diesel mobile equipment was supplied. Annual diesel and petrol fuel consumption was supplied for each significant portion of the site and utilized in calculation of emissions:			

<table>
<tr><th>Activity</th><th>Emission Equation</th><th>Information assumed/provided</th></tr>
<tr><td></td><td></td><td>

- Diesel = 480 000 litres/year
- Petrol = 52 000 litres/year

Since no distinction was made between equipment quantities for different years of operation, emissions were distributed over entire applicable areas.

A load factor of 0.5 (NPI, 2008) was applied to account for variation in engine load i.e. full load and idling.

18 hrs per day, 6 days per week.

</td></tr>
<tr><td>Gaseous Emissions from point Sources</td><td>

$$E_i = Q_f \times \left[\frac{100 - ER_i}{100}\right]$$

Where:

E_i = Total emission of substance I from an engine (kg/a)

Q_f = Quantity of fuel combusted during the reporting year

EF_i = Emission factor of substance i

I = Substance i

Plant Equipment emissions Derived from Emission Limits measured under normal conditions of 273 K, 101. 3 kPa, specific oxygen percentage and dry gas. (Subcategory 4.1, 4.16, and 4.17). Emission Hours per year CRK- 312, dryer-8760, smelter – 104

Vent emissions derived from Mine Health and Safety Act No 29 of 1996: Chapter 22.9(2)(a) Occupational Exposure Limits for Airborne pollutants

</td><td>

<table>
<tr><th></th><th>PM_{10}</th><th>$PM_{2.5}$</th><th>NOx</th><th>Unit</th><th>Stack Height (m)</th><th>Diameter (m)</th><th>Temperature (K)</th><th>Exit velocity (m/s)</th></tr>
<tr><td>carbon regeneration kiln</td><td>50</td><td>50</td><td>300</td><td>mg/Nm^3</td><td>4.00</td><td>0.20</td><td>673.15</td><td>1.185</td></tr>
<tr><td>Drying of concentrate</td><td>50</td><td>50</td><td>500</td><td>mg/Nm^3</td><td>20.00</td><td>0.20</td><td>313.15</td><td>3.316</td></tr>
<tr><td>Smelting of Dore</td><td>50</td><td>50</td><td>300</td><td>mg/Nm^3</td><td>20.00</td><td>0.50</td><td>298.15</td><td>9.054</td></tr>
<tr><td>Frankfort Vent</td><td>5</td><td>5</td><td>5</td><td>mg/Nm^3</td><td>4.00</td><td>2.52</td><td>293.25</td><td>2.40</td></tr>
<tr><td>Morgenzon Vent</td><td>5</td><td>5</td><td>5</td><td>mg/Nm^3</td><td>4.00</td><td>2.52</td><td>293.25</td><td>2.40</td></tr>
<tr><td>Dukes Upper Vent</td><td>5</td><td>5</td><td>5</td><td>mg/Nm^3</td><td>4.00</td><td>2.52</td><td>293.25</td><td>2.40</td></tr>
</table>

</td></tr>
</table>

Activity	Emission Equation	Information assumed/provided								
		Dukes Lower Vent	5	5	5	mg/Nm^3	4.00	2.52	293.25	2.40
		Beta North Vent	5	5	5	mg/Nm^3	4.00	2.52	293.25	2.40
			SO_2	**Cl_2**	**HCl**	**HF**	**NH_3**	**Unit kg/m^3**		
		carbon regeneration kiln	400	50	30	30	100	mg/Nm^3		
		Smelting of Dore	400	50	30	30	100	mg/Nm^3		

Table 54: Estimated control efficiencies (CE) provided for mitigation measures applied to various mining operations (NPI, 2012)

Operation/Activity	Control method and emission reduction
Unpaved surface haul roads	50% CE for water sprays, level 1 watering (2 litres/m²/hr)
Paved public road	No control
Materials handling (loading and unloading)	No control due to high moisture content ore
Crushing and screening	50% CE for water sprays keeping ore wet
Windblown dust from WRDs and stockpiles	50% CE for water sprays keeping waste wet
Gaseous emissions	No control
Stacks and vents	No control

Table 55: Scenario 1 – Calculated emission rates from unmitigated and mitigated mining operations at Beta North and plant area

Activity/ Area of operation	Unmitigated			Mitigated		
	TSP (tpa)	PM_{10} (tpa)	$PM_{2.5}$ (tpa)	TSP (tpa)	PM_{10} (tpa)	$PM_{2.5}$ (tpa)
Materials Handling	0.37	0.17	0.03	0.37	0.17	0.03
Crushing and Screening	35.45	14.18	1.19	17.73	7.09	0.59
Vehicle Entrainment	23.83	3.08	0.31	11.92	1.54	0.15
Gaseous Emissions	6.68	6.69	6.16	6.68	6.69	6.16
Stacks and vents	13.07	7.90	7.90	13.07	7.90	7.90
Wind erosion	10.24	4.38	1.19	5.12	2.19	0.59
Total	**89.64**	**36.4**	**16.78**	**54.89**	**25.58**	**15.42**

Table 56: Scenario 2 – Calculated emission rates from unmitigated and mitigated mining operations at CDM area

Activity/ Area of operation	Unmitigated			Mitigated		
	TSP (tpa)	PM_{10} (tpa)	$PM_{2.5}$ (tpa)	TSP (tpa)	PM_{10} (tpa)	$PM_{2.5}$ (tpa)
Materials Handling	0.33	0.16	0.02	0.33	0.16	0.02
Crushing and Screening	9.16	3.66	0.55	4.58	1.83	0.28
Vehicle Entrainment	6.00	0.76	0.08	3.00	0.38	0.04
Gaseous Emissions	1.81	1.89	1.72	1.81	1.89	1.72
Stacks and vents	10.34	5.17	5.17	10.34	5.17	5.17
Wind erosion	0.07	0.03	0.01	0.03	0.01	0.00
Total	**27.71**	**11.67**	**7.55**	**20.09**	**9.44**	**7.23**

Table 57: Scenario 3 – Calculated emission rates from unmitigated and mitigated mining operations at Frankfort

Activity/ Area of operation	Unmitigated			Mitigated		
	TSP (tpa)	PM_{10} (tpa)	$PM_{2.5}$ (tpa)	TSP (tpa)	PM_{10} (tpa)	$PM_{2.5}$ (tpa)
Materials Handling	0.25	0.12	0.02	0.25	0.12	0.02
Crushing and Screening	10.86	4.34	0.66	5.43	2.17	0.33
Vehicle Entrainment	19.73	2.55	0.25	9.87	1.27	0.13
Gaseous Emissions	1.62	1.63	1.49	1.62	1.63	1.49
Stacks and vents	4.25	2.13	2.13	4.25	2.13	2.13
Wind erosion	0.81	0.40	0.06	0.41	0.20	0.03
Total	**37.52**	**11.18**	**4.61**	**21.83**	**7.53**	**4.12**

Scenario 1 (Beta North and plant area) would result in total higher emission rates for TSP, PM10 and PM2.5 compared to the other scenarios. This is due to a higher ore and waste throughput, processing plant stacks and a much longer LoM. Dust entrained during ore and waste transportation is comparably high for all scenarios although the values are not high in comparison. Emissions from other activities such as materials handling and gases from mobile equipment are slight for all scenarios. With the proposed mitigation measures in place, PM emissions would reduce by between 15% and 27%.

Dispersion modelling was undertaken to determine highest hourly, highest daily and annual average ground level concentrations as well as dustfall rates for each of the pollutants considered in the study. Averaging periods were selected to facilitate the comparison of predicted pollutant concentrations to relevant ambient air quality and inhalation health criteria as well as dustfall regulations.

Impact of the Operational Phase of the mine was simulated using the parameters and emission rates given in Table 18. Short-term (hourly or daily) concentrations were extracted at the 99th percentile, to account for the number of exceedances allowed by the recommended and prescribed guidelines and targets. A visual reference of the AQSRs taken into account in this study and their proximity to the site is shown in the subsequent isopleth plots that represent pollutant dispersion.

Isopleth plots reflect the incremental ground level concentrations (GLCs) for SO_2, NO_2, CO, VOC's, $PM_{2.5}$ and PM_{10}, as well as dustfall rates for TSP. Due to the absence of ambient baseline concentrations, cumulative pollutant concentrations could not be determined but qualitative commentary is provided in the discussion of impact significance in section 13.3.13.2.

13.3.1.1 SCENARIO 1 – BETA NORTH AND PLANT AREA

PM $_{10}$

The simulated isopleths of highest daily and annual average PM_{10} GLCs for unmitigated and mitigated operations are provided in **Figure 109**, **Figure 110**, **Figure 111** and **Figure 112** respectively.

There are no areas over which the 24-hour National Ambient Air Quality Standards (NAAQS) (75 µg/m³) is exceeded, for the unmitigated option (when the entire TSF area is deemed to be exposed) (**Figure 109**). The annual average PM_{10} GLCs do not exceed the NAAQS of 40 µg/m³ for the unmitigated option (**Figure 111**).

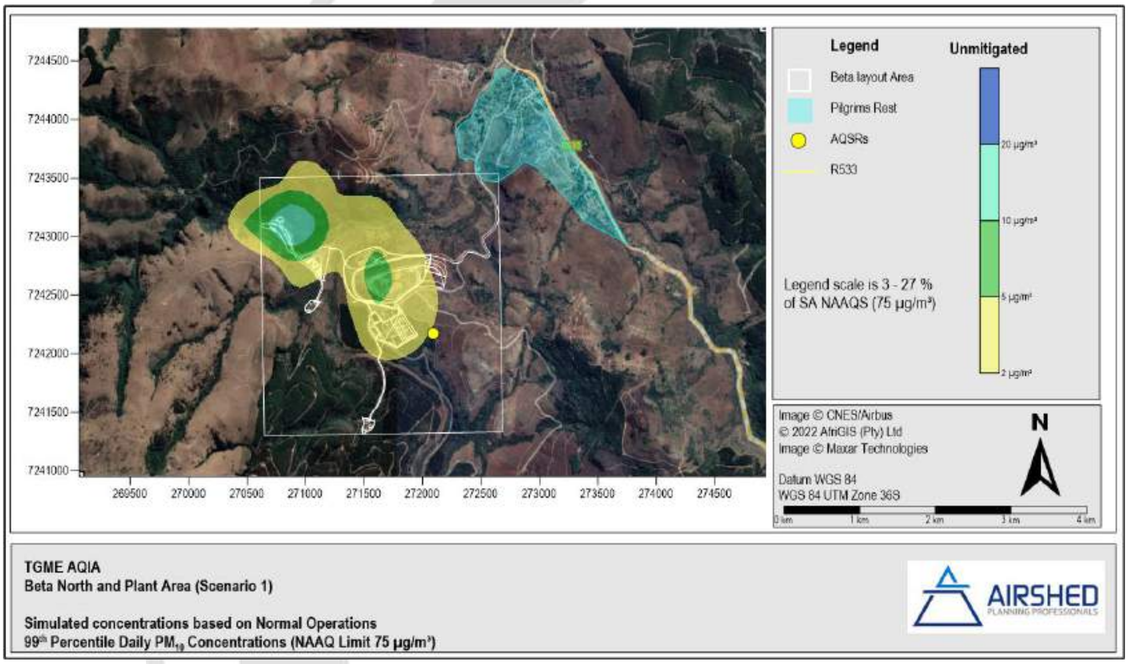


Figure 109: Simulated daily average PM_{10} concentrations for unmitigated operational activities at Beta North and Plant

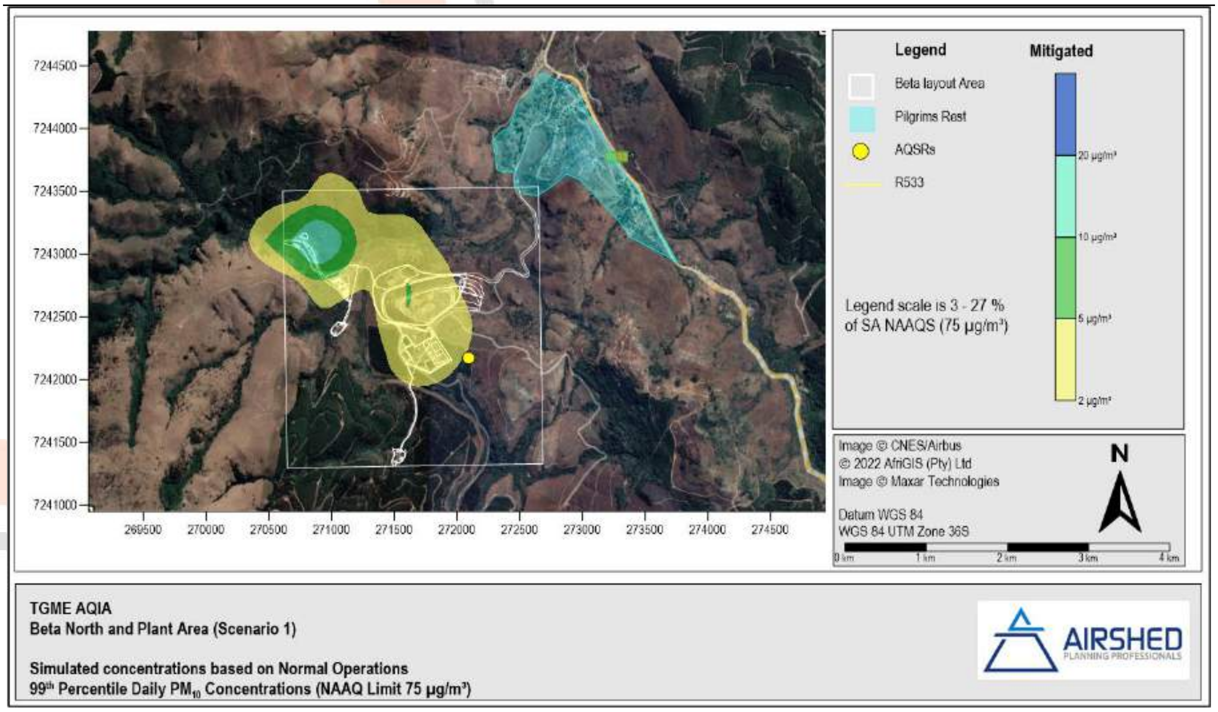


Figure 110: Simulated daily average PM_{10} concentrations for mitigated operational activities at Beta North and Plant

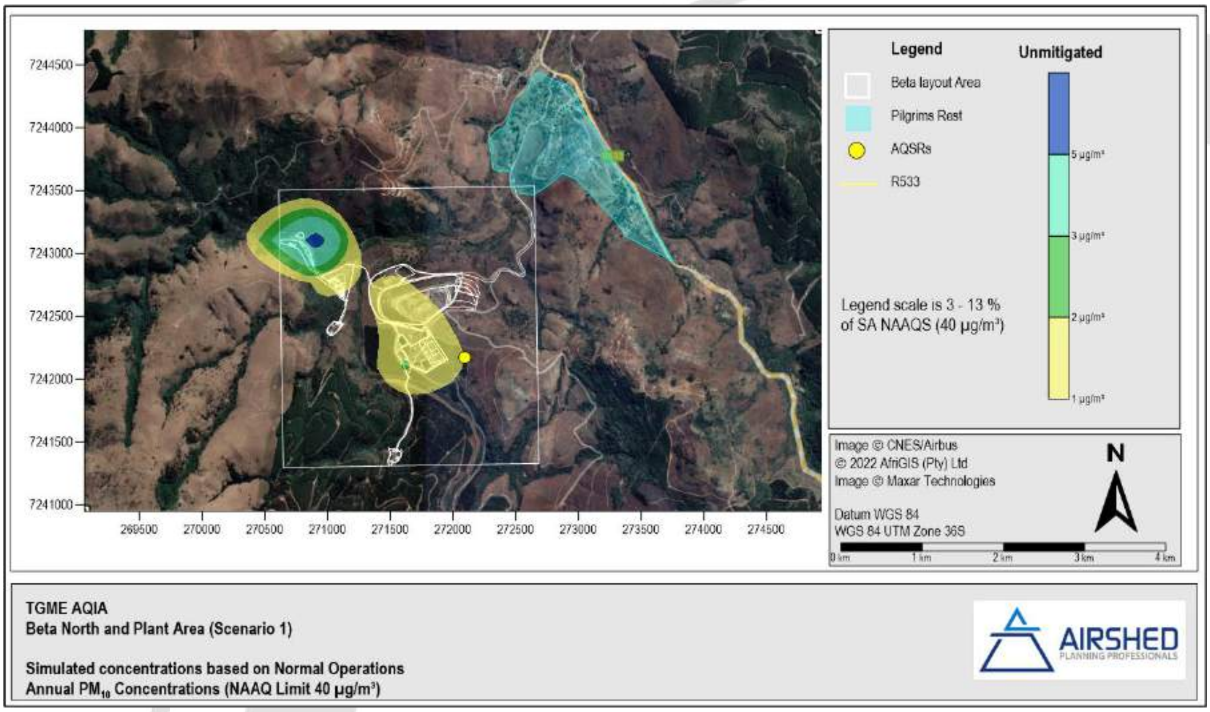


Figure 111: Simulated annual average PM_{10} concentrations for unmitigated operational activities at Beta North and Plant

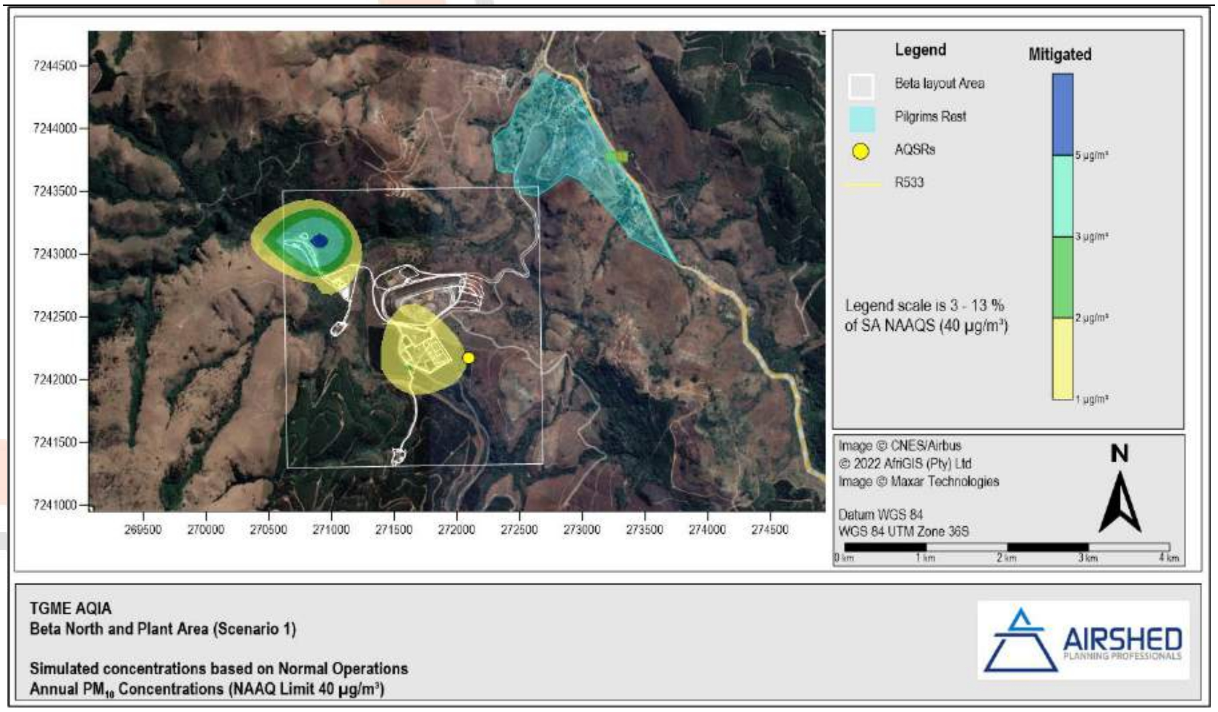


Figure 112: Simulated annual average PM_{10} concentrations for unmitigated operational activities at Beta North and Plant

PM2.5

The simulated isopleths of highest daily and annual average $PM_{2.5}$ GLCs for unmitigated operations are provided in **Figure 113** and **Figure 114** respectively. There are no areas over which the 24-hour NAAQS (40 µg/m³) is exceeded (**Figure 113**), for the unmitigated option. Similarly, the annual average $PM_{2.5}$ GLCs do not exceed the NAAQS of 20 µg/m³ for the unmitigated option (**Figure 114**).

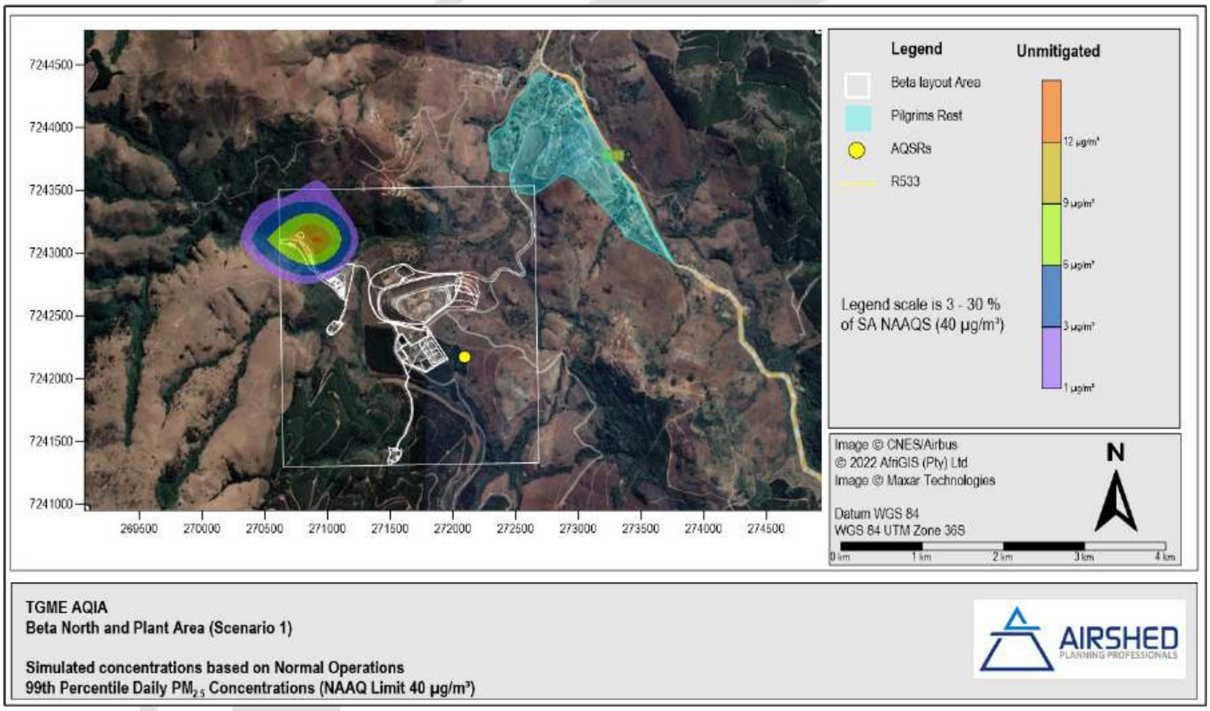


Figure 113: Simulated daily average $PM_{2.5}$ concentrations for unmitigated operational activities at Beta North and Plant

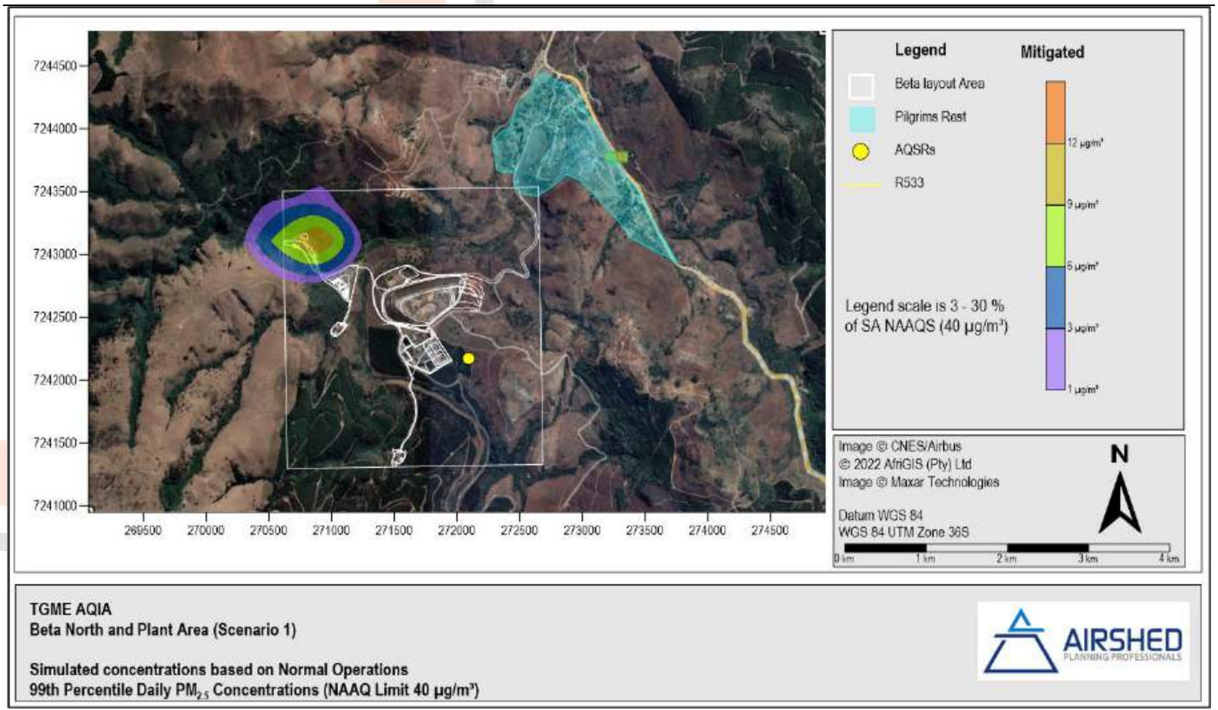


Figure 114: Simulated annual average $PM_{2.5}$ concentrations for unmitigated operational activities at Beta North and Plant

Dust Fallout

Based on the highest monthly simulated dustfall rates, the daily average dustfall rate does not exceed the NDCR limit for non-residential areas (1200 mg/m²-day) and residential areas (600 mg/m²-day) within the project boundary and at any AQSRs respectively (**Figure 115)**. The simulated isopleth (20 – 250 mg/m²-day) is comparable to the measured dustfall at TSF 2 West.

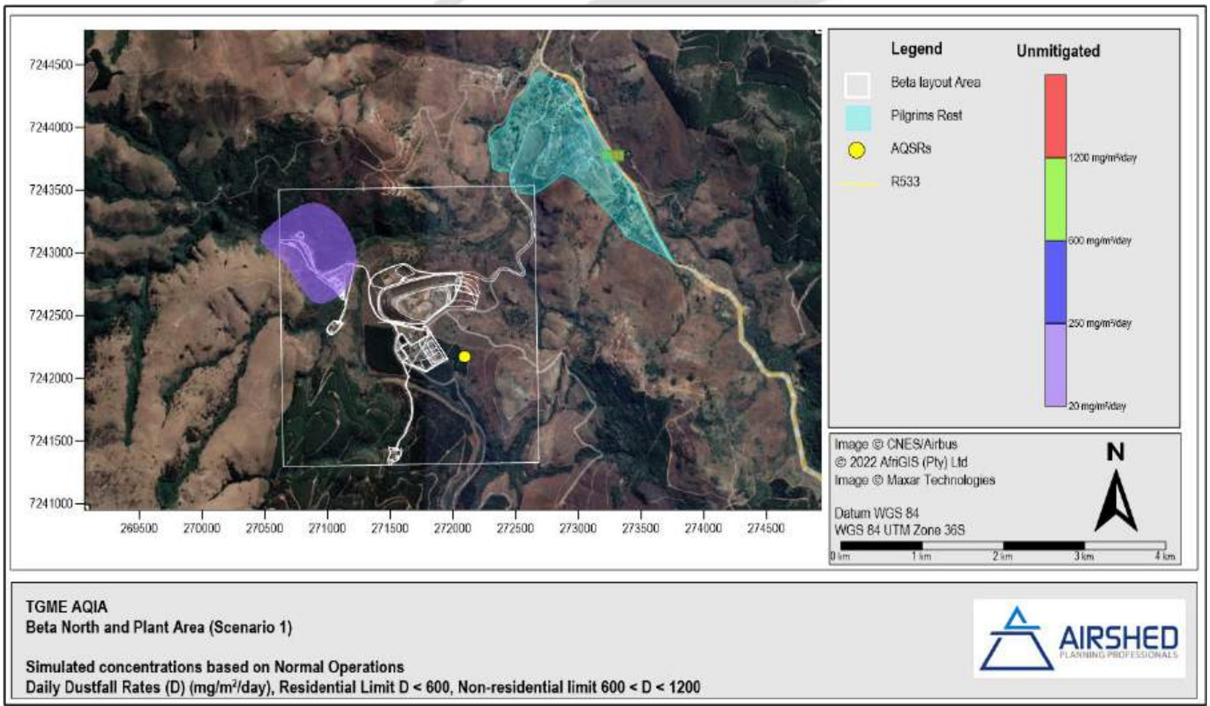


Figure 115: Simulated daily dustfall rates for unmitigated operational activities at Beta North and Plant

Gaseous pollutants

Simulated SO_2 GLCs do not exceed the shorth term (1-hour and 24-hour) and long term (annual) NAAQS of 350 µg/m^3, 125 µg/m^3 and 50 µg/m^3. Similarly, the simulated SO_2 concentrations do not exceed the critical level for all vegetation types. The simulated concentrations are extremely low and were not plotted.

Simulated daily average NOx concentrations do not exceed the NAAQS of 200 µg/m^3 onsite and at any of the AQSRs (**Figure 116**). There are also no exceedances to the annual NAAQS of 40 µg/m^3 onsite and at any of the AQSRs (**Figure 117**). The simulated NOx concentrations do not exceed the critical level for all vegetation types. It was conservatively assumed that all NOx is converted to NO_2.

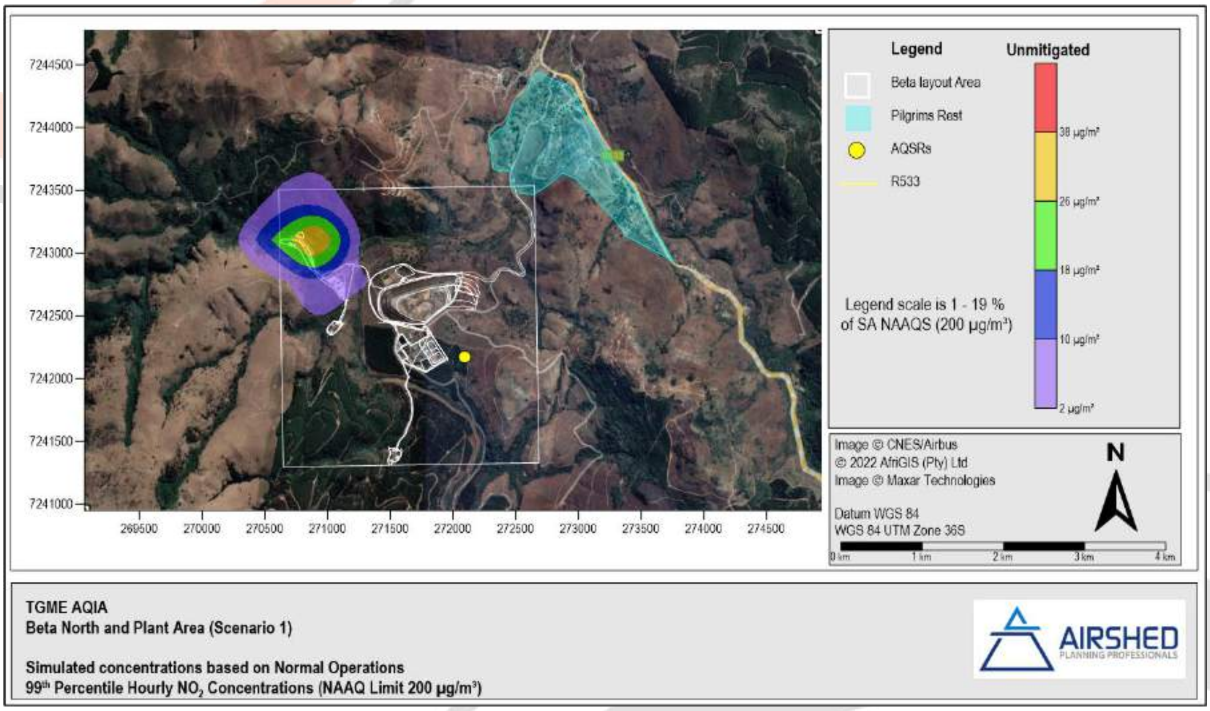


Figure 116: Simulated hourly concentrations for NO_2 at the Beta North and plant area

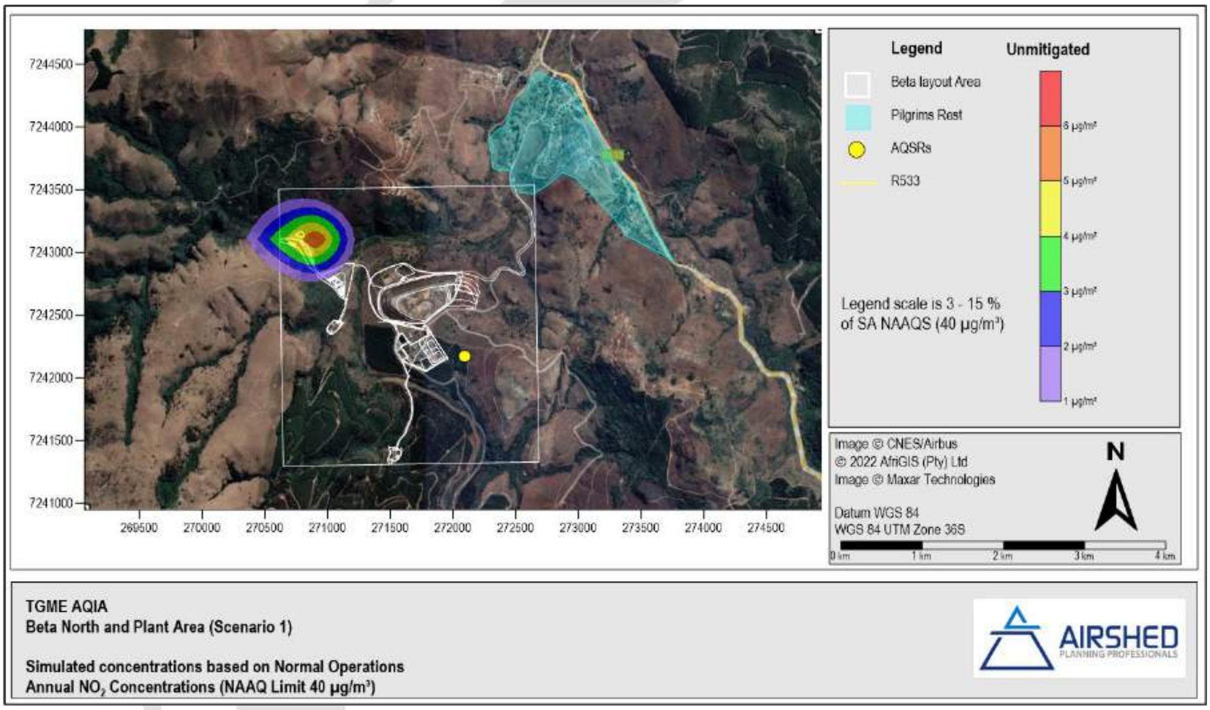


Figure 117: Simulated annual concentrations for NO_2 at the Beta North and plant area

Carbon monoxide (CO)

There are no exceedances to the neither the 1-hour nor the 8-hour NAAQS of 30 000 µg/m³ and 10 000 µg/m³ respectively. The GLCs are well below the NAAQ limits therefore were not plotted.

Volatile Organic Compounds (VOCs)

Simulated annual average VOC concentrations are presented in **Figure 118** with Benzene used as a surrogate and main indicator for VOCs. There are no exceedances to the NAAQ limit of 5 µg/m³ within or outside the layout area.

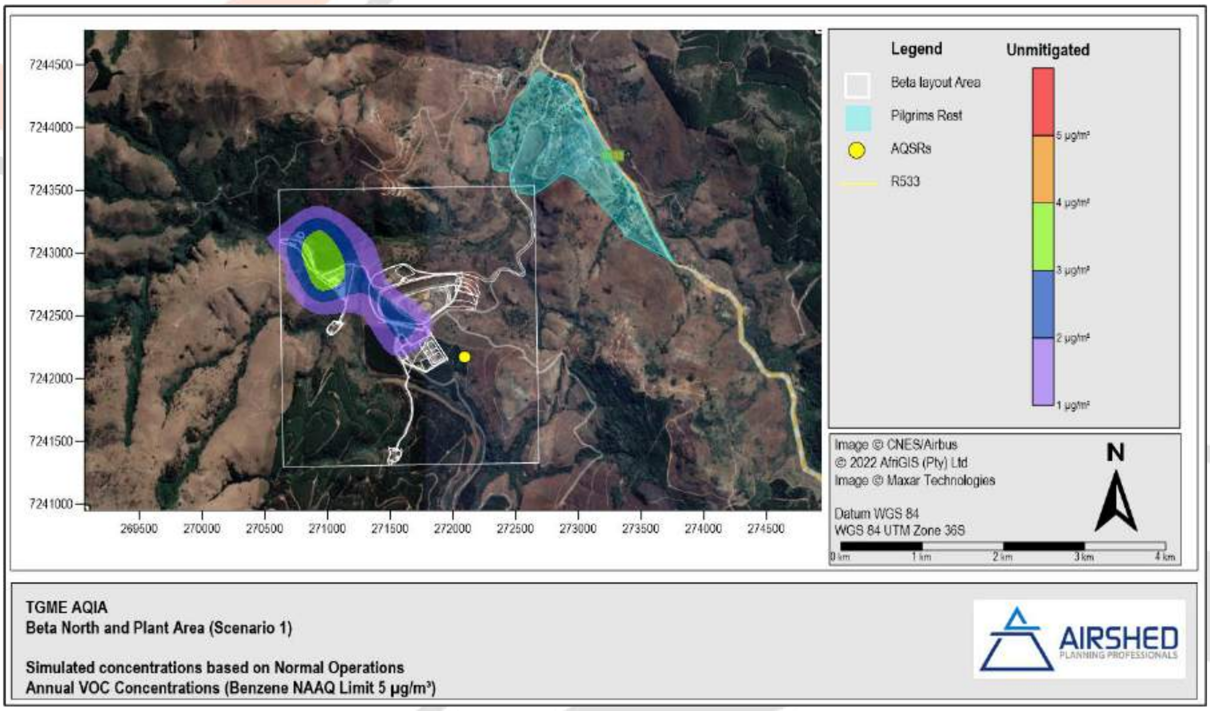


Figure 118: Simulated annual concentrations for VOCs at the Beta North and plant area

Chlorine (Cl_2)

The simulated concentrations are below the selected acute and sub-chronic criteria for Cl_2.However, the simulated GLCs exceeded the selected chronic levels within the mine layout area but not at any AQSRs as indicated in **Figure 119**.

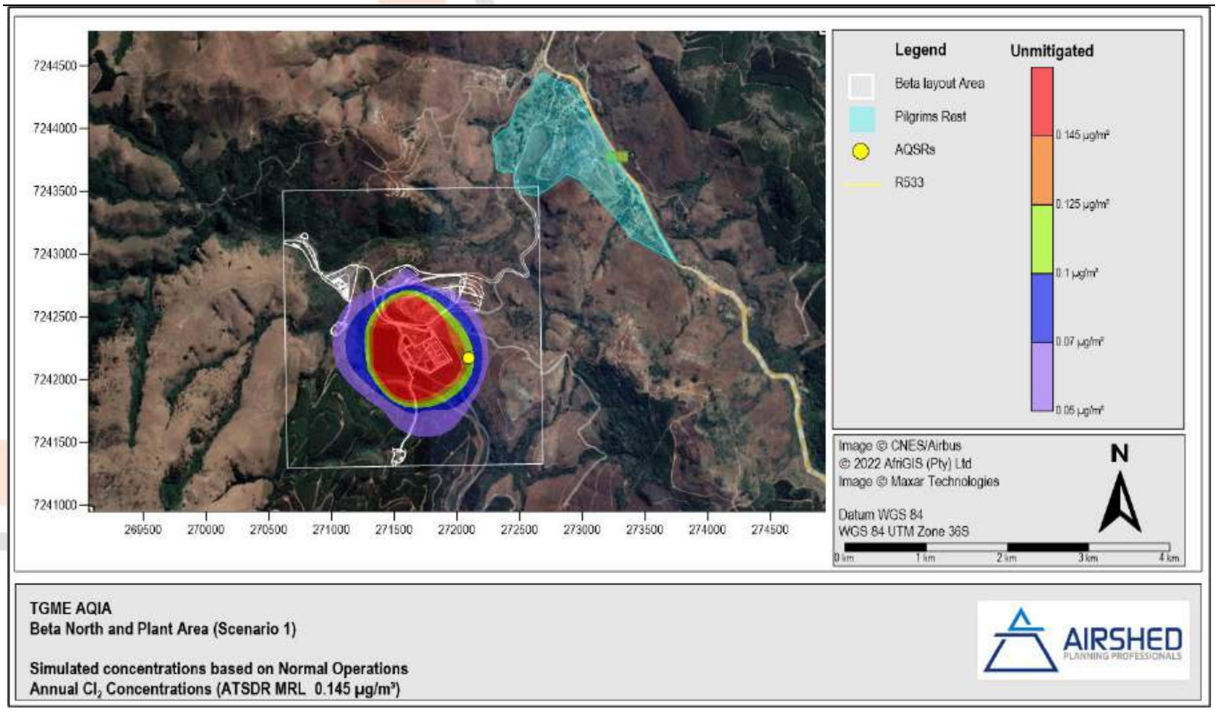


Figure 119: Simulated annual average Cl_2 concentrations for unmitigated operational activities at Beta North and Plant

Hydrogen Chloride (HCl), Hydrogen Fluoride ((HF), and Ammonia (NH_3)

There are no exceedances to the either of the selected criteria for HCl, HF, and NH_3. The simulated GLCs for these respective pollutants are miniscule and therefore have been excluded.

13.3.1.2 SCENARIO 2 – CDM AREA

PM_{10}

The simulated isopleths of highest daily and annual average PM_{10} GLCs for unmitigated operations are provided in **Figure 120** and **Figure 121** respectively. There are no areas over which the 24-hour NAAQS (75 µg/m³) is exceeded (**Figure 120)**, for the unmitigated option. Similarly, the annual average PM_{10} GLCs do not exceed the NAAQS of 40 µg/m³ for the unmitigated option (**Figure 121**).

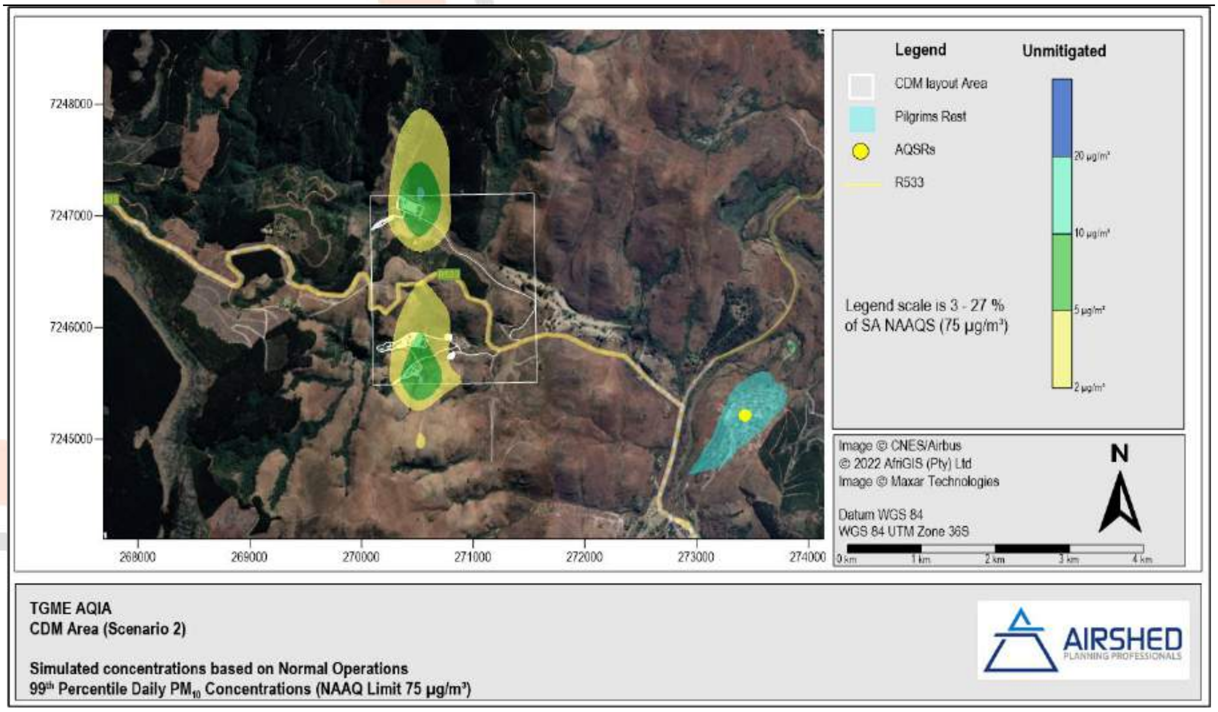


Figure 120: Simulated daily average PM_{10} concentrations for unmitigated operational activities at CDM

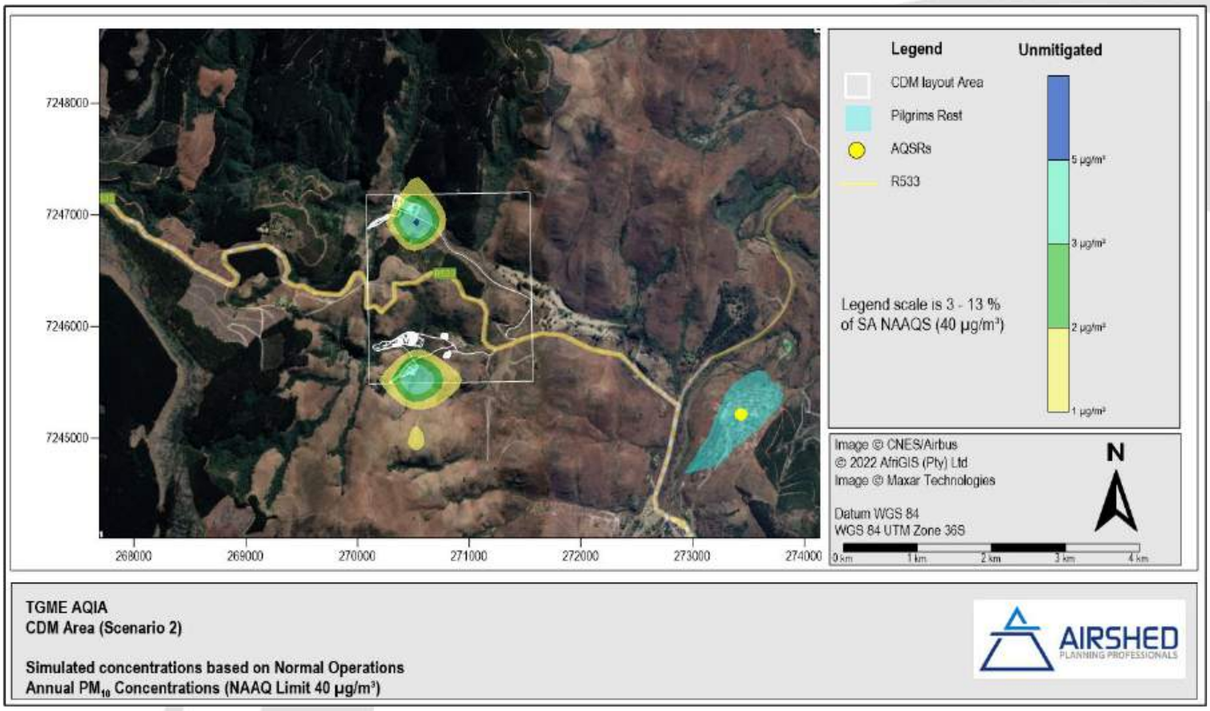


Figure 121: Simulated annual average PM_{10} concentrations for unmitigated operational activities at CDM

$PM_{2.5}$

The simulated isopleths of highest daily average $PM_{2.5}$ GLCs for unmitigated operations are provided in **Figure 122**. There are no areas over which the 24-hour NAAQS (40 µg/m³) is exceeded (**Figure 122**), for the unmitigated option. The simulated annual average GLCs for the unmitigated option are well below the NAAQ limit of 20 µg/m³, hence are not illustrated.

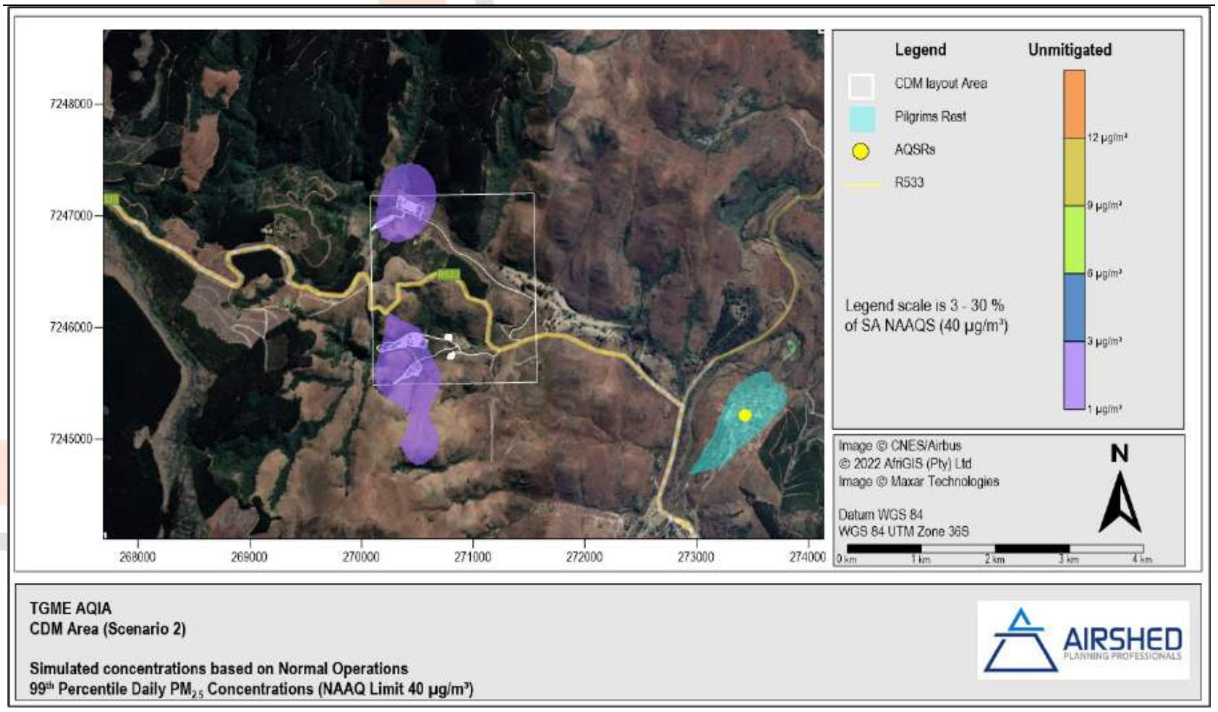


Figure 122: Simulated daily average $PM_{2.5}$ concentrations for unmitigated operational activities at CDM

Dust Fallout

Based on the highest monthly simulated dustfall rates, the daily average dustfall rate does not exceed the NDCR limit for non-residential areas (1200 mg/m²-day) and residential areas (600 mg/m²-day) within the project boundary and at any AQSRs respectively (**Figure 123**).

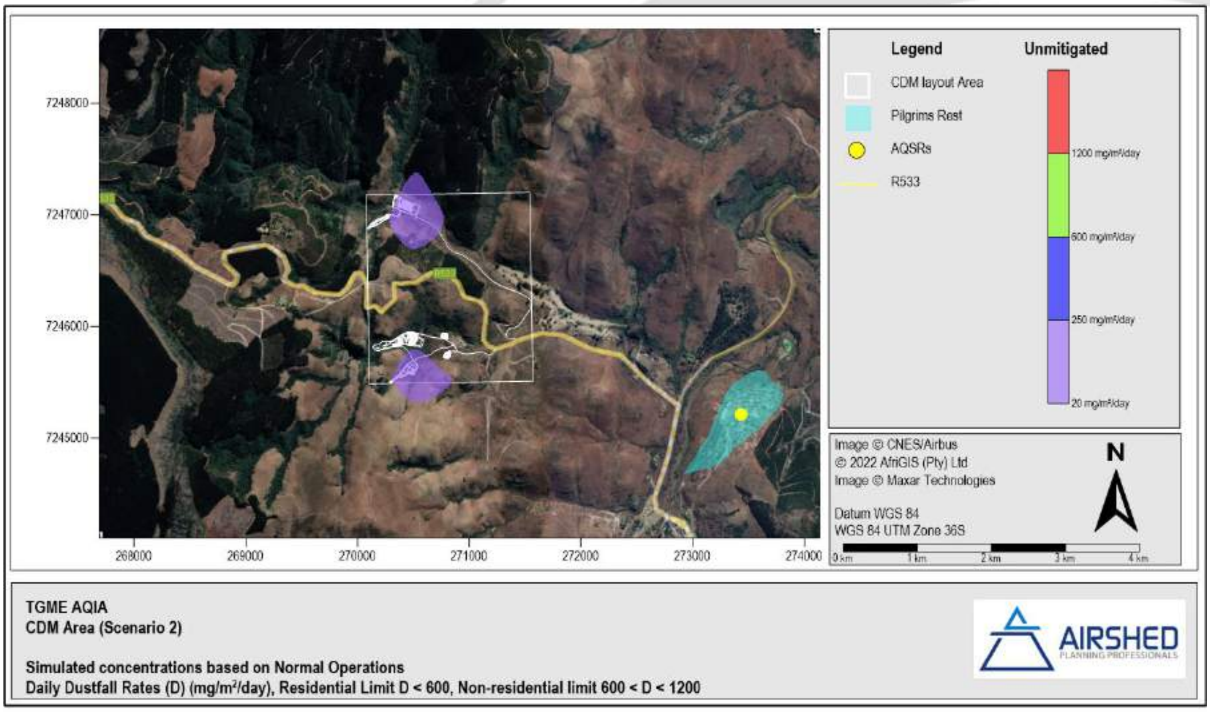


Figure 123: Simulated daily dustfall rates for unmitigated operational activities at CDM

VOCs, NO_2, CO, SO_2 Impacts

Simulated VOC, NO_2, CO and SO_2 impacts were very low and did not result in offsite exceedances of assessment criteria. The GLC due to CO and SO_2 emissions are expected to be insignificant, as is typical of similar processes (mining operations).

13.3.1.3 SCENARIO 3 – FRANKFORT AREA

PM_{10}

The simulated isopleths of highest daily and annual average PM_{10} GLCs for unmitigated operations are provided in Figure 124 and **Figure 125** respectively. There are no areas over which the 24-hour NAAQS (75 µg/m³) is exceeded (**Figure 124**), for the unmitigated option. Similarly, the annual average PM_{10} GLCs do not exceed the NAAQS of 40 µg/m³ for the unmitigated option (**Figure 125**).

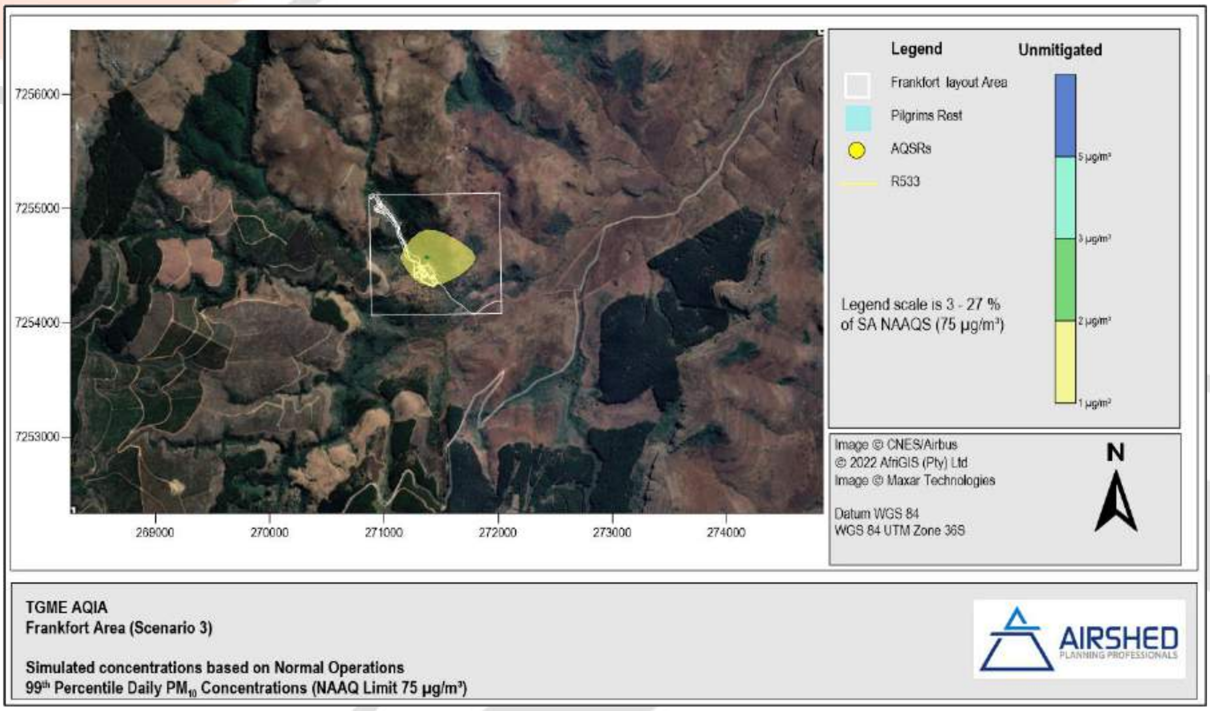


Figure 124: Simulated daily average PM_{10} concentrations for unmitigated operational activities at Frankfort

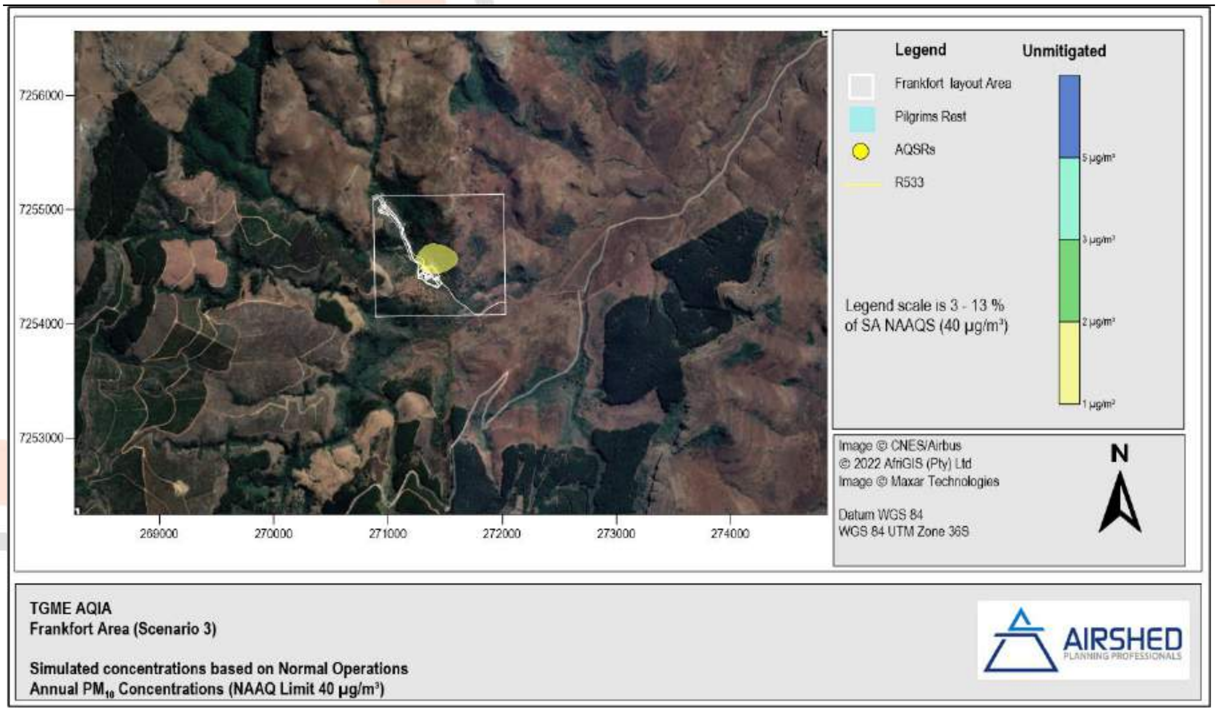


Figure 125: Simulated annual average PM_{10} concentrations for unmitigated operational activities at Frankfort

$PM_{2.5}$

The simulated isopleths of highest daily and annual average $PM_{2.5}$ GLCs for unmitigated operations are provided in **Figure 126** and **Figure 127** respectively. There are no areas over which the 24-hour NAAQS (40 µg/m³) is exceeded (**Figure 126**), for the unmitigated option. The simulated annual average GLCs for the unmitigated option are below the NAAQ limit of 20 µg/m³ (**Figure 127**).

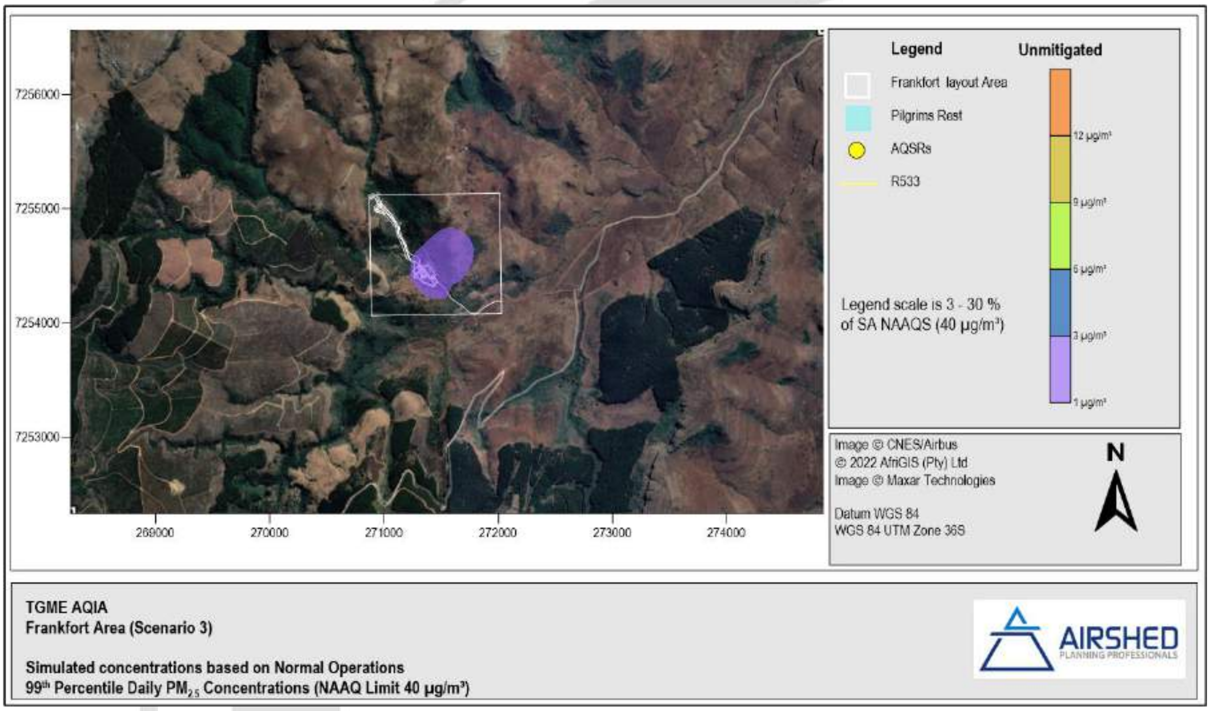


Figure 126: Simulated daily average $PM_{2.5}$ concentrations for unmitigated operational activities at Frankfort

Figure 127: Simulated annual average $PM_{2.5}$ concentrations for unmitigated operational activities at Frankfort

Dust Fallout

Based on the highest monthly simulated dustfall rates, the daily average dustfall rate does not exceed the NDCR limit for non-residential areas (1200 mg/m²-day) and residential areas (600 mg/m²-day) within the project boundary and at any of the AQSRs respectively (**Figure 123**). Simulated dustfall ranges between 20 – 250 mg/m²-day at Frankfort.

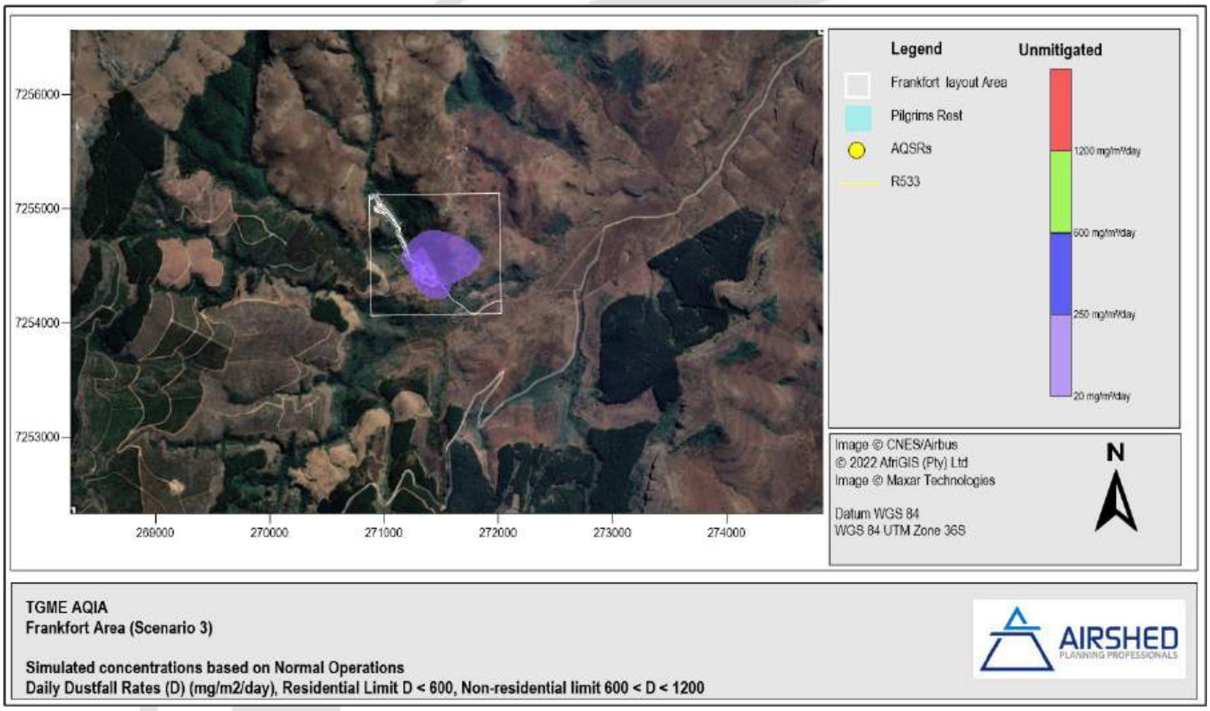


Figure 128: Simulated daily dustfall rates for unmitigated operational activities at Frankfort

Gaseous pollutants (VOCs, NO_2, CO, SO_2 Impacts)

Similar to Scenario 2, the GLCs for the gaseous pollutants do not exceed any set criteria and were too low to be represented on isopleth plots.

The NAAQS are intended to indicate safe daily exposure levels for most of the population, including the very young and the elderly, throughout an individual's lifetime. Simulated results show that the NAAQS are not exceeded at any AQSRs, thus the simulated operations are unlikely to be a significant risk to human health at the existing surrounding receptors.

The following three potential construction and operational phase impacts on the air quality of the area were identified and are rated in **Table 65**:

- Potential impact on human health from increased pollutant concentrations due to construction and proposed operations
- Increased nuisance dustfall rates associated with the proposed operations; and
- Potential impact on vegetation health from increased dustfall rates and pollutant concentrations.

It is assumed that all operations will have ceased by the decommissioning phase. It is expected that all surface infrastructure will be demolished and removed except for roads which will remain for public use. It is also expected that the stockpile surfaces will be covered with topsoil and vegetated.

The potential for air quality impacts during the decommissioning phase will depend on the extent of demolition and rehabilitation efforts during decommissioning and on features which will remain.

The likely activities associated with the decommissioning phase of the operations are:

- infrastructure removal/demolition;
- topsoil recovered from stockpiles for rehabilitation and re-vegetation of surroundings;
- vehicle entrainment on unpaved road surfaces during rehabilitation –once that is done, vehicle activity associated with TGME should cease; and
- exhaust emissions from vehicles utilised during the closure phase – once that is done, vehicle activity associated with TGME should cease.

The closure phase includes the period of aftercare and maintenance after the decommissioning phase. During this phase rehabilitated areas are checked and maintained. The activities that may be included are irregular and minimal vehicle entrainment on roads and vehicle exhaust emissions when the property is checked on.

Due to the lack of sufficient data, the decommissioning and closure phases are assessed qualitatively with $PM_{2.5}$, PM_{10} and TSP being the pollutants likely to have potential impacts on human health, vegetations and nuisance. Similar to the construction and operational phases, the environmental risk rating of impacts is based on the following criteria:

- Potential impact on human health from increased pollutant concentrations due to proposed decommissioning/closure operations;
- Increased nuisance dustfall rates associated with the proposed decommissioning/closure operations; and,
- Potential impact on vegetation from increased dustfall rates and pollutant concentrations due to proposed decommissioning/closure operations.

It can therefore be concluded that the environmental risk rating of proposed project operations related to inhalation health impacts, nuisance and vegetation impacts is likely to be "low" without mitigation measures applied and becomes "negligible", with mitigation measures applied. The overall environmental risk rating is expected to be "low".

The environmental risk rating of proposed project closure related to inhalation health impacts, nuisance and vegetation impacts is likely to be “low”, “moderate”, and “negligible” respectively. The environmental risk rating of proposed project decommissioning related to inhalation health impacts, nuisance and vegetation impacts is likely to be “low”, “low” and “negligible” respectively without mitigation measures applied and becomes “negligible”, with mitigation measures applied. The overall environmental risk rating is expected to be “low”.

13.3.2 IMPACTS ON GREENHOUSE GAS EMISSIONS

Greenhouse gases (GHG) are “those gaseous constituents of the atmosphere, both natural and anthropogenic, that absorb and emit radiation at specific wavelengths within the spectrum of thermal infrared radiation emitted by the earth’s surface, the atmosphere itself, and by clouds. This property causes the GHG effect. Water vapour (H_2O), CO2, nitrous oxide (N_2O), methane (CH_4) and O_3 are the primary greenhouse gases in the earth’s atmosphere. Moreover, there are a number of entirely human-made GHG gases in the atmosphere, such as the halocarbons and other chlorine and bromine containing substances, dealt with under the Montreal Protocol. Beside CO_2, N_2O and CH_4, the Kyoto Protocol deals with the greenhouse gases sulphur hexafluoride (SF_6), hydrofluorocarbons (HFCs) and perfluorocarbons (PFCs) (IPCC, 2007). Human activities since the beginning of the Industrial Revolution (taken as the year 1750) have produced a 40% increase in the atmospheric concentration of carbon dioxide, from 280 ppm in 1,750 to 406 ppm in early 2017 (NOAA, 2017). This increase has occurred despite the uptake of a large portion of the emissions by various natural "sinks" involved in the carbon cycle (NOAA, 2017). Anthropogenic CO_2 emissions (i.e., emissions produced by human activities) come from combustion of fossil fuels, principally coal, oil, and natural gas, along with deforestation, soil erosion and animal agriculture (IPCC, 2007).

The proposed operations would most likely fall under the category of “industry” for the global GHG inventory. According to the “mitigation of climate change” document as part of the Intergovernmental Panel on Climate Change (IPCC) fifth Assessment Report (AR5) (IPCC, 2013) the 2010 global GHG emissions were 49 (±4.5) Gt CO_2-e, of which 21% (10 Gt CO_2-e) was a result of industry. The World Resources Institute Climate Watch global GHG emissions from the “industrial processes” sector were 2.77 Gt CO_2-e in 2016 (6% of total anthropogenic GHG emissions).

GHG emissions for the project were calculated and compared to the global and national emission inventory and compared to international benchmarks for the project.

13.3.2.1 CARBON FOOTPRINT CALCULATION

The Carbon Footprint is an indication of the GHGs estimated to be emitted directly and/or indirectly by an organisation, facility, or product. It can be estimated from

$$Carbon\ emissions = Activity\ information * emission\ factor * GWP$$

where

- Activity information relates to the activity that causes the emissions
- Emission factor refers to the amount of GHG emitted per unit of activity
- GWP or global warming potential is the potential of an emitted gas to cause global warming relative to CO_2. This converts the emissions of all GHGs to the equivalent amount of CO_2 or CO_2-e.

For combustion processes, the emission factor is often calculated from a carbon mass balance, where the combustion of each unit mass of carbon in the fuel leads to an equivalent emission of 3.67 mass units of CO_2 (from 44/12, the ratio of molecular weight of CO_2 to that of carbon).

The previous National inventory for 2015 global warming potential (GWP) (obtained from the IPCC Second Assessment Report [AR2]) were applied in this study. These GWPs are compliant with UNFCCC Reporting Requirements. The GWPs used were 21 for CH_4 and 310 for N_2O.

The three broad scopes for estimating GHG are:

- Scope 1: All direct GHG emissions.
- Scope 2: Indirect GHG emissions from consumption of purchased electricity, heat, or steam.
- Scope 3: Other indirect emissions, such as the extraction and production of purchased materials and fuels, transport-related activities in vehicles not owned or controlled by the reporting entity, electricity-related activities not covered in Scope 2, outsourced activities, waste disposal, etc.

This study considered Scope 1 emissions, which are the emissions directly attributable to the project. Scope 2 emissions which are the emissions associated with bought-in electricity, and Scope 3 emissions which consider the "embedded" carbon in bought-in materials and transport as well as the use of exported materials, were not estimated. Only scope 1 emissions need to be quantified to be in line with the DFFE guidelines; the addition of scope 2 would put it in line with the guidelines provided by the International Finance Corporation (IFC, 2012).

As the emission of greenhouse gases has a global impact, it is not feasible to follow the normal impact assessment methodology by comparing the state of the physical environment after implementation of the project to the condition of the physical environment prior to its implementation. Instead, this report will assess the following:

- The GHG emissions during the construction, operation and decommissioning of the project compared to the global and South African emission inventory and to international benchmarks for the project.
- The impact of climate change over the lifetime of the project taking the robustness of the project into account.
- The vulnerability of communities in the immediate vicinity of the project to climate change.

13.3.2.2 IMPACT ASSESSMENT: THE PROJECT'S CARBON FOOTPRINT

Clearing and Rehabilitation - Carbon Sequestration and Carbon Sink

Accounting for the uptake of carbon by plants, soils and water is referred to as *carbon sequestration* and these sources are commonly referred to as *carbon sinks*. Quantifying the rate of carbon sequestration is however not a trivial task requiring detailed information on the geographical location, climate (specifically temperature and humidity) and species dominance (Ravin & Raine, 2007).

Photosynthesis is the main sequestration process in forests and in soils. Carbon is absorbed as fixed carbon into the roots, trunk, branches and leaves and during the shedding of leaves, but is emitted – although at a reduced percentage – from foliage and when biomass decays. Several factors also determine the amount of carbon absorbed by trees such as species, size and age. Mature trees, for example, will absorb more carbon than saplings (Ravin & Raine, 2007).

Aspects required in order to calculate the carbon stack change in the pool (in tons of carbon per year) include the climate, the type of forest or vegetation removed and the type to be re-introduced, and management measures. Soil type also has different absorption and release ratios that need to be included. This level of information was not available for the quantification of carbon sequestration for the project.

Construction

There will be an initial carbon sink loss due to the vegetation removal for the new and expansion areas. GHG will also be emitted through operating diesel-powered mobile and stationary equipment. Due to the already disturbed nature of the proposed project area, and the temporary nature of the construction phase, the GHG emissions during construction are not expected to constitute a material fraction of the overall project emissions.

Operations

The main sources of GHG due to the proposed operations are the mobile and stationary equipment consuming diesel and petrol (scope 1). Annual diesel and petrol fuel consumption was supplied for each significant portion of the site and utilized in calculation of emissions:

- Diesel = 480,000 litres/year
- Petrol = 52,000 litres/year

Since no distinction was made between equipment quantities for different years of operation, GHG emissions were also applied to the equipment list provided (**Table 58**) to provide a possible GHG emissions range for Scope 1.

Table 58: Diesel consumption based on proposed mining equipment [79]

Mine Area	Equipment type	Source type [(a)]	Engine Power (kW)	Load factor	Operational hours/annum	Energy demand (kWh/annum)	Diesel (litres/annum) [(b)]
Beta North	Long Hole drill rig	stationary	55	0.65	4428	974,160	92,045.88
	Drill rig	stationary	60	0.6	4428	1,062,720	100,413.68
	Load Haul Dumper	mobile	86	0.5	708.48	1,523,232	143,926.28
	Mobile Charging Unit	mobile	175	0.25	492	1,549,800	146,436.62
	Haul Truck	mobile	356	0.5	4428	4,729,104	446,840.90
	Utility Vehicle	mobile	30	0.2	246	132,840	13,983.05
	LDV	mobile	110	0.25	984	1,948,320	205,084.68
Frankfort	Long Hole drill rig	stationary	55	0.65	4428	487,080	46,022.94
	Drill rig	stationary	60	0.6	4428	531,360	50,206.84
	Load Haul Dumper	mobile	86	0.5	708.48	761,616	71,963.14

[79] Notes: (a) stationary versus mobile split based on equipment description

(b) all fuel assumed to be diesel, based on conversion from kWh to diesel consumption (38.1 MJ/litre, and 1MJ = 0.278 kWh)

Mine Area	Equipment type	Source type [a]	Engine Power (kW)	Load factor	Operational hours/annum	Energy demand (kWh/annum)	Diesel (litres/annum) [b]
	Mobile Charging Unit	mobile	175	0.25	492	774,900	73,218.31
	Haul Truck	mobile	160	0.5	4428	708,480	66,942.46
	Utility Vehicle	mobile	30	0.2	246	132,840	13,983.05
	LDV	mobile	110	0.25	984	974,160	102,542.34
CDM	Long Hole drill rig	stationary	55	0.65	4428	487,080	46,022.94
	Drill rig	stationary	60	0.6	4428	531,360	50,206.84
	Load Haul Dumper	mobile	86	0.5	708.48	761,616	71,963.14
	Mobile Charging Unit	mobile	175	0.25	492	1,549,800	146,436.62
	Haul Truck	mobile	160	0.5	4428	708,480	66,942.46
	Utility Vehicle	mobile	30	0.2	246	265 680	27 966.09
	LDV	mobile	110	0.25	984	974 160	102 542.34
Total fuel consumption (litres/annum)		**stationary**					**384 919.13**
		mobile					**1 700 771.47**

The South African CO_2eq emission factors (kg/tonne of fuel consumed) were used as provided in **Table 59**, with different emission factors for diesel and petrol mobile and stationary sources.

The total CO_2eq emission rate from the TGME operations for a single year is 2,091.45 tpa using supplied fuel consumption, and 6,907.22 tpa using the equipment list (**Table 59**). The main sources of GHG gas emissions from the TGME operations would be diesel fuel-use from mobile engines.

Decommissioning

As operations progress, the previously cleared areas that form part of the project will be rehabilitated resulting in a carbon sink gain. Even assuming rehabilitation uses the same indigenous vegetation, the carbon balance will not be completely restored. There may also be potential soil degradation due to stockpiling. However, there is insufficient data at this point to determine the decommissioning GHG emissions. This is likely to be equivalent or less than the construction phase, with the reestablishment of a carbon sink in the revegetation of the site.

Table 59: Greenhouse gas emission factors TGME consumption rates

Fuel	Source Type	CO_2	CH_4	N_2O	CO_2-e	Density	Consumption (based on fuel consumption)		CO_2-e	Consumption (based on equipment list)[a]		CO_2-e
		SA Emission Factors (kg/tonne)			(kg/tonne)	(kg/litre)	(litres/ annum)	(tpa)	(tpa)	(litres/ annum)	(tpa)	(tpa)
Diesel	Mobile source	3,341.08	0.19	1.29	3,727.08	0.85	391,414.87	330.75	1,232.72	1,700,771.47	1,437.15	5 356.39
	Stationary source	3,341.08	0.14	0.03	3,352.20	0.85	88,585.13	74.85	250.93	332,919.13	281.32	943.03
Petrol	Mobile source	3,160.08	0.1596	0.25992	3,240.69	0.75	-	-	-	-	-	-
	Stationary source	3,160.08	0.1368	0.02736	3,171.32	0.75	52,000.00	39.00	123.68	52,000.00	39.00	123.68
Blasting agents	Stationary source	0	0	0	1,300.00		1,610.00	1,610.00	484.13	1,610.00	1,610.00	484.13
TOTAL Emissions									**2,091.45**			**6,907.22**

Notes: [a] Petrol consumption and Blasting agents were taken from the supplied fuel consumption

The Project's GHG Emissions Impact

The GHG emissions from the project will be relatively low and will not likely result in a noteworthy contribution to climate change on its own.

The proposed operations will likely result in an increase in Scope 1 emissions for the IPPU sector, therefore, changing the national inventory's total annual CO_2-e emissions by between 2 091.45 tpa and 6 907.22 tpa during the operational phase. The TGME operations will contribute a between 0.01% and 0.02% to the total IPPU annual CO_2-e emissions.

Most of the South African policy is still in the planning phase; however, the project will likely not have to report on GHG emissions in the SAGERS reporting format once operational, but it may be in the future as DFFE develops more country specific emission factors. Should the mine report the annual CO_2-e to DFFE voluntarily it could assist with improving the accuracy of future National GHG inventories and developing country specific emission factors. The CO_2-e emissions will be below the SAGERS and Carbon Tax reporting as well as the pollution prevention plan requirement threshold of 100 000 t/a.

13.3.3 IMPACTS ON LAND USE AND SOIL POTENTIAL

The following impacts haven been identified by STS as part of the specialist study (STS (d), 2022).

13.3.3.1 SOIL EROSION

Parameters determining the extent and severity of soil erosion are highly complex, with water and wind as the main geomorphic agents, and soil erosion is largely dependent on land use and soil management and is generally accelerated by anthropogenic activities. In the absence of detailed South African guidelines on erosion classification, the erosion potential and interpretation are based on field observations as well as observed soil profile characteristics. In general, soils with high clay content have a high-water retention capacity, thus less prone to erosion in comparison to sandy textured soils, which in contrast are more susceptible to erosion.

The proposed development footprint is located on undulating terrain with steep slopes, which increases the erosion hazard. While the identified soils display a moderate susceptibility to erosion under current conditions, their susceptibility to erosion is likely to increase once the land is cleared for construction activities, and the soils will inevitably be exposed to wind and stormwater. Refer to **Table 65** for the impact significance ratings.

Impact Register Pre Construction	Construction	Operational
Potential poor planning leading to excessive or unnecessary placement of infrastructure outside the 83MR project boundary or the demarcated infrastructure areas leading to increased soils erosion.	Site clearing, removal and associated disturbances to soils, leading to, increased runoff, erosion and consequent loss of land capability in cleared areas.	Constant disturbances of soils, resulting in risk of erosion.
Potential frequent movement of digging machinery within lose and exposed soils, leading to excessive erosion.		

13.3.3.2 SOIL COMPACTION

Heavy equipment traffic during construction and operational activities is anticipated to cause soil compaction. The surrounding soils are not deemed highly susceptible to compaction due to their shallow nature and the indurated bedrock material, however mitigation measures would still be required to ensure that the impact is limited as far as practically possible. Soil compaction will likely potentially lead to:

- Increased bulk density and soil strength, reduced aeration and lower infiltration rate;
- Destroyed soil structure, causing it to become more massive with fewer natural voids with a high possibility of soil crusting; and
- Soil biodiversity is also influenced by reduced soil aeration. Severe soil compaction may cause reduced microbial biomass. Soil compaction may not influence the quantity, but the distribution of macro fauna that is vital for soil structure including earthworms due to reduction in large pores.

Pre-Construction	Construction	Operational
Potential poor planning leading to excessive or unnecessary placement of infrastructure outside the 83MR project boundary or the demarcated infrastructure areas leading to increased soils erosion.	Site clearing and associated disturbances to soils, leading to, increased runoff, soil compaction and consequent loss of land capability in cleared areas.	Constant disturbances of soils, resulting in risk of compaction
	Potential frequent movement of digging machinery and construction vehicles within lose and exposed soils, leading to excessive soil compaction	Using of excessively heavy equipment which leads to a more severe impact on soils

13.3.3.3 SOIL CONTAMINATION

The soils are considered equally predisposed to potential contamination, as contamination sources are generally unpredictable and often occur as incidental spills or leak for construction developments. However, strict waste management protocols as well as product stockpile management and activity specific and monitoring guidelines should be adhered to during the construction and operational activities.

If the management protocols are not well managed this will more likely lead to:

- Contaminants leaching into the soil and thus potentially rendering the soil sterile. reducing the yield potential of soils.
- Potential reduction of water quality used for irrigation and for livestock use.

Impact Register Pre-Construction	Construction	Operational
Potential poor designs of pollution control infrastructures, leading to leakages of hydrocarbons and petroleum substances resulting in the contamination of soil resources.	Spillage of petroleum hydrocarbons during construction of associated infrastructure.	Leaching of hydrocarbons chemicals into the soils, leading to alteration of the soil chemical status as well as contamination of ground water.
	Disposal of hazardous and non-hazardous waste, including waste material spills and refuse deposits into the soil.	Disposal of hazardous and non-hazardous waste, including waste material spills and refuse deposits into the soil.

13.3.3.4 LOSS OF AGRICULTURAL LAND CAPABILITY

The proposed project is not anticipated to result in a significant loss of agricultural land capability since most of the soils are shallow to support cultivate agriculture and they occur in a sloping terrain to allow movement of ploughing equipment. The loss is anticipated to be Medium without mitigation measures and Low with mitigation measures.

13.3.4 IMPACT ON GROUNDWATER

The following risks are generally associated with the mining:

- Lowering of the regional groundwater level to keep the mining operations dry.
- Impact on the regional groundwater quality because of seepage of contaminants from the mining site.
- Impact on the regional groundwater quality because of seepage of contaminants from waste bodies.

13.3.4.1 IMPACT ON GROUNDWATER QUALITY

The calibrated numerical model was used to assess the potential impacts from the Tailings Facility (TSF) on the groundwater quality and the potential impact on the Blyde River.

Based on the waste assessment, the leach testing results from the tailings material and the geochemical modelling (see Section 9.9.5), TDS was selected as a representative tracer to show potential contaminant migration. The source concentrations used in the mass transport model are based on the geochemical modelling, which is slightly higher than the concentrations from the leach testing.

The expected leachate concentrations from the tailings material for the operational as well as post-closure phases are shown in Table 60**.** It is evident from the geochemical study that the quality of the leachate does not pose a risk to the groundwater. The source concentrations for TDS and sulphate exceeds the WUL limits, but not the SANS 241 Drinking water limits.

Table 60: Source term concentrations

Parameter	Abbreviation	*Units*	Value
Existing Tailings			
pH	pH	*pH units*	7.6
Total dissolved solids	TDS	*mg/L*	2299
Sulphate	SO_4		1547
Calcium	Ca		683
Copper	Cu		1.6
Iron	Fe		<0.001
Magnesium	Mg		32
Manganese	Mn		<0.001
Potassium	K		0.2
New Tailings			
pH	pH	*pH units*	8.2
Total dissolved solids	TDS	*mg/L*	105
Sulphate	SO_4		19
Calcium	Ca		25
Copper	Cu		<0.001
Iron	Fe		<0.001
Magnesium	Mg		1.1
Manganese	Mn		<0.001

According to the geochemical modelling the TDS concentrations at source are 2299 mg/L for the existing tailings and 105 mg/L for the new tailings. The high modelled TDS concentration is significantly higher than the leach test TDS concentrations of 396 mg/L and 436 mg/L for the two tailings samples.

Using a source TDS concentration of 2299 mg/L in the numerical model is not supported by the concentrations in the monitoring boreholes. The TDS concentrations in the groundwater monitoring boreholes closest to the TSF are 496 mg/L (BGW6) and 476 mg/L (TSF04). The input source concentration was therefore changed during the mass transport model calibration until the concentrations in the boreholes are mimicked by the model.

The calibrated TDS concentrations that were finally used to define the source term concentrations (tailings) as input into the mass transport model are as follows:

- Operational TDS concentration: 860 mg/L.
- Post-closure TDS concentration: 540 mg/L.

The calibrated source concentrations are an indication that the geochemical model is conservative and probably an overestimate of the actual impact concentrations.

It is important to note that these concentrations are significantly less than the SANS 241 (2015) drinking water limits of 1200 mg/L.

The current impact is illustrated in **Figure 57.** Groundwater flow appears most prominent along the dyke that was identified during the geophysical study and subsequent drilling. Typically, a river would act as a groundwater flow barrier, but it was established in this instance that the Blyde River is a losing river. As a result, the “contaminant” plume continues to migrate past the river. The term “contaminant plume” is loosely used to illustrate leachate seepage from the TSF. The potential contaminant concentrations in the source are very low based on the waste assessment and geochemical assessment. Therefore, there is currently no impact on the Blyde River. Previous assessments of the water quality in the Blyde River confirm this finding.

Figure 129 shows the plume migration after 100 years. This shows even less potential impact on the Blyde River. The reason for this is primarily due to a lower source term concentration that will come into effect when the new tailings are deposited. The new tailings contain significantly lower contaminant concentrations resulting in an improved leachate quality.

Although the perceived impact from the TSF is low, the most effective solution to contain any contamination that may be detected, is through scavenger boreholes. **Figure 130** shows the plume distribution after 50 years when pumping the shown scavenger boreholes at a rate of 1 l/sec.

The simulated impacts from the TSF show negligible impacts. These simulations were done **without any liner system**. The mine, however, proposes to install a Class C liner on top of the existing tailings as well as under the extension, prior to commencing with further disposal. The benefit of such a liner is that it will minimise any further seepage from the TSF, and it is expected that the current contaminant concentrations in the groundwater will dissipate naturally over time (see **Figure 129**).

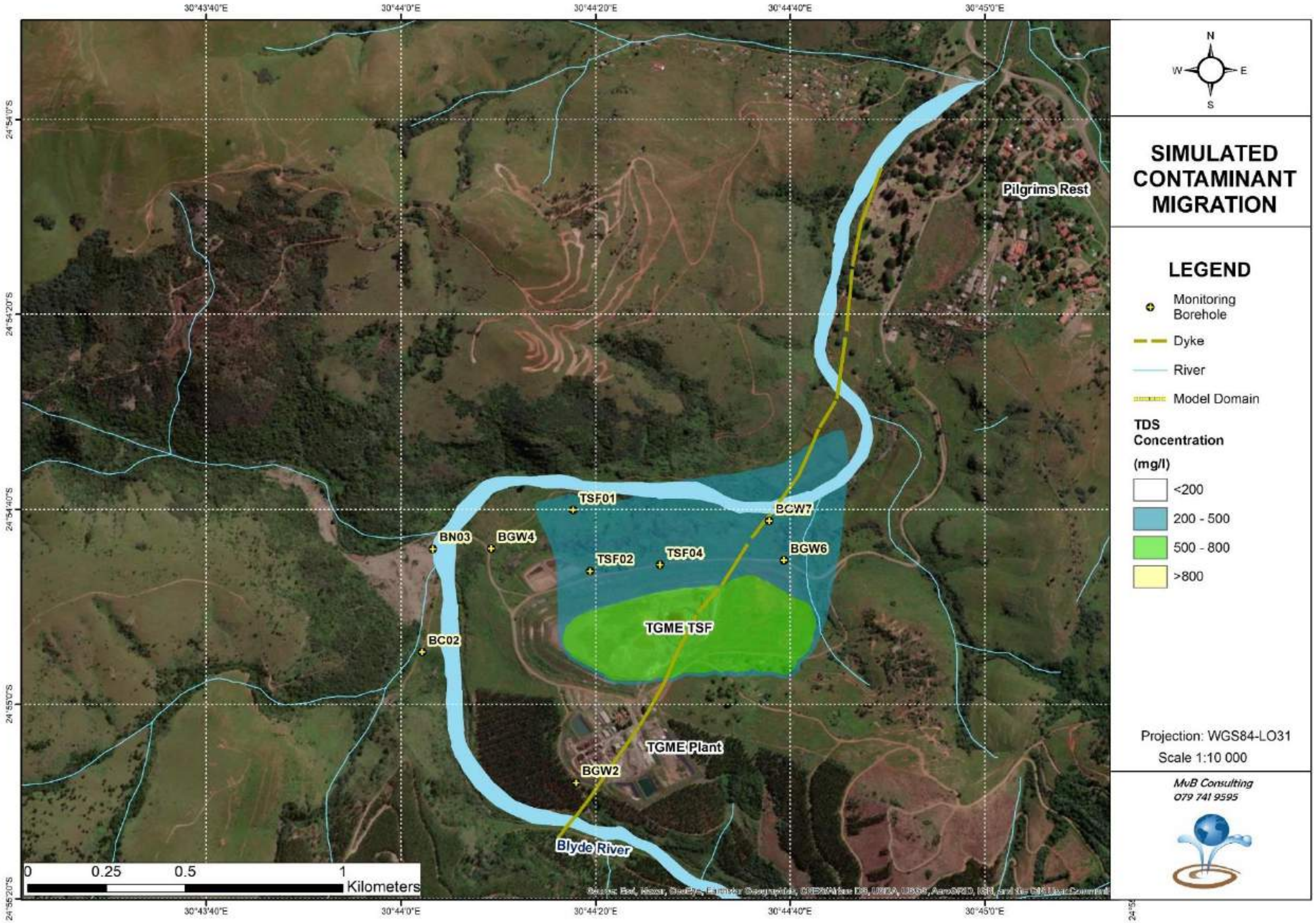


Figure 129: Simulated impact from the TSF in 100 years – No rehabilitation

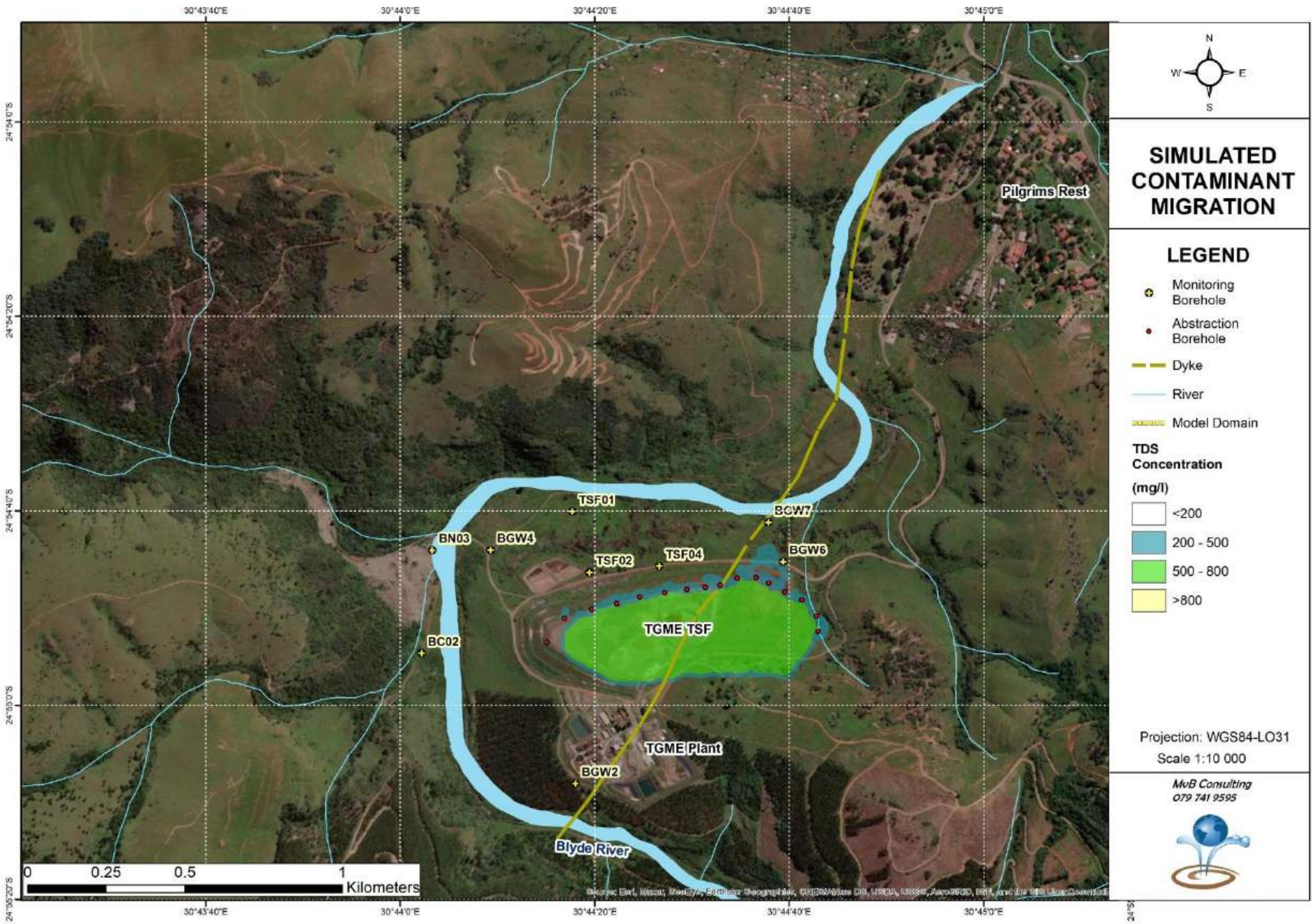


Figure 130: Simulated impact from the TSF in 50 years – Rehabilitated

13.3.4.2 IMPACT ON GROUNDWATER QUANTITY

The historical mining intersected some water during its operations. **Figure 131** shows the localities of the adits where water flows from the mine workings and includes the following:

- Beta Adit: Estimated flow 1 350 m^3/day.
- Morgenzon Adit: Estimated flow 80 m^3/day.
- Dukes Adit: Unable to assess due to illegal mining activity.
- Frankfort Mine: No information.

The current inflow volumes have not been measured accurately, but the estimated flow from the Beta mine is considered the most accurate. The calculations in this report are largely based on the current inflow, represented by the outflow from Beta adit, into the Beta mine.

Two methods were used to calculate the expected groundwater inflow at the end of mining. Both methods require the areas that were mined and proposed to be mined.

The proportional method is simply dividing the current water inflow by the area mined and proportionally projecting the litres/m^2 to the proposed mining area. The results from the Proportional Method are presented in Table 61.

Table 61: Estimated groundwater inflow – Proportional calculation

Mine	Area mined	Proposed Mining	Groundwater Inflow		Additional Inflow	Total Estimated Inflow
	(m^2)	(m^2)	(m^3/day)	(lit/m^2)	(m^3/day)	(m^3/day)
Beta	1 423 344	883 741	1 350	0.95	838	**2 188**
Clewer-Dukes-Morgenzon	1 045 463	332 579	1 000	0.96	318	**1 318**
Frankfort	190 132	360 517	200	1.05	379	**579**

The second method is more scientific and uses the Darcy equation for vertical flow. The equation is as follows:

$$Q = KiA = K\left(\frac{h + h_0}{h_0}\right)A$$

Where:

Q = flow in m^3/day.

K = Hydraulic Conductivity in m/day/.

I = groundwater gradient.

A = area in m^2.

In this method the flow at the Beta Adit was used as this is considered relatively accurate. The gradient is taken as 1 since the flow is vertical into the mine and the area is based on the measured historical mining. Based on this information the hydraulic conductivity (K) is calculated as 1x10^{-2} m/day. This K-value was also used in the other two mining areas to determine the current and future groundwater inflow.

The results from the Darcy flow assessment are presented in Table 62.

Table 62: Estimated groundwater inflow –Darcy flow calculation

Mine	Area mined	Proposed Mining	Groundwater Inflow	Additional Inflow	Total Estimated Inflow
	(m^2)	(m^2)	(m^3/day)	(m^3/day)	(m^3/day)
Beta	1 423 344	883 741	1 423	884	**2 307**
Clewer-Dukes-Morgenzon	1 045 463	332 579	1 045	333	**1 378**
Frankfort	190 132	360 517	190	361	**551**

The Darcy flow calculation indicates slightly more groundwater inflow than the proportional method but is considered more accurate.

The continuous inflow of groundwater into the mine may lead to an impact on the groundwater levels overlying the mine workings. The simulated groundwater level impacts (drawdown >0.1m), to account for the estimated inflow, are shown on **Figure 131**. The impacts are localised and not expected to be noticeable.

The current flow volumes are relatively low, considering that the mines are situated within a dolomite aquifer. There is potentially a risk that larger groundwater inflows, associated with geological structures such as faults and dykes or even cavities. Measures will have to be put in place to manage this risk.

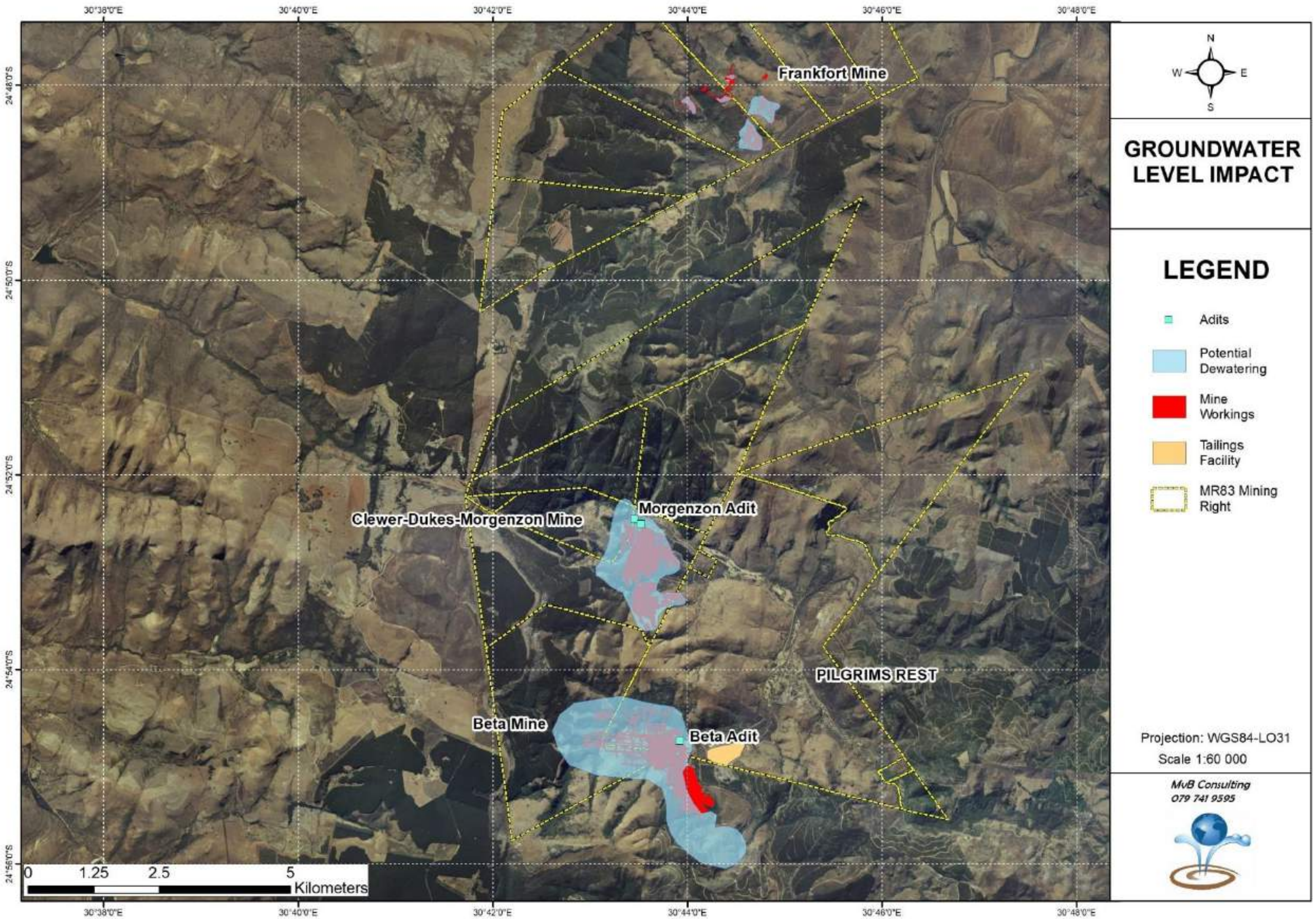


Figure 131: Estimated groundwater level impact area

13.3.5 AQUATIC ECOLOGICAL IMPACTS

Numerous freshwater ecosystems, including the Blyde River, the Peach Tree Stream, Clewer Creek and the Molototse River, as well as numerous smaller drainage systems and tributaries of these systems, were identified within and in the vicinity of the 83MR areas. These freshwater ecosystems were assessed in order to define their ecological condition, importance and sensitivity, and provisioning of goods and services (i.e. ecological functioning and socio-cultural benefits). The various freshwater ecosystems were found to be of high ecological importance and sensitivity, and to provide intermediate to moderately high levels of various ecological services such as biodiversity maintenance (especially in the upper reaches of systems [with special mention of the Blyde River] where disturbances were fewer), flood attenuation, assimilation of nutrients and toxicants and streamflow regulation. As a result of the increased ecological integrity and the degree to which ecoservices are provisioned, all systems were deemed to be of moderate to high ecological importance and sensitivity. Sensitivity maps and layout overlays are shown in **Figure 79** to **Figure 85**.

The aquatic assemblages of the various rivers and streams assessed (i.e. the Blyde River, Clewer Creek and the Molototse River) of the assessed sites can be defined as being extremely sensitive to water quality changes as well as changes in flow regimes, with these two parameters also considered to be the most important ecological parameters in the Blyde River system (affected by both natural seasonal variation as well as existing anthropogenic impact) with more significant influence from the changes in flow regime. Species of concern, the Treur River Barb (*Enteromius cf treurensis*) (Critically Endangered) can potentially be impacted by the project, however further investigation is required.

The temporal and spatial results of the aquatic ecological assessment indicate that the integrity of the Blyde River, while still largely classified overall as an Ecological Category B along the entire portion of the Blyde River assessed, has begun to decline in a downstream direction over time. This decline may be largely related to the surrounding land-use activities, including forestry, illegal artisanal mining activities, seepage and runoff from historical mining areas, increasing urbanization and proliferation of alien and invasive species (resulting in altered surface runoff into the river), and the ingress of sewage related to the Pilgrims Rest waste water treatment works (WWTW). The illegal artisanal mining activities observed has resulted in severe sedimentation in some areas and may potentially have contributed to blanketing of benthos and algal proliferation in a downstream direction, which has begun to compromise the habitat integrity and water clarity of the Blyde River in a downstream direction.

Construction related activities that will be undertaken, include the removal of topsoil and clearing of vegetation, even though limited in extent due to areas being previously disturbed. The construction of these facilities may potentially lead to destruction or alteration of habitat, in turn leading to loss or alteration of ecological structure and indirect impacts on fresh water ecosystems. Clearing of vegetation prior to construction, and ongoing disturbances during operational activities will result in exposed soils. This, combined with the steep slopes, will, in turn, increase the risk of erosion and potentially sedimentation of downgradient freshwater ecosystems.

Impacts on the freshwater ecosystems will potentially lead to a loss of migratory routes for faunal species, impacts to water quality, and loss of recharge to downstream reaches. These activities, if not effectively mitigated, may result in long term to permanent impacts on portions of freshwater ecosystems which are directly affected (for example, road crossings over the Peach Tree Stream), and potentially extend to downstream/downgradient areas (nearly all surface infrastructure areas are located upgradient of freshwater ecosystems). Potential impacts in the vicinity of the Beta north surface infrastructure which encroaches on the 1:100 year floodline of the Blyde River are additional considerations and is an aspect that requires extensive mitigation.

Operational activities may result in the contamination of soils and groundwater with specific mention of increased salt loads and contamination by specific Chemical Pollutants of Concern (CPC's), as well as ongoing disturbances to soil leading to increased sediment loads, possibly leading to contamination of surface water within the freshwater ecosystems associated with the various UG areas, in turn potentially leading to the alteration or loss of habitat for floral and faunal species associated with these freshwater areas.

From a hydropedological point of view, no significant impact from the proposed mining project (on the freshwater ecosystems) is foreseen due to the dominance of shallow responsive soils which are event driven. No interflow soils were identified within the UG areas, thus contribution of vadose zone to the freshwater ecosystems is limited. Although impact is anticipated to be low, if mitigation measures are carefully implemented, the impact significance can be further reduced to ensure that there is a minimised net loss of catchment yield to the freshwater ecosystems of the region.

Post-closure seepage and decant is likely to impact the water quality of the Blyde River for a long duration until water quality rebounds to natural conditions and it is likely that a number of sensitive species observed during the seasonal studies carried out may be lost. It is therefore considered critical that should the proposed mining project be authorised, very strict adherence to cogent, well-developed mitigation measures must take place throughout the life of the project, with specific mention of planning, separation of clean and dirty water, management of potential decant, dewatering and sedimentation of the receiving environment as well as, during closure, rehabilitation of affected areas. In addition, it is deemed essential that immediate control of the illegal artisanal mining take place to prevent further significant impact.

Activities which are likely to negatively affect the freshwater ecosystems associated with the various UG areas include, but are not limited to, the following:

- Placement of infrastructure within preferential surface water flow paths or the floodline (for example, the surface infrastructure associated with Beta north) and freshwater ecosystems with riparian vegetation (albeit largely limited to linear infrastructure);
- Stripping (vegetation clearance) of surface infrastructure areas and disturbances to soil prior to construction of infrastructure and ongoing disturbances to soil during the operational phase;
- Potential destruction of freshwater ecosystem habitat during construction and operational activities;
- Construction of hard standing areas that increase runoff volumes, including roads, buildings and paved areas;
- Canalisation of run-off may potentially lead to the creation of supercritical flows, which would lead to erosion and incision of drainage systems affected. Furthermore, the mobilised sediment would lead to sedimentation in the receiving environment which in turn would affect habitat integrity and aquatic biota. This is particularly significant in the case of the perennial rivers in the region since the biota of these systems are particularly reliant on clear fast flowing water flowing over a rocky and or gravel substrate, clear of fine sediment for foraging breeding and cover. Furthermore, the fish community of the systems are reliant on the availability of deeper refugia which can become silted up if the catchment is excessively disturbed and not appropriately managed;
- Discharge and/or spills and seepage from mining surface infrastructure;
- Construction of clean and dirty water separation areas leading to a loss of catchment yield; and
- Build-up of contaminants in sediments leading to the creation of a sediment sink and chronic source of potential water contamination.

The freshwater ecosystems located within, and downgradient of the proposed mining activities remain at risk due to the proposed activities. Additionally, should any rehabilitation of historical mining areas be undertaken prior to or concurrently with the proposed mining activities, care must be taken during the rehabilitation process to ensure that further impacts on the freshwater ecosystems do not occur as a result.

13.3.6 TERRESTRIAL IMPACTS

13.3.6.1 FLORA

Impact on Floral Habitat and Diversity

The data gathered during the site visit indicate that the Transformed Habitat sub-unit (Degraded Habitat) is of Low sensitivity, the AIP-dominated Vegetation (Degraded Habitat), Riparian Woodland of Beta North (Freshwater Habitat Unit), and Valley Habitat (historically impacted) of Moderately low sensitivity, the Watercourse Habitat sub-unit & Riparian Woodlands of Dukes and Morgenzon (Freshwater Habitat Unit), Valley Habitat Unit, and Woodlands of Beta North, Dukes and Morgenzon (Woody Communities) of Intermediate sensitivity, the Riparian Forests & Riparian Woodland of Dukes (Freshwater Habitat Unit) and intact Woodlands associated with Dukes and Frankfort (Woody Communities) of Moderately high sensitivity, and the Indigenous Forest (Woody Communities) of High sensitivity.

The largest of the proposed footprint will be in the Transformed Habitat and AIP-dominated Vegetation which will not result in impacts on indigenous vegetation, nor will it result in the direct loss of habitat that is considered important for sustaining floral ecology in the area. Of concern regarding activities in these sub-units are the potential for edge effects on adjacent or nearby, natural habitat. Stormwater management, erosion control, and the control of AIPs will be of the utmost importance to ensure adverse impacts stemming from activities in these habitat sub-units do not result in loss of more sensitive habitat. Smaller/ more localised footprints are associated with the Valley Habitat Unit and the degraded Woodland sub-unit. Although activities in these units will result in the loss of indigenous vegetation, the impact on floral ecology stemming from direct loss of habitat and species will be minor. This is not just due to the smaller extents of footprints in these units, but also due to the impaired or diminished habitat integrity of these units. Neither the Valley Habitat Unit nor the degraded Woodland sub-unit are representative of the reference vegetation types, e.g., the degraded Woodland sub-unit has developed in response to historic anthropogenic disturbances (previously grasslands), whereas the surrounding anthropogenic activities have resulted in altered floral communities and a high incidence of AIPs within the Valley Habitat.

Some clearance of intact Woodland habitat is proposed; however, this will be of limited extent and includes the sections of Woodland that have been fragmented from the larger Woodland communities. Where linear developments will impact on the Woodland habitat along steeper sloped sections of Frankfort, erosion control will be required. No habitat associated with Indigenous Forests will be cleared; however, the proposed activities will occur in the 30 m DFFE forest exclusion buffer. Impacts to forest dynamics will need to be managed if the activities are authorised within the 30 m buffer zone, i.e., gaps in the forest should be avoided, no wood collection from the forests, and AIPs must be controlled.

Apart from the construction of crossings, the freshwater habitat has been excluded from the proposed activities. With no significant direct impacts anticipated, the indirect impacts from potential leaks or pollution of freshwater systems, poor stormwater and/or erosion control, and spread of AIP species poses the biggest threat to habitat integrity of the Freshwater Habitat unit. The current illegal mining activities associated with mainly Beta North, Dukes, and Morgenzon, have impacted negatively on water quality and even direct diversions of streams.

With the proposed activities occurring mainly within areas that are already disturbed, degraded, and/or transformed, the anticipated impacts from the proposed mining activities will not be detrimental or significant, given that mitigation measures are implemented.

Activities which are likely to negatively affect the floral habitat integrity of the 83MR project areas includes, but are not limited to, the following:

- Placement of infrastructure within natural habitat outside of the authorised footprint;
- Destruction of floral habitat during construction and operational activities;

- AIP proliferation and erosion in disturbed areas;
- Increased human movement, leading to greater pressure on natural floral habitat and increasing the potential for harvesting of protected floral species; and
- Alteration of hydrology and runoff patterns if storm water management is inadequate.

Impacts on Floral SCC

The potential for the proposed activities to impact directly on floral SCC is low. No SCC were recorded within the direct footprints, although MNCA-protected species such as Aloes and orchids may be impacted. The greatest threat to floral SCC will be the potential harvesting of species.

A walkdown of the footprint area is recommended to confirm the absence or presence of protected species for which permit applications would be required. If any SCCs are encountered within the proposed footprints and avoiding impacts to the species are deemed unlikely, it is recommended that a rescue and relocation plan be devised, or permits be acquired to destroy such species. Authorisation to relocate such species must be obtained from the MTPA or the DFFE.

Activities which are likely to negatively affect the flora of conservation concern within and around the 83MR Areas include, but are not limited to, the following:

- Destruction, removal or harvesting of nationally and/or provincially protected species during construction and operational activities; and
- Potentially poorly implemented and monitored rescue and relocation of eligible SCC (only feasible for Aloe species) that will be affected by the proposed project, leading to unsuccessful rescue efforts and loss of SCC individuals.

Impact on CBAs, ESAs, Threatened Vegetation and Protected Areas

The proposed development will impact on the EN Malmani Karstlands threatened ecosystem, CBAs, ESAs, Forests and a protected area; however, CBAs and ESAs were only confirmed for the Indigenous Forest Habitat, intact Woodland, and Freshwater Habitat, for which little to no impacts from the proposed activities will result. The EN Malmani Karstlands are associated with the grassland vegetation types in the area which were not represented within the 83MR Areas. Forests will not be impacted directly, however activities will take place in the 30 m DFFE recommended exclusion buffer. Strict mitigation of edge effects in the buffers will be required to prevent adverse impacts on forests.

Dukes occurs in the Morgenzon Forest Nature Reserve. No mining related activities are permitted in a NR - As per Section 48(1)(a) of NEMPAA, "*despite other legislation, no person may conduct commercial prospecting, mining, exploration, production, or related activities (a) in a special nature reserve, national park, or nature reserve*". However, given that the proposed activities in Dukes will occur in Degraded Habitat, no additional loss of habitat in the Morgenzon Forest Nature Reserve is anticipated. It is highly recommended that rehabilitation post-closure aims to reinstate vegetation representative of the reference vegetation types of the area – as far as is feasible – and that during mining and post-closure, the presence of AIPs be controlled. A net gain in biodiversity can result post-mining, which will prove favourable for achieving biodiversity targets in the Forest Nature Reserve.

Probable Latent Impacts

Even with extensive mitigation, latent impacts on the receiving floral ecological environment are deemed likely. The following points highlight the key latent impacts that have been identified:

- Permanent loss of floral habitat;
- Permanent loss of and altered floral species diversity;

- Edge effects such as further habitat fragmentation and AIP proliferation;
- The ongoing loss of SCC/protected floral species and suitable habitat for such species; and
- Disturbed areas not rehabilitated to an ecologically functioning state resulting in the loss of floral habitat, species diversity and SCC/protected floral species.

13.3.6.2 FAUNA

The perceived impact significance of the proposed mining development and activities on faunal habitat, diversity, and SCC ranges from moderate to low significance without mitigation. Should mitigatory measures not be implemented, impacts can be reduced to low and negligible levels, considering that much of the proposed infrastructure is located in already transformed areas. Increased impact significance prior to mitigation is largely based on the assumption that mitigation measures will not be implemented, that areas outside of the proposed development footprint will also be cleared and that no rescue and relocation, rehabilitation or alien plant control plans will be implemented. When factoring in the mitigation measures stipulated within this report the overall anticipated impacts decrease to low/acceptable levels, especially considering that the majority of the mining infrastructure will be located in old mining footprint and areas that have already been compromised and contain little value from a faunal perspective.

Impact on Faunal Habitat and Diversity

Much of the proposed mining infrastructure will be located in the Transformed habitat, a habitat that is of very little value to faunal species. Portions of the proposed infrastructure areas will however extend into the surrounding habitats, though, the footprints of these is notably small and not expected to have a significant impact on faunal species diversity. It is noted that portions of the linear structures, roads, pipelines, fences etc. do intersect areas of increased sensitivity. Habitat clearance in these areas of increased sensitivity is concerning, however, given the small extents of the proposed clearing and with mitigation measures implemented, it is unlikely that there will be a significant impact to faunal species.

Impacts on Faunal SCC

One faunal SCC, namely *Rhinolophus blasii* (Blasius's Horseshoe Bat, NT), was observed in an old adit located to the north of the proposed Morgenzon mine, outside of any potential disturbance footprint. Several other faunal SCC may also occur either within or adjacent to the proposed mining footprints. It is however important to note that none of the SCC are likely reliant on the proposed footprint areas, likely only foraging in the areas or moving through the proposed mining areas as they form part of a larger home range of a species. Impacts to faunal SCC from the proposed mining activities is expected to be limited given the mine locations, small overall footprints and already impacted areas. Provided all mitigation measures are implemented, impacts to faunal SCC are likely to be manageable and not detrimental to SCC.

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. It should be noted, however, that these impacts are also a result of the already degraded state of the environment due to the historic mining activities in the areas as well as the current illegal mining activities.

- Continued degradation of natural habitat adjacent to the proposed mining footprint as a result of edge effects;
- Altered faunal species diversity;
- Potential loss of faunal abundance in the local area;
- Edge effects such as further habitat fragmentation and AIP proliferation; and
- Disturbed areas are highly unlikely to be rehabilitated to baseline levels of ecological functioning and loss of faunal habitat and species diversity may be long term.

13.3.7 IMPACT ON VISUAL ENVIRONMENT

The sections below serve to summarise the significance of potential visual impacts that may occur as a result of the proposed project.

Landscape Character and Sense of Place

The character of the landscape associated with the 83MR areas can be described as semi-rural, with the exception of Frankfort which is considered rural. The area is characterised by mountainous landscape, with open grassland, indigenous forests, woodlands, commercial forestry plantations and freshwater habitats (as discussed under Section 9.10.2). The above mentioned characteristics along with the man-made elements provides significant visual variety and diversity within the greater Pilgrim's Rest area and within the 83MR Areas. The proposed mining activities will have a high negative visual impact on the sense of place of the area, especially for hikers utilising the Lost City Hiking Trail within the Mount Sheba Private Nature Reserve (PNR) and a moderate negative visual impact for people residing in and visiting the town of Pilgrim's Rest. It should however be stated that historic mining activities have taken place in and around the 83MR Areas, where remains of existing infrastructure, adits and tailings facilities are present. It should also be stated that Pilgrims rest and its tourism is based on the history of mining in the area. The surrounding area have therefore previously been exposed to visual disturbance associated with mining activities. Additionally, current illegal artisanal mining activities at old adits in the Pilgrim's Rest and Sabie region are taking place which is leading to larger unmanaged impacts.

Due to the undulating terrain associated with the 83MR Areas, and the vegetation cover (forests, woodland and commercial plantations) within the landscape, the distance from which the mining activities will be observed is restricted to sensitive receptors located within 0–2 km radius of the 83MRAreas. Even then, the view of some sensitive receptors situated within that range are partially or completely obscured by local vegetation, terrain and man-made structures.

Visual Intrusion and Visual Absorption Capacity (VAC)

It may be concluded that the landscape in its current state provides a positive viewing experience, with panoramic mountainous views, and that the proposed mining development may result in a reduction of this landscape character type within the local area, mostly to tourists driving along the paths. Visual observations of the 83MR Areas however requires knowledge of the exact locations of the proposed 83MR Areas, as such motorists will not directly observe the proposed mining activities in the landscape. Furthermore, the Mpumalanga Province is associated with existing mining activities, which already negatively affects the landscape character of the region on a provincial level. The Pilgrim's Rest area, however, has fewer mining activities and more commercial forestry plantations which are periodically harvested, resulting in negative viewing experiences of bare ground, logs and tree stumps at various times throughout the year.

Furthermore, historic mining infrastructure such as old mining shaft infrastructure, PCDs, TSF, and waste rock dumps are present in the area, forming part of the heritage and tourism attraction of the area. No authorised mining is taking place within the 83MR Areas, however illegal mining is currently taking place and the existing TGME metallurgical plant, offices and TSF at the Beta North Area are still in use and will form part of the operational activities of the proposed project. The proposed project will be in keeping with the historic artisanal and underground mining activities of the area, and the proposed surface infrastructure will be placed in already disturbed footprint areas.

The VAC of the area is considered high, indicating that the proposed project will be absorbed in the area. The main contributing factor of the high VAC is the vast mountainous terrain, obscuring most of the views down the valleys where the proposed mining activities are located. Additionally, the indigenous forests, commercial plantations and woodlands in the surrounding areas as well as tree lines along the roads, further assist in screening the proposed mining activities from sensitive receptors.

By definition the Beta North Area is located in the further extent of the foreground of the town of Pilgrim's Rest, and the Dukes and Morgenzon Area are located in the middle ground, due to its close proximity to the town, however with the town situated in a valley surrounded by hills, and local vegetation associated with the town, the proposed Beta North, Dukes and Morgenzon Areas are not visible from the majority of the town of Pilgrim's Rest. It should however be noted that the entire Beta North Area will be highly visible from the Mount Sheba hiking trial, especially from the S3 viewpoint of the Lost City Hiking Trail, while portions of the Dukes and Morgenzon Areas are likely to be visible from there.

Landscape Quality and Value

The landscape value is considered high. This is due to the mountainous terrain associated with the 83MR Areas forming part of the panoramic scenery and tourist attraction of the greater Pilgrim's Rest region. Since the town of Pilgrim's Rest and the Blyde River – Bourke's Luck Potholes is a main tourist attraction of the Mpumalanga Province it contributes to the high scenic landscape quality and value of the area.

The Municipality Spatial Development Framework identifies Pilgrim's Rest and the surrounding area as a protected provincial heritage site and an important tourism node within its area of jurisdiction (SDP, 2007), which is richly imbued with a diversity of natural, cultural and historic gems. The proposed mining activities might add to the tourism experience for certain tourists interested in mining, although these individuals are considered the minority.

The cultural landscape qualities of the region essentially consist of two components: the first is a limited pre-colonial (Stone Age and Iron Age) occupation. The second component is a rural area in which the human occupation consists of two elements. The first element discovery of gold during the late 19th century resulted in a flood of people entering the area, establishing gold mining activities all over the landscape. The second element is a rural farming community, which, since the early 20th century revolved around forestry, which altered the large portions of the landscape beyond recognition. These two elements led to the establishment of a number of smaller towns in the region, all which are now part of an ongoing tourism industry.

Additionally, EDM plays a dominant role in tourism in Mpumalanga hosting popular tourist destinations including the Kruger National Park (KNP) in the Bushbuckridge Local Municipality as well as numerous prime tourism attractions located in Thaba Chweu Municipal area (e.g. Pilgrim 's Rest, God's Window in Blyde River Canyon, Three Rondawels, Bourke's Luck Potholes, Mac Falls). Thaba Chweu furthermore hosts numerous events throughout the year that attracts both local residents and visitors to the area including the Long Tom Marathon, Subaru/Ashburton Sabie Classic Mountain Bike race and Sabie Forest Fair (Thaba Chweu, 2016).

The 83MR Areas are likely to be most valued by tourists, hikers, local residents within the town of Pilgrim's Rest and Graskop, as well as visitors to the Mount Sheba Nature reserve, particularly the Lost City hiking trial, businesses gaining monetary value from the tourists visiting the town, workers residing in villages and companies invested in the town. Since the area is of national cultural and heritage importance the landscape value of the area is considered high, and thus the proposed mining activities and mining infrastructure is likely to lower the landscape value of the area.

Key Observation Points

Key Observation Points (KOPs) were identified based on prominent viewpoints, where mostly uninterrupted views of the proposed 83MR Areas are expected to occur. The KOPs were selected within 2 km of the proposed project, as visual receptors beyond this distance are unlikely to be affected. KOPs were also selected to be representative of a larger area, such as a section of a roadway or larger village, where required.

Conceptual visual simulations were rendered from the KOPs selected for the proposed project with the location of KOPs indicated in **Figure 132**. All photographs were taken towards the proposed 83MR Areas and the visual simulations are presented as the project is envisioned in its pre-mitigated state. With appropriate mitigation and management measures put in place as outlined in Section 5 of this report, with specific emphasis on limiting vegetation clearing wherever possible, implementing dust and lighting control measures, and ensuring that progressive rehabilitation takes place and considering overall appearance, the visual impact may be reduced.

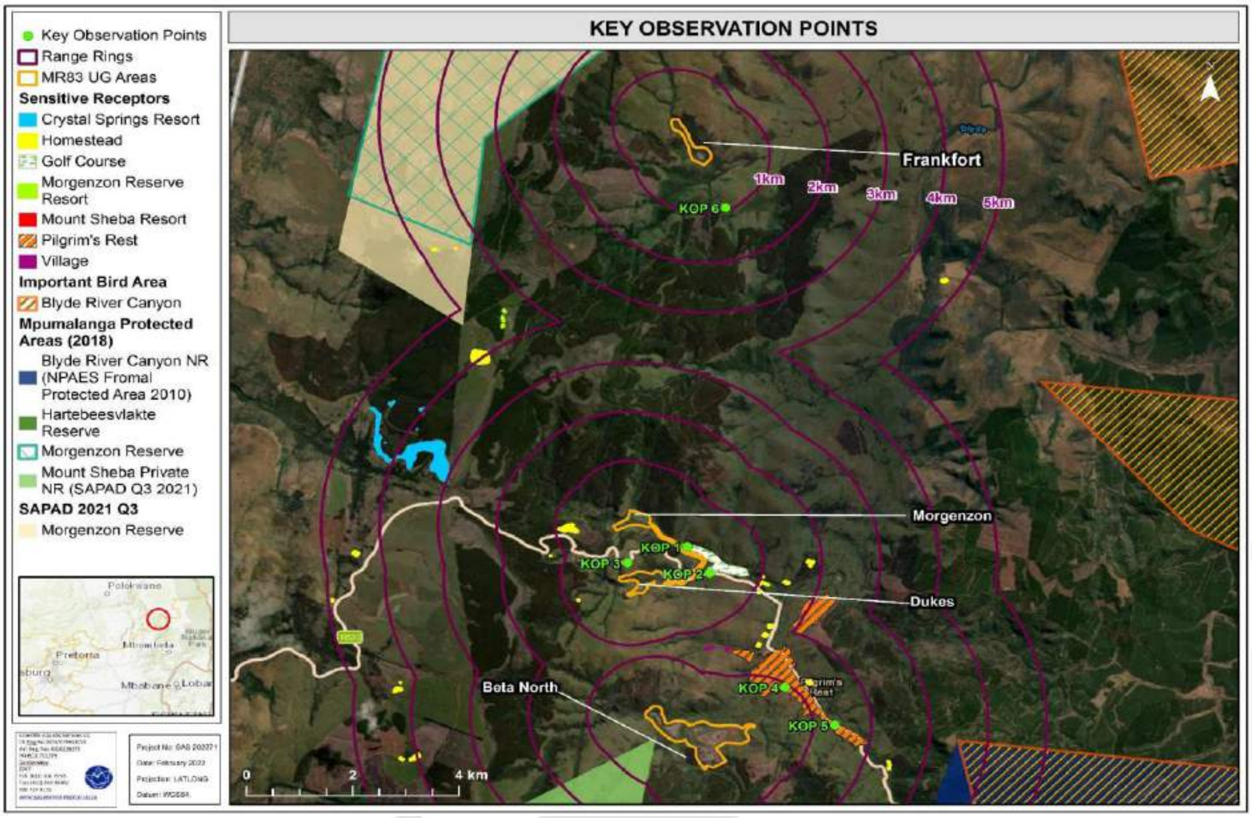


Figure 132: Key observation points identified

Table 63: Conceptual rendering of the view from key observation points

Location and description	Conceptual rendering
Conceptual rendering of the view from KOP1 where the Morgenzon Area (dashed red arrow) will not be visible from the Pilgrim's Rest Golf Course, due to the hill providing screening.	

Location and description	Conceptual rendering
Conceptual rendering of the view from KOP2 where the Dukes Area (red arrow in top photo) will be visible in the distance from the R533 road, however not significantly visually intrusive, due to it situated on the foothill, thus the mountainous terrain partially screens the view.	 
Conceptual rendering of the view from KOP2 where the Morgenzon Area (dashed red arrow) will not be visible in the distance from the R533 road	

Location and description	Conceptual rendering
Conceptual rendering of the view from KOP3 where the Dukes Area (red arrow) will be visible in the distance from this point on the R533 road. With the momentary view of motorists, the mountainous terrain and without the knowledge of the exact location, the Dukes mining activities will not be significantly visually intrusive on the R533 road	
Conceptual rendering of the view from KOP4 where the Beta TSF (existing and expansion) (red arrow) is visible from the downtown area of Pilgrim's Rest due to its close proximity. With the existing TSF already having well established vegetation the visual intrusion will be moderately low for the proposed expansion. The other mining infrastructure will however not be visible from this point due to the mountainous terrain.	
Conceptual rendering of the view from KOP5 where the Beta Area will not be visible due to the hill obscuring the view of motorists traveling along the R533 going through the town of Pilgrim's Rest	

<table>
<tr><th>Location and description</th><th>Conceptual rendering</th></tr>
<tr><td>Conceptual rendering of the view from KOP6 where the Frankfort Area will be visible in the distance from the forestry road, particularly the waste rock dump, pollution control dam and the DMS plant.</td><td>
</td></tr>
</table>

Visual exposure and visibility impact relates directly to the perception of sensitive visual receptors towards the proposed project. Highly sensitive visual receptors have been determined to primarily comprise residents and tourists of the town of Pilgrim's Rest, hikers on the Lost City Hiking Trail, while moderate sensitive receptors are road users of the R533 and various gravel roads in and around the 83MR Areas, and people at their place of work are considered low sensitive receptors. Visual exposure will take place directly as portions of the Morgenzon, Dukes and Beta North Areas, which includes vegetation clearing and infrastructure, will be visible from certain vantage points within the town of Pilgrim's Rest, the R533 road and the Lost City Hiking Trail. Indirect visual exposure includes fugitive dust generated by construction and operation related activities, such as earthwork activities and construction and operational vehicles driving on dirt roads, altering the visual environment. Additionally, impacts from potential erosion as a result of bare soils, and alteration of landscape morphology will also create a noticeable contrast in the landscape and will be visible to receptors.

Night Time Lighting

Lighting associated with the proposed mining project may be visible during both day and night, but lighting is only likely to have a visual impact during the night time. Lighting may be visible for significant distances and indirect lighting impacts, such as sky glow (the scattering of light in the sky) and glare may reduce the night sky quality at locations some distance from the light sources.

The 83MR Areas, in its current state, contains limited sources of night-time lighting in the area associated predominantly with the TGME mine office. Furthermore, the close proximity of the town of Pilgrim's Rest further contributes to the effects of skyglow and affects the intrinsically dark atmosphere of the area. With the Frankfort Area being remote, there are no sources of night-time lighting, as such the lighting environment associated with the Frankfort Area can be described as intrinsically dark. The proposed mining activities at the Frankfort Area, is however likely to alter the environment by contributing to the effects of sky glow and artificial lighting in an intrinsically dark area to some degree.

The lighting environment associated with the 83MR Areas directly is considered intrinsically dark, while taking the larger region into consideration, the area is considered to fall within the low district brightness zone, due to the TGME offices and town of Pilgrim's Rest. The proposed project is expected to further contribute to the effects of sky glow and artificial lighting in the region, particularly as a result of stationary lighting sources.

Night time lighting as a result of potential 24-hour mining operations will reduce the visibility of starry skies within the low district brightness landscape. The images below indicate lighting associated with a typical mining operation from a distance of approximately 1km and from a distance of approximately 100m. From these images, it is evident that the night time lighting impact will be significant from this range.

Based on the impact assessment, it was determined that the 83MR Project will have a moderate visual impact on the receiving environment, even though it is situated within close proximity to the town of Pilgrim's Rest. With the proposed 83MR Areas located at the foothills and in disturbed areas, and the mountainous backdrop, the sensitive receptors present is not likely to experience significant visual intrusion. As evident from the viewshed analysis and confirmed during the field assessment, only small portions within the town of Pilgrim's Rest and small stretches along the R533 will observe portions of the proposed mining activities.

Night-time lighting as a result of potential 24-hour mining operations will reduce the visibility of starry skies within the intrinsically dark to rural landscape. Should 24-hour mining activities take place, the night-time lighting associated with the 83MR Areas will have a moderately high impact. With mitigation and management measures implemented, with particular reference to lighting design and placement, the impact of night-time lighting may result in the impact being reduced to moderately low levels.

13.3.8 IMPACT ON NOISE ENVIRONMENT

The following main noise generating activities were considered for a modelled investigated scenario(s):

- Topsoil removal/clearance - During the construction and preparations of footprints, a direct line-of-sight can be achieved from noise generating activities to receptors.
- The development of stockpiles (Run-Off-Mine (ROM), hard, softs, topsoils, overburden etc.) will also take place during this phase. Stockpile activities may occur only during the daytime as opposed to the operational scenario (24-hour cycle). A day scenario will be assessed, with mitigation proposed should a night-time direct-line-of-sight scenario be conducted.
- Construction of haul/access routes. The haul routes will connect existing municipality routes to the project. The following was considered for conveyor and haul routes:
    - The development/upgrading of haul routes (daytime only) entails the clearance of the corridor to be compacted and potentially paved (if required). During the development of road corridors, topsoil are removed with earthworks conducted. The surface bed is compacted for the required density making use of aggregate (e.g. soils, gravel, crushed stone etc.). The development of the conveyor route will require the clearance of the corridor for concrete works, and placement of conveyor route.
    - Road surface may make use of various options, likely asphalt (bitumous binders) or concrete, however most mine haul routes are unpaved.

   - Equipment[80] required for road construction would vary from placing equipment, pavers, vibration and compaction and finishing equipment etc. Noise levels and equipment specifications will greatly vary.
- The implementation of concrete and surface related infrastructure (offices, stores, plant etc.). The following was considered
   - General and civil construction related activities are generally kept to daytime hours (06:00 – 22:00).
   - Noisy construction equipment may include vibration, mixing and placing equipment (cranage etc.). Small construction equipment also include drilling, compaction (vibration),grinding etc.
   - During the night-times concrete and surface related infrastructure activities may be required as deadlines need to be met or pouring of concrete over extended hours may be required. These activities are usually short-term and occurring rarely.

The linear noise project is presented below in **Figure 133**. The impact assessment rating is further presented in **Table 65**.

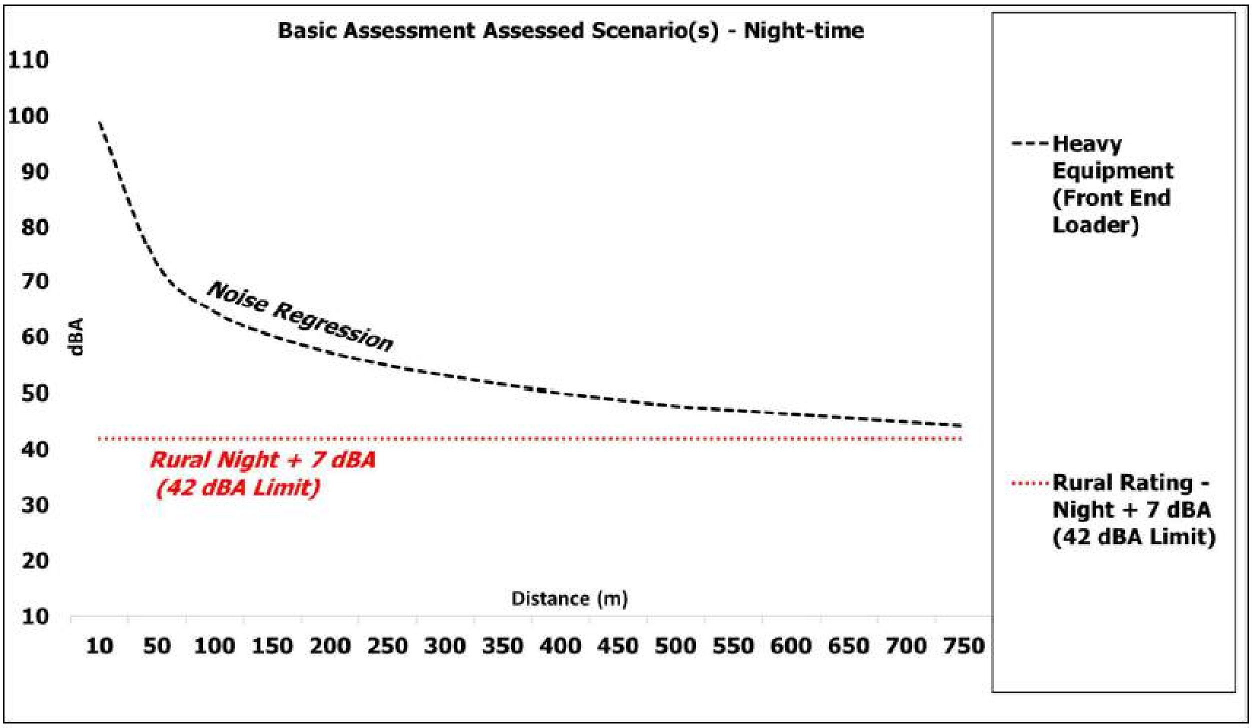


Figure 133: Construction/Operational noise levels – Linear representation of certain activities

A desktop assessment and onsite investigations indicated that there are no receptors within 1000m of the Frankfort layout. No further investigations were conducted for the site as receptors are too far for any potential impacts.

The assessment made use of online moderately high Sound Power Levels (SPL) equipment operating localities. The following main noise generating activities were considered for a modelled Operational investigated scenario(s):

[80] South African National Roads Agency SOC Ltd. South African Pavement Engineering Manual Chapter 12. Construction Equipment and Method Guidelines. 2013

- Stockpiles – Stockpiles could consist of topsoil, hard, softs, ROM etc. Stockpiles themselves may act as an acoustical shield in relation to receptors. This however does depend on the design of the stockpiles, slope of it in relation to receptors and berms implemented on the stockpiles.

The developer must implement various management and design acoustical mitigation regarding their operations. The introduction of berms in key areas (or the use of stockpile slopes as berms) is a primary mitigation option to consider. The primary receptor to consider is receptor R3 (see **Figure 135** for locality).

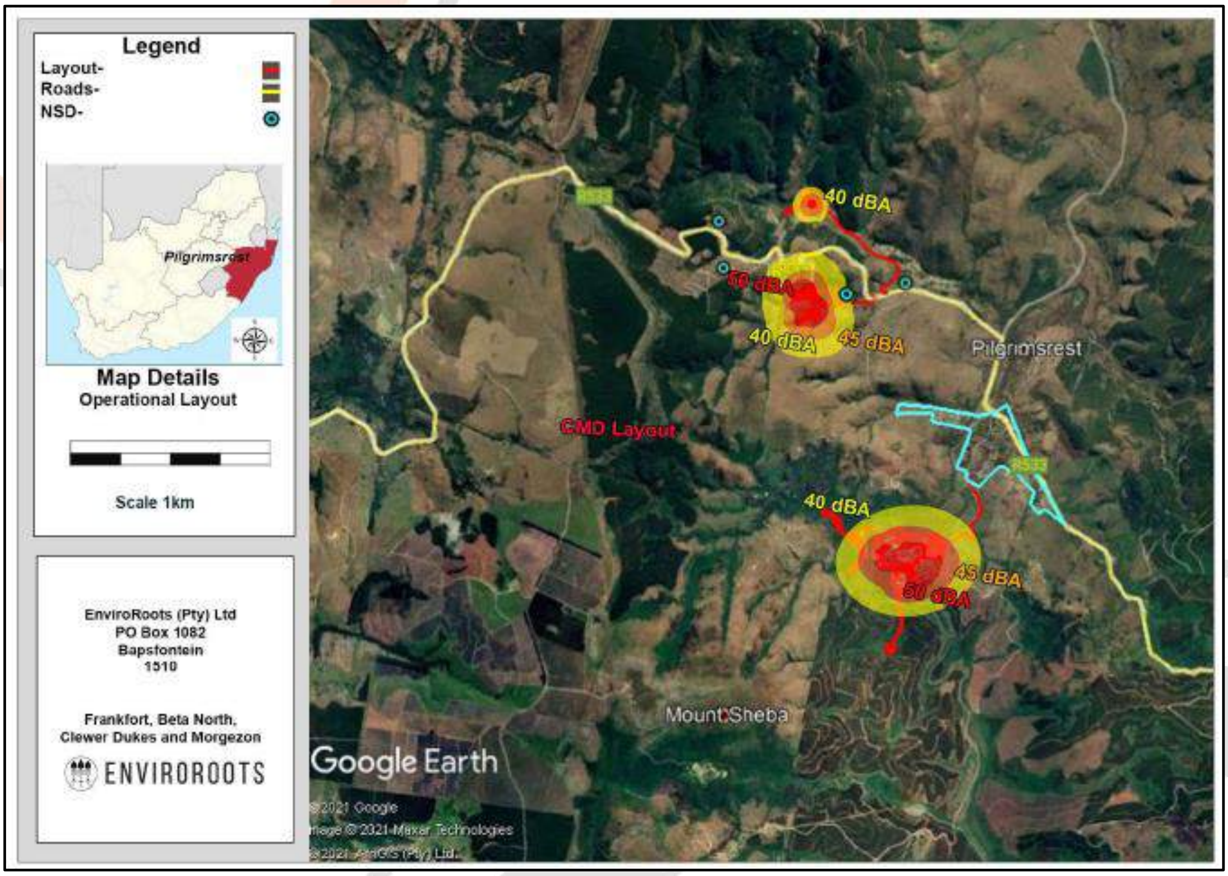


Figure 134: Assessed CDM and Beta – Operational Phase Equivalent Continuous Rating Level - Noise Contours LReq,T

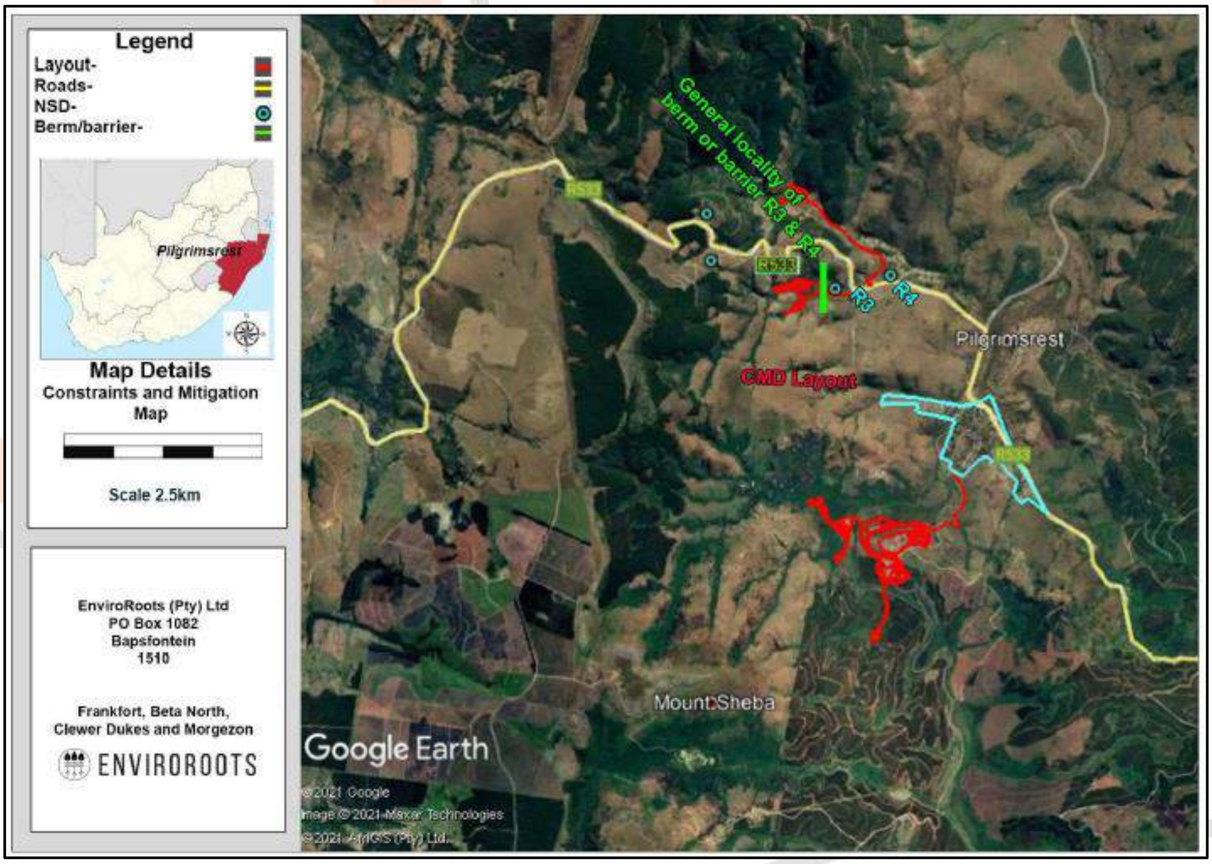


Figure 135: Mitigation and constraints maps

13.3.9 IMPACTS ON HERITAGE

The TGME mining and project areas revealed some of the types and ranges of heritage resources outlined the NHRA These resources included rock art, heritage remains associated with gold mining during the last 130 years, historical villages and settlements, individual historical period houses / structures, historical period features such as telephone lines, power lines and tram track lines and burial sites. For the purposes of this study, general descriptions of heritage resources in the baseline environment are provided but only heritage features directly affected by proposed mining developed are detailed. It should be noted that in many instances historical adits were used by TGME to continue with modern mining operations and many of these portals are today yet again extensively worked by illegal miners. This superimposition of contemporary and more recent mining works on older (historical) workings has been a common occurrence in the Pilgrims Rest gold fields since the discovery of gold 130 years ago.

As noted in previous sections, Pilgrim's Rest and its surrounds have been well documented in terms of its archaeology and history and this assessment particularly drew on a number of Cultural Resources Management projects and research projects conducted for TGME. All of these projects added significantly to a better understanding of the heritage landscape in question.

The mining landscape around the project areas holds countless traces of historical mining, settlement and industrial expansion. These include mining heritage remains associated with gold mining, many cemeteries and burial sites, mining settlement remains and the remains of individual historical period pioneer houses. In addition, the hills surrounding Pilgrim's Rest are littered with mine adits, ventilation shafts and underground drainage channels. The assessment in the EIA will focus on the findings within the footprint areas of the redevelopment. For reference to the surrounding findings please refer to ANNEXURE Q.

<u>Beta mining area</u>

An existing adit occurs along the foot of a mountain on Ponieskrans 543KT within the project area. A number of stone terraces occur around the adit where the slope has been stabilized in former years. According to Pistorius (2005) other historical mining features such as the ruins of a power house, a tipping bay and a concrete structure occurred here as part of the historical Beta mining operations. However, these features have been destroyed where most of this area has been excavated and dug up by illegal miners. The adit has been in used in recent years and is currently being used as an access to underground mining areas by illegal miners. It is a common occurrence in this area that newer mining infrastructure replace older mining heritage sites where mining continues but the site holds significance in terms of its association with historical mining in the area and it is rated moderate significance and graded as Generally Protected A. The site is situated within areas proposed for mining development and the mitigation of direct and indirect impacts to the site will be a requirement.

Site	**NH-TGME-2430DC-01**	
Coordinates	S24.9094644 E30.7E3055718	
50K Map Series	2430DC	
Type	Historical / Extant Adit	
Field Rating:	Generally Protected A	
NHRA Category	*Structures older than 60 years - Section 34 of NHRA*	

The so-called Beta West shaft was used for draining the water, which was pumped out of the mine into Peach Tree Creek. The entrance to the shaft is supported by wooden beams and an apparent iron access door hasbeen removed. Drainage pipes at the entrance are intact. The site might hold significance in terms of its association with historical mining in the area and it is rated moderate significance and graded as Generally Protected A. The site is situated within areas proposed for mining development and the mitigation of directand indirect impacts to the site will be a requirement.

Site	**NH-TGME-2430DC-02**	
Coordinates	S24.91218324 E30.73162034	
50K Map Series	2430DC	
Type	Historical / Extant drainage shaft	
Field Rating:	Generally Protected A	
NHRA Category	*Structures older than 60 years - Section 34 of NHRA*	

The partial remains of a tram line / cocopan line occurs near the old Beta North mine works next to the site access road. The line runs along a small tributary of the Blyde River along the foot of a mountain towards the central reduction works. Large sections of the tracks have been removed and undercut by illegal mining and excavations and the occurrence is in poor state of preservation. The rail track is nonetheless considered to be of high heritage significance and graded as Provincial Significance Grade 2. The site is situated within areas proposed for mining development and the mitigation of direct and indirect impacts to the site will be a requirement.

Site	**NH-TGME-2430DC-03**	
Coordinates	S24.91138905 E30.73157986	
50K Map Series	2430DC	

Type	Historical Period Mining Site	
Field Rating:	***Provincial Significance Grade 2***	
NHRA Category	*Structures older than 60 years - Section 34 of NHRA*	

The partial remains of a concrete water furrow occurs near the old Beta North mine works next to the site access road. The furrow line runs along a small tributary of the Blyde River along the foot of a mountain. The furrow has been destroyed in places by illegal mining and excavations and the occurrence is in poor state of preservation. The feature is nonetheless considered to be of high heritage significance and graded as Provincial Significance Grade 2. The site is situated within areas proposed for mining development and the mitigation of direct and indirect impacts to the site will be a requirement.

Site	**NH-TGME-2430DC-04**	
Coordinates	S24.91226438 E30.73193139	
50K Map Series	2430DC	
Type	Historical Period Mining Site	
Field Rating:	***Provincial Significance Grade 2***	
NHRA Category	*Structures older than 60 years - Section 34 of NHRA*	

The remains of a concrete structure occur near the ore bin in the Beta North area. The structure can possibly be associated with historic mining activity in this area. As such, the site holds significance in terms of its association with historical mining in the area and it is rated moderate significance and graded as Generally Protected A. The site is situated within areas proposed for mining development and the mitigation of direct and indirect impacts to the site will be a requirement.

Site	**NH-TGME-2430DC-05**
Coordinates	S24.91334388 E30.73328256
50K Map Series	2430DC
Type	Historical Period Mining Site
Field Rating:	***3. High Significance***
NHRA Category	*Structures older than 60 years - Section 34 of NHRA*

The remains of a suspension bridge over the Blyde River occur in close proximity of the project area. The bridge was used by pedestrians to cross the river to access the mining areas. A concrete base and some cablings remain but the site is generally poorly preserved. The site might hold significance in terms of its association with historical mining in the area and it is rated moderate significance and graded as Generally Protected A. The site is situated within areas proposed for mining development and the mitigation of direct and indirect impacts to the site will be a requirement.

Site	**NH-TGME-2430DC-06**	
Coordinates	S24.91421836 E30.7341956	
50K Map Series	2430DC	
Type	Historical Period Mining Site	

Field Rating:	***3. High Significance***
NHRA Category	*Structures older than 60 years - Section 34 of NHRA*

The remains of a concrete structure occur the main Beta mine in the project area North area. The structure and foundations can possibly be associated with historic mining activity in this area. As such, the site holds significance in terms of its association with historical mining in the area and it is rated moderate significance and graded as Generally Protected A. The site is situated within areas proposed for mining development and the mitigation of direct and indirect impacts to the site will be a requirement.

Site	**NH-TGME-2430DC-07**
Coordinates	S24.91383615 E30.73648151
50K Map Series	2430DC
Type	Historical Period Mining Site
Field Rating:	***3. High Significance***
NHRA Category	*Structures older than 60 years - Section 34 of NHRA*

The old Farmer's Race occurs extends south and east around the current TGME mine offices and the current slimes dam partially covers a section of the feature. A race is an open channel for conveying water and it can be a simple earth ditch, or lined with timber or metal, or a masonry structure, and often incorporated flumes to cross declivities and maintain a constant fall. The Farmer's Race was built in 1884 by the Transvaal Gold Exploration and Land Company to supply water to the hydro-electric power station at Brown's Hill. It was 4.5 kms in length, 1800 mm wide and 1200mm deep. It was lined with metal plates screwed together. Fragmentary metal plates remain in the landscape around the project area and the occurrence is in poor state of preservation. The feature is nonetheless considered to be of high heritage significance and graded as Provincial Significance Grade 2. The site is situated within areas proposed for mining development and the mitigation of direct and indirect impacts to the site will be a requirement.

Site	**NH-TGME-2430DC-08**
Coordinates	S24.91240494 E30.74267188
50K Map Series	2430DC
Type	Historical Period Mining Site
Field Rating:	***Provincial Significance Grade 2***
NHRA Category	*Structures older than 60 years - Section 34 of NHRA*

A concrete low-level bridge connects the main Beta mine with the Beta North mining area. The feather can possibly be associated with historic mining activity in this area. As such, the site might hold significance in terms of its association with historical mining in the area and it is rated moderate significance and graded as

Generally Protected A. The site is situated within areas proposed for mining development and the mitigation of direct and indirect impacts to the site will be a requirement.

Site	**NH-TGME-2430DC-09**
Coordinates	S24.91189616 E30.73512783
50K Map Series	2430DC
Type	Historical Period Mining Site
Field Rating:	***3. High Significance***
NHRA Category	*Structures older than 60 years - Section 34 of NHRA*

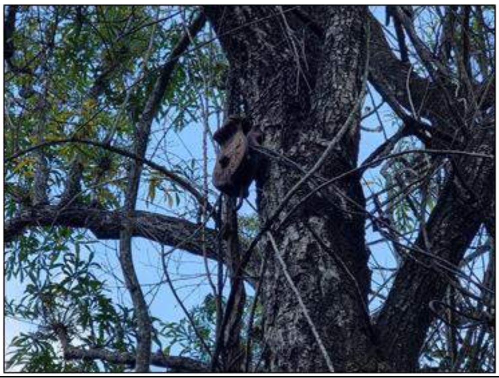
<u>Frankfort Mine</u>

The poorly preserved remains of a MET plant building occur within the Frankfort Project area. The structure is approximately three stories high and it consists of dilapidated stone and concrete walls, floors and foundations. The building would have been covered with a corrugated iron roof and a section of cocopan track connected the structure to the mining area. The structure was built against the steep slope of the mountain. The feature has largely been destroyed in places by illegal mining and excavations and the occurrence is in poor state of preservation. The site is nonetheless considered to be of high heritage significance and graded as Provincial Significance Grade 2. The site is situated within areas proposed for mining development and the mitigation of direct and indirect impacts to the site will be a requirement

Site	**NH-TGME-2430DC-10**	 
Coordinates	S24.80798168 E30.73723462	
50K Map Series	2430DC	
Type	Historical Period Mining Site	
Field Rating:	***Provincial Significance Grade 2***	
NHRA Category	*Structures older than 60 years - Section 34 of NHRA*	

The remains of a possible suspension bridge or pulley system occurs in close proximity of the existing Frankfort Mine adit in the project area in a deep valley. Here, a stone support structure as well as cabling suspended on a large tree remain. The site is generally poorly preserved but it might hold significance in terms of its association with historical mining in the area and it is rated moderate significance and graded as Generally Protected A. The site is situated within areas proposed for mining development and the mitigation of direct and indirect impacts to the site will be a requirement.

Site	**NH-TGME-2430DC-11**	

Coordinates	S24.80160624 E30.73392478	 
50K Map Series	2430DC	
Type	Historical Period Mining Site	
Field Rating:	***3. High Significance***	
NHRA Category	*Structures older than 60 years - Section 34 of NHRA*	

CDM Mining Area

The partial remains of a tram line / cocopan line occurs near the Dukes Lower mine works. The line runs along the hill contour where the tracks have been constructed in an embankment which is still visible. The tracks have largely been removed and the occurrence is in poor state of preservation. The rail track is nonetheless considered to be of high heritage significance and graded as Provincial Significance Grade 2. The site is situated within areas proposed for mining development and the mitigation of direct and indirect impacts to the site will be a requirement.

Site	**NH-TGME-2430DC-12**	
Coordinates	S24.88738856 E30.72903293	
50K Map Series	2430DC	
Type	Historical Period Ruins	
Field Rating:	***Provincial Significance Grade 2***	

A large stormwater concrete water channel occurs at the Dukes lower adit along the slope of the adjacent hill. The channel, which directs water away from the adit and the mining area, remains intact and in a fair state of preservation. The feature probably dates to later mining periods at Dukes during the 1960's but it nonetheless considered to be of heritage significance and graded as Generally Protected A. The site is situated within areas proposed for mining development and the mitigation of direct and indirect impacts to the site will be a requirement.

Site	**NH-TGME-2430DC-13**	
Coordinates	S24.88777312 E30.72660604	
50K Map Series	2430DC	

Type	Historical Period Mining Site
Field Rating:	Generally Protected A
NHRA Category	*Structures older than 60 years - Section 34 of NHRA*

A possible historical adit (or ventilation shaft) with associated supporting stone walls and terraces occur around the Dukes Lower adit along the lower slope of a mountain. The adit has collapsed and only a small section of the entrance is visible. The adit nonetheless being used as an access to underground mining areas by illegal miners. The feature it is rated moderate significance and graded as Generally Protected A. The site is situated within areas proposed for mining development and the mitigation of direct and indirect impacts to the site will be a requirement.

Site	**NH-TGME-2430DC-14**
Coordinates	S24.88826497 E30.72639582
50K Map Series	2430DC
Type	Historical Period Mining Site
Field Rating:	Generally Protected A
NHRA Category	*Structures older than 60 years - Section 34 of NHRA*

The existing Lower Dukes adit occurs along the foot of a mountain within the project area. According to Pistorius (2005) other historical mining features such as the ruins of a power house, a tipping bay and a concrete structure occurred here as part of the historical Dukes mining operations. However, these features have been destroyed where most of this area has been excavated and dug up by illegal miners. The adit has been in used in recent years and is currently being used extensively as an access to underground mining areas by illegal miners. The site might be significant in terms of its association with historical mining in the area and it is rated moderate significance and graded as Generally Protected A. The site is situated within areas proposed for mining development and the mitigation of direct and indirect impacts to the site will be a requirement.

Site	**NH-TGME-2430DC-15**
Coordinates	S24.8882716 E30.7260934
50K Map Series	2430DC
Type	Historical / Extant Adit
Field Rating:	***3. High Significance***
NHRA Category	*Structures older than 60 years - Section 34 of NHRA*

Another possible historical adit (or ventilation shaft) with associated supporting metal grid, stone walls and terraces occur around the Dukes Upper adit along the lower slope of a mountain. The adit has collapsed and only a small section of the entrance is visible. The adit nonetheless being used as an access to underground mining areas by illegal miners. The feature it is rated moderate significance and graded as Provincial Significance Grade 2. The site is situated within areas proposed for mining development and the mitigation of direct and indirect impacts to the site will be a requirement.

Site	**NH-TGME-2430DC-16**
Coordinates	S24.88504498 E30.72539829
50K Map Series	2430DC
Type	Historical Adit
Field Rating:	***Provincial Significance Grade 2***
NHRA Category	*Structures older than 60 years - Section 34 of NHRA*

The existing Morgenzon / Clewer adit occurs along the foot of a mountain within the project area. The site is characterized by an adit with a concrete entrance flanked by elaborate stone wall. A ventilation shaft partially covered with stones and a well-preserved section of stone walling occurs at the site. The adit has been in used in recent years and is currently being used extensively as an access to underground mining areas by illegal miners. The site might be significant in terms of its association with historical mining in the area and it is rated moderate significance and graded as Provincial Significance Grade 2. The site is situated within areas proposed for mining development and the mitigation of direct and indirect impacts to the site will be a requirement.

Site	**NH-TGME-2430DC-17**
Coordinates	S24.87579061 E30.72431015
50K Map Series	2430DC
Type	Historical / Extant Adit
Field Rating:	***Provincial Significance Grade 2***
NHRA Category	*Structures older than 60 years - Section 34 of NHRA*

Another possible historical adit with associated supporting metal grid (which has been removed), elaborate stone walls and terraces at the entrance occur around the Morgenzon / Clewer adit along the lower slope of a mountain. The adit and the stone terracing and walling have collapsed around the entrance where access trenches have been dug by illegal miners. The feature it is rated moderate significance and graded as Provincial Significance Grade 2. The site is situated within areas proposed for mining development and the mitigation of direct and indirect impacts to the site will be a requirement.

Site	**NH-TGME-2430DC-018**	
Coordinates	S24.87549028 E30.72402382	
50K Map Series	2430DC	
Type	Historical Adit	
Field Rating:	***Provincial Significance Grade 2***	
NHRA Category	*Structures older than 60 years - Section 34 of NHRA*	

An informal burial site occurs at the former TGME Morgenzon / Clewer offices next to the parking area. The site contains an unknown number of graves and it is indicated by stones, one of which is painted with a yellow cross marking. The site is of high significance, it is situated within areas proposed for mining development and the mitigation of direct and indirect impacts to the site will be essential.

Site	**NH-TGME-2430DC-19**	
Coordinates	S24.87365289 E30.72676638	
50K Map Series	2430DC	
Type	Burial Site	
Field Rating:	***3. High Significance***	
NHRA Category	*Graves, Cemeteries and Burial Grounds - Section 36 of NHRA*	

The impacts on the above findings have been rated in **Table 65.** Should the mitigation proposed be implemented all impacts can be reduced to low or negligible significance.

<u>Palaeontological Landscape</u>

In terms of the Palaeontological Landscape (Butler, 2022), it was noted that the proposed mining site is underlain by Quaternary alluvium and scree, diabase, and the Timeball Hill Formation (Pretoria Group, Transvaal Supergroup) as well as the Malmani Subgroup (Chuniespoort Group, Transvaal Supergroup). According to the PalaeoMap of South African Heritage Resources Information System the palaeontological Sensitivity of the Quaternary superficial sediments is low but locally High, the diabase is igneous in origin and has an insignificant palaeontological Sensitivity while that of the Timeball Hill Formation is High and the palaeontological Sensitivity of the Malmani Subgroup (Transvaal Supergroup) is Very High (Almond and Pether 2008, SAHRIS website). No visible evidence of fossiliferous outcrops was found in the development footprint and thus an overall medium palaeontological significance is allocated to the proposed development footprint. It was concluded that the proposed development will not lead to detrimental impacts on the palaeontological reserves of the area and construction of the development may be authorised in its whole extent.

13.3.10 IMPACTS ON SOCIO-ECONOMIC ENVIRONMENT

The socio-economic impacts were determined by Southern Economic Development (ANNEXURE R).

13.3.10.1 CONSTRUCTION PHASE

Pre-construction activities would include fencing off the mining sections (sites), earth clearing activities (clearing of vegetation, soil stripping), road construction and the upgrading and/or extension of site offices, security checkpoints, and surface infrastructure, as well as the establishment of contractor's laydown areas for the temporary storage of materials and equipment.

During the construction phase, the appointed contractors will be responsible for the erection of the temporary change/ablution facilities (chemical toilets). This infrastructure will remain on-site for the duration of the construction phase. Permanent infrastructure will then be established on-site after the finalisation of the construction phase. Infrastructure will consist of access roads and other road infrastructure, power and water supply, underground infrastructure, and upgrades to the processing plant.

TGME plans to spend R1,1 billion on construction over a 10-year period. The construction period will overlap with the operational phase of the mine as production is expected to commence 1 or 2 years after the construction phase started.

<u>Positive impact on the local economy</u>

Construction activities could create approximately 120 full-time equivalents (FTE) employment opportunities (the total mine complement will enlarge to 426 over a 10-year period). The potential number of semi-skilled and elementary category labour is very high (32% and 51% of total employment). TGME aims to ensure that 70% of its workforce will be sourced from local residents.

At its peak, construction activities will significantly reduce the numerous unemployed people currently residing in Pilgrim's Rest.

Construction activities are however only anticipated to employ relatively large numbers directly for 3 years (Year 2, Year 5, and Year 6). As mentioned above, it is also important to note that construction activities will overlap with operational mining activities as mining production is expected to commence 1 or 2 years after the initial construction phase started. At this time TGME together with the local community forums will develop and implement a youth development programme fostering the development of an inclusive, empowered local society.

Construction activities related to the project could also significantly increase local income levels. The economic production (Gross Value Added or GVA) of the town is estimated in the region of R 20 million (pre-COVID). Direct spending on construction activities alone could be almost seven times the current size of the Pilgrim's Rest economy during its peak (year 5). The direct income (GVA) from construction activities is also expected to have some distributive impact as low-income households are expected to earn a slightly higher portion (14%) of total income compared to their 13% contribution in provincial income and 16% in national income.

Due to the limited spending opportunities of these increased wages and salaries in the local economy of Pilgrim's Rest, the adjacent towns of Sabie and Graskop are also expected to receive some induced spending benefits from increased income levels. Spending on construction suppliers/inputs will also mainly occur outside the local Pilgrim's Rest economy. Within Pilgrim's Rest, the income of the general dealer/hardware store could experience a significant increase and activities could ensure a high turnover to a local petrol station. Some of the restaurants and accommodation facilities might also experience some increase in turnover. The local community enterprise development participants will also benefit during this phase of the project.

Flow on impacts due to spending on suppliers and induced construction spending due to higher income could create up to 121 additional jobs during peak construction mainly in the larger region of which half could be created in Mpumalanga Province and the rest in the larger national economy.

The potential influx of people to the project area

Population characteristics are expected to evolve as a result of the expected influx of people and households to the area as a result of the project. Few of these may be related to those formally employed by the project (TGME aims to ensure that 70% of its workforce will be sourced from local residents), but more substantially, there is an expected influx of prospective jobseekers hoping to find work on the news of the economic activity. The result could be a change in the size and density, as well as the demographic profile of the local community.

Peak employment during construction is expected to last for short periods in Years 2, 5, and 6 of the Project. Some of these individuals would be from outside the TCLM area, this could result in some change in the temporary population figures and population density of Pilgrim's Rest (as Beta North and CDM would be in close proximity to town), and an expected smaller change in the population figures and density of the Moremela, Leroro and Mathibidi communities. As the construction activities would involve some semi-skilled and elementary workers, it is expected that locals will be employed which would result in a limited population change.

The settlements in the study area have experienced an inflow of outsiders over the last couple of years. Once the recruitment process starts, more individuals will become aware of the mining projects. This, together with the overall high unemployment levels in the TCLM area, can increase the in-migration of jobseekers to settlements near the mining sites such as Pilgrim's Rest, Darks Gully, Newton/Schoonplaas, Moremela, Leroro, and Mathibidi. Jobseekers can also comprise of unemployed locals including ex-miners residing in the local settlements.

Infrastructure and service provision within the TCLM already does not address the needs of the communities, especially those within the northern areas, where water and sanitation services are lacking. DPW also indicated that the existing services and aging infrastructure in the Pilgrim's Rest area will not be able to handle a significant inflow of additional residents which could result in challenges with regard to infrastructure and service delivery.

For the duration of the construction period, non-local and/or temporary contract workers forming part of the construction team of the main contractor would require accommodation. It is anticipated that these contractors would make use of the existing establishments in close proximity to the site. Depending on the number of workers involved, local accommodation facilities within Pilgrim's Rest, Graskop, and Sabie are likely to be utilised. It is possible that there could be a shortage of accommodation in close proximity to the site due to the requirements of team members. Should the upgrading of the Caravan Park be completed, this facility can further provide possible accommodation to members of the temporary construction workforce.

The influx of individuals to an area in search of employment is difficult to quantify and to exercise control. It can further not only be attributed to one single project as migration is dependent on various socio-economic factors. The procurement of local labour can mitigate this impact. This is critical to the success of the project and will assist in minimising the negative impacts on infrastructure and services associated with the possible inflow of people, as it is not foreseen that the existing state of the infrastructure will be able to accommodate high volumes of new residents.

Increase in nuisance factors (noise, traffic and dust)

Noise created by construction activities could create nuisance factors, especially during peak construction periods. This would materialise at the different construction sites due to the inflow of workers, construction activities undertaken by the construction teams, heavy vehicle movement, and use of equipment. This could possibly have an impact on the rural, social environment (low ambient noise levels), but due to the distance of the Frankfort construction area to the nearest dwellings (Moremela), the impact in this area is anticipated to be of a low significance (with mitigation). The Brown's Hill settlement in close proximity to the Beta North mining area could be a critical sensitive receptor in terms of the noise impacts, this is assessed in the Noise specialist study. Construction would be phased and not all construction workers will be on-site for the full duration of the construction period. The intensity of the impacts will thus depend on the average size of the construction teams, the number of teams, and the number of workers anticipated to be on site.

The R533 serves as the main access route to all three sites. Access from the R533 would be via established gravel roads. The Beta North site would be accessed from Pilgrim's Rest on the gravel road leading to the TGME process plant. The same road is used by the residents of Brown's Hill to access Pilgrim's Rest town and will furthermore be used by visitors to the Pilgrim's Rest Caravan Park. This road crosses the Blyde River on two occasions and would thus need to be upgraded. Provision has been made for haul road construction. The gravel roads leading to the CDM sites are a short distance. Limited, if any, upgrading of these roads is foreseen. The movement of workers along the R533 could have an impact on the daily living and movement patterns of residents in the area. The Frankfort site would be accessed from Pilgrim's Rest and the TGME process plant via the Vaalbank/Bourke's Luck Road. Sections of this road would also have to be upgraded. Provision has been made for haul road construction within this area. According to the Traffic Impact Assessment, a maximum of ten 25-ton trucks will travel to and from the Beta North, Frankfort, and CDM sites daily which will result in one truck per hour in both directions (based on a ten-hour construction day). Further trips to transport workers are estimated. Overall, four (4) vehicle trips will be undertaken per direction per hour for each site, totaling eight (8) additional vehicular trips per hour (4 to enter and 4 to exit). These vehicle movements will be a significant increase from the existing traffic volumes with resultant noise and dust impacts, as well as impacts on the road surfaces.

These road constructions and upgrading, as well as the usage of gravel roads during construction, could result in dust fallout increases. Dust fallout must be managed in line with the requirements of the EMPr.

The Brown's Hill settlement is approximately 300 meters from the existing process plant and existing TSF. This settlement could be exposed to risks mainly due to the movement of mining vehicles, possible noise and dust fallout (wind erosion), as well as the increase in traffic on the access road, these risks must be managed in line with the requirements of the EMPr.

The main visual impact associated with the construction phase would be the actual construction sites, and possible storage of material and equipment, as well as the disruption of the soil and vegetation due to the infrastructure footprints. The actual construction sites, however, would have limited temporary negative visual impacts due to their extent and location to dwellings, settlements, and roads frequently used by tourists, except in the case of the Brown's Settlement which is in close proximity to the Beta North mining activities.

Impacts on Community Health

An increased health risk, such as the spread of HIV/AIDS, Tuberculosis (TB) as well as Covid-19 with long-term possible consequences, could be created due to the informal influx of jobseekers to the area and social interaction with the local population.

If the construction sites are not properly managed it could result in negative impacts on the environment with related health impacts on the surrounding communities such as pollution of water sources due to improper sanitation facilities, solid waste management, or wastewater management. These risks must be managed in line with the requirements of the EMPr.

Clinics in the area are not necessarily equipped to deal with emergencies, with only the Mathibidi hospital in close proximity to the site. There is a further lack of sufficient emergency vehicles servicing the larger area. It is unlikely that the existing health services will be able to effectively deal with major construction-related accidents and emergencies due to the lack of sufficient localised services. It is for this reason TGME has contracted Netcare to provide mine related medical services. Their service will include full-time trained medical personnel on-site which includes full-time ambulance on site and air transport support.

Impacts on Community Safety

During the construction phase, community safety can be at risk, mainly due to the movement of construction vehicles on the R533, safety hazards, increased fire risks, and the possible increase in criminal activities due to the movement of more people in the area. The conflict between locals, jobseekers, and illegal miners can also occur.

On-site, construction workers would furthermore be exposed to operational safety risks. These risks should be addressed as part of the Mine Health and Safety Act, 1995 (Act 29 of 1996) (MHSA) and its incorporated regulations. Other safety aspects, not included as part of the aforementioned, will have to be dealt with as part of the Occupational Health and Safety Act, 1993 (Act 85 of 1993).

Fires could pose a serious risk for timber plantations as they would result in long-term negative impacts (growth span of tree stock) with severe financial consequences for the land/business owner.

The area is experiencing a significant increase in illegal mining activities which already pose community safety risks, especially in the Moremela and Pilgrim's Rest areas. These activities are undertaken by ex-mineworkers (from various areas) and/or immigrants who resort to artisanal or subsistence mining at non-operational mining sites, the various old adits, and the shallow reefs in some areas of the study area. These mining activities are undertaken without state permission and mining rights. Illegal miners are armed and conflicts between the different factions have previously led to violence and in some unfortunate events, the death of illegal miners and even community members. There is the risk that the formally appointed mine workers could come into conflict with illegal miners during the construction phase. More intensive security measures to deal with the illegal miners would also result in increased costs, but will improve the livelihood of the workforce and the surrounding communities.

Community members are of the opinion that formal mining and the associated security measures implemented will decrease the presence of illegal miners with possible positive socio-economic impacts.

An influx of jobseekers to an area could result in negative social impacts such as:

- the development of illegal and/or informal settlements (especially on state-owned land),
- possible sub-letting with associated environmental pollution,
- the social conflict between the jobseekers and locals to secure employment, especially due to jobs being a scarce resource in the area,
- conflict between informal vendors (also seen as jobseekers) for new business,
- misbehaviour of jobseekers (e.g., possible increase in alcohol use),
- possible increase in crime due to these jobseekers being unemployed,
- increased pressure on already strained infrastructure; and
- additional pressure on health and community services.

It should be noted that the number of construction vehicles, driver conduct, as well as the actual number of outside construction workers would influence the intensity of the different community safety impacts. Due to the anticipated sizes of the construction workforce and the phasing of the construction activities, these temporary impacts are perceived to be of limited significance.

13.3.10.2 OPERATIONAL PHASE

Positive impacts on local income and employment

The operational phase related to the mining application is expected to last between 7 and 8 years. It is assumed that 426 direct employment opportunities, could, on average, be created over the 10 years, representing close to 1% of total employment across the entire TCLM - a very high percentage for any single project. The employment is directly related to the proposed mining activities and will be created as in-house employment by the mining license holder itself, as service providers (e.g. security, tailings facility management, administration, and gold handling). Of the direct employment, 23% could be skilled; 55% semi-skilled and 22% could be elementary (elementary) employment positions. TGME has committed to employing 70% of workers from the local community.

The operations will invest 1.2% of its annual payroll in skills development activities as provided for in a Social and Labour Plan (SLP) budget. The SLP should also make provision for a Skills Development Programme, career progression, mentorship, bursary and internship, and employment equity plans.

The direct contribution of the mining operations to the Gross Value added (GVA) of TCLM could be in the region of R425million on average per annum, representing close to 3% of the current economic output of TCLM. A relatively small portion of the GVA however consists of salaries and wages, and of the total labour bill. A relatively small portion is expected to be earned by semi-skilled and elementary employees potentially originating from Pilgrim's Rest. Assuming that the elementary labour and 25% of semi-skilled labour are recruited from Pilgrim's Rest (i.e. close to 120 local employment opportunities), the potential number of local employment in the mine could well double formal employment figures in Pilgrim's Rest.

In addition to the direct employment and income generation of the mine, its supply spending and further induced spending due to higher income levels could add some flow-on income of R210m on average per annum and flow-on employment in the region of 100 jobs for the larger regional economy during mining operations. Most of the additional income and employment will be generated in the larger regional economy due to the limited economic activity in Pilgrim's Rest. There are a few local/ Pilgrim's Rest procurement opportunities for the mine in terms of its spending on alien vegetation removal, procuring basic hardware supplies, engineering works, catering, and accommodation services. While this spending could only contribute 2% or less of the total discretionary spending (excluding overheads and utility costs) of the project, it could still add significantly to income levels within Pilgrim's Rest.

Furthermore, while a large portion of skilled and semi-skilled mineworkers might not stay in Pilgrim's Rest, they will still spend their working days close to the town, and even if they should spend only a small portion of their income in town on fuel, restaurants and basic foodstuffs (bread, milk, etc.) could also have a relatively high impact on income levels in the town. It is estimated that this joint supply and induced spending impact could potentially increase total sales in Pilgrim's Rest on average to around R2m per annum with the potential to create an additional 5 to 10 jobs in town.

Increase in public revenues

Table 64 below shows the different contributions of the mining project to public revenues during the 10-year operational period of the mine.

Table 64: Average annual forecasted public revenues of the project[81]

Public funds (Rm)	Total
Royalties	0,5
National skills fund (1% of labour costs)	0.8
Mine Health and Safety Regulations (1% of labour costs)	0,8
Occupational Health (0,5% of labour costs)	0,4
Local economic development funds (for eight years)	4,0
Taxes (personal, company, and indirect taxes) from mining activity (direct)	120,0
Taxes (personal, company, and indirect taxes) from suppliers and induced impacts (flow-on)	70,0
Total public revenues	**196,5**

The table shows that the project could possibly create close to R2 billion in public revenues over the 10-year period. The contribution of the project to central government tax and royalty revenues is particularly high and contributes around 30% towards the total GVA (direct and flow-on) of the project compared to the 26% contribution that taxes, in general, contribute to national GVA. The 26% contribution is furthermore already considered high in terms of international standards. This high tax ratio signifies a strong emphasis on rectifying the generally low contribution of low-income households in the total income generated during mining operations as well as compensating local communities for potential negative social and environmental impacts associated with hosting mining projects in general. The benefits of additional taxes, royalties as well as an increase in the National Levy is a benefit for the larger national economy Pilgrim's Rest and surrounds, as the affected mining community close to the project, will be the focus of the Local Economic Development Fund that forms part of the SLP.

In terms of local contributions, mining legislation specifies that mining operations should contribute to the economic development of the affected local community as per the SLP's. The Local Economic Development plan should be aligned with the local, provincial and national development priorities. The local communities should furthermore be consulted. Both income-generating activities and social infrastructure should be implemented as part of the plan.

While the old (2010) mining guidelines did not specify a specific portion of turnover or profit to be allocated to such a fund, a generally good practice among mining companies was to set aside 1% of net profits after tax. The 2018 Mining Charter targets an equity equivalent benefit to the minimum of 5% to be allocated to the socio-economic development of local communities. Mining legislation furthermore specifies that 0.5% of income that multinational suppliers receive from the mining operations must be contributed to a social development fund.

The MWP for this project makes provision for some R40million to the local community for local economic development over the lifetime of the project (from year 3 to year 9 of the project).

[81] Source: Estimates based on information supplied by TGME Mine Works Programme (2021), Mpumalanga Social Accounting Matrix (2018); Quarterly Employment Stats (2021).

Impact on other local non-mining sectors

Economic activities in the local area are mainly centered around tourism, forestry, and to a more limited extent, agriculture. This section focuses on potential spin-offs that the project might have on these dominant local economic sectors.

The timber companies operating in the area have to comply with the principles of the Forest Stewardship Certification (FSC). Compliance is thus critical for their economic sustainability and to maintain their current markets. As part of these principles, some of the forestry companies conserve and manage grasslands and wetlands within and around their plantations. Although these areas are managed and operated as nature reserves, these areas are not proclaimed as nature reserves.

Negative impacts associated with mining activities such as the following could occur:

- Intrusion on forestry and conservation areas as a result of the presence and movement of workers in close proximity to these areas;
- Illegal harvesting of trees;
- Environmental pollution (impacts on water quality and quantity, soil, littering, and so forth);
- Dust pollution as a result of mining activities and vehicle movement on gravel roads;
- Increased fire risks;
- Possible congestion on local gravel and tar roads, affecting transport time;
- Fuel emissions;
- Possible subsidence where underground mining is taking place;
- Risk of increase in illegal mining with illegal miners trespassing on forestry and conservation areas with the associated security risks involved.

The above-mentioned negative impacts could undermine the companies' adherence to the FSC principles if they realise.

The tourism sector plays a dominant role in the Pilgrim's Rest economy. While the stakeholders interviewed in Pilgrim's rest al maintain that the mine will have net positive impacts on the local economy, potential negative impacts on the local tourism industry should be considered for completeness:

- Visual impacts on Mount Sheba's walking trails could for instance impact negatively on visitors (identified as sensitive visual receptors by the VIA) to Mount Sheba Forever Resorts and Mount Sheba ShareBlock Company (timeshare units, which in turn could reduce the number of visitors to Pilgrim's Rest). Since the main mining method is underground mining and the fact that mining and its infrastructure have historically been associated with the area, the visual impacts of the mining infrastructure are anticipated to have minimal impacts on the local sense of place.
- From a transport point of view, mining activities during the operational phase will contribute marginally to increased traffic flow in the area since gold will be airlifted to Rand Refinery. Workers staying in Graskop, Sabie, or Lydenburg will contribute marginally to current traffic flows on these roads. It is therefore anticipated that the project will have a low impact on road users such as tourists or cyclists.
- Negative impacts on tourism due to nuisance factors will mainly emanate from increased noise due to mining activities. The mining operating times will consist of two shifts a day (excluding Sundays) from 6 am to 4 pm and from 4 pm to 2 am. The process plant will run on a 24 hour per day, 7 days a week basis.
- In terms of impact on the crime level, it could be argued that unemployment levels should decline substantially once mining starts and hence could have a positive impact on lowering crime rates in the local area. It could also be argued that TGME's resuming the active control of illegal mining activities in the neighbourhood could also reduce crime rates in Pilgrim's Rest. However, high levels of project-

induced in-migration (as mentioned above) could somewhat defeat this objective. In some mining areas in South Africa, unemployment and crime rates have risen despite high rates of local employment growth.

- There is a real risk that the mining project could crowd-out long-term tourism jobs while offering only short-term benefits to the town. It is however highly probable that this project, once successful, will lead to further investment in mining projects in the area by TGME that could last for another 20 years. Follow-up projects would furthermore focus on underground mining with less associated negative socio-economic impacts. While these projects could last up to two decades it should however still be noted that there is a limited lifespan to any mining project and it is, therefore, crucial that any mining company operating in this area should prioritise the long-term sustainability and conservation of the tourism industry in Pilgrim's Rest.

Potential negative impacts on the local agriculture sector include:

- Recruiting informally skilled agricultural or forestry workers could increase the training and recruiting costs for these sectors.
- The livelihood of the farmers, community members (as well as the timber industry in the area and the residents in the towns) depends on their water quality and quantity. Water remains a scarce commodity and any decrease in the water tables would result in severe negative impacts with subsequent economic losses. The possible impact of the project on water quality and quantity is a definite concern for the local community and economy. According to the Geohydrological Report related to the project (MvB Consulting, 2022) the biggest concern regarding the groundwater is the potential seepage of contaminants from the mining site, specifically the TSF, to the groundwater. The risk posed by the waste material and the mining in general is, however, considered low and there are currently no additional management requirements, other than groundwater monitoring. The planned post-closure rehabilitation of the TSF will further protect the underlying groundwater resource.

Pollution of the Blyde River could have dire consequences for the economy of the Blyde River catchment area that relies heavily on the health of the river for agricultural and tourism activities. From a socio-economic perspective, it must still be noted that any possible negative impacts on ground and surface water could permanently damage the economy that supports the economic livelihood of an estimated 2 000 people. In this regard, it should however be noted that the geohydrology assessment's groundwater model concluded that the "contaminant risk to the aquifer system and the Blyde River is minimal".

<u>Increased use of scarce natural resources</u>

The project could have an impact on natural resources like water and energy. It is however known that the mining sector is relatively water efficient meaning that it produces a fair amount of GVA (R 530 at 2019 prices) for every cubic meter of water consumed compared to a national average of R200 (Inglesi-Lotz, 2011). Energy and water efficiency are of the highest priority to the mine.

<u>Potential influx of people to the project area</u>

The formal inflow of workers coupled with an informal inflow of jobseekers to the area could start during the construction phase, and peak just before operation and at the onset of operational activities.

Such an increase over a short timeframe could potentially have negative impacts on the provision of infrastructure (water and sanitation, health, roads, accommodation, schools, and so forth) and services in the towns. Furthermore, the area is largely characterised by low-density, rural residential and farming areas or vacant land and the inflow of such a large workforce over time, apart from the normal increase can also introduce new social classes, together with densification, which could lead to discontentment. It is however anticipated that skilled workers would most probably not stay within Pilgrim's Rest and would rather stay in areas like Graskop and Sabie. TGME will be employing 70% of the workforce from the local community to mitigate the pressure on infrastructure and services.

During the operational phase of the mine, temporary, migrant, and/or foreign employees would require accommodation. This additional demand (depending on the number of locals that are employed) would place pressure on the existing housing infrastructure and settlement arrangements in the area within a very short period of time. Overcrowding, sub-letting, and the development of informal settlements could indicate that the increased housing needs have not been met.

The employment of locals will be a key mitigation measure to limit the increased pressure on the provision of accommodation, local infrastructure, and services and will assist to avoid social conflict and discontentment. It can further assist in limiting a continuous inflow of jobseekers for the entire Life of Mine. TGME indicates that 70 % of the workforce should be sourced from local residents.

The employment of locals as far as possible is thus critical. It would furthermore result in increased local purchasing power with vast indirect positive impacts for small businesses and entrepreneurs with even further trickle-down positive impacts for the local communities. TGME has made a commitment to the community to source 70 % of the workforce from local residents.

<u>Increase in nuisance factors (noise and dust)</u>

Noise created by the mining activities and equipment, employees, and vehicular movement will have some impact on the rural, low-density environment with relatively low ambient noise levels. Due to the distances of sensitive receptors at the Frankfort mining site (e.g. Moremela), the impact in this area is anticipated to be of a low significance (with mitigation).

The significance of the impacts has been determined by the Noise Impact Assessment but should be noted in the context of the area being a historical mining area.

Employees would have a daily commute from the local area, wider municipal area, and even the district. This can be undertaken via private vehicles and public transport (taxis and busses). The main roads in the local study area that would be affected are the R533 (Ohrigstad - Graskop – Pilgrim's Rest) and the R532 (Graskop – Moremela). The gravel road (D1056) between Pilgrim's Rest and Moremela would serve as a secondary road to access the Frankfort site from either Pilgrim's Rest or the Moremela area.

According to the Traffic Impact Assessment, a maximum of thirty 25-ton trucks will travel between the Frankfort and CDM sites to the processing plant on a daily basis. This will result in three trucks per hour in both directions. Further trips to transport workers are estimated at 4 trips per day. Mining material will only be transported between the Beta North adit area and the processing plant, but the access road to the plant will also have to accommodate the vehicles from the Frankfort and CDM Mines. Overall, twelve additional vehicular trips per hour are expected at Frankfort and CDM mines and 24 trips per hour on the access road to the plant. These vehicle movements will result in an increase in the traffic volumes on these localised roads compared to the existing situation with resultant noise and dust impacts, as well as impacts on the road surfaces. Roads will be damped down to control the dust levels as per the Air Quality mitigation on internal gravel/dirt roads. Maintenance will be done on all roads as necessary.

Dust from the above-mentioned vehicle movement on gravel roads and general mining activities could be a nuisance to surrounding land uses, as well as a potential health risk in worst-case circumstances. Dust fallout must be managed in line with the requirements of the EMPr.

Blasting at the mining sites can have negative impacts on nearby structures or dwellings. Blasting could impact on property values if it were scientifically found to impact on the stability of the structures.

Blasting could furthermore result in disturbing negative noise impacts, especially in this rural type of area characterised by relatively low ambient noise levels. The Blasting Study that was undertaken indicated that the construction workers, residents of nearby communities such as Brown's Hill, Darks Gully, Pilgrim's Rest (residents and tourists), and Schoonplaas/Newtown will not be affected by blasting related noise and that the stability of infrastructure will not be affected.

Sense of place relates to the way individuals and/or communities experience their living environment. This is not a static concept as it is influenced by past and present experiences and current perspectives, and thus has the potential to change over time and could have different relevance for various groups of people that share the same environment.

The northern areas fall under the jurisdiction of Tribal Authorities. Land Claims have also been awarded which indicate a strong traditional tie of residents with the area, associated with a rural sense of place and peacefulness. The land Claim owners are in support of mining taking place within this area. The mining activities and infrastructure could change the visual character and rural isolated ambiance of the study area and can contribute to lighting pollution at night. The surface infrastructure at the different mining sites, however, will be contained within relatively small areas and on previously disturbed mining footprints. Thus far there appears to be significant community support for the project.

Tourists can be classified as sensitive receptors focused on the scenery and sense of place. The undulating landscape and presence of large sections of forestry areas would also assist in limiting the visibility of some of the infrastructure. The Frankfort mining site is not located in close proximity to routes frequently used by tourists, and the CDM and Beta North mining areas can be mitigated by the hilly landscape. Given the extent of this and the historical mining character within the Pilgrim's Rest area, the overall impact on the sense of place would be of moderate significance.

Impact on Community Health

In mining areas, there are concerns relating to migrant employees bringing health risks and nowadays the threat of Covid-19 infection to small towns. Pilgrim's Rest and surrounds, as well as the northern areas, are already characterised by vulnerable households and inadequate public health services that cannot always effectively deal with the health risks associated with the pandemic. With regards to the proposed mining, in-migration (controlled/formalised and uncontrolled/jobseekers) is anticipated which will have negative impacts on local residents. It will remain the responsibility of the authorities and the mining companies to continue their support to surrounding communities to reduce vulnerability.

Further concerns revolve around the possible public health impact of the general mining activities (including the tailings facility and waste rock dumps) on the health of the surrounding landowners and communities due to possible air/dust pollution (vehicle emissions, windblown particulates), as well as noise pollution and the impact on the water quality. Care should, however, be taken to limit any possible health-related impacts by striving toward international best practices.

The possible impact on the water quality and quantity would remain of concern. The livelihood of community members within the area, as well as the timber industry in the area and the residents in the towns, depends on their water quality and quantity. Various households in the area still depended on borehole water as well as on springs, rivers, and streams to serve their daily needs. The issue of water and the possible impact on the water sources would remain a critical issue and needs to be addressed to avoid social mobilisation against the proposed project.

Should it be found that any pollution occurs, the existing health services as such would come under additional pressure, especially in light of the Covid-19 pandemic which also puts strain on the local health services.

As illegal miners are currently impacting on the water quality, the perception exists that formal mining would drive illegal miners out of the area with subsequent positive impacts on the water quality.

Not only the mining activities but also the storage of hazardous substances (diesel and explosives) on-site creates safety risks. Even though all precautionary safety measures will be implemented with regard to the storage, transportation, and handling of these substances, this remains a concern. It is thus clear that the way in which the mine attends to health and safety issues will influence the quality of life of the communities.

Impact on community safety

Unfulfilled community expectations in terms of employment creation and the distribution of community development funds could cause discontent.

It could be argued that unemployment levels should decline substantially once mining starts and hence could have a positive impact on lowering crime rates in the local area. It could also be argued that as TGME would be resuming the active control of illegal mining activities in the neighbourhood, this could also reduce crime rates in Pilgrim's Rest and Moremela directly related to these illegal activities.

Overall, the mining activities will lead to an increase in the population profile which will likely have a negative impact on the crime rate in the towns. In some mining areas in South Africa, unemployment and crime rates have risen despite high rates of local employment growth.

Phase 2 of the expansion of the existing TSF will extend onto the Brown's Hill Settlement.The movement of mining vehicles, mining activities, as well as the increase in traffic on the access road, will create safety risks for the residents of this settlement. To limit the safety risks and impacts as a result of the expansion and mining activities, it is important that the resettlement of the Brown's Hill community be undertaken prior to the operational phase. Resettlement of these residents would result in further negative impacts on their sense of place, their social networks, and their quality of life. It could include the following:

- Disruption in their small social network, and social relationships with possible negative psychological consequences;
- Loss of community cohesion and loss of "sense of place" by residents;
- Periods of uncertainty due to negotiations and finalisation of resettlement process; and
- Conflict between parties involved in the process and conflicting viewpoints/attitudes regarding resettlement within the community.

It should however be noted that positive economic implications could result for those residents that would be resettled such as:

- Proximity to work or employment opportunities;
- Proximity to amenities such as health and educational facilities;
- Closer proximity to the town of Pilgrim's Rest;
- Once resettled, infrastructural improvements such as proper housing facilities, as well as access to water and sanitation facilities could positively impact on their quality of life.

Resettlement and the process to be followed such as the compilation of a Resettlement Action Plan (RAP) and the actual resettlement of residents do not form part of the EIA process. The communities in the study area put a high level of confidence in the fact that criminal activities and socio-economic problems created by illegal mining activities will be halted by formal mining activities.

Mineworkers and mine security could come into conflict with the existing illegal mining activities which could pose safety and security hazards for the mineworkers, as well as communities near these activities.

Fires spreading from mining sites to forestry areas will result in severe negative financial impacts for the timber production companies.

13.3.10.3 DECOMMISSIONING AND CLOSURE

Decrease/cessation of employment

When the mining project nears the end of LoM, about 426 direct job employment opportunities in the local economy will become redundant, however, should there be other operational mining sites, the consideration of an internal transfer to these sites is highly considered in order to keep the percentage of unemployment as low as feasibly possible.

Termination of local social funds

The commitment with regards to the economic development of between R4million per annum is expected to cease over the course of the decommissioning and closure of mining operations. In this regard a closure social and labour plan will be compiled.

Permanent loss of agricultural land

According to the MWP (TGME,2021), the total mining area is 230 hectares of which 72 hectares will be redeveloped for infrastructure. At 0,072 square kilometres the surface infrastructure represents less than 0,05% of the joint surface area of Wards 13 (1,055 sqm) and Ward 10 (1,098). All activities will be located on the previously disturbed areas.

Nuisance factors

During the decommissioning phase, general decommissioning activities, similar to construction activities create different types of noise, such as noise associated with the movement of heavy vehicles, the reverse indicator of trucks, the loading or movement of material, and equipment, as well as the decommissioning activities. These types of noises would have different nuisance impacts on those within the construction site. It is unlikely that the noise impacts will have negative impacts on nearby dwellings and residents within Darks Gully, Pilgrim's Rest, and Schoonplaas/Newtown. Some negative noise impacts can be experienced at the Pilgrim's Rest Golf course and by visitors at the Caravan Park. These noise impacts will be intermittent and of short duration. It is unlikely that decommissioning at Frankfort Mine will result in noise impacts on neighbouring areas. It should also be noted that there are no sensitive receptors located near the site.

As with the construction phase, dust will be created by vehicular movement on gravel roads and some decommissioning activities. The dust pollution is not anticipated to have any long-term negative impacts on the health of residents. Dust impacts, mainly created by vehicular movement will be felt by visitors to the Caravan Park, although for short durations only. Dust fall-out from the TSF can impact on the air quality for a long period after the actual decommissioning of above-ground infrastructure. Proper rehabilitation according to the environmental regulations would have to address any possible negative impacts in this regard. Ongoing health risks for residents in Dark's Gully and Pilgrim's Rest can thus remain.

Decommissioning of the above-ground infrastructure will include re-vegetation of the area and the removal of mining related infrastructure. This can have a positive impact on the overall sense of place as the area can return to its pre-project state with less mining related infrastructure and visual impacts thereof. Rehabilitation of gravel haul roads will be a long process and the visual impacts in this regard will remain for some time after decommissioning of the infrastructure. Rehabilitation will be undertaken at the TSF, but the impact on the sense of place will remain in the long term.

Consultation with landowners as part of the finalisation of the rehabilitation plan and end-land use is thus important to determine what is required from an environmental perspective but to also address localised community needs. If the rehabilitation is not successful, negative permanent visual impacts would remain.

Community safety

Some residual environmental impacts might pose safety risks to the local communities close to the mine including the risk of sinkholes, and subsidence due to historical underground mining, ground or surface water pollution, as well as illegal mining activities.

Once formal mining ceases, the risks remain that illegal miners can either continue their illegal activities or return to the area to again mine at the adits that were re-established as part of the underground mining activities of TGME. Such illegal mining activities will again create community safety risks and can result in the unauthorised sub-letting of rooms or houses to these foreigners. Financial provisions must include funds for additional safety and security to be established once rehabilitation of the sites has been completed.

Closure and decommissioning of a TSF can continue to release harmful substances through seepages and windblown dust. Pollution of soils and water resources (e.g. boreholes, and the Blyde River) would therefore remain a concern as contaminants can affect the downstream water quality with further impacts on the health of communities and downstream farming activities. Inhalation of windblown dust could also continue to cause health risks.

These types of waste facilities must be properly attended to through pollution control systems and rehabilitation measures. It would thus be imperative to ensure public health and safety through compliance with environmental standards and regulations. Possible seepage, impacts on groundwater quality, air quality, and radioactivity compliance levels must be monitored and sufficiently addressed.

The main objective during decommissioning and rehabilitation would be to ensure a safe facility that is stable and non-contaminating, with minimal requirements for ongoing maintenance after closure.

13.3.11 IMPACTS ON TRAFFIC

By using the data collected, traffic operating conditions were determined by means of the traffic engineering capacity analysis software, SIDRA INTERSECTION 8.

To determine the traffic impact during construction the following construction activity assumptions are made (based on estimates sourced from TGME):

- Frankfort: A maximum of ten 25-ton trucks will travel to and from the site daily (both directions). Assuming a ten-hour construction day, this yields one truck per hour in both directions. Assuming a further three management/labour-based trips per hour this yields a total hourly trip generation rate of four trips per direction. This is expected to be true during the weekday AM and PM peak hours;
- CDM (Morgenzon & Dukes): A maximum of ten 25-ton trucks will travel to and from the site daily (both directions). Assuming a ten-hour construction day, this yields one truck per hour in both directions. Assuming a further three management/labour based trips per hour this yields a total hourly trip generation rate of four trips per direction. This is expected to be true during the weekday AM and PM peak hours, and
- Beta: A maximum of ten 25-ton trucks will travel to and from the site daily (both directions). Assuming a ten-hour construction day, this yields one truck per hour in both directions. Assuming a further three management/labour-based trips per hour this yields a total hourly trip generation rate of four trips per direction. This is expected to be true during the weekday AM and PM peak hours.

Based on the assumptions above the construction phase is expected to generate peak hour traffic volumes of eight cars in the morning and 8 in the evening peak hours. The SIDRA analysis results indicate that good traffic operating conditions are expected during the construction phase at the key study intersections.

To determine the traffic impact during the production phase the following production activity assumptions are made (based on estimates sourced from TGME):

- Frankfort: A maximum of 30 25-ton trucks will travel to and from the site daily (both directions, between the site and the processing plant at the TGME area). Assuming a ten-hour production day, this yields three trucks per hour in both directions. Assuming a further three management/labour-based trips per hour this yields a total hourly trip generation rate of six trips per direction. This is expected to be true during the weekday AM and PM peak hours;
- CDM (Morgenzon & Dukes): A maximum of 30 25-ton trucks will travel to and from the site daily (both directions, between the site and the processing plant at the TGME area). Assuming a ten-hour production day, this yields three trucks per hour in both directions. Assuming a further three management/labour-based trips per hour this yields a total hourly trip generation rate of six trips per direction. This is expected to be true during the weekday AM and PM peak hours, and
- Beta North: The Beta North area is not expected to generate external trips as the mining material mined at the Beta shafts will be transported internally to the processing plant in the TGME area. However, the TGME area will receive the trips generated by the Frankfort, Morgenzon and Dukes mines. Therefore, a total of 12 hourly trips is expected to enter and exit the TGME area per hour. This is expected to be true during the weekday AM and PM peak hours.

The expected peak hour traffic volumes at the study intersections during the future production phase. These volumes also include an expected 2.0% annual growth in background traffic (i.e. existing traffic) over a period of three years. This is to account for background traffic growth during the stated three year production phase.

The operating conditions for the key intersections during the future operational phase show approximately 12 to 24 trips in peak hours. The SIDRA analysis results indicate that good traffic operating conditions are expected during the operational phase at the study intersections.

By comparing the expected operating conditions during the project's construction and production phases with the baseline it is observed that an insignificant traffic impact on the external road network is expected for both these project phases.

13.3.12 IMPACTS OF BLASTING AND VIBRATION

In the process of ore extraction conventional drilling and blasting will be done as described in the Blasting assessment attached as ANNEXURE T.

Conventional drilling and blast operations do require consideration of ground vibration effects. Though the blasting is done in panels the whole surface area of each shaft complex is evaluated plus an area around the different project areas. No air blast or fly rock is considered due to the mine being an underground operation during the operational phase. These effects do not have any influence on the surface environment.

Presented herewith are the expected ground vibration levels at different distances from the underground mining area and discussion of relevant influences from underground blasting operations. Expected ground vibration levels were calculated for each POI identified surrounding the mining area and evaluated with regards to possible structural concerns and human perception.

Ground vibration is calculated for the underground panel blasting at specific distances from the outline of the underground area. These levels are then plotted and overlaid with current mining plans to observe possible influences at structures identified. Structures or POI's for consideration are also plotted in this model. Ground vibration predictions were done considering distances ranging from 50 m to 200 m around the underground mining area.

The simulation provided shows ground vibration contours only for a limited number of levels. The levels used are based on the minimum depth below anticipated up to 200 m from the edge of the underground area. This enables immediate review of possible concerns that may be applicable to any of the privately-owned structures, social gathering areas or sensitive installations.

Data is provided as follows: Vibration contours for minimum and maximum charge expected at specific distances. Figures shows surface view for each mine. A cross section is provided for the CDM mine indicating the vertical effect expected. Ground vibration summary is provided giving expected influences.

Review of expected levels of ground vibration from underground blasting operations it is clear that levels expected are low. There is mainly one POI within the boundary of the CDM North project area.

The expected levels of ground vibration are in the order of 23.3 mm/s for the maximum charge calculated. The minimum charge indicates a level of 8.4 mm/s. Predictions indicate that at 150 m the maximum charge is expected to yield 6 mm/s of ground vibration. This level is associated with the most stringent ground vibration limit applied.

Thus indicating should any public installations be erected further than 150 from the mining areas the ground vibration will be within limits. It is also clear that as blasting progresses deeper into the shafts the levels of ground vibration on surface will also decrease significantly to a point where no vibration can be experienced.

On the shallow areas ground vibration in the order of 36.8 mm/s is expected. The planned blasting and subsequent multiple panels to be blasted is not expected any substantial ground vibration that is of concern for the current surface environment.

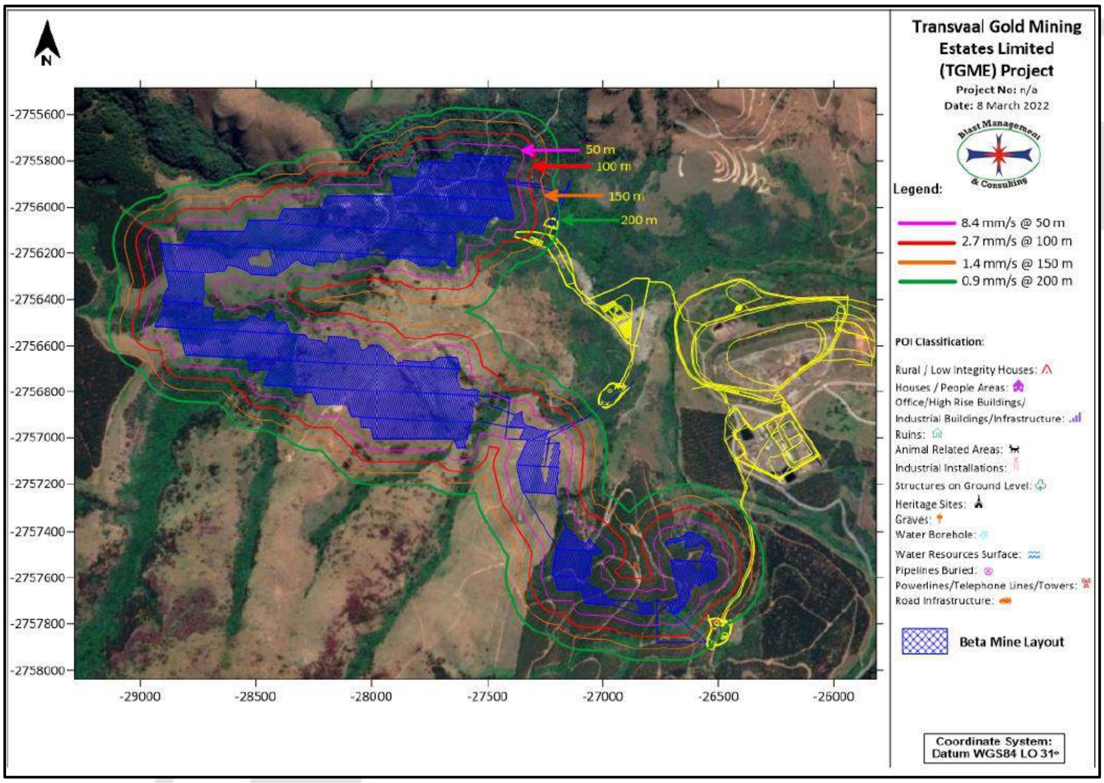


Figure 136: Ground vibration influence from underground blasting operations – Beta North Mine (Minimum charge mass per delay - 15 kg – underground blasting)

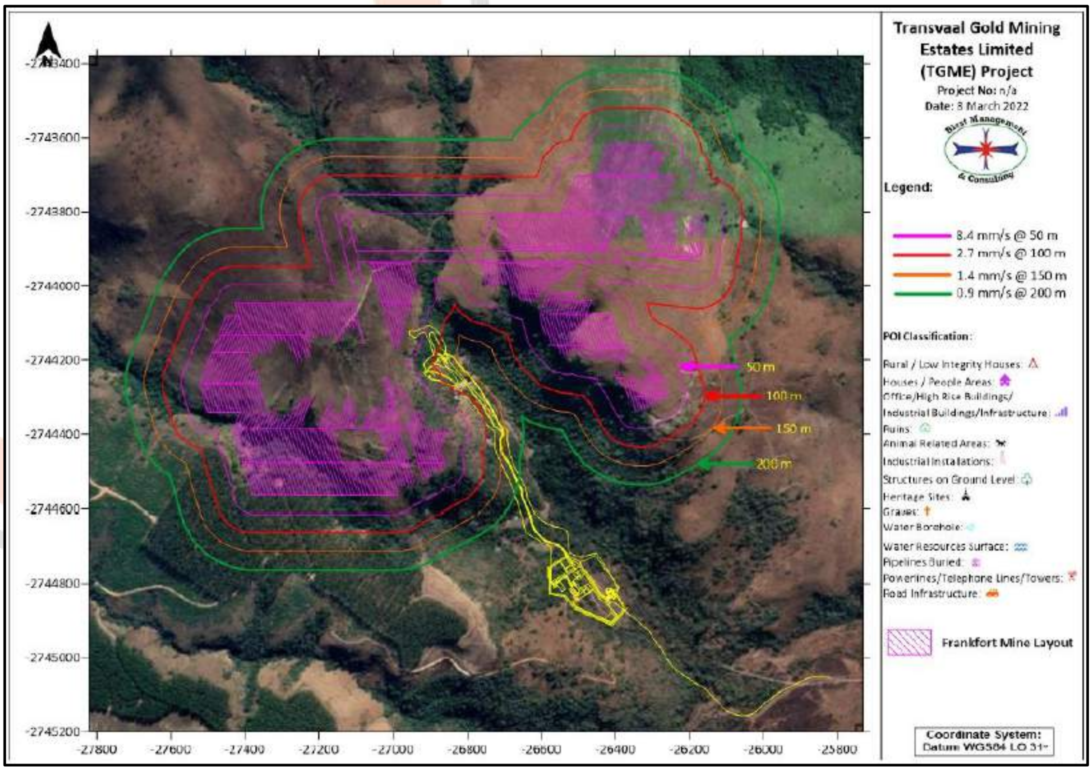


Figure 137: Ground vibration influence from underground blasting operations – Frankfort Mine (Minimum charge mass per delay - 15 kg – underground blasting)

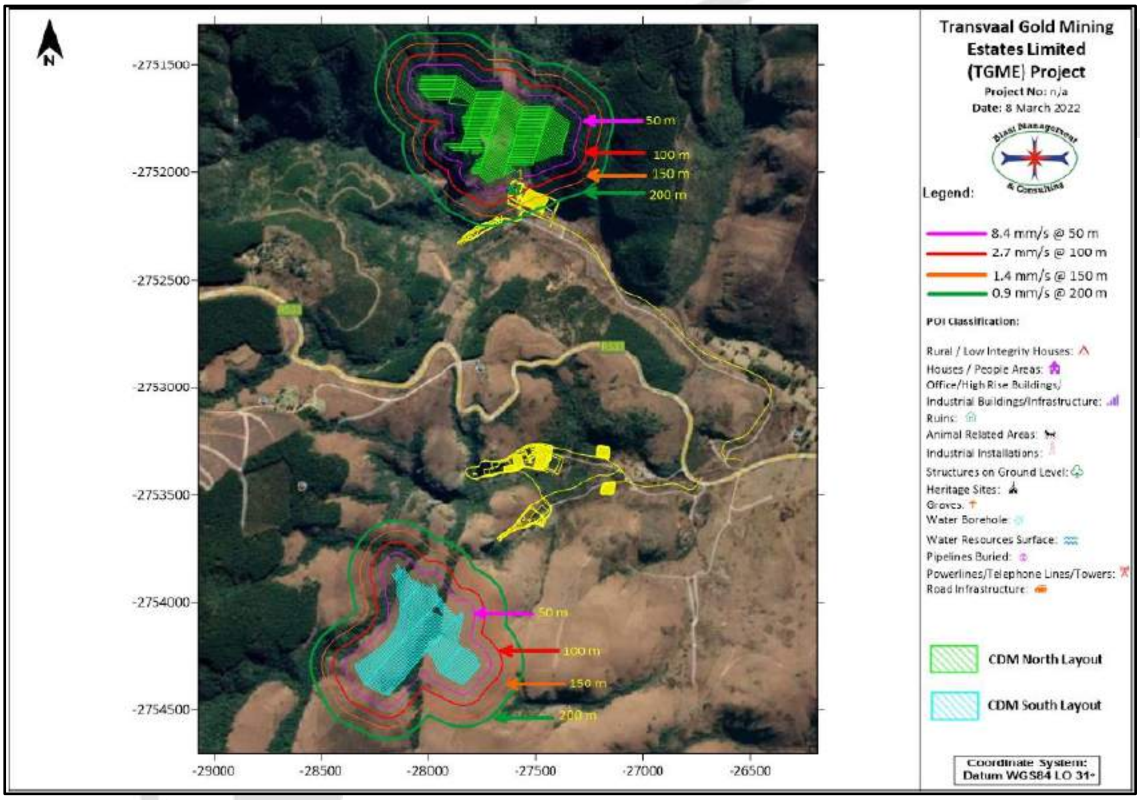


Figure 138: Ground vibration influence from underground blasting operations – CDM (Minimum charge mass per delay - 15 kg – underground blasting)

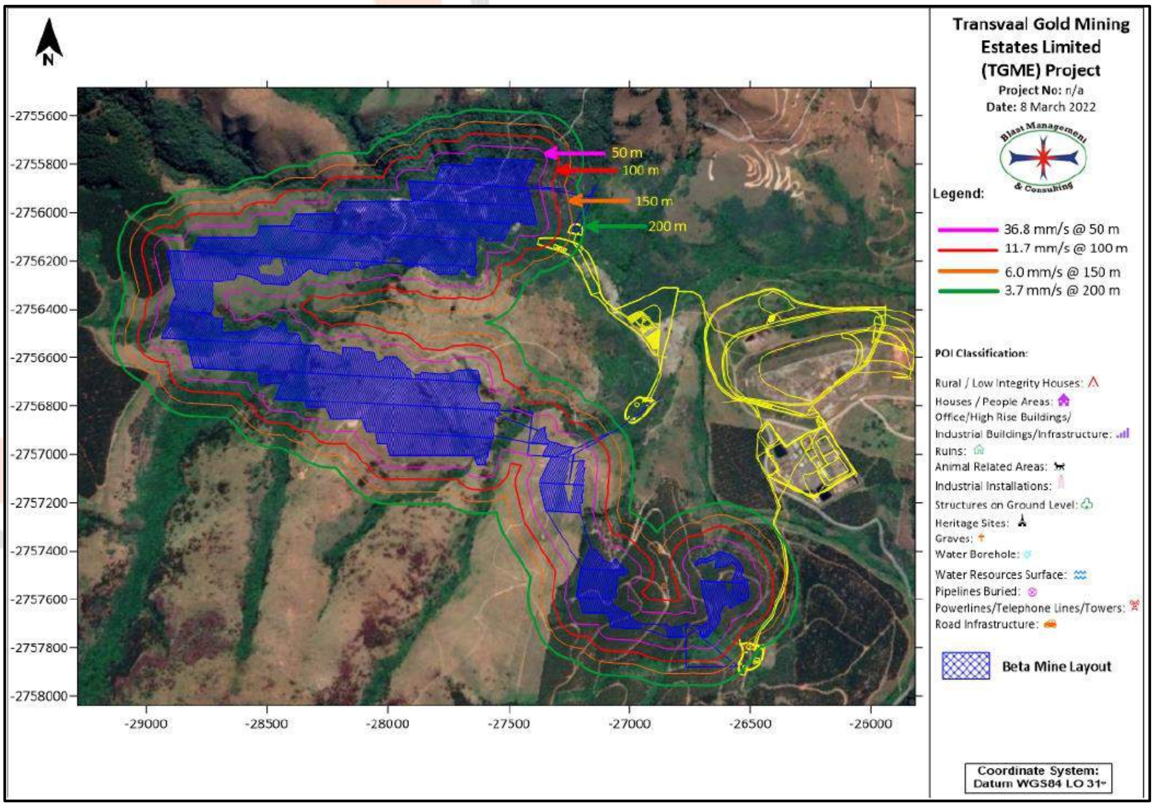


Figure 139: Ground vibration influence from underground blasting operations – Beta North Mine (Maximum charge mass per delay - 90 kg – underground blasting)

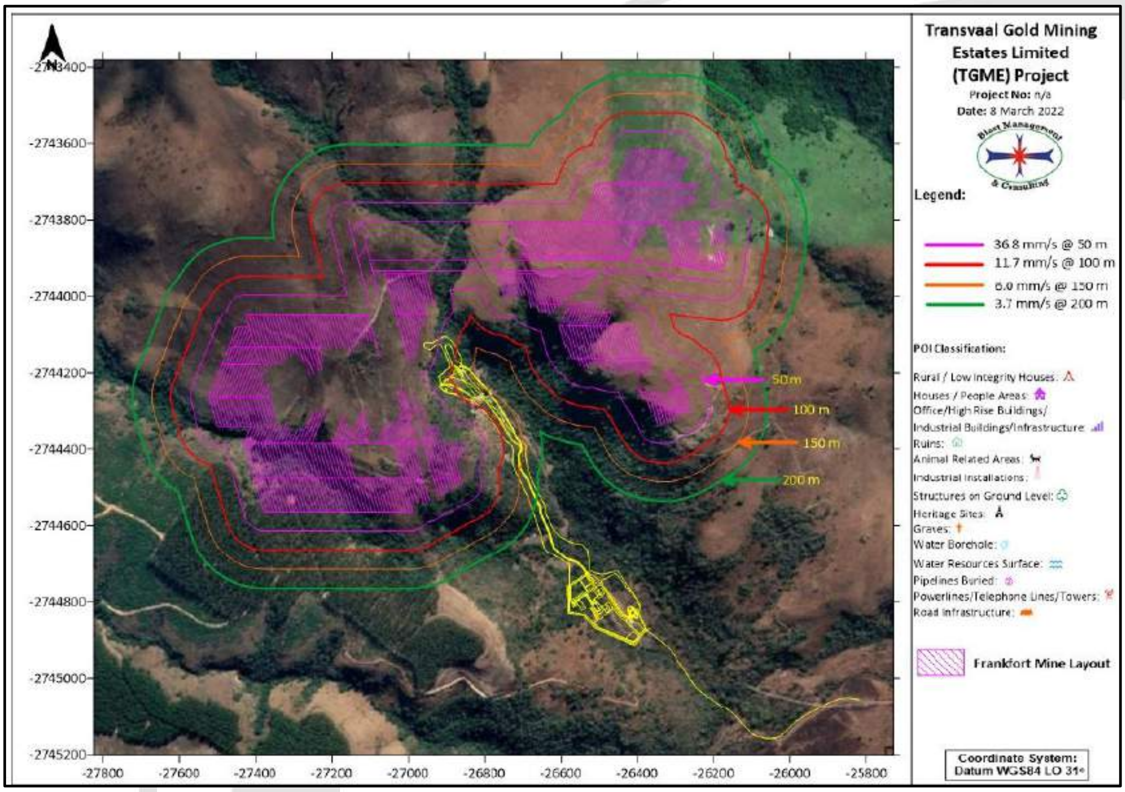


Figure 140: Ground vibration influence from underground blasting operations – Frankfort Mine (Maximum charge mass per delay - 90 kg – underground blasting)

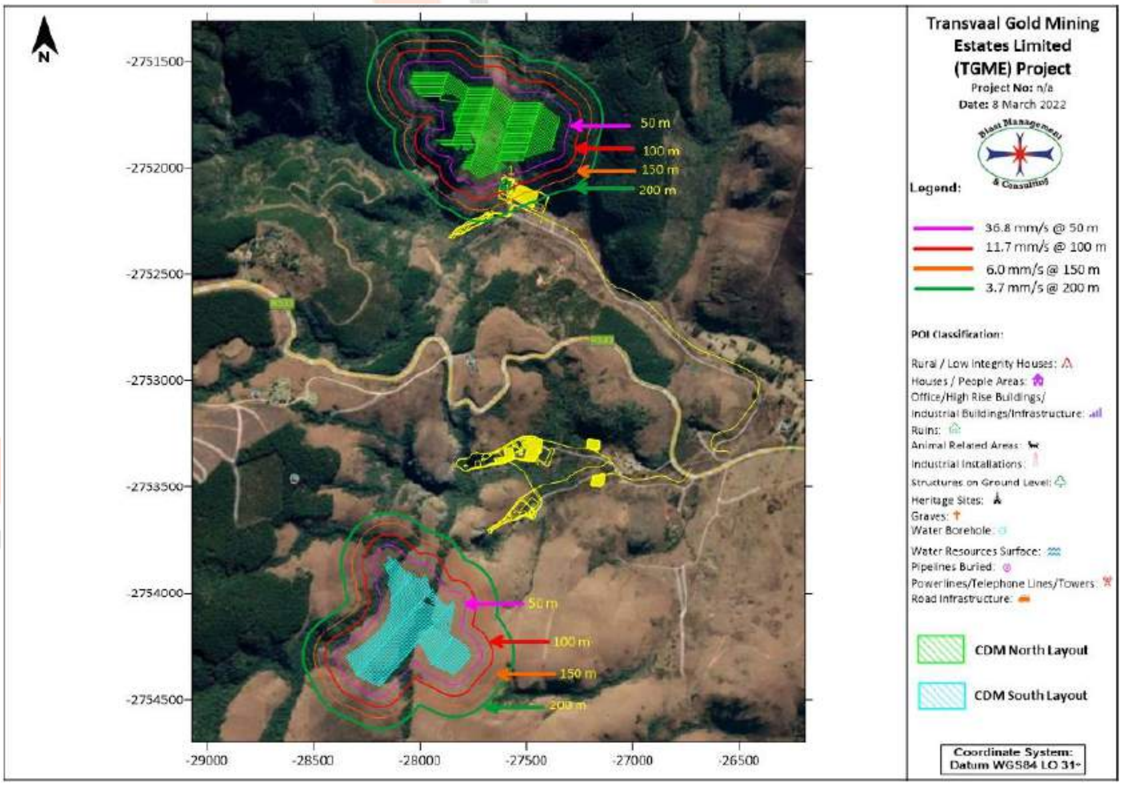


Figure 141: Ground vibration influence from underground blasting operations – CDM Mine (Maximum charge mass per delay – 90 kg – underground blasting)

13.3.13 CUMULATIVE IMPACTS

According to the Internationl Finance Corporation (IFC) standards the following objectives need to be met in a cumulative assessment:

- Assess the potential impacts and risks of a proposed development over time, in the context of potential effects from other developments and natural environmental and social external drivers on a chosen environmental and social attribute.
- Verify that the proposed development's cumulative social and environmental impacts and risks will not exceed a threshold that could compromise the sustainability or viability of selected environmental and social attributes.
- Confirm that the proposed development's value and feasibility are not limited by cumulative social and environmental effects.
- Support the development of governance structures for making decisions and managing cumulative impacts at the appropriate geographic scale (e.g., airshed, river catchment, town, regional landscape).
- Ensure that the concerns of affected communities about the cumulative impacts of a proposed development are identified, documented, and addressed.
- Manage potential reputation risks.

A cumulative impact may result from an additive impact i.e. where it adds to the impact which is caused by other similar impacts or an interactive impact i.e. where a cumulative impact is caused by different impacts that combine to form a new kind of impact. Interactive impacts may either be countervailing (net adverse cumulative impact is less than the sum of the individual impacts) or synergistic (net adverse cumulative impact is greater than the sum of the individual impacts).

The cumulative impacts are assessed by taking into account the current monitoring and baseline assessment that include the projects that are in close proximity (e.g. Illegal mining and Plantations). From there the mine impacts was simulated on top of the current impacts. Two types of Cumulative impacts as explained below (**Figure 142**) in are evaluated and rated in this report.

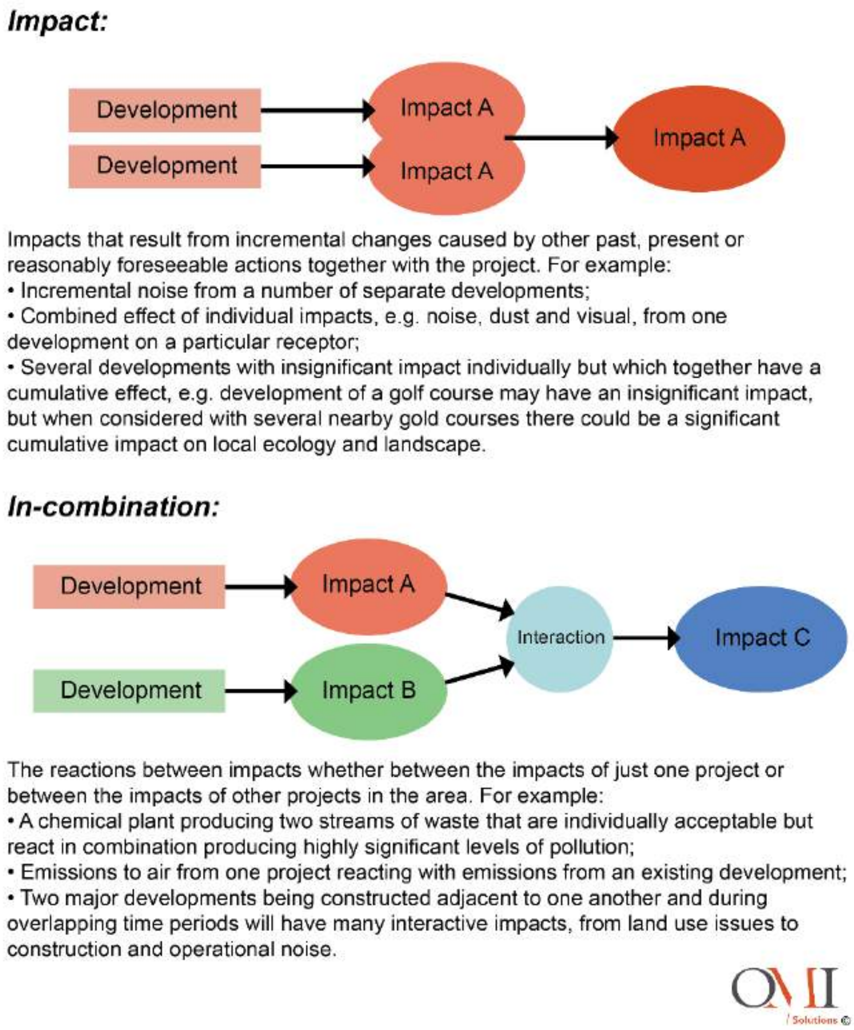


Figure 142: Illustration of cumulative impact prediction methods

The assessment of cumulative impacts on a study area is complex; especially if many of the impacts occur on a much wider scale than the site being assessed and evaluated. It is often difficult to determine at which point the accumulation of many small impacts reaches the point of an undesired or unintended cumulative impact that should be avoided or mitigated. There are often factors which are uncertain when potential cumulative impacts are identified.

Where modelling of impacts have been done for the project these have been assessed in a cumulative matter placing the predicted impacts on top of the simulated or determined baseline/impacts currently taking place. This includes impact predictions related to groundwater, noise, air quality and visual impacts.

13.3.13.1 AQUATIC ECOLOGY CUMULATIVE IMPACT

The proposed 83MR Project is located in an area where commercial forestry, agricultural activities, peri-urban settlements and tourism facilities to a lesser degree, place a strain on freshwater ecosystems present. Cumulative impacts as a result of these land uses results in loss or diversion of surface water, and associated loss of catchment yield, as well as potential impacts on water quality (e.g. informal discharge of domestic effluent into the Blyde River from informal settlements and from the Pilgrims Rest WWTW). Historical mining, current artisanal mining and agricultural activities have resulted in alterations to and losses of sensitive wetland, aquatic and riparian habitat, contributing to loss of aquatic biodiversity and placing additional pressure on faunal species reliant on this habitat for breeding, foraging and migration routes. This too, applies to the rare and endangered biota that are endemic to the region such as the critically endangered Treur River Barb (*Enteromius treurensis*) as well as the Natal Mountain Catfish (*Amphilius natalensis* (DD)), Amphilius sp. 'natalensis cf. treur' (DD), the vulnerable *Pseudagrion newtoni* ("Harlequin sprite" damselfly), and amphibian species (*Hadromophryne natalensis* – Vulnerable in Mpumalanga) (SAS, 2022).

13.3.13.2 CUMULATIVE AIR QUALITY IMPACTS

Land use in the region includes residences, farming, mining and wilderness. The mining and processing operations (other companies), farming activities, domestic fires, vehicle exhaust emissions and dust entrained by vehicles on public roads without the addition of the proposed operations will likely result in elevated ambient air pollutant concentrations and dustfall rates compared to an area where there are no anthropogenic emission sources. It is difficult to predict the location and contribution of the sources from residences, farming and wilderness to existing air quality. The potential cumulative scenario includes the following atmospheric emissions:

- Particulate emissions form windblown dust on the TGME TSF;
- Miscellaneous fugitive dust sources including vehicle entrainment on roads and wind-blown dust from open areas;
- Particulate emissions from vehicle exhaust emissions;
- Particulate and gaseous emissions from local logging and timber sawmills;
- Particulate emissions from the long range transport from disused mines surrounding the locality;
- Particulate emissions from household fuel burning; and
- Particulate emissions from biomass burning (e.g. wild fires).

Based on the simulated results exceedances of some criteria pollutants near some AQSRs may occur after the commencement of the 83MR Project. However, if the background concentrations are low, the cumulative impact significance is expected to be similar to that of incremental for most pollutants i.e. Low for all scenarios.

Thus the cumulative effect from the mining and processing operations could result in increases in dustfall during periods of high wind speeds that will likely result in exceedances of the NDCR limits. The cumulative dustfall impacts are likely to remain Low during normal operations near the plant area for the mitigated scenarios respectively while they remain Low for both scenarios at the other mining areas (CDM and Frankfort).

13.3.13.3 CUMULATIVE TERRESTRIAL ECOLOGY IMPACTS

The greatest cumulative threat to the floral ecology within the survey area is likely to be the potential spread of AIPs, which may result in long-term changes to floral communities and displacement of native species. This is already a significant problem in the region, especially with wattle invasion into grasslands and along drainage lines.

The Pilgrims Rest area is well known from a historical mining perspective, and more recently from an illegal mining one. Much of the landscape has seen significant habitat and biodiversity loss due to extensive vegetation clearance for plantations, mostly comprising of pine trees. In addition to this, historic mining activities has resulted in disturbance footprints scattered throughout the local area, some more noticeable than others. As a result, the remaining intact habitat areas are considered to be of increased importance for faunal species. These remaining areas however are now being heavily impacted upon as a result of illegal mining activities and AIP proliferation. The proposed 83MR mining activities are predominantly located in old mining areas, many of which are currently occupied by illegal miners. As such, the cumulative impacts are expected to be minimal as the majority of impacts will be located within already impacted sites. It is however possible that legal mining activities may in turn have a positive cumulative impact to the region through the controlling of AIPs and through controlled mining activities that do not lead to the pollution of the freshwater systems and surrounding areas as is currently seen with the illegal miners.

13.3.13.4 CUMULATIVE VISUAL IMPACT

The 83MR Project is located in an area where commercial forestry, historic and existing mining activities, agricultural activities, villages and the town of Pilgrim's Rest are present in the landscape. Cumulative impacts as a result of these land uses results in the loss of the intrinsic value of the natural vegetation associated with the aesthetically pleasing mountainous terrain.

Due to the abovementioned land uses, the panoramic landscape can no longer be referred to as unspoilt and natural in terms of vegetation, especially due to the periodic contrast in soil from exposure of bare ground during the logging of plantations. The proposed 83MR Project has the potential to further contribute to soil contrast, thus affecting the quality and character of the landscape. The cumulative impact of additional traffic on the local and regional roads as well as combined impacts from night-time lighting will also affect the sense of place of the larger region.

Furthermore, if all surface infrastructure is not removed post closure and the stripped areas are not shaped and revegetated to a condition similar to the surrounding mountainous landscape, long term impacts on the terrain, landscape character and quality, and sense of place may occur. This is likely to further contribute to cumulative impacts on the visual environment, leading to further loss of the mountainous scenic landscape.

13.3.13.5 CONCLUSION ON CUMULATIVE IMPACTS

It should be noted that the proposed 83MR Project is a "pilot" project and may be the catalyst for additional gold mining within the greater Pilgrim's Rest area. Thus, whilst the cumulative impacts associated with the proposed 83MR Project are not expected to be extensive, the cumulative impacts associated with future mining activities in the greater area, should such projects come to fruition, may have a regional and potentially provincial influence on the some of the receiving environment.

The only way to surely determine any cumulative impacts is with development of a Strategic Environmental Assessment and the full co-operation of the all surrounding land users. Some assumptions have been mentioned in the specialist reports where information was not available and or cannot be obtained or project information not yet available to determine impacts. The implementation and also creation of a proper cumulative assessment is therefore beyond the capacity of individual proponents like TGME and should be done in combination with the various roleplayers in the catchment.

13.4 ASSESSMENT OF EACH IDENTIFIED POTENTIALLY SIGNIFICANT IMPACT AND RISK

The impact assessment details is listed below in **Table 65**.

Table 65: Impact assessment table

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Probability		Duration		Scale		Magnitude/ Severity		Significance	
					Magnitude	Score	Magnitude	Score	Magnitude	Score	Magnitude	Score	Score	Magnitude
Air Quality Impact Assessment														
Construction Phase														
Construction associated with the proposed project	Air Quality - Health Risk Impact Significance	Increased health risk at Air Quality Sensitive Receptors (AQSRs.)	WOM	Negative	Highly Probable	4	Short term	1	Site	2	Medium	6	36	Low
			WM	Negative	Highly Probable	4	Short term	1	Site	2	Medium	6	36	Low
Construction associated with the proposed project	Air Quality - Nuisance Impact Significance	Increased health risk at AQSRs.	WOM	Negative	Definite	5	Short term	1	Site	2	High	8	55	Moderate
			WM	Negative	Definite	5	Short term	1	Site	2	High	8	55	Moderate
Construction associated with the proposed project	Air Quality - Vegetation Impact Significance	Increased health risk at AQSRs.	WOM	Negative	Improbable	1	Short term	1	Site	2	Medium	6	9	Negligible
			WM	Negative	Improbable	1	Short term	1	Site	2	Medium	6	9	Negligible
Operational Phase														
Mining and processing operations associated with the proposed project.	Air Quality - Health Risk Impact Significance	Increased health risk at AQSRs.	WOM	Negative	Probable	2	Medium term	3	Site	2	Medium	6	22	Low
			WM	Negative	Probable	2	Short term	1	Local	1	Low	2	8	Negligible
Mining and processing operations associated with the proposed project.	Air Quality - Nuisance Impact Significance	Increased health risk at AQSRs.	WOM	Negative	Highly Probable	4	Medium term	3	Site	2	Medium	6	44	Low
			WM	Negative	Probable	2	Short term	1	Local	1	Low	2	8	Negligible
Mining and processing operations associated with the proposed project.	Air Quality - Vegetation Impact Significance	Increased health risk at AQSRs.	WOM	Negative	Probable	2	Medium term	3	Site	2	Medium	6	22	Low
			WM	Negative	Probable	2	Medium term	3	Site	2	Medium	6	22	Low
Closure Phase														
Closure activities	Air Quality - Health Risk Impact Significance	Increased health risk at AQSRs.	WOM	Negative	Highly Probable	4	Short term	1	Site	2	Medium	6	36	Low
			WOM	Negative	Highly Probable	4	Short term	1	Site	2	Medium	6	36	Low
Closure activities	Air Quality - Nuisance Impact Significance	Increased health risk at AQSRs.	WOM	Negative	Highly Probable	4	Short term	1	Site	2	High	8	44	Moderate
			WOM	Negative	Highly Probable	4	Short term	1	Site	2	High	8	44	Moderate
Closure activities	Air Quality - Vegetation Impact Significance	Increased health risk at AQSRs.	WOM	Negative	Improbable	1	Short term	1	Site	2	Medium	6	9	Negligible
			WOM	Negative	Improbable	1	Short term	1	Site	2	Medium	6	9	Negligible
Decommissioning Phase														
Post closure activities	Air Quality - Health Risk Impact Significance	Increased health risk at AQSRs.	WOM	Negative	Probable	2	Medium term	3	Site	2	Medium	6	22	Low
			WM	Negative	Probable	2	Short term	1	Local	1	Low	2	8	Negligible
Post closure activities	Air Quality - Nuisance Impact Significance	Increased health risk at AQSRs.	WOM	Negative	Probable	2	Medium term	3	Site	2	Medium	6	22	Low
			WM	Negative	Probable	2	Short term	1	Local	1	Low	2	8	Negligible
Post closure activities	Air Quality - Vegetation Impact Significance	Increased health risk at AQSRs.	WOM	Negative	Improbable	1	Short term	1	Site	2	Medium	6	9	Negligible
			WM	Negative	Improbable	1	Short term	1	Local	1	Medium	6	8	Negligible
Soil and Land Capability Assessment														

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Probability		Duration		Scale		Magnitude/ Severity		Significance	
					Magnitude	Score	Magnitude	Score	Magnitude	Score	Magnitude	Score	Score	Magnitude
Construction Phase														
Construction of the infrastructure	Soil Erosion	Loosening of soils due to removal of vegetation associated with the surface infrastructure. Leading to Increased runoff, erosion and consequent loss of land capability in cleared areas.	WOM	Negative	Definite	5	Long term	4	Site	2	Medium	7	65	High
			WM	Negative	Highly Probable	4	Medium term	3	Site	2	Medium	5	40	Low
	Soil Compaction	Potential frequent movement of digging machinery and construction vehicles within lose and exposed soils, leading to excessive soil compaction.	WOM	Negative	Definite	5	Long term	4	Site	2	Medium	7	65	High
			WM	Negative	Highly Probable	4	Long term	4	Local	1	Medium	5	40	Low
	Soil Contamination	Spillage of petroleum hydrocarbons during construction of associated infrastructure. Disposal of hazardous and non-hazardous waste, including waste material spills and refuse deposits into the soil.	WOM	Negative	Highly Probable	4	Long term	4	Site	2	Medium	7	52	Moderate
			WM	Negative	Probable	3	Medium term	3	Site	2	Low	4	27	Low
	Land Capability	Loss of land capability	WOM	Negative	Definite	5	Medium term	3	Site	2	Medium	4	45	Moderate
			WM	Negative	Highly Probable	4	Medium term	3	Site	2	Medium	4	36	Low
Operational Phase														
Operation of mines and movement of vehicles	Soil Erosion	Constant disturbances of soils, resulting in risk of erosion	WOM	Negative	Definite	5	Long term	4	Site	2	Medium	6	60	Moderate
			WM	Negative	Highly Probable	4	Medium term	3	Site	2	Medium	5	40	Low
	Soil Compaction	Constant disturbances of soils, resulting in risk of compaction	WOM	Negative	Definite	5	Long term	4	Site	2	Medium	6	60	Moderate
			WM	Negative	Highly Probable	4	Medium term	3	Site	2	Medium	5	40	Low
	Soil Contamination	Leaching of hydrocarbons chemicals into the soils, leading to alteration of the soil chemical status as well as contamination of ground water. Disposal of hazardous and non-hazardous waste, including waste material spills and refuse deposits into the soil.	WOM	Negative	Highly Probable	4	Long term	4	Site	2	Medium	6	48	Moderate
			WM	Negative	Highly Probable	4	Medium term	3	Local	1	Medium	5	36	Low
	Land Capability	Loss of land capability	WOM	Negative	Highly Probable	4	Long term	4	Site	2	Medium	6	48	Moderate
			WM	Negative	Highly Probable	4	Medium term	3	Site	2	Medium	5	40	Low
Closure and Post closure													0	
Removal of infrastructure and rehabilitation	Soil Erosion	Soil handling during decommissioning and capping leading to erosion.	WOM	Negative	Probable	2	Long term	4	Site	2	Medium	6	24	Low
			WM	Negative	Probable	2	Medium term	3	Site	2	Medium	6	22	Low
	Soil Compaction	Movement of vehicles and machinery during rehabilitation leading to soil compaction.	WOM	Negative	Probable	2	Long term	4	Site	2	Medium	6	24	Low
			WM	Negative	Probable	2	Medium term	3	Site	2	Medium	6	22	Low
	Soil Contamination	Spillage of hydrocarbons resulting from leakages from demolition equipment/machinery and other chemical storage facilities, leading to soil contamination (soil chemical characteristics.	WOM	Negative	Probable	3	Long term	4	Site	2	Medium	6	36	Low
			WM	Negative	Probable	3	Medium term	3	Site	2	Medium	5	30	Low
	Land Capability	Potentially poor rehabilitation strategy may result to lower infiltration rate, and consequently increased surface runoff. Increased soil erosion leading to permanent loss of soil resources	WOM	Negative	Probable	3	Long term	4	Site	2	Medium	6	36	Low
			WM	Negative	Probable	2	Medium term	3	Site	2	Medium	6	22	Low
Geohydrological and Groundwater Assessment														
Construction Phase														

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Probability		Duration		Scale		Magnitude/ Severity		Significance	
					Magnitude	Score	Magnitude	Score	Magnitude	Score	Magnitude	Score	Score	Magnitude
Tailings Facility - Continuation	Groundwater	Seepage of contaminated leachate into the aquifer system	WOM	Negative	Improbable	1	Short term	1	Local	1	Medium	6	8	Negligible
Underground Mining Establishment	Groundwater Quality	Prior to the actual mining commencing the opening up and dewatering of main accessways will take place. Dewatering of flooded underground workings may pose a risk of contaminated water spilling into the surface water streams.	WOM	Negative	Probable	2	Short term	1	Regional	3	Medium	6	20	Negligible
Operational Phase														
Waste Deposition - Tailings Facility (TSF) - Return Water Dams (RWD) - Waste Rock Dumps (WRD)	Groundwater Quality	-Generation and disposal of hazardous operational waste i.e. waste rock, tailings, etc. -Seepage of contaminated leachate into the aquifer system.	WOM	Negative	Highly Probable	4	Long term	4	Site	2	High	8	56	Moderate
Underground Mining	Groundwater Level and Yield	Water flow into the mine resulting in the draining of the aquifer and potential lowering of the groundwater level.	WOM	Negative	Highly Probable	4	Permanent	5	Local	1	Medium	6	48	Moderate
Underground Mining	Groundwater Quality	Groundwater entering the mine coming into contact with contaminants causing deterioration of the water quality.	WOM	Negative	Probable	2	Long term	4	Site	2	Medium	6	24	Low
Closure and Post closure														
Residual groundwater contamination from TSF, RWD and WRD after closure of the mine	Groundwater Quality	-Generation and disposal of hazardous operational waste i.e. waste rock, tailings, etc. - Seepage of contaminated leachate into the aquifer system.	WOM	Negative	Probable	2	Long term	4	Regional	3	High	8	30	Low
Continued groundwater inflow into the mine	Groundwater Level and Yield	Water flow into the mine resulting in the draining of the aquifer and potential lowering of the groundwater level.	WOM	Negative	Highly Probable	4	Permanent	5	Local	1	Medium	6	48	Moderate
Residual groundwater contamination after closure of the mine	Groundwater Quality	Groundwater entering the mine coming into contact with contaminants causing deterioration of the water quality.	WM	Negative	Probable	2	Long term	4	Site	2	Medium	6	24	Low
Biodiversity Assessment - Floral Assessment														
Beta North														
Construction Phase														

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Probability		Duration		Scale		Magnitude/ Severity		Significance	
					Magnitude	Score	Magnitude	Score	Magnitude	Score	Magnitude	Score	Score	Magnitude
Expansion and re-working of the TSF	Degraded Habitat Unit	• Site clearing and the removal of vegetation associated with the Transformed Habitat Unit; • Potential inadequate design of infrastructure leading to pollution of soils. Contaminated soils lead to a loss of viable growing conditions for plants and results in a decrease of floral habitat, diversity, and SCC – rehabilitation effort will also be increased as a result; and • Potential proliferation of AIP species that colonise areas of increased disturbances and that outcompetes native species, including the further transformation of adjacent or nearby natural, more sensitive habitat, such as downslope watercourses.	WOM	Negative	Definite	5	Long term	4	Site	2	Low	2	40	Low
			WM	Negative	Definite	5	Long term	4	Local	1	Low	2	35	Low
	Freshwater Habitat		WOM	Negative	Probable	2	Long term	4	Regional	3	High	8	30	Low
			WM	Negative	Improbable	1	Medium term	3	Site	2	Medium	6	11	Negligible
	Woody Communities		WOM	Negative	Improbable	1	Medium term	3	Local	1	Low	2	6	Negligible
			WM	Negative	Improbable	1	Short term	1	Local	1	Low	2	4	Negligible
	Valley Habitat		WOM	Negative	Improbable	1	Medium term	3	Local	1	Low	2	6	Negligible
			WM	Negative	Improbable	1	Short term	1	Local	1	Low	2	4	Negligible
Construction of Crossing(s)	Freshwater Habitat	• Vegetation clearing within the Riparian Woodland sub-unit (i.e., Peach Tree Stream; • Temporary alteration of stream flow; • Spread of AIPs along the Riparian Woodland sub-unit from contaminated construction material; and • Increased sediment loads and potential erosion of stream banks resulting from construction activities and increased movement of construction workers along / across the Riparian Woodland.	WOM	Negative	Definite	5	Long term	4	Site	2	Medium	6	60	Moderate
			WM	Negative	Definite	5	Long term	4	Local	1	Low	2	35	Low
Construction of surface infrastructure associated with Operational Infrastructure, Shafts, Supporting Infrastructure, WRDs and Stockpiles	Degraded Habitat Unit	• Site preparation and clearing of small extents of indigenous vegetation for mine-related infrastructure; • Impaired water quality and reduced flow of watercourses due to the accumulation of vegetation cuttings and debris resulting from vegetation clearing; • Waste from construction material leading to disturbance of natural vegetation; • Increased personnel on site leading to loss of floral habitat through the potential for increased fire frequency and intensity (further promoting wattle thicket formation), as well as indiscriminate driving through natural veld; • Potential proliferation of AIP species that colonise areas of increased disturbances arising from dumping of excavated and construction material outside of designated areas. Loss of floral habitat and species diversity as AIPs outcompete native species and transform adjacent or nearby natural, more sensitive habitat; • Dust generated during construction activities accumulating on the surrounding floral individuals, altering the photosynthetic ability of plants, and potentially further decreasing optimal growing/re-establishing conditions; • Potential failure to concurrently rehabilitate bare areas or disturbed sites as soon as they become available, potentially resulting in loss of viable soils, increasing erosion risk and/or permitting the proliferation of AIPs; and • Potential failure to implement a biodiversity action plan (BAP), including the auditing of the	WOM	Negative	Definite	5	Long term	4	Site	2	Low	2	40	Low
			WM	Negative	Definite	5	Long term	4	Local	1	Low	2	35	Low
	Freshwater Habitat		WOM	Negative	Highly Probable	4	Long term	4	Site	2	Medium	6	48	Moderate
			WM	Negative	Improbable	1	Short term	1	Local	1	Low	2	4	Negligible
	Woody Communities		WOM	Negative	Probable	2	Short term	1	Site	2	Low	2	10	Negligible
			WM	Negative	Improbable	1	Short term	1	Local	1	Low	2	4	Negligible
	Valley Habitat		WOM	Negative	Highly Probable	4	Long term	4	Site	2	Medium	6	48	Moderate
			WM	Negative	Probable	2	Short term	1	Local	1	Low	2	8	Negligible

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Probability		Duration		Scale		Magnitude/ Severity		Significance	
					Magnitude	Score	Magnitude	Score	Magnitude	Score	Magnitude	Score	Score	Magnitude
		BAP, leading to permanent transformation of floral habitat and long-term degradation of important floral habitat within the region.												
Construction of Linear Developments	Woody Communities	• Site clearing and the removal of vegetation along continuous leading to fragmented habitat and a disturbance corridor along which AIPs can establish and spread to adjacent sites.	WOM	Negative	Definite	5	Long term	4	Site	2	Medium	6	60	Moderate
			WM	Negative	Definite	5	Long term	4	Local	1	Low	2	35	Low
	Degraded Habitat Unit		WOM	Negative	Definite	5	Long term	4	Site	2	Low	2	40	Low
			WM	Negative	Definite	5	Long term	4	Local	1	Low	2	35	Low
	Freshwater Habitat		WOM	Negative	Highly Probable	4	Long term	4	Site	2	Medium	6	48	Moderate
			WM	Negative	Probable	2	Short term	1	Site	2	Medium	6	18	Negligible
	Valley Habitat		WOM	Negative	Definite	5	Long term	4	Site	2	Low	2	40	Low
			WM	Negative	Highly Probable	4	Medium term	3	Local	1	Low	2	24	Low
Removal and/or relocation of floral SCC	Floral SCC	• Failure to plan a summer floral SCC walkdown to confirm the presence/absence of such species within the direct footprint areas, including the potential untimely application for permits to relocate/ destroy any floral SCC found within the footprint areas; and • Increased human presence due to construction-related activities, potentially resulting in increased harvesting/ collection of SCC.	WOM	Negative	Highly Probable	4	Medium term	3	Local	1	Medium	6	40	Low
			WM	Negative	Probable	2	Short term	1	Local	1	Low	2	8	Negligible
Operational Phase														
All activities associated with mining and the movement of vehicles	Degraded Habitat Unit	• Potential failing/collapse of TSF resulting in loss of surrounding habitat; • Further loss of floral habitat beyond the project footprint because of vegetation clearing related to operational-phase disturbances and expansion of stockpiles and waste rock dumps, on-going disturbance of soils due to operational activities, and edge effects associated with mining activities; • Ongoing disturbances from operational activities resulting in increased or continued proliferation of AIPs; Failure to concurrently rehabilitate bare areas or disturbed sites as soon as they become available, potentially resulting in loss of viable soils, increasing erosion risk and/or permitting the proliferation of AIPs; • Erosion as a result of mining development, stormwater runoff and on-going disturbance of soils due to operational activities; • Risk of contamination from all operational facilities may pollute receiving environment; • Loss of floral SCC through ineffective monitoring of relocation success of rescued and relocated floral SCC (where applicable), and/or due to the harvesting of protected floral species by mining and operational personnel; and • Additional pressure on floral habitat by increased human populations associated with the proposed mining activities, contributing to increases in the collection of plant material for	WOM	Negative	Definite	5	Long term	4	Local	1	Low	2	35	Low
			WM	Negative	Definite	5	Long term	4	Local	1	Low	2	35	Low
	Freshwater Habitat		WOM	Negative	Highly Probable	4	Long term	4	Site	2	Low	2	32	Low
			WM	Negative	Probable	2	Long term	4	Local	1	Low	2	14	Negligible
	Woody Communities		WOM	Negative	Highly Probable	4	Long term	4	Site	2	Low	2	32	Low
			WM	Negative	Probable	2	Short term	1	Local	1	Low	2	8	Negligible
	Valley Habitat		WOM	Negative	Highly Probable	4	Medium term	3	Local	1	Medium	6	40	Low
			WM	Negative	Probable	2	Short term	1	Local	1	Low	2	8	Negligible
	Floral SCC		WOM	Negative	Highly Probable	4	Medium term	3	Site	2	Medium	6	44	Moderate
			WM	Negative	Probable	2	Medium term	3	Site	2	Medium	6	22	Low

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Probability		Duration		Scale		Magnitude/ Severity		Significance	
					Magnitude	Score	Magnitude	Score	Magnitude	Score	Magnitude	Score	Score	Magnitude
		medicinal purposes and promoting the introduction and spread of AIPs that may displace habitat for SCCs.												
Ongoing AIP management within 30 m of proposed activities	Floral Habitat and Diversity	• Ongoing AIP clearing and management as part of operational activities, resulting in an increase in floral diversity and habitat integrity.	WOM	Positive	Improbable	1	Short term	1	Local	1	Medium	6	8	Negligible
			WM	Positive	Definite	5	Medium term	3	Local	1	High	8	60	Moderate
Closure and Post closure														
Seepage from TSF and WRDs	Floral Habitat and diversity	• On-going risk of discharge from mining facilities beyond closure leading to a permanent impact on floral habitat and downstream impacts on Riparian Habitat and Forest Remnants	WOM	Negative	Highly Probable	4	Medium term	3	Site	2	Medium	6	44	Moderate
			WM	Negative	Probable	2	Short term	1	Site	2	Medium	6	18	Negligible
Rehabilitation and restoration activities	Floral Habitat and diversity	• Permanent loss of floral habitat, diversity and SCC, and a higher likelihood of edge effect impacts on adjacent and nearby natural vegetation of increased sensitivity due to potential failure to effectively implement and monitor rehabilitation efforts, leading to: a) Reintroduction and proliferation of alien and invasive plant species; b) Compacted soils limiting the re-establishment of natural vegetation; c) Increased risk of erosion in areas left disturbed and inadequately vegetated; d) Improper rehabilitation of disturbed areas leading to permanent floral habitat loss. Ultimately leading to a permanent loss of floral habitat, diversity and SCC, and a higher likelihood of edge effect impacts on adjacent and nearby natural vegetation of increased sensitivity.	WOM	Negative	Definite	5	Permanent	5	Site	2	High	8	75	High
			WM	Negative	Probable	2	Long term	4	Site	2	Medium	6	24	Low
Rehabilitation and restoration activities	Floral Habitat and diversity	• Rehabilitation of currently degraded habitat and AIP clearance of already proliferated areas. Some ecological functioning will be restored that has been lost due to AIP proliferation and habitat transformation.	WOM	Positive	Probable	2	Medium term	3	Local	1	Medium	6	20	Negligible
			WM	Positive	Definite	5	Long term	4	Site	2	Medium	6	60	Moderate
Dukes														
Construction Phase														
Construction of surface infrastructure associated with Operational Infrastructure, Supporting Infrastructure, WRDs and Stockpiles	Degraded Habitat Unit	• Site preparation and clearing of indigenous vegetation for mine-related infrastructure; • Construction related activities within the recommended 30 m forest exclusion buffer, resulting in the potential loss or degradation of the zone buffering the forest from external impacts, e.g., degradation of habitat integrity of the 30 m buffer decreasing forest resilience, increasing the risk of AIP proliferation and native woody encroachment; • Dumping of cut vegetation, including AIPs, outside of already disturbed areas or outside of the authorised footprints, resulting in the loss of favourable habitat for the establishment of native species; • Impaired water quality and reduced flow of watercourses due to the accumulation of vegetation cuttings and debris within the Freshwater Habitat resulting from vegetation clearing; • Waste from construction material leading to disturbance of natural vegetation;	WOM	Negative	Definite	5	Long term	4	Site	2	Low	2	40	Low
			WM	Negative	Definite	5	Long term	4	Local	1	Low	2	35	Low
	Freshwater Habitat		WOM	Negative	Highly Probable	4	Long term	4	Site	2	Medium	6	48	Moderate
			WM	Negative	Probable	2	Long term	4	Site	2	Medium	6	24	Low
	Woody Communities		WOM	Negative	Definite	5	Long term	4	Site	2	Medium	6	60	Moderate
			WM	Negative	Definite	5	Long term	4	Local	1	Low	2	35	Low
	Valley Habitat		WOM	Negative	Definite	5	Long term	4	Site	2	Low	2	40	Low
			WM	Negative	Definite	5	Long term	4	Local	1	Low	2	35	Low

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Probability		Duration		Scale		Magnitude/ Severity		Significance	
					Magnitude	Score	Magnitude	Score	Magnitude	Score	Magnitude	Score	Score	Magnitude
		• Increased personnel on site leading to loss of floral habitat through the potential for increased fire frequency and intensity (further promoting wattle thicket formation), as well as indiscriminate driving through natural veld; • Potential proliferation of AIP species that colonise areas of increased disturbances and that outcompetes native species, including the further transformation of adjacent or nearby natural, more sensitive habitat, such as downslope watercourses; • Dust generated during construction activities accumulating on the surrounding floral individuals, altering the photosynthetic ability of plants, and potentially further decreasing optimal growing/re-establishing conditions; • Potential failure to concurrently rehabilitate bare areas or disturbed sites as soon as they become available, potentially resulting in loss of viable soils, increasing erosion risk and/or permitting the proliferation of AIPs; and • Potential failure to implement a BAP, including the auditing of the BAP, leading to permanent transformation of floral habitat and long-term degradation of important floral habitat within the region.												
Construction of Linear Developments	Woody Communities	• Site clearing and the removal of vegetation along continuous leading to fragmented habitat and a disturbance corridor along which AIPs can establish and spread to adjacent sites; and • Construction related activities within the recommended 30 m forest exclusion buffer, resulting in the potential loss or degradation of the zone buffering the forest from external impacts, e.g., degradation of habitat integrity of the 30 m buffer decreasing forest resilience, increasing the risk of AIP proliferation and native woody encroachers.	WOM	Negative	Definite	5	Long term	4	Local	1	High	8	65	High
			WM	Negative	Definite	5	Long term	4	Local	1	Low	2	35	Low
	Degraded Habitat Unit		WOM	Negative	Definite	5	Long term	4	Site	2	Low	2	40	Low
			WM	Negative	Definite	5	Long term	4	Local	1	Low	2	35	Low
	Freshwater Habitat		WOM	Negative	Highly Probable	4	Long term	4	Site	2	Medium	6	48	Moderate
			WM	Negative	Probable	2	Short term	1	Site	2	Low	2	10	Negligible
	Valley Habitat		WOM	Negative	Definite	5	Long term	4	Local	1	Low	2	35	Low
			WM	Negative	Definite	5	Long term	4	Local	1	Low	2	35	Low
Removal and/or relocation of floral SCC	Floral SCC	• Loss of occurring and potentially occurring floral SCC due to potential failure to conduct a walkdown of the footprint area before construction activities where floral SCC, if present, are marked and relocated to suitable habitat outside the development footprint prior to the construction phase; • Extensive and unnecessary loss of favourable floral habitat, leading to a decline in floral diversity, including a decline in floral SCC numbers within the site, resulting from potentially poorly planned placement of the proposed infrastructure within natural areas and areas identified as increasingly sensitive during ecological studies; and • Increased human presence due to construction-related activities, potentially resulting in increased harvesting/ collection of SCC.	WOM	Negative	Highly Probable	4	Medium term	3	Local	1	Low	2	24	Low
			WM	Negative	Probable	2	Short term	1	Local	1	Low	2	8	Negligible

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Probability		Duration		Scale		Magnitude/ Severity		Significance	
					Magnitude	Score	Magnitude	Score	Magnitude	Score	Magnitude	Score	Score	Magnitude
Operational Phase														
All activities associated with mining and the movement of vehicles	Degraded Habitat Unit	• Further loss of floral habitat beyond the project footprint because of vegetation clearing related to operational-phase disturbances and expansion of stockpiles and waste rock dumps, on-going disturbance of soils due to operational activities, and edge effects associated with mining activities; • Potential trimming or slashing of vegetation associated with the Forest and Woodland habitat units, or wood collection from these habitat units, creating 'gaps' in the woody layer that will impact the dynamics of these systems (increased light and potential for increased fire frequency), ultimately resulting in potential alterations in species composition and ecological function; • Ongoing disturbances from operational activities resulting in increased or continued proliferation of AIPs; • Failure to concurrently rehabilitate bare areas or disturbed sites as soon as they become available, potentially resulting in loss of viable soils, increasing erosion risk and/or permitting the proliferation of AIPs; • Erosion as a result of mining development, stormwater runoff and on-going disturbance of soils due to operational activities; • Risk of contamination from all operational facilities may pollute receiving environment; • Loss of floral SCC through ineffective monitoring of relocation success of rescued and relocated floral SCC (where applicable), and/or due to the harvesting of protected floral species by mining and operational personnel; and • Additional pressure on floral habitat by increased human populations associated with the proposed mining activities, contributing to increases in the collection of plant material for medicinal purposes and promoting the introduction and spread of AIPs that may displace habitat for SCCs.	WOM	Negative	Definite	5	Medium term	3	Local	1	Low	2	30	Low
			WM	Negative	Definite	5	Medium term	3	Local	1	Low	2	30	Low
	Freshwater Habitat		WOM	Negative	Definite	5	Medium term	3	Local	1	Low	2	30	Low
			WM	Negative	Definite	5	Medium term	3	Local	1	Low	2	30	Low
	Woody Communities		WOM	Negative	Highly Probable	4	Long term	4	Site	2	Medium	6	48	Moderate
			WM	Negative	Probable	2	Medium term	3	Site	2	Medium	6	22	Low
	Valley Habitat		WOM	Negative	Definite	5	Long term	4	Site	2	High	8	70	High
			WM	Negative	Highly Probable	4	Long term	4	Local	1	Medium	6	44	Moderate
	Floral SCC		WOM	Negative	Definite	5	Long term	4	Local	1	Low	2	35	Low
			WM	Negative	Probable	2	Medium term	3	Local	1	Low	2	12	Negligible
Ongoing AIP management within 30 m of proposed activities	Floral Habitat and Diversity	Alien invasive prolification	WOM	Positive	Definite	5	Medium term	3	Site	2	Medium	6	55	Moderate
			WM	Positive	Probable	2	Medium term	3	Site	2	Medium	6	22	Low
Closure and Post closure														
Rehabilitation and restoration activities	Floral Habitat and diversity	• Permanent loss of floral habitat, diversity and SCC, and a higher likelihood of edge effect impacts on adjacent and nearby natural vegetation of increased sensitivity due to potential failure to effectively implement and monitor rehabilitation efforts, leading to: a) Reintroduction and proliferation of alien and invasive plant species; b) Compacted soils limiting the re-establishment of natural vegetation; c) Increased risk of erosion in areas left disturbed and inadequately vegetated; d) Improper rehabilitation of disturbed areas leading to permanent floral habitat loss.	WOM	Negative	Highly Probable	4	Permanent	5	Regional	3	High	8	64	High
			WM	Negative	Probable	2	Long term	4	Site	2	Medium	6	24	Low

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Probability		Duration		Scale		Magnitude/ Severity		Significance	
					Magnitude	Score	Magnitude	Score	Magnitude	Score	Magnitude	Score	Score	Magnitude
		Ultimately leading to a permanent loss of floral habitat, diversity and SCC, and a higher likelihood of edge effect impacts on adjacent and nearby natural vegetation of increased sensitivity.												
Rehabilitation and restoration activities	Floral Habitat and diversity	• Reinstatement of native floral communities due to rehabilitation of currently transformed and degraded habitat and AIP clearance within heavily infested areas. Return of ecological functioning that has been lost due to AIP proliferation and habitat transformation.	WOM	Positive	Improbable	1	Medium term	3	Site	2	Medium	6	11	Negligible
			WM	Positive	Definite	5	Long term	4	Site	2	High	8	70	High
Frankfort														
Construction Phase														
Construction of surface infrastructure associated with Operational Infrastructure, Supporting Infrastructure, WRDs and Stockpiles	Degraded Habitat Unit	• Site preparation and clearing of indigenous vegetation for mine-related infrastructure; • Construction related activities within the recommended 30 m forest exclusion buffer, resulting in the potential loss or degradation of the zone buffering the forest from external impacts, e.g., degradation of habitat integrity of the 30 m buffer decreasing forest resilience, increasing the risk of AIP proliferation and native woody encroachment; • Dumping of cut vegetation, including AIPs, outside of already disturbed areas or outside of the authorised footprints, resulting in the loss of favourable habitat for the establishment of native species; • Impaired water quality and reduced flow of watercourses due to the accumulation of vegetation cuttings and debris within the Freshwater Habitat resulting from vegetation clearing; • Potential failure to have a stormwater management plan and erosion control plan in place during construction activities. The proposed activities will occur in mountainous terrain with watercourses (i.e., Riparian Forest and Riparian Woodland) downslope of these activities; • Potential inadequate stabilisation of steep slopes in the event that vegetation will be cleared along such slopes. Consequently, increased erosion will lead to the smothering of surrounding vegetation and larger disturbance footprints as slopes continue to erode; • Waste from construction material leading to disturbance of natural vegetation; • Increased personnel on site leading to loss of floral habitat through the potential for increased fire frequency and intensity (further promoting wattle thicket formation), as well as indiscriminate driving through natural veld; • Potential proliferation of AIP species that colonise areas of increased disturbances and that outcompetes native species, including the further transformation of adjacent or nearby natural, more sensitive habitat, such as downslope watercourses; • Dust generated during construction activities accumulating on the surrounding floral	WOM	Negative	Definite	5	Long term	4	Site	2	Low	2	40	Low
			WM	Negative	Definite	5	Long term	4	Local	1	Low	2	35	Low
	Freshwater Habitat		WOM	Negative	Highly Probable	4	Long term	4	Site	2	High	8	56	Moderate
			WM	Negative	Probable	2	Long term	4	Site	2	Medium	6	24	Low
	Woody Communities		WOM	Negative	Definite	5	Long term	4	Site	2	High	8	70	High
			WM	Negative	Definite	5	Long term	4	Local	1	Medium	6	55	Moderate

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Probability		Duration		Scale		Magnitude/ Severity		Significance	
					Magnitude	Score	Magnitude	Score	Magnitude	Score	Magnitude	Score	Score	Magnitude
		individuals, altering the photosynthetic ability of plants, and potentially further decreasing optimal growing/re-establishing conditions; • Potential failure to concurrently rehabilitate bare areas or disturbed sites as soon as they become available, potentially resulting in loss of viable soils, increasing erosion risk and/or permitting the proliferation of AIPs; and • Potential failure to implement a BAP, including the auditing of the BAP, leading to permanent transformation of floral habitat and long-term degradation of important floral habitat within the region.												
Construction of Linear Developments	Woody Communities	• Site clearing and the removal of vegetation along continuous leading to fragmented habitat and a disturbance corridor along which AIPs can establish and spread to adjacent sites; • Potential failure to implement an Erosion Control Plan for construction of linear features occurring along mountain slopes, especially where areas are already disturbed and soils are less stable, leading to sedimentation of downslope watercourses and smothering of surrounding vegetation; • Construction related activities within the recommended 30 m forest exclusion buffer, resulting in the potential loss or degradation of the zone buffering the forest from external impacts, e.g., degradation of habitat integrity of the 30 m buffer decreasing forest resilience, increasing the risk of AIP proliferation and native woody encroachers; and • Potential slope failure during construction activities, directly affecting forest communities or resulting in gaps in the forest where increased light may open the potential for non-forest species to establish, thereby resulting in potential changes in forest dynamics in the long-run.	WOM	Negative	Definite	5	Long term	4	Site	2	High	8	70	High
			WM	Negative	Definite	5	Long term	4	Local	1	Medium	6	55	Moderate
	Degraded Habitat Unit		WOM	Negative	Definite	5	Long term	4	Local	1	Low	2	35	Low
			WM	Negative	Highly Probable	4	Medium term	3	Local	1	Low	2	24	Low
	Freshwater Habitat		WOM	Negative	Highly Probable	4	Long term	4	Site	2	Medium	6	48	Moderate
			WM	Negative	Probable	2	Long term	4	Local	1	Medium	6	22	Low
Removal and/or relocation of floral SCC	Floral SCC	• Loss of occurring and potentially occurring floral SCC due to potential failure to conduct a walkdown of the footprint area before construction activities where floral SCC, if present, are marked and relocated to suitable habitat outside the development footprint prior to the construction phase; • Extensive and unnecessary loss of favourable floral habitat, leading to a decline in floral diversity, including a decline in floral SCC numbers within the site, resulting from potentially poorly planned placement of the proposed infrastructure within natural areas and areas identified as increasingly sensitive during ecological studies; and • Increased human presence due to construction-related activities, potentially resulting in increased harvesting/ collection of SCC.	WOM	Negative	Highly Probable	4	Long term	4	Regional	3	High	8	60	Moderate
			WM	Negative	Probable	2	Long term	4	Site	2	Medium	6	24	Low
Operational Phase														
	Degraded Habitat Unit	• Further loss of floral habitat beyond the project footprint because of vegetation clearing related	WOM	Negative	Highly Probable	4	Long term	4	Site	2	Low	2	32	Low

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Probability		Duration		Scale		Magnitude/ Severity		Significance	
					Magnitude	Score	Magnitude	Score	Magnitude	Score	Magnitude	Score	Score	Magnitude
All activities associated with mining and the movement of vehicles		to operational-phase disturbances and expansion of stockpiles and waste rock dumps, on-going disturbance of soils due to operational activities, and edge effects associated with mining activities; • Potential trimming or slashing of vegetation associated with the Forest and Woodland habitat units, or wood collection from these habitat units, creating 'gaps' in the woody layer that will impact the dynamics of these systems (increased light and potential for increased fire frequency), leading to potential alterations in species composition and ecological function; • Ongoing disturbances from operational activities resulting in increased or continued proliferation of AIPs; • Failure to concurrently rehabilitate bare areas or disturbed sites as soon as they become available, potentially resulting in loss of viable soils, increasing erosion risk and/or permitting the proliferation of AIPs; • Erosion as a result of mining development, stormwater runoff and on-going disturbance of soils due to operational activities; • Risk of contamination from all operational facilities may pollute receiving environment; • Loss of floral SCC through ineffective monitoring of relocation success of rescued and relocated floral SCC (where applicable), and/or due to the harvesting of protected floral species by mining and operational personnel; and • Additional pressure on floral habitat by increased human populations associated with the proposed mining activities, contributing to increases in the collection of plant material for medicinal purposes and promoting the introduction and spread of AIPs that may displace habitat for SCCs.	WM	Negative	Probable	2	Long term	4	Site	2	Low	2	16	Negligible
	Freshwater Habitat		WOM	Negative	Highly Probable	4	Long term	4	Site	2	Medium	6	48	Moderate
			WM	Negative	Probable	2	Long term	4	Site	2	Medium	6	24	Low
	Woody Communities		WOM	Negative	Definite	5	Long term	4	Site	2	High	8	70	High
			WM	Negative	Highly Probable	4	Long term	4	Local	1	Medium	6	44	Moderate
	Floral SCC		WOM	Negative	Highly Probable	4	Long term	4	Site	2	Medium	6	48	Moderate
			WM	Negative	Probable	2	Long term	4	Local	1	Medium	6	22	Low
Ongoing AIP management within 30 m of proposed activities	Floral Habitat and Diversity	• Ongoing AIP clearing and management as part of operational activities, resulting in an increase in floral diversity and habitat integrity.	WOM	Positive	Improbable	1	Medium term	3	Site	2	Medium	6	11	Negligible
			WM	Positive	Definite	5	Medium term	3	Site	2	Medium	6	55	Moderate
Closure and Post closure														
Rehabilitation and restoration activities	Floral Habitat and diversity	• Permanent loss of floral habitat, diversity and SCC, and a higher likelihood of edge effect impacts on adjacent and nearby natural vegetation of increased sensitivity due to potential failure to effectively implement and monitor rehabilitation efforts, leading to: a) Reintroduction and proliferation of alien and invasive plant species; b) Compacted soils limiting the re-establishment of natural vegetation; c) Increased risk of erosion in areas left disturbed and inadequately vegetated; d) Improper rehabilitation of disturbed areas leading to permanent floral habitat loss. Ultimately leading to a permanent loss of floral habitat, diversity and SCC, and a higher likelihood of edge effect impacts on adjacent	WOM	Negative	Definite	5	Permanent	5	Site	2	High	8	75	High
			WM	Negative	Probable	2	Long term	4	Site	2	Medium	6	24	Low

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Probability		Duration		Scale		Magnitude/ Severity		Significance	
					Magnitude	Score	Magnitude	Score	Magnitude	Score	Magnitude	Score	Score	Magnitude
		and nearby natural vegetation of increased sensitivity.												
Rehabilitation and restoration activities	Floral Habitat and diversity	• Reinstatement of native floral communities due to rehabilitation of currently transformed and degraded habitat and AIP clearance within heavily infested areas. Return of ecological functioning that has been lost due to AIP proliferation and habitat transformation.	WOM	Positive	Probable	2	Medium term	3	Site	2	Medium	6	22	Low
			WM	Positive	Highly Probable	4	Permanent	5	Site	2	High	8	60	Moderate
Morgenzon														
Construction Phase														
Construction of Crossing(s)	Freshwater Habitat	• Vegetation clearing within the Riparian Woodland sub-unit (i.e., Peach Tree Stream; • Temporary alteration of stream flow; • Spread of AIPs along the Riparian Woodland sub-unit from contaminated construction material; and • Increased sediment loads and potential erosion of stream banks resulting from construction activities and increased movement of construction workers along / across the Riparian Woodland.	WOM	Negative	Definite	5	Long term	4	Site	2	Medium	6	60	Moderate
			WM	Negative	Definite	5	Long term	4	Local	1	Low	2	35	Low
Construction of surface infrastructure associated with Operational Infrastructure, Supporting Infrastructure, WRDs and Stockpiles	Degraded Habitat Unit	• Site preparation and clearing of indigenous vegetation for mine-related infrastructure; • Dumping of cut vegetation, including AIPs, outside of already disturbed areas or outside of the authorised footprints, resulting in the loss of favourable habitat for the establishment of native species; • Impaired water quality and reduced flow of watercourses due to the accumulation of vegetation cuttings and debris resulting from vegetation clearing; • Potential failure to have a stormwater management plan and erosion control plan in place during construction activities; • Waste from construction material leading to disturbance of natural vegetation; • Increased personnel on site leading to loss of floral habitat through the potential for increased fire frequency and intensity (further promoting wattle thicket formation), as well as indiscriminate driving through natural veld; • Potential proliferation of AIP species that colonise areas of increased disturbances and that outcompetes native species, including the further transformation of adjacent or nearby natural, more sensitive habitat, such as nearby watercourses; • Dust generated during construction activities accumulating on the surrounding floral individuals, altering the photosynthetic ability of plants, and potentially further decreasing optimal growing/re-establishing conditions; • Potential failure to concurrently rehabilitate bare areas or disturbed sites as soon as they become available, potentially resulting in loss of viable soils, increasing erosion risk and/or permitting the proliferation of AIPs; and • Potential failure to implement a BAP, including the auditing of the BAP, leading to permanent transformation of floral habitat and long-term	WOM	Negative	Definite	5	Long term	4	Site	2	Low	2	40	Low
			WM	Negative	Definite	5	Long term	4	Local	1	Low	2	35	Low
	Freshwater Habitat		WOM	Negative	Definite	5	Long term	4	Site	2	Medium	6	60	Moderate
			WM	Negative	Highly Probable	4	Long term	4	Site	2	Low	2	32	Low
	Woody Communities		WOM	Negative	Highly Probable	4	Long term	4	Site	2	Medium	6	48	Moderate
			WM	Negative	Probable	2	Long term	4	Site	2	Low	2	16	Negligible
	Valley Habitat		WOM	Negative	Highly Probable	4	Long term	4	Site	2	Low	2	32	Low
			WM	Negative	Probable	2	Long term	4	Local	1	Low	2	14	Negligible

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Probability		Duration		Scale		Magnitude/ Severity		Significance	
					Magnitude	Score	Magnitude	Score	Magnitude	Score	Magnitude	Score	Score	Magnitude
		degradation of important floral habitat within the region.												
Construction of Linear Developments	Woody Communities	• Site clearing and the removal of vegetation along continuous leading to fragmented habitat and a disturbance corridor along which AIPs can establish and spread to adjacent sites; • Potential failure to implement an Erosion Control Plan for construction of linear features, especially where areas are already disturbed and soils are less stable, leading to sedimentation of nearby watercourses and smothering of surrounding vegetation; and • Construction related activities within the recommended 30 m forest exclusion buffer, resulting in the potential loss or degradation of the zone buffering the forest from external impacts, e.g., degradation of habitat integrity of the 30 m buffer decreasing forest resilience, increasing the risk of AIP proliferation and native woody encroachers.	WOM	Negative	Highly Probable	4	Long term	4	Local	1	Medium	6	44	Moderate
			WM	Negative	Probable	2	Long term	4	Local	1	Medium	6	22	Low
	Degraded Habitat Unit		WOM	Negative	Definite	5	Medium term	3	Site	2	Low	2	35	Low
			WM	Negative	Definite	5	Medium term	3	Local	1	Low	2	30	Low
	Freshwater Habitat		WOM	Negative	Highly Probable	4	Long term	4	Site	2	Medium	6	48	Moderate
			WM	Negative	Probable	2	Medium term	3	Site	2	Low	2	14	Negligible
	Valley Habitat		WOM	Negative	Definite	5	Long term	4	Site	2	Low	2	40	Low
			WM	Negative	Definite	5	Long term	4	Local	1	Low	2	35	Low
Removal and/or relocation of floral SCC	Floral SCC	• Loss of occurring and potentially occurring floral SCC due to potential failure to conduct a walkdown of the footprint area before construction activities where floral SCC, if present, are marked and relocated to suitable habitat outside the development footprint prior to the construction phase; • Extensive and unnecessary loss of favourable floral habitat, leading to a decline in floral diversity, including a decline in floral SCC numbers within the site, resulting from potentially poorly planned placement of the proposed infrastructure within natural areas and areas identified as increasingly sensitive during ecological studies; and • Increased human presence due to construction-related activities, potentially resulting in increased harvesting/ collection of SCC.	WOM	Negative	Definite	5	Medium term	3	Local	1	Medium	6	50	Moderate
			WM	Negative	Highly Probable	4	Medium term	3	Local	1	Medium	6	40	Low
Operational Phase														
All activities associated with mining and the movement of vehicles	Degraded Habitat Unit	• Further loss of floral habitat beyond the project footprint because of vegetation clearing related to operational-phase disturbances and expansion of stockpiles and waste rock dumps, on-going disturbance of soils due to operational activities, and edge effects associated with mining activities; • Potential trimming or slashing of vegetation associated with the Forest and Woodland habitat units, or wood collection from these habitat units, creating 'gaps' in the woody layer that will impact the dynamics of these systems (increased light and potential for increased fire frequency), leading to potential alterations in species composition and ecological function; • Ongoing disturbances from operational activities resulting in increased or continued proliferation of AIPs; • Failure to concurrently rehabilitate bare areas or disturbed sites as soon as they become available, potentially resulting in loss of viable	WOM	Negative	Definite	5	Long term	4	Site	2	Low	2	40	Low
			WM	Negative	Highly Probable	4	Medium term	3	Local	1	Low	2	24	Low
	Freshwater Habitat		WOM	Negative	Highly Probable	4	Medium term	3	Site	2	Low	2	28	Low
			WM	Negative	Probable	2	Short term	1	Site	2	Low	2	10	Negligible
	Woody Communities		WOM	Negative	Definite	5	Long term	4	Site	2	Medium	6	60	Moderate
			WM	Negative	Highly Probable	4	Short term	1	Site	2	Medium	6	36	Low
	Valley Habitat		WOM	Negative	Definite	5	Medium term	3	Site	2	Medium	6	55	Moderate
			WM	Negative	Probable	2	Short term	1	Site	2	Low	2	10	Negligible
	Floral SCC		WOM	Negative	Definite	5	Medium term	3	Site	2	Medium	6	55	Moderate
			WM	Negative	Highly Probable	4	Medium term	3	Site	2	Low	2	28	Low

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Probability		Duration		Scale		Magnitude/ Severity		Significance	
					Magnitude	Score	Magnitude	Score	Magnitude	Score	Magnitude	Score	Score	Magnitude
		soils, increasing erosion risk and/or permitting the proliferation of AIPs; • Erosion as a result of mining development, stormwater runoff and on-going disturbance of soils due to operational activities; • Risk of contamination from all operational facilities may pollute receiving environment; • Loss of floral SCC through ineffective monitoring of relocation success of rescued and relocated floral SCC (where applicable), and/or due to the harvesting of protected floral species by mining and operational personnel; and • Additional pressure on floral habitat by increased human populations associated with the proposed mining activities, contributing to increases in the collection of plant material for medicinal purposes and promoting the introduction and spread of AIPs that may displace habitat for SCCs.												
Ongoing AIP management within 30 m of proposed activities	Floral Habitat and Diversity	• Ongoing AIP clearing and management as part of operational activities, resulting in an increase in floral diversity and habitat integrity.	WOM	Positive	Improbable	1	Medium term	3	Site	2	Medium	6	11	Negligible
			WM	Positive	Definite	5	Long term	4	Site	2	Medium	6	60	Moderate
Closure and Post closure														
Rehabilitation and restoration activities	Floral Habitat and Diversity	• Failure to monitor rehabilitation efforts, leading to: a) Reintroduction and proliferation of alien and invasive plant species; b) Compacted soils limiting the re-establishment of natural vegetation; c) Increased risk of erosion in areas left disturbed and inadequately vegetated; d) Improper rehabilitation of disturbed areas leading to permanent floral habitat loss. Ultimately leading to a permanent loss of floral habitat, diversity and SCC, and a higher likelihood of edge effect impacts on adjacent and nearby natural vegetation of increased sensitivity.	WOM	Negative	Highly Probable	4	Permanent	5	Site	2	Medium	6	52	Moderate
			WM	Negative	Probable	2	Long term	4	Site	2	Medium	6	24	Low
Rehabilitation and restoration activities	Floral Habitat and Diversity	• Reinstatement of native floral communities due to rehabilitation of currently transformed and degraded habitat and AIP clearance within heavily infested areas. Return of ecological functioning that has been lost due to AIP proliferation and habitat transformation.	WOM	Positive	Improbable	1	Medium term	3	Site	2	Medium	6	11	Negligible
			WM	Positive	Definite	5	Long term	4	Site	2	Medium	6	60	Moderate
Biodiversity Assessment - Faunal Assessment														
Construction Phase														
Clearance of vegetation in the AIP-Dominated Habitat	Faunal habitat and species	• Loss of marginal faunal habitat where footprint areas extend into habitat unit. • Decrease in seasonal food resources provided by flowering and fruiting plants (AIPs). • Potential marginal decrease in faunal species abundances. • Alien plant proliferation likely to occur in disturbed areas.	WOM	Negative	Definite	5	Long term	4	Site	2	Medium	6	60	Moderate
			WM	Negative	Definite	5	Medium term	3	Local	1	Medium	6	50	Moderate
Clearance of vegetation in the Riparian Forest	Faunal habitat and species	• Loss of faunal habitat where fence structure extends through a section of this habitat unit at	WOM	Negative	Highly Probable	4	Short term	1	Local	1	Medium	6	32	Low

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Probability		Duration		Scale		Magnitude/ Severity		Significance	
					Magnitude	Score	Magnitude	Score	Magnitude	Score	Magnitude	Score	Score	Magnitude
		Frankfort. • Possible proliferation and erosion from fence installation leading habitat degradation and sedimentation of the downslope habitat. • Potential loss of faunal SCC.	WM	Negative	Probable	2	Short term	1	Local	1	Low	2	8	Negligible
Clearance of vegetation in the Riparian Woodland	Faunal habitat and species	• Loss of faunal habitat where footprint areas extend into habitat unit, notably linear structures. • Potential marginal decrease in faunal species abundances due to fences limiting faunal species movement. • Alien plant proliferation likely to occur in disturbed areas. • Potential loss of faunal SCC.	WOM	Negative	Definite	5	Long term	4	Local	1	Medium	6	55	Moderate
			WM	Negative	Definite	5	Medium term	3	Site	2	Low	2	35	Low
Linear crossings of the Watercourse Habitat	Faunal habitat and species	• Increased sedimentation due to runoff from haul roads and pipeline footprints altering bankside vegetation and instream faunal habitat. • Increased risk of hydrocarbons entering the watercourses as a result of leaks and spills from construction vehicles when crossing the watercourse habitat potentially impacting on the bankside and instream faunal species (amphibians). • Altered flow patterns and hydrological cycles impacting on water dependant faunal species both down and upstream of the crossing. • Potential loss of faunal SCC.	WOM	Negative	Definite	5	Medium term	3	Site	2	Medium	6	55	Moderate
			WM	Negative	Definite	5	Medium term	3	Local	1	Low	2	30	Low
Clearance of vegetation in the Indigenous Forest	Faunal habitat and species	• Loss of faunal habitat where linear infrastructure is located within the Forest habitat. • Decreased faunal diversity due to disturbances to Forest habitat. • Increased risk of AIPs proliferating in the disturbed areas changing the vegetative composition of the forest. • Potential loss of faunal SCC.	WOM	Negative	Highly Probable	4	Long term	4	Site	2	Medium	6	48	Moderate
			WM	Negative	Probable	2	Medium term	3	Local	1	Low	2	12	Negligible
Clearance of vegetation in the Degraded Woodland	Faunal habitat and species	• Loss of faunal habitat within the proposed footprint areas. • Displacement and potential loss of faunal species within the proposed footprint areas. • Edge effects as a result of poor management of construction activities leading to further habitat and faunal species loss.	WOM	Negative	Definite	5	Long term	4	Site	2	Medium	6	60	Moderate
			WM	Negative	Definite	5	Long term	4	Local	1	Medium	6	55	Moderate
Clearance of vegetation in the Intact Woodland	Faunal habitat and species	• Loss of faunal habitat where linear infrastructure is located within the woodland habitat. • Decreased faunal diversity due to disturbances to woodland habitat. • Increased risk of AIPs proliferating in the disturbed areas changing the vegetative composition of the woodlands. • Potential loss of faunal SCC.	WOM	Negative	Definite	5	Long term	4	Site	2	Medium	6	60	Moderate
			WM	Negative	Definite	5	Medium term	3	Local	1	Medium	6	50	Moderate
Clearance of vegetation in the Valley Habitat	Faunal habitat and species	• Loss of faunal habitat within the proposed footprint areas. • Displacement and potential loss of faunal species within the proposed footprint areas. • Edge effects as a result of poor management of construction activities leading to further habitat and faunal species loss.	WOM	Negative	Definite	5	Long term	4	Site	2	Medium	6	60	Moderate
			WM	Negative	Definite	5	Medium term	3	Local	1	Medium	6	50	Moderate
All construction related activities	Faunal habitat and species	• Edge effects impacting adjacent habitat e.g., the of alien vegetation and the loss of viable soils for re-establishment of indigenous species if soils are allowed to become compacted and /	WOM	Negative	Highly Probable	4	Medium term	3	Local	1	Medium	6	40	Low
			WM	Negative	Probable	2	Medium term	3	Local	1	Medium	6	20	Negligible

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Probability		Duration		Scale		Magnitude/ Severity		Significance	
					Magnitude	Score	Magnitude	Score	Magnitude	Score	Magnitude	Score	Score	Magnitude
		or eroded. • Snaring, poaching / hunting of faunal species by construction personnel. • Fauna mortalities from vehicle strikes. • Runaway fires may lead to habitat and species loss. • Too frequent / uncontrolled fires may lead to structural and plant species composition of habitats. • Potential loss of faunal SCC. • Movement of personnel into old adits disturbing roosting bats, notably SCC.												
Operational Phase														
Movement of in vehicles	Faunal species	• Collisions with mine vehicles and fauna. • Spillage/leakage of chemicals, fuel and oils from equipment leading to hydrocarbon ingress into the soils affecting plant growth (faunal habitat and food resources) and soil organisms. • Hydrocarbons may impact surrounding habitat as a result of water runoff or leaching into subterranean water sources during rainfall events	WOM	Negative	Definite	5	Long term	4	Site	2	Low	2	40	Low
			WM	Negative	Highly Probable	4	Long term	4	Local	1	Low	2	28	Low
Mine operation - lighting	Faunal species	• Artificial lighting in dark landscapes impacts on natural behavioural patterns of nocturnal species, notably insects. Such impacts include alteration of breeding and foraging patterns which in the long term can affects population numbers. • Attraction to light sources also creates an unnaturally high abundance of insects in a single spot, with insectivores such as bats and reptiles capitalising on this. This may lead to increased predation on insects.	WOM	Negative	Definite	5	Long term	4	Site	2	Low	2	40	Low
			WM	Negative	Definite	5	Long term	4	Local	1	Low	2	35	Low
Mining operations - edge effects	Faunal habitat and species	• Further loss of habitat and faunal species therein in the areas adjacent the mining activities. • Increased vehicle and personnel movement assists in the further spread of AIPs within the footprint areas as well as the surrounding habitats • Increased AIP proliferation in these disturbed footprints. • Unauthorised and/or planned clearance of vegetation outside of the footprint leading to further habitat disturbance.	WOM	Negative	Definite	5	Long term	4	Site	2	Medium	6	60	Moderate
			WM	Negative	Highly Probable	4	Long term	4	Local	1	Low	2	28	Low
Poor erosion control	Faunal habitat and species	• Increase erosion and sediment runoff impacting on habitat in the surrounding areas. • Degradation of Freshwater systems. • Sedimentation of Freshwater systems will impact upon amphibians and other aquatic species, potentially SCC.	WOM	Negative	Highly Probable	4	Medium term	3	Local	1	High	8	48	Moderate
			WM	Negative	Probable	2	Medium term	3	Local	1	Medium	6	20	Negligible
Mine operation - personnel	Faunal habitat and species	• Increased risk of snaring / poaching of animals and possibly SCC. • Runaway fires causing damage to the surrounding vegetation types, leading to potential change in vegetation structure and faunal species diversity.	WOM	Negative	Highly Probable	4	Medium term	3	Local	1	Medium	6	40	Low
			WM	Negative	Probable	2	Medium term	3	Local	1	Medium	6	20	Negligible
Mine operation - noise	Faunal species	• Increased ambient noise from operational activities and facilities may drown out calls / communication of faunal species nearby. Increased ambient noise may lead to decreased	WOM	Negative	Probable	2	Long term	4	Site	2	Medium	6	24	Low
			WM	Negative	Probable	2	Long term	4	Local	1	Medium	6	22	Low

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Probability		Duration		Scale		Magnitude/ Severity		Significance	
					Magnitude	Score	Magnitude	Score	Magnitude	Score	Magnitude	Score	Score	Magnitude
		breeding success or failure to hear nearby predator.												
Closure and Post Phase														
Rehabilitation	Faunal habitat and species	• Failure to reinstate degraded and impacted faunal habitat through rehabilitation activities. • Proliferation of AIPs in the disturbed areas post mining, replacing indigenous (and endemic) vegetation leading to long term loss of faunal habitat and species diversity. • Failure to remove and remedy all TSF and PCD structures so that no contamination of the surrounding habitat occurs.	WOM	Negative	Definite	5	Long term	4	Site	2	Medium	6	60	Moderate
			WM	Negative	Probable	2	Long term	4	Local	1	Medium	6	22	Low
Closure operations	Faunal habitat and species	• Failure to break down and remove all mining structures and rehabilitating the footprints to a pre-mining state leading to long term and potentially permanent habitat degradation and species diversity loss. • Poaching of faunal species by closure staff and contract workers leading to further loss of species diversity.	WOM	Negative	Probable	2	Long term	4	Site	2	Medium	6	24	Low
			WM	Negative	Probable	2	Long term	4	Local	1	Medium	6	22	Low
Freshwater- It should be noted that the impacts below have been reworked from the DWS risk assessment done by the specialist. The impacts by the specialist have only been rated WM and therefore provided as such below														
Pre-Construction Planning Phase														
Planning of proposed surface infrastructure layout.	The location of surface infrastructure directly within riverine resources (specifically linear infrastructure which traverses drainage systems) and within the floodline of the Blyde River (Beta north), or within the 32 m or 100 m zones of regulation according to the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA) and Government Notice (GN) 704 of the National Water Act, 1998 (Act No. 36 of 1998) (NWA).	Loss of catchment yield and surface water recharge, potential inadequate management of clean and dirty water separation, which can lead to a loss of general loss of aquatic and riparian biodiversity as well as SCCs, impaired water quality, loss of instream habitat integrity and overall EcoStatus as well as impacts to aquatic resources further downstream of the proposed mining activity.	WM	Negative	Highly Probable	4	Long term	4	Regional	3	Medium	6	52	Moderate
Construction Phase														
Removal of topsoil from project footprint areas and stockpiling thereof for rehabilitation.	Topsoil removal and creation of temporary stockpiles.	• Increased risk of transportation of sediment from exposed soils in stormwater runoff, leading to increased turbidity of surface water, sedimentation of freshwater ecosystems and changing the characteristics of the stream beds, smothering of vegetation and/or altered vegetation composition, smothering of benthic taxa and/or destruction of suitable macro-invertebrate and fish habitats; • Excavation and denuding activities will alter the natural runoff and flow regime of the area. Altered flow regime may lead to destruction of suitable macro-invertebrate and fish habitat; • Loss of riparian habitat and functionality due to the disturbance of the activity; • Alteration of the chemical properties of the rivers / streams as a result of vegetation removal and deforestation; • Exposure of soils, leading to increased runoff and erosion, and thus increased sedimentation of the rivers / streams;	WM	Negative	Highly Probable	4	Long term	4	Regional	3	Medium	6	52	Moderate
Clearing of vegetation within the drainage systems in preparation for construction of linear infrastructure such as road crossings, diversion/containment berms and water related infrastructure.			WM	Negative	Definite	4	Long term	4	Regional	2	Medium	6	48	Moderate

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Probability		Duration		Scale		Magnitude/ Severity		Significance	
					Magnitude	Score	Magnitude	Score	Magnitude	Score	Magnitude	Score	Score	Magnitude
		• Increased sedimentation of the rivers / streams, leading to smothering of benthos, loss of rheophilic taxa, diverse biotopes and potentially altering surface water quality; • Increased hardened surfaces and compacted soils thus altering the pattern, timing and distribution of recharge which affects the freshwater ecosystems within the zone of influence; • Loss of foraging and breeding habitat [or hampering access to such suitable habitat (loss of connectivity)] and faunal migratory corridors; and • Proliferation of alien vegetation as a result of disturbances.												
Construction of additional access roads, resurfacing of existing roads and refurbishment of existing buildings.	Altered drainage patterns due to increased impermeable surfaces. Installation of culverts/pipes as part of the construction of stream crossings.	• Increased water inputs to freshwater ecosystems, altering flow patterns and wetting patterns leading to further changes to vegetation and aquatic biota communities; • Contaminants from roads (e.g. oil spills) contained in runoff causing pollution to surface water within freshwater ecosystems with resulting potential direct impact on aquatic biota; • Possible incision and sedimentation of freshwater ecosystems due to increased water velocity (direct impact on biota in terms of smothering and indirect impact in terms of habitat destruction).	WM	Negative	Probable	2	Long term	4	Local	1	Medium	6	22	Low
Construction of surface infrastructure.	Risk of contaminated stormwater runoff (e.g. hydrocarbons, sediment, originating from impermeable surfaces).	• Possible contamination of the associated freshwater ecosystems downstream of the surface structures (water quality impact with associated direct impact on aquatic biota); • Possible erosion/incision of the freshwater ecosystems adjacent to surface infrastructure due to concentration of stormwater runoff; and • Erosion and sedimentation risk with associated impact on aquatic biota and suitable habitat).		Negative	Highly Probable	4	Long term	4	Regional	3	Medium	6	52	Moderate
	Stockpiling of topsoil and overburden, earthworks, movement of vehicles within the regulated zones associated with freshwater ecosystems.	• Sediment-laden runoff entering riparian habitat leading to altered water quality, and changes to aquatic habitat; and • Altered drainage/flow regimes, leading to altered runoff patterns and formation of preferential flow paths.		Negative	Probable	2	Long term	4	Local	1	Medium	6	22	Low

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Probability		Duration		Scale		Magnitude/ Severity		Significance	
					Magnitude	Score	Magnitude	Score	Magnitude	Score	Magnitude	Score	Score	Magnitude
	Potential disposal of hazardous and non-hazardous materials in riverine areas.	• Altered water quality, possible changes to flow patterns as a result of blockages caused by solid waste/rubble.		Negative	Probable	2	Long term	4	Local	1	Medium	6	22	Low
Operational Phase														
Alteration of the local hydrological regime due to potentially poorly managed stormwater, compaction of soil and increased extent of impermeable surfaces.	Altered drainage patterns, potentially leading to the formation of preferential flow paths and/or concentrated flows.	• Erosion of terrestrial areas as preferential flow paths are formed in the landscape, resulting in sedimentation of freshwater ecosystems, leading to altered channel competency, altered vegetation community structures, blanketing of benthos and loss of rheophilic taxa and suitable habitat.		Negative	Highly Probable	4	Long term	4	Regional	3	Medium	6	52	Moderate
Presence of clean and dirty separation infrastructure upstream of surface infrastructure.	Loss of catchment yield due to stormwater containment.	• Potential for erosion of terrestrial areas as a result of the formation of preferential flow paths, leading to sedimentation of the freshwater ecosystems; • Reduction in volume of water entering the freshwater ecosystems, leading to loss of recharge (and thus desiccation) of downstream system; and • Altered vegetation communities due to moisture stress.		Negative	Highly Probable	4	Long term	4	Regional	3	Medium	6	52	Moderate
Deposition of tailings, waste rock, general operations of the mine.	Possible pollution of surface water as result of seepage/runoff from proposed infrastructure (e.g. water treatment facilities, ROM stockpiles, PCD, WRD, TSF and workshop/fuel storage areas). Potential groundwater pollution, leading to plumes, which may affect freshwater ecosystems downstream of the surface infrastructure for a long period of time until water quality rebounds to the background values.	• Possible contamination of surface and ground water, leading to impaired water quality and salination of soils within riparian areas; • Sedimentation of freshwater ecosystems could lead to altered water quality, altered channel integrity and altered vegetation community structures; and • Changes to vegetation growth due to increased nutrients as a result of altered groundwater properties.		Negative	Highly Probable	4	Long term	4	Regional	3	Medium	6	52	Moderate

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Probability		Duration		Scale		Magnitude/ Severity		Significance	
					Magnitude	Score	Magnitude	Score	Magnitude	Score	Magnitude	Score	Score	Magnitude
Operational activities including underground mining	• Increased risk of contamination of freshwater ecosystems with hydrocarbons in runoff due to vehicle impacts; • Increased run-off from altered hard surfaces may affect hydrological function in the freshwater ecosystems (e.g. altered flow patterns that may also alter in-stream habitat and result in bank erosion and instability); • Increased risk of sediment transport in surface runoff from surface infrastructure to freshwater ecosystems, leading to altered water quality and sedimentation of freshwater systems.			Negative	Highly Probable	4	Long term	4	Regional	3	Medium	6	52	Moderate
Closure and Post Closure Phase														
Decant from shafts post-closure	• Increased risk of pollution of surface water as a result of decant from the adit post closure. • Increased risk of pollution of groundwater, potentially leading to the formation of a contaminated groundwater plume, which may decant to the surface infrastructure, thus possibly affecting the downgradient freshwater systems.	• Increased risk of pollution (AMD) entering the freshwater ecosystems; • Increased runoff volumes and formation of preferential surface flow paths as a result of compacted soil and unvegetated areas, leading to increased sedimentation, erosion, and increased water inputs to downgradient aquatic systems.		Negative	Highly Probable	4	Long term	4	Regional	3	Medium	6	52	Moderate

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Probability		Duration		Scale		Magnitude/ Severity		Significance	
					Magnitude	Score	Magnitude	Score	Magnitude	Score	Magnitude	Score	Score	Magnitude
Decommissioning / removal of surface infrastructure and sealing of shaft adits	Compacted soils, latent impacts of vegetation losses.	• Increased runoff volumes and formation of preferential surface flow paths as a result of compacted soil and unvegetated areas, leading to increased sedimentation, erosion, and increased water inputs to downgradient aquatic systems; • Proliferation of alien vegetation due to disturbances, which will impact natural flow regimes; and • Potential visual scars, affecting aesthetic features and faunal habitat.		Negative	Highly Probable	4	Long term	4	Regional	3	Medium	6	52	Moderate
Visual Impact Assessment														
Morgenzon, Dukes and Beta														
Site clearing of the project footprint areas associated with the shafts,WRDs, RoM Stockpiles, PCDs, DMS Plant, other supporting infrastructure, access roads and associated contractor laydown areas.	Visual	• Further removal of vegetation leading to visual contrast, potential loss of Visual Absorption Capacity of the landscape and visual intrusion on sensitive receptors especially the town of Pilgrim's Rest. • Erosion and loss of topsoil leading to visual contrast, and possible loss of Visual Absorption Capacity of the landscape. • Construction related earthworks activities resulting in increased dust suspension. • Increased vehicular movement in the vicinity of the study area. • Yellow construction vehicles visible from the lush green background, increasing the likelihood of motorists observing the proposed construction activities.	WOM	Negative	Definite	5	Long term	4	Regional	3	Medium	6	65	High
			WM	Negative	Highly Probable	4	Medium term	3	Regional	3	Medium	6	48	Moderate
Construction and excavation activities related to the shafts , PCDs, WRDs, RoM Stockpiles and access roads.	Visual	• Excavation during construction of mining infrastructure will lead to visual intrusion and visual exposure of receptors. • Mine infrastructure including buildings, stockpiles and dumps being visible and creating contrast with the surrounding landscape. • An increase in construction vehicular and human activity in the area, leading to an increase in dust. • Excavation resulting in increased dust suspension. • Use of security lighting.	WOM	Negative	Definite	5	Long term	4	Regional	3	Medium	6	65	High
			WM	Negative	Highly Probable	4	Medium term	3	Site	2	Medium	6	44	Moderate
On-going mining activities. Increase in trucks on the surrounding roads, transporting the material extracted.	Visual	• Continual stockpiling of material, including the resource, and potentially increasing heights of stockpiles and WRD during operational activities. • Generation of dust leading to visual intrusion, visual exposure of receptors and impacts on the overall landscape character. • Additional vehicular traffic impacting on the character of the region and leading to visual exposure of receptors further from the MR 83 UG Areas to mining activities. • Night time lighting due to security lighting, adding to the skyglow of the area.	WOM	Negative	Highly Probable	4	Medium term	3	Site	2	Medium	6	44	Moderate
			WM	Negative	Highly Probable	4	Short term	1	Site	2	Medium	6	36	Low
Demolition of surface infrastructure	Visual	• Removal of infrastructure and general decommissioning and closure activities leading	WOM	Negative	Highly Probable	4	Medium term	3	Site	2	Medium	6	44	Moderate

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Probability		Duration		Scale		Magnitude/ Severity		Significance	
					Magnitude	Score	Magnitude	Score	Magnitude	Score	Magnitude	Score	Score	Magnitude
		to potential visual intrusion on sensitive receptors. • Potential ineffective rehabilitation leading to landscape scarring, permanent visual contrast and a permanent alteration of the landscape character and sense of place within the region.	WM	Negative	Highly Probable	4	Medium term	3	Site	2	Low	2	28	Low
Frankfort														
Site clearing of the project footprint areas associated with the shafts, WRDs, RoM Stockpiles, PCDs, DMS Plant, other supporting infrastructure, access roads and associated contractor laydown areas.	Visual	• Further removal of vegetation leading to visual contrast, potential loss of Visual Absorption Capacity of the landscape and visual intrusion on sensitive receptors especially the town of Pilgrim's Rest. • Erosion and loss of topsoil leading to visual contrast, and possible loss of Visual Absorption Capacity of the landscape. • Construction related earthworks activities resulting in increased dust suspension. • Increased vehicular movement in the vicinity of the study area. • Yellow construction vehicles visible from the lush green background, increasing the likelihood of motorists observing the proposed construction activities in some instances and albeit from a distance.	WOM	Negative	Highly Probable	4	Medium term	3	Site	2	Medium	6	44	Moderate
			WM	Negative	Probable	2	Medium term	3	Site	2	Medium	6	22	Low
Construction and excavation activities related to the shafts, PCDs, WRDs, RoM Stockpiles and access roads.	Visual	• Excavation during construction of mining infrastructure will lead to visual intrusion and visual exposure of receptors. • Mine infrastructure including buildings, stockpiles and dumps being visible and creating contrast with the surrounding landscape. • An increase in construction vehicular and human activity in the area, leading to an increase in dust. • Excavation resulting in increased dust suspension. • Use of security lighting.	WOM	Negative	Definite	5	Medium term	3	Site	2	Medium	6	55	Moderate
			WM	Negative	Highly Probable	4	Medium term	3	Site	2	Medium	6	44	Moderate
On-going mining activities. Increase in trucks on the surrounding roads, transporting the material extracted.	Visual	• Continual stockpiling of material, including the resource, and potentially increasing heights of stockpiles and WRD during operational activities. • Generation of dust leading to visual intrusion, visual exposure of receptors and impacts on the overall landscape character. • Additional vehicular traffic impacting on the character of the region and leading to visual exposure of receptors further from the MR 83 UG Areas to mining activities. • Night time lighting due to security lighting, adding to the skyglow of the area.	WOM	Negative	Highly Probable	4	Medium term	3	Site	2	Medium	6	44	Moderate
			WM	Negative	Highly Probable	4	Short term	1	Site	2	Medium	6	36	Low
Demolition of surface infrastructure	Visual	• Removal of infrastructure and general decommissioning and closure activities leading to potential visual intrusion on sensitive receptors. • Potential ineffective rehabilitation leading to landscape scarring, permanent visual contrast and a permanent alteration of the landscape character and sense of place within the region.	WOM	Negative	Highly Probable	4	Medium term	3	Site	2	Low	2	28	Low
			WM	Negative	Highly Probable	4	Medium term	3	Site	2	Low	2	28	Low
Noise Assessment														
Construction Phase														

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Probability		Duration		Scale		Magnitude/ Severity		Significance	
					Magnitude	Score	Magnitude	Score	Magnitude	Score	Magnitude	Score	Score	Magnitude
Activities associated with the construction of the mines	Environmental Noise	Increase above 7 dBA above Rating Level	WOM	Negative	Probable	2	Short term	1	Site	2	Medium	6	18	Negligible
			WM	Negative	Probable	2	Short term	1	Site	2	Low	2	10	Negligible
Operational Phase														
Activities associated with the operations of the mines	Environmental Noise	Increase above 7 dBA above Rating Level, increase of 61 dBA over a 24 hour period (at the boundary of the mine footprint).	WOM	Negative	Highly Probable	4	Long term	4	Site	2	Medium	6	48	Moderate
			WM	Negative	Probable	2	Long term	4	Site	2	Low	2	16	Negligible
Movement of vehicles on mine and haul roads	Environmental Noise	Increase above 7 dBA above Rating Level	WOM	Negative	Highly Probable	4	Long term	4	Site	2	Medium	6	48	Moderate
			WM	Negative	Probable	2	Long term	4	Site	2	Low	2	16	Negligible
Underground mine ventilation stacks operations	Environmental Noise	Increase above 7 dBA above Rating Level, increase of 61 dBA over a 24 hour period (at the boundary of the mine footprint).	WOM	Negative	Probable	2	Long term	4	Site	2	Medium	6	24	Low
			WM	Negative	Probable	2	Long term	4	Site	2	Low	2	16	Negligible
Closure and Post closure														
Activities associated with the construction of the mines	Environmental Noise	Increase above 7 dBA above Rating Level	WOM	Negative	Probable	2	Short term	1	Site	2	Medium	6	18	Negligible
			WM	Negative	Probable	2	Short term	1	Site	2	Low	2	10	Negligible
Heritage Impact Assessment														
Construction Phase														
	Heritage	Damage/destruction of high significance heritage resources in the Beta North Mining Area, Frankfort Mining Area and CDM Mining Area.	WOM	Negative	Highly Probable	4	Permanent	5	Regional	3	High	8	64	High
			WM	Negative	Definite	5	Permanent	5	Local	1	Low	2	40	Low
			WOM	Negative	Probable	2	Short term	1	Local	1	Low	2	8	Negligible
Operational Phase														
	Heritage	Damage/destruction of high significance heritage resources in the Beta North Mining Area, Frankfort Mining Area and CDM Mining Area.	WOM	Negative	Highly Probable	4	Permanent	5	Regional	3	High	8	64	High
			WM	Negative	Probable	2	Long term	4	Regional	3	High	8	30	Low
			WM	Negative	Highly Probable	4	Long term	4	Site	2	Low	2	32	Low
Closure & Post Closure Phase														
	Heritage	Damage/destruction of high significance heritage resources in the Beta North Mining Area, Frankfort Mining Area and CDM Mining Area.	WOM	Negative	Improbable	1	Permanent	5	Regional	3	High	8	16	Negligible
			WM	Negative	Improbable	1	Long term	4	Site	2	High	8	14	Negligible
			WOM	Negative	Improbable	1	Long term	4	Regional	3	Low	2	9	Negligible
Palaeontological Impact Assessment														
Re-mining of sites	Palaeontology	The damage or destruction of any palaeontological materials by proposed development	WOM	Negative	Highly Probable	4	Permanent	5	Site	2	High	8	60	Moderate
			WM	Negative	Probable	2	Permanent	5	Site	2	Medium	6	26	Low
Socio-Economic Impact Assessment														
Construction Phase														
Construction Activities	Socio-Economic	Positive Impact on Local Income and Employment	WOM	Positive	Highly Probable	4	Long term	4	Regional	3	Medium	6	52	Moderate

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Probability		Duration		Scale		Magnitude/ Severity		Significance	
					Magnitude	Score	Magnitude	Score	Magnitude	Score	Magnitude	Score	Score	Magnitude
			WM	Positive	Highly Probable	4	Long term	4	Regional	3	High	8	60	Moderate
Construction Activities	Socio-Economic	Potential Influx of People Population Change	WOM	Negative	Highly Probable	4	Long term	4	Local	1	High	8	52	Moderate
			WM	Negative	Highly Probable	4	Long term	4	Local	1	Medium	6	44	Moderate
Construction Activities	Socio-Economic	Increase in Nuisance Factors (Noise & Dust)	WOM	Negative	Highly Probable	4	Long term	4	Site	2	Medium	6	48	Moderate
			WM	Negative	Probable	2	Long term	4	Local	1	Medium	6	22	Low
Construction Activities	Socio-Economic	Community Health	WOM	Negative	Probable	2	Long term	4	Regional	3	Medium	6	26	Low
			WM	Negative	Probable	2	Long term	4	Regional	3	Low	2	18	Negligible
Construction Activities	Socio-Economic	Community Safety	WOM	Negative	Highly Probable	4	Long term	4	Regional	3	Medium	6	52	Moderate
			WM	Negative	Highly Probable	4	Long term	4	Regional	3	Low	2	36	Low
Operational Phase														
Operational Activities	Socio-Economic	Positive Impact on Local Income and Employment	WOM	Positive	Highly Probable	4	Long term	4	Regional	3	Medium	6	52	Moderate
			WM	Positive	Highly Probable	4	Long term	4	Regional	3	High	8	60	Moderate
Operational Activities	Socio-Economic	Increase in Public Revenues	WOM	Positive	Highly Probable	4	Long term	4	Regional	3	Medium	6	52	Moderate
			WM	Positive	Highly Probable	4	Long term	4	Regional	3	High	8	60	Moderate
Operational Activities	Socio-Economic	Impact on Non-Mining Related Economic Activities	WOM	Negative	Highly Probable	4	Long term	4	Regional	3	Medium	6	52	Moderate
			WM	Negative	Probable	2	Long term	4	Regional	3	Medium	6	26	Low
Operational Activities	Socio-Economic	Increased economic concentration of the local economy	WOM	Negative	Highly Probable	4	Long term	4	Regional	3	High	8	60	Moderate
			WM	Negative	Highly Probable	4	Long term	4	Regional	3	Medium	6	52	Moderate
Operational Activities	Socio-Economic	Increased use of scarce natural resources	WOM	Negative	Highly Probable	4	Long term	4	Local	1	High	8	52	Moderate
			WM	Negative	Highly Probable	4	Long term	4	Local	1	Medium	6	44	Moderate
Operational Activities	Socio-Economic	Potential Influx of People Population Change	WOM	Negative	Highly Probable	4	Long term	4	Regional	3	High	8	60	Moderate
			WM	Negative	Highly Probable	4	Long term	4	Regional	3	Medium	6	52	Moderate
Operational Activities	Socio-Economic	Increase in Nuisance Factors (Noise & Dust)	WOM	Negative	Highly Probable	4	Long term	4	Regional	3	Medium	6	52	Moderate
			WM	Negative	Highly Probable	4	Long term	4	Regional	3	Low	2	36	Low
Operational Activities	Socio-Economic	Community Health	WOM	Negative	Highly Probable	4	Long term	4	Regional	3	Medium	6	52	Moderate
			WM	Negative	Probable	2	Long term	4	Regional	3	Medium	6	26	Low
Operational Activities	Socio-Economic	Community Safety	WOM	Negative	Highly Probable	4	Long term	4	Regional	3	Medium	6	52	Moderate
			WM	Negative	Highly Probable	4	Long term	4	Site	2	Low	2	32	Moderate
Closure and Decommissioning Phase													0	
Closure Activities	Socio-Economic	Job losses due to scaling down of mining activities and mine closure	WOM	Negative	Definite	5	Long term	4	Local	1	High	8	65	High

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Probability		Duration		Scale		Magnitude/ Severity		Significance	
					Magnitude	Score	Magnitude	Score	Magnitude	Score	Magnitude	Score	Score	Magnitude
			WM	Negative	Highly Probable	4	Long term	4	Local	1	High	8	52	Moderate
Closure Activities	Socio-Economic	Termination of local social funds	WOM	Negative	Definite	5	Long term	4	Local	1	High	8	65	High
			WM	Negative	Definite	5	Long term	4	Local	1	Medium	6	55	Moderate
Closure Activities	Socio-Economic	Loss of agricultural land	WOM	Negative	Highly Probable	4	Permanent	5	Site	2	Low	2	36	Low
			WM	Negative	Probable	2	Permanent	5	Site	2	Low	2	18	Negligible
Closure Activities	Socio-Economic	Nuisance Factors (Noise & Dust)	WOM	Negative	Highly Probable	4	Medium Term	3	Site	2	Medium	6	44	Moderate
			WM	Negative	Probable	2	Medium Term	3	Site	2	Medium	6	22	Low
Closure Activities	Socio-Economic	Community Safety	WOM	Negative	Highly Probable	4	Long term	4	Regional	3	Medium	6	52	Moderate
			WM	Negative	Highly Probable	4	Long term	4	Site	2	Low	2	32	Low
Blasting and Vibration														
Operational Phase														
Blasting at underground mining areas	Ground Vibration	Damage to houses or infrastructure not owned by the mine, upset people and occupants of houses	WOM	Negative	Probable	2	Medium term	3	Local	1	Low	2	12	Negligible
			WM	Negative	Probable	2	Medium term	3	Local	1	Low	2	12	Negligible
Traffic Impact Assessment														
Construction Phase														
Traffic impact during the construction activity	Traffic	Traffic impact on the external road network	WOM	Negative	Highly Probable	4	Short term	1	Regional	3	Low	1	20	Negligible
Operational Phase														
Traffic impact during the production phase	Traffic	Traffic impact on the external road network	WOM	Negative	Highly Probable	4	Medium term	3	Regional	3	Low	1	28	Negligible

13.5 THE POSSIBLE MITIGATION MEASURES THAT COULD BE APPLIED AND THE LEVEL OF RISK

Table 66: Impact Management Measures

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance	Management Measures	Management objective	Mitigation Effect
					Magnitude			
Air Quality Impact Assessment								
Construction Phase						All internal gravel roads should be dust suppressed. To ensure the lowest possible impact on AQSRs and environment it is recommended that the air quality management plan as set out in this report should be adopted. This includes: • The management of the operations; resulting in the mitigation of associated air quality impacts. • TGME's current dustfall sampling be expanded and monthly dustfall reporting form part of the project's air quality management plan. o The recommended dustfall network will comprise of 15 single dustfall units, with nine (9) located at Beta North, three (3) located at CDM and three (3) at Frankfort.		
Construction associated with the proposed project	Air Quality - Health Risk Impact Significance	Increased health risk at Air Quality Sensitive Receptors (AQSRs.)	WOM	Negative	Low		Reduce emissions impacts on sensitive receptors	Can be avoided, managed or mitigated
			WM	Negative	Low			
Construction associated with the proposed project	Air Quality - Nuisance Impact Significance	Increased health risk at AQSRs.	WOM	Negative	Moderate			
			WM	Negative	Moderate			
Construction associated with the proposed project	Air Quality - Vegetation Impact Significance	Increased health risk at AQSRs.	WOM	Negative	Negligible			
			WM	Negative	Negligible			
Operational Phase								
		Increased health risk at AQSRs.	WOM	Negative	Low			

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance	Management Measures	Management objective	Mitigation Effect
					Magnitude			
Mining and processing operations associated with the proposed project.	Air Quality - Health Risk Impact Significance		WM	Negative	Negligible	o Dustfall collected monthly, should be analysed, and reported on with the results compared to the NDCR, which in this case would need to comply with the Non-residential limit of 1 200 mg/m²/day, not to be exceeded for two consecutive months. In the case of such events, the cause for high dustfall should be investigated and mitigation measures identified and implemented. • Record keeping and community liaison procedures. • GHG emissions from project can be reduced by: o ensuring the vehicles and equipment are maintained through an effective inspection and maintenance program; and, o limiting the removal or vegetation and ensuring adequate re-vegetation or addition of vegetation surrounding the project.	Reduce emissions impacts on sensitive receptors	Can be avoided, managed or mitigated
Mining and processing operations associated with the proposed project.	Air Quality - Nuisance Impact Significance	Increased health risk at AQSRs.	WOM	Negative	Low			
			WM	Negative	Negligible			
Mining and processing operations associated with the proposed project.	Air Quality - Vegetation Impact Significance	Increased health risk at AQSRs.	WOM	Negative	Low			
			WM	Negative	Low			
Closure Phase								
Closure activities	Air Quality - Health Risk Impact Significance	Increased health risk at AQSRs.	WOM	Negative	Low		Reduce emissions impacts on sensitive receptors	Can be avoided, managed or mitigated
			WOM	Negative	Low			
Closure activities	Air Quality - Nuisance Impact Significance	Increased health risk at AQSRs.	WOM	Negative	Moderate			
			WOM	Negative	Moderate			
Closure activities	Air Quality - Vegetation Impact Significance	Increased health risk at AQSRs.	WOM	Negative	Negligible			
			WOM	Negative	Negligible			
Decommissioning Phase								
Post closure activities	Air Quality - Health Risk Impact Significance	Increased health risk at AQSRs.	WOM	Negative	Low		Reduce emissions impacts on sensitive receptors	Can be reversed
			WM	Negative	Negligible			
Post closure activities	Air Quality - Nuisance Impact Significance	Increased health risk at AQSRs.	WOM	Negative	Low			
			WM	Negative	Negligible			
Post closure activities	Air Quality - Vegetation Impact Significance	Increased health risk at AQSRs.	WOM	Negative	Negligible			
			WM	Negative	Negligible			
Soil and Land Capability Assessment								
Construction Phase								
Construction of the infrastructure	Soil Erosion	Loosening of soils due to removal of vegetation associated with the surface infrastructure. Leading to Increased runoff, erosion and consequent loss of land capability in cleared areas.	WOM	Negative	High	• Regulated speed limits of 40km/hr must be maintained on gravel roads to minimize dust generation; • The mine should implement adequate wet suppression techniques to limit dust release; • Bare soils within the access roads 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; • Activity should be limited to area of disturbance (if feasible); • All vehicles and machinery will be regularly serviced to ensure they are in proper working condition and to reduce risk of leaks; • All leaks should be cleaned up immediately using an absorbent material and spill kits, in the prescribed manner; • All vehicular traffic should be restricted to the existing service roads and the selected road servitude as far as practically possible; • Withdraw equipment for maintenance if change in emission characteristics is noticeable; • Spill kits (such as spill-sorb or a similar type of product) must be kept on site and used to clean up hydrocarbon spills in the event that they should occur; • All hazardous waste generated shall be kept separate and shall not be mixed with general waste; All hazardous waste shall be stored within a closed drum on an impermeable surfaced area within the central waste storage and transition area. Prevent and reduce and remedy through management measures. • Activity should be limited to area of disturbance. Where required the compacted soils should be disked to an adequate depth and re-vegetated with indigenous plants;	Prevent soil erosion	Can be avoided, managed or mitigated
			WM	Negative	Low			
	Soil Compaction	Potential frequent movement of digging machinery and construction vehicles within lose and exposed soils, leading to excessive soil compaction.	WOM	Negative	High		Prevent soil compaction	Can be avoided, managed or mitigated
			WM	Negative	Low			
	Soil Contamination	Spillage of petroleum hydrocarbons during construction of associated infrastructure. Disposal of hazardous and non-hazardous waste, including waste material spills and refuse deposits into the soil.	WOM	Negative	Moderate		Prevent soil contamination	Can be avoided, managed or mitigated
			WM	Negative	Low			
	Land Capability	Loss of land capability	WOM	Negative	Moderate		Prevent loss of land capability	Can be avoided, managed or mitigated
			WM	Negative	Low			

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance	Management Measures	Management objective	Mitigation Effect
					Magnitude			
						• Soils compacted, should be deeply ripped to loosen compacted layers and re-graded to even running levels. • Direct surface disturbance of the identified arable soils can be avoided where possible to minimise loss of arable soils; and • Soils of different characteristics should be stockpiLocal Economic Development programme separately and clearly demarcated.		
Operational Phase								
Operation of mines and movement of vehicles	Soil Erosion	Constant disturbances of soils, resulting in risk of erosion	WOM	Negative	Moderate	• Excessive compaction of the soil by heavy machinery should be avoided by using prescribed access routes. • Contractors should be committed not to overload trucks to avoid spillage. Spillage from trucks will be monitored and if necessary remedial measures should be implemented. • Storage of hazardous substances and materials to avoid and/or minimise chemical leaks/spills causing contamination of soil and groundwater resources; • Spillage from trucks will be monitored and if necessary remedial measures should be implemented. If spills occur and soils are polluted, the affected soils should be removed and discarded at an appropriate permitted waste site; • All vehicular traffic should be restricted to the existing service roads and the selected road servitude as far as practically possible; • Compacted soils should be deeply ripped to loosen compacted layers and re-graded to even running levels; • Contamination of these soils by possible seepage and return water runoff will be reduced by the use of collector drains and cut off trenches; • Regular monitoring of site activities and machinery must be undertaken to identify spills or leaks; • Excess vegetation will be removed from the storm water berm drainage route to prevent back-up of flood occurring; • All Vehicles and machinery should be serviced regularly to ensure they are in a proper working condition and to avoid any oil leaks; • An emergency management system with procedures and training will be developed; • If spills occur the affected soils will be removed using absorbent material and spill kits and disposed of to a permitted waste site; • All disturbed areas adjacent to the project infrastructural 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. • Stockpiles that will remain in location for more than one growing season and that have not revegetated naturally, should be revegetated to avoid erosion losses; and • The dumping of waste materials next to or on the stockpiles should be prohibited.	Prevent soil erosion	Can be avoided, managed or mitigated
			WM	Negative	Low			
	Soil Compaction	Constant disturbances of soils, resulting in risk of compaction	WOM	Negative	Moderate		Prevent soil compaction	Can be avoided, managed or mitigated
			WM	Negative	Low			
	Soil Contamination	Leaching of hydrocarbons chemicals into the soils, leading to alteration of the soil chemical status as well as contamination of ground water. Disposal of hazardous and non-hazardous waste, including waste material spills and refuse deposits into the soil.	WOM	Negative	Moderate		Prevent soil contamination	Can be avoided, managed or mitigated
			WM	Negative	Low			
	Land Capability	Loss of land capability	WOM	Negative	Moderate		Prevent loss of land capability	Can be avoided, managed or mitigated
			WM	Negative	Low			
Closure and Post closure								
Removal of infrastructure and rehabilitation	Soil Erosion	Soil handling during decommissioning and capping leading to erosion.	WOM	Negative	Low	• All disturbed areas should be re-vegetated with an indigenous grass mix, if necessary, to re-establish a protective cover or return to conditions conducive for forestry land use, to minimise soil erosion; • Compacted soils adjacent to the proposed developments during construction should be lightly ripped to at least 25 cm below ground surface to alleviate compaction; • Soil Compaction is usually greatest when soils are moist, so soils should be stripped when moisture content is as low as possible. If they have to be moved when wet, truck and shovel should be used as bowl scrapers create excessive compaction	Prevent soil erosion	Can be avoided, managed or mitigated
			WM	Negative	Low			
	Soil Compaction	Movement of vehicles and machinery during rehabilitation leading to soil compaction.	WOM	Negative	Low		Prevent soil compaction	Can be avoided, managed or mitigated
			WM	Negative	Low			
	Soil Contamination	Spillage of hydrocarbons resulting from leakages from demolition equipment/machinery and other	WOM	Negative	Low		Prevent soil contamination	Can be avoided,
			WM	Negative	Low			

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance	Management Measures	Management objective	Mitigation Effect
					Magnitude			
		chemical storage facilities, leading to soil contamination (soil chemical characteristics.				when moving wet soils • Temporary erosion control measures may be used to protect the disturbed soils during the rehabilitation until adequate vegetation has established; • The stormwater design should be implemented to reduce the volume and velocity of flows crossing disturbed areas and to prevent the mixing of clean and dirty runoff as far as possible; • Runoff attenuation, which function as wetlands or bioswales can potentially be placed at strategic points in the bottom of the landscape to assist with the assimilation of contaminants and to trap sediments; • Compaction should be minimised by use of appropriate equipment and replacing soils to the greatest possible thickness in single lifts; • Heavy equipment movement over replaced soils should be minimised; • Where revegetation is not possible, the soils should be tilLocal Economic Development programme to produce a seed-bed suitable for the plant species selected for seeding to be seeded into; and • Undertake inspection of rehabilitated area to ascertain level of success of rehabilitation efforts and effectiveness (vegetation growth, erosion monitoring), and • During the decommissioning phase the footprint should be thoroughly cleaned, and all building material should be removed to a authorised disposal facility. After clearing the post-closure land use can be targeted for forestry.		managed or mitigated
	Land Capability	Potentially poor rehabilitation strategy may result to lower infiltration rate, and consequently increased surface runoff. Increased soil erosion leading to permanent loss of soil resources	WOM	Negative	Low		Prevent loss of land capability	Can be avoided, managed or mitigated
			WM	Negative	Low			
Geohydrological and Groundwater Assessment								
Construction Phase								
Tailings Facility - Continuation	Groundwater	Seepage of contaminated leachate into the aquifer system	WOM	Negative	Negligible	Tailings deposition will not take place during the construction phase and no impact is therefore expected. No management measures are recommended other than the establishment of a suitable groundwater monitoring network.	Avoid contaminated seepage	Can be avoided, managed or mitigated
Underground Mining Establishment	Groundwater Quality	Prior to the actual mining commencing the opening up and dewatering of main accessways will take place. Dewatering of flooded underground workings may pose a risk of contaminated water spilling into the surface water streams.	WOM	Negative	Negligible	- Sample water regularly to assess the water quality - If quality is not suitable for discharge it should be pumped to an adequate holding facility.	Prevent contaminated water from entering surface streams	Can be avoided, managed or mitigated
Operational Phase								
Waste Deposition - Tailings Facility (TSF) - Return Water Dams (RWD) - Waste Rock Dumps (WRD)	Groundwater Quality	-Generation and disposal of hazardous operational waste i.e. waste rock, tailings, etc. -Seepage of contaminated leachate into the aquifer system.	WOM	Negative	Moderate	- Design and placement of suitable liner and drainage system according to the waste classification requirements. - Routine monitoring to act as early warning of potential impacts. - Implementation of remedial options to contain or remove contaminant plume, if required.	Avoid or reduce contaminated seepage	Can be avoided, managed or mitigated

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance	Management Measures	Management objective	Mitigation Effect
					Magnitude			
Underground Mining	Groundwater Level and Yield	Water flow into the mine resulting in the draining of the aquifer and potential lowering of the groundwater level.	WOM	Negative	Moderate	- Drilling of cover boreholes ahead of development in virgin ground. These holes must be equipped with valves so that they can be closed if water is intersected and to allow for later grouting if necessary. - It is recommended that groundwater intersections in the cover holes are grouted to allow for dry mining of the development ends. - Pillars may be required around water-bearing geological structures. - Accurate record keeping of all water intersections and the following should be recorded: - Position of the water intersection, - Water pressure of the intersection as this provides an indication of the groundwater level, - Groundwater quality, - Grout Volumes and sealing pressure.	Reduce the volume of groundwater flowing into the mine	Can be avoided, managed or mitigated
Underground Mining	Groundwater Quality	Groundwater entering the mine coming into contact with contaminants causing deterioration of the water quality.	WOM	Negative	Low	- Water that cannot be seaLocal Economic Development programme should be included in the mining and processing circuit as far as possible. - Water should be contained in underground dams from where it can be piped to holding dams on surface (prevent the water from flowing through the mineralised areas). - Reduce the contact time between the water and the rock.	Prevent groundwater from becoming contaminated when entering the mine.	Can be avoided, managed or mitigated
Closure and Post closure								
Residual groundwater contamination from TSF, RWD and WRD after closure of the mine	Groundwater Quality	-Generation and disposal of hazardous operational waste i.e. waste rock, tailings, etc. - Seepage of contaminated leachate into the aquifer system.	WOM	Negative	Low	Design and implementation of a suitable rehabilitation plan.	Avoid seepage of rainwater through the waste material and contaminated leachate from entering the aquifer.	Can be avoided, managed or mitigated
Continued groundwater inflow into the mine	Groundwater Level and Yield	Water flow into the mine resulting in the draining of the aquifer and potential lowering of the groundwater level.	WOM	Negative	Moderate	Water entering the mine should be seaLocal Economic Development programme as far as possible.	Reduce the volume of groundwater flowing into the mine	Can be avoided, managed or mitigated
Residual groundwater contamination after closure of the mine	Groundwater Quality	Groundwater entering the mine coming into contact with contaminants causing deterioration of the water quality.	WM	Negative	Low	Continued monitoring of the water quality and possible treatment of water if required.	Prevent contaminated water from entering surface streams	Can be avoided, managed or mitigated
Biodiversity Assessment - Floral Assessment								
Beta North								
Construction Phase								
Expansion and re-working of the TSF	Degraded Habitat Unit	• Site clearing and the removal of vegetation associated with the Transformed Habitat Unit; • Potential inadequate design of infrastructure leading to pollution of soils. Contaminated soils lead to a loss of viable growing conditions for plants and results in a decrease of floral habitat, diversity, and SCC – rehabilitation effort will also be increased as a result; and • Potential proliferation of AIPsspecies that colonise areas of increased disturbances and that	WOM	Negative	Low	• Ensure adequate design of TSF; • Prior to the commencement of construction activities, the entire construction servitude, including lay down areas and stockpile areas etc., should be fenced off and clearly demarcated; • Minimise loss of indigenous vegetation where possible; • All construction-related waste and material is to be disposed of at a licensed waste facility and no waste of construction rubble is to be dumped in the surrounding natural habitats; • Implement AIPscontrol; and • Ensure AIPsvegetation cuttings/propagules are disposed of at a designated spot where spread of these species is prevented.	Minimise effects of vegetation removal and alien invasive spreading on the area outside of the footprint	Can be avoided, managed or mitigated
			WM	Negative	Low			
	Freshwater Habitat		WOM	Negative	Low			
			WM	Negative	Negligible			
	Woody Communities		WOM	Negative	Negligible			
			WM	Negative	Negligible			
	Valley Habitat		WOM	Negative	Negligible			
			WM	Negative	Negligible			

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance	Management Measures	Management objective	Mitigation Effect
					Magnitude			
		outcompetes native species, including the further transformation of adjacent or nearby natural, more sensitive habitat, such as downslope watercourses.						
Construction of Crossing(s)	Freshwater Habitat	• Vegetation clearing within the Riparian Woodland sub-unit (i.e., Peach Tree Stream; • Temporary alteration of stream flow; • Spread of AIPs along the Riparian Woodland sub-unit from contaminated construction material; and • Increased sediment loads and potential erosion of stream banks resulting from construction activities and increased movement of construction workers along / across the Riparian Woodland.	WOM	Negative	Moderate	• All crossings over watercourses must be kept to the bare minimum and are adequately designed to prevent impacts on habitat, instream flow, pattern and timing of water and water quality; • Minimise loss of indigenous vegetation where possible; • Ensure AIPsvegetation cutting and propagules do not enter the watercourses where crossings will be constructed; and • As much as possible, existing access roads and river crossings must be utilised (if necessary, upgraded) to minimise further disturbances to the watercourses.	Protecting the riparian habitat and function	Can be avoided, managed or mitigated
			WM	Negative	Low			
Construction of surface infrastructure associated with Operational Infrastructure, Shafts, Supporting Infrastructure, WRDs and Stockpiles	Degraded Habitat Unit	• Site preparation and clearing of small extents of indigenous vegetation for mine-related infrastructure; • Impaired water quality and reduced flow of watercourses due to the accumulation of vegetation cuttings and debris resulting from vegetation clearing; • Waste from construction material leading to disturbance of natural vegetation; • Increased personnel on site leading to loss of floral habitat through the potential for increased fire frequency and intensity (further promoting wattle thicket formation), as well as indiscriminate driving through natural veld; • Potential proliferation of AIPsspecies that colonise areas of increased disturbances arising from dumping of excavated and construction material outside of designated areas. Loss of floral habitat and species diversity as AIPs outcompete native species and transform adjacent or nearby natural, more sensitive habitat; • Dust generated during construction activities accumulating on the surrounding floral individuals, altering the photosynthetic ability of plants, and potentially further decreasing optimal growing/re-establishing conditions; • Potential failure to concurrently rehabilitate bare areas or	WOM	Negative	Low	• Prior to the commencement of construction activities, the entire construction servitude, including lay down areas and stockpile areas etc., should be fenced off and clearly demarcated; • The construction footprint and removal of vegetation must be kept as small as possible within the authorised footprints to minimise impact on the surrounding environment (edge effect management); • No vegetation cuttings may be left to accumulate in watercourses. Discard all construction related waste and material (including cleared vegetation) at a licensed waste facility (or in a secluded area designated by the mine) and no waste of construction rubble is to be dumped in the surrounding natural habitats; • If any spills occur, they should be immediately cleaned up to avoid soil contamination that can hinder floral rehabilitation later down the line; • Edge effects of all construction activities, which may affect floral habitat within surrounding areas, are to be strictly managed, e.g., implement an AIPscontrol plan from the get-go, mitigate soil erosion by reducing soil compaction caused by movement of construction personnel and vehicles, suppress dust in order to mitigate the impact of dust on flora within a close proximity of construction activities; • No illicit fires must be allowed during any phases of the proposed mining development. A Fire Management Plan (FMP) should be set in place to ensure that any fires that do originate can be managed and / or stopped before significant damage to the environment occurs; • No indiscriminate driving through the veld is allowed. As far as possible vehicles are to utilise the existing roads. Where this is not feasible, new roads are to be located in areas of existing high disturbance, and not encroach upon sensitive habitats; 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.	Minimise effects of vegetation removal and alien invasive spreading on the area outside of the footprint	Can be avoided, managed or mitigated
			WM	Negative	Low			
	Freshwater Habitat		WOM	Negative	Moderate		Protecting the riparian habitat and function	Can be avoided, managed or mitigated
			WM	Negative	Negligible			
	Woody Communities		WOM	Negative	Negligible		Minimise effects of vegetation removal and alien invasive spreading on the area outside of the footprint	Can be avoided, managed or mitigated
			WM	Negative	Negligible			
	Valley Habitat		WOM	Negative	Moderate		Protecting the riparian habitat and function	Can be avoided, managed or mitigated
			WM	Negative	Negligible			

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance	Management Measures	Management objective	Mitigation Effect
					Magnitude			
		disturbed sites as soon as they become available, potentially resulting in loss of viable soils, increasing erosion risk and/or permitting the proliferation of AIPs; and • Potential failure to implement a biodiversity action plan (BAP), including the auditing of the BAP, leading to permanent transformation of floral habitat and long-term degradation of important floral habitat within the region.						
Construction of Linear Developments	Woody Communities	• Site clearing and the removal of vegetation along continuous vegetation leading to fragmented habitat and a disturbance corridor along which AIPs can establish and spread to adjacent sites.	WOM	Negative	Moderate	• The construction footprint and removal of vegetation must be kept as small as possible within the authorised footprints to minimise impact on the surrounding environment (edge effect management); • Access roads should be kept to existing roads so to reduce fragmentation of existing natural habitat; • Roadsides and linear developments serve as common corridors along which alien and invasive floral species are introduced and dispersed. Therefore, an AIPscontrol plan should be implemented along all linear disturbances; and • All construction related waste and material is to be disposed of at a licensed waste facility and no waste of construction rubble is to be dumped in the surrounding natural habitats.	Minimise effects of vegetation removal and alien invasive spreading on the area outside of the footprint	Can be avoided, managed or mitigated
			WM	Negative	Low			
	Degraded Habitat Unit		WOM	Negative	Low		Protecting the riparian habitat and function	Can be avoided, managed or mitigated
			WM	Negative	Low			
	Freshwater Habitat		WOM	Negative	Moderate		Minimise effects of vegetation removal and alien invasive spreading on the area outside of the footprint	Can be avoided, managed or mitigated
			WM	Negative	Negligible			
	Valley Habitat		WOM	Negative	Low		Protecting the riparian habitat and function	Can be avoided, managed or mitigated
			WM	Negative	Low			
Removal and/or relocation of floral SCC	Floral SCC	• Failure to plan a summer floral SCC walkdown to confirm the presence/absence of such species within the direct footprint areas, including the potential untimely application for permits to relocate/ destroy any floral SCC found within the footprint areas; and • Increased human presence due to construction-related activities, potentially resulting in increased harvesting/ collection of SCC.	WOM	Negative	Low	• Before any construction activities can occur, a detaiLocal Economic Development programme walk down of the area must take place, during which all NFA-protected tree species, MNCA-protected floral species and potentially occurring RDL species are marked. If SCC are encountered and will be affected by the construction activities, these species must, as far as is possible, be avoided. If avoidance of impacts to SCC are not possible, the following is recommended: 1) For NFA-protected trees, permit applications will be required from DFFE for removal/destruction of species. For specimens too large to relocate, collection of propagules should take place and these propagated in nurseries for use in rehabilitation later down the line; 2) For MNCA-protected species, permit application from MTPA will be required to rescue and relocate such species; 3) For RDL species, an investigation must be initiated into potential relocation. If not possible, offsetting the loss of RDL species should be pursued. • No collection of firewood, floral SCC or medicinal floral species must be allowed by construction or mining personnel.	Limiting removal and protecting SCC's	Can be avoided, managed or mitigated
			WM	Negative	Negligible			
Operational Phase								
All activities associated with mining and the movement of vehicles	Degraded Habitat Unit	• Potential failing/collapse of TSF resulting in loss of surrounding habitat; • Further loss of floral habitat beyond the project footprint	WOM	Negative	Low	HABITAT AND DIVERSITY: • Ongoing monitoring of TSF stability; • Stockpiles, discard dumps and PCD etc. positions, and their expansion as material is deposited, should be kept as small as possible;	Minimise effects of vegetation removal and alien invasive spreading on	Can be avoided, managed or mitigated
			WM	Negative	Low			

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance	Management Measures	Management objective	Mitigation Effect
					Magnitude			
		because of vegetation clearing related to operational-phase disturbances and expansion of stockpiles and waste rock dumps, on-going disturbance of soils due to operational activities, and edge effects associated with mining activities; • Ongoing disturbances from operational activities resulting in increased or continued proliferation of AIPs; Failure to concurrently rehabilitate bare areas or disturbed sites as soon as they become available, potentially resulting in loss of viable soils, increasing erosion risk and/or permitting the proliferation of AIPs; • Erosion as a result of mining development, stormwater runoff and on-going disturbance of soils due to operational activities; • Risk of contamination from all operational facilities may pollute receiving environment; • Loss of floral SCC through ineffective monitoring of relocation success of rescued and relocated floral SCC (where applicable), and/or due to the harvesting of protected floral species by mining and operational personnel; and • Additional pressure on floral habitat by increased human populations associated with the proposed mining activities, contributing to increases in the collection of plant material for medicinal purposes and promoting the introduction and spread of AIPs that may displace habitat for SCCs.				• No additional habitat is to be disturbed during the operational phase of the development; • Manage all edge effects or indirect disturbances stemming from mining operations and infrastructure areas: a) Implement erosion control measures where necessary to ensure that further habitat loss does not occur; b) Any waste or toxic spills from vehicles or mining infrastructure must be dealt with immediately in accordance with the waste management plan (emergency incident procedure or spill procedure); c) No uncontrolLocal Economic Development programme or unsanctioned fires are allowed. A FMP should be in place; d) Vehicles should be restricted to travelling only on designated roadways to limit the ecological footprint of the proposed mining activities; and e) Implement an AIPsManagement / Control Plan that includes ongoing monitoring and control of the presence and/or re-emergence of such species. • Rehabilitate areas that are no longer used for mining. FLORAL SCC: • Monitoring of relocation success of potentially rescued and relocated floral SCC should take place during the operational phase; • Manage all edge effects stemming from mining operations and infrastructure areas; and • Harvesting of protected floral species by mining and operational personnel should be strictly prohibited.	the area outside of the footprint	
	Freshwater Habitat		WOM	Negative	Low		Protecting the riparian habitat and function	Can be avoided, managed or mitigated
			WM	Negative	Negligible			
	Woody Communities		WOM	Negative	Low		Minimise effects of vegetation removal and alien invasive spreading on the area outside of the footprint	Can be avoided, managed or mitigated
			WM	Negative	Negligible			
	Valley Habitat		WOM	Negative	Low		Protecting the riparian habitat and function	Can be avoided, managed or mitigated
			WM	Negative	Negligible			
	Floral SCC		WOM	Negative	Moderate		Limiting removal and protecting SCC's	Can be avoided, managed or mitigated
			WM	Negative	Low			
Ongoing AIPsmanagement within 30 m of proposed activities	Floral Habitat and Diversity	• Ongoing AIPs clearing and management as part of operational activities, resulting in an increase in floral diversity and habitat integrity.	WOM	Positive	Negligible	The proliferation of AIPs is expected within any disturbed areas and especially along linear developments. AIPs must be monitored and must be removed throughout the operational phase of the project to prevent their spread beyond the development footprint areas: • Removal of the AIPs, with specific emphasis on Category 1b alien species, encountered within the footprint area and immediate surrounds (approximately 30 m buffer around activities) must take place (as per NEMBA: Alien and Invasive Species Regulations of 2020); • Removal of alien invasive species should preferably commence during the construction phases and continue throughout the operational, decommissioning and post-closure phases; and • The AIPs Management/Control Plan should be implemented by a qualified professional. No chemical control of AIPs to occur within 32 m of a watercourse.	Increase in floral diversity and habitat integrity.	Can be reversed
			WM	Positive	Moderate			
Closure and Post closure								

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance	Management Measures	Management objective	Mitigation Effect
					Magnitude			
Seepage from TSF and WRDs	Floral Habitat and diversity	• On-going risk of discharge from mining facilities beyond closure leading to a permanent impact on floral habitat and downstream impacts on Riparian Habitat and Forest Remnants	WOM	Negative	Moderate	• Ensure TSF is stable and monitor often to ensure rapid response in the event of discharge.	Protecting impact on riparian habitat and Forest Remains	Can be avoided, managed or mitigated
			WM	Negative	Negligible			
Rehabilitation and restoration activities	Floral Habitat and diversity	• Permanent loss of floral habitat, diversity and SCC, and a higher likelihood of edge effect impacts on adjacent and nearby natural vegetation of increased sensitivity due to potential failure to effectively implement and monitor rehabilitation efforts, leading to: a) Reintroduction and proliferation of alien and invasive plant species; b) Compacted soils limiting the re-establishment of natural vegetation; c) Increased risk of erosion in areas left disturbed and inadequately vegetated; d) Improper rehabilitation of disturbed areas leading to permanent floral habitat loss. Ultimately leading to a permanent loss of floral habitat, diversity and SCC, and a higher likelihood of edge effect impacts on adjacent and nearby natural vegetation of increased sensitivity.	WOM	Negative	High	• Ensure sound implementation of AIPs Management / Control Plan; • Where soils have been compacted, they are to be ripped and where necessary reprofiled; • Indigenous floral species are to be used for revegetation of disturbed areas. Where possible, reinstatement of floral communities similar to the reference vegetation type for the area must form the goal of rehabilitation activities; • All surface infrastructure is to be removed and waste material disposed of at a registered dump site. Waste and remnant mine related material are not to be dumped or left within the focus area. • A bi-annual alien vegetation clearance programme should be implemented for up to 2 years after closure but preferably until all AIPs species are under control and no risk of spread to adjacent, natural habitat remains; • Follow up with alien and invasive plant control measures for a period of 5 years post-closure; • Use of a nursery developed by the mine to cultivate indigenous/endemic floral species and floral SCCs with a focus on rehabilitation during the post-closure phase in conjunction with a suitably qualified specialist. This will assist in areas where regrowth is not to an acceptable standard; and • Continue monitoring of rehabilitation activities for a minimum period of 5 years following the mine closure or until an acceptable level of habitat and biodiversity re-instatement has occurred, in such a way as to ensure that natural processes and veld succession will lead to the re-establishment of the natural wilderness conditions which are analogous to the pre-mining conditions of the area.	Increase in floral diversity and habitat integrity.	Can be reversed
			WM	Negative	Low			
Rehabilitation and restoration activities	Floral Habitat and diversity	• Rehabilitation of currently degraded habitat and AIPs clearance of already proliferated areas. Some ecological functioning will be restored that has been lost due to AIPs proliferation and habitat transformation.	WOM	Positive	Negligible		Increase in floral diversity and habitat integrity.	Can be reversed
			WM	Positive	Moderate			
Dukes								
Construction Phase								
Construction of surface infrastructure associated with Operational Infrastructure, Supporting Infrastructure, WRDs and Stockpiles	Degraded Habitat Unit	• Site preparation and clearing of indigenous vegetation for mine-related infrastructure; • Construction related activities within the recommended 30 m forest exclusion buffer, resulting in the potential loss or degradation of the zone buffering the forest from external impacts, e.g., degradation of habitat integrity of the 30 m buffer decreasing forest resilience, increasing the risk of AIPs proliferation and native woody encroachment; • Dumping of cut vegetation, including AIPs, outside of already disturbed areas or outside of the authorised footprints, resulting in the loss of favourable habitat for	WOM	Negative	Low	• Prior to the commencement of new construction activities, the entire construction servitude, including lay down areas and stockpile areas etc., should be fenced off and clearly demarcated; • Restrict construction related activities to outside of the 30 m forest exclusion buffer where possible and feasible; • The construction footprint and removal of vegetation must be kept as small as possible within the authorised footprints to minimise impact on the surrounding environment (edge effect management); • No vegetation cuttings may be left to accumulate in watercourses. Discard all construction related waste and material (including cleared vegetation) at a licensed waste facility (or in a secluded area designated by the mine) and no waste of construction rubble is to be dumped in the surrounding natural habitats; • If any spills occur, they should be immediately cleaned up to avoid soil contamination that can hinder floral rehabilitation later down the line;	Minimise effects of vegetation removal and alien invasive spreading on the area outside of the footprint	Can be avoided, managed or mitigated
			WM	Negative	Low			
	Freshwater Habitat		WOM	Negative	Moderate		Protecting the riparian habitat and function	Can be avoided, managed or mitigated
			WM	Negative	Low			
	Woody Communities		WOM	Negative	Moderate		Minimise effects of vegetation removal and alien invasive spreading on the area outside of the footprint	Can be avoided, managed or mitigated
			WM	Negative	Low			
	Valley Habitat		WOM	Negative	Low			

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance	Management Measures	Management objective	Mitigation Effect
					Magnitude			
		the establishment of native species; • Impaired water quality and reduced flow of watercourses due to the accumulation of vegetation cuttings and debris within the Freshwater Habitat resulting from vegetation clearing; • Waste from construction material leading to disturbance of natural vegetation; • Increased personnel on site leading to loss of floral habitat through the potential for increased fire frequency and intensity (further promoting wattle thicket formation), as well as indiscriminate driving through natural veld; • Potential proliferation of AIPs species that colonise areas of increased disturbances and that outcompetes native species, including the further transformation of adjacent or nearby natural, more sensitive habitat, such as downslope watercourses; • Dust generated during construction activities accumulating on the surrounding floral individuals, altering the photosynthetic ability of plants, and potentially further decreasing optimal growing/re-establishing conditions; • Potential failure to concurrently rehabilitate bare areas or disturbed sites as soon as they become available, potentially resulting in loss of viable soils, increasing erosion risk and/or permitting the proliferation of AIPs; and • Potential failure to implement a BAP, including the auditing of the BAP, leading to permanent transformation of floral habitat and long-term degradation of important floral habitat within the region.	WM	Negative	Low	• Edge effects of all construction activities, which may affect floral habitat within surrounding areas, are to be strictly managed, e.g., implement an AIPs control plan from the get-go, mitigate soil erosion by reducing soil compaction caused by movement of construction personnel and vehicles, suppress dust in order to mitigate the impact of dust on flora within a close proximity of construction activities; • No illicit fires must be allowed during any phases of the proposed mining development. A FMP should be set in place to ensure that any fires that do originate can be managed and / or stopped before significant damage to the environment occurs; • No indiscriminate driving through the veld is allowed. As far as possible vehicles are to utilise the existing roads. Where this is not feasible, new roads are to be located in areas of existing high disturbance, and not encroach upon sensitive habitats; • 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.	Protecting the riparian habitat and function	Can be avoided, managed or mitigated
Construction of Linear Developments	Woody Communities	• Site clearing and the removal of vegetation along continuous vegetation along continuous leading to fragmented habitat and a disturbance corridor along which AIPs can establish and spread to adjacent sites; and • Construction related activities within the recommended 30 m forest exclusion buffer, resulting in the potential loss or degradation of the zone buffering the forest	WOM	Negative	High	• The construction footprint and removal of vegetation must be kept as small as possible within the authorised footprints to minimise impact on the surrounding environment (edge effect management); • Limit, as far as possible, the disturbance footprint within the 30 m forest exclusion buffer; • Access roads should be kept to existing roads so to reduce fragmentation of existing natural habitat; • Roadsides and linear developments serve as common corridors along which alien and invasive floral species are introduced and dispersed. Therefore, an AIPs control plan	Minimise effects of vegetation removal and alien invasive spreading on the area outside of the footprint	Can be avoided, managed or mitigated
			WM	Negative	Low			
	Degraded Habitat Unit		WOM	Negative	Low		Minimise effects of vegetation removal and alien invasive	Can be avoided, managed or mitigated
			WM	Negative	Low			

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance	Management Measures	Management objective	Mitigation Effect
					Magnitude			
		from external impacts, e.g., degradation of habitat integrity of the 30 m buffer decreasing forest resilience, increasing the risk of AIPs proliferation and native woody encroachers.				should be implemented along all linear disturbances; and • All construction related waste and material is to be disposed of at a licensed waste facility and no waste of construction rubble is to be dumped in the surrounding natural habitats.	spreading on the area outside of the footprint	
	Freshwater Habitat		WOM	Negative	Moderate		Protecting the riparian habitat and function	Can be avoided, managed or mitigated
			WM	Negative	Negligible			
	Valley Habitat		WOM	Negative	Low		Protecting the riparian habitat and function	Can be avoided, managed or mitigated
			WM	Negative	Low			
Removal and/or relocation of floral SCC	Floral SCC	• Loss of occurring and potentially occurring floral SCC due to potential failure to conduct a walkdown of the footprint area before construction activities where floral SCC, if present, are marked and relocated to suitable habitat outside the development footprint prior to the construction phase; • Extensive and unnecessary loss of favourable floral habitat, leading to a decline in floral diversity, including a decline in floral SCC numbers within the site, resulting from potentially poorly planned placement of the proposed infrastructure within natural areas and areas identified as increasingly sensitive during ecological studies; and • Increased human presence due to construction-related activities, potentially resulting in increased harvesting/ collection of SCC.	WOM	Negative	Low	Before any construction activities can occur, a detaiLocal Economic Development programme walk down of the area must take place, during which all NFA-protected tree species, MNCA-protected floral species and potentially occurring RDL species are marked. If SCC are encountered and will be affected by the construction activities, these species must, as far as is possible, be avoided. If avoidance of impacts to SCC are not possible, the following is recommended: 1) For NFA-protected trees, permit applications will be required from DFFE for removal/destruction of species. For specimens too large to relocate, collection of propagules should take place and these propagated in nurseries for use in rehabilitation later down the line; 2) For MNCA-protected species, permit application from MTPA will be required to rescue and relocate such species; 3) For RDL species, an investigation must be initiated into potential relocation. If not possible, offsetting the loss of RDL species should be pursued. • No collection of firewood, floral SCC or medicinal floral species must be allowed by construction or mining personnel.	Limiting removal and protecting SCC's	Can be avoided, managed or mitigated
			WM	Negative	Negligible			
Operational Phase								
All activities associated with mining and the movement of vehicles	Degraded Habitat Unit	• Further loss of floral habitat beyond the project footprint because of vegetation clearing related to operational-phase disturbances and expansion of stockpiles and waste rock dumps, on-going disturbance of soils due to operational activities, and edge effects associated with mining activities; • Potential trimming or slashing of vegetation associated with the Forest and Woodland habitat units, or wood collection from these habitat units, creating 'gaps' in the woody layer that will impact the dynamics of these systems (increased light and potential for increased fire frequency), ultimately resulting in potential alterations in species composition and ecological function; • Ongoing disturbances from	WOM	Negative	Low	HABITAT AND DIVERSITY • Ongoing monitoring of TSF stability; • Stockpiles, discard dumps and PCD etc positions, and their expansion as material is deposited, should be kept as small as possible; • No additional habitat is to be disturbed during the operational phase of the development; • Manage all edge effects or indirect disturbances stemming from mining operations and infrastructure areas: a) Implement erosion control measures where necessary to ensure that further habitat loss does not occur; b) Any waste or toxic spills from vehicles or mining infrastructure must be dealt with immediately in accordance with the waste management plan (emergency incident procedure or spill procedure); c) No uncontroLocal Economic Development programme or unsanctioned fires are allowed. A FMP should be in place; d) Vehicles should be restricted to travelling only on designated roadways to limit the ecological footprint of the proposed mining activities; and e) Implement an AIPs Management / Control Plan that includes ongoing monitoring and control of the presence and/or re-emergence of such species.	Minimise effects of vegetation removal and alien invasive spreading on the area outside of the footprint	Can be avoided, managed or mitigated
			WM	Negative	Low			
	Freshwater Habitat		WOM	Negative	Low		Protecting the riparian habitat and function	Can be avoided, managed or mitigated
			WM	Negative	Low			
	Woody Communities		WOM	Negative	Moderate		Minimise effects of vegetation removal and alien invasive spreading on the area outside of the footprint	Can be avoided, managed or mitigated
			WM	Negative	Low			
	Valley Habitat		WOM	Negative	High		Protecting the riparian habitat and function	Can be avoided, managed or mitigated
			WM	Negative	Moderate			
	Floral SCC		WOM	Negative	Low			

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance	Management Measures	Management objective	Mitigation Effect
					Magnitude			
		operational activities resulting in increased or continued proliferation of AIPs; • Failure to concurrently rehabilitate bare areas or disturbed sites as soon as they become available, potentially resulting in loss of viable soils, increasing erosion risk and/or permitting the proliferation of AIPs; • Erosion as a result of mining development, stormwater runoff and on-going disturbance of soils due to operational activities; • Risk of contamination from all operational facilities may pollute receiving environment; • Loss of floral SCC through ineffective monitoring of relocation success of rescued and relocated floral SCC (where applicable), and/or due to the harvesting of protected floral species by mining and operational personnel; and • Additional pressure on floral habitat by increased human populations associated with the proposed mining activities, contributing to increases in the collection of plant material for medicinal purposes and promoting the introduction and spread of AIPs that may displace habitat for SCCs.	WM	Negative	Negligible	• No firewood collection may be permitted from the Forest Habitat, Riparian Forest or Riparian Woodlands. Ensure no disturbances to forest edges (including unauthorised activities within the 30 m forest exclusion buffer) take place that will result in the opening of forest “gaps”; and • Rehabilitate areas that are no longer used for mining FLORAL SCC. • Monitoring of relocation success of potentially rescued and relocated floral SCC should take place during the operational phase; • Manage all edge effects stemming from mining operations and infrastructure areas; and • Harvesting of protected floral species by mining and operational personnel should be strictly prohibited.	Limiting removal and protecting SCC's	Can be avoided, managed or mitigated
Ongoing AIPs management within 30 m of proposed activities	Floral Habitat and Diversity	Alien invasive prolification	WOM	Positive	Moderate	The proliferation of AIPs is expected within any disturbed areas and especially along linear developments. AIPs must be monitored and must be removed throughout the operational phase of the project to prevent their spread beyond the development footprint areas: • Removal of the AIPs, with specific emphasis on Category 1b alien species, encountered within the footprint area and immediate surrounds (approximately 30 m buffer around activities) must take place (as per NEMBA: Alien and Invasive Species Regulations of 2020); • Removal of alien invasive species should preferably commence during the construction phases and continue throughout the operational, decommissioning and post-closure phases; and • The AIPs Management/Control Plan should be implemented by a qualified professional. No chemical control of AIPs to occur within 32 m of a watercourse.	Avoid AIPs proliferation	Can be avoided, managed or mitigated
			WM	Positive	Low			
Closure and Post closure								
Rehabilitation and restoration activities	Floral Habitat and diversity	• Permanent loss of floral habitat, diversity and SCC, and a higher likelihood of edge effect impacts on adjacent and nearby natural vegetation of increased sensitivity due to potential failure to effectively implement and monitor rehabilitation efforts, leading to: a) Reintroduction and proliferation	WOM	Negative	High	• Ensure sound implementation of AIPs Management / Control Plan; • Where soils have been compacted, they are to be ripped and where necessary reprofiled; • Indigenous floral species are to be used for revegetation of disturbed areas. Where possible, reinstatement of floral communities similar to the reference vegetation type for the area must form the goal of rehabilitation activities; • All surface infrastructure is to be removed and waste material	Increase in floral diversity and habitat integrity.	Can be reversed
			WM	Negative	Low			

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance	Management Measures	Management objective	Mitigation Effect
					Magnitude			
		of alien and invasive plant species; b) Compacted soils limiting the re-establishment of natural vegetation; c) Increased risk of erosion in areas left disturbed and inadequately vegetated; d) Improper rehabilitation of disturbed areas leading to permanent floral habitat loss. Ultimately leading to a permanent loss of floral habitat, diversity and SCC, and a higher likelihood of edge effect impacts on adjacent and nearby natural vegetation of increased sensitivity.				disposed of at a registered dump site. Waste and remnant mine related material are not to be dumped or left within the focus area; and • A bi-annual alien vegetation clearance programme should be implemented for up to 2 years after closure but preferably until all AIPs species are under control and no risk of spread to adjacent, natural habitat remains; • Follow up with alien and invasive plant control measures for a period of 5 years post-closure. • Use of a nursery developed by the mine is recommended to cultivate indigenous/endemic floral species and floral SCCs with a focus on rehabilitation during the post-closure phase in conjunction with a suitably qualified specialist. This will assist in areas where regrowth is not to an acceptable standard; and • Continue monitoring of rehabilitation activities for a minimum period of 5 years following the mine closure or until an acceptable level of habitat and biodiversity re-instatement has occurred, in such a way as to ensure that natural processes and veld succession will lead to the re-establishment of the natural wilderness conditions which are analogous to the pre-mining conditions of the area.		
Rehabilitation and restoration activities	Floral Habitat and diversity	• Reinstatement of native floral communities due to rehabilitation of currently transformed and degraded habitat and AIPs clearance within heavily infested areas. Return of ecological functioning that has been lost due to AIPs proliferation and habitat transformation.	WOM	Positive	Negligible		Increase in floral diversity and habitat integrity.	Can be reversed
			WM	Positive	High			
Frankfort								
Construction Phase								
Construction of surface infrastructure associated with Operational Infrastructure, Supporting Infrastructure, WRDs and Stockpiles	Degraded Habitat Unit	• Site preparation and clearing of indigenous vegetation for mine-related infrastructure; • Construction related activities within the recommended 30 m forest exclusion buffer, resulting in the potential loss or degradation of the zone buffering the forest from external impacts, e.g., degradation of habitat integrity of the 30 m buffer decreasing forest resilience, increasing the risk of AIPs proliferation and native woody encroachment; • Dumping of cut vegetation, including AIPs, outside of already disturbed areas or outside of the authorised footprints, resulting in the loss of favourable habitat for the establishment of native species; • Impaired water quality and reduced flow of watercourses due to the accumulation of vegetation cuttings and debris within the Freshwater Habitat resulting from vegetation clearing; • Potential failure to have a stormwater management plan and erosion control plan in place during construction activities. The proposed activities will occur in mountainous terrain with	WOM	Negative	Low	• Prior to the commencement of construction activities, the entire construction servitude, including lay down areas and stockpile areas etc., should be fenced off and clearly demarcated; • Restrict construction related activities to outside of the 30 m forest exclusion buffer where possible and feasible; • The construction footprint and removal of vegetation must be kept as small as possible within the authorised footprints to minimise impact on the surrounding environment (edge effect management); • No vegetation cuttings may be left to accumulate in watercourses. Discard all construction related waste and material (including cleared vegetation) at a licensed waste facility (or in a secluded area designated by the mine) and no waste of construction rubble is to be dumped in the surrounding natural habitats; • If any spills occur, they should be immediately cleaned up to avoid soil contamination that can hinder floral rehabilitation later down the line; • Edge effects of all construction activities, which may affect floral habitat within surrounding areas, are to be strictly managed, e.g., implement an AIPs control plan from the get-go, mitigate soil erosion by reducing soil compaction caused by movement of construction personnel and vehicles, suppress dust in order to mitigate the impact of dust on flora within a close proximity of construction activities; • No illicit fires must be allowed during any phases of the proposed mining development. A FMP should be set in place to ensure that any fires that do originate can be managed and / or stopped before significant damage to the environment occurs; • No indiscriminate driving through the veld is allowed. As far as possible vehicles are to utilise the existing roads. Where this is not feasible, new roads are to be located in areas of existing high disturbance, and not encroach upon sensitive habitats;	Minimise effects of vegetation removal and alien invasive spreading on the area outside of the footprint	Can be avoided, managed or mitigated
			WM	Negative	Low			
	Freshwater Habitat		WOM	Negative	Moderate		Protecting the riparian habitat and function	Can be avoided, managed or mitigated
			WM	Negative	Low			
	Woody Communities		WOM	Negative	High		Minimise effects of vegetation removal and alien invasive spreading on the area outside of the footprint	Can be avoided, managed or mitigated
			WM	Negative	Moderate			

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance	Management Measures	Management objective	Mitigation Effect
					Magnitude			
		watercourses (i.e., Riparian Forest and Riparian Woodland) downslope of these activities; • Potential inadequate stabilisation of steep slopes in the event that vegetation will be cleared along such slopes. Consequently, increased erosion will lead to the smothering of surrounding vegetation and larger disturbance footprints as slopes continue to erode; • Waste from construction material leading to disturbance of natural vegetation; • Increased personnel on site leading to loss of floral habitat through the potential for increased fire frequency and intensity (further promoting wattle thicket formation), as well as indiscriminate driving through natural veld; • Potential proliferation of AIPs species that colonise areas of increased disturbances and that outcompetes native species, including the further transformation of adjacent or nearby natural, more sensitive habitat, such as downslope watercourses; • Dust generated during construction activities accumulating on the surrounding floral individuals, altering the photosynthetic ability of plants, and potentially further decreasing optimal growing/re-establishing conditions; • Potential failure to concurrently rehabilitate bare areas or disturbed sites as soon as they become available, potentially resulting in loss of viable soils, increasing erosion risk and/or permitting the proliferation of AIPs; and • Potential failure to implement a BAP, including the auditing of the BAP, leading to permanent transformation of floral habitat and long-term degradation of important floral habitat within the region.				• 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.		
Construction of Linear Developments	Woody Communities	• Site clearing and the removal of vegetation along continuous leading to fragmented habitat and a disturbance corridor along which AIPs can establish and spread to adjacent sites; • Potential failure to implement an	WOM	Negative	High	• The construction footprint and removal of vegetation must be kept as small as possible within the authorised footprints to minimise the impact on the surrounding environment (edge effect management); • Limit, as far as possible, the disturbance footprint within the 30 m forest exclusion buffer; • Access roads should be kept to existing roads so to reduce	Minimise effects of vegetation removal and alien invasive spreading on the area outside of the footprint	Can be avoided, managed or mitigated
			WM	Negative	Moderate			

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance	Management Measures	Management objective	Mitigation Effect
					Magnitude			
	Degraded Habitat Unit	Erosion Control Plan for construction of linear features occurring along mountain slopes, especially where areas are already disturbed and soils are less stable, leading to sedimentation of downslope watercourses and smothering of surrounding vegetation; • Construction related activities within the recommended 30 m forest exclusion buffer, resulting in the potential loss or degradation of the zone buffering the forest from external impacts, e.g., degradation of habitat integrity of the 30 m buffer decreasing forest resilience, increasing the risk of AIPs proliferation and native woody encroachers; and • Potential slope failure during construction activities, directly affecting forest communities or resulting in gaps in the forest where increased light may open the potential for non-forest species to establish, thereby resulting in potential changes in forest dynamics in the long-run.	WOM	Negative	Low	fragmentation of existing natural habitat; • Ensure slopes are stabilised at all times and ensure measures are in place to prevent slope failure along construction activities; • Roadsides and linear developments serve as common corridors along which alien and invasive floral species are introduced and dispersed. Therefore, an AIPs control plan should be implemented along all linear disturbances; and • All construction related waste and material is to be disposed of at a licensed waste facility and no waste of construction rubble is to be dumped in the surrounding natural habitats.	Minimise effects of vegetation removal and alien invasive spreading on the area outside of the footprint	Can be avoided, managed or mitigated
			WM	Negative	Low			
	Freshwater Habitat		WOM	Negative	Moderate		Protecting the riparian habitat and function	Can be avoided, managed or mitigated
			WM	Negative	Low			
Removal and/or relocation of floral SCC	Floral SCC	• Loss of occurring and potentially occurring floral SCC due to potential failure to conduct a walkdown of the footprint area before construction activities where floral SCC, if present, are marked and relocated to suitable habitat outside the development footprint prior to the construction phase; • Extensive and unnecessary loss of favourable floral habitat, leading to a decline in floral diversity, including a decline in floral SCC numbers within the site, resulting from potentially poorly planned placement of the proposed infrastructure within natural areas and areas identified as increasingly sensitive during ecological studies; and • Increased human presence due to construction-related activities, potentially resulting in increased harvesting/ collection of SCC.	WOM	Negative	Moderate	Before any construction activities can occur, a detaiLocal Economic Development programme walk down of the area must take place, during which all NFA-protected tree species, MNCA-protected floral species and potentially occurring RDL species are marked. If SCC are encountered and will be affected by the construction activities, these species must, as far as is possible, be avoided. If avoidance of impacts to SCC are not possible, the following is recommended: 1) For NFA-protected trees, permit applications will be required from DFFE for removal/destruction of species. For specimens too large to relocate, collection of propagules should take place and these propagated in nurseries for use in rehabilitation later down the line; 2) For MNCA-protected species, permit application from MTPA will be required to rescue and relocate such species; 3) For RDL species, an investigation must be initiated into potential relocation. If not possible, offsetting the loss of RDL species should be pursued. • No collection of firewood, floral SCC or medicinal floral species must be allowed by construction or mining personnel.	Limiting removal and protecting SCC's	Can be avoided, managed or mitigated
			WM	Negative	Low			
Operational Phase								
All activities associated with mining and the movement of vehicles	Degraded Habitat Unit	• Further loss of floral habitat beyond the project footprint because of vegetation clearing related to operational-phase disturbances and expansion of stockpiles and waste rock dumps, on-going disturbance of soils due	WOM	Negative	Low	HABITAT AND DIVERSITY • Ongoing monitoring of TSF stability; • Stockpiles, discard dumps and PCD etc positions, and their expansion as material is deposited, should be kept as small as possible; • No additional habitat is to be disturbed during the operational phase of the development;	Minimise effects of vegetation removal and alien invasive spreading on the area outside of the footprint	Can be avoided, managed or mitigated
			WM	Negative	Negligible			

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance	Management Measures	Management objective	Mitigation Effect
					Magnitude			
	Freshwater Habitat	to operational activities, and edge effects associated with mining activities; • Potential trimming or slashing of vegetation associated with the Forest and Woodland habitat units, or wood collection from these habitat units, creating 'gaps' in the woody layer that will impact the dynamics of these systems (increased light and potential for increased fire frequency), leading to potential alterations in species composition and ecological function; • Ongoing disturbances from operational activities resulting in increased or continued proliferation of AIPs; • Failure to concurrently rehabilitate bare areas or disturbed sites as soon as they become available, potentially resulting in loss of viable soils, increasing erosion risk and/or permitting the proliferation of AIPs; • Erosion as a result of mining development, stormwater runoff and on-going disturbance of soils due to operational activities; • Risk of contamination from all operational facilities may pollute receiving environment; • Loss of floral SCC through ineffective monitoring of relocation success of rescued and relocated floral SCC (where applicable), and/or due to the harvesting of protected floral species by mining and operational personnel; and • Additional pressure on floral habitat by increased human populations associated with the proposed mining activities, contributing to increases in the collection of plant material for medicinal purposes and promoting the introduction and spread of AIPs that may displace habitat for SCCs.	WOM	Negative	Moderate	• Manage all edge effects or indirect disturbances stemming from mining operations and infrastructure areas: a) Implement erosion control measures where necessary to ensure that further habitat loss does not occur; b) Any waste or toxic spills from vehicles or mining infrastructure must be dealt with immediately in accordance with the waste management plan (emergency incident procedure or spill procedure); c) No uncontrolLocal Economic Development programme or unsanctioned fires are allowed. A FMP should be in place; 2 d) Vehicles should be restricted to travelling only on designated roadways to limit the ecological footprint of the proposed mining activities; and e) Implement an AIPs Management / Control Plan that includes ongoing monitoring and control of the presence and/or re-emergence of such species. • No firewood collection may be permitted from the Forest Habitat, Riparian Forest or Riparian Woodlands. Ensure no disturbances to forest edges (including unauthorised activities within the 30 m forest exclusion buffer) take place that will result in the opening of forest "gaps"; and • Rehabilitate areas that are no longer used for mining.	Protecting the riparian habitat and function	Can be avoided, managed or mitigated
			WM	Negative	Low			
	Woody Communities		WOM	Negative	High		Minimise effects of vegetation removal and alien invasive spreading on the area outside of the footprint	Can be avoided, managed or mitigated
			WM	Negative	Moderate			
	Floral SCC		WOM	Negative	Moderate	FLORAL SCC • Monitoring of relocation success of potentially rescued and relocated floral SCC should take place during the operational phase; • Manage all edge effects stemming from mining operations and infrastructure areas; and • Harvesting of protected floral species by mining and operational personnel should be strictly prohibited.	Limiting removal and protecting SCC's	Can be avoided, managed or mitigated
			WM	Negative	Low			
Ongoing AIPs management within 30 m of proposed activities	Floral Habitat and Diversity	• Ongoing AIPs clearing and management as part of operational activities, resulting in an increase in floral diversity and habitat integrity.	WOM	Positive	Negligible	The proliferation of AIPs is expected within any disturbed areas and especially along linear developments. AIPs must be monitored and must be removed throughout the operational phase of the project to prevent their spread beyond the development footprint areas: • Removal of the AIPs, with specific emphasis on Category 1b alien species, encountered within the footprint area and immediate surrounds (approximately 30 m buffer around activities) must take place (as per NEMBA: Alien and Invasive Species Regulations of 2020); • Removal of alien invasive species should preferably	Avoid AIPs proliferation	Can be avoided, managed or mitigated
			WM	Positive	Moderate			

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance	Management Measures	Management objective	Mitigation Effect
					Magnitude			
						commence during the construction phases and continue throughout the operational, decommissioning and post-closure phases; and • The AIPs Management/Control Plan should be implemented by a qualified professional. No chemical control of AIPs to occur within 32 m of a watercourse.		
Closure and Post closure								
Rehabilitation and restoration activities	Floral Habitat and diversity	• Permanent loss of floral habitat, diversity and SCC, and a higher likelihood of edge effect impacts on adjacent and nearby natural vegetation of increased sensitivity due to potential failure to effectively implement and monitor rehabilitation efforts, leading to: a) Reintroduction and proliferation of alien and invasive plant species; b) Compacted soils limiting the re-establishment of natural vegetation; c) Increased risk of erosion in areas left disturbed and inadequately vegetated; d) Improper rehabilitation of disturbed areas leading to permanent floral habitat loss. Ultimately leading to a permanent loss of floral habitat, diversity and SCC, and a higher likelihood of edge effect impacts on adjacent and nearby natural vegetation of increased sensitivity.	WOM	Negative	High	• Ensure sound implementation of AIPs Management / Control Plan; • Where soils have been compacted, they are to be ripped and where necessary reprofiled; • Indigenous floral species are to be used for revegetation of disturbed areas. Where possible, reinstatement of floral communities similar to the reference vegetation type for the area must form the goal of rehabilitation activities; • All surface infrastructure is to be removed and waste material disposed of at a registered dump site. Waste and remnant mine related material are not to be dumped or left within the focus area. • A bi-annual alien vegetation clearance programme should be implemented for up to 2 years after closure but preferably until all AIPs species are under control and no risk of spread to adjacent, natural habitat remains; • Follow up with alien and invasive plant control measures for a period of 5 years post-closure; • Use of a nursery developed by the mine to cultivate indigenous/endemic floral species and floral SCCs with a focus on rehabilitation during the post-closure phase in conjunction with a suitably qualified specialist. This will assist in areas where regrowth is not to an acceptable standard; and • Continue monitoring of rehabilitation activities for a minimum period of 5 years following the mine closure or until an acceptable level of habitat and biodiversity re-instatement has occurred, in such a way as to ensure that natural processes and veld succession will lead to the re-establishment of the natural wilderness conditions which are analogous to the pre-mining conditions of the area.	Increase in floral diversity and habitat integrity.	Can be reversed
			WM	Negative	Low			
Rehabilitation and restoration activities	Floral Habitat and diversity	• Reinstatement of native floral communities due to rehabilitation of currently transformed and degraded habitat and AIPs clearance within heavily infested areas. Return of ecological functioning that has been lost due to AIPs proliferation and habitat transformation.	WOM	Positive	Low		Increase in floral diversity and habitat integrity.	Can be reversed
			WM	Positive	Moderate			
Morgenzon								
Construction Phase								
Construction of Crossing(s)	Freshwater Habitat	• Vegetation clearing within the Riparian Woodland sub-unit (i.e., Peach Tree Stream; • Temporary alteration of stream flow; • Spread of AIPs along the Riparian Woodland sub-unit from contaminated construction material; and • Increased sediment loads and potential erosion of stream banks resulting from construction activities and increased movement of construction workers along / across the Riparian Woodland.	WOM	Negative	Moderate	• All crossings over watercourses must be kept to the bare minimum and are adequately designed to prevent impacts on habitat, instream flow, pattern and timing of water and water quality; • Minimise loss of indigenous vegetation where possible; • Ensure AIPs vegetation cutting and propagules do not enter the watercourses where crossings will be constructed; and • As much as possible, existing access roads and river crossings must be utilised (if necessary, upgraded) to minimise further disturbances to the watercourses.	Protecting the riparian habitat and function	Can be avoided, managed or mitigated
			WM	Negative	Low			
			WOM	Negative	Low			

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance	Management Measures	Management objective	Mitigation Effect
					Magnitude			
Construction of surface infrastructure associated with Operational Infrastructure, Supporting Infrastructure, WRDs and Stockpiles	Degraded Habitat Unit	• Site preparation and clearing of indigenous vegetation for mine-related infrastructure; • Dumping of cut vegetation, including AIPs, outside of already disturbed areas or outside of the authorised footprints, resulting in the loss of favourable habitat for the establishment of native species; • Impaired water quality and reduced flow of watercourses due to the accumulation of vegetation cuttings and debris resulting from vegetation clearing; • Potential failure to have a stormwater management plan and erosion control plan in place during construction activities; • Waste from construction material leading to disturbance of natural vegetation; • Increased personnel on site leading to loss of floral habitat through the potential for increased fire frequency and intensity (further promoting wattle thicket formation), as well as indiscriminate driving through natural veld; • Potential proliferation of AIPs species that colonise areas of increased disturbances and that outcompetes native species, including the further transformation of adjacent or nearby natural, more sensitive habitat, such as nearby watercourses; • Dust generated during construction activities accumulating on the surrounding floral individuals, altering the photosynthetic ability of plants, and potentially further decreasing optimal growing/re-establishing conditions; • Potential failure to concurrently rehabilitate bare areas or disturbed sites as soon as they become available, potentially resulting in loss of viable soils, increasing erosion risk and/or permitting the proliferation of AIPs; and • Potential failure to implement a BAP, including the auditing of the BAP, leading to permanent transformation of floral habitat and long-term degradation of important floral habitat within the region.	WM	Negative	Low	• Prior to the commencement of construction activities, the entire construction servitude, including lay down areas and stockpile areas etc., should be fenced off and clearly demarcated; • Restrict construction related activities to outside of the 30 m forest exclusion buffer where possible and feasible; • The construction footprint and removal of vegetation must be kept as small as possible within the authorised footprints to minimise impact on the surrounding environment (edge effect management); • No vegetation cuttings may be left to accumulate in watercourses. Discard all construction related waste and material (including cleared vegetation) at a licensed waste facility (or in a secluded area designated by the mine) and no waste of construction rubble is to be dumped in the surrounding natural habitats; • If any spills occur, they should be immediately cleaned up to avoid soil contamination that can hinder floral rehabilitation later down the line; • Edge effects of all construction activities, which may affect floral habitat within surrounding areas, are to be strictly managed, e.g., implement an AIPs control plan from the get-go, mitigate soil erosion by reducing soil compaction caused by movement of construction personnel and vehicles, suppress dust in order to mitigate the impact of dust on flora within a close proximity of construction activities; • No illicit fires must be allowed during any phases of the proposed mining development. A FMP should be set in place to ensure that any fires that do originate can be managed and / or stopped before significant damage to the environment occurs; • No indiscriminate driving through the veld is allowed. As far as possible vehicles are to utilise the existing roads. Where this is not feasible, new roads are to be located in areas of existing high disturbance, and not encroach upon sensitive habitats; • 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.	Minimise effects of vegetation removal and alien invasive spreading on the area outside of the footprint	Can be avoided, managed or mitigated
	Freshwater Habitat		WOM	Negative	Moderate		Protecting the riparian habitat and function	Can be avoided, managed or mitigated
			WM	Negative	Low			
	Woody Communities		WOM	Negative	Moderate		Minimise effects of vegetation removal and alien invasive spreading on the area outside of the footprint	Can be avoided, managed or mitigated
			WM	Negative	Negligible			
	Valley Habitat		WOM	Negative	Low		Protecting the riparian habitat and function	Can be avoided, managed or mitigated
			WM	Negative	Negligible			

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance	Management Measures	Management objective	Mitigation Effect
					Magnitude			
Construction of Linear Developments	Woody Communities	• Site clearing and the removal of vegetation along continuous leading to fragmented habitat and a disturbance corridor along which AIPs can establish and spread to adjacent sites; • Potential failure to implement an Erosion Control Plan for construction of linear features, especially where areas are already disturbed and soils are less stable, leading to sedimentation of nearby watercourses and smothering of surrounding vegetation; and • Construction related activities within the recommended 30 m forest exclusion buffer, resulting in the potential loss or degradation of the zone buffering the forest from external impacts, e.g., degradation of habitat integrity of the 30 m buffer decreasing forest resilience, increasing the risk of AIPs proliferation and native woody encroachers.	WOM	Negative	Moderate	• The construction footprint and removal of vegetation must be kept as small as possible within the authorised footprints to minimise impact on the surrounding environment (edge effect management); • Limit, as far as possible, the disturbance footprint within the 30 m forest exclusion buffer; • Access roads should be kept to existing roads so to reduce fragmentation of existing natural habitat; • Roadsides and linear developments serve as common corridors along which alien and invasive floral species are introduced and dispersed. Therefore, an AIPs control plan should be implemented along all linear disturbances; and • All construction related waste and material is to be disposed of at a licensed waste facility and no waste of construction rubble is to be dumped in the surrounding natural habitats.	Minimise effects of vegetation removal and alien invasive spreading on the area outside of the footprint	Can be avoided, managed or mitigated
			WM	Negative	Low			
	Degraded Habitat Unit		WOM	Negative	Low		Protecting the riparian habitat and function	Can be avoided, managed or mitigated
			WM	Negative	Low			
	Freshwater Habitat		WOM	Negative	Moderate		Minimise effects of vegetation removal and alien invasive spreading on the area outside of the footprint	Can be avoided, managed or mitigated
			WM	Negative	Negligible			
	Valley Habitat		WOM	Negative	Low		Protecting the riparian habitat and function	Can be avoided, managed or mitigated
			WM	Negative	Low			
Removal and/or relocation of floral SCC	Floral SCC	• Loss of occurring and potentially occurring floral SCC due to potential failure to conduct a walkdown of the footprint area before construction activities where floral SCC, if present, are marked and relocated to suitable habitat outside the development footprint prior to the construction phase; • Extensive and unnecessary loss of favourable floral habitat, leading to a decline in floral diversity, including a decline in floral SCC numbers within the site, resulting from potentially poorly planned placement of the proposed infrastructure within natural areas and areas identified as increasingly sensitive during ecological studies; and • Increased human presence due to construction-related activities, potentially resulting in increased harvesting/ collection of SCC.	WOM	Negative	Moderate	Before any construction activities can occur, a detaiLocal Economic Development programme walk down of the area must take place, during which all NFA-protected tree species, MNCA-protected floral species and potentially occurring RDL species are marked. If SCC are encountered and will be affected by the construction activities, these species must, as far as is possible, be avoided. If avoidance of impacts to SCC are not possible, the following is recommended: 1) For NFA-protected trees, permit applications will be required from DFFE for removal/destruction of species. For specimens too large to relocate, collection of propagules should take place and these propagated in nurseries for use in rehabilitation later down the line; 2) For MNCA-protected species, permit application from MTPA will be required to rescue and relocate such species; 3) For RDL species, an investigation must be initiated into potential relocation. If not possible, offsetting the loss of RDL species should be pursued. • No collection of firewood, floral SCC or medicinal floral species must be allowed by construction or mining personnel.	Limiting removal and protecting SCC's	Can be avoided, managed or mitigated
			WM	Negative	Low			
Operational Phase								
All activities associated with mining and the movement of vehicles	Degraded Habitat Unit	• Further loss of floral habitat beyond the project footprint because of vegetation clearing related to operational-phase disturbances and expansion of stockpiles and waste rock dumps, on-going disturbance of soils due to operational activities, and edge effects associated with mining activities;	WOM	Negative	Low	HABITAT AND DIVERSITY • Ongoing monitoring of TSF stability; • Stockpiles, discard dumps and PCD etc positions, and their expansion as material is deposited, should be kept as small as possible; • No additional habitat is to be disturbed during the operational phase of the development; • Manage all edge effects or indirect disturbances stemming from mining operations and infrastructure areas: a) Implement erosion control measures where necessary to	Minimise effects of vegetation removal and alien invasive spreading on the area outside of the footprint	Can be avoided, managed or mitigated
			WM	Negative	Low			
	Freshwater Habitat		WOM	Negative	Low		Protecting the riparian habitat and function	
			WM	Negative	Negligible			

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance	Management Measures	Management objective	Mitigation Effect
					Magnitude			
	Woody Communities	• Potential trimming or slashing of vegetation associated with the Forest and Woodland habitat units, or wood collection from these habitat units, creating 'gaps' in the woody layer that will impact the dynamics of these systems (increased light and potential for increased fire frequency), leading to potential alterations in species composition and ecological function; • Ongoing disturbances from operational activities resulting in increased or continued proliferation of AIPs; • Failure to concurrently rehabilitate bare areas or disturbed sites as soon as they become available, potentially resulting in loss of viable soils, increasing erosion risk and/or permitting the proliferation of AIPs; • Erosion as a result of mining development, stormwater runoff and on-going disturbance of soils due to operational activities; • Risk of contamination from all operational facilities may pollute receiving environment; • Loss of floral SCC through ineffective monitoring of relocation success of rescued and relocated floral SCC (where applicable), and/or due to the harvesting of protected floral species by mining and operational personnel; and • Additional pressure on floral habitat by increased human populations associated with the proposed mining activities, contributing to increases in the collection of plant material for medicinal purposes and promoting the introduction and spread of AIPs that may displace habitat for SCCs.	WOM	Negative	Moderate	ensure that further habitat loss does not occur; b) Any waste or toxic spills from vehicles or mining infrastructure must be dealt with immediately in accordance with the waste management plan (emergency incident procedure or spill procedure); c) No uncontrolLocal Economic Development programme or unsanctioned fires are allowed. A FMP should be in place; d) Vehicles should be restricted to travelling only on designated roadways to limit the ecological footprint of the proposed mining activities; and e) Implement an AIPs Management / Control Plan that includes ongoing monitoring and control of the presence and/or re-emergence of such species. • No firewood collection may be permitted from the Forest Habitat, Riparian Forest or Riparian Woodlands. Ensure no disturbances to forest edges (including unauthorised activities within the 30 m forest exclusion buffer) take place that will result in the opening of forest "gaps"; and • Rehabilitate areas that are no longer used for mining. FLORAL SCC • Monitoring of relocation success of potentially rescued and relocated floral SCC should take place during the operational phase; • Manage all edge effects stemming from mining operations and infrastructure areas; and • Harvesting of protected floral species by mining and operational personnel should be strictly prohibited.	Minimise effects of vegetation removal and alien invasive spreading on the area outside of the footprint	
			WM	Negative	Low			
	Valley Habitat		WOM	Negative	Moderate		Protecting the riparian habitat and function	
			WM	Negative	Negligible			
	Floral SCC		WOM	Negative	Moderate		Limiting removal and protecting SCC's	
			WM	Negative	Low			
Ongoing AIPs management within 30 m of proposed activities	Floral Habitat and Diversity	• Ongoing AIPs clearing and management as part of operational activities, resulting in an increase in floral diversity and habitat integrity.	WOM	Positive	Negligible	The proliferation of AIPs is expected within any disturbed areas and especially along linear developments. AIPs must be monitored and must be removed throughout the operational phase of the project to prevent their spread beyond the development footprint areas: • Removal of the AIPs, with specific emphasis on Category 1b alien species, encountered within the footprint area and immediate surrounds (approximately 30 m buffer around activities) must take place (as per NEMBA: Alien and Invasive Species Regulations of 2020); • Removal of alien invasive species should preferably commence during the construction phases and continue throughout the operational, decommissioning and post-closure phases; and	Avoid AIPs proliferation	Can be avoided, managed or mitigated
			WM	Positive	Moderate			

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance	Management Measures	Management objective	Mitigation Effect
					Magnitude			
						• The AIPs Management/Control Plan should be implemented by a qualified professional. No chemical control of AIPs to occur within 32 m of a watercourse.		
Closure and Post closure								
Rehabilitation and restoration activities	Floral Habitat and Diversity	• Failure to monitor rehabilitation efforts, leading to: a) Reintroduction and proliferation of alien and invasive plant species; b) Compacted soils limiting the re-establishment of natural vegetation; c) Increased risk of erosion in areas left disturbed and inadequately vegetated; d) Improper rehabilitation of disturbed areas leading to permanent floral habitat loss. Ultimately leading to a permanent loss of floral habitat, diversity and SCC, and a higher likelihood of edge effect impacts on adjacent and nearby natural vegetation of increased sensitivity.	WOM	Negative	Moderate	• Ensure sound implementation of AIPs Management / Control Plan; • Where soils have been compacted, they are to be ripped and where necessary reprofiled; • Indigenous floral species are to be used for revegetation of disturbed areas. Where possible, reinstatement of floral communities similar to the reference vegetation type for the area must form the goal of rehabilitation activities; • All surface infrastructure is to be removed and waste material disposed of at a registered dump site. Waste and remnant mine related material are not to be dumped or left within the focus area. • A bi-annual alien vegetation clearance programme should be implemented for up to 2 years after closure but preferably until all AIPs species are under control and no risk of spread to adjacent, natural habitat remains; • Follow up with alien and invasive plant control measures for a period of 5 years post-closure; • Use of a nursery developed by the mine to cultivate indigenous/endemic floral species and floral SCCs with a focus on rehabilitation during the post-closure phase in conjunction with a suitably qualified specialist. This will assist in areas where regrowth is not to an acceptable standard; and • Continue monitoring of rehabilitation activities for a minimum period of 5 years following the mine closure or until an acceptable level of habitat and biodiversity re-instatement has occurred, in such a way as to ensure that natural processes and veld succession will lead to the re-establishment of the natural wilderness conditions which are analogous to the pre-mining conditions of the area.	Increase in floral diversity and habitat integrity.	Can be reversed
			WM	Negative	Low			Can be reversed
Rehabilitation and restoration activities	Floral Habitat and Diversity	• Reinstatement of native floral communities due to rehabilitation of currently transformed and degraded habitat and AIPs clearance within heavily infested areas. Return of ecological functioning that has been lost due to AIPs proliferation and habitat transformation.	WOM	Positive	Negligible		Increase in floral diversity and habitat integrity.	Can be reversed
			WM	Positive	Moderate			Can be reversed
Biodiversity Assessment - Faunal Assessment								
Construction Phase								
Clearance of vegetation in the AIP-Dominated Habitat	Faunal habitat and species	• Loss of marginal faunal habitat where footprint areas extend into habitat unit. • Decrease in seasonal food resources provided by flowering and fruiting plants (AIPs). • Potential marginal decrease in faunal species abundances. • Alien plant proliferation likely to occur in disturbed areas.	WOM	Negative	Moderate	• At all times, ensure that sound environmental management is in place during the construction phase. • An AIPs Management/Control Plan should be compiLocal Economic Development programme for implementation prior to vegetation clearance and construction starting. • A Biodiversity Action Plan must be developed and implemented. • Should any SCC need to be removed (unlikely) the removal and/or rescue and relocation should be overseen by a MTPA-suitably qualified ecologist with all permits/authorisations in place. • Clearly demarcate the project footprints and ensure that no vegetation clearance or vehicle movement occurs beyond these demarcated areas. • Ensure that existing roads are used as far as possible and that limited development of new roads occurs. • Where linear infrastructure, notably fences etc encroaches into sensitive habitat, it is recommended that these structures be shifted so as to avoid the sensitive habitat. • All Freshwater crossing points are to be designed in such a way that they do no impact on the geomorphological or hydrological functioning of the systems. • No hunting/catching of faunal species or SCC is allowed by mining employees.	Avoid AIPs proliferation	Can be avoided, managed or mitigated
			WM	Negative	Moderate			
Clearance of vegetation in the Riparian Forest	Faunal habitat and species	• Loss of faunal habitat where fence structure extends through a section of this habitat unit at Frankfort. • Possible proliferation and erosion from fence installation leading habitat degradation and sedimentation of the downslope habitat. • Potential loss of faunal SCC.	WOM	Negative	Low		Avoid degradation of faunal habitats	Can be avoided, managed or mitigated
			WM	Negative	Negligible			
Clearance of vegetation in the Riparian Woodland	Faunal habitat and species	• Loss of faunal habitat where footprint areas extend into habitat unit, notably linear structures. • Potential marginal decrease in	WOM	Negative	Moderate		Avoid degradation of faunal habitats	Can be avoided, managed or mitigated
			WM	Negative	Low			

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance	Management Measures	Management objective	Mitigation Effect
					Magnitude			
		faunal species abundances due to fences limiting faunal species movement. • Alien plant proliferation likely to occur in disturbed areas. • Potential loss of faunal SCC.				• No informal fires by construction personnel are allowed. • Construction footprints must be regularly monitored for edge effects. • Smaller species such as scorpions and reptiles are likely to be less mobile during the colder period, as such should any be observed in the 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 the need for their conservation. Smaller scorpion species and harmless reptiles should be carefully relocated by a suitably nominated construction person or nominated mine official. For larger venomous snakes, a suitably trained mine official or specialist should be contacted to effect the relocation of the species, should it not move off on its own. • Areas of increased ecological sensitivity falling outside of the direct mine footprint should be designated as No-Go areas. • All old adits should not be close so as to ensure their continued use for bat species. Where these adits intercept the current mine operation and pose a safety risk, the should be seaLocal Economic Development programme from the inside where the old adit meets the proposed working area. This will ensure that the roosting sights for bats are not closed off and they can continue to utilise these areas. • All external lights must be downward facing and with warm/yellow light emitting globes to minimise insect attraction. The bare minimum amount of external lighting in order to ensure personnel safety must be used.		
Linear crossings of the Watercourse Habitat	Faunal habitat and species	• Increased sedimentation due to runoff from haul roads and pipeline footprints altering bankside vegetation and instream faunal habitat. • Increased risk of hydrocarbons entering the watercourses as a result of leaks and spills from construction vehicles when crossing the watercourse habitat potentially impacting on the bankside and instream faunal species (amphibians). • Altered flow patterns and hydrological cycles impacting on water dependant faunal species both down and upstream of the crossing. • Potential loss of faunal SCC.	WOM	Negative	Moderate		Avoid degradation of faunal habitats	Can be avoided, managed or mitigated
			WM	Negative	Low			
Clearance of vegetation in the Indigenous Forest	Faunal habitat and species	• Loss of faunal habitat where linear infrastructure is located within the Forest habitat. • Decreased faunal diversity due to disturbances to Forest habitat. • Increased risk of AIPs proliferating in the disturbed areas changing the vegetative composition of the forest. • Potential loss of faunal SCC.	WOM	Negative	Moderate		Avoid degradation of faunal habitats	Can be avoided, managed or mitigated
			WM	Negative	Negligible			
Clearance of vegetation in the Degraded Woodland	Faunal habitat and species	• Loss of faunal habitat within the proposed footprint areas. • Displacement and potential loss of faunal species within the proposed footprint areas. • Edge effects as a result of poor management of construction activities leading to further habitat and faunal species loss.	WOM	Negative	Moderate		Avoid degradation of faunal habitats	Can be avoided, managed or mitigated
			WM	Negative	Moderate			
Clearance of vegetation in the Intact Woodland	Faunal habitat and species	• Loss of faunal habitat where linear infrastructure is located within the woodland habitat. • Decreased faunal diversity due to disturbances to woodland habitat. • Increased risk of AIPs proliferating in the disturbed areas changing the vegetative composition of the woodlands. • Potential loss of faunal SCC.	WOM	Negative	Moderate		Avoid degradation of faunal habitats	Can be avoided, managed or mitigated
			WM	Negative	Moderate			
Clearance of vegetation in the Valley Habitat	Faunal habitat and species	• Loss of faunal habitat within the proposed footprint areas. • Displacement and potential loss of faunal species within the proposed footprint areas. • Edge effects as a result of poor management of construction	WOM	Negative	Moderate		Avoid degradation of faunal habitats	Can be avoided, managed or mitigated
			WM	Negative	Moderate			

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance	Management Measures	Management objective	Mitigation Effect
					Magnitude			
		activities leading to further habitat and faunal species loss.						
All construction related activities	Faunal habitat and species	• Edge effects impacting adjacent habitat e.g., the of alien vegetation and the loss of viable soils for re-establishment of indigenous species if soils are allowed to become compacted and / or eroded. • Snaring, poaching / hunting of faunal species by construction personnel. • Fauna mortalities from vehicle strikes. • Runaway fires may lead to habitat and species loss. • Too frequent / uncontrolLocal Economic Development programme fires may lead to structural and plant species composition of habitats. • Potential loss of faunal SCC. • Movement of personnel into old adits disturbing roosting bats, notably SCC.	WOM	Negative	Low		Avoid degradation of faunal habitats	Can be avoided, managed or mitigated
			WM	Negative	Negligible			
Operational Phase								
Movement of in vehicles	Faunal species	• Collisions with mine vehicles and fauna. • Spillage/leakage of chemicals, fuel and oils from equipment leading to hydrocarbon ingress into the soils affecting plant growth (faunal habitat and food resources) and soil organisms. • Hydrocarbons may impact surrounding habitat as a result of water runoff or leaching into subterranean water sources during rainfall events	WOM	Negative	Low	• At all times, ensure that sound environmental management is in place during the operation phase. • An AIPs Management/Control Plan should be in place and AIPs control should be carried out as required. • A Biodiversity Action Plan must be implemented. • Should any SCC need to be removed (unlikely) the removal and/or rescue and relocation should be overseen by a MTPA-suitably qualified ecologist with all permits/authorisations in place. • No vegetation clearance or vehicle movement should occur outside of the operational footprint area unless authorised. • Ensure that existing roads are used as far as possible and that limited development of new roads occurs. • All infrastructure is to be regularly inspected for erosion or environmental risks, notably the fence lines (erosion) and the freshwater crossings. • All pipelines are to be regularly inspected to ensure no leaks are present and that no contamination of the receiving environment has occurred. • Freshwater crossing points are to be checked and if need be debris cleared to main the hydrological functioning of the system. • No hunting/catching of faunal species or SCC is allowed by mining employees. • No informal fires by construction personnel are allowed. • Construction footprints must be regularly monitored for edge effects. • Smaller species such as scorpions and reptiles are likely to be less mobile during the colder period, as such should any be observed in the site during operational activities, they are to be carefully and safely moved to an area of similar habitat outside of the disturbance footprint. Personnel are to be educated about these species and the need for their conservation. Smaller scorpion species and harmless reptiles should be carefully relocated by a suitably nominated construction person or nominated mine official. For larger venomous snakes, a suitably	Avoid killing of faunal species	Can be avoided, managed or mitigated
			WM	Negative	Low			
Mine operation - lighting	Faunal species	• Artificial lighting in dark landscapes impacts on natural behavioural patterns of nocturnal species, notably insects. Such impacts include alteration of breeding and foraging patterns which in the long term can affects population numbers. • Attraction to light sources also creates an unnaturally high abundance of insects in a single spot, with insectivores such as bats and reptiles capitalising on this. This may lead to increased predation on insects.	WOM	Negative	Low		Protect faunal movement patterns	Can be avoided, managed or mitigated
			WM	Negative	Low			
Mining operations - edge effects	Faunal habitat and species	• Further loss of habitat and faunal species therein in the areas adjacent the mining activities. • Increased vehicle and personnel movement assists in the further spread of AIPs within the footprint areas as well as the surrounding habitats	WOM	Negative	Moderate		Avoid degradation of faunal habitats	Can be avoided, managed or mitigated
			WM	Negative	Low			

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance	Management Measures	Management objective	Mitigation Effect
					Magnitude			
		• Increased AIPs proliferation in these disturbed footprints. • Unauthorised and/or planned clearance of vegetation outside of the footprint leading to further habitat disturbance.				trained mine official or specialist should be contacted to effect the relocation of the species, should it not move off on its own. • Areas of increased ecological sensitivity falling outside of the direct mine footprint should be designated as No-Go areas. • Old adits should not be closed at the entrance so as to ensure their continued use for bat species unless for health and safety reasons. • All external lights must be downward facing and with warm/yellow light emitting globes to minimise insect attraction. The bare minimum amount of external lighting in order to ensure personnel safety must be used. • It is recommended that a faunal monitoring program be put in place to monitor species diversity and the potential changes thereof during the life of mine.		
Poor erosion control	Faunal habitat and species	• Increase erosion and sediment runoff impacting on habitat in the surrounding areas. • Degradation of Freshwater systems. • Sedimentation of Freshwater systems will impact upon amphibians and other aquatic species, potentially SCC.	WOM	Negative	Moderate		Avoid erosion and sediment runoff	Can be avoided, managed or mitigated
			WM	Negative	Negligible			
Mine operation - personnel	Faunal habitat and species	• Increased risk of snaring / poaching of animals and possibly SCC. • Runaway fires causing damage to the surrounding vegetation types, leading to potential change in vegetation structure and faunal species diversity.	WOM	Negative	Low		Avoid killing of faunal species	Can be avoided, managed or mitigated
			WM	Negative	Negligible			
Mine operation - noise	Faunal species	• Increased ambient noise from operational activities and facilities may drown out calls / communication of faunal species nearby. Increased ambient noise may lead to decreased breeding success or failure to hear nearby predator.	WOM	Negative	Low		Protect faunal movement patterns	Can be avoided, managed or mitigated
			WM	Negative	Low			
Closure and Post Phase								
Rehabilitation	Faunal habitat and species	• Failure to reinstate degraded and impacted faunal habitat through rehabilitation activities. • Proliferation of AIPs in the disturbed areas post mining, replacing indigenous (and endemic) vegetation leading to long term loss of faunal habitat and species diversity. • Failure to remove and remedy all TSF and PCD structures so that no contamination of the surrounding habitat occurs.	WOM	Negative	Moderate	• Implement all recommendations as per the mine closure plan. • All surface infrastructure should be removed, and waste material disposed of at a registered dump site. Waste and remnant mine related material should not be dumped or left on site. • Where soils have been compacted, they are to be ripped and where necessary reprofiLocal Economic Development programme in accordance with the rehabilitation plan. • Indigenous floral species are to be used for revegetation of disturbed areas with the end goal to achieve the same vegetation composition and similar structure as pre-mining conditions. • Continue with AIPs control as per the AIPs control and mine closure plan. • Continue monitoring of rehabilitation activities for a minimum period of 5 years following the mine closure or until an acceptable level of habitat and biodiversity reinstatement has occurred, in such a way as to ensure that natural processes and veld succession will lead to the re-establishment of the natural wilderness conditions which are analogous to the pre-mining conditions of the area.	Ensure habitat reinstatement post closure	Can be reversed
			WM	Negative	Low			
Closure operations	Faunal habitat and species	• Failure to break down and remove all mining structures and rehabilitating the footprints to a pre-mining state leading to long term and potentially permanent habitat degradation and species diversity loss. • Poaching of faunal species by closure staff and contract workers leading to further loss of species diversity.	WOM	Negative	Low		Avoid long term and potentially permanent habitat degradation and species diversity loss.	
			WM	Negative	Low			
Freshwater- It should be noted that the impacts below have been reworked from the DWS risk assessment done by the specialist. The impacts by the specialist have only been rated								

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance	Management Measures	Management objective	Mitigation Effect
					Magnitude			
WM and therefore provided as such below								
Pre-Construction Planning Phase								
Planning of proposed surface infrastructure layout.	The location of surface infrastructure directly within riverine resources (specifically linear infrastructure which traverses drainage systems) and within the floodline of the Blyde River (Beta north), or within the 32 m or 100 m zones of regulation according to the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA) and Government Notice (GN) 704 of the National Water Act, 1998 (Act No. 36 of 1998) (NWA).	Loss of catchment yield and surface water recharge, potential inadequate management of clean and dirty water separation, which can lead to a loss of general loss of aquatic and riparian biodiversity as well as SCCs, impaired water quality, loss of instream habitat integrity and overall EcoStatus as well as impacts to aquatic resources further downstream of the proposed mining activity.	WM	Negative	Moderate	1. Project footprint, infrastructure design and general construction phase • All activities should adhere to the design requirements of GN704 of the National Water Act, 1998 (Act No 36 of 1998) (NWA); • During the planning phase, the location of access roads should take into consideration the sensitivity maps provided in Section 7.1 of this report, and wherever possible, access roads should not be planned adjacent to, or traversing, any freshwater ecosystem. Should it be essential that access roads cross over any freshwater ecosystem, this should be planned at existing crossing points or points of existing disturbance within the river and/or riparian zone; • As far as possible no development of any geographically variable infrastructure should take place within the floodline of the Blyde River, its tributaries, or any other delineated freshwater ecosystem in line with regulation GN704 of the National Water Act as far as possible, while ensuring that mining is done safely and to optimise resource abstraction as far as possible without causing irreversible harm to the freshwater ecosystems of the region. Where positions within the regulated zone cannot be avoided, extra attention must be given to ensuring designs prevent the risk of contamination; • All road crossings over freshwater ecosystems must be kept to the bare minimum and are adequately designed to prevent impacts on habitat, instream flow, pattern and timing of water and water quality. • All mining infrastructure must remain out of the riparian zones and associated zones of regulation in line with the requirements of GN704 and GN509 of the NWA. Any mining infrastructure within the applicable zones of regulation in terms of GN704 and GN509 must be appropriately authorised; • Limit the footprint area of the construction activity to what is absolutely essential in order to minimise the loss of clean water runoff areas and catchment yield and the concomitant recharge of streams in the area; • Design of infrastructure should be environmentally and structurally sound and all possible precautions taken to prevent contamination of surface and resources present; • No dirty water runoff must be permitted to reach the freshwater ecosystems, 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 of each project/mining unit; • It is deemed essential that the mine be designed in such a way as to ensure that decant is prevented for the life of the proposed mining activities and beyond closure unless measures to treat decant to background water qualities can be ensured until the q quality of the decant naturally returns to these background levels; • Water quality, with special mention of pH and dissolved salts need to be managed, and monitored to ensure that reasonable water quality occurs downstream of the mined areas to allow for the on-going survival of a riparian and aquatic community in line with the REC and RMO, and in support of Resource Quality Objectives for the major freshwater ecosystems of the region and most notably the Blyde River; • Mine design and planning must ensure that connectivity of the	Avoid loss of catchment yield and surface water recharge	Can be reversed
Construction Phase								
Removal of topsoil from project footprint areas and stockpiling thereof for rehabilitation.	Topsoil removal and creation of temporary stockpiles.	• Increased risk of transportation of sediment from exposed soils in stormwater runoff, leading to increased turbidity of surface water, sedimentation of freshwater ecosystems and changing the characteristics of the stream beds, smothering of vegetation and/or altered vegetation composition, smothering of benthic taxa and/or destruction of suitable macro-invertebrate and fish habitats; • Excavation and denuding activities will alter the natural runoff and flow regime of the area. Altered flow regime may lead to destruction of suitable macro-invertebrate and fish habitat; • Loss of riparian habitat and functionality due to the disturbance of the activity; • Alteration of the chemical properties of the rivers / streams as a result of vegetation removal and deforestation; • Exposure of soils, leading to increased runoff and erosion, and thus increased sedimentation of the rivers / streams; • Increased sedimentation of the rivers / streams, leading to smothering of benthos, loss of	WM	Negative	Moderate		Reduce risk on the riparian habitat from increased sedimentation	Can be reversed
Clearing of vegetation within the drainage systems in preparation for construction of linear infrastructure such as road crossings, diversion/containment berms and water related infrastructure.			WM	Negative	Moderate		Reduce rusk to the riparian habitat when removing vegetation	Can be avoided, managed or mitigated

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance	Management Measures	Management objective	Mitigation Effect
					Magnitude			
		rheophilic taxa, diverse biotopes and potentially altering surface water quality; • Increased hardened surfaces and compacted soils thus altering the pattern, timing and distribution of recharge which affects the freshwater ecosystems within the zone of influence; • Loss of foraging and breeding habitat [or hampering access to such suitable habitat (loss of connectivity)] and faunal migratory corridors; and • Proliferation of alien vegetation as a result of disturbances.				freshwater ecosystems is maintained; • All proposed haul and access roads, fences and any additional linear infrastructure (e.g. PCD pump columns and Eskom power supply) must cross the freshwater ecosystems at the narrowest point and at a 90-degree angles. As much as possible, existing access roads and river crossings must be utilised (if necessary, upgraded) to minimise further disturbances to the freshwater ecosystems; • The substrate characteristics of the freshwater ecosystem and instream connectivity must be monitored by a suitably qualified freshwater ecologist and maintained in a condition that supports the REC; • Obstruction of flow should not take place or should only occur for very short periods, if absolutely essential; • Restrict construction of clean and dirty water systems and infrastructure within freshwater ecosystems (e.g. bridge crossings) to the drier winter months to avoid sedimentation of the freshwater ecosystems in the vicinity of the proposed mining project; • Vehicles to be serviced at the contractor laydown area and all refuelling is to take place outside of the freshwater ecosystems and applicable setback zones; and • Sanitation services must be provided for construction personnel, whereby at least one portable toilet will be provided per ten personnel and will be emptied and appropriately disposed of regularly. 2. Access control • During the construction phase no vehicles must be allowed to indiscriminately drive through the freshwater ecosystems and vehicles must remain on designated roadways; • New crossings of the freshwater ecosystems should be avoided. If new crossings are required, the substrate conditions of the freshwater ecosystems and stream connectivity must be maintained; • Permit only essential construction personnel beyond approved construction areas; and • All areas of increased ecological sensitivity (i.e. the freshwater ecosystems and areas which are important in terms of recharge) must be designated as "No-Go" areas and be off limits to all unauthorised vehicles and personnel during all phases of the proposed mining project. 3. Hydrological drivers and consumption management • If decant will occur, all water is to be treated to background water quality values prior to release into the receiving environment; • Measures to contain and reuse as much water as possible within the mine process water system must be sought, and very strict control of water consumption must take place. DetaiLocal Economic Development programme monitoring must be implemented and maintained to ensure that all water usage is continuously optimised; • No dirty water runoff must be permitted to reach the riverine resources during the entire life of mine, and clean and dirty water management systems must be put in place to prevent the contaminated runoff (suspended solids and salts and water with low pH) from entering the receiving aquatic environment. Clean and dirty water runoff systems must be constructed before construction of any other infrastructure takes place;		
Construction of additional access roads, resurfacing of existing roads and refurbishment of existing buildings.	Altered drainage patterns due to increased impermeable surfaces. Installation of culverts/pipes as part of the construction of stream crossings.	• Increased water inputs to freshwater ecosystems, altering flow patterns and wetting patterns leading to further changes to vegetation and aquatic biota communities; • Contaminants from roads (e.g. oil spills) contained in runoff causing pollution to surface water within freshwater ecosystems with resulting potential direct impact on aquatic biota; • Possible incision and sedimentation of freshwater ecosystems due to increased water velocity (direct impact on biota in terms of smothering and indirect impact in terms of habitat destruction).	WM	Negative	Low		Avoid altering drainage paterns	Can be avoided, managed or mitigated
Construction of surface infrastructure.	Risk of contaminated stormwater runoff (e.g. hydrocarbons, sediment, originating from impermeable surfaces).	• Possible contamination of the associated freshwater ecosystems downstream of the surface structures (water quality impact with associated direct impact on aquatic biota); • Possible erosion/incision of the freshwater ecosystems adjacent to surface infrastructure due to concentration of stormwater runoff; and • Erosion and sedimentation risk with associated impact on aquatic biota and suitable habitat).		Negative	Moderate		Avoid contaminated runoff	Can be avoided, managed or mitigated
	Stockpiling of topsoil and overburden, earthworks, movement of vehicles within the regulated zones associated with freshwater ecosystems.	• Sediment-laden runoff entering riparian habitat leading to altered water quality, and changes to aquatic habitat; and • Altered drainage/flow regimes, leading to altered runoff patterns and formation of preferential flow paths.		Negative	Low		Avoid sediment runoff into riparian areas	Can be avoided, managed or mitigated

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance	Management Measures	Management objective	Mitigation Effect
					Magnitude			
	Potential disposal of hazardous and non-hazardous materials in riverine areas.	• Altered water quality, possible changes to flow patterns as a result of blockages caused by solid waste/rubble.		Negative	Low	• Any dirty water runoff containment facilities must, as far as practically possible considering topographic constraints and available space within existing disturbed areas, remain outside of the defined riparian areas and their buffers (setback zones / zones of regulation) as a measure to minimise the impact on the receiving environment; • Strict control of sewage water treatment must take place and the sewage system must form part of the mine's closed process water system; • All dirty water containment structures must be designed to contain a minimum storm event of a 1 in 50 year flood event; • All pollution control facilities must be managed in such a way as to ensure that storage and surge capacity is available if a rainfall event occurs; • Special attention needs to be paid to the use of the disposal of tailings generated and the lining of the facilities to be used according to the specifications of the National Environmental Management Waste Act, 2008 (Act No. 59 of 2008); • All new storage facilities (WRD, PCD, stockpiles) to be lined with appropriate liners to prevent seepage. Existing facilities which will be upgraded must be lined where feasible, or where this is not possible (e.g. existing WRDs which cannot be moved) must have appropriate stormwater and barrier systems in place to minimise the risk of seepage or spills to the receiving environment • Adequate stormwater management must be incorporated into the design of the proposed mining project in order to prevent erosion and the associated sedimentation of the riparian and instream areas. In this regard special mention is made of: - Sheet runoff from cleared areas, paved surfaces and access roads needs to be curtailed; - Runoff from paved surfaces should be slowed down by the strategic placement of berms; and - All overburden stockpiles and waste stockpiles must have berms and/catchment paddocks at their toe to contain runoff from the facilities. • The use of 'green' stormwater management techniques such as vegetated swales, constructed wetlands (attenuation ponds), and permeable paving (where practical, e.g. in parking areas) is strongly recommended. Such methods will assist in polishing stormwater runoff, thus minimising potential pollution of the receiving aquatic environment; • Stormwater trenches/berms must be constructed, and water contained therein may be recycLocal Economic Development programme and utilised within the mine water circuit (dust suppression), or pumped to a Pollution Control facility for evaporation; and • Monitor all potentially affected drainage systems for changes in riparian vegetation structure related to water stress should variation in the vegetation be observed 4. Waste and contamination management • No material may be dumped, disposed of or stockpiLocal Economic Development programme within any of the freshwater	Ensure proper stormwater management	Can be avoided, managed or mitigated
Operational Phase								
Alteration of the local hydrological regime due to potentially poorly managed stormwater, compaction of soil and increased extent of impermeable surfaces.	Altered drainage patterns, potentially leading to the formation of preferential flow paths and/or concentrated flows.	• Erosion of terrestrial areas as preferential flow paths are formed in the landscape, resulting in sedimentation of freshwater ecosystems, leading to altered channel competency, altered vegetation community structures, blanketing of benthos and loss of rheophilic taxa and suitable habitat.		Negative	Moderate		Avoid sediment runoff into riparian areas	May cause irreplaceable loss of resources
Presence of clean and dirty separation infrastructure upstream of surface infrastructure.	Loss of catchment yield due to stormwater containment.	• Potential for erosion of terrestrial areas as a result of the formation of preferential flow paths, leading to sedimentation of the freshwater ecosystems; • Reduction in volume of water entering the freshwater ecosystems, leading to loss of recharge (and thus desiccation) of downstream system; and • Altered vegetation communities due to moisture stress.		Negative	Moderate		Ensure proper stormwater management	Can be avoided, managed or mitigated
Deposition of tailings, waste rock, general operations of the mine.	Possible pollution of surface water as result of seepage/runoff from proposed infrastructure (e.g. water treatment facilities, ROM stockpiles, PCD, WRD, TSF and workshop/fuel storage areas). Potential groundwater pollution, leading to plumes, which may affect freshwater ecosystems downstream of the surface infrastructure for a long period of time until water quality rebounds to the background values.	• Possible contamination of surface and ground water, leading to impaired water quality and salination of soils within riparian areas; • Sedimentation of freshwater ecosystems could lead to altered water quality, altered channel integrity and altered vegetation community structures; and • Changes to vegetation growth due to increased nutrients as a result of altered groundwater properties.		Negative	Moderate		Ensure proper stormwater management	Can be avoided, managed or mitigated

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance	Management Measures	Management objective	Mitigation Effect
					Magnitude			
Operational activities including underground mining	• Increased risk of contamination of freshwater ecosystems with hydrocarbons in runoff due to vehicle impacts; • Increased run-off from altered hard surfaces may affect hydrological function in the freshwater ecosystems (e.g. altered flow patterns that may also alter in-stream habitat and result in bank erosion and instability); • Increased risk of sediment transport in surface runoff from surface infrastructure to freshwater ecosystems, leading to altered water quality and sedimentation of freshwater systems.			Negative	Moderate	ecosystems in the vicinity of the proposed mining project. If any spills occur, they must be immediately cleaned up; and • No dirty water (as defined by GN704) is to be released into the receiving environment 5. Geomorphological drivers and habitat management • All areas affected by construction or decommissioning activities must be rehabilitated upon closure of the mining expansion. All contaminated soils must be removed and disposed of at an appropriate facility. Affected areas must be reshaped to be free draining and reseeded with indigenous grasses should take place as required; • Ensure that all stockpiles are well managed and have measures such as berms and protection with hessian sheets or silt traps as deemed applicable by the project engineers implemented to prevent erosion, sedimentation and eutrophication (Reno mattresses, gabions, re-vegetation etc.), which may lead to transformation of riparian and/or aquatic habitat and lead to impaired water quality; • All erosion noted within any study area must be remedied immediately and included as part of an ongoing rehabilitation plan; • Strict supervision of all construction activities to ensure that edge effects are minimised and that development remains within the approved footprint; • During the construction and operational phases of the proposed TGME mining expansion, erosion berms should be instaLocal Economic Development programme to prevent the formation of erosion gullies as a result of the formation of any preferential surface flow paths, and the possible sedimentation of the assessed sites and surrounding freshwater systems; and • The following points serve to guide the placement of erosion berms when implementing erosion control: - Where the track has slope of less than 2%, berms every 50m should be installed; - Where the track slopes between 2% and 10%, berms every 25m should be installed; - Where the track slopes between 10%-15%, berms every 20m should be installed; - Where the track has slope greater than 15%, berms every 10m should be installed. 6. Vegetation • Implement alien vegetation control program within freshwater ecosystem areas with special mention of water loving tree species. Throughout the life of mine measures to control alien vegetation must be implemented and specific attention to riverine features should be paid; • Limit footprint of vegetation clearing to what is essential; • Retain as much indigenous vegetation as possible; and • Rehabilitation and re-vegetation of disturbed areas immediately after construction.	Ensure proper stormwater management	Can be avoided, managed or mitigated
Closure and Post Closure Phase								

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance	Management Measures	Management objective	Mitigation Effect
					Magnitude			
Decant from shafts post-closure	• Increased risk of pollution of surface water as a result of decant from the adit post closure. • Increased risk of pollution of groundwater, potentially leading to the formation of a contaminated groundwater plume, which may decant to the surface infrastructure, thus possibly affecting the downgradient freshwater systems.	• Increased risk of pollution (AMD) entering the freshwater ecosystems; • Increased runoff volumes and formation of preferential surface flow paths as a result of compacted soil and unvegetated areas, leading to increased sedimentation, erosion, and increased water inputs to downgradient aquatic systems.		Negative	Moderate	7. Closure • The following recommendations must be considered in conjunction with the recommendations of the geohydrologist. The geohydrologist recommendations must take precedence over the recommendations presented below: - Strict monitoring throughout LOM and post-closure is required in order to ensure the health and functioning of freshwater ecosystems is retained and monitoring data must be proactively utilised to identify any possible pollutants entering the system. - Drilling of groundwater monitoring boreholes to monitor water levels and quality as the groundwater rebounds. • Demolition footprint must be clearly demarcated and no related activities, including the movement of vehicles, must be permitted to occur outside of the footprint area; • All related waste and rubble must be removed from site and disposed of according to relevant SABS standards. No waste must be permitted to enter freshwater ecosystems; • Edge effects such as erosion must be monitored and managed as recommended during construction and operational phases; • All areas affected by stockpiling during the operational phase of the mine must be rehabilitated and stabilised using cladding or a suitable grass mix to prevent sedimentation of the freshwater ecosystems in the area; • Rehabilitation 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; • All areas must be resloped and an appropriate layer of topsoil reapplied and where necessary and reseeded with indigenous species; • It is critical that ongoing monitoring of alien vegetation is maintained post-closure, as proliferation of alien vegetation in the demolition areas is expected; and • Ongoing freshwater ecosystem (riparian) and aquatic biomonitoring must take place throughout the closure phase of the mine and must continue into the post closure phase for a period of at least ten years to define latent impacts that need to be mitigated.	Ensure proper stormwater management	May cause irreplaceable loss of resources
Decommissioning / removal of surface infrastructure and sealing of shaft adits	Compacted soils, latent impacts of vegetation losses.	• Increased runoff volumes and formation of preferential surface flow paths as a result of compacted soil and unvegetated areas, leading to increased sedimentation, erosion, and increased water inputs to downgradient aquatic systems; • Proliferation of alien vegetation due to disturbances, which will impact natural flow regimes; and • Potential visual scars, affecting aesthetic features and faunal habitat.		Negative	Moderate		Ensure proper management and rehabilitation to avoid latent impacts	Can be avoided, managed or mitigated
Visual Impact Assessment								
Morgenzon, Dukes and Beta								
Site clearing of the project footprint areas associated with the shafts,WRDs, RoM Stockpiles, PCDs, DMS Plant, other supporting infrastructure, access roads and associated contractor laydown areas.	Visual	• Further removal of vegetation leading to visual contrast, potential loss of Visual Absorption Capacity of the landscape and visual intrusion on sensitive receptors especially the town of Pilgrim's Rest. • Erosion and loss of topsoil leading to visual contrast, and possible loss of Visual Absorption Capacity of the landscape. • Construction related earthworks activities resulting in increased dust suspension. • Increased vehicular movement in the vicinity of the study area. • Yellow construction vehicles visible from the lush green background, increasing the likelihood of motorists observing the proposed construction activities.	WOM	Negative	High	• It must be ensured that existing vegetation in the vicinity of 83MR Areas is retained during the construction phase to ensure that visual scarring of landscape and vegetation clearing does not occur beyond the mining footprint area. • Excavation is to be kept to a minimum and limited to essential areas. • Where mining infrastructure is sited within view of visually sensitive areas, vegetation around the mining footprints should be retained to assist in screening. In particular the areas around the WRDs of the Dukes mining activities. • Erosion, which may lead to high levels of visual contrast and further detract from the visual environment, must be prevented throughout the lifetime of the project by means of putting soil stabilisation measures in place and concurrent rehabilitation. • It must be ensured that topsoil, run of mine stockpiles and WRDs are not steeply sloped, so as to blend in with the undulating terrain. • The sites should be kept neat and tidy at all times. • The height of structures should be a low as possible, where this can be achieved without increasing the infrastructure footprint. • Painting or coating infrastructure components to match darker	Reduce negative visual contrast	Can be avoided, managed or mitigated
			WM	Negative	Moderate			Can be avoided, managed or mitigated

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance	Management Measures	Management objective	Mitigation Effect
					Magnitude			
Construction and excavation activities related to the shafts , PCDs, WRDs, RoM Stockpiles and access roads.	Visual	• Excavation during construction of mining infrastructure will lead to visual intrusion and visual exposure of receptors. • Mine infrastructure including buildings, stockpiles and dumps being visible and creating contrast with the surrounding landscape. • An increase in construction vehicular and human activity in the area, leading to an increase in dust. • Excavation resulting in increased dust suspension. • Use of security lighting.	WOM	Negative	High	colours in the natural surroundings may reduce the distance required for effective screening. • Visually cluttered material storage yards and laydown areas should be screened through the use of material fencing, which will result in a more unified and tidy appearance. • Natural colours should be used in all instances and the use of highly reflective material should be avoided. Any metal surfaces should be painted to fit in with the natural environment in a colour that blends in effectively with the background. White structures are to be avoided as these will contrast significantly with the natural surroundings. • The identification of appropriate colours and textures for facility materials should take into account both summer and winter appearance. • The use of permanent signs and project construction signs should be minimised and visually unobtrusive. • During rehabilitation, the removal of infrastructure, ripping of roads and reshaping of impacted areas should take place. • The relevant exposed construction site areas and internal access roads should be irrigated on a regular basis, with just enough moisture to keep the dust down without creating undue runoff. • Construction activities should be restricted to daylight hours as far as possible, in order to limit the need to bright floodlighting and the potential for skyglow. • All lights used for illumination (except for lighting associated with security) should be faced inwards and shielded to avoid light escaping above the horizon. • As a safety precaution and due to illegal miners active in the area, the use of stationary security lighting at offices and the maintenance area are highly recommended.	Reduce negative visual intrusion	Can be avoided, managed or mitigated
			WM	Negative	Moderate			Can be avoided, managed or mitigated
On-going mining activities. Increase in trucks on the surrounding roads, transporting the material extracted.	Visual	• Continual stockpiling of material, including the resource, and potentially increasing heights of stockpiles and WRD during operational activities. • Generation of dust leading to visual intrusion, visual exposure of receptors and impacts on the overall landscape character. • Additional vehicular traffic impacting on the character of the region and leading to visual exposure of receptors further from the MR 83 UG Areas to mining activities. • Night time lighting due to security lighting, adding to the skyglow of the area.	WOM	Negative	Moderate	• The design and height increase of stockpiles must be monitored to ensure that these components relate to acceptable environmental standards in terms of slope and elevation. • All internal access roads will require effective dust suppression such as regular watering. • An effective dust management plan taking into account stockpile and dump areas, as well as internal access roads must be designed and implemented in order to mitigate the impact of dust on sensitive receptors throughout all mining phases. • Vehicle speed on unpaved roads must be reduced to limit dust generation. • As far as possible, existing roads are to be utilised, also for construction purposes, to prevent cumulative impacts from roads and traffic. • Transport of the mined resource should be optimised as far as possible to limit the number of additional vehicles on local and district roads. • As far as possible, operational activities should take place during the daylight hours, in order to limit the use of bright floodlighting and to avoid the use of additional night-time lighting which may add to skyglow. As underground mining activities will take place 24 hours 7 days a week, it must be ensured that up-lighting structures be avoided. • Outdoor lighting must be strictly controlled. • The use of high light masts and high pole top security lighting should be avoided along the periphery of the operations. Any high lighting masts should be covered to reduce sky glow. • Up-lighting of structures must be avoided, with lighting instaLocal Economic Development programme at downward angles that provide precisely directed illumination beyond the immediate surrounding of the mining infrastructure, thereby	Reduce negative visual intrusion	Can be avoided, managed or mitigated
			WM	Negative	Low			Can be avoided, managed or mitigated

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance	Management Measures	Management objective	Mitigation Effect
					Magnitude			
						minimising the light spill and trespass. • Care should be taken when selecting luminaries to ensure that appropriate units are chosen and that their location will reduce spill light and glare to a minimum. Only "full cut-off" light fixtures that direct light only below the horizontal must be used on the building. • Censored and motion lighting may be instalLocal Economic Development programme at office areas, workshops and other buildings to prevent use of lights when not needed. • Minimum wattage light fixtures should be used, with the minimum intensity necessary to accomplish the light's purpose. • Vehicle-mounted lights or portable light towers are preferred over permanently mounted lighting for night-time maintenance activities. If possible, such lighting should be equipped with hoods or louvers and be aimed toward the ground to avoid causing glare and skyglow (BLM, 2013). • The use of low-pressure sodium lamps, yellow Local Economic Development programme lighting, or an equivalent reduces skyglow and wildlife impacts. Bluish-white lighting is more likely to cause glare and attract insects, and is associated with other human physiological issues (BLM, 2013).		
Demolition of surface infrastructure	Visual	• Removal of infrastructure and general decommissioning and closure activities leading to potential visual intrusion on sensitive receptors. • Potential ineffective rehabilitation leading to landscape scarring, permanent visual contrast and a permanent alteration of the landscape character and sense of place within the region.	WOM	Negative	Moderate	• Decommissioning footprints and disturbed areas should be kept as small as possible and no further vegetation should be cleared or soils exposed for this purpose. • All areas where infrastructure is removed must be resloped to and revegetated as soon as possible. • Rehabilitation measures post construction and decommissioning must be strictly adhered to and disturbed areas must be rehabilitated as soon as possible by replacing topsoil and revegetating disturbed areas. • Indigenous and locally occurring plant species selected for use in re-vegetation should be selected taken quick growth rates into consideration in order to cover bare areas and prevent soil erosion. • Upon final rehabilitation, it must be aimed to remove as much surface infrastructure where practically feasible and to reshape the landscape to blend in with the surrounding mountainous terrain.	Reduce negative visual intrusion on sensitive receptors	Can be reversed
			WM	Negative	Low			Can be reversed
Frankfort								
Site clearing of the project footprint areas associated with the shafts, WRDs, RoM Stockpiles, PCDs, DMS Plant, other supporting infrastructure, access roads and associated contractor laydown areas.	Visual	• Further removal of vegetation leading to visual contrast, potential loss of Visual Absorption Capacity of the landscape and visual intrusion on sensitive receptors especially the town of Pilgrim's Rest. • Erosion and loss of topsoil leading to visual contrast, and possible loss of Visual Absorption Capacity of the landscape. • Construction related earthworks activities resulting in increased dust suspension. • Increased vehicular movement in the vicinity of the study area. • Yellow construction vehicles visible from the lush green background, increasing the likelihood of motorists observing the proposed construction activities in some instances and albeit from a distance.	WOM	Negative	Moderate	Same as above	Reduce negative visual contrast	Can be avoided, managed or mitigated
			WM	Negative	Low			Can be avoided, managed or mitigated

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance	Management Measures	Management objective	Mitigation Effect
					Magnitude			
Construction and excavation activities related to the shafts, PCDs, WRDs, RoM Stockpiles and access roads.	Visual	• Excavation during construction of mining infrastructure will lead to visual intrusion and visual exposure of receptors. • Mine infrastructure including buildings, stockpiles and dumps being visible and creating contrast with the surrounding landscape. • An increase in construction vehicular and human activity in the area, leading to an increase in dust. • Excavation resulting in increased dust suspension. • Use of security lighting.	WOM	Negative	Moderate	Same as above	Reduce negative visual intrusion	Can be avoided, managed or mitigated
			WM	Negative	Moderate			Can be avoided, managed or mitigated
On-going mining activities. Increase in trucks on the surrounding roads, transporting the material extracted.	Visual	• Continual stockpiling of material, including the resource, and potentially increasing heights of stockpiles and WRD during operational activities. • Generation of dust leading to visual intrusion, visual exposure of receptors and impacts on the overall landscape character. • Additional vehicular traffic impacting on the character of the region and leading to visual exposure of receptors further from the MR 83 UG Areas to mining activities. • Night time lighting due to security lighting, adding to the skyglow of the area.	WOM	Negative	Moderate	Same as above	Reduce negative visual intrusion	Can be avoided, managed or mitigated
			WM	Negative	Low			Can be avoided, managed or mitigated
Demolition of surface infrastructure	Visual	• Removal of infrastructure and general decommissioning and closure activities leading to potential visual intrusion on sensitive receptors. • Potential ineffective rehabilitation leading to landscape scarring, permanent visual contrast and a permanent alteration of the landscape character and sense of place within the region.	WOM	Negative	Low	Same as above	Reduce negative visual intrusion on sensitive receptors	Can be avoided, managed or mitigated
			WM	Negative	Low			Can be avoided, managed or mitigated
Noise Assessment								
Construction Phase								
Activities associated with the construction of the mines	Environmental Noise	Increase above 7 dBA above Rating Level	WOM	Negative	Negligible	Construction crew must conduct toolbox talks to educate their employees and ensure that they are aware of the legislation regarding noise. Should a noisy construction activity occur off the project footprint and near a receptor, the Environmental Coordinator should inform the receptor prior to the activity. Should noisy night-time activity occur (after 9pm, e.g. concrete pouring) the Environmental Coordinator should make receptors aware of the activity prior to the occurrence.	Keep noise levels below 7 dBA at receptors Rating Level	Can be avoided, managed or mitigated
			WM	Negative	Negligible			Can be avoided, managed or mitigated
Operational Phase								
Activities associated with the operations of the mines	Environmental Noise	Increase above 7 dBA above Rating Level, increase of 61 dBA	WOM	Negative	Moderate		Keep noise levels below 7	Can be avoided,

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance	Management Measures	Management objective	Mitigation Effect
					Magnitude			
		over a 24 hour period (at the boundary of the mine footprint).				The introduction of berms or acoustical shields in key areas . The CMD layout near receptors R3 and R4 require acoustical screens/berms.	dBA at receptors Rating Level. Keep noise levels below 61 dBA (24 hr) at the boundary of the project footprint.	managed or mitigated
			WM	Negative	Negligible			Can be avoided, managed or mitigated
Movement of vehicles on mine and haul roads	Environmental Noise	Increase above 7 dBA above Rating Level	WOM	Negative	Moderate	The project should consider reverse alarms that do not generate a high noise nuisance due to its tonality. Although heavy vehicle reverse alarms are exempt from noise legalisation (GN R154) and needs to meet occupational health and safety standards, certain reverse alarms are less intrusive (less tonal more broadband character etc.). Movement of heavy vehicles along haul routes (past receptors) towards municipal routes, should be minimised during night-times (receptor R3 and R4).	Keep noise levels below 7 dBA at receptors Rating Level	Can be avoided, managed or mitigated
			WM	Negative	Negligible			Can be avoided, managed or mitigated
Underground mine ventilation stacks operations	Environmental Noise	Increase above 7 dBA above Rating Level, increase of 61 dBA over a 24 hour period (at the boundary of the mine footprint).	WOM	Negative	Low	The following could be considered: -Sonic lining - Sonic Liner reduces the sound transmission along the vent duct. - Silencers/sound attenuator, duct silencer, sound trap, muffler - Noise can be redirected or lowered by means of above-mentioned design implementation. - Direction (to be discussed with project engineers) – Diffraction in the temperature layers at night could redirect the noise levels back to a receptor. The ventilation outputs could be directed rather away (opposed to upwards) from receptors within 2 km by means as previously stated (Silencers/sound attenuator, duct silencer, sound trap, muffler). - Barrier/berm - If feasible vents could be obscured (acoustical berm or shield) The berm/acoustical barrier should consider the following: - The berms should be solid (aggregate, brick etc. no foliage e.g. trees). - The height should be a minimum of two (2) meters higher than top of the vent shaft. - The berm/barrier will assist in the spill over points (create an acoustical shadow at 900 due to vent noise spill over at 900) on the exit point of the vent, but not the return of noise levels due to refraction in the atmosphere temperature layers. - Berms or the selected acoustical barrier should enclose all sides of the vent exit port in relation to receptors -A berm or solid double brick wall could be implemented here. - The acoustical shield needs to be implemented as feasibly close as possible to the vents as possible.	Keep noise levels below 7 dBA at receptors Rating Level. Keep noise levels below 61 dBA (24 hr) at the boundary of the project footprint.	Can be avoided, managed or mitigated
			WM	Negative	Negligible			Can be avoided, managed or mitigated
Closure and Post closure								
Activities associated with the construction of the mines	Environmental Noise	Increase above 7 dBA above Rating Level	WOM	Negative	Negligible	Construction crew must conduct toolbox talks to educate their employees and ensure that they are aware of the legislation regarding noise. Should a noisy construction activity occur off the project footprint and near a receptor, the Environmental Coordinator should inform the receptor prior to the activity. Should noisy night-time activity occur (after 9pm, e.g. concrete pouring) the Environmental Coordinator should make receptors aware of the activity prior to the occurrence.	Keep noise levels below 7 dBA at receptors Rating Level	Can be avoided, managed or mitigated
			WM	Negative	Negligible			Can be avoided, managed or mitigated
Heritage Impact Assessment								
Construction Phase								
	Heritage	Damage/destruction of high significance heritage resources in the Beta North Mining Area,	WOM	Negative	High	* Site Management Plan: Compile a heritage Site Management Plan (SMP) detailing a plan of action and measures for the long-term conservation and management of the heritage resource and its historical fabric.	Mitigate heritage resources, manage and	May cause irreplaceable loss of resources

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance	Management Measures	Management objective	Mitigation Effect
					Magnitude			
		Frankfort Mining Area and CDM Mining Area.	WM	Negative	Low	* Phase 2 Mitigation: Integrated and Legally compliant Phase 2 Study and assessment. * Site Monitoring: Strict monitoring (construction and commissioning) by the heritage consultant or an Environmental Officer (EO) familiar with the heritage occurrences of the sites. * Site Declaration Status: Engage the relevant heritage authority(SAHRA, SAHRA Built Environment) in terms of site declaration status as Grade II Provincial Heritage Resources subject to the NHRA 1999 (Section 7). * Further Research: Engage with tertiary institutions, academics and relevant specialists to document and further research the Pilgrim's Rest and Ponieskrants historical horizon. * Site Monitoring: General site monitoring by informed EO on a biweekly basis during construction. * Burials - Avoidance: Implement a heritage conservation buffer of at least 100m around the graves / cemetery, redesign the project layouts to avoid the heritage resource and the proposed conservation buffer. * Fence all burial places and apply access control. * Implement a site management plan detailing strict site management conservation measures. * Burials - Site Management Plan: Compile a heritage Site Management Plan (SMP) detailing a plan of action and measures for the long-term conservation and management of the heritage resource and its historical fabric. * Burials - Grave Relocation: Relocation of burials and documentation of site, full social consultation with affected parties, possible conservation management and protection measures. * Subject to authorisations and relevant permitting from heritage authorities and affected parties.	preserve historical fabric of the sites.	Can be avoided, managed or mitigated
			WOM	Negative	Negligible			Can be avoided, managed or mitigated
Operational Phase								
	Heritage	Damage/destruction of high significance heritage resources in the Beta North Mining Area, Frankfort Mining Area and CDM Mining Area.	WOM	Negative	High	* Site Management Plan: Implement heritage Site Management Plan (SMP) detailing a plan of action and measures for the long-term conservation and management of the heritage resource and its historical fabric. * Phase 2 Mitigation: Integrated and Legally compliant Phase 2 Study and assessment. * Site Monitoring: Strict monitoring (construction and commissioning) by the heritage consultant or an EO familiar with the heritage occurrences of the sites. * Further Research: Engage with tertiary institutions, academics and relevant specialists to document and further research the Pilgrim's Rest and Ponieskrants historical horizon. * Site Monitoring: General site monitoring by informed EO on a bi weekly basis during construction. * Burials - Avoidance: Implement a heritage conservation buffer of at least 100m around the graves / cemetery, redesign the project layouts to avoid the heritage resource and the proposed conservation buffer. * Fence all burial places and apply access control. * Implement a site management plan detailing strict site management conservation measures. * Burials - Site Management Plan: Implement a heritage Site Management Plan (SMP) detailing a plan of action and measures for the long-term conservation and management of the heritage resource and its historical fabric.	Mitigate heritage resources, manage and preserve historical fabric of the sites	May cause irreplaceable loss of resources
			WM	Negative	Low			Can be avoided, managed or mitigated
			WM	Negative	Low			Can be avoided, managed or mitigated
Closure & Post Closure Phase								
	Heritage	Damage/destruction of high significance heritage resources in	WOM	Negative	Negligible	* Site Management Plan: Implement heritage Site Management Plan (SMP) detailing a plan of action and measures for the long-	Mitigate heritage	Can be avoided,

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance	Management Measures	Management objective	Mitigation Effect
					Magnitude			
		the Beta North Mining Area, Frankfort Mining Area and CDM Mining Area.				term conservation and management of the heritage resource and its historical fabric. * Site Monitoring: Strict monitoring (construction and commissioning) by the heritage consultant or an EO familiar with the heritage occurrences of the sites. * Further Research: Engage with tertiary institutions, academics and relevant specialists to document and further research the Pilgrim's Rest and Ponieskrants historical horizon. * Burials - Site Monitoring: General site monitoring by informed EO on a bi-weekly basis during construction. * Burials - Avoidance: Implement a heritage conservation buffer of at least 100m around the graves / cemetery, redesign the project layouts to avoid the heritage resource and the proposed conservation buffer. * Burials -site Management Plan: Compile a heritage Site Management Plan (SMP) detailing a plan of action and measures for the long-term conservation and management of the heritage resource and its historical fabric.	resources, manage and preserve historical fabric of the sites	managed or mitigated
			WM	Negative	Negligible			Can be avoided, managed or mitigated
			WOM	Negative	Negligible			Can be avoided, managed or mitigated
Palaeontological Impact Assessment								
Re-mining of sites	Palaeontology	The damage or destruction of any palaeontological materials by proposed development	WOM	Negative	Moderate	* The EO for this project must be informed that the Palaeontological Sensitivity of the Timeball Hill Formation is High while that of the Malmani Subgroup (Transvaal Supergroup) is Very High. * If Palaeontological Heritage is uncovered during surface clearing and excavations the Chance find Protocol attached should be implemented immediately. Fossil discoveries ought to be protected and the EO/site manager must report to South African Heritage Resources Agency (SAHRA) (Contact details: SAHRA, 111 Harrington Street, Cape Town. PO Box 4637, Cape Town 8000, South Africa. Tel: 021 462 4502. Fax: +27 (0)21 462 4509. Web: www.sahra.org.za) so that mitigation (recording and collection) can be carried out. * Before any fossil material can be collected from the development site the specialist involved would need to apply for a collection permit from SAHRA. Fossil material must be housed in an official collection (museum or university), while all reports and fieldwork should meet the minimum standards for palaeontological impact studies proposed by SAHRA (2012). * These recommendations should be incorporated into the Environmental Management Plan for the proposed mining Development.	Protecting Palaeontological findings	Can be avoided, managed or mitigated
			WM	Negative	Low			Can be avoided, managed or mitigated
Socio-Economic Impact Assessment								
Construction Phase								
Construction Activities	Socio-Economic	Positive Impact on Local Income and Employment	WOM	Positive	Moderate	• Prioritise local labour in the recruitment process as part of the company's own recruitment policy or as part of the contractor management plan • Provide up-skilling opportunities for elementary and semi-skilLocal Economic Development programme local workers during the construction phase • If use is made of a contractor, explore the possibility of placement of up-skilLocal Economic Development programme local workers in other projects • Explore possible placement of local construction workers in mining operations • Incorporate the mitigation measures worker related management plans and employment contracts as well as contractor management plans	Maximise local income and employment	Can be avoided, managed or mitigated
			WM	Positive	Moderate			
Construction Activities	Socio-Economic	Potential Influx of People Population Change	WOM	Negative	Moderate	• Prioritise recruitment of local labour as far as possible. • Access skills databases currently being drawn up by local community representatives such as ward counsellors and TCLM.	Avoid influx of people	Can be avoided,
			WM	Negative	Moderate			

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance	Management Measures	Management objective	Mitigation Effect
					Magnitude			
						• No recruitment to be undertaken on-site. • Enter into formal employment contracts with casual labour and the construction staff to ensure that they are aware that employment is for a limited period only and that it is unlikely that the mine will employ construction staff on the mine when in operation. • Communicate redeployment with current operational staff and in the media to prevent word spreading of new job opportunities at the mine. • Availability of accommodation facilities to be established prior to and during the construction phase		managed or mitigated
Construction Activities	Socio-Economic	Increase in Nuisance Factors (Noise & Dust)	WOM	Negative	Moderate	• Mitigation measures with regards to noise impacts as per the EIA Report should be implemented. • All construction vehicles should be in a good condition and adhere to road-worthy standards. • Maintenance of vehicles and machinery should be done regularly. • Construction hours must preferably be limited to daylight day hours e.g., 6 am to 6 pm where possible. • Construction site management to adhere to the Theta Safety Health Environment and Quality requirements • Dust control measures e.g., wetting of gravel roads to be implemented where feasible. • Dust monitoring to be undertaken at Brown's Hill • Public transport options to be provided to construction workers • Concurrent rehabilitation/cleaning of construction sites to be undertaken • Resettlement of Brown's Hill community members to be considered during this phase or prior to construction of the extension of the TSF	Reduce and manage health effects on surrounding landusers	Can be avoided, managed or mitigated
			WM	Negative	Low			
Construction Activities	Socio-Economic	Community Health	WOM	Negative	Low	• Prioritise recruitment of local labour as far as possible. • All construction vehicles should be in a good condition and adhere to road-worthy standards. • Maintenance of vehicles and machinery should be done regularly. • Construction site management to adhere to the Theta Safety Health Environment and Quality requirement. • Dust monitoring to be undertaken at Brown's Hill settlement, Pilgrim's Rest, Darks Gully and Schoonplaas/Newtown • First aid and/or emergency supplies should be available at various points at the construction site • HIV/AIDS, TB, and Covid-19 awareness and support programmes to be supported and to be implemented as part of induction procedures • Safety measurements to be communicated to employees on a continuous basis • Covid-19 regulations to be adhered to and to be communicated to construction workers • The general health of construction workers should be monitored on an ongoing basis • Emergency action plans to be developed in consultation with localised health and emergency services • Resettlement of Brown's Hill community members to be considered during this phase or prior to construction of the extension of the TSF	Avoid Health effects on surrounding landusers	Can be avoided, managed or mitigated
			WM	Negative	Negligible			
Construction Activities	Socio-Economic	Community Safety	WOM	Negative	Moderate	• Recruitment of local labour must be prioritised. • Unauthorised entry to 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 operators must adhere to the speed limit	Ensure community safety with mining activities taking place	Can be avoided, managed or mitigated
			WM	Negative	Low			

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance	Management Measures	Management objective	Mitigation Effect
					Magnitude			
						parameters at all times. • Traffic control and direction indication, visible roadworks signs as well as pedestrian occurrence signs must be implemented • The South African Police Service (SAPS) and forums such as the Mpumalanga Illegal Mining Stakeholder Forum and the DMRE to curb illegal mining through their preventative measures that include: Demolishing illegal m mining infrastructure; confiscating gold-bearing material; arresting illegal miners; deporting illegal immigrants; introducing biometric scanners at mines; additional security guards at shaft entrances; inspection of material cars on shaft heads for food parcels and illegal entries; involving stakeholders, such as the surrounding communities at mines, businesses, and the local council, to participate in combating illegal mining; and establishing whistle-blower channels. • TGME developed a comprehensive security strategy dealing with the illegal miners in and around the proposed mining areas. This strategy will be implemented as part of the start-up phase of the mines. • A Fire/Emergency Management Plan and associated communication channels should be developed and implemented (in conjunction with neighbouring landowners and timber companies operating in the areas surrounding the construction sites). • Appropriate firefighting equipment should be on-site and construction workers should be appropriately trained for firefighting. • Visible policing in the settlements in close proximity to the construction sites is required. • Security teams to regularly patrol areas around construction sites. • Transparent procurement processes to be implemented with regards to potential vendors.		
Operational Phase								
Operational Activities	Socio-Economic	Positive Impact on Local Income and Employment	WOM	Positive	Moderate	• TGME aims to ensure that 70% of its workforce will be sourced from local residents , Newtown/Schoonplaas, and Darks Gully, and secondly from rural areas in Wards 10, 9, and 8 • Up-skilling of the local labour force as per the requirements of the SLP • Develop a database of goods and services that could potentially be outsourced to the local community • Establish a supplier development programme as part of the Local Economic Development component of the SLP. The programme should focus on small businesses in Pilgrim's Rest that could supply non-core mining goods and services to the mine (e.g., catering and cleaning) as well as larger businesses within the region. • Focus on the local supplier development programme on creating sustainable local businesses that could continue to operate after mine closure, e.g., by assisting local businesses in market diversification strategies • Participate in the development of a regional mine supplier hub to promote the development of a local supply base (e.g., the current enterprise hub in Lydenburg that was launched by Glencore) • Put a contractor management plan (including direct service providers) in place to ensure that the local employment and procurement targets of the operations are met. The targets should also be aligned with the Mining Charter of 2018.	Maximise local income and employment	Can be avoided, managed or mitigated
			WM	Positive	Moderate			
Operational Activities	Socio-Economic	Increase in Public Revenues	WOM	Positive	Moderate			

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance	Management Measures	Management objective	Mitigation Effect
					Magnitude			
			WM	Positive	Moderate	• Develop an updated Local Economic Plan as part of an updated SLP for the project in consultation with the local community • Ensure that the current allocation as per TGME's Mine Works Programme for the updated SLP is in line with the targets of the Mining Charter of 2018 • Monitor and manage the social contribution of multinational suppliers (in-house as well as suppliers to contractor and direct service providers)	Assist with community upliftment	Can be avoided, managed or mitigated
Operational Activities	Socio-Economic	Impact on Non-Mining Related Economic Activities	WOM	Negative	Moderate	• Engage on a regular basis with the business sector through the local business chambers (Sabie, Graskop, and Pilgrim's Rest) to address issues that could negatively impact on local businesses, specifically tourist businesses. • Mitigation measures as stipulated in the EMPr must be strictly adhered to, to avoid and minimise any environmental pollution Effective management of the mining activities to avoid any environmental pollution focusing on water, and dust pollution, and limiting any increase in noise levels as per the respective environmental management plans (high priority) • An integrated Fire/Emergency Management Plan should be developed and implemented. It would be important to regularly review the functionality and efficiency of such a plan in conjunction with the local emergency teams, mine management, forestry industry, and affected communities as well as neighbouring landowners • Pro-active security measures should be put in place to avoid unauthorised entry onto mining sections, as well as forestry and conservation areas • Specify the conduct of contract workers in worker related management plans and employment contracts • Security companies employed by the mining sector to develop an integrated security management plan with the focus on unauthorised entries and issues associated with illegal mining. • 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 (e.g. 7 am until 5 pm) where possible • Heavy machinery and heavy vehicles should be kept in a good working order. Also, ensure that all vehicles and equipment comply with generally accepted noise levels and noise abatement regulations • Dust suppression measures should be applied if and when necessary • Sequence the operations phase to commence after the construction phase, if possible, to avoid negative cumulative impacts • TGME should proceed in facilitating the development of a detaiLocal Economic Development programme tourist strategy for Pilgrims Rest as part of its Local Economic Development programme programme in close consultation with the local community and local tourism sector. Some ideas that could be explored further include: o Commitment from business visitors to the mine to use the overnight facilities in Pilgrim's Rest or the immediate surroundings o Caravan Park space development (one-part offices, the other ablution blocks, and ground clearance and maintenance for caravan standing areas) – TGME already assisting with the management of the golf course o Assist with maintenance of e.g. the road between Graskop and Pilgrim's (bush clearance and some repairs) o Museum support (gold panning)	Reduce impacts on non mining related economic activities	Can be avoided, managed or mitigated
			WM	Negative	Low			

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance	Management Measures	Management objective	Mitigation Effect
					Magnitude			
						o Assist and liaise with SAFCOL in promoting and re-establishing their hiking trails o Facilitate the establishment of an ATM in town o Expanding their existing involvement in the Pilgrim's Rest Golf Club by assisting with the management and maintenance of the club, and by providing the impetus for capacity building and skills transfers • Liaise and assist with the promotion of Road safety on the R533 • Involve the SAPS and other relevant stakeholders (e.g. other business entities operating in the area, as well as Police Forums and Sector Forums) in the preventative security measures to be undertaken		
Operational Activities	Socio-Economic	Increased economic concentration of the local economy	WOM	Negative	Moderate	• Focus on the support of non-mining related activities in community development programmes • Focus on the development of the local tourist market in community development programmes • Focus the local procurement programme on non-core mining inputs in Pilgrim's Rest with a broader regional market (e.g. catering, accommodation) • If a supplier development programme is established, focus the programme on non-core mining inputs in Pilgrim's Rest with a broader regional market	Increase economic concentration of the local economy	Can be avoided, managed or mitigated
			WM	Negative	Moderate			
Operational Activities	Socio-Economic	Increased use of scarce natural resources	WOM	Negative	Moderate	• TGME to develop a strategy to cause minimal disruptions to electricity supply in the local area. For example, continue discussions with ESKOM to resolve supply of energy to the mine and use off-grid solutions until agreement for stable local supply is reached • Develop a resource use plan with the specific objective to minimize the mining operations' energy and water use as far as practical. For example, treated discharge water could possibly be used for irrigation purposes e.g. at the golf course and caravan park if such a proposal adheres to environmental regulations. • Ensure that water quality and quantity issues are managed appropriately through engineering controls and through regular and required quality and quantity groundwater monitoring • Mitigation measures of the Geohydrology and Surface Water Hydrology Impact Assessments must be strictly implemented.	Management of services and natural resources	Can be avoided, managed or mitigated
			WM	Negative	Moderate			
Operational Activities	Socio-Economic	Potential Influx of People Population Change	WOM	Negative	Moderate	• Prioritise recruitment of local labour as far as possible • Access skills databases currently being drawn up by local community representatives such as ward councillors and TCLM. • Develop a procurement strategy as well as a contractor management plan (if relevant) to ensure that local employment is enhanced as far as possible within the semi-skilLocal Economic Development programme and skilLocal Economic Development programme categories and that all elementary labour is recruited from local communities of the larger Pilgrim's Rest area, the larger Moremela area, Leroro, Mathibidi, Graskop and Sabie • Employment of locals would limit the negative impacts (e.g. Infrastructure requirements) associated with a sudden or additional population increase. • The local labour procurement strategy as well as proof of residence required should be clearly communicated through community structures well in advance. The communication strategy should ensure that unrealistic employment expectations are not created. • TGME to discuss the infrastructure requirements of the operational phase with the TCLM and DPWRT to pro-actively deal with the possible negative impacts	Avoid influx of people	Can be avoided, managed or mitigated
			WM	Negative	Moderate			

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance	Management Measures	Management objective	Mitigation Effect
					Magnitude			
						• Maintenance of the roads frequently used by mine related traffic should be discussed and negotiated with the DPWRT.		
Operational Activities	Socio-Economic	Increase in Nuisance Factors (Noise & Dust)	WOM	Negative	Moderate	• Mitigation measures with regards to noise impacts as per the EIA Report should be implemented. • All vehicles should be in a good condition and adhere to road-worthy standards. • Maintenance of vehicles and machinery should be done regularly. • Movement of mining-related vehicles to be scheduLocal Economic Development programme outside peak traffic hours where possible. • Mining site management to adhere to the Theta Safety Health Environment and Quality requirements • Dust control measures e.g. wetting of gravel roads to be implemented where feasible. • Public Transport options to be provided to the employees during the operational phase of the project • Positioning of lights to be carefully considered. • The mitigation measures proposed by the Visual Impact Assessment must be implemented.	Limited nuisance factors	Can be avoided, managed or mitigated
			WM	Negative	Low			
Operational Activities	Socio-Economic	Community Health	WOM	Negative	Moderate	• Prioritise recruitment of local labour as far as possible. • Reduce vulnerability by providing and supporting HIV/AIDS, TB, and Covid-19 awareness and support programmes • Covid-19 regulations to be adhered to and to be communicated to workers • The general health of workers should be monitored on an ongoing basis • Emergency action plans to be developed in consultation with localised health and emergency services • Dust control measures e.g. wetting of gravel roads to be implemented where feasible • Mining site management to adhere to the Theta Safety Health Environment and Quality requirements. • The mine could, through Local Economic Development programme programmes and infrastructure development assist in improving the overall health services within the communities • Continuous water monitoring to be undertaken at specific locations as determined by the relevant specialist studies. • Reporting on the water monitoring and the findings must be regularly undertaken through formalised communication channels.	Avoid Health effects on surrounding landusers	Can be avoided, managed or mitigated
			WM	Negative	Low			
Operational Activities	Socio-Economic	Community Safety	WOM	Negative	Moderate	• A comprehensive Resettlement Action Plan (RAP) must be developed in consultation with the affected inhabitants. This plan would include the number of dwellings and individuals to be affected, timeframes, and the availability of a site where resettlement could occur. • Representatives of the DPWRT and TGME must liaise with the inhabitants and local councillor with regard to the resettlement process and timeframes. This communication must further ensure that the correct information regarding this issue is portrayed to the community members. • It would be desirable to address issues relating to resettlement as a matter of urgency and also to provide definitive timeframes linked to any possible resettlement • Recruitment of local labour must be prioritised. • Unauthorised entry into the mining area must not be allowed. Access control should continue to be implemented. Mining areas must be secured and fenced. • Livestock should be moved to other grazing areas away from the mining activities. • The South African Police Service (SAPS) and forums such as the Mpumalanga Illegal Mining Stakeholder Forum and the DMR	Ensure community safety with mining activities taking place	Can be avoided, managed or mitigated
			WM	Negative	Moderate			

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance	Management Measures	Management objective	Mitigation Effect
					Magnitude			
						to curb illegal mining through their preventative measures that include: Demolishing illegal mining infrastructure; confiscating gold-bearing material; arresting illegal miners; deporting illegal immigrants; introducing of biometric scanners at mines; additional security guards at shaft entrances; inspection of material cars on shaft heads for food parcels and illegal entries; involving stakeholders, such as the surrounding communities at mines, businesses, and the local council, to participate in combating illegal mining; and establishing whistle-blower channels. • A Fire/Emergency Management Plan and associated communication channels should be developed and implemented (in conjunction with neighbouring landowners and timber companies operating in the areas surrounding the construction sites.) • Appropriate firefighting equipment should be on-site and workers should be appropriately trained for firefighting. • Visible policing in the settlements in close proximity to the mining sites is required. • Security teams to regularly patrol areas around mining sites.		
Closure and Decommissioning Phase								
Closure Activities	Socio-Economic	Job losses due to scaling down of mining activities and mine closure	WOM	Negative	High	• As per the requirements of the SLP develop mechanisms to assist employees, prior to the retrenchment date in the transition phase and after the closure of the operations. This would include providing portable skilLocal Economic Development programme development programmes during the operational phase of the mine, providing assistance in accessing available and suitable jobs with other local mines or companies, etc. • Focus on supporting non-core local supply links in procurement strategies as well as potential local enterprise development programmes during the operational phases of the mine to facilitate easier transitioning of local suppliers to other customers	Ensure social and economic sustainability	Can be reversed
			WM	Negative	Moderate			
Closure Activities	Socio-Economic	Termination of local social funds	WOM	Negative	High	• Focus on community support programmes with that build local capacity and sustainability in the local community • Plan projects with an exit strategy and follow a clear communication strategy with beneficiaries	Ensure social and economic sustainability	Can be reversed
			WM	Negative	Moderate			
Closure Activities	Socio-Economic	Loss of agricultural land	WOM	Negative	Low	• Dismantle infrastructure and rehabilitate as far as possible land to original land use	To return the area to original land use	Can be reversed
			WM	Negative	Negligible			
Closure Activities	Socio-Economic	Nuisance Factors (Noise & Dust)	WOM	Negative	Moderate	• Dust control measures to be implemented on gravel roads during the active decommissioning phase • Mining areas should be rehabilitated as soon as the Mining Works Programme allows • The recommendations made by the Visual Impact Assessment should be adhered to • Mining infrastructure must be removed or where applicable should be maintained and incorporated into a mining tourism strategy • Re-vegetation and landscaping options should be considered but should aim to re-establish the area to its pre-mining state as far as possible. • The end land use should be determined in consultation with the local community and relevant government departments to determine what is required from an environmental perspective but to also address localised community needs. • On-going dust fall out monitoring must be undertaken to monitor emissions • Pollution control measures must be implemented over a long period of time • The TSF must be stabilised, rehabilitated or removed to prevent erosion	Reduce Nuisance Factors (Noise & Dust)	Can be avoided, managed or mitigated
			WM	Negative	Low			

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance	Management Measures	Management objective	Mitigation Effect
					Magnitude			
Closure Activities	Socio-Economic	Community Safety	WOM	Negative	Moderate	• Rehabilitation and closure must ensure that the future risk of failure to the environment and public is reduced • The TSF must be rehabilitated to minimise the seepage of contaminated water to the surface and ground water sources • The TSF must be stabilised and rehabilitated to prevent erosion • Pollution control measures must be implemented over a long period of time • On-going dust fall-out monitoring must be undertaken to monitor emissions for at least five years after rehabilitation of the areas. • Long-term security measures must be implemented to avoid unauthorised entry to decommissioned sites and to prevent illegal miners from entering these areas.	Ensure community safety after closure	Can be avoided, managed or mitigated
			WM	Negative	Low			
Blasting and Vibration								
Operational Phase								
Blasting at underground mining areas	Ground Vibration	Damage to houses or infrastructure not owned by the mine, upset people and occupants of houses	WOM	Negative	Negligible	There is no specific mitigations required for the underground blasting operations	N/A	N/A
			WM	Negative	Negligible		N/A	N/A
Traffic Impact Assessment								
Construction Phase								
Traffic impact during the construction activity	Traffic	Traffic impact on the external road network	WOM	Negative	Negligible	No mitigation required	N/A	N/A
Operational Phase								
Traffic impact during the production phase	Traffic	Traffic impact on the external road network	WOM	Negative	Negligible	No mitigation required	N/A	N/A

14 MOTIVATION WHERE NO ALTERNATIVE SITES WERE CONSIDERED.

Refer to Section 0 for alternatives considered.

15 STATEMENT MOTIVATING THE ALTERNATIVE DEVELOPMENT LOCATION WITHIN THE OVERALL SITE.

The proposed new site alternatives have been largely influenced by the following:

- Previously mined and disturbed areas
- Ecological sensitivity
- Floodlines
- Resource availability
- Heritage findings

For more information refer to Section 0 above.

16 FULL DESCRIPTION OF THE PROCESS UNDERTAKEN TO IDENTIFY, ASSESS AND RANK THE IMPACTS AND RISKS THE ACTIVITY WILL IMPOSE ON THE PREFERRED SITE (IN RESPECT OF THE FINAL SITE LAYOUT PLAN) THROUGH THE LIFE OF THE ACTIVITY

Refer to EIA methodology in Section 13.

17 SUMMARY OF SPECIALIST REPORTS.

Table 67: Summary of specialist recommendations

List Of Studies Undertaken	Recommendations Of Specialist Reports	Specialist Recommendations Included in EIA Report	Section of Report where Specialist Recommendations have been Included
Air Quality Assessment Airshed Planning ANNEXURE I	To ensure the lowest possible impact on Air Quality and environment it is recommended that the air quality management plan as set out in this report should be adopted. This includes: • The management of the operations; resulting in the mitigation of associated air quality impacts. • TGME's current dustfall sampling be expanded and monthly dustfall reporting form part of the project's air quality management plan. 　○ The recommended dustfall network will comprise of 15 single dustfall units, with nine (9) located at Beta North, three (3) located at CDM and three (3) at Frankfort. • Dustfall collected monthly, should be analysed, and reported on with the results compared to the NDCR, which in this case would need to comply with the Non-residential limit of 1 200 mg/m²/day, not to be exceeded for two consecutive months. In the case of such events, the cause for high dustfall should be investigated and mitigation measures identified and implemented. • Record keeping and community liaison procedures. • GHG emissions from project can be reduced by: 　• ensuring the vehicles and equipment are maintained through an effective inspection and maintenance program; and, 　• limiting the removal or vegetation and ensuring adequate re-vegetation or addition of vegetation surrounding the project. In light of these findings and assuming the recommended mitigation, management, and monitoring procedures are followed, the specialist opinion is that the project may be	YES	Refer to Sections 13.3.1 13.5 37.1.1

List Of Studies Undertaken	Recommendations Of Specialist Reports	Specialist Recommendations Included in EIA Report	Section of Report where Specialist Recommendations have been Included
	authorised as long as the recommended measures are implemented, and the periodic reviews (every 5 years) are conducted as recommended.		
Soil and landuse **Scientific Terrestrial Services CC** **ANNEXURE J**	Key mitigation measures to minimise impacts on the soil regime include but are not limited to: • The project operations should be kept within the demarcated footprint areas which must be well defined; • Ensure all stockpiles (especially topsoil) are clearly and permanently demarcated and located in areas defined as no-go areas; • Stockpile areas should be located on flat areas (if feasible) to minimise the risk of soil erosion during high erosive rainfall events; • The topsoil stockpile should be vegetated and while vegetating, measures will be needed to contain erosion of the stockpile during rain events; • A soil erosion plan should be developed by a suitably qualified soil scientist so as to ensure that the risk of soil erosion and the subsequent loss of soil is reduced as far as practically possible; • Regular inspection of the disturbed areas to assess erosion which may result from a loss in vegetation; • Bare soils within the access roads 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 should be re-vegetated with an indigenous grass mix, if necessary, to re-establish a protective cover, to minimise soil erosion; • Laydown areas should be located within disturbed soils (Witbank Soil forms) to avoid compaction of natural soils; • 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 contamination;		

List Of Studies Undertaken	Recommendations Of Specialist Reports	Specialist Recommendations Included in EIA Report	Section of Report where Specialist Recommendations have been Included
	• The post closure land use should be aimed at forestry with indigenous species.		
Dolomite stability **Jones and Wagner** **ANNEXURE G**	According to SANS 1936 Part 1, the appropriate dolomite area designation shall be determined based on the type of development and the adjudged IHC. The requirements for each dolomite area designation are as follows: • Dolomite area designation D1 o No precautionary measures required • Dolomite area designation D2 o General precautionary measures, in accordance with the requirements of SANS1936-3, that are intended to prevent the concentrated ingress of water into the ground are required. • Dolomite area designation D3 o Precautionary measures in addition to those pertaining to the prevention of concentrated ingress of water into the ground, in accordance with the relevant requirements of SANS 1936-3, are required. • Dolomite area designation D4 o Additional site-specific precautionary measures are required. Designs from the civil engineers have taken these areas into consideration: • the findings of the near surface investigation, • the IHC as indicated by the dolomite stability assessment • the requirements for the dolomite area designation, D2/D3/D4.	YES	Refer to ANNEXURE G
Geohydrology **MvB Consulting** **ANNEXURE L**	The biggest concern regarding the groundwater is the potential seepage of contaminants from the mining site, specifically the TSF, to the groundwater. Due to the low risk posed by the waste material and the mining in general there are currently no additional management requirements, other than groundwater monitoring. The planned	YES	Refer to ANNEXURE L 13.3.4and 13.5

List Of Studies Undertaken	Recommendations Of Specialist Reports	Specialist Recommendations Included in EIA Report	Section of Report where Specialist Recommendations have been Included
	post-closure rehabilitation of the TSF will further protect the underlying groundwater resource. A detailed geophysical survey was conducted as part of the dolomite stability assessment for the proposed project. Thirty-one percussion boreholes were drilled in accordance with SANS 1936-2. Seven of these boreholes were constructed to act as groundwater monitoring boreholes for the proposed infrastructure expansion. The remaining boreholes were backfilled according to SANS guidelines. A groundwater monitoring network is therefore in place, which includes the newly drilled boreholes. The current groundwater monitoring points are adequate, and no further expansion of the network is recommended at this stage. In the operational phase and closure phase, quarterly monitoring of groundwater quality and groundwater levels is recommended. It is important to note that a groundwater-monitoring network should also be dynamic. This means that the network should be extended over time to accommodate the migration of potential contaminants through the aquifer as well as the expansion of infrastructure and/or addition of possible pollution sources. New mining ventures seldom have detailed, closely spaced, site-specific information and several assumptions must be made during these assessments. The TGME Project, however, is different and the closely spaced exploration drilling provided valuable information on the geology that allowed for a thorough geohydrological conceptual model to be developed. The historical mining in the region and recent studies in the existing mining areas provided valuable information that was incorporated into the assessment. This increases the confidence in the conclusions that were reached. As mining and groundwater monitoring continues the conceptual and numerical modelling can be verified and adjusted if necessary.		
Terrestrial Ecology **STS** **ANNEXURE M**	Due to the nature of the proposed project (underground mining) and the design of the proposed surface layouts, the activities will have restricted and mitigatable, direct impacts on indigenous vegetation and habitat of increased sensitivity. Sensitive habitat has largely been excluded from the layout designs and with edge effect control, AIP management, stormwater	YES	Refer to 13.3.6 13.5 18.4

List Of Studies Undertaken	Recommendations Of Specialist Reports	Specialist Recommendations Included in EIA Report	Section of Report where Specialist Recommendations have been Included
	management, and erosion control, the impacts from the proposed mining activities will be of localised extent and will be site specific. If the 83MR project will be authorised, as far as is possible, clearing of natural vegetation should be minimised where these are associated with the Indigenous Forest sub-unit, Woodland sub-unit (where not degraded), and the Freshwater Habitat. If avoidance is not possible, then offsetting and/or compensation should be investigated. If rehabilitation post-closure is aimed at clearing and controlling AIPs, as well as reinstating native floral communities, the proposed project may result in a net gain in biodiversity for the area. Compensation for mining in a Forest Nature Reserve should be investigated. It is the opinion of the ecologists that this study provides the relevant information required to implement Integrated Environmental Management (IEM) and to ensure that the best long-term use of the ecological resources in the 83MR project areas will be made in support of the principle of sustainable development.		
Ecological Compensation for Continued Mining **Conservation Strategy Tactics & Insight;**	The following measures are proposed as a fundamental part of the conditions that should be imposed on TGME for the right to continue mining in a nature reserve and to operate in the listed Malmani Karstlands ecosystem and the Blyde River Catchment Freshwater Ecosystem Priority Area and class 1 Water Resource. They are not necessarily exclusive or meant to displace any other required mitigation and are designed to address the primary bio- and geo-physical threats to ecosystem integrity and function. **REMOVAL OF LEGACY INFRASTRUCTURE & AMELIORATION OF HISTORICAL IMPACTS** As a commitment to addressing legacy impacts, and pursuing good corporate stewardship in and around the addition to Morgenzon Forest Nature Reserve, TGME should:	Yes	Refer to Sections9.10.3 ANNEXURE V

List Of Studies Undertaken	Recommendations Of Specialist Reports	Specialist Recommendations Included in EIA Report	Section of Report where Specialist Recommendations have been Included
	• Control all AIPs within 1km of the existing mining operations that it intends to continue mining, including Frankfort, Clewer-Dukes Hill – Morgenzon mine complex, Beta Mine complex, as well as within 1km of the Processing plant, as per Diagram 1. • Where appropriate and legally permissible, rework and reshape the existing mining waste rock dumps and tailings deposits at the above mining operations, with a view to returning the waste rock underground, to leave the landforms and Peach Tree Stream in a stable state that permits the continued functioning of natural geomorphological processes. • Where appropriate and legally permissible, remove and repurpose all redundant, broken, and unusable mining infrastructure from the above mining operations. • Rehabilitate, subject to any required licences or permits, the existing river crossings on the Blyde River and Peach Tree stream. • Incorporate the above activities into the mine closure objectives, plan, and reports, subject to compliance with rehabilitation and closure laws. **REHABILITATION OF PROSPECTING ROADS AT IOTA & THETA** TGME should, in addition to the revegetation of currently alien infested land • Repair and rehabilitate as far as technically feasible all the prospecting and access roads constructed on the Iota and Theta hills. The objective of this rehabilitation is to restore the natural landform to substantially replicate what existed prior to this disturbance, to prevent soil erosion, to inhibit the establishment of alien and invasive species, and to allow the natural regeneration of indigenous biodiversity. • Revegetate the disturbed areas with a suitable mix of indigenous species as approved by the MTPA. **DELINEATION & MANAGEMENT PLAN OF ADDITION TO MORGENZON FOREST NATURE RESERVE**		

List Of Studies Undertaken	Recommendations Of Specialist Reports	Specialist Recommendations Included in EIA Report	Section of Report where Specialist Recommendations have been Included

	TGME should:
	
	Provide technical assistance as may be required, to the statutory entity responsible for the Morgenzon Forest Nature Reserve, to effectively delineate its current and future intended mining operations, provide for any other zonation required, and to draft a Management Plan for the effective management and rehabilitation of the Forest Nature Reserve
	
	IMPLEMENTATION OF THE COMPENSATION PROGRAMME
	
	As a requirement of the Ecological Compensation Report in the EIA process, the following must be included as specific conditions of authorisation. To comply with required mitigation and their commitment to good corporate stewardship in the Blyde Catchment, TGME must:
	
	• Within 6 (six) months of issue of the final regulatory approval for the listed activities, commence implementation of a comprehensive Ecological Compensation Programme, aimed at rehabilitating the ecological and hydrological functioning of parts of the upper portions of the Blyde River Catchment (in quaternary catchments B60A and B60B), and replenishing the licenced abstraction volume as provided for under N permit reference 1351N or any subsequent licence issued under Section 21(a) of the NWA (such replenishment being not less than 300 000m3 per year) by inter alia funding the planning, coordination and implementation of AIPs control efforts, revegetation, and fire belt implementation, as set out in the Ecological Compensation Programme (set out in more detail below);
	    o Provide, to an appropriate organisation with the requisite expertise and experience related to developing, assessing, and releasing biocontrol agents, to pursue the development, release and augmentation of an effective destructive biological control agent for Silver Wattle (Acacia dealbata).
	    o Control at least 273 condensed hectares (an area equivalent to 100% dense infestation) of invasive alien trees located within and immediately adjacent to the		

List Of Studies Undertaken	Recommendations Of Specialist Reports	Specialist Recommendations Included in EIA Report	Section of Report where Specialist Recommendations have been Included
	Farms Ponieskrans 543 KT, Morgenzon 525 KT, Peach Tree 544 KT, Grootfontein 562 KT in and around the addition to Morgenzon Forest Nature Reserve (FNR), and Graskop 564 KT (portion 25) and Desire 563 KT (designated as the Graskop Grasslands Unique Natural Community and managed by MTPA), and the immediate surrounding land parcels. This control must be to a level of no seeding adult trees, and an AIP canopy coverage less than 1%, within 7 years of issue of the final regulatory approval for the listed activities subject to this authorisation. ○ Control, through regular and repeated reconnaissance and control measures, all invasive alien trees within the riparian Zone of the Blyde River, from the applicant's water offtake point on the Farm Grootfontein 562 KT, down to the boundary of the Provincial Blyde River Canyon Nature Reserve at Bourke's Luck Potholes. Where there is doubt as to the boundary of the riparian zone, it can be defined as the land within 100m of the centre line of the Blyde River. ○ Implement annually at least 11km of a fire belt and a related control measures program, in conjunction with affected adjacent landowners, MTPA and the Lowveld Escarpment Fire Protection Association, on the 2021 addition to Morgenzon FNR and the Graskop Grasslands Unique Natural Community. Where required in writing to do so by a statutory management authority, the applicant must as far as reasonably possible support fire suppression and/or controlled burning regimes through the provision of labour, equipment, and in-kind support on these areas. ○ Implement erosion and sediment control operations on all areas (at least 370 ha) cleared of invasive alien trees and other susceptible areas, by revegetating all cleared areas with indigenous plant species (especially grasses native to the region) to the level of a cover of at least 15% within 10 years, with the objective of removing unnatural levels of sediment input into the Blyde River system.		

List Of Studies Undertaken	Recommendations Of Specialist Reports	Specialist Recommendations Included in EIA Report	Section of Report where Specialist Recommendations have been Included
	• TGME must use its best endeavors to, within 6 (six) months of the final date of authorisation (after appeal period), conclude an implementation agreement with a suitable service provider that has experience and expertise in invasive alien tree control and ecological rehabilitation in the region, preferably including statutory nature reserves. This implementation agreement shall cover, amongst other things set out in any applicable statutory guideline, the following: ○ the objectives and specific targets for the Ecological Compensation Program set out herein (and provided in more detail in the Report on "Ecological Compensation in the Blyde River Headwaters" by Mark Botha dated 13 April 2022) ○ clearly defined areas for control and rehabilitation, and time frames and milestones for achieving the required ecological compensation targets (including the biocontrol program), and a detailed activity plan that must be submitted to the Regional Office of the Natural Resource Management Program of the DFFE, the Head: Water Regulation in the regional office of the DWS, and the Director for Conservation: MTPA ○ institutional arrangements for implementation, monitoring, auditing, oversight, alignment, and coordination with other relevant parties, ○ provisions for managing breach, rectification, withdrawal, arbitration, and penalties ○ financial arrangements for the investment of an amount of not less than R58,3 million (fifty-eight comma three million rand), being the estimated amount of operational costs necessary for delivering the ecological compensation over the planned 11-year Compensation Program, and financial guarantees for this amount in favour of the implementing agent. • TGME shall notify this office, and the DFFE, DWS and MTPA of: ○ Conclusion of the implementation agreement and financial guarantee provision;		

List Of Studies Undertaken	Recommendations Of Specialist Reports	Specialist Recommendations Included in EIA Report	Section of Report where Specialist Recommendations have been Included
	○ progress with implementation at least annually, especially regarding the measurement of replenishment and sediment reduction objectives; ○ the emergence of any issues frustrating implementation that may require authorities' action, intervention, and/or enforcement functions; ○ the outcomes of all independent audit reports; ○ the successful completion of the Ecological Compensation Program. • This authorisation shall be of no force and effect until such time as the Implementation Agreement is concluded with a suitable party, and the financial guarantee or other arrangements acceptable to the implementing party is in place, and both agreement and guarantee submitted to this office, DWS, DFFE and MTPA. **Mine closure objectives** If not already effectively incorporated in mine rehabilitation and closure plans, TGME shall include, as a component of the Mine closure objectives for listed activities, the following: • Recognising the need to secure the Blyde River catchment as the heart of a strategic water source area, the closure objective should be to return all the disturbed areas to a stable landform that is not subject to excessive erosion or subsequent invasion by invasive alien trees • Leave the surface area of the Morgenzon Forest Nature Reserve and the rehabilitated section of the 'Graskop Grasslands Unique Community' in at least a maintenance phase regarding the control of AIPs, with no seeding adult trees, and an invasive alien tree canopy coverage less than 1%, and a canopy cover of indigenous vegetation of at least 100%. The objective should be to leave a landscape that supports achieving the gazetted Resource Quality Objectives of the Blyde River.		
Aquatic Freshwater Study	It is therefore considered critical that should the proposed mining project be authorised, very strict adherence to cogent, well-developed mitigation measures must take place throughout	YES	Refer to Section 9.10.2

List Of Studies Undertaken	Recommendations Of Specialist Reports	Specialist Recommendations Included in EIA Report	Section of Report where Specialist Recommendations have been Included
SAS ANNEXURE N	the life of the project, with specific mention of planning, separation of clean and dirty water, management of potential decant, dewatering and sedimentation of the receiving environment as well as, during closure, rehabilitation of affected areas. Due to the likelihood that certain aspects of the proposed TGME mining project may potentially have moderate impacts on the receiving environment, extensive mitigation must be applied during the construction and operational phases of the project to ensure that no impact takes place beyond the surface infrastructure footprint. In this regard particular mention is made of the management of surface water and the dirty water area of the mine footprint. Strict monitoring throughout the life of the mine and post-closure would be required to ensure the ecological integrity and functioning of the freshwater ecosystems is retained in this sensitive drainage area, and monitoring data must be utilised to proactively manage any identified emerging issues. Thus, it is strongly recommended that during the detailed planning phase, the delineations of the freshwater ecosystems and their applicable zones of regulation be utilised in order to further optimise the layout of surface infrastructure, wherever possible, with particular mention of reducing encroachment on the 1:100 year floodline of the Blyde River to prevent impacts as far as possible. Further to this, it is strongly recommended that a suitably qualified freshwater ecologist must form part of the project management team to monitor and guide the construction, operational, rehabilitation and closure objectives of the mine. It is important to note that it is unlikely that, should further impacts to the Blyde River and its associated tributaries occur, that the river would have the potential to be restored to its original ecological state. Post-closure seepage and decant is likely to impact the water quality of the Blyde River for a long duration until water quality rebounds to natural conditions and it is likely that a number of sensitive species observed during the seasonal studies carried out may be lost. It is therefore considered critical that should the proposed mining project be authorised, very strict adherence to cogent, well-developed mitigation measures must take place throughout the life of the project, with specific mention of planning, separation of clean and dirty water, management of potential decant, dewatering and sedimentation of the receiving environment as well as, during closure, rehabilitation of affected areas. In addition,		13.3.5 13.5

List Of Studies Undertaken	Recommendations Of Specialist Reports	Specialist Recommendations Included in EIA Report	Section of Report where Specialist Recommendations have been Included
	it is deemed essential that immediate control of the illegal artisanal mining take place to prevent further significant impact. Based on the above, it is clear that certain aspects of the proposed project have the potential to impact upon the receiving freshwater environment throughout the life cycle of the project and into the post-closure phase of the proposed project without the responsible implementation of the mitigation hierarchy and exceptionally strict implementation of well-developed, cogent mitigation measures throughout all phases of the proposed project, some of which are highlighted in this report. Strong consideration must be given to comments from all other specialists who have prepared work for this WUL and EIA/EMPR		
Noise impact assessment **EnviroRoots (Pty) Ltd** **ANNEXURE P**	To ensure that the noise compliance is achieved under all circumstances, to minimise the potential of a disturbing noise, and to ensure compliance of the footprint boundary limits, to the following key mitigation options should be implemented at the mines: • Operational Phases – The developer must implement various management and design acoustical mitigation regarding their operations. The introduction of berms in key areas (or the use of stockpile slopes as berms) is a primary mitigation option to consider. The primary receptor to consider is receptor R3. • It is highly recommended that the TGME employee responsible for Environmental Management keep continuous communication with receptors regarding noises and potential loud noise events. Prior knowledge of a noise event will be far more ideal than a receptor who has not been notified of loud events. • A Bi-Annual noise measurements programme occurring twice a year is recommended during all phases. • Should the layout assessed in this report change, the new layout should be reviewed in terms of environmental acoustics. • Should the mine develop underground ventilation stacks (at surface level) within 1,000m of a receptor, this document be reviewed with the ventilation stacks assessed. • Existing municipal routes feature within the study area of which mining vehicles would have to use access the mine. If mining vehicles make use of these routes, the municipality should be aware that it may have the potential to change receptors Rating	YES	Refer to Section ANNEXURE P 13.3.8 13.5

List Of Studies Undertaken	Recommendations Of Specialist Reports	Specialist Recommendations Included in EIA Report	Section of Report where Specialist Recommendations have been Included
	levels up to 250m from the route(s). During the night-times, the mine should limit the use of haul routes past receptors R3 and R4. • With mitigation measures implemented the mine would comply to GN R154 legislation. In terms of noise the proposed project does not present a fatal flaw. IFC guidelines targets will also be achieved should mitigation be implemented. The project should be authorised in terms of noise, with mitigation measures adhered to.		
Visual Impact assessment **SAS** **ANNEXURE O**	Based on the impact assessment, it was determined that the 83MR Project will have a moderate visual impact on the receiving environment, even though it is situated within close proximity to the town of Pilgrim's Rest. With the proposed 83MR project areas located at the foothills and in disturbed areas, and the mountainous backdrop, the sensitive receptors present is not likely to experience significant visual intrusion. As evident from the viewshed analysis and confirmed during the field assessment, only small portions within the town of Pilgrim's Rest and small stretches along the R533 will observe portions of the proposed mining activities. Should the project be authorised to proceed, it is imperative that all mitigation measures as stipulated in this report be strictly adhered to. Said mitigation measures would need to comprise concurrent rehabilitation throughout the construction and operational phases and effective management of dust generation.	Yes	Refer to ANNEXURE O 13.3.7 13.5
Heritage and Palaeontology **Heritage Management and Benzai**	The following recommendations are made based on heritage sites within the TGME Mining Project areas that risk direct impact from the project activities: In the proposed Beta North Mining Area, a number of features of significance were noted. In many instances, these features are poorly preserved or destroyed but the sites are nonetheless intrinsically linked to the highly significant Pilgrim's Rest Mining legacy thus bearing high heritage value. In addition, the sites and features are older than 60 years and protected under the NHRA. The sites will be directly impacted on by the proposed project where the significance of the impact is essentially high. As the farm Ponieskrans is a declared Provincial Heritage site, retaining and conserving the sites would essentially be required but there remains little to conserve at most of the sites and uncontrolled destruction of the landscape by illegal miners is ongoing. For this reason, it is recommended that a	Yes	Refer to Sections ANNEXURE Q 13.3.9 13.5

List Of Studies Undertaken	Recommendations Of Specialist Reports	Specialist Recommendations Included in EIA Report	Section of Report where Specialist Recommendations have been Included
	comprehensive research-driven Phase 2 heritage mitigation plan is implemented to include all these sites, informed a robust research framework. The framework should determine the extent of the heritage horizons within the project areas and immediate surroundings, investigate the nature, extent and historical context of mining at each of the project sites,provide a description and interpretation of these mining sites within the context of the Pilgrim's Rest heritage landscape and the Ponieskrans Provincial Heritage Site values, and aim to preserve the historical fabric of the mining legacy at the project areas and in particular, development areas for the purposes of future research in the Pilgrim's Rest landscape. This process should include a detailed desktop assessment, reappraisal of previous publications and a literature study of sources on the Pilgrim's Rest area whereby robust research driven mitigation methodology based on current research themes is formulated. All features should be documented by means of systematic surveys, site mapping and the complete recording of all heritage resources in the project areas. This heritage mitigation plan should culminate in the publication of research findings. The mitigation plan should be undertaken subject to close liaison with the relevant heritage authorities and the process should include a comprehensive Public Participation and Social Engagement process whereby all relevant stakeholders (SAHRA, MP- PHRA, the SAHRA Built Environment Unit, TGME, Pilgrim's Rest Museum, the TCLM and others) are adequately consulted. Finally, destruction permits should be obtained from SAHRA after completion of the Phase 2 Mitigation Plan and prior to the alteration or destruction of heritage remains at the sites. For the burial site in the CDM Mining Area (NH-TGME-2430DC-19) it is primarily recommended that the burial site be conserved in situ and that a conservation buffer of at least 50m be implemented around the heritage receptor. The site should be fenced and an access gate should provide controlled access to the sites. A distance of at least 2m should be maintained between the grave and fence which should be at least 1,5m high. A clear signboard should be erected indicating the heritage sensitivity of the site and contact details for visitation of the graves should be provided. The sites should be monitored on a weekly basis during initial site clearing and earth moving activities by an EO familiar with the sensitivity of receptors, or the Heritage Consultant in order to detect any impact at the earliest opportunity. Should this measure prove unachievable, the graves should be		

List Of Studies Undertaken	Recommendations Of Specialist Reports	Specialist Recommendations Included in EIA Report	Section of Report where Specialist Recommendations have been Included
	relocated by a qualified archaeologist, and in accordance with relevant legislation, permitting, statutory permissions and subject to any local and regional provisions and laws and by-laws pertaining to human remains. A full social consultation process should occur in conjunction with the mitigation of cemeteries and burials (see Addendum 1). Generally, it is recommended that the PPP address the possibility of further graves occurring in the project area. It is further recommended that TGME engage the relevant heritage authority (SAHRA, SAHRA Built Environment Unit, MP-PHRA) with regards to the impact of the project on the Ponieskrans Provincial Heritage Site and proposed mitigation measures. A careful watching brief monitoring process is recommended whereby an informed EO inspect the construction site on regular basis in order to monitor possible impact on heritage resources. Should any previously undetected paleontological, archaeological or historical material, heritage resources, graves or human remains be exposed during construction activities, the operations in the affected area must be suspended and a qualified archaeologist be contacted for an assessment of the find. The mining landscape around the project areas holds countless traces of historical mining, settlement and industrial expansion. These include mining heritage remains associated with gold mining, many cemeteries and burial sites, mining settlement remains and the remains of individual historical period pioneer houses. In addition, the hills surrounding Pilgrim's Rest are littered with mine adits, ventilation shafts and underground drainage channels. The following recommendations are made based on the baseline environment around the 83MR project area that risk indirect impact from the project activities: • It is recommended that a Site Conservation Management Plan for heritage resources in the baseline be implemented. The plan should be developed in order to manage and conserved heritage resources in the landscape surrounding the project areas during construction and operation of the mines. The plan should include basic training for construction staff on possible heritage finds, chance find procedures and action steps for mitigation measures as well as communication routes to follow in the case of a discovery. It is recommended that key stakeholders such as the Pilgrim's Rest Museum be closely involved in the compilation and implementation of the management plan.		

List Of Studies Undertaken	Recommendations Of Specialist Reports	Specialist Recommendations Included in EIA Report	Section of Report where Specialist Recommendations have been Included
	• It would be advisable to conduct regular blast vibration monitoring during the initial stages of mining at the Beta North site to assess potential effects of blasting on the nearby rock art. This measure should include frequent site monitoring by a suitably qualified Rock Art Specialist. Should it be established that the site is deteriorating, or the adjacent geological feature is destabilizing due to mining activities the possibility of relocation of the rock art site must be considered and investigated. • Human burial sites are highly significant and sensitive heritage resources and every measure should be taken to avoid impact on these receptors. It is generally recommended that burial sites be conserved in situ and that conservation buffers of at least 50m be implemented around the heritage receptors. Where possible, sites should be fenced and access gates should provide controlled access to the sites. Clear signboards should be erected indicating the heritage sensitivity of the sites and contact details for visitation of the graves should be provided. Cemeteries and graves situated in close proximity pf proposed mining developments should be monitored on a frequent basis during initial site clearing and earth moving activities by an EO familiar with the sensitivity of receptors, or the Heritage Consultant in order to detect any impact at the earliest opportunity. Monthly monitoring of burial sites is recommended during operational stages of the development, the details of which should be stipulated in the Site Conservation Management Plan. The developer should carefully liaise with the heritage specialist and the SAHRA Burial Ground and Graves (BGG) Unit with regards to these recommended management measures. • It should be stated that it is likely that further undetected archaeological remains might occur elsewhere in the project landscape at archeological sites, along water sources and drainage lines, fountains and pans would often have attracted human activity in the past. Also, since Stone Age material seems to originate from below present soil surfaces in eroded areas, the larger landscape should be regarded as potentially sensitive in terms of possible subsurface deposits. Burials and historically significant structures dating to the Colonial Period occur on farms in the area and these resources should be avoided during all phases of construction and development, including the operational phases of the development. In terms of the Paleontological Landscape the following recommendations were made:		

List Of Studies Undertaken	Recommendations Of Specialist Reports	Specialist Recommendations Included in EIA Report	Section of Report where Specialist Recommendations have been Included
	• The EO for this project must be informed that the Palaeontological Sensitivity of the Timeball Hill Formation is High while that of the Malmani Subgroup (Transvaal Supergroup) is Very High. • If Palaeontological Heritage is uncovered during surface clearing and excavations the Chance find Protocol attached should be implemented immediately. Fossil discoveries ought to be protected and the EO/site manager must report to SAHRA (Contact details: SAHRA, 111 Harrington Street, Cape Town. PO Box 4637, Cape Town 8000, South Africa. Tel: 021 462 4502. Fax: +27 (0)21 462 4509. Web: www.sahra.org.za) so that mitigation (recording and collection) can be carried out. • Before any fossil material can be collected from the development site the specialist involved would need to apply for a collection permit from SAHRA. Fossil material must be housed in an official collection (museum or university), while all reports and fieldwork should meet the minimum standards for palaeontological impact studies proposed by SAHRA (2012).		
Socio – Economic **SED** **ANNEXURE R**	The proposed project is expected to have both positive and negative socio-economic impacts on the local environment. The most critical negative impacts that can be highlighted are: • The potential negative impacts associated with the construction phase are typical of general construction-related projects. These relate to the inflow of workers to the area, an inflow of jobseekers, impact on daily living and movement patterns of nearby residents (e.g. noise pollution, increased vehicle movement and so forth), as well as safety and security issues. • The inflow of workers to the different mining sites and subsequent intrusion impacts would mainly be felt by the residents of the northern areas such as Moremela, Leroro and Mathibidi, but even more so in Pilgrim's Rest, Schoonplaas/Newtown and Darks Gully. These settlements are in close proximity to the mining sites and activities.	Yes	Refer to Sections ANNEXURE R 13.3.10 13.5

List Of Studies Undertaken	Recommendations Of Specialist Reports	Specialist Recommendations Included in EIA Report	Section of Report where Specialist Recommendations have been Included
	• The inflow of jobseekers is difficult to mitigate and control, but it is expected that through proper communication on the recruitment methods and by the employment of local community members this impact can be mitigated to some extent. • The social impacts associated with an inflow of a workforce and jobseekers (temporary and permanent), however, also in nearby towns such as Pilgrim's Rest, and Graskop. In this regard, the impacts could be minimised should local residents be employed. • Development of the various mining sections and the associated change in the population profile will increase the pressure on the provision of infrastructure, especially housing, and services in the area. This could have further far-reaching impacts on the entire northern region of the study area, the town of Pilgrim's Rest, Schoonplaas/Newtown, and Darks Gully. The employment of locals must be pursued to mitigate this negative impact. • A Resettlement Action Plan needs to be developed for the Brown's Hill Community (approximately 10 permanent residents) and the proposed process and possible implications should be discussed with the residents of the Brown's Hill Community. • The proposed project could result in illegal mining extending to other areas. It is unlikely that illegal mining in the area would be successfully halted, but through the proposed project it should be aimed to minimise illegal mining as far as possible. • The mining project should be to the benefit of the overall community and not only for select individuals. The implementation of social services support and LED programmes should thus take this requirement into consideration. • The socio-economic development programmes and efforts should aim to establish an additional employment sector, create food security, develop infrastructure and even provide support to agricultural projects.		

List Of Studies Undertaken	Recommendations Of Specialist Reports	Specialist Recommendations Included in EIA Report	Section of Report where Specialist Recommendations have been Included
	In conclusion, the proposed Project is in line with development priorities to support the mining sector in the district and province. The project should also be considered within the broader context of the negative economic impacts of the COVID-19 pandemic and the slow recovery anticipated for the South African economy. In this context, the proposed project will make a significant positive contribution to providing much needed employment opportunities and tax income, not only for the local but also for the larger regional and national economy. Based on the findings of the socio-economic impact assessment for the project it is therefore recommended that the proposed Project be approved.		
Traffic Impact Assesment **Infratrans** **ANNEXURE S**	Seeing as no traffic challenges or congestion are expected as a result of the project activities no mitigation measures are required. It is, however, recommended that the access positioning and configuration to the subject mines be implemented as per the report. It is also recommended that all access areas should be treated as construction areas for both the construction and production phases with all associated road signs installed in accordance with the relevant requirements of the Mpumalanga Province's DPWRT.	YES	Refer to Sections 0 13.5
Blasting and Vibration **Blast Management and Consulting (PTY) LTD** **ANNEXURE T**	Review of the surface areas indicated no private houses or installations within the radius on surface considered. One POI was identified as a ruin at the CDM north shaft. This ruin is part of the old mining infrastructure at this shaft. It is expected to be of low value. Ground vibrations predicted for the blasting operations were relatively low. Levels predicted ranged between 36.8 mm/s at 50 m and 3.8 mm/s at 200 m from the shafts footprints. These levels are considered acceptable and the absence of any infrastructure of concern within these ranges indicates no specific influence from blasting ground vibrations outside of the actual mines. No specific mitigations are required for management of ground vibration. There is no concern for influence from underground blasting operations on the immediate surface areas.	YES	Refer to Sections 13.3.12 13.5

18 ENVIRONMENTAL IMPACT STATEMENT

18.1 SUMMARY OF THE KEY FINDINGS OF THE ENVIRONMENTAL IMPACT ASSESSMENT

The impacts evident from the detailed impact assessment are included in Section 13.4.

18.2 FINAL SITE MAP

A layout map is included in ANNEXURE D.

18.3 SUMMARY OF THE POSITIVE AND NEGATIVE IMPLICATIONS AND RISKS OF THE PROPOSED ACTIVITY AND IDENTIFIED ALTERNATIVES

Refer to Section 13. .

18.4 PROPOSED IMPACT MANAGEMENT OUTCOMES FOR INCLUSION IN THE EMPR;

The management measures and specialist recommendations referred to should form part of the EMPrs well as for inclusion as conditions of authorisation.

1 Specialist recommendations which could be included as conditions have been discussed in Table 67.
2 Specialist management measures as well as the significance of the impacts prior and post mitigation are provided in Section 13 and contained in the respective studies.

19 FINAL PROPOSED ALTERNATIVES

The alternatives have been addressed in section 0.

The final alternatives have been specified and include the following:

- Mining to be the preferred continued landuse
- Layouts as presented in Section 4 are preferred
- Eskom and generator power to be utilized

20 ASPECTS FOR INCLUSION AS CONDITIONS OF AUTHORISATION

The Mitigation measures as specified within the EMPr are to be included in the EA. In addition the condition of continued mining should be included in the EA.

The following measures are proposed as a fundamental part of the conditions that should be imposed on TGME for the right to continue mining in a nature reserve and to operate in the listed Malmani Karstlands ecosystem and the Blyde River Catchment Freshwater Ecosystem Priority Area and class 1 Water Resource. They are not necessarily exclusive or meant to displace any other required mitigation and are designed to address the primary bio- and geo-physical threats to ecosystem integrity and function.

20.1 REMOVAL OF LEGACY INFRASTRUCTURE & AMELIORATION OF HISTORICAL IMPACTS

As a commitment to addressing legacy impacts, and pursuing good corporate stewardship in and around the addition to Morgenzon Forest Nature Reserve, TGME should:

- Control all AIPs within 1km of the existing mining operations that it intends to continue mining on under 83MR, including Frankfort, Clewer-Dukes Hill – Morgenzon mine complex, Beta Mine complex, as well as within 1km of the Processing plant, as per Diagram 1.
- Where appropriate and legally permissible, rework and reshape the existing mining waste rock dumps and tailings deposits at the above mining operations, with a view to returning the waste rock underground, to leave the landforms and Peach Tree Stream in a stable state that permits the continued functioning of natural geomorphological processes.
- Where appropriate and legally permissible, remove and repurpose all redundant, broken, and unusable mining infrastructure from the above mining operations.
- Rehabilitate, subject to any required licences or permits, the existing river crossings on the Blyde River and Peach Tree stream.
- Incorporate the above activities into the mine closure objectives, plan, and reports, subject to compliance with rehabilitation and closure laws.

20.2 REHABILITATION OF PROSPECTING ROADS AT IOTA & THETA

TGME should, in addition to the revegetation of currently alien infested land

- Repair and rehabilitate as far as technically feasible all the prospecting and access roads constructed on the Iota and Theta hills. The objective of this rehabilitation is to restore the natural landform to substantially replicate what existed prior to this disturbance, to prevent soil erosion, to inhibit the establishment of alien and invasive species, and to allow the natural regeneration of indigenous biodiversity.
- Revegetate the disturbed areas with a suitable mix of indigenous species as approved by the MTPA.

20.3 DELINEATION & MANAGEMENT PLAN OF ADDITION TO MORGENZON FOREST NATURE RESERVE

TGME should:

Provide technical assistance as may be required, to the statutory entity responsible for the Morgenzon Forest Nature Reserve, to effectively delineate its current and future intended mining operations, provide for any other zonation required, and to draft a Management Plan for the effective management and rehabilitation of the Forest Nature Reserve.

20.4 IMPLEMENTATION OF THE COMPENSATION PROGRAMME

As a requirement of the Ecological Compensation Report in the EIA process, the following must be included as specific conditions of authorisation. To comply with required mitigation and their commitment to good corporate stewardship in the Blyde Catchment, TGME must:

- Within 6 (six) months of issue of the final regulatory approval for the listed activities, commence implementation of a comprehensive Ecological Compensation Programme, aimed at rehabilitating the ecological and hydrological functioning of parts of the upper portions of the Blyde River Catchment (in quaternary catchments B60A and B60B), and replenishing the licenced abstraction volume as provided for under N permit reference 1351N or any subsequent licence issued under Section 21(a) of the NWA (Act 36 of 1998) (such replenishment being not less than 300 000m3 per year) by inter alia funding the planning, coordination and implementation of AIPs control efforts, revegetation, and fire belt implementation, as set out in the Ecological Compensation Programme (set out in more detail below);
    - Provide, to an appropriate organisation with the requisite expertise and experience related to developing, assessing, and releasing biocontrol agents, to pursue the development, release and augmentation of an effective destructive biological control agent for Silver Wattle (Acacia dealbata).

  - Control at least 273 condensed hectares (an area equivalent to 100% dense infestation) of invasive alien trees located within and immediately adjacent to the Farms Ponieskrans 543 KT, Morgenzon 525 KT, Peach Tree 544 KT, Grootfontein 562 KT in and around the addition to Morgenzon Forest Nature Reserve (FNR), and Graskop 564 KT (portion 25) and Desire 563 KT (designated as the Graskop Grasslands Unique Natural Community and managed by MTPA), and the immediate surrounding land parcels. This control must be to a level of no seeding adult trees, and an AIPs canopy coverage less than 1%, within 7 years of issue of the final regulatory approval for the listed activities subject to this authorisation.
  - Control, through regular and repeated reconnaissance and control measures, all invasive alien trees within the riparian Zone of the Blyde River, from the applicant's water offtake point on the Farm Grootfontein 562 KT, down to the boundary of the Provincial Blyde River Canyon Nature Reserve at Bourke's Luck Potholes. Where there is doubt as to the boundary of the riparian zone, it can be defined as the land within 100m of the centre line of the Blyde River.
  - Implement annually at least 11km of a fire belt and a related control measures program, in conjunction with affected adjacent landowners, MTPA and the Lowveld Escarpment Fire Protection Association, on the 2021 addition to Morgenzon FNR and the Graskop Grasslands Unique Natural Community. Where required in writing to do so by a statutory management authority, the applicant must as far as reasonably possible support fire suppression and/or controlled burning regimes through the provision of labour, equipment, and in-kind support on these areas.
  - Implement erosion and sediment control operations on all areas (at least 370 ha) cleared of invasive alien trees and other susceptible areas, by revegetating all cleared areas with indigenous plant species (especially grasses native to the region) to the level of a cover of at least 15% within 10 years, with the objective of removing unnatural levels of sediment input into the Blyde River system.
- TGME must use its best endeavours to, within 6 (six) months of the date of authorisation, conclude an implementation agreement with a suitable service provider that has experience and expertise in invasive alien tree control and ecological rehabilitation in the region, preferably including statutory nature reserves. This implementation agreement shall cover, amongst other things set out in any applicable statutory guideline, the following:
  - the objectives and specific targets for the Ecological Compensation Program set out herein (and provided in more detail in the Report on "Ecological Compensation in the Blyde River Headwaters" by Mark Botha dated 13 April 2022)
  - clearly defined areas for control and rehabilitation, and time frames and milestones for achieving the required ecological compensation targets (including the biocontrol program), and a detailed activity plan that must be submitted to the Regional Office of the Natural Resource Management Program of the DFFE, the Head: Water Regulation in the regional office of the DWS, and the Director for Conservation: MTPA
  - institutional arrangements for implementation, monitoring, auditing, oversight, alignment, and coordination with other relevant parties,
  - provisions for managing breach, rectification, withdrawal, arbitration, and penalties
  - financial arrangements for the investment of an amount of not less than R58,3 million (fifty-eight comma three million rand), being the estimated amount of operational costs necessary for delivering the ecological compensation over the planned 11-year Compensation Program, and financial guarantees for this amount in favour of the implementing agent.
- TGME shall notify this office, and the DFFE, DWS and MTPA of:
  - Conclusion of the implementation agreement and financial guarantee provision;
  - progress with implementation at least annually, especially regarding the measurement of replenishment and sediment reduction objectives;

  - the emergence of any issues frustrating implementation that may require authorities' action, intervention, and/or enforcement functions;
  - the outcomes of all independent audit reports;
  - the successful completion of the Ecological Compensation Program.
- This authorisation shall be of no force and effect until such time as the Implementation Agreement is concluded with a suitable party, and the financial guarantee or other arrangements acceptable to the implementing party is in place, and both agreement and guarantee submitted to this office, DWS, DFFE and MTPA.

20.5 MINE CLOSURE OBJECTIVES

If not already effectively incorporated in mine rehabilitation and closure plans, TGME shall include, as a component of the Mine closure objectives for listed activities, the following:

- Recognising the need to secure the Blyde River catchment as the heart of a strategic water source area, the closure objective should be to return all the disturbed areas to a stable landform that is not subject to excessive erosion or subsequent invasion by invasive alien trees.
- Leave the surface area of the Morgenzon Forest Nature Reserve and the rehabilitated section of the 'Graskop Grasslands Unique Community' in at least a maintenance phase regarding the control of AIPs, with no seeding adult trees, and an invasive alien tree canopy coverage less than 1%, and a canopy cover of indigenous vegetation of at least 100%. The objective should be to leave a landscape that supports achieving the gazetted Resource Quality Objectives of the Blyde River.

21 DESCRIPTION OF ANY ASSUMPTIONS, UNCERTAINTIES AND GAPS IN KNOWLEDGE

OMI Solutions has exercised due care in reviewing the information supplied by TGME. Whilst OMI Solutions has compared key data with expected values, the accuracy of the results and conclusions from the review are entirely reliant on the accuracy and completeness of the data supplied by TGME.

Opinions presented in this report apply to the information about the project site and the proposed project as it existed at the time of OMI Solutions investigations, and those reasonably foreseeable. These opinions do not necessarily apply to conditions and features that may arise after the date of this report, about which OMI Solutions had no prior knowledge nor had the opportunity to evaluate.

All the data and information supplied to OMI Solutions is assumed to be accurate and reflective of the current condition of the focus area. It is assumed that the baseline information was scrutinised and used to explain the environmental profile is accurate.

The public involvement process has been sufficiently effective in identifying perceived stakeholder issues and has been addressed in the EIA / EMPr by the EAP. The public involvement process has sought to involve key stakeholders and individual landowners.

The information requested and the comments raised by I&APs during the initial Scoping Report phase has, wherever possible, been sufficiently addressed and incorporated into the EIA and EMPr that will be submitted to the DMRE.

The assumptions, uncertainties and gaps will be discussed per discipline for the various specialist inputs:

21.1 AIR QUALITY

The main assumptions, exclusions and limitations are summarized below:

- Baseline characterisation:

- In the absence of on-site meteorological data, use was made of South African Weather Service (SAWS) meteorological data for Graskop for the period 2016-2018. The station is located approximately 9.5 km to the east of Beta Project area. The data is regarded representative of the site's dispersion potential and comply with the Regulations regarding Air Dispersion Modelling were promulgated in Government Gazette No. 37804 vol. 589; 11 July 2014 (Republic of South Africa, 2014).
- No ambient air quality data aside from the on-site dustfall network is available to determine the baseline air quality in the region. The dustfall network is also limited to the TSF only, with no dustfall collected at the mining sites.
- The impact assessment is limited to the project and process information and descriptions provided.
- In the identification of AQSR use was made of the Google maps and observations made during the site visit which was conducted on the 4th and 5th of October 2021.

- Impact assessment:
  - The impact assessment was limited to the pollutants of concern. Some of these pollutants are regulated under NAAQS and considered key pollutants released by the operations associated with the future operations.
  - The quantification of sources of emission was restricted to the TGME future operations. Other existing sources of emission within the area including farming activities, domestic fires, biomass burning, vehicle exhaust emissions and dust entrained by vehicles on public roads are not included as part of the emissions inventory and simulations. Without detailed data on other regional operations and activities (when this project will be operational) cumulative assessment is not possible.
  - Construction operations has their own duration and potential for dust generation and it is therefore often necessary to estimate area wide construction emissions, without regard to the actual plans of any individual construction process. Quantified construction emissions are usually lower than operational phase emissions and due to their temporary nature and duration, and the likelihood that these activities will not occur concurrently at all portions of the site; dispersion simulation was not undertaken for construction emissions.
  - Nitrogen monoxide (NO) emissions are rapidly converted in the atmosphere into nitrogen dioxide (NO_2). Since the maximum NOx concentrations were lower than the NAAQS for NO_2, it was conservatively assumed that all NOx is converted to NO_2.
  - The health risk assessment is limited to the screening of ambient air concentrations against NAAQS and applicable international legal guidelines and limits and does not include a detailed human health risk assessment. Human health risk can occur due to exposures through inhalation, ingestion, and dermal contact. The scope of the study was confined to the quantification of impacts due to exposures via the inhalation pathway only.
  - A human health risk and nuisance and environmental impact screening assessment for the operational phase was based on dispersion simulation results.
  - Closure and post closure operations were assessed qualitatively.

21.2 SOIL AND LANDUSE

For the purpose of this assessment, the following assumptions and limitations are applicable:

- The soil survey conducted as part of the land capability assessment was confined within the 83MR project areas and the 50 m zone of influence, which is considered adequate for the purpose of this investigation;

- It is virtually impossible to achieve 100% purity in soil mapping, thus the delineated soil map units could include other soil type(s) as the boundaries between the mapped soils are not absolute but rather form a continuum and gradually change from one type to another.
- Soil mapping on this report was undertaken at a high level, and the findings of this assessment were therefore inferred from extrapolations from individual observation points. The data collected is however deemed sufficient to support informed decision making; and
- Since soils occur in a continuum with infinite variances, it is often problematic to classify any given soils as one form, or another. For this reason, the classifications presented in this report are based on the "best fit" to the soil classification system of South Africa.

21.3 GEOHYDROLOGICAL

The following conditions typically need to be described in a model:

- Geological and geohydrological features.
- Boundary conditions of the study area (based on the geology and geohydrology).
- Initial groundwater levels of the study area.
- The processes governing groundwater flow.
- Assumptions for the selection of the most appropriate numerical code.

Field data is essential in solving the conditions listed above and developing the numerical model into a site-specific groundwater model. Specific assumptions related to the available field data include:

- The top of the aquifer is represented by the generated groundwater heads.
- The available geological / geohydrological information was used to describe the different aquifers. The available information on the geology and field tests is considered as correct.
- Many aquifer parameters have not been determined in the field and therefore had to be estimated.

To develop a model of an aquifer system certain assumptions must be made. The following assumptions were made:

- The system is initially in equilibrium and therefore in steady state even though natural conditions may have been disturbed.
- No abstraction boreholes were included in the initial model.
- The boundary conditions assigned to the model are considered correct.
- The impacts of other activities (e.g. agriculture) have not been considered.

It is important to note that a numerical groundwater model is a representation of the real system. It is therefore at most an approximation and the level of accuracy depends on the quality of the data that is available. This implies that there are always errors associated with groundwater models due to uncertainty in the data and the capability of numerical methods to describe natural physical processes.

21.4 TERRESTRIAL ECOLOGY

The following assumptions and limitations are applicable to the desktop assessment report:

- The biodiversity desktop assessment is confined to the 83MR project areas and does not include detailed results of the adjacent properties, although ecological important or sensitive areas according to the desktop databases of surrounding areas and the greater project area have been included on the relevant maps; and
- It is important to note that although all data sources used provide useful and often verifiable, high-quality data, the various databases used do not always provide an entirely accurate indication of the actual site characteristics within the 83MR project areas at the scale required to inform an

environmental process. However, this information is useful as background information to the study and is important in legislative contextualisation of risk and impact and was used as a guideline to inform the assessment and to focus on areas and aspects of increased conservation importance. It must, however, be noted that site assessment of key areas may potentially contradict the information contained in the relevant databases, in which case the site verified information must carry more weight in the decision-making process.

The following assumptions and limitations are applicable to the flora assessment report:

The floral assessment is confined to the 83MR project areas, which includes a pre-defined 20-50 m buffer around the proposed activities. The immediate surroundings were, however, not part of the floral assessment but were included in the desktop analysis of which the results are presented in Part A desktop report.

- Sampling by its nature means that not all individuals are assessed and identified. With ecology being dynamic and complex, some aspects (some of which may be important) may have been overlooked.
- Several field assessments were undertaken to determine the ecological status of the 83MR areas and to “ground-truth” the results of the updated desktop databases:
    - Site screening (high-level assessments of Beta North, Morgenzon and Frankfort): 19th – 22nd April 2021;
    - Site screening (high-level assessment of Dukes): 27th – 28th October 2021; and
    - Comprehensive Site Assessments (all 83MRAreas): 17th – 19th February 2022.

- The field assessment thus spanned several seasons and mostly falls within the recommended season (November to February) for vegetation assessments as per the MTPA recommended minimum requirements for assessing and mitigating environmental impacts. A more comprehensive assessment would require that more than one assessment take place and that these assessments occur across all seasons of the year. However, data was augmented by desktop research and project experience in the area and the findings of this report are considered an accurate depiction of the floral ecology of the 83MR areas; and
- Some floral SCC identities will not be made known in this report, although their potential to occur on site will still be assessed. As per the best practice guideline that accompanies the SANBI protocol and Screening Tool, the name of the sensitive species may not appear in the final Environmental Impact Assessment (EIA) report nor any of the specialist reports released into the public domain. It will be referred to as sensitive plants, and its threat status included, e.g., critically endangered sensitive plant.

The following assumptions and limitations are applicable to the fauna assessment report:

This faunal assessment is confined to the 83MR areas and allocated buffers (20 m for linear and 50 m for non-linear infrastructure) as guided by the layouts provided by the mine;

- With ecology being dynamic and complex and the habits of many faunal species, some aspects (some of which may be important) may have been overlooked. It is, however, expected that most faunal communities have been accurately assessed and considered and the information provided is considered sufficient to allow informed decision making to take place and facilitate integrated environmental management.
- Due to the nature and habits of many faunal taxa, the high level of surrounding anthropogenic activities, it is unlikely that all species or classes would have been observed during a field assessment of limited duration. Furthermore, time constraints and security risks prevented employment of sherman and camera traps. Therefore, site observations were compared with literature studies where necessary; and

- Several field assessments were undertaken to determine the ecological status of the 83MR project areas and to "ground-truth" the results of the updated desktop databases. These included 1) site screening as part of the pre-feasibility assessment (high level assessments of Beta, Morgenzon and Frankfort) from the 19th – 22nd April 2021, 2) site screening as part of the pre-feasibility assessment (high level assessment of Dukes) from the 27th – 28th October 2021, and 3) a comprehensive site assessment as part of the EIA phase studies (all 83MRAreas): 17th – 19th January 2022. A more comprehensive assessment would require that assessments take place in all seasons of the year, notably during the rainy season when insect abundances drastically increase, and a better understanding of forage potential can be determined. However, on-site data was significantly augmented with all available desktop data and specialist experience in the area.

21.5 AQUATIC ECOLOGY

The following points serve to indicate the assumptions and limitations with regard to the freshwater and aquatic assessment:

- Determination of Boundaries: The determination of the freshwater ecosystem boundaries and the assessment thereof, is confined to the 83MR areas. All freshwater ecosystems identified within 500m of the 83MR project areas were delineated in fulfilment of the requirements of GN509 of the NWA using various desktop methods including use of topographic maps, historical and current digital satellite imagery and aerial photographs. These freshwater ecosystems were not assessed except where they were located downgradient of 83MR project areas and may therefore be impacted upon by the proposed activities. The general surroundings were, however, considered in the desktop assessment of the 83MR areas;
- Global Positioning System (GPS) technology: GPS technology is inherently inaccurate and some inaccuracies due to the use of handheld GPS instrumentation may occur. If more accurate assessments are required the freshwater ecosystems will need to be surveyed and pegged according to surveying principles and with survey equipment;
- Transitional Areas: Wetland, riparian and terrestrial zones create transitional areas where an ecotone is formed as vegetation species change from terrestrial to obligate/facultative species. Within this transition zone, some variation of opinion on the freshwater ecosystem boundary may occur. However, if the DWAF (2008) method is followed, all assessors should get largely similar results;
- Reference conditions are unknown: Considering historical and existing mining activities in the larger catchment, the composition of aquatic biota in the 83MR areas, prior to disturbance associated with approximately a century of mining activity as well as the associated settlement of people in the area, is unknown. The majority of aquatic resources associated with the 83MR areas are subject to plantations, extensively utilised for forestry (Eucalyptus spp. and Pinus spp.). These forestry disturbances have been in place for decades and current plantations are evident on digital satellite imagery. For this reason, reference conditions are hypothetical, and are based on professional judgement and/or inferred from limited data available such as the Department of Water and Sanitation (DWS) Resource Quality Information Services (RQIS) PES/EIS database.
- Temporal variability: The data presented in this report is based predominantly on two site visits undertaken during October 2021 and January 2022, however, where historical data was available, this was used to draw temporal comparisons. The effects of natural seasonal and long-term variation in the ecological conditions and aquatic biota found in the streams are, therefore, unknown at the time of writing this report. Ideally aquatic assessments should be undertaken, as a minimum, in the summer/high flow and winter/low flow seasons, to account for and define seasonal variability. However, consideration was given to local data on the DWS RQIS PES/EIS database, the outcome of aquatic biomonitoring assessments undertaken by Clean Stream Biological Services (Pty) Ltd (2021) (hereafter "Clean Stream"). Said information assists in understanding variability in the system and thus ensures that observations and discussions on impacts are adequately understood to inform this study. During the January 2022 assessment, rainfall received in the area prior to and during the site visit

resulted in very high flows particularly within the Blyde River. Assessment of aquatic biota was therefore not undertaken at the time due to drowning risk;

- Ecological assessment timing: Aquatic ecosystems are dynamic and complex. It is possible that aspects, some of which may be important, could have been overlooked. A reliable assessment of the biota would require seasonal sampling, with sampling being undertaken under both low flow and high flow conditions (also see previous point, “Temporal variability”). Due to the nature of the aquatic systems, the observations made in this study are deemed adequate to: a) provide the information required to define the risk to the aquatic ecosystem, and b) to ensure that sufficient insight into management and mitigation measures is provided, to allow adequate protection and maintain the PES of the system;
- Accessibility: Due to access constraints relating to terrain and personal safety concerns particularly within the Dukes 83MR project area, limitations were experienced in representative site selection as well as the verification of the extent and characteristics of some sections of some freshwater ecosystems. Due to the limitations, some aspects of the aquatic ecology of the 83MR project areas, some of which may be important, may have been overlooked (also see previous point, “Ecological assessment timing”). However, based on the available desktop assessment reference and assessment results, the data presented herein are deemed adequate to provide the required level of understanding of the systems for the study. Furthermore, limitations were experienced in accessing the full extent of some freshwater ecosystems within the 83MR project areas and 500m thereof during the site visits. Therefore, some delineations were undertaken utilising historical and current digital satellite imagery and relevant topographic maps. Where field verification was feasible, the desktop delineations proved to be accurate, and the delineations as presented in this report are thus regarded as a best estimate of the riparian zone boundaries based on the site conditions present at the time of assessment;
- Differences in methods of assessment: The methods of assessment utilised for the purposes of this study may differ marginally from those utilised by Clean Stream (2021), in particular, the Index of habitat integrity which is applied to ascertain the instream and riparian habitat integrity of the rivers. For the purposes of the bi-annual biomonitoring assessments, Clean Stream (2021) utilise a modified version of the IHI based on the procedures developed by Kleynhans and Lous (2006) whilst SAS has applied the method described by Kleynhans, Louw and Graham (2008). Thus, any differences pertaining to the PES category between the biomonitoring assessments (Clean Stream, 2021) and this assessment undertaken by SAS, are due to differences in the method and not the result of inconsistent application of the method; and
- Risk Assessment Matrix: The risk assessment was undertaken based on available information pertaining to the proposed surface infrastructure areas, which indicates that the proposed surface infrastructure will be placed within sensitive areas, although it is acknowledged that the footprints have been optimised through a series of workshops. Thus, when undertaking the risk assessment, the principles enshrined in the relevant South African legislation and advocated by the DEA et al (2013), the precautionary principle was followed and a “worst case scenario” was considered.

21.6 NOISE ASSESSMENT

There are limitations and uncertainties regarding acoustical measurements. Noise levels have the potential to fluctuate based on numerous components, including:

- The noise level may change from day to day due to activities within a community (e.g. road traffic fluctuations, see point below) or even at a singular dwelling itself. Dwelling related infrastructure (e.g. air-conditioning units, swimming pool pumps etc.) that has the potential to influence noise levels in terms of dB.
- Seasonal changes have the potential to influence sound levels directly (e.g. rain) or indirectly (influence from faunal communication, see point below). Faunal communication measurement fluctuations due to seasonal, time of day or night etc. Certain fauna communicates during certain hours e.g. cicada may only audible during night hours, crepuscular birds are only audible during evening or night hours, crickets may be more audible active as seasons get hotter etc.

- Measurements near mining and industries fluctuates depending on equipment in use, capacity load in use, unforeseen equipment in care and maintenance. Certain equipment may not be running optimally, with the consequence been excessive elevated noise levels (e.g. gas leaks, conveyor pulley roller squeaking, excessive vibrations (and associated noise) from unmaintained dampers on equipment etc.
- Road traffic noise fluctuates due to time of measurement investigation (e.g. peak traffic morning or evening conditions, early morning hours etc.; and
- Metrological conditions can influence noise measurements. These include inversion and diffraction in the temperature layer, change in temperature and humidity etc.
- Where necessary longer-term measurements may be required to be conducted. For a Rating level determination, 10-minute measurements (day and night), desktop assessment (of development of the area) as well as onsite investigations can be considered sufficient. For a noise source investigation (e.g. operational monitoring) longer-term measurements may counter above limitations (if confidence in 10-minute measurements is low).

The assessment of the noise impact of the site on the surrounding receptors is based on a worst-case approach. The simulation conditions and variables were configured as follows:

- The noise point sources were positioned at approximate geometric centre of mass of the equipment above the ground plane (DGM in SoundPLAN) and approximate altitudes (e.g. rooftop condenser units). If the noise sources are situated closer to the ground, the impact may be less than if the sources are raised higher off the ground.
- The ground effect was considered by modelling the ground at each site with a sound absorption coefficient of 0.75 across mid-high frequencies. This approximation was made considering that the Concawe method suggests a fully absorptive (absorption coefficient of ‘1’) characteristic for ground that consists of dense vegetation, with moist conditions. At the other end of the spectrum (‘0’), a reflective characteristic is suggested where hard surfaces and minimal vegetation exist with dry conditions.
- To simulate the worst-case condition when low atmospheric sound absorption can be expected (for low to mid frequencies), the following parameters were used in the simulations: air temperature of 20ºC; atmospheric pressure of 1013.25 mbar and humidity of 80 %.
- Dynamic factors such as meteorological conditions, which include wind velocity, temperature inversion and clouds, have not been considered in the simulations. Static calculations are presented only.
- Under temperature inversion conditions, sound propagation can extend much further afield. This condition is however difficult to cater for due to the number of variables and was not factored in during the simulation. An increase of up to 6 dBA from the predicted noise levels could result due to such conditions.
- The ground was modelled with elevation contours of 50 m intervals. These intervals provide sufficient detail over the distances encountered for modelling purposes.
- The presented noise contours are only one scenario based on an over engineered principal of the maximum capacity of the project. The contours will not be applicable during all times and is only a tool to assist with the potential worst-case impact assessment.
- SPL sourced for the modelled scenario made use of online resources, no measurements were conducted to determine the SPL of equipment.
- SPL used will likely represent a worst-case maximum output from the loudest point on the equipment (i.e., an exhaust port from a FEL) at maximum full load capacity. As such the modelled noise sources are a worst-case scenario for each piece of equipment; and
- Many models consider noise contours in a hemispherical fashion. Noise sources can be directional e.g., speakers or exhaust ports.

21.7 VISUAL ASSESSMENT

- No specific national legal requirements for VIAs currently exist in South Africa. The assessment of visual impacts is required by implication when the provisions of relevant legislation governing environmental management are considered and when certain characteristics of either the receiving environment or the proposed project indicate that visibility and aesthetics are likely to be significant issues and that visual input is required (Oberholzer, 2005);

- Due to a lack of visual impact assessment guidelines within the Mpumalanga Province, the “Guidelines for Involving Visual and Aesthetic Specialists in the EIA Process” (Oberholzer, 2005), prepared for the Western Cape Department of Environmental Affairs & Development Planning, was used;
- All information relating to the proposed project as referred to in this report is assumed to be the latest available information. Additionally, best practice guidelines were taken into consideration and utilising the maximum expected heights of the infrastructure and the placement thereof in viewshed calculations as a precautionary approach; and abstract or qualitative aspects of the environment and the intangible value of elements of visual and aesthetic significance are difficult to measure or quantify and as such depend to some degree on subjective judgments. It is therefore necessary to differentiate between aspects that involve a degree of subjective opinion and those that are more objective and quantifiable. (Oberholzer, 2005)
- The viewsheds resulting from the DEM and as illustrated in this report, indicate the areas from which the proposed project is likely to be visible and does not take local vegetation cover and man-made structures into account. Potential sensitive receptor sites, indicated to fall within the viewsheds have been ground truthed during the field assessment; and
- The Impact Assessment used is not specific to visual resource management. Some limitations in the accuracy of the description of impacts thus occur due to the inherent characteristics of the impact assessment supplied by the EAP and it is the opinion of the specialists that in some instances the impacts are over or underestimated.

21.8 HERITAGE ASSESSMENT

- The study areas are accessed via a number of regional roads connecting to the R533 Road to Pilgrim’s Rest. Access control is applied to some of the project areas but the consultant moved around in a group accompanied by TGME personnel and no access restrictions onto the sites were encountered during the site visit. Portions of the project areas are densely vegetated which constrained movement on some of the sites.
- The project areas are current mined by large numbers of illegal miners, some of whom are armed and aggressive. Safety proved to be a major concern and the consultant moved around in a group accompanied by TGME personnel and private security companies. This proved to me a constraint in terms of free-movement on the sites.
- The surrounding vegetation in the project area mostly comprised out of forests, pockets of pioneering species and mixed grasslands. The general visibility at the time of the HIA survey (October 2021) ranged from moderate along the exiting footpaths and agricultural fields, to low in densely overgrown areas. In single cases during the survey sub-surface inspection was possible.

21.9 PALAEONTOLOGIC ASSESSMENT

- The focal point of geological maps is the geology of the area, and the sheet explanations were not meant to focus on palaeontological heritage. Many inaccessible regions of South Africa have never been reviewed by palaeontologists and data is generally based on aerial photographs alone. Locality and geological information of museums and universities databases have not been kept up to date or data collected in the past have not always been accurately documented.
- Comparable Assemblage Zones in other areas is sourced to provide information on the existence of fossils in an area which was not documented in the past. When using similar Assemblage Zones and geological formations for Desktop studies it is generally assumed that exposed fossil heritage is present within the footprint. A field-assessment that will improve the accuracy of the desktop assessment was thus conducted.

21.10 TRAFFIC ASSESSMENT

To determine the traffic impact during construction the following construction activity assumptions are made (based on estimates sourced from TGME):

- Frankfort: A maximum of ten 25-ton trucks will travel to and from the site daily (both directions). Assuming a ten-hour construction day, this yields one truck per hour in both directions. Assuming a further three management/labour-based trips per hour this yields a total hourly trip generation rate of four trips per direction. This is expected to be true during the weekday AM and PM peak hours;
- CDM (Morgenzon & Dukes): A maximum of ten 25-ton trucks will travel to and from the site daily (both directions). Assuming a ten-hour construction day, this yields one truck per hour in both directions. Assuming a further three management/labour based trips per hour this yields a total hourly trip generation rate of four trips per direction. This is expected to be true during the weekday AM and PM peak hours, and
- Beta: A maximum of ten 25-ton trucks will travel to and from the site daily (both directions). Assuming a ten-hour construction day, this yields one truck per hour in both directions. Assuming a further three management/labour-based trips per hour this yields a total hourly trip generation rate of four trips per direction. This is expected to be true during the weekday AM and PM peak hours.

To determine the traffic impact during the production phase the following production activity assumptions are made (based on estimates sourced from TGME):

- Frankfort: A maximum of 30 25-ton trucks will travel to and from the site daily (both directions, between the site and the processing plant at the TGME area). Assuming a ten-hour production day, this yields three trucks per hour in both directions. Assuming a further three management/labour-based trips per hour this yields a total hourly trip generation rate of six trips per direction. This is expected to be true during the weekday AM and PM peak hours;
- CDM (Morgenzon & Dukes): A maximum of 30 25-ton trucks will travel to and from the site daily (both directions, between the site and the processing plant at the TGME project area). Assuming a ten-hour production day, this yields three trucks per hour in both directions. Assuming a further three management/labour-based trips per hour this yields a total hourly trip generation rate of six trips per direction. This is expected to be true during the weekday AM and PM peak hours, and
- Beta: The Beta area is not expected to generate external trips as the mining material mined at the Beta shafts will be transported internally to the processing plant in the TGME area. However, the TGME area will receive the trips generated by the Frankfort, Morgenzon and Dukes mines. Therefore, a total of 12 hourly trips is expected to enter and exit the TGME area per hour. This is expected to be true during the weekday AM and PM peak hours.

21.11 BLASTING ASSESSMENT

The following assumptions have been made:

- The project is previously operational mine to be revived.
- The anticipated levels of influence estimated in this report are calculated using standard accepted methodology according to international and local regulations.
- The assumption is made that the predictions are a good estimate with significant safety factors to ensure that expected levels are based on worst case scenarios. These will have to be confirmed with actual measurements once the operation is active.
- The limitation is that no data is available from this operation for a specific confirmation of the predicted values as no blasting activities is currently being done.
- Predictions were based on information provided and typical underground gold blasting process.
- The work done is based on the author’s knowledge and information provided by the project applicant.

21.12 SOCIO–ECONOMIC ASSESSMENT

The following assumptions apply to the socio-economic study:

- Where up to date site specific /ward level socio-economic data is missing, municipal and provincial trends were used as proxy for trends in the local area.
- It is assumed that the local community development priorities are expressed through public processes and public documents such as municipal integrated development plans.
- Provincial (Mpumalanga) ratios were used to represent the economic structure of the local economy such as value added to total income, low income as percentage of production income, etc. These ratios were based on the Mpumalanga Social Accounting Matrix 2018 prices.

With regards to the socio-economic to undertaken, the following should be noted:

- The socio-economic includes consultations with key stakeholders and potentially affected parties as part of the impact assessment phase. This does not form part of the PPP required for the overall EIA process, except where it was specifically specified as such during the consultation session.
- Socio-economic baseline information was mainly based on official statistics from Stats SA, as well as municipal documentation. Sub-municipal data was only available for 2011. Recent trends, as well as information on a sub-municipal level, were also based on quantitative and qualitative information received from local representatives with local knowledge. The lack of more recent official socio-economic data is therefore seen as a limiting factor, although it is not anticipated to influence the outcome of the report.
- The profile of Pilgrim's Rest's economy was based on information supplied by the Pilgrim's Rest business community in 2019 and updated in January 2022. No extensive audit was undertaken but rather information from an existing non-official audit of the economy was used as the basis of the employment and output estimates of the local economy, cross-checked with other local data sources.
- Ratios of the national and provincial economy were used to establish the economic output of the economy and cross-check local employment data to be consistent with output figures.

22 REASONED OPINION AS TO WHETHER THE PROPOSED ACTIVITY SHOULD OR SHOULD NOT BE AUTHORISED

22.1 REASONS WHY THE ACTIVITY SHOULD BE AUTHORIZED OR NOT

Please refer to Section 23. The findings of this EMPR conclude that, provided that the recommended mitigation and management measures are implemented, there are no environmental flaws which, post the recommended mitigation, should prevent the project from continuing.

23 CONDITIONS THAT MUST BE INCLUDED IN THE AUTHORISATION

23.1 SPECIFIC CONDITIONS TO BE INCLUDED INTO THE COMPILATION AND APPROVAL OF EMPR

Please refer to **Section 20** for specific conditions to be included in the approval.

23.2 REHABILITATION REQUIREMENTS

The detailed list of recommended management activities which, if followed, will assist the mine in achieving their closure objectives for final rehabilitation, decommissioning and closure. These recommended management activities will ensure avoidance, rehabilitation, and management of potential risks and impacts. A high-level summary of these is listed in **Table 68.**

Table 68: Actions for Final Rehabilitation, Decommissioning and Closure

Action	Impacts to Manage	Link to Mine Plan	Assumptions	Schedule Drivers
Sealing/securing of adits	Theft and Vandalism Illegal mining with associated environmental impacts	Security must remain for at least 5 years	Fencing or seals are broken Illegal miners may move into the area again Blasius bat habitat might be threatened Safety of people entering the underground areas	Safety Habitat destruction
Decommission, dismantle, demolish and remove all infrastructure	Sewage Facilities Oil separators Hazardous waste Cyanide decontamination Spillage of contaminated water from PCDs and other dams/ponds	Remove only once not required for employees, machinery, process or monitoring crew	Once decommissioned, the risk will no longer remain	Presence of employees Use of Machinery Water quality monitoring results
Scarify and seed areas where infrastructure has been removed and landscaped dams	Alien invasive plants	Monitor and remove invasive plants continuously	Surrounding landowners do not control their alien invasive plants	Holistic land management Effective alien invasive control plan
Fencing & Security	Theft and Vandalism Illegal mining with associated environmental impacts	Security must remain for at least 5 years	Fencing is stolen and squatting becomes a risk Illegal miners may move into the area again	Poverty Political unrest and/or incitement Community protests
Allow for indigenous revegetation to successfully establish, especially on the rehabilitated TSF and other dams	Erosion and Dust Alien invasive interference with new indigenous plant growth Loss of floral and faunal SCC	During rainy and windy months this may be a problem	Wind and rain will increase the risk of both erosion and dust during different seasons	Storm water management and control Dust prevention methods Focus on indigenous flora which in turn would attract

Action	Impacts to Manage	Link to Mine Plan	Assumptions	Schedule Drivers
				indigenous fauna

It should be noted that the infrastructure has all been planned on previously disturbed areas. The current timeline for the final decommissioning, rehabilitation and closure plan is summarised below.

23.2.1 YEAR 1 PRE-CONSTRUCTION & CONSTRUCTION PHASE

Figure 143 is a graphic demonstration of the three (3) options when encountering environmental risk issues, namely:

1) Avoid or prevent the impact;
2) Minimise the impact;
3) Engineering solutions: design, construct and manage means of removing the impact. In this case, a focus area is to construct e.g. mine residue stockpiles as per approved engineering designs and standards.

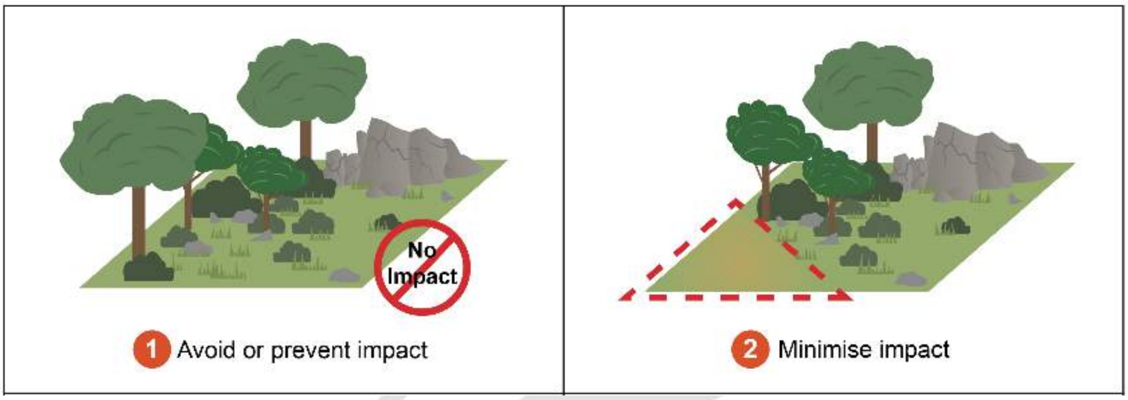


Figure 143: Avoid, Prevent and Minimise Impact

23.2.2 YEAR 2 TO END OF LOM: OPERATIONAL PHASE

A good principle to follow during the operational phase of a project, is the “Four Rs” principle: Remediate, Rehabilitate, Restore and monitor potential Residual impacts. This can be done in parallel to minimising impacts. All these actions must be in line with all existing environmental authorisations and water use licences, and must be carried out over all physical and biophysical components, including roads.

23.2.3 YEAR 1 TO END OF MINE LIFE: PARALLEL TO MINING

The schematic in **Figure 144** demonstrates steps in an AIP management programme, which include:

1) Control and manage AIP’s.
2) Explore the potential to generate compost/mulch from legumes and grass cuttings to use in the propagation of plants.
3) Delineation & Management Plan for the FNR.
4) Implement a Compensation Programme.

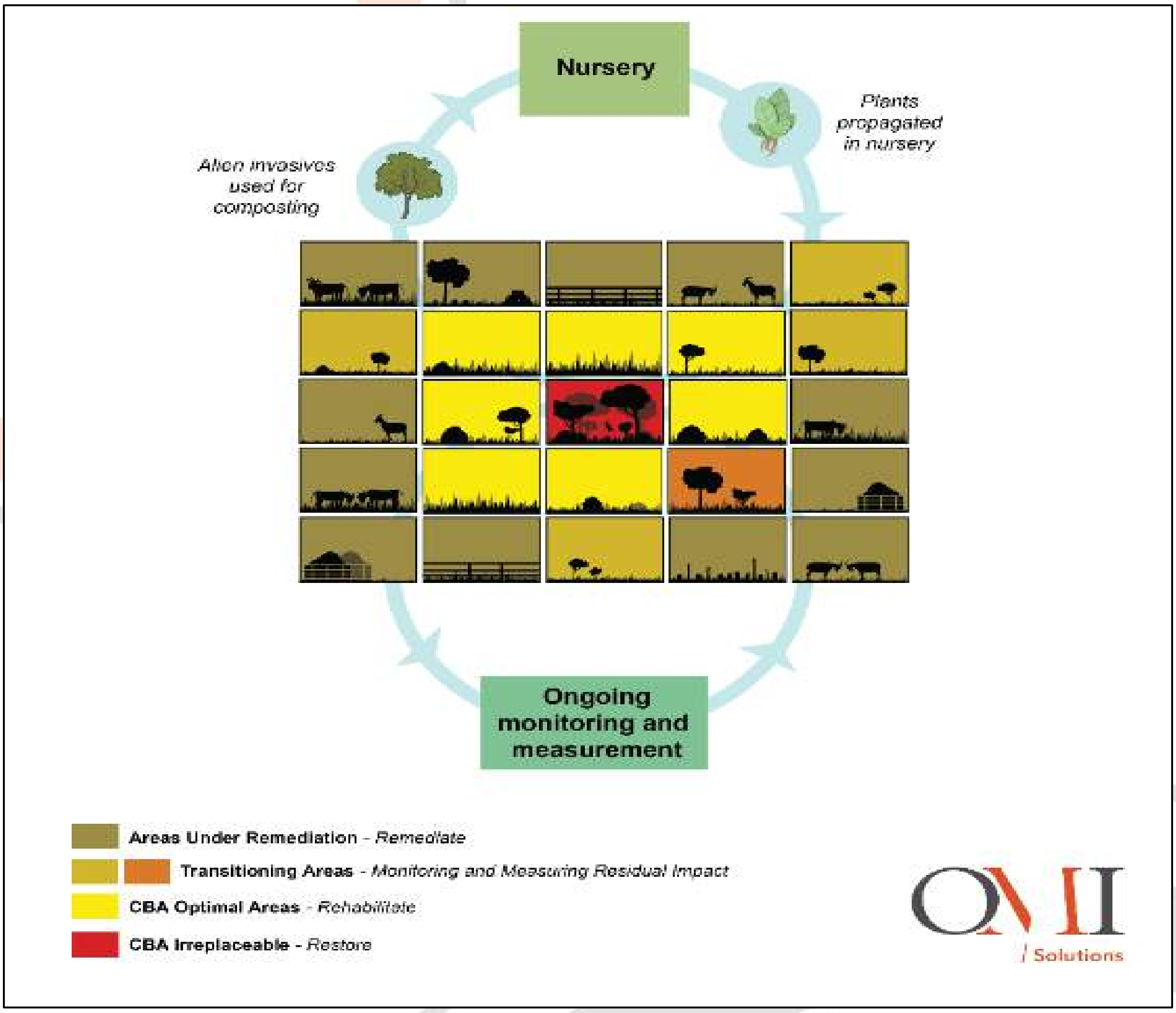


Figure 144. Alien invasive management programme

24 PERIOD FOR WHICH THE ENVIRONMENTAL AUTHORISATION IS REQUIRED.

The environmental authorisation will be required for a minimum of 10 years. This should however have to be amended if the LoM increases.

25 FINANCIAL PROVISION

25.1 EXPLAIN HOW THE AFORESAID AMOUNT WAS DERIVED

The Financial Provisioning has been updated to present the Financial Provisioning for the proposed 83MR project. The Closure and Financial Provisioning Report included in ANNEXURE H.

Financial Provisioning Regulations, 2015[82] (FP Regulations), which are published in terms of the NEMA, came into effect on 20 November 2015. The FP Regulations introduced a new approach to closure cost calculations.

[82] The *Regulations Pertaining to the Financial Provision for Prospecting, Exploration, Mining or Production Operations* published in GN R1147 in GG 39425 of 20 November 2015 as amended by GN 1314 in GG 40371 of 26 October 2016; GN R452 in GG 41584

MR 83 was granted to TGME before 20 November 2015 and in terms of the transitional provisions TGME will be required to ensure compliance with the requirements of the FP Regulations by 19 June 2022.[83] This report has therefore been aligned to the requirements of the FP Regulations.

25.2 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

A number of closure objectives/actions were identified in the 2013 approved EMPR (GCS, 2005). These have been revisited and revised to be in line with the study findings and mining and processing plans for the new project, as documented in this report.

The closure objectives need to be measurable and auditable, and be developed on the basis that the rehabilitated areas are safe, stable, non-polluting and are able to support a self-sustaining ecosystem, similar to surrounding historical natural baseline environment.

It must be noted that the current natural baseline environment has been negatively impacted upon by historical mining, illegal miners and illegal mining from a Biodiversity and Socio-economic perspective. There is quantifiable evidence that the illegal mining has accelerated the loss of biodiversity in the area and therefore the closure objectives will also focus strongly on remediating those areas impacted by the illegal mining which are in close proximity to the proposed mining activities. A graphic presentation of the (summarised) recommended closure objectives for the project is shown in **Figure 145**.

Closure objectives set for the proposed redevelopment of the existing underground operations include:

of 20 April 2018; GN 991 in GG 41921 of 21 September 2018; GN 24 in GG 42956 of 17 January 2020; and GN 495 in GG 44698 of 11 June 2021.

[83] A transitional period of 15 months was initially applicable for holders prospecting and mining rights and permits and exploration or production rights, who had applied for such rights and permits prior to 20 November 2015. The initial deadline for compliance was extended from February 2017 to February 2019. Thereafter the transitional period was extended another three times with the current deadline for compliance set as 19 June 2022. It is expected that the FP Regulations will be replaced in its entirety before the aforementioned compliance deadline.

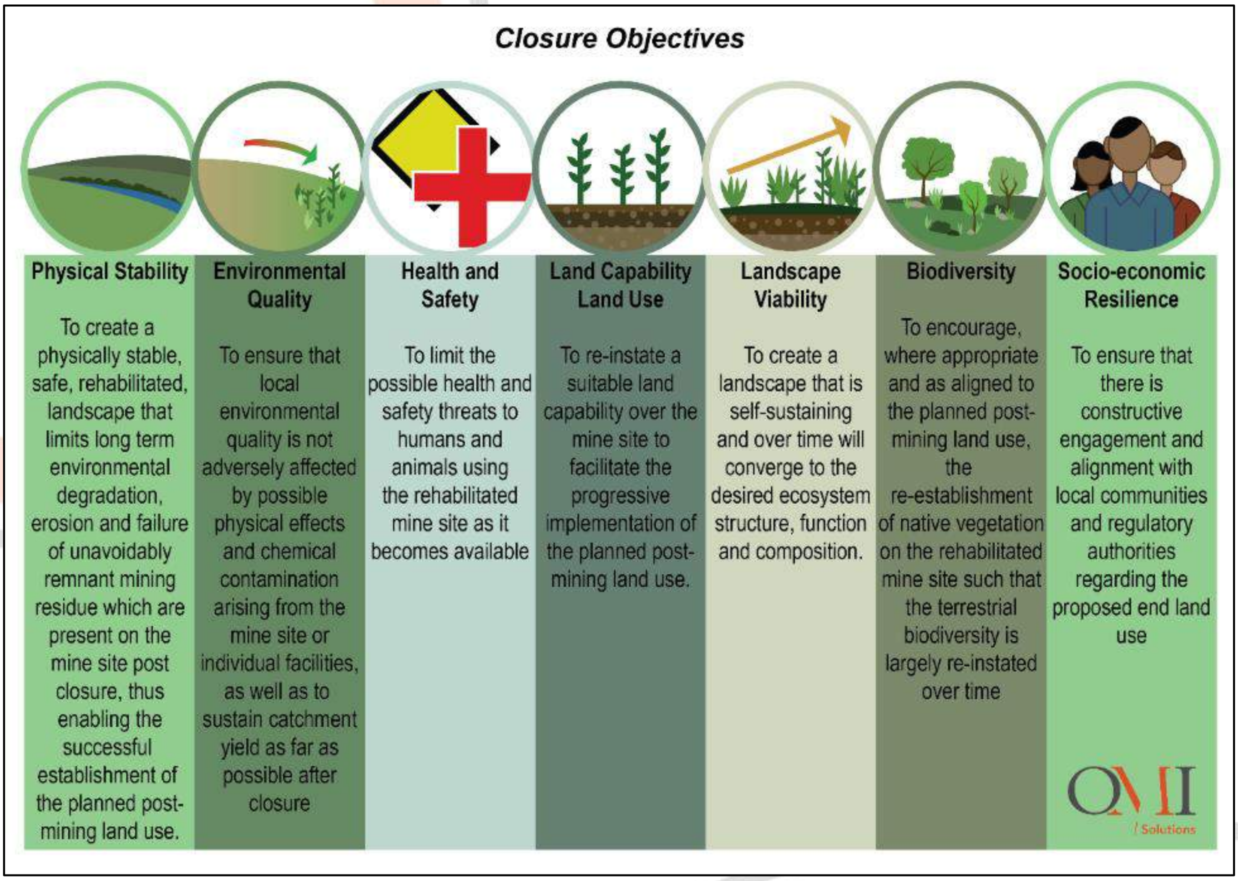


Figure 145: Recommended Closure Objectives

25.3 CONFIRM SPECIFICALLY THAT THE ENVIRONMENTAL OBJECTIVES IN RELATION TO CLOSURE HAVE BEEN CONSULTED WITH LANDOWNER AND INTERESTED AND AFFECTED PARTIES

The environmental objectives in relation to closure will be made available to all registered I&APs for comment. All comments received will be appended to this report.

25.4 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

Refer to Section 25.2 above.

25.5 EXPLAIN WHY IT CAN BE CONFIRMED THAT THE REHABILITATION PLAN IS COMPATIBLE WITH THE CLOSURE OBJECTIVES

The rehabilitation plan will be compiled in accordance with the objectives and goals according to GNR 1147 of the National Environmental Management Act, 1988 (Act No. 107 of 1998). Refer to Section 25.2.

25.6 CALCULATE AND STATE THE QUANTUM OF THE FINANCIAL PROVISION REQUIRED TO MANAGE AND REHABILITATE THE ENVIRONMENT IN ACCORDANCE WITH THE APPLICABLE GUIDELINE

The estimated closure cost was calculated from the Bill of Quantities (BoQ) prepared by registered quantity surveyors. The BoQ for existing infrastructure was compiled from physical measurements on site. For the proposed infrastructure, the layout plans received from the design engineers were used. In the case of the

TSF, some measurements were augmented with area estimates using Google Earth. The rates used were based on 2020/2021 rates, escalated by either SEIFSA or CPI increases as published[84].

For the purpose of the FP, the existing and proposed infrastructure were split, to take into account the fact that the proposed infrastructure will not be built until the required authorisations have been obtained, plus the necessary funding received. It is expected that construction will commence 2023-2024; as this date is not currently known, the commencement of the planned construction is referred to as Year 1.

The summarised closure liability for the existing infrastructure is shown in **Table 69**. The unscheduled closure liability, as calculated in April 2022, is R20,312,163.26 (including P&G and contingency, excluding VAT). The financial provision guarantee that is available for rehabilitation is R16,417,743.34 (Constantia Insurance Company Limited), resulting in a shortfall of R3,894,419.92 (excluding VAT).

The main reasons for the sharp increase over the 2021 value of R10,071,792.57 are:

- Increase of 16.7% in SEIFSA rates for construction/demolition during 2021, and CPI increase of 5.7%
- For mining rights issued before 2015, which applies to 83MR, FP must be calculated according to the new GNR 1147 regulations, which here means the inclusion of environmental items such as monitoring, alien vegetation removal, and final rehabilitation (soil and seeding).

The unscheduled and scheduled closure cost for the proposed new infrastructure is shown in **Table 70**. In this case, the years are indicated as Year 1 through Year 10, the former being commencement once all approvals have been received, and the latter being the estimated end of life of the proposed operations. Once approvals have been obtained and construction commences, the closure cost of the new infrastructure will be added to the existing FP when the annual updates are done.

Table 69: Unscheduled Closure Liability – Existing Infrastructure

Description	Unscheduled Closure [2022]	Scheduled Closure [LOM = 2031]
EXISTING INFRASTRUCTURE	**R14,671,522**	**R58,661,172**
Existing Infrastructure: Shafts	R2,885,786	R11,589,450
Existing Infrastructure: Processing Plant & TSF	R11,785,736	R47,071,722
ENVIRONMENTAL ITEMS	**R1,977,792**	**R5,579,743**
Water Management	R958,796	R1,487,407
Rehabilitation	R1,018,996	R4,092,336
SUB-TOTAL 1	**R16,649,314**	**R64,240,915**
P&G at 12%	*R1,997,918*	*R7,708,910*
Contingency at 10%	*R1,664,931*	*R6,424,092*
SUB-TOTAL 2	**R20,312,163**	**R78,373,917**

Table 70: Unscheduled Closure Liability – Proposed Infrastructure

Description	Unscheduled Closure [Year 1]	Scheduled Closure [LOM = Year 10]
PROPOSED NEW INFRASTRUCTURE	**R18,966,285**	**R76,169,469**
Proposed New Infrastructure: Shafts	R15,780,654	R63,375,830

84 https://pips.seifsa.co.za/

Proposed New Infrastructure: Processing Plant & TSF	R3,185,631	R12,793,639
ENVIRONMENTAL ITEMS	**R1,726,571**	**R3,384,795**
Water Management	R0	R0
Rehabilitation	R1,726,571	R3,384,795
SUB-TOTAL 1	**R20,692,856**	**R79,554,264**
P&G at 12%	*R2,483,143*	*R9,546,512*
Contingency at 10%	*R2,069,286*	*R7,955,426*
SUB-TOTAL 2	**R25,245,284**	**R97,056,201**

25.7 CONFIRM THAT THE FINANCIAL PROVISION WILL BE PROVIDED AS DETERMINED

The financial provision will be provided for in the form of a bank gaurantee upon approval of the project by TGME.

26 DEVIATIONS FROM THE APPROVED SCOPING REPORT AND PLAN OF STUDY

26.1 DEVIATIONS FROM THE METHODOLOGY USED IN DETERMINING THE SIGNIFICANCE OF POTENTIAL ENVIRONMENTAL IMPACTS AND RISKS

No deviation have taken place.

26.2 MOTIVATION FOR THE DEVIATION

Not applicable.

27 OTHER INFORMATION REQUIRED BY THE COMPETENT AUTHORITY

27.1 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, 1998 (ACT NO. 107 OF 1998) THE EIA REPORT MUST INCLUDE THE

27.1.1 IMPACT ON THE SOCIO-ECONOMIC CONDITIONS OF ANY DIRECTLY AFFECTED PERSON

The summary table shows that most socio-economic impacts are rated low to medium before mitigation apart from the closure risks of job losses and loss of social funds. The latter two risks are particular to mining projects that play a large role in local economies and could be mitigated to moderate risks.

The project is expected to bring moderate advantages to the local and regional economy during the construction and operational phases due to local employment creation and an increase in social spending (including taxes and local economic development funds).

Socio-economic Impact	Phase	Significance of Impact	
		Pre-mitigation	Post-mitigation
Employment and income generation	Construction	Moderate (52) **+**	Moderate (62) +
Project induced in-migration	Construction	Moderate (52) -	Moderate (44) -
Nuisance factors	Construction	Moderate (48) -	Low (22) -
Community health risks	Construction	Low (26)-	Negligible (18)-

Socio-economic Impact	Phase	Significance of Impact	
		Pre-mitigation	Post-mitigation
Safety and Health Risks	Construction	Moderate (52) -	Low (36) -
Local employment and income	Operations	Moderate (52) +	Moderate (62) +
Increase in Public revenues	Operations	Moderate (48) +	Moderate (56) +
Impact on non-mining sectors	Operations	Moderate (52) -	Low (36) -
Decline in economic diversity	Operations	Moderate (60) -	Moderate (52) -
Impact on resource use (mainly energy)	Operations	Moderate (52) -	Moderate (44) -
Project Induced in-migration	Operations	Moderate (60) -	Moderate (52) -
Nuisance factors	Operations	Moderate (51) -	Low (36) -
Impact on community health	Operations	Moderate (52) -	Low (26) -
Impact on community safety	Operations	Moderate (52) -	Moderate (44) -
Loss of jobs	Closure	High (65) -	Moderate (52) -
Decrease/Termination of social funds	Closure	High (65) -	Moderate (52) -
Permanent loss of agricultural land	Closure	Low (36)-	Negligible (18)-
Nuisance factors	Closure	Moderate (44) -	Low (22) -
Impact on community safety	Closure	Moderate (52) -	Low (36) -

27.1.1.1 IMPACT ON ANY NATIONAL ESTATE REFERRED TO IN SECTION 3(2) OF THE NATIONAL HERITAGE RESOURCES ACT, 1999

The TGME Mine Project on the Farms Frankfort 509KT, Krugers Hoop 527KT, Van Der Merwes Reef 526KT, Morgenzon 525KT, Peach Tree 544KT and Ponieskrans 543KT is situated within the larger Pilgrim's Rest heritage landscape which is regarded as highly significant and of National significance. As such, Pilgrim's Rest and the farm Ponieskrans was declared a Provincial Heritage Site in 1986 and an application for World Heritage Site status for the Reduction works was lodged in November 2006 but the site was not declared as such. Ponieskrans is a rich and significant historic landscape with regards to Section 3(3) of the NHRA in particular, as a result of, as follows:

(a) its importance in the community, or pattern of South Africa's history;

Within the Pilgrim's Rest landscape, the farm Ponieskrans represents a historic epoch where gold mining introduced a momentous period of world trade, industrial and commercial expansion, and social development. This period was instrumental in attracting thousands immigrant prospectors to the goldfields of South African and the subsequent discovery of gold on the Witwatersrand.

(b) its possession of uncommon, rare or endangered aspects of South Africa’s natural or cultural heritage;

The mining and industrial heritage of South Africa has for long been neglected in terms of heritage conservation. The commercial development on historical mining areas such as Barberton, the Witwatersrand and Pilgrim’s Rest during the past 50 years has destroyed much remains of early mining activities. Pilgrim’s Rest is one of the final localities where the pioneering years of gold mining of the late 1800’s are still displayed through heritage structures and landscapes.

(c) its potential to yield information that will contribute to an understanding of South Africa's natural or cultural heritage;

The rich cultural heritage and heritage structures within the area still holds research interest and can provide valuable information on social, mining and rural development within the framework of the historic and pioneering years of 19th century gold mining.

(d) its importance in demonstrating the principal characteristics of a particular class of South Africa's natural or cultural places or objects;

Mine developments in the general landscape (such as those at the Beta-North, Frankfort and CDM mines) and their association with the subsequent Pilgrim’s Rest town layout demonstrates the evolution of a small mining community over a century, from pioneering years to the subsequent demise of mining activities and social structures. Pilgrim’s Rest is also a prime example of the transformation of a historic mining town to a popular heritage tourism destination.

(f) its importance in demonstrating a high degree of creative or technical achievement at a particular period;

Mining at Beta-North, Frankfort and CDM mines (and in particular the Reduction Works at the Beta Mine), demonstrates the development of mining activities from primitive panning techniques for placer gold in the Blyde River, the working of alluvial deposits through sluicing, the discovery of gold bearing reefs and the working of the ore through batteries, the use of water races and water wheels, to the development of a reduction works over a period of 20 years.

27.1.2 OTHER MATTERS REQUIRED IN TERMS OF SECTIONS 24(4)(A) AND (B) OF THE ACT.

Section 24(4)(b)(i) of the NEMA (as amended), provides that an investigation must be undertaken of the potential consequences or impacts of the alternatives to the activity on the environment and assessment of the significance of those potential consequences or impacts, including the option of not implementing the activity.

Alternatives relating to site layout, infrastructure and operation activities were considered. The location of the proposed project is constrained to the location of the mineral resource, and proven reserve.

Please refer to Section 0 where alternatives are discussed.

28 UNDERTAKING

The signed undertaking is included in Section 38 of Part B and is valid for both the Environmental Impacts Assessment (Part A) and the Environmental Management Programme (Part B).

PART B

ENVIRONMENTAL MANAGEMENT PROGRAMME REPORT

29 DETAILS OF THE EAP

Name of the Practitioner: Reneé Kruger

E-mail address: **renee@omisolutions.co.za**

29.1 EXPERTISE OF THE EAP

29.1.1 THE QUALIFICATIONS OF THE EAP

Please also refer to **ANNEXURE A: EAP'S QUALIFICATIONS**.

Reneé Kruger has a master's degree in Environmental Management from North-West University. Preceding this Degree, she obtained a BSc Honours in Geography and Environmental Management and BSc in Geography and Zoology. She is registered as an Environmental Assessment Practitioner at EAPASA and as a Professional Natural Scientist with SACNASP. Reneé is also a voluntary member of IAIASA.

Annechris Sewards holds an MSc in Computer Science and a BSc in Metallurgical Engineering. She is a voluntary member of IAIASA and of NICOLA.

30 DESCRIPTION OF THE ASPECTS OF THE ACTIVITY

An overview map of all the activities is provided in Section 4 with an A3 size being provided in ANNEXURE D.

Please note that more detailed maps are included for each of the various operational areas in the relevant sub-sections under Section 4. All the large-scale versions of these maps are included under ANNEXURE D.

30.1 EXISTING AUTHORISATIONS

TGME currently holds the following authorisations:

- EMPr with DMR REF: MP 30/5/1/2/3/2/1 (83) EM, dated October 2005 and approved by the Department of Mineral Resources (DMR) on 16 October 2013
- Integrated Water Use Licence: 24023343 (IWUL) with file number 27/2/2/B60A/021 was issued to TGME by the then Department of Water Affairs (now referred to as the Department of Water and Sanitation or "DWS") on 29 March 2011 for a period of 10 years; A renewal application is currently under review by DWS.
- Permit (Permit number: 1351N), referred to at the N-Permit, to abstract 456 250 m^3 per annum water from the Blyde River.

30.2 REQUIRED AUTHORISATIONS

Before TGME may commence with proposed project the following environmental authorisation and licence applications must be approved in accordance with the relevant national legislation:

- An integrated application for Environmental Authorisation (EA) in terms of the National Environmental Management Act No. 107 of 1998 (NEMA) and for a Waste Management Licence (WML) in terms of the National Environmental Management: Waste Amendment Act 26 of 2014 (NEMWAA)
- Application for amendment to the current Environmental Management Programme (EMPr) approved by the DMRE in terms of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002) (MPRDA) on 16 October 2013.
- Application for an Integrated Water Use Licence (IWUL) under the National Water Act No. 36 of 1998 (NWA) will be submitted for approval to the Department of Water and Sanitation (DWS).
- Application for an Atmospheric Emission Licence (AEL) under the National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) (NEMAQA), required to operate the upgraded process and beneficiation plant.

30.3 LISTED AND SPECIFIED ACTIVITIES

The Listed Activities which will require authorisation are shown in Table 3. Environmental authorisations will be required under the NEMA, NEMWA and the NWA.

31 COMPOSITE MAP

Please refer to Annexure 4 of this report.

32 DETERMINATION OF CLOSURE OBJECTIVES

Rehabilitation will be done for the underground section as per historic closure objectives. These have been assessed in the Closure and Financial Report in 2022 and these have been discussed within Section 25.2.

32.1 THE PROCESS FOR MANAGING ANY ENVIRONMENTAL DAMAGE, POLLUTION, PUMPING AND TREATMENT OF EXTRANEOUS WATER OR ECOLOGICAL DEGRADATION AS A RESULT OF UNDERTAKING A LISTED ACTIVITY

Any activity that results in damage or pollution to the environment will be rated and signed a value to determine the risk. An environmental emergency is defined as an unplanned situation or event resulting in potential pollution of the environment. A pollution incident means an incident or set of circumstances during or as a consequence of which there is or is likely to be a leak, spill or other escape or deposit of a substance, as a result of which pollution has occurred, is occurring or is likely to occur.

32.1.1 ROLES AND RESPONSIBILITIES

TGME’s management system is consistent with international and organisational standards, legislation and other relevant requirements. They undertake to ensure that their management system is developed, documented, implemented and maintained in a manner that is both understood and effective at all levels in the business, to enable them to:

- Identify, assess and manage risks to employees, contractors, the environment and communities;
- Strive to achieve leading industry practice and recognition;
- Meet and, where appropriate, exceed applicable legislation;
- Define SHEQ objectives and targets (including reducing and preventing pollution) and continually measure and monitor activities and progress against these objectives;
- Lead and develop their people and provide resources to achieve targets;
- Support the fundamental human rights of employees, contractors and communities in which TGME operates and safeguard them from exposure to unacceptable risk;

- Respect the rights of indigenous people and value cultural heritage;
- Minimise the impact of operations on the environment through control of pollution, waste, hazardous materials and the conservation of natural resources;
- Design and implement processes that ensure cost effective and quality product provision.

TGME is committed to seeking opportunities to share their success by developing partnerships that focus on creating sustainable value for all stakeholders. In this, they will work with communities to contribute to social infrastructure needs through the development and use of appropriate skills and technologies.

The Environmental Manager must ensure that regular internal operational inspections and/or are conducted across the 83MR Mine so that environmental non-compliances and incidents are identified and addressed. All employees and its contractors working for the mine are responsible for reporting any accident/emergency to their supervisor immediately, and if required notifying the emergency response teams. Personnel must be nominated as response team members and must receive appropriate training to manage emergencies. All other personnel must be made aware of potential emergencies and trained in emergency response. Management must be aware of their responsibilities in case of emergency.

32.1.2 RESPONSE TO ENVIRONMENTAL EMERGENCIES

32.1.2.1 EMERGENCY PLAN

An emergency plan must be developed for each potential environmental emergency situation. The emergency plan must give information on:

- The date and time of the incident
- A description of the incident
- The source of the pollution or potential pollution
- The impact or potential impact on the water resource and the relevant water users
- Remedial action taken or to be taken to remedy the effects of the incident.

32.1.2.2 CLASSIFICATION OF EMERGENCIES

The following incidents will be classified as an emergency:

- Natural Disasters;
- Damage to radiological/nuclear sources equipment;
- Strikes, protest or unrest;
- Information Management System Failure (plc systems);
- Health and Disease Outbreaks;
- Serous Incident or Fatality;
- High Potential Risk Incidents (Fatality, serious environmental pollution);
- Collapse of underground areas; and
- Other emergencies.

32.1.2.3 REPORTING EMERGENCIES

TGME is busy establishing updated procedures.

These procedures will aim to identify the potential for, and response to, incidents and emergency situations and for preventing and mitigating the illness, injury or environmental hazard that may be associated with them. It will review its emergency preparedness and response plans and procedures, in particular, after the occurrence of incidents or emergency situations. The mine shall also periodically test such procedures where and when practicable.

In the event of a serious incident or fatality occurring it is of the utmost importance to not only ensure the Health and Safety of every person involved but also to ensure that certain evidence is protected and gathered for use, with the aim of the prevention of a similar incident/accident occurring in the future.

A "No Blame Fixing" approach to incident investigation will be implemented and it must be stressed that the gathering of information must be seen as preventative action and not as blame fixing. In light of the above, and in addition to the emergency procedure that is relevant to the specific area where the incident/accident occurred, and in relation to the notifying of person and first aid treatment/safety of any person involved, the following steps must be taken immediately after an incident/accident classified above has occurred.

In the event of a reportable/major environmental incident that could lead to danger to the public or the environment (death or sustaining impact on the environment) the appointee of that specific section, in consultation with SHEQ Manager, is responsible for communicating with and drafting an external report (in terms of Section 30 of National Environmental Management Act, 1998 (Act No. 108 of 1998) and Sections 19 and 20 of the National Water Act, 1998 (Act No. 36 of 1998) to the national and provincial department and the municipality containing the:

- Nature of the incident;
- Substances and quantities and accurate effect on persons and environment;
- Initial measures to minimise impacts;
- Causes of the incident;
- Accordance measures;
- When an environmental incident occurs, the following should be adhered to:
- Report incident as per Incident Reporting Flow Diagram;
- Measures to clean up any spillage/pollution must be taken as per Emergency Procedure.
- It is important to ensure that no secondary pollution is caused by incorrect handling of an environmental incident, e.g. incorrect disposal of absorbent material use to clean up a spill; and
- For high potential risk incident (HPRI)/reportable environmental incidents, the SHEQ Manager will conduct a closeout investigation prior to closure of the incident. This will be done one month after all actions has been completed to verify the effectiveness of the actions.
- For all environmental emergencies, the response must be tailored to the type and extent of the emergency.
- Reportable environmental emergencies are defined as environmental emergencies requiring external reporting to relevant authorities, as defined within legislation.

Legislation reference	Reporting Authority	Legal Reporting Time Frame
Section 20 of the NWA	DWS, Local Fire Department, Relevant Catchment Management Agency	As soon as reasonably practicable.

Section 30 of the NEMA	Relevant authorities	Section 30 requires immediate notification; investigation within 14 days to the relevant authorities and the taking of steps to amongst others, contain possible pollution, undertake clean-up and to take remedial actions.

32.1.2.4 ENVIRONMENTAL EMERGENCY INCIDENTS

The SHEQ Manager must, within 14 days of the incident, report information on the incident to enable initial evaluation to the following:

- Director-General of Environmental Affairs;
- Provincial Head of Department (DMR);
- Provincial Head of Department (DWS); and
- Local Municipality.

The report must include:

- Nature of the incident;
- Substance involved and an estimation of quantity released and their possible acute effects on persons and the environment;
- Initial measures taken to minimise impacts;
- Cause of incident, whether direct or indirect; and
- Measures taken to avoid recurrence of such incident.

32.1.2.5 WATER POLLUTION EMERGENCY INCIDENT

Water Pollution Emergency Incident is any accident /incident in which a substance pollutes or has the potential to pollute a water resource or a substance that has or is likely to have a detrimental effect on a water resource.

The responsible person who was in control of the substance involved in the incident at the time or responsible for the section the incident occurred will immediately inform the superior of the area where the incident occurred.

The information with regard to the incident is communicated to the Mine Manager, SHEQ Manager and Security Personnel immediately by the superior of the area. The SHEQ Manager and the Mine Manager must, as soon as reasonably practicable after obtaining the knowledge of the incident, (i.e. within 14 days) report to:

- DWS (Regional Manager);
- South African Police Services or relevant fire department; and
- The Catchment Management Agency;
- The SHEQ Manager and crisis management team must:
- Take all reasonable measures to contain and minimise the effects of the incident;
- Undertake clean-up procedures;
- Remedy the effects of the incidents; and
- Sample the water together with the responsible person of the area.

32.1.2.6 AIR POLLUTION EMERGENCY INCIDENTS (IF RELEVANT)

- Record of any non-compliance is kept;
- The non-compliance with conditions will be reported telephonically, by fax or by email to the Chief Air Pollution Control Officer as soon as possible but not later than 24 hours after violation will start to occur. The particulars of such violation, including details of measure is put in place to prevent it happening in the future, will be included respective or in the weekly or monthly report;
- If the utilization and/or efficiency of air pollution control fail to meet requirements as specified in the certificate, then the process is managed under emergency procedures until such time as it will be possible to operate in compliance with the conditions of this certificate; and
- Record is kept of periods of upset and abnormal emissions, e.g. off-gas vented directly to the atmosphere or excess thereof due to the faults or limited capacity of air pollution control equipment or limits for process parameters being exceeded, etc. and the Chief Air Pollution Control Officer is notified immediately should it occur.

32.1.2.7 ENVIRONMENTAL IMPACT REGISTER

All non-conformances pertaining to safety, health, environmental, quality of project activities and Employees shall be documented as identified by according to documented procedures. The mine will make provision for recording and reviewing the nature and extent of any non-conformance that may be encountered during the Project Execution phase.

32.1.2.8 RECORDS

Records must be kept of all environmental emergencies and non-conformances.

33 ACID MINE DRAINAGE

(Indicate whether or not the mining can result in acid mine drainage)

33.1 POTENTIAL RISK OF ACID MINE DRAINAGE

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

Sulphide minerals are formed and stable under reducing conditions (Dold, 2017). Acid mine drainage commonly occurs when sulphide minerals (pyrite, chalcopyrite, galena, covellite and sphalerite) are exposed to oxidizing conditions. The oxidizing conditions are created by exposure to moisture and oxygen. The oxidation process results in the release of dissolved Fe2+, SO42- and H+ (ABA, 2001). The oxidation of sulphide-minerals containing iron produce net acidity via its oxidation, except for common sulphides such as molybdenite, enargite and stibnite (Dold, 2017).

The rate of pyrite oxidation depends on a number of factors, the main factors being reactive surface area of pyrite, oxygen concentration and solution pH, presence of bacteria and catalytic agents (Skousen J., Sextone A. and Ziemkiewics, 2000).

Where mine-water pumping is constant and the mine water level is stable, little pyrite oxidation occurs below the water level and few metals are leached, resulting in a relatively non-environmentally aggressive mine water. Active pyrite oxidation will, however, continue to occur in the unsaturated zone and, if pumps are turned off, the rising water level will leach out heavy metals, resulting in a highly acid and contaminating solution (Banks et al., 1996)

In some geological settings the alkaline content of surrounding lithologies could act as buffering systems, countering the acid produced from pyrite oxidation. Carbonates and Clays have proven to sufficiently neutralize acid rock drainage (Skousen J., Sextone A. and Ziemkiewics, 2000). The balance between acid-producing potential and neutralizing capacity should provide reasonable indication of the potential acidity or alkalinity that may occur from the weathering of mined material.

The geochemical model indicates that the pH of leachate from the new tailings, DMS Float and old tailings material is likely to be alkaline. This is due to sufficient neutralisation capacity of the carbonate minerals, i.e. dolomite [CaMg(CO3)2] and calcite [CaCO3], in the waste material.

33.1.2 ENGINEERING OR MINE DESIGN SOLUTIONS TO BE IMPLEMENTED TO AVOID OR REMEDY ACID MINE DRAINAGE

Usually, the best way to prevent Acid Mine Drainage for underground sections is to flood all mined areas as soon as possible to minimise oxygen from reacting with the remaining pyrite. Closure management of the underground sections in terms of Hydrogeological aspects should be assessed before the onset of Closure. Currently the underground sections are flooded since it is not pumped at present.

33.1.3 MEASURES THAT WILL BE PUT IN PLACE TO REMEDY ANY RESIDUAL OR CUMULATIVE IMPACT THAT MAY RESULT FROM ACID MINE DRAINAGE

Based on the Waste Classification results, however, in the unlikely event that AMD occurs in the future, the responsibility will be with the mine to implement management measures, which include the following:

- The best way to prevent Acid Mine Drainage in the underground sections is to flood all mined areas as soon as possible to minimise oxygen from reacting with the remaining pyrite;
- Where significant water ingress cannot be prevented, measures should be put in place to intercept ingress water as close as possible to the source in order that it can be pumped out of the mine before its quality can deteriorate through contact with sulphide minerals;
- Water quantity and quality data should be collected on a regular, ongoing basis during mine operations. These data will be used to recalibrate and update the mine water management model, to prepare monitoring and audit reports, to report to the regulatory authorities against the requirements of the IWWMP;
- Areas that may have subsided or areas of depressions and/or sinkholes should be filled to create free draining surfaces. Where leachate is generated, it must be contained separately from water which is only slightly polluted through contact with the waste;
- Surface and groundwater quality and quality monitoring should be continued until a steady state is reached. If required, A pollution control dam could be used to intercept polluted seepage water stemming from the underground activities. An interception trench is an additional option to treat the contaminated discharge;
- Implement as many closure measures during the operational phase, while conducting appropriate monitoring programmes to demonstrate actual performance of the various management actions during the life of mine; and
- Mining should remove all ore from the underground and separate acid forming and non-acid forming material.

34 WATER USE

34.1 VOLUMES AND RATE OF WATER USE REQUIRED FOR THE MINING, TRENCHING OR BULK SAMPLING OPERATION

The water balance has been discussed in Section 4.5.8. The water uses to be applied for are shown in **Table 71**.

Table 71: Water use activities to be applied for

Applicable Water use according to Section 21	Purpose	Properties	Current Water use status	Volume (m^3/a)	Capacity/ Dimension (m)	Co-ordinates	Quaternary Drainage
Section 21(a)	Taking water from the Blyde River	Portion 1 of the Farm Grootfontein 562 KT	Converting Permit (Permit number: 1351N), referred to at the N-Permit	456 250 m^3 (Current) reduce to 171,185m^3/a	N/A	-24.920228° 30.738881°	B60A
Section 21(a)	Taking water from Underground at Frankfort mine to be re-used underground and at shaft	Portion 3 of Frankfort 509KT	Water use to be authorised	95742	N/A	-24.802713° 30.733877°	B60B
Section 21(a)	Taking water from Underground at Morgenzon mine to be re-used underground and at shaft	Re of Morgenzon 525 KT	Water use to be authorised	95742	N/A	-24.875751° 30.724363°	B60A
Section 21(a)	Taking water from Underground at Dukes Upper mine to be re-used underground and at shaft	Re of Morgenzon 525 KT	Water use to be authorised	1715	N/A	-24.885016° 30.725896°	B60A

Applicable Water use according to Section 21	Purpose	Properties	Current Water use status	Volume (m^3/a)	Capacity/ Dimension (m)	Co-ordinates	Quaternary Drainage
Section 21(a)	Taking water from Underground at Dukes Lower mine to be re-used underground and at shaft	Re of Morgenzon 525 KT	Water use to be authorised	1825	N/A	-24.888195° 30.726172°	B60A
Section 21(a)	Taking water from Underground at Beta North mine and re-use	Portion 42 of the Farm Ponieskrans KT	Water use to be authorised	95742	N/A	-24.909719° 30.730508°	B60A
Section 21(b)	2x Potable water tank-Frankfort	Portion 3 of Frankfort 509KT	Water use to be authorised	TBD	1000 m3	-24.808266° 30.737829°	B60B
Section 21(b)	2x Potable water tank Morgenzon North	Re of Morgenzon 525 KT	Water use to be authorised	TBD	1000 m3	-24.873403° 30.726900°	B60A
Section 21(b)	2x Potable water tank Morgenzon South	Re of Morgenzon 525 KT	Water use to be authorised	TBD	1000 m3	-24.875641° 30.724600°	B60A
Section 21(b)	Dukes upper Potable water tank	Re of Morgenzon 525 KT	Water use to be authorised	TBD	TBD	-24.885499° 30.724985°	B60A

Applicable Water use according to Section 21	Purpose	Properties	Current Water use status	Volume (m^3/a)	Capacity/ Dimension (m)	Co-ordinates	Quaternary Drainage
Section 21(b)	Dukes lower Potable water tank	Re of Morgenzon 525 KT	Water use to be authorised	30000	TBD	-24.887610° 30.728015°	B60A
Section 21(b)	Beta Potable water tanks	Portion 42 of the Farm Ponieskrans KT	Water use to be authorised	TBD	TBD	-24.910304° 30.729847°	B60A
Section 21(b)	Two Potable water tanks at plant	Portion 1 of the Farm Grootfontein 562 KT	Water use to be authorised	TBD	TBD	-24.916842° 30.740512°	B60A
Section 21(c and I)	Frankfort Culvert Crossing of haul road and pipelines over non-perennial drainage	Portion 3 of Frankfort 509KT	Water use to be authorised	N/A	TBD	-24.807206° 30.737589°	B60B
Section 21(c and I)	Crossing between Morgenzon North and South over non-perennial drainage line	Re of Morgenzon 525 KT	Water use to be authorised	N/A	TBD	-24.874778° 30.727122°	B60A
Section 21(c and I)	Crossing of the Blyde from the plant to the	Portion 42 of the Farm Ponieskrans KT	Water use to be authorised	N/A	TBD	-24.911921° 30.735159°	B60A

Applicable Water use according to Section 21	Purpose	Properties	Current Water use status	Volume (m^3/a)	Capacity/ Dimension (m)	Co-ordinates	Quaternary Drainage
	Beta North Shaft. Road and pipelines						
Section 21(c and I)	Shaft to adit area is located within the peach tree creek	Portion 42 of the Farm Ponieskrans KT	Water use to be authorised	N/A	TBD	TBD	B60A
Section 21(c and I)	Rehab of peach tree creek	Portion 42 of the Farm Ponieskrans KT	Water use to be authorised	N/A	TBD	TBD	B60A
Section 21(g)	Dewatering reservoir - Frankfort	Portion 3 of Frankfort 509KT	Water use to be authorised	95742m3	1000 m3	-24.802370° 30.734133°	B60B
Section 21(g)	Dust suppression on roads from the PCD-Frankfort	Portion 3 of Frankfort 509KT	Water use to be authorised	1460m3	N/A	TBD	B60B
Section 21(g)	Frankfort PCD 1	Portion 3 of Frankfort 509KT	Water use to be authorised	4633 m3	TBD	-24.807642° 30.738339°	B60B
Section 21(g)	Frankfort waste rock dump	Portion 3 of Frankfort 509KT	Updated of WUL capacity required-		CAPACITY = 38 000 TONNES	-24.808488°	B60B

Applicable Water use according to Section 21	Purpose	Properties	Current Water use status	Volume (m^3/a)	Capacity/ Dimension (m)	Co-ordinates	Quaternary Drainage
			Previous 9600 tons		AREA = 4 616m²	30.738451°	
Section 21(g)	Frankfort settling ponds	Portion 3 of Frankfort 509KT	Water use to be authorised	100193 m3/a		-24.808114° 30.737741°	B60B
Section 21(g)	Frankfort DMS stockpiles foot pad areas	Portion 3 of Frankfort 509KT	Water use to be authorised		2 x 2400 tonnes Dimension: 400m2 each	-24.807707° 30.737901°	B60B
Section 21(g)	Frankfort north sump	Portion 3 of Frankfort 509KT	Water use to be authorised	1441 m3/a	50m3	-24.802332° 30.734366°	B60B
Section 21(g)	Frankfort dirty water channels	Portion 3 of Frankfort 509KT	Water use to be authorised	TBD	Approx. 1000m	TBD	B60B
Section 21(g)	Frankfort Septic tank	Portion 3 of Frankfort 509KT	Water use to be authorised with new capacity increase from 629m3/a	9640m3/a		-24.807961° 30.737301°	B60B

Applicable Water use according to Section 21	Purpose	Properties	Current Water use status	Volume (m^3/a)	Capacity/ Dimension (m)	Co-ordinates	Quaternary Drainage
Section 21(g)	RoM Pad- Tipper area	Portion 3 of Frankfort 509KT	Water use to be authorised		CAPACITY = 10 500 TONNES AREA = 1 354m²	-24.807669° 30.737331°	B60B
Section 21(g)	Dewatering reservoir Morgenzon	Re of Morgenzon 525 KT	Water use to be authorised		1000m3	-24.875014° 30.726040°	B60A
Section 21(g)	Dust suppression on roads from the PCD at Morgenzon	Re of Morgenzon 525 KT	Water use to be authorised	27m3/a		TBD	B60A
Section 21(g)	Morgenzon PCD 3	Re of Morgenzon 525 KT	Water use to be authorised		4000 m3	-24.874595° 30.728379°	B60A
Section 21(g)	Morgenzon waste rock dump	Re of Morgenzon 525 KT	Updated design Previous Authorisation 82 230 tons		?	-24.874022° 30.727480°	B60A

Applicable Water use according to Section 21	Purpose	Properties	Current Water use status	Volume (m^3/a)	Capacity/ Dimension (m)	Co-ordinates	Quaternary Drainage
Section 21(g)	Morgenzon south sump	Re of Morgenzon 525 KT	Water use to be authorised		498 m3	-24.874785° 30.726091°	B60A
Section 21(g)	Morgenzon dirty water channels	Re of Morgenzon 525 KT	Water use to be authorised		TBD	-24.875241° 30.725127°	B60A
Section 21(g)	Dewatering reservoir Dukes Upper	Re of Morgenzon 525 KT	Water use to be authorised		Capacity 1000m3	-24.885443° 30.725613°	B60A
Section 21(g)	Dewatering reservoir Dukes Lower	Re of Morgenzon 525 KT	Water use to be authorised		Capacity 1000m3	-24.885513° 30.724998°	B60A
Section 21(g)	Dust suppression on roads from the PCD at Dukes Upper (north)	Re of Morgenzon 525 KT	Water use to be authorised	507m3/a		TBD	B60A
Section 21(g)	Dust suppression on roads from the PCD at Dukes lower (south)	Re of Morgenzon 525 KT	Water use to be authorised	507m3/a		TBD	B60A

Applicable Water use according to Section 21	Purpose	Properties	Current Water use status	Volume (m^3/a)	Capacity/ Dimension (m)	Co-ordinates	Quaternary Drainage
Section 21(g)	Dukes Waste rock dump 3	Re of Morgenzon 525 KT	Water use to be authorised		2000m2	-24.884639° 30.730922°	B60A
Section 21(g)	Dukes Waste rock dump 2	Re of Morgenzon 525 KT	Water use to be authorised		2500m2	-24.886214° 30.731148°	B60A
Section 21(g)	Dukes Waste rock dump 1	Re of Morgenzon 525 KT	Water use to be authorised		6000m2	-24.885012° 30.728059°	B60A
Section 21(g)	Dukes Run of Mine area 1	Re of Morgenzon 525 KT	Water use to be authorised		2600m2	-24.885034° 30.726997°	B60A
Section 21(g)	Dukes Run of Mine area 2	Re of Morgenzon 525 KT	Water use to be authorised		1200m2	-24.885259° 30.726781°	B60A
Section 21(g)	Dukes PCD 1 North	Re of Morgenzon 525 KT	Water use to be authorised		Capacity 6500m3	-24.885125° 30.728640°	B60A

Applicable Water use according to Section 21	Purpose	Properties	Current Water use status	Volume (m^3/a)	Capacity/ Dimension (m)	Co-ordinates	Quaternary Drainage
Section 21(g)	Dukes PCD 2 south	Re of Morgenzon 525 KT	Water use to be authorised		Capacity 1167 m3	-24.887141° 30.728091°	B60A
Section 21(g)	Dukes DMS stockpiles foot pad areas	Re of Morgenzon 525 KT	Water use to be authorised		2 x 2400 tonnes Dimension: 400m2 each?	-24.884668° 30.727592°	B60A
Section 21(g)	Dukes Sump Upper	Re of Morgenzon 525 KT	Water use to be authorised		498m3	-24.884995° 30.728331°	B60A
Section 21(g)	Dukes Sump Lower	Re of Morgenzon 525 KT	Water use to be authorised		498m3	-24.887267° 30.727922°	B60A
Section 21(g)	Beta Operations Dam/Reservoir	Portion 42 of the Farm Ponieskrans KT	Water use to be authorised		Capacity: 1000m3	-24.910274° 30.729711°	B60A
Section 21(g)	Reworking of Beta North dump under previous License	Portion 42 of the Farm Ponieskrans KT	Water use to be authorised		TBD	-24.912814° 30.733531°	B60A

Applicable Water use according to Section 21	Purpose	Properties	Current Water use status	Volume (m^3/a)	Capacity/ Dimension (m)	Co-ordinates	Quaternary Drainage
Section 21(g)	Beta WRD on previous WRD footprint after reworking	Portion 42 of the Farm Ponieskrans KT	Water use to be authorised Previous 25998 tons		1990m2	-24.913829° 30.733701°	B60A
Section 21(g)	Beta North PCD	Portion 42 of the Farm Ponieskrans KT	Water use to be authorised		VOLUME :6700m3	-24.912998° 30.733785°	B60A
Section 21(g)	Beta North ROM pad	Portion 42 of the Farm Ponieskrans KT	Water use to be authorised		Area: 9500m2	-24.912906° 30.732971°	B60A
Section 21(g)	Beta DMS stockpiles foot pad areas	Portion 42 of the Farm Ponieskrans KT	Water use to be authorised		2 x 2400 tonnes Dimension: 400m2 each?	-24.912983° 30.733327°	B60A
Section 21(g)	Dust suppression on roads from the PCD at Beta	Portion 42 of the Farm Ponieskrans KT and Portion 1 of the Farm Grootfontein 562 KT	Water use to be authorised	1774 m3/a		TBD	B60A

Applicable Water use according to Section 21	Purpose	Properties	Current Water use status	Volume (m^3/a)	Capacity/ Dimension (m)	Co-ordinates	Quaternary Drainage
Section 21(g)	Expansion of TSF phase 1	Portion 42 of the Farm Ponieskrans KT	Amended capacity to be authorised – Increase from 36000m3/month		0.79 Mt	-24.914766° 30.740350°	B60A
Section 21(g)	Expansion of TSF phase 2	Portion 42 of the Farm Ponieskrans KT	Amended capacity to be authorised Increase from 36000m3/month		1.3 Mt	-24.913718° 30.743488°	B60A
Section 21(g)	Phase 2 TSF RWD Extension	Portion 42 of the Farm Ponieskrans KT	Water use to be authorised	6716 m3/a	11680m3	-24.912381° 30.738753°	B60A
Section 21(g)	TSF Silt trap	Portion 42 of the Farm Ponieskrans KT	Water use to be authorised	7701.5 m3/a		-24.912955° 30.738566°	B60A
Section 21(g)	WRD on old Heap Leach pad	Portion 1 of the Farm Grootfontein 562 KT	Water use to be authorised		7200m2	-24.918064° 30.740998°	B60A

Applicable Water use according to Section 21	Purpose	Properties	Current Water use status	Volume (m^3/a)	Capacity/ Dimension (m)	Co-ordinates	Quaternary Drainage
Section 21(g)	Plant ROM Area	Portion 1 of the Farm Grootfontein 562 KT	Water use to be authorised		4400m2	-24.917946° 30.740174°	B60A
Section 21(g)	Plant PCD 2	Portion 1 of the Farm Grootfontein 562 KT	Upgrade from previous license		Capacity: 4532m3	-24.918468° 30.738382°	B60A
Section 21(g)	Plant PCD 1	Portion 1 of the Farm Grootfontein 562 KT	Upgrade from previous license		Capacity: 5110m3	-24.919001° 30.740306°	B60A
Section 21(g)	Water make -up dam	Portion 1 of the Farm Grootfontein 562 KT	Upgrade from previous license		10043	-24.917317° 30.738575°	B60A
Section 21(g)	Water treatment plant- treatment of raw water from Blyde	Portion 1 of the Farm Grootfontein 562 KT	Water use to be authorised	148172 m3/a	TBD	-24.916794° 30.740447°	B60A

Applicable Water use according to Section 21	Purpose	Properties	Current Water use status	Volume (m^3/a)	Capacity/ Dimension (m)	Co-ordinates	Quaternary Drainage
Section 21(j)	Taking water from Underground at Frankfort mine to be re-used underground	Portion 3 of Frankfort 509KT	Increase water use from previous 37000m3	95742	N/A	-24.802713° 30.733877°	B60B
Section 21(j)	Taking water from Underground at Morgenzon mine to be re-used underground and at shaft	Re of Morgenzon 525 KT	Increase water use from previous	95742	N/A	-24.875751° 30.724363°	B60A
Section 21(j)	Taking water from Underground at Dukes Upper mine to be re-used underground and at shaft	Re of Morgenzon 525 KT	Water use to be authorised	1715	N/A	-24.885016° 30.725896°	B60A
Section 21(j)	Taking water from Underground at Dukes Lower mine to be re-used underground and at shaft	Re of Morgenzon 525 KT	Water use to be authorised	1825	N/A	-24.888195° 30.726172°	B60A
Section 21(j)	Taking water from Underground at Beta North mine and re-use	Portion 42 of the Farm Ponieskrans KT	Water use to be authorised	95742	N/A	-24.909719° 30.730508°	B60A

34.2 HAS A WATER USE LICENCE HAS BEEN APPLIED FOR?

An IWUL was granted to TGME by the DWS, under licence number 24023343, in terms of the NWA on 29 March 2011. The IWUL was granted for a period of 10 year and an application to renew and amend the IWUL was submitted on 16 October 2020, prior to the lapsing of the IWUL. A resubmission of the renewal is currently underway after additional studies were conducted.

Permit (Permit number: 1351N), referred to at the N-Permit, to abstract 456 250 m^3 per annum water from the Blyde River.

Various new water uses have been identified to support the for the redevelopment of underground mines. The application is currently in the initial phase of the application on the Electronic Water Use Licence Application and Authorisation System (e-WULAAS) and a pre application meeting has been held with DWS on the 11th of April 2022.

Water uses to be applied for are listed in **Table 71** and expanded on in ANNEXURE F.

35 IMPACTS TO BE MITIGATED IN THEIR RESPECTIVE PHASES

Table 72: Management measures

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance		Management Measures	Management objective	Mitigation Effect	Potential for residual risk	Compliance with Standards (where applicable)
					Score	Magnitude					
Air Quality Impact Assessment											
Construction Phase											
Construction associated with the proposed project	Air Quality - Health Risk Impact Significance	Increased health risk at Air Quality Sensitive Receptors (AQSRs.)	WOM	Negative	36	Low	All internal roads should be dust suppressed. To ensure the lowest possible impact on AQSRs and environment it is recommended that the air quality management plan as set out in this report should be adopted. This includes: • The management of the operations; resulting in the mitigation of associated air quality impacts. • TGME's current dustfall sampling be expanded and monthly dustfall reporting form part of the project's air quality management plan. o The recommended dustfall network will comprise of 15 single dustfall units, with nine (9) located at Beta North, three (3) located at CDM and three (3) at Frankfort. o Dustfall collected monthly, should be analysed, and reported on with the results compared to the NDCR, which in this case would need to comply with the Non-residential limit of 1 200 mg/m²/day, not to be exceeded for two consecutive months. In the case of such events, the cause for high dustfall should be investigated and mitigation measures identified and implemented. • Record keeping and community liaison procedures. • GHG emissions from project can be reduced by: o ensuring the vehicles and equipment are maintained through an effective inspection and maintenance program; and, o limiting the removal or vegetation and ensuring adequate re-vegetation or addition of vegetation surrounding the project.	Reduce emissions impacts on sensitive receptors	Can be avoided, managed or mitigated	No	GNR 827 and SANS 1929-2004.
			WM	Negative	36	Low				No	GNR 827 and SANS 1929-2004.
Construction associated with the proposed project	Air Quality - Nuisance Impact Significance	Increased health risk at AQSRs.	WOM	Negative	55	Moderate				No	GNR 827 and SANS 1929-2004.
			WM	Negative	55	Moderate				No	GNR 827 and SANS 1929-2004.
Construction associated with the proposed project	Air Quality - Vegetation Impact Significance	Increased health risk at AQSRs.	WOM	Negative	9	Negligible				No	GNR 827 and SANS 1929-2004.
			WM	Negative	9	Negligible				No	GNR 827 and SANS 1929-2004.
Operational Phase											
Mining and processing operations associated with the proposed project.	Air Quality - Health Risk Impact Significance	Increased health risk at AQSRs.	WOM	Negative	22	Low		Reduce emissions impacts on sensitive receptors	Can be avoided, managed or mitigated	No	GNR 827 and SANS 1929-2004.
			WM	Negative	8	Negligible					
Mining and processing operations associated with the proposed project.	Air Quality - Nuisance Impact Significance	Increased health risk at AQSRs.	WOM	Negative	44	Low				No	
			WM	Negative	8	Negligible					
Mining and processing operations associated with the proposed project.	Air Quality - Vegetation Impact Significance	Increased health risk at AQSRs.	WOM	Negative	22	Low				No	
			WM	Negative	22	Low					
Closure Phase											
Closure activities	Air Quality - Health Risk Impact Significance	Increased health risk at AQSRs.	WOM	Negative	36	Low		Reduce emissions impacts on sensitive receptors	Can be avoided, managed or mitigated	No	GNR 827 and SANS 1929-2004.
			WOM	Negative	36	Low				No	
Closure activities	Air Quality - Nuisance Impact Significance	Increased health risk at AQSRs.	WOM	Negative	44	Moderate				No	
			WOM	Negative	44	Moderate				No	
Closure activities	Air Quality - Vegetation Impact Significance	Increased health risk at AQSRs.	WOM	Negative	9	Negligible				No	
			WOM	Negative	9	Negligible				No	
Decommissioning Phase											
Post closure activities	Air Quality - Health Risk Impact Significance	Increased health risk at AQSRs.	WOM	Negative	22	Low		Reduce emissions impacts on sensitive receptors	Can be reversed	No	
			WM	Negative	8	Negligible					
Post closure activities	Air Quality - Nuisance Impact Significance	Increased health risk at AQSRs.	WOM	Negative	22	Low				No	
			WM	Negative	8	Negligible					
Post closure activities	Air Quality - Vegetation Impact Significance	Increased health risk at AQSRs.	WOM	Negative	9	Negligible				No	
			WM	Negative	8	Negligible					

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance		Management Measures	Management objective	Mitigation Effect	Potential for residual risk	Compliance with Standards (where applicable)
					Score	Magnitude					
Soil and Land Capability Assessment											
Construction Phase											
Construction of the infrastructure	Soil Erosion	Loosening of soils due to removal of vegetation associated with the surface infrastructure. Leading to Increased runoff, erosion and consequent loss of land capability in cleared areas.	WOM	Negative	65	High	• Regulated speed limits of 40km/hr must be maintained on gravel roads to minimize dust generation; • The mine should implement adequate wet suppression techniques to limit dust release; • Bare soils within the access roads 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; • Activity should be limited to area of disturbance (if feasible); • All vehicles and machinery will be regularly serviced to ensure they are in proper working condition and to reduce risk of leaks; • All leaks should be cleaned up immediately using an absorbent material and spill kits, in the prescribed manner; • All vehicular traffic should be restricted to the existing service roads and the selected road servitude as far as practically possible; • Withdraw equipment for maintenance if change in emission characteristics is noticeable; • Spill kits (such as spill-sorb or a similar type of product) must be kept on site and used to clean up hydrocarbon spills in the event that they should occur; • All hazardous waste generated shall be kept separate and shall not be mixed with general waste; All hazardous waste shall be stored within a sealed drum on an impermeable surfaced area within the central waste storage and transition area. Prevent and reduce and remedy through management measures. • Activity should be limited to area of disturbance. Where required the compacted soils should be disked to an adequate depth and re-vegetated with indigenous plants; • Soils compacted, should be deeply ripped to loosen compacted layers and re-graded to even running levels. • Direct surface disturbance of the identified arable soils can be avoided where possible to minimise loss of arable soils; and • Soils of different characteristics should be stockpiled separately and clearly demarcated.	Prevent soil erosion	Can be avoided, managed or mitigated	No	National Environmental Management Act, (Act 107 of 1998) (NEMA);
			WM	Negative	40	Low					
	Soil Compaction	Potential frequent movement of digging machinery and construction vehicles within lose and exposed soils, leading to excessive soil compaction.	WOM	Negative	65	High		Prevent soil compaction	Can be avoided, managed or mitigated	No	National Environmental Management: Waste Act (Act 59 of 2008);
			WM	Negative	40	Low					
	Soil Contamination	Spillage of petroleum hydrocarbons during construction of associated infrastructure. Disposal of hazardous and non-hazardous waste, including waste material spills and refuse deposits into the soil.	WOM	Negative	52	Moderate		Prevent soil contamination	Can be avoided, managed or mitigated	No	Conservation of Agricultural Resources Act, 1983 (Act 43 of 1983) (CARA); and
			WM	Negative	27	Low					
	Land Capability	Loss of land capability	WOM	Negative	45	Moderate		Prevent loss of land capability	Can be avoided, managed or mitigated	No	Mineral and Petroleum Resources Development Act, 2002 (Act 28 of 2002) (MPRDA).
			WM	Negative	36	Low					
Operational Phase											
Operation of mines and movement of vehicles	Soil Erosion	Constant disturbances of soils, resulting in risk of erosion	WOM	Negative	60	Moderate	• Excessive compaction of the soil by heavy machinery should be avoided by using prescribed access routes. • Contractors should be committed not to overload trucks to avoid spillage. Spillage from	Prevent soil erosion	Can be avoided, managed or mitigated	No	National Environmental Management Act, (Act 107 of 1998) (NEMA);

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance		Management Measures	Management objective	Mitigation Effect	Potential for residual risk	Compliance with Standards (where applicable)
					Score	Magnitude					
			WM	Negative	40	Low	trucks will be monitored and if necessary remedial measures should be implemented. • Storage of hazardous substances and materials to avoid and/or minimise chemical leaks/spills causing contamination of soil and groundwater resources; • Spillage from trucks will be monitored and if necessary remedial measures should be implemented. If spills occur and soils are polluted, the affected soils should be removed and discarded at an appropriate permitted waste site; • All vehicular traffic should be restricted to the existing service roads and the selected road servitude as far as practically possible; • Compacted soils should be deeply ripped to loosen compacted layers and re-graded to even running levels; • Contamination of these soils by possible seepage and return water runoff will be reduced by the use of collector drains and cut off trenches; • Regular monitoring of site activities and machinery must be undertaken to identify spills or leaks; • Excess vegetation will be removed from the storm water berm drainage route to prevent back-up of flood occurring; • All Vehicles and machinery should be serviced regularly to ensure they are in a proper working condition and to avoid any oil leaks; • An emergency management system with procedures and training will be developed; • If spills occur the affected soils will be removed using absorbent material and spill kits and disposed of to a permitted waste site; • All disturbed areas adjacent to the project infrastructural 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. • Stockpiles that will remain in location for more than one growing season and that have not revegetated naturally, should be revegetated to avoid erosion losses; and • The dumping of waste materials next to or on the stockpiles should be prohibited.				
	Soil Compaction	Constant disturbances of soils, resulting in risk of compaction	WOM	Negative	60	Moderate		Prevent soil compaction	Can be avoided, managed or mitigated	No	National Environmental Management: Waste Act (Act 59 of 2008);
			WM	Negative	40	Low					
	Soil Contamination	Leaching of hydrocarbons chemicals into the soils, leading to alteration of the soil chemical status as well as contamination of ground water. Disposal of hazardous and non-hazardous waste, including waste material spills and refuse deposits into the soil.	WOM	Negative	48	Moderate		Prevent soil contamination	Can be avoided, managed or mitigated	No	Conservation of Agricultural Resources Act, 1983 (Act 43 of 1983) (CARA); and
			WM	Negative	36	Low					
	Land Capability	Loss of land capability	WOM	Negative	48	Moderate		Prevent loss of land capability	Can be avoided, managed or mitigated	No	Mineral and Petroleum Resources Development Act, 2002 (Act 28 of 2002) (MPRDA).
			WM	Negative	40	Low					
Closure and Post closure					0						
Removal of infrastructure and rehabilitation	Soil Erosion	Soil handling during decommissioning and capping leading to erosion.	WOM	Negative	24	Low	• All disturbed areas should be re-vegetated with an indigenous grass mix, if necessary, to re-establish a protective cover or return to conditions conducive for forestry land use, to minimise soil erosion; • Compacted soils adjacent to the proposed developments during construction should be lightly ripped to at least 25 cm below ground surface to alleviate compaction; • Soil Compaction is usually greatest when soils	Prevent soil erosion	Can be avoided, managed or mitigated	Yes	National Environmental Management Act, (Act 107 of 1998) (NEMA);
			WM	Negative	22	Low					

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance		Management Measures	Management objective	Mitigation Effect	Potential for residual risk	Compliance with Standards (where applicable)
					Score	Magnitude					
	Soil Compaction	Movement of vehicles and machinery during rehabilitation leading to soil compaction.	WOM	Negative	24	Low	are moist, so soils should be stripped when moisture content is as low as possible. If they have to be moved when wet, truck and shovel should be used as bowl scrapers create excessive compaction when moving wet soils • Temporary erosion control measures may be used to protect the disturbed soils during the rehabilitation until adequate vegetation has established; • A site-specific drainage system design should be implemented to reduce the volume and velocity of flows crossing disturbed areas and to prevent the mixing of clean and dirty runoff as far as possible; • Runoff attenuation, which function as wetlands or bioswales can potentially be placed at strategic points in the bottom of the landscape to assist with the assimilation of contaminants and to trap sediments; • Compaction should be minimised by use of appropriate equipment and replacing soils to the greatest possible thickness in single lifts; • Heavy equipment movement over replaced soils should be minimised; • Where revegetation is not possible, the soils should be tilled to produce a seed-bed suitable for the plant species selected for seeding to be seeded into; and • Undertake inspection of rehabilitated area to ascertain level of success of rehabilitation efforts and effectiveness (vegetation growth, erosion monitoring), and • During the decommissioning phase the footprint should be thoroughly cleaned, and all building material should be removed to a suitable disposal facility. After clearing the post-closure land use can be targeted for forestry.	Prevent soil compaction	Can be avoided, managed or mitigated	Yes	National Environmental Management: Waste Act (Act 59 of 2008);
			WM	Negative	22	Low					
	Soil Contamination	Spillage of hydrocarbons resulting from leakages from demolition equipment/machinery and other chemical storage facilities, leading to soil contamination (soil chemical characteristics.	WOM	Negative	36	Low		Prevent soil contamination	Can be avoided, managed or mitigated	Yes	Conservation of Agricultural Resources Act, 1983 (Act 43 of 1983) (CARA); and
			WM	Negative	30	Low					
	Land Capability	Potentially poor rehabilitation strategy may result to lower infiltration rate, and consequently increased surface runoff. Increased soil erosion leading to permanent loss of soil resources	WOM	Negative	36	Low		Prevent loss of land capability	Can be avoided, managed or mitigated	Yes	Mineral and Petroleum Resources Development Act, 2002 (Act 28 of 2002) (MPRDA).
			WM	Negative	22	Low					
Geohydrological and Groundwater Assessment											
Construction Phase											
Tailings Facility - Continuation	Groundwater	Seepage of contaminated leachate into the aquifer system	WOM	Negative	8	Negligible	Tailings deposition will not take place during the construction phase and no impact is therefore expected. No management measures are recommended other than the establishment of a suitable groundwater monitoring network.	Avoid contaminated seepage	Can be avoided, managed or mitigated	Yes	National Environmental Management Act (NEMA)
Underground Mining Establishment	Groundwater Quality	Prior to the actual mining commencing the opening up and dewatering of main accessways will take place. Dewatering of flooded underground workings may pose a risk of contaminated water spilling into the surface water streams.	WOM	Negative	20	Negligible	- Sample water regularly to assess the water quality - If quality is not suitable for discharge it should be pumped to an adequate holding facility.	Prevent contaminated water from entering surface streams	Can be avoided, managed or mitigated	Yes	National Environmental Management Act (NEMA), National Water Act (NWA)
Operational Phase											

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance		Management Measures	Management objective	Mitigation Effect	Potential for residual risk	Compliance with Standards (where applicable)
					Score	Magnitude					
Waste Deposition - Tailings Facility (TSF) - Return Water Dams (RWD) - Waste Rock Dumps (WRD)	Groundwater Quality	-Generation and disposal of hazardous operational waste i.e. waste rock, tailings, etc. -Seepage of contaminated leachate into the aquifer system.	WOM	Negative	56	Moderate	- Design and placement of suitable liner and drainage system according to the waste classification requirements. - Routine monitoring to act as early warning of potential impacts. - Implementation of remedial options to contain or remove contaminant plume, if required.	Avoid or reduce contaminated seepage	Can be avoided, managed or mitigated	Yes	National Environmental Management Act (NEMA), National Water Act (NWA)
Underground Mining	Groundwater Level and Yield	Water flow into the mine resulting in the draining of the aquifer and potential lowering of the groundwater level.	WOM	Negative	48	Moderate	- Drilling of cover boreholes ahead of development in virgin ground. These holes must be equipped with valves so that they can be closed if water is intersected and to allow for later grouting if necessary. - It is recommended that groundwater intersections in the cover holes are grouted to allow for dry mining of the development ends. - Pillars may be required around water-bearing geological structures. - Accurate record keeping of all water intersections and the following should be recorded: - Position of the water intersection, - Water pressure of the intersection as this provides an indication of the groundwater level, - Groundwater quality, - Grout Volumes and sealing pressure.	Reduce the volume of groundwater flowing into the mine	Can be avoided, managed or mitigated	Yes	National Environmental Management Act (NEMA), National Water Act (NWA)
Underground Mining	Groundwater Quality	Groundwater entering the mine coming into contact with contaminants causing deterioration of the water quality.	WOM	Negative	24	Low	- Water that cannot be sealed should be included in the mining and processing circuit as far as possible. - Water should be contained in underground dams from where it can be piped to holding dams on surface (prevent the water from flowing through the mineralised areas). - Reduce the contact time between the water and the rock.	Prevent groundwater from becoming contaminated when entering the mine.	Can be avoided, managed or mitigated	Yes	National Environmental Management Act (NEMA), National Water Act (NWA)
Closure and Post closure											
Residual groundwater contamination from TSF, RWD and WRD after closure of the mine	Groundwater Quality	-Generation and disposal of hazardous operational waste i.e. waste rock, tailings, etc. - Seepage of contaminated leachate into the aquifer system.	WOM	Negative	30	Low	Design and implementation of a suitable rehabilitation plan.	Avoid seepage of rainwater through the waste material and contaminated leachate from entering the aquifer.	Can be avoided, managed or mitigated	Yes	National Environmental Management Act (NEMA), National Water Act (NWA)
Continued groundwater inflow into the mine	Groundwater Level and Yield	Water flow into the mine resulting in the draining of the aquifer and potential lowering of the groundwater level.	WOM	Negative	48	Moderate	Water entering the mine should be sealed as far as possible.	Reduce the volume of groundwater flowing into the mine	Can be avoided, managed or mitigated	Yes	National Environmental Management Act (NEMA), National Water Act (NWA)

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance		Management Measures	Management objective	Mitigation Effect	Potential for residual risk	Compliance with Standards (where applicable)
					Score	Magnitude					
Residual groundwater contamination after closure of the mine	Groundwater Quality	Groundwater entering the mine coming into contact with contaminants causing deterioration of the water quality.	WM	Negative	24	Low	Continued monitoring of the water quality and possible treatment of water if required.	Prevent contaminated water from entering surface streams	Can be avoided, managed or mitigated	Yes	National Environmental Management Act (NEMA), National Water Act (NWA)
Biodiversity Assessment - Floral Assessment											
Beta North											
Construction Phase											
Expansion and re-working of the TSF	Degraded Habitat Unit	• Site clearing and the removal of vegetation associated with the Transformed Habitat Unit; • Potential inadequate design of infrastructure leading to pollution of soils. Contaminated soils lead to a loss of viable growing conditions for plants and results in a decrease of floral habitat, diversity, and SCC – rehabilitation effort will also be increased as a result; and • Potential proliferation of AIP species that colonise areas of increased disturbances and that outcompetes native species, including the further transformation of adjacent or nearby natural, more sensitive habitat, such as downslope watercourses.	WOM	Negative	40	Low	• Ensure adequate design of TSF; • Prior to the commencement of construction activities, the entire construction servitude, including lay down areas and stockpile areas etc., should be fenced off and clearly demarcated; • Minimise loss of indigenous vegetation where possible; • All construction-related waste and material is to be disposed of at a registered waste facility and no waste of construction rubble is to be dumped in the surrounding natural habitats; • Implement AIP control; and • Ensure AIP vegetation cuttings/propagules are disposed of at a designated spot where spread of these species is prevented.	Minimise effects of vegetation removal and alien invasive spreading on the area outside of the footprint	Can be avoided, managed or mitigated		National Biodiversity Assessment (NBA, 2018) National Threatened Ecosystems (2011) (GN 1002) National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA). National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) (NEMBA).
			WM	Negative	35	Low					
	Freshwater Habitat		WOM	Negative	30	Low					
			WM	Negative	11	Negligible					
	Woody Communities		WOM	Negative	6	Negligible					
			WM	Negative	4	Negligible					
	Valley Habitat		WOM	Negative	6	Negligible					
			WM	Negative	4	Negligible					
Construction of Crossing(s)	Freshwater Habitat	• Vegetation clearing within the Riparian Woodland sub-unit (i.e., Peach Tree Stream; • Temporary alteration of stream flow; • Spread of AIPs along the Riparian Woodland sub-unit from contaminated construction material; and • Increased sediment loads and potential erosion of stream banks resulting from construction activities and increased movement of construction workers along / across the Riparian Woodland.	WOM	Negative	60	Moderate	• All crossings over watercourses must be kept to the bare minimum and are adequately designed to prevent impacts on habitat, instream flow, pattern and timing of water and water quality; • Minimise loss of indigenous vegetation where possible; • Ensure AIP vegetation cutting and propagules do not enter the watercourses where crossings will be constructed; and • As much as possible, existing access roads and river crossings must be utilised (if necessary, upgraded) to minimise further disturbances to the watercourses.	Protecting the riparian habitat and function	Can be avoided, managed or mitigated		
			WM	Negative	35	Low					
Construction of surface infrastructure associated with Operational Infrastructure, Shafts, Supporting	Degraded Habitat Unit	• Site preparation and clearing of small extents of indigenous vegetation for mine-related infrastructure; • Impaired water quality and reduced flow of watercourses due to the accumulation of vegetation cuttings and	WOM	Negative	40	Low	• Prior to the commencement of construction activities, the entire construction servitude, including lay down areas and stockpile areas etc., should be fenced off and clearly demarcated; • The construction footprint and removal of	Minimise effects of vegetation removal and alien invasive	Can be avoided, managed or mitigated	No	

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance		Management Measures	Management objective	Mitigation Effect	Potential for residual risk	Compliance with Standards (where applicable)
					Score	Magnitude					
Infrastructure, WRDs and Stockpiles		debris resulting from vegetation clearing; • Waste from construction material leading to disturbance of natural vegetation; • Increased personnel on site leading to loss of floral habitat through the potential for increased fire frequency and intensity (further promoting wattle thicket formation), as well as indiscriminate driving through natural veld; • Potential proliferation of AIP species that colonise areas of increased disturbances arising from dumping of excavated and construction material outside of designated areas. Loss of floral habitat and species diversity as AIPs outcompete native species and transform adjacent or nearby natural, more sensitive habitat; • Dust generated during construction activities accumulating on the surrounding floral individuals, altering the photosynthetic ability of plants, and potentially further decreasing optimal growing/re-establishing conditions; • Potential failure to concurrently rehabilitate bare areas or disturbed sites as soon as they become available, potentially resulting in loss of viable soils, increasing erosion risk and/or permitting the proliferation of AIPs; and • Potential failure to implement a biodiversity action plan (BAP), including the auditing of the BAP, leading to permanent transformation of floral habitat and long-term degradation of important floral habitat within the region.	WM	Negative	35	Low	vegetation must be kept as small as possible within the authorised footprints to minimise impact on the surrounding environment (edge effect management); • No vegetation cuttings may be left to accumulate in watercourses. Discard all construction related waste and material (including cleared vegetation) at a registered waste facility (or in a secluded area designated by the mine) and no waste of construction rubble is to be dumped in the surrounding natural habitats; • If any spills occur, they should be immediately cleaned up to avoid soil contamination that can hinder floral rehabilitation later down the line; • Edge effects of all construction activities, which may affect floral habitat within surrounding areas, are to be strictly managed, e.g., implement an AIP control plan from the get-go, mitigate soil erosion by reducing soil compaction caused by movement of construction personnel and vehicles, suppress dust in order to mitigate the impact of dust on flora within a close proximity of construction activities; • No illicit fires must be allowed during any phases of the proposed mining development. A Fire Management Plan (FMP) should be set in place to ensure that any fires that do originate can be managed and / or stopped before significant damage to the environment occurs; • No indiscriminate driving through the veld is allowed. As far as possible vehicles are to utilise the existing roads. Where this is not feasible, new roads are to be located in areas of existing high disturbance, and not encroach upon sensitive habitats; 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.	spreading on the area outside of the footprint			
	Freshwater Habitat		WOM	Negative	48	Moderate		Protecting the riparian habitat and function	Can be avoided, managed or mitigated		
			WM	Negative	4	Negligible					
	Woody Communities		WOM	Negative	10	Negligible		Minimise effects of vegetation removal and alien invasive spreading on the area outside of the footprint	Can be avoided, managed or mitigated		
			WM	Negative	4	Negligible					
	Valley Habitat		WOM	Negative	48	Moderate		Protecting the riparian habitat and function	Can be avoided, managed or mitigated		
			WM	Negative	8	Negligible					
Construction of Linear Developments	Woody Communities	• Site clearing and the removal of vegetation along continuous leading to fragmented habitat and a disturbance corridor along which AIPs can establish and spread to adjacent sites.	WOM	Negative	60	Moderate	• The construction footprint and removal of vegetation must be kept as small as possible within the authorised footprints to minimise impact on the surrounding environment (edge effect management); • Access roads should be kept to existing roads so to reduce fragmentation of existing natural habitat; • Roadsides and linear developments serve as common corridors along which alien and invasive floral species are introduced and	Minimise effects of vegetation removal and alien invasive spreading on the area outside of the footprint	Can be avoided, managed or mitigated	No	
			WM	Negative	35	Low					

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance		Management Measures	Management objective	Mitigation Effect	Potential for residual risk	Compliance with Standards (where applicable)
					Score	Magnitude					
	Degraded Habitat Unit		WOM	Negative	40	Low	dispersed. Therefore, an AIP control plan should be implemented along all linear disturbances; and • All construction related waste and material is to be disposed of at a registered waste facility and no waste of construction rubble is to be dumped in the surrounding natural habitats.	Protecting the riparian habitat and function	Can be avoided, managed or mitigated	No	
			WM	Negative	35	Low					
	Freshwater Habitat		WOM	Negative	48	Moderate		Minimise effects of vegetation removal and alien invasive spreading on the area outside of the footprint	Can be avoided, managed or mitigated	No	
			WM	Negative	18	Negligible					
	Valley Habitat		WOM	Negative	40	Low		Protecting the riparian habitat and function	Can be avoided, managed or mitigated	No	
			WM	Negative	24	Low					
Removal and/or relocation of floral SCC	Floral SCC	• Failure to plan a summer floral SCC walkdown to confirm the presence/absence of such species within the direct footprint areas, including the potential untimely application for permits to relocate/ destroy any floral SCC found within the footprint areas; and • Increased human presence due to construction-related activities, potentially resulting in increased harvesting/ collection of SCC.	WOM	Negative	40	Low	• Before any construction activities can occur, a detailed walk down of the area must take place, during which all NFA-protected tree species, MNCA-protected floral species and potentially occurring RDL species are marked. If SCC are encountered and will be affected by the construction activities, these species must, as far as is possible, be avoided. If avoidance of impacts to SCC are not possible, the following is recommended: 1) For NFA-protected trees, permit applications will be required from DFFE for removal/destruction of species. For specimens too large to relocate, collection of propagules should take place and these propagated in nurseries for use in rehabilitation later down the line; 2) For MNCA-protected species, permit application from MTPA will be required to rescue and relocate such species; 3) For RDL species, an investigation must be initiated into potential relocation. If not possible, offsetting the loss of RDL species should be pursued. • No collection of firewood, floral SCC or medicinal floral species must be allowed by construction or mining personnel.	Limiting removal and protecting SCC's	Can be avoided, managed or mitigated	No	
			WM	Negative	8	Negligible				No	
Operational Phase											
All activities associated with mining and the movement of vehicles	Degraded Habitat Unit	• Potential failing/collapse of TSF resulting in loss of surrounding habitat; • Further loss of floral habitat beyond the project footprint because of vegetation clearing related to operational-phase	WOM	Negative	35	Low	HABITAT AND DIVERSITY: • Ongoing monitoring of TSF stability; • Stockpiles, discard dumps and PCD etc. positions, and their expansion as material is deposited, should be kept as small as possible;	Minimise effects of vegetation removal and alien	Can be avoided, managed or mitigated	No	National Biodiversity Assessment (NBA, 2018) National Threatened Ecosystems (2011)

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance		Management Measures	Management objective	Mitigation Effect	Potential for residual risk	Compliance with Standards (where applicable)
					Score	Magnitude					
		disturbances and expansion of stockpiles and waste rock dumps, on-going disturbance of soils due to operational activities, and edge effects associated with mining activities; • Ongoing disturbances from operational activities resulting in increased or continued proliferation of AIPs; Failure to concurrently rehabilitate bare areas or disturbed sites as soon as they become available, potentially resulting in loss of viable soils, increasing erosion risk and/or permitting the proliferation of AIPs; • Erosion as a result of mining development, stormwater runoff and on-going disturbance of soils due to operational activities; • Risk of contamination from all operational facilities may pollute receiving environment; • Loss of floral SCC through ineffective monitoring of relocation success of rescued and relocated floral SCC (where applicable), and/or due to the harvesting of protected floral species by mining and operational personnel; and • Additional pressure on floral habitat by increased human populations associated with the proposed mining activities, contributing to increases in the collection of plant material for medicinal purposes and promoting the introduction and spread of AIPs that may displace habitat for SCCs.	WM	Negative	35	Low	• No additional habitat is to be disturbed during the operational phase of the development; • Manage all edge effects or indirect disturbances stemming from mining operations and infrastructure areas: a) Implement erosion control measures where necessary to ensure that further habitat loss does not occur; b) Any waste or toxic spills from vehicles or mining infrastructure must be dealt with immediately in accordance with the waste management plan (emergency incident procedure or spill procedure); c) No uncontrolled or unsanctioned fires are allowed. A FMP should be in place; d) Vehicles should be restricted to travelling only on designated roadways to limit the ecological footprint of the proposed mining activities; and e) Implement an AIP Management / Control Plan that includes ongoing monitoring and control of the presence and/or re-emergence of such species. • Rehabilitate areas that are no longer used for mining. FLORAL SCC: • Monitoring of relocation success of potentially rescued and relocated floral SCC should take place during the operational phase; • Manage all edge effects stemming from mining operations and infrastructure areas; and • Harvesting of protected floral species by mining and operational personnel should be strictly prohibited.	invasive spreading on the area outside of the footprint			(GN 1002) National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA). National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) (NEMBA).
	Freshwater Habitat		WOM	Negative	32	Low		Protecting the riparian habitat and function	Can be avoided, managed or mitigated	No	
			WM	Negative	14	Negligible					
	Woody Communities		WOM	Negative	32	Low		Minimise effects of vegetation removal and alien invasive spreading on the area outside of the footprint	Can be avoided, managed or mitigated	No	
			WM	Negative	8	Negligible					
	Valley Habitat		WOM	Negative	40	Low		Protecting the riparian habitat and function	Can be avoided, managed or mitigated	No	
			WM	Negative	8	Negligible					
	Floral SCC		WOM	Negative	44	Moderate		Limiting removal and protecting SCC's	Can be avoided, managed or mitigated	No	
			WM	Negative	22	Low					
Ongoing AIP management within 30 m of proposed activities	Floral Habitat and Diversity	• Ongoing AIP clearing and management as part of operational activities, resulting in an increase in floral diversity and habitat integrity.	WOM	Positive	8	Negligible	The proliferation of AIPs is expected within any disturbed areas and especially along linear developments. AIPs must be monitored and must be removed throughout the operational phase of the project to prevent their spread beyond the development footprint areas: • Removal of the AIPs, with specific emphasis on Category 1b alien species, encountered within the footprint area and immediate surrounds (approximately 30 m buffer around activities) must take place (as per NEMBA: Alien and	Increase in floral diversity and habitat integrity.	Can be reversed	No	

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance		Management Measures	Management objective	Mitigation Effect	Potential for residual risk	Compliance with Standards (where applicable)
					Score	Magnitude					
			WM	Positive	60	Moderate	Invasive Species Regulations of 2020); • Removal of alien invasive species should preferably commence during the construction phases and continue throughout the operational, decommissioning and post-closure phases; and • The AIP Management/Control Plan should be implemented by a qualified professional. No chemical control of AIPs to occur within 32 m of a watercourse.				
Closure and Post closure											
Seepage from TSF and WRDs	Floral Habitat and diversity	• On-going risk of discharge from mining facilities beyond closure leading to a permanent impact on floral habitat and downstream impacts on Riparian Habitat and Forest Remnants	WOM	Negative	44	Moderate	• Ensure TSF is stable and monitor often to ensure rapid response in the event of discharge.	Protecting impact on riparian habitat and Forest Remains	Can be avoided, managed or mitigated	No	National Biodiversity Assessment (NBA, 2018) National Threatened Ecosystems (2011) (GN 1002) National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA). National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) (NEMBA).
			WM	Negative	18	Negligible					
Rehabilitation and restoration activities	Floral Habitat and diversity	• Permanent loss of floral habitat, diversity and SCC, and a higher likelihood of edge effect impacts on adjacent and nearby natural vegetation of increased sensitivity due to potential failure to effectively implement and monitor rehabilitation efforts, leading to: a) Reintroduction and proliferation of alien and invasive plant species; b) Compacted soils limiting the re-establishment of natural vegetation; c) Increased risk of erosion in areas left disturbed and inadequately vegetated; d) Improper rehabilitation of disturbed areas leading to permanent floral habitat loss. Ultimately leading to a permanent loss of floral habitat, diversity and SCC, and a higher likelihood of edge effect impacts on adjacent and nearby natural vegetation of increased sensitivity.	WOM	Negative	75	High	• Ensure sound implementation of AIP Management / Control Plan; • Where soils have been compacted, they are to be ripped and where necessary reprofiled; • Indigenous floral species are to be used for revegetation of disturbed areas. Where possible, reinstatement of floral communities similar to the reference vegetation type for the area must form the goal of rehabilitation activities; • All surface infrastructure is to be removed and waste material disposed of at a registered dump site. Waste and remnant mine related material are not to be dumped or left within the focus area. • A bi-annual alien vegetation clearance programme should be implemented for up to 2 years after closure but preferably until all AIP species are under control and no risk of spread to adjacent, natural habitat remains; • Follow up with alien and invasive plant control measures for a period of 5 years post-closure; • Use of a nursery developed by the mine to cultivate indigenous/endemic floral species and floral SCCs with a focus on rehabilitation during the post-closure phase in conjunction with a suitably qualified specialist. This will assist in areas where regrowth is not to an acceptable standard; and • Continue monitoring of rehabilitation activities for a minimum period of 5 years following the mine closure or until an acceptable level of habitat and biodiversity re-instatement has occurred, in such a way as to ensure that natural processes and veld succession will lead to the re-establishment of the natural wilderness conditions which are analogous to the pre-mining conditions of the area.	Increase in floral diversity and habitat integrity.	Can be reversed	No	
			WM	Negative	24	Low					
Rehabilitation and restoration activities	Floral Habitat and diversity	• Rehabilitation of currently degraded habitat and AIP clearance of already proliferated areas. Some ecological functioning will be restored that has been lost due to AIP proliferation and habitat transformation.	WOM	Positive	20	Negligible		Increase in floral diversity and habitat integrity.	Can be reversed	No	
			WM	Positive	60	Moderate					
Dukes											
Construction Phase											

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance		Management Measures	Management objective	Mitigation Effect	Potential for residual risk	Compliance with Standards (where applicable)
					Score	Magnitude					
Construction of surface infrastructure associated with Operational Infrastructure, Supporting Infrastructure, WRDs and Stockpiles	Degraded Habitat Unit	• Site preparation and clearing of indigenous vegetation for mine-related infrastructure; • Construction related activities within the recommended 30 m forest exclusion buffer, resulting in the potential loss or degradation of the zone buffering the forest from external impacts, e.g., degradation of habitat integrity of the 30 m buffer decreasing forest resilience, increasing the risk of AIP proliferation and native woody encroachment; • Dumping of cut vegetation, including AIPs, outside of already disturbed areas or outside of the authorised footprints, resulting in the loss of favourable habitat for the establishment of native species; • Impaired water quality and reduced flow of watercourses due to the accumulation of vegetation cuttings and debris within the Freshwater Habitat resulting from vegetation clearing; • Waste from construction material leading to disturbance of natural vegetation; • Increased personnel on site leading to loss of floral habitat through the potential for increased fire frequency and intensity (further promoting wattle thicket formation), as well as indiscriminate driving through natural veld; • Potential proliferation of AIP species that colonise areas of increased disturbances and that outcompetes native species, including the further transformation of adjacent or nearby natural, more sensitive habitat, such as downslope watercourses; • Dust generated during construction activities accumulating on the surrounding floral individuals, altering the photosynthetic ability of plants, and potentially further decreasing optimal growing/re-establishing conditions; • Potential failure to concurrently rehabilitate bare areas or disturbed sites as soon as they become available, potentially resulting in loss of viable soils, increasing erosion risk and/or permitting the proliferation of AIPs; and • Potential failure to implement a BAP, including the auditing of the BAP, leading to permanent transformation of floral habitat and long-term degradation of important floral habitat within the region.	WOM	Negative	40	Low	• Prior to the commencement of new construction activities, the entire construction servitude, including lay down areas and stockpile areas etc., should be fenced off and clearly demarcated; • Restrict construction related activities to outside of the 30 m forest exclusion buffer where possible and feasible; • The construction footprint and removal of vegetation must be kept as small as possible within the authorised footprints to minimise impact on the surrounding environment (edge effect management); • No vegetation cuttings may be left to accumulate in watercourses. Discard all construction related waste and material (including cleared vegetation) at a registered waste facility (or in a secluded area designated by the mine) and no waste of construction rubble is to be dumped in the surrounding natural habitats; • If any spills occur, they should be immediately cleaned up to avoid soil contamination that can hinder floral rehabilitation later down the line; • Edge effects of all construction activities, which may affect floral habitat within surrounding areas, are to be strictly managed, e.g., implement an AIP control plan from the get-go, mitigate soil erosion by reducing soil compaction caused by movement of construction personnel and vehicles, suppress dust in order to mitigate the impact of dust on flora within a close proximity of construction activities; • No illicit fires must be allowed during any phases of the proposed mining development. A FMP should be set in place to ensure that any fires that do originate can be managed and / or stopped before significant damage to the environment occurs; • No indiscriminate driving through the veld is allowed. As far as possible vehicles are to utilise the existing roads. Where this is not feasible, new roads are to be located in areas of existing high disturbance, and not encroach upon sensitive habitats; • 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.	Minimise effects of vegetation removal and alien invasive spreading on the area outside of the footprint	Can be avoided, managed or mitigated	No	National Biodiversity Assessment (NBA, 2018) National Threatened Ecosystems (2011) (GN 1002) National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA). National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) (NEMBA).
			WM	Negative	35	Low					
	Freshwater Habitat		WOM	Negative	48	Moderate		Protecting the riparian habitat and function	Can be avoided, managed or mitigated	No	
			WM	Negative	24	Low					
	Woody Communities		WOM	Negative	60	Moderate		Minimise effects of vegetation removal and alien invasive spreading on the area outside of the footprint	Can be avoided, managed or mitigated	No	
			WM	Negative	35	Low					
	Valley Habitat		WOM	Negative	40	Low		Protecting the riparian habitat and function	Can be avoided, managed or mitigated	No	

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance		Management Measures	Management objective	Mitigation Effect	Potential for residual risk	Compliance with Standards (where applicable)
					Score	Magnitude					
			WM	Negative	35	Low					
Construction of Linear Developments	Woody Communities	• Site clearing and the removal of vegetation along continuous leading to fragmented habitat and a disturbance corridor along which AIPs can establish and spread to adjacent sites; and • Construction related activities within the recommended 30 m forest exclusion buffer, resulting in the potential loss or degradation of the zone buffering the forest from external impacts, e.g., degradation of habitat integrity of the 30 m buffer decreasing forest resilience, increasing the risk of AIP proliferation and native woody encroachers.	WOM	Negative	65	High	• The construction footprint and removal of vegetation must be kept as small as possible within the authorised footprints to minimise impact on the surrounding environment (edge effect management); • Limit, as far as possible, the disturbance footprint within the 30 m forest exclusion buffer; • Access roads should be kept to existing roads so to reduce fragmentation of existing natural habitat; • Roadsides and linear developments serve as common corridors along which alien and invasive floral species are introduced and dispersed. Therefore, an AIP control plan should be implemented along all linear disturbances; and • All construction related waste and material is to be disposed of at a registered waste facility and no waste of construction rubble is to be dumped in the surrounding natural habitats.	Minimise effects of vegetation removal and alien invasive spreading on the area outside of the footprint	Can be avoided, managed or mitigated	No	
			WM	Negative	35	Low					
	Degraded Habitat Unit		WOM	Negative	40	Low		Minimise effects of vegetation removal and alien invasive spreading on the area outside of the footprint	Can be avoided, managed or mitigated	No	
			WM	Negative	35	Low					
	Freshwater Habitat		WOM	Negative	48	Moderate		Protecting the riparian habitat and function	Can be avoided, managed or mitigated	No	
			WM	Negative	10	Negligible					
	Valley Habitat		WOM	Negative	35	Low		Protecting the riparian habitat and function	Can be avoided, managed or mitigated	No	
			WM	Negative	35	Low					
Removal and/or relocation of floral SCC	Floral SCC	• Loss of occurring and potentially occurring floral SCC due to potential failure to conduct a walkdown of the footprint area before construction activities where floral SCC, if present, are marked and relocated to suitable habitat outside the development footprint prior to the construction phase; • Extensive and unnecessary loss of favourable floral habitat, leading to a decline in floral diversity, including a	WOM	Negative	24	Low	Before any construction activities can occur, a detailed walk down of the area must take place, during which all NFA-protected tree species, MNCA-protected floral species and potentially occurring RDL species are marked. If SCC are encountered and will be affected by the construction activities, these species must, as far as is possible, be avoided. If avoidance of impacts to SCC are not possible, the following is recommended: 1) For NFA-protected trees, permit applications	Limiting removal and protecting SCC's	Can be avoided, managed or mitigated	No	

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance		Management Measures	Management objective	Mitigation Effect	Potential for residual risk	Compliance with Standards (where applicable)
					Score	Magnitude					
		decline in floral SCC numbers within the site, resulting from potentially poorly planned placement of the proposed infrastructure within natural areas and areas identified as increasingly sensitive during ecological studies; and • Increased human presence due to construction-related activities, potentially resulting in increased harvesting/ collection of SCC.	WM	Negative	8	Negligible	will be required from DFFE for removal/destruction of species. For specimens too large to relocate, collection of propagules should take place and these propagated in nurseries for use in rehabilitation later down the line; 2) For MNCA-protected species, permit application from MTPA will be required to rescue and relocate such species; 3) For RDL species, an investigation must be initiated into potential relocation. If not possible, offsetting the loss of RDL species should be pursued. • No collection of firewood, floral SCC or medicinal floral species must be allowed by construction or mining personnel.			No	
Operational Phase											
All activities associated with mining and the movement of vehicles	Degraded Habitat Unit	• Further loss of floral habitat beyond the project footprint because of vegetation clearing related to operational-phase disturbances and expansion of stockpiles and waste rock dumps, on-going disturbance of soils due to operational activities, and edge effects associated with mining activities; • Potential trimming or slashing of vegetation associated with the Forest and Woodland habitat units, or wood collection from these habitat units, creating 'gaps' in the woody layer that will impact the dynamics of these systems (increased light and potential for increased fire frequency), ultimately resulting in potential alterations in species composition and ecological function; • Ongoing disturbances from operational activities resulting in increased or continued proliferation of AIPs; • Failure to concurrently rehabilitate bare areas or disturbed sites as soon as they become available, potentially resulting in loss of viable soils, increasing erosion risk and/or permitting the proliferation of AIPs; • Erosion as a result of mining development, stormwater runoff and on-going disturbance of soils due to operational activities; • Risk of contamination from all operational facilities may pollute receiving environment; • Loss of floral SCC through ineffective monitoring of relocation success of rescued and relocated floral SCC (where applicable), and/or due to the harvesting	WOM	Negative	30	Low	HABITAT AND DIVERSITY • Ongoing monitoring of TSF stability; • Stockpiles, discard dumps and PCD etc positions, and their expansion as material is deposited, should be kept as small as possible; • No additional habitat is to be disturbed during the operational phase of the development; • Manage all edge effects or indirect disturbances stemming from mining operations and infrastructure areas: a) Implement erosion control measures where necessary to ensure that further habitat loss does not occur; b) Any waste or toxic spills from vehicles or mining infrastructure must be dealt with immediately in accordance with the waste management plan (emergency incident procedure or spill procedure); c) No uncontrolled or unsanctioned fires are allowed. A FMP should be in place; d) Vehicles should be restricted to travelling only on designated roadways to limit the ecological footprint of the proposed mining activities; and e) Implement an AIP Management / Control Plan that includes ongoing monitoring and control of the presence and/or re-emergence of such species. • No firewood collection may be permitted from the Forest Habitat, Riparian Forest or Riparian Woodlands. Ensure no disturbances to forest edges (including unauthorised activities within the 30 m forest exclusion buffer) take place that will result in the opening of forest "gaps"; and • Rehabilitate areas that are no longer used for mining FLORAL SCC. • Monitoring of relocation success of potentially rescued and relocated floral SCC should take	Minimise effects of vegetation removal and alien invasive spreading on the area outside of the footprint	Can be avoided, managed or mitigated	No	National Biodiversity Assessment (NBA, 2018) National Threatened Ecosystems (2011) (GN 1002) National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA). National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) (NEMBA).
			WM	Negative	30	Low					
	Freshwater Habitat		WOM	Negative	30	Low		Protecting the riparian habitat and function	Can be avoided, managed or mitigated	No	
			WM	Negative	30	Low					
	Woody Communities		WOM	Negative	48	Moderate		Minimise effects of vegetation removal and alien invasive spreading on the area outside of the footprint	Can be avoided, managed or mitigated	No	
			WM	Negative	22	Low					
	Valley Habitat		WOM	Negative	70	High		Protecting the riparian habitat and function	Can be avoided, managed or mitigated	No	

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance		Management Measures	Management objective	Mitigation Effect	Potential for residual risk	Compliance with Standards (where applicable)
					Score	Magnitude					
		of protected floral species by mining and operational personnel; and • Additional pressure on floral habitat by increased human populations associated with the proposed mining activities, contributing to increases in the collection of plant material for medicinal purposes and promoting the introduction and spread of AIPs that may displace habitat for SCCs.	WM	Negative	44	Moderate	place during the operational phase; • Manage all edge effects stemming from mining operations and infrastructure areas; and • Harvesting of protected floral species by mining and operational personnel should be strictly prohibited.				
	Floral SCC		WOM	Negative	35	Low		Limiting removal and protecting SCC's	Can be avoided, managed or mitigated	No	
			WM	Negative	12	Negligible					
Ongoing AIP management within 30 m of proposed activities	Floral Habitat and Diversity	Alien invasive prolification	WOM	Positive	55	Moderate	The proliferation of AIPs is expected within any disturbed areas and especially along linear developments. AIPs must be monitored and must be removed throughout the operational phase of the project to prevent their spread beyond the development footprint areas: • Removal of the AIPs, with specific emphasis on Category 1b alien species, encountered within the footprint area and immediate surrounds (approximately 30 m buffer around activities) must take place (as per NEMBA: Alien and Invasive Species Regulations of 2020); • Removal of alien invasive species should preferably commence during the construction phases and continue throughout the operational, decommissioning and post-closure phases; and • The AIP Management/Control Plan should be implemented by a qualified professional. No chemical control of AIPs to occur within 32 m of a watercourse.	Avoid AIP proliferation	Can be avoided, managed or mitigated	No	
			WM	Positive	22	Low					
Closure and Post closure											
Rehabilitation and restoration activities	Floral Habitat and diversity	• Permanent loss of floral habitat, diversity and SCC, and a higher likelihood of edge effect impacts on adjacent and nearby natural vegetation of increased sensitivity due to potential failure to effectively implement and monitor rehabilitation efforts, leading to: a) Reintroduction and proliferation of alien and invasive plant species; b) Compacted soils limiting the re-establishment of natural vegetation; c) Increased risk of erosion in areas left disturbed and inadequately vegetated;	WOM	Negative	64	High	• Ensure sound implementation of AIP Management / Control Plan; • Where soils have been compacted, they are to be ripped and where necessary reprofiled; • Indigenous floral species are to be used for revegetation of disturbed areas. Where possible, reinstatement of floral communities similar to the reference vegetation type for the area must form the goal of rehabilitation activities; • All surface infrastructure is to be removed and waste material disposed of at a registered dump site. Waste and remnant mine related material are not to be dumped or left within the focus	Increase in floral diversity and habitat integrity.	Can be reversed	No	National Biodiversity Assessment (NBA, 2018) National Threatened Ecosystems (2011) (GN 1002) National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA). National Environmental

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance		Management Measures	Management objective	Mitigation Effect	Potential for residual risk	Compliance with Standards (where applicable)
					Score	Magnitude					
		d) Improper rehabilitation of disturbed areas leading to permanent floral habitat loss. Ultimately leading to a permanent loss of floral habitat, diversity and SCC, and a higher likelihood of edge effect impacts on adjacent and nearby natural vegetation of increased sensitivity.	WM	Negative	24	Low	area; and • A bi-annual alien vegetation clearance programme should be implemented for up to 2 years after closure but preferably until all AIP species are under control and no risk of spread to adjacent, natural habitat remains; • Follow up with alien and invasive plant control measures for a period of 5 years post-closure. • Use of a nursery developed by the mine is recommended to cultivate indigenous/endemic floral species and floral SCCs with a focus on rehabilitation during the post-closure phase in conjunction with a suitably qualified specialist. This will assist in areas where regrowth is not to an acceptable standard; and • Continue monitoring of rehabilitation activities for a minimum period of 5 years following the mine closure or until an acceptable level of habitat and biodiversity re-instatement has occurred, in such a way as to ensure that natural processes and veld succession will lead to the re-establishment of the natural wilderness conditions which are analogous to the pre-mining conditions of the area.				Management: Biodiversity Act, 2004 (Act No. 10 of 2004) (NEMBA).
Rehabilitation and restoration activities	Floral Habitat and diversity	• Reinstatement of native floral communities due to rehabilitation of currently transformed and degraded habitat and AIP clearance within heavily infested areas. Return of ecological functioning that has been lost due to AIP proliferation and habitat transformation.	WOM	Positive	11	Negligible		Increase in floral diversity and habitat integrity.	Can be reversed	No	
			WM	Positive	70	High					
Frankfort											
Construction Phase											
Construction of surface infrastructure associated with Operational Infrastructure, Supporting Infrastructure, WRDs and Stockpiles	Degraded Habitat Unit	• Site preparation and clearing of indigenous vegetation for mine-related infrastructure; • Construction related activities within the recommended 30 m forest exclusion buffer, resulting in the potential loss or degradation of the zone buffering the forest from external impacts, e.g., degradation of habitat integrity of the 30 m buffer decreasing forest resilience, increasing the risk of AIP proliferation and native woody encroachment; • Dumping of cut vegetation, including AIPs, outside of already disturbed areas or outside of the authorised footprints, resulting in the loss of favourable habitat	WOM	Negative	40	Low	• Prior to the commencement of construction activities, the entire construction servitude, including lay down areas and stockpile areas etc., should be fenced off and clearly demarcated; • Restrict construction related activities to outside of the 30 m forest exclusion buffer where possible and feasible; • The construction footprint and removal of vegetation must be kept as small as possible within the authorised footprints to minimise impact on the surrounding environment (edge effect management); • No vegetation cuttings may be left to accumulate in watercourses. Discard all construction related waste and material	Minimise effects of vegetation removal and alien invasive spreading on the area outside of the footprint	Can be avoided, managed or mitigated	No	National Biodiversity Assessment (NBA, 2018) National Threatened Ecosystems (2011) (GN 1002) National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA). National Environmental Management: Biodiversity Act, 2004

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance		Management Measures	Management objective	Mitigation Effect	Potential for residual risk	Compliance with Standards (where applicable)
					Score	Magnitude					
		for the establishment of native species; • Impaired water quality and reduced flow of watercourses due to the accumulation of vegetation cuttings and debris within the Freshwater Habitat resulting from vegetation clearing; • Potential failure to have a stormwater management plan and erosion control plan in place during construction activities. The proposed activities will occur in mountainous terrain with watercourses (i.e., Riparian Forest and Riparian Woodland) downslope of these activities; • Potential inadequate stabilisation of steep slopes in the event that vegetation will be cleared along such slopes. Consequently, increased erosion will lead to the smothering of surrounding vegetation and larger disturbance footprints as slopes continue to erode; • Waste from construction material leading to disturbance of natural vegetation; • Increased personnel on site leading to loss of floral habitat through the potential for increased fire frequency and intensity (further promoting wattle thicket formation), as well as indiscriminate driving through natural veld; • Potential proliferation of AIP species that colonise areas of increased disturbances and that outcompetes native species, including the further transformation of adjacent or nearby natural, more sensitive habitat, such as downslope watercourses; • Dust generated during construction activities accumulating on the surrounding floral individuals, altering the photosynthetic ability of plants, and potentially further decreasing optimal growing/re-establishing conditions; • Potential failure to concurrently rehabilitate bare areas or disturbed sites as soon as they become available, potentially resulting in loss of viable soils, increasing erosion risk and/or permitting the proliferation of AIPs; and • Potential failure to implement a BAP, including the auditing of the BAP, leading to permanent transformation of floral habitat and long-term degradation	WM	Negative	35	Low	(including cleared vegetation) at a registered waste facility (or in a secluded area designated by the mine) and no waste of construction rubble is to be dumped in the surrounding natural habitats; • If any spills occur, they should be immediately cleaned up to avoid soil contamination that can hinder floral rehabilitation later down the line; • Edge effects of all construction activities, which may affect floral habitat within surrounding areas, are to be strictly managed, e.g., implement an AIP control plan from the get-go, mitigate soil erosion by reducing soil compaction caused by movement of construction personnel and vehicles, suppress dust in order to mitigate the impact of dust on flora within a close proximity of construction activities; • No illicit fires must be allowed during any phases of the proposed mining development. A FMP should be set in place to ensure that any fires that do originate can be managed and / or stopped before significant damage to the environment occurs; • No indiscriminate driving through the veld is allowed. As far as possible vehicles are to utilise the existing roads. Where this is not feasible, new roads are to be located in areas of existing high disturbance, and not encroach upon sensitive habitats; • 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.				(Act No. 10 of 2004) (NEMBA).
	Freshwater Habitat		WOM	Negative	56	Moderate		Protecting the riparian habitat and function	Can be avoided, managed or mitigated	No	
			WM	Negative	24	Low					
	Woody Communities		WOM	Negative	70	High		Minimise effects of vegetation removal and alien invasive spreading on the area outside of the footprint	Can be avoided, managed or mitigated	No	

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance		Management Measures	Management objective	Mitigation Effect	Potential for residual risk	Compliance with Standards (where applicable)
					Score	Magnitude					
		of important floral habitat within the region.	WM	Negative	55	Moderate					
Construction of Linear Developments	Woody Communities	• Site clearing and the removal of vegetation along continuous leading to fragmented habitat and a disturbance corridor along which AIPs can establish and spread to adjacent sites; • Potential failure to implement an Erosion Control Plan for construction of linear features occurring along mountain slopes, especially where areas are already disturbed and soils are less stable, leading to sedimentation of downslope watercourses and smothering of surrounding vegetation; • Construction related activities within the recommended 30 m forest exclusion buffer, resulting in the potential loss or degradation of the zone buffering the forest from external impacts, e.g., degradation of habitat integrity of the 30 m buffer decreasing forest resilience, increasing the risk of AIP proliferation and native woody encroachers; and • Potential slope failure during construction activities, directly affecting forest communities or resulting in gaps in the forest where increased light may open the potential for non-forest species to establish, thereby resulting in potential changes in forest dynamics in the long-run.	WOM	Negative	70	High	• The construction footprint and removal of vegetation must be kept as small as possible within the authorised footprints to minimise the impact on the surrounding environment (edge effect management); • Limit, as far as possible, the disturbance footprint within the 30 m forest exclusion buffer; • Access roads should be kept to existing roads so to reduce fragmentation of existing natural habitat; • Ensure slopes are stabilised at all times and ensure measures are in place to prevent slope failure along construction activities; • Roadsides and linear developments serve as common corridors along which alien and invasive floral species are introduced and dispersed. Therefore, an AIP control plan should be implemented along all linear disturbances; and • All construction related waste and material is to be disposed of at a registered waste facility and no waste of construction rubble is to be dumped in the surrounding natural habitats.	Minimise effects of vegetation removal and alien invasive spreading on the area outside of the footprint	Can be avoided, managed or mitigated	No	
			WM	Negative	55	Moderate					
	Degraded Habitat Unit		WOM	Negative	35	Low		Minimise effects of vegetation removal and alien invasive spreading on the area outside of the footprint	Can be avoided, managed or mitigated	No	
			WM	Negative	24	Low					
	Freshwater Habitat		WOM	Negative	48	Moderate		Protecting the riparian habitat and function	Can be avoided, managed or mitigated	No	
			WM	Negative	22	Low					

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance		Management Measures	Management objective	Mitigation Effect	Potential for residual risk	Compliance with Standards (where applicable)
					Score	Magnitude					
Removal and/or relocation of floral SCC	Floral SCC	• Loss of occurring and potentially occurring floral SCC due to potential failure to conduct a walkdown of the footprint area before construction activities where floral SCC, if present, are marked and relocated to suitable habitat outside the development footprint prior to the construction phase; • Extensive and unnecessary loss of favourable floral habitat, leading to a decline in floral diversity, including a decline in floral SCC numbers within the site, resulting from potentially poorly planned placement of the proposed infrastructure within natural areas and areas identified as increasingly sensitive during ecological studies; and • Increased human presence due to construction-related activities, potentially resulting in increased harvesting/ collection of SCC.	WOM	Negative	60	Moderate	Before any construction activities can occur, a detailed walk down of the area must take place, during which all NFA-protected tree species, MNCA-protected floral species and potentially occurring RDL species are marked. If SCC are encountered and will be affected by the construction activities, these species must, as far as is possible, be avoided. If avoidance of impacts to SCC are not possible, the following is recommended: 1) For NFA-protected trees, permit applications will be required from DFFE for removal/destruction of species. For specimens too large to relocate, collection of propagules should take place and these propagated in nurseries for use in rehabilitation later down the line; 2) For MNCA-protected species, permit application from MTPA will be required to rescue and relocate such species; 3) For RDL species, an investigation must be initiated into potential relocation. If not possible, offsetting the loss of RDL species should be pursued. • No collection of firewood, floral SCC or medicinal floral species must be allowed by construction or mining personnel.	Limiting removal and protecting SCC's	Can be avoided, managed or mitigated	No	
			WM	Negative	24	Low					
Operational Phase											
All activities associated with mining and the movement of vehicles	Degraded Habitat Unit	• Further loss of floral habitat beyond the project footprint because of vegetation clearing related to operational-phase disturbances and expansion of stockpiles and waste rock dumps, on-going disturbance of soils due to operational activities, and edge effects associated with mining activities; • Potential trimming or slashing of vegetation associated with the Forest and Woodland habitat units, or wood collection from these habitat units, creating 'gaps' in the woody layer that will impact the dynamics of these systems (increased light and potential for increased fire frequency), leading to potential alterations in species composition and ecological function; • Ongoing disturbances from operational activities resulting in increased or continued proliferation of AIPs; • Failure to concurrently rehabilitate bare areas or disturbed sites as soon as they	WOM	Negative	32	Low	HABITAT AND DIVERSITY • Ongoing monitoring of TSF stability; • Stockpiles, discard dumps and PCD etc positions, and their expansion as material is deposited, should be kept as small as possible; • No additional habitat is to be disturbed during the operational phase of the development; • Manage all edge effects or indirect disturbances stemming from mining operations and infrastructure areas: a) Implement erosion control measures where necessary to ensure that further habitat loss does not occur; b) Any waste or toxic spills from vehicles or mining infrastructure must be dealt with immediately in accordance with the waste management plan (emergency incident procedure or spill procedure); c) No uncontrolled or unsanctioned fires are allowed. A FMP should be in place; 2 d) Vehicles should be restricted to travelling only on designated roadways to limit the ecological footprint of the proposed mining activities; and	Minimise effects of vegetation removal and alien invasive spreading on the area outside of the footprint	Can be avoided, managed or mitigated	No	National Biodiversity Assessment (NBA, 2018) National Threatened Ecosystems (2011) (GN 1002) National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA). National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) (NEMBA).
			WM	Negative	16	Negligible					
	Freshwater Habitat		WOM	Negative	48	Moderate		Protecting the riparian habitat and function	Can be avoided, managed or mitigated	No	

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance		Management Measures	Management objective	Mitigation Effect	Potential for residual risk	Compliance with Standards (where applicable)
					Score	Magnitude					
		become available, potentially resulting in loss of viable soils, increasing erosion risk and/or permitting the proliferation of AIPs; • Erosion as a result of mining development, stormwater runoff and on-going disturbance of soils due to operational activities; • Risk of contamination from all operational facilities may pollute receiving environment; • Loss of floral SCC through ineffective monitoring of relocation success of rescued and relocated floral SCC (where applicable), and/or due to the harvesting of protected floral species by mining and operational personnel; and • Additional pressure on floral habitat by increased human populations associated with the proposed mining activities, contributing to increases in the collection of plant material for medicinal purposes and promoting the introduction and spread of AIPs that may displace habitat for SCCs.	WM	Negative	24	Low	e) Implement an AIP Management / Control Plan that includes ongoing monitoring and control of the presence and/or re-emergence of such species. • No firewood collection may be permitted from the Forest Habitat, Riparian Forest or Riparian Woodlands. Ensure no disturbances to forest edges (including unauthorised activities within the 30 m forest exclusion buffer) take place that will result in the opening of forest "gaps"; and • Rehabilitate areas that are no longer used for mining. FLORAL SCC • Monitoring of relocation success of potentially rescued and relocated floral SCC should take place during the operational phase; • Manage all edge effects stemming from mining operations and infrastructure areas; and • Harvesting of protected floral species by mining and operational personnel should be strictly prohibited.				
	Woody Communities		WOM	Negative	70	High		Minimise effects of vegetation removal and alien invasive spreading on the area outside of the footprint	Can be avoided, managed or mitigated	No	
			WM	Negative	44	Moderate					
	Floral SCC		WOM	Negative	48	Moderate		Limiting removal and protecting SCC's	Can be avoided, managed or mitigated	No	
			WM	Negative	22	Low					
Ongoing AIP management within 30 m of proposed activities	Floral Habitat and Diversity	• Ongoing AIP clearing and management as part of operational activities, resulting in an increase in floral diversity and habitat integrity.	WOM	Positive	11	Negligible	The proliferation of AIPs is expected within any disturbed areas and especially along linear developments. AIPs must be monitored and must be removed throughout the operational phase of the project to prevent their spread beyond the development footprint areas: • Removal of the AIPs, with specific emphasis on Category 1b alien species, encountered within the footprint area and immediate surrounds (approximately 30 m buffer around activities) must take place (as per NEMBA: Alien and Invasive Species Regulations of 2020); • Removal of alien invasive species should preferably commence during the construction phases and continue throughout the operational, decommissioning and post-closure phases; and • The AIP Management/Control Plan should be implemented by a qualified professional. No chemical control of AIPs to occur within 32 m of a watercourse.	Avoid AIP proliferation	Can be avoided, managed or mitigated	No	
			WM	Positive	55	Moderate					
Closure and Post closure											

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance		Management Measures	Management objective	Mitigation Effect	Potential for residual risk	Compliance with Standards (where applicable)
					Score	Magnitude					
Rehabilitation and restoration activities	Floral Habitat and diversity	• Permanent loss of floral habitat, diversity and SCC, and a higher likelihood of edge effect impacts on adjacent and nearby natural vegetation of increased sensitivity due to potential failure to effectively implement and monitor rehabilitation efforts, leading to: a) Reintroduction and proliferation of alien and invasive plant species; b) Compacted soils limiting the re-establishment of natural vegetation; c) Increased risk of erosion in areas left disturbed and inadequately vegetated; d) Improper rehabilitation of disturbed areas leading to permanent floral habitat loss. Ultimately leading to a permanent loss of floral habitat, diversity and SCC, and a higher likelihood of edge effect impacts on adjacent and nearby natural vegetation of increased sensitivity.	WOM	Negative	75	High	• Ensure sound implementation of AIP Management / Control Plan; • Where soils have been compacted, they are to be ripped and where necessary reprofiled; • Indigenous floral species are to be used for revegetation of disturbed areas. Where possible, reinstatement of floral communities similar to the reference vegetation type for the area must form the goal of rehabilitation activities; • All surface infrastructure is to be removed and waste material disposed of at a registered dump site. Waste and remnant mine related material are not to be dumped or left within the focus area. • A bi-annual alien vegetation clearance programme should be implemented for up to 2 years after closure but preferably until all AIP species are under control and no risk of spread to adjacent, natural habitat remains; • Follow up with alien and invasive plant control measures for a period of 5 years post-closure; • Use of a nursery developed by the mine to cultivate indigenous/endemic floral species and floral SCCs with a focus on rehabilitation during the post-closure phase in conjunction with a suitably qualified specialist. This will assist in areas where regrowth is not to an acceptable standard; and • Continue monitoring of rehabilitation activities for a minimum period of 5 years following the mine closure or until an acceptable level of habitat and biodiversity re-instatement has occurred, in such a way as to ensure that natural processes and veld succession will lead to the re-establishment of the natural wilderness conditions which are analogous to the pre-mining conditions of the area.	Increase in floral diversity and habitat integrity.	Can be reversed	No	National Biodiversity Assessment (NBA, 2018) National Threatened Ecosystems (2011) (GN 1002) National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA). National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) (NEMBA).
			WM	Negative	24	Low					
Rehabilitation and restoration activities	Floral Habitat and diversity	• Reinstatement of native floral communities due to rehabilitation of currently transformed and degraded habitat and AIP clearance within heavily infested areas. Return of ecological functioning that has been lost due to AIP proliferation and habitat transformation.	WOM	Positive	22	Low		Increase in floral diversity and habitat integrity.	Can be reversed	No	
			WM	Positive	60	Moderate					
Morgenzon											
Construction Phase											
Construction of Crossing(s)	Freshwater Habitat	• Vegetation clearing within the Riparian Woodland sub-unit (i.e., Peach Tree Stream; • Temporary alteration of stream flow; • Spread of AIPs along the Riparian Woodland sub-unit from contaminated construction material; and • Increased sediment loads and potential	WOM	Negative	60	Moderate	• All crossings over watercourses must be kept to the bare minimum and are adequately designed to prevent impacts on habitat, instream flow, pattern and timing of water and water quality; • Minimise loss of indigenous vegetation where possible; • Ensure AIP vegetation cutting and propagules	Protecting the riparian habitat and function	Can be avoided, managed or mitigated	No	National Biodiversity Assessment (NBA, 2018) National Threatened Ecosystems (2011) (GN 1002) National Environmental

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance		Management Measures	Management objective	Mitigation Effect	Potential for residual risk	Compliance with Standards (where applicable)
					Score	Magnitude					
		erosion of stream banks resulting from construction activities and increased movement of construction workers along / across the Riparian Woodland.	WM	Negative	35	Low	do not enter the watercourses where crossings will be constructed; and • As much as possible, existing access roads and river crossings must be utilised (if necessary, upgraded) to minimise further disturbances to the watercourses.			No	Management Act, 1998 (Act No. 107 of 1998) (NEMA). National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) (NEMBA).
Construction of surface infrastructure associated with Operational Infrastructure, Supporting Infrastructure, WRDs and Stockpiles	Degraded Habitat Unit	• Site preparation and clearing of indigenous vegetation for mine-related infrastructure; • Dumping of cut vegetation, including AIPs, outside of already disturbed areas or outside of the authorised footprints, resulting in the loss of favourable habitat for the establishment of native species; • Impaired water quality and reduced flow of watercourses due to the accumulation of vegetation cuttings and debris resulting from vegetation clearing; • Potential failure to have a stormwater management plan and erosion control plan in place during construction activities; • Waste from construction material leading to disturbance of natural vegetation; • Increased personnel on site leading to loss of floral habitat through the potential for increased fire frequency and intensity (further promoting wattle thicket formation), as well as indiscriminate driving through natural veld; • Potential proliferation of AIP species that colonise areas of increased disturbances and that outcompetes native species, including the further transformation of adjacent or nearby natural, more sensitive habitat, such as nearby watercourses; • Dust generated during construction activities accumulating on the surrounding floral individuals, altering the photosynthetic ability of plants, and potentially further decreasing optimal growing/re-establishing conditions; • Potential failure to concurrently rehabilitate bare areas or disturbed sites as soon as they become available, potentially resulting in loss of viable soils, increasing erosion risk and/or permitting the proliferation of AIPs; and • Potential failure to implement a BAP, including the auditing of the BAP, leading to permanent transformation of floral habitat and long-term degradation of important floral habitat within the region.	WOM	Negative	40	Low	• Prior to the commencement of construction activities, the entire construction servitude, including lay down areas and stockpile areas etc., should be fenced off and clearly demarcated; • Restrict construction related activities to outside of the 30 m forest exclusion buffer where possible and feasible; • The construction footprint and removal of vegetation must be kept as small as possible within the authorised footprints to minimise impact on the surrounding environment (edge effect management); • No vegetation cuttings may be left to accumulate in watercourses. Discard all construction related waste and material (including cleared vegetation) at a registered waste facility (or in a secluded area designated by the mine) and no waste of construction rubble is to be dumped in the surrounding natural habitats; • If any spills occur, they should be immediately cleaned up to avoid soil contamination that can hinder floral rehabilitation later down the line; • Edge effects of all construction activities, which may affect floral habitat within surrounding areas, are to be strictly managed, e.g., implement an AIP control plan from the get-go, mitigate soil erosion by reducing soil compaction caused by movement of construction personnel and vehicles, suppress dust in order to mitigate the impact of dust on flora within a close proximity of construction activities; • No illicit fires must be allowed during any phases of the proposed mining development. A FMP should be set in place to ensure that any fires that do originate can be managed and / or stopped before significant damage to the environment occurs; • No indiscriminate driving through the veld is allowed. As far as possible vehicles are to utilise the existing roads. Where this is not feasible, new roads are to be located in areas of existing high disturbance, and not encroach upon sensitive habitats; • 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.	Minimise effects of vegetation removal and alien invasive spreading on the area outside of the footprint	Can be avoided, managed or mitigated	No	
			WM	Negative	35	Low				No	
	Freshwater Habitat		WOM	Negative	60	Moderate		Protecting the riparian habitat and function	Can be avoided, managed or mitigated	No	
			WM	Negative	32	Low				No	
	Woody Communities		WOM	Negative	48	Moderate		Minimise effects of vegetation removal and alien invasive spreading on the area outside of the footprint	Can be avoided, managed or mitigated	No	
			WM	Negative	16	Negligible				No	
	Valley Habitat		WOM	Negative	32	Low		Protecting the riparian habitat and function	Can be avoided, managed or mitigated	No	

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance		Management Measures	Management objective	Mitigation Effect	Potential for residual risk	Compliance with Standards (where applicable)
					Score	Magnitude					
			WM	Negative	14	Negligible				No	
Construction of Linear Developments	Woody Communities	• Site clearing and the removal of vegetation along continuous leading to fragmented habitat and a disturbance corridor along which AIPs can establish and spread to adjacent sites; • Potential failure to implement an Erosion Control Plan for construction of linear features, especially where areas are already disturbed and soils are less stable, leading to sedimentation of nearby watercourses and smothering of surrounding vegetation; and • Construction related activities within the recommended 30 m forest exclusion buffer, resulting in the potential loss or degradation of the zone buffering the forest from external impacts, e.g., degradation of habitat integrity of the 30 m buffer decreasing forest resilience, increasing the risk of AIP proliferation and native woody encroachers.	WOM	Negative	44	Moderate	• The construction footprint and removal of vegetation must be kept as small as possible within the authorised footprints to minimise impact on the surrounding environment (edge effect management); • Limit, as far as possible, the disturbance footprint within the 30 m forest exclusion buffer; • Access roads should be kept to existing roads so to reduce fragmentation of existing natural habitat; • Roadsides and linear developments serve as common corridors along which alien and invasive floral species are introduced and dispersed. Therefore, an AIP control plan should be implemented along all linear disturbances; and • All construction related waste and material is to be disposed of at a registered waste facility and no waste of construction rubble is to be dumped in the surrounding natural habitats.	Minimise effects of vegetation removal and alien invasive spreading on the area outside of the footprint	Can be avoided, managed or mitigated	No	
			WM	Negative	22	Low				No	
	Degraded Habitat Unit		WOM	Negative	35	Low		Protecting the riparian habitat and function	Can be avoided, managed or mitigated	No	
			WM	Negative	30	Low				No	
	Freshwater Habitat		WOM	Negative	48	Moderate		Minimise effects of vegetation removal and alien invasive spreading on the area outside of the footprint	Can be avoided, managed or mitigated	No	
			WM	Negative	14	Negligible				No	
	Valley Habitat		WOM	Negative	40	Low		Protecting the riparian habitat and function	Can be avoided, managed or mitigated	No	
			WM	Negative	35	Low				No	
Removal and/or relocation of floral SCC	Floral SCC	• Loss of occurring and potentially occurring floral SCC due to potential failure to conduct a walkdown of the footprint area before construction activities where floral SCC, if present, are marked and relocated to suitable habitat outside the development footprint prior to the construction phase; • Extensive and unnecessary loss of favourable floral habitat, leading to a decline in floral diversity, including a decline in floral SCC numbers within the site, resulting from potentially poorly	WOM	Negative	50	Moderate	Before any construction activities can occur, a detailed walk down of the area must take place, during which all NFA-protected tree species, MNCA-protected floral species and potentially occurring RDL species are marked. If SCC are encountered and will be affected by the construction activities, these species must, as far as is possible, be avoided. If avoidance of impacts to SCC are not possible, the following is recommended: 1) For NFA-protected trees, permit applications will be required from DFFE for removal/destruction of species. For specimens	Limiting removal and protecting SCC's	Can be avoided, managed or mitigated	No	

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance		Management Measures	Management objective	Mitigation Effect	Potential for residual risk	Compliance with Standards (where applicable)
					Score	Magnitude					
		planned placement of the proposed infrastructure within natural areas and areas identified as increasingly sensitive during ecological studies; and • Increased human presence due to construction-related activities, potentially resulting in increased harvesting/ collection of SCC.	WM	Negative	40	Low	too large to relocate, collection of propagules should take place and these propagated in nurseries for use in rehabilitation later down the line; 2) For MNCA-protected species, permit application from MTPA will be required to rescue and relocate such species; 3) For RDL species, an investigation must be initiated into potential relocation. If not possible, offsetting the loss of RDL species should be pursued. • No collection of firewood, floral SCC or medicinal floral species must be allowed by construction or mining personnel.			No	
Operational Phase											
All activities associated with mining and the movement of vehicles	Degraded Habitat Unit	• Further loss of floral habitat beyond the project footprint because of vegetation clearing related to operational-phase disturbances and expansion of stockpiles and waste rock dumps, on-going disturbance of soils due to operational activities, and edge effects associated with mining activities; • Potential trimming or slashing of vegetation associated with the Forest and Woodland habitat units, or wood collection from these habitat units, creating 'gaps' in the woody layer that will impact the dynamics of these systems (increased light and potential for increased fire frequency), leading to potential alterations in species composition and ecological function; • Ongoing disturbances from operational activities resulting in increased or continued proliferation of AIPs; • Failure to concurrently rehabilitate bare areas or disturbed sites as soon as they become available, potentially resulting in loss of viable soils, increasing erosion risk and/or permitting the proliferation of AIPs; • Erosion as a result of mining development, stormwater runoff and on-going disturbance of soils due to operational activities; • Risk of contamination from all operational facilities may pollute receiving environment; • Loss of floral SCC through ineffective monitoring of relocation success of rescued and relocated floral SCC (where applicable), and/or due to the harvesting of protected floral species by mining and operational personnel; and • Additional pressure on floral habitat by increased human populations associated with the proposed mining activities,	WOM	Negative	40	Low	HABITAT AND DIVERSITY • Ongoing monitoring of TSF stability; • Stockpiles, discard dumps and PCD etc positions, and their expansion as material is deposited, should be kept as small as possible; • No additional habitat is to be disturbed during the operational phase of the development; • Manage all edge effects or indirect disturbances stemming from mining operations and infrastructure areas: a) Implement erosion control measures where necessary to ensure that further habitat loss does not occur; b) Any waste or toxic spills from vehicles or mining infrastructure must be dealt with immediately in accordance with the waste management plan (emergency incident procedure or spill procedure); c) No uncontrolled or unsanctioned fires are allowed. A FMP should be in place; d) Vehicles should be restricted to travelling only on designated roadways to limit the ecological footprint of the proposed mining activities; and e) Implement an AIP Management / Control Plan that includes ongoing monitoring and control of the presence and/or re-emergence of such species. • No firewood collection may be permitted from the Forest Habitat, Riparian Forest or Riparian Woodlands. Ensure no disturbances to forest edges (including unauthorised activities within the 30 m forest exclusion buffer) take place that will result in the opening of forest "gaps"; and • Rehabilitate areas that are no longer used for mining. FLORAL SCC • Monitoring of relocation success of potentially rescued and relocated floral SCC should take place during the operational phase; • Manage all edge effects stemming from mining operations and infrastructure areas; and • Harvesting of protected floral species by mining	Minimise effects of vegetation removal and alien invasive spreading on the area outside of the footprint	Can be avoided, managed or mitigated	No	National Biodiversity Assessment (NBA, 2018) National Threatened Ecosystems (2011) (GN 1002) National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA). National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) (NEMBA).
			WM	Negative	24	Low				No	
	Freshwater Habitat		WOM	Negative	28	Low		Protecting the riparian habitat and function		No	
			WM	Negative	10	Negligible				No	
	Woody Communities		WOM	Negative	60	Moderate		Minimise effects of vegetation removal and alien invasive spreading on the area outside of the footprint		No	
			WM	Negative	36	Low				No	
	Valley Habitat		WOM	Negative	55	Moderate		Protecting the riparian habitat and function		No	

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance		Management Measures	Management objective	Mitigation Effect	Potential for residual risk	Compliance with Standards (where applicable)
					Score	Magnitude					
		contributing to increases in the collection of plant material for medicinal purposes and promoting the introduction and spread of AIPs that may displace habitat for SCCs.	WM	Negative	10	Negligible	and operational personnel should be strictly prohibited.			No	
	Floral SCC		WOM	Negative	55	Moderate		Limiting removal and protecting SCC's		No	
			WM	Negative	28	Low				No	
Ongoing AIP management within 30 m of proposed activities	Floral Habitat and Diversity	• Ongoing AIP clearing and management as part of operational activities, resulting in an increase in floral diversity and habitat integrity.	WOM	Positive	11	Negligible	The proliferation of AIPs is expected within any disturbed areas and especially along linear developments. AIPs must be monitored and must be removed throughout the operational phase of the project to prevent their spread beyond the development footprint areas: • Removal of the AIPs, with specific emphasis on Category 1b alien species, encountered within the footprint area and immediate surrounds (approximately 30 m buffer around activities) must take place (as per NEMBA: Alien and Invasive Species Regulations of 2020); • Removal of alien invasive species should preferably commence during the construction phases and continue throughout the operational, decommissioning and post-closure phases; and • The AIP Management/Control Plan should be implemented by a qualified professional. No chemical control of AIPs to occur within 32 m of a watercourse.	Avoid AIP proliferation	Can be avoided, managed or mitigated	No	
			WM	Positive	60	Moderate				No	
Closure and Post closure											
Rehabilitation and restoration activities	Floral Habitat and Diversity	• Failure to monitor rehabilitation efforts, leading to: a) Reintroduction and proliferation of alien and invasive plant species; b) Compacted soils limiting the re-establishment of natural vegetation; c) Increased risk of erosion in areas left disturbed and inadequately vegetated; d) Improper rehabilitation of disturbed areas leading to permanent floral habitat loss.	WOM	Negative	52	Moderate	• Ensure sound implementation of AIP Management / Control Plan; • Where soils have been compacted, they are to be ripped and where necessary reprofiled; • Indigenous floral species are to be used for revegetation of disturbed areas. Where possible, reinstatement of floral communities similar to the reference vegetation type for the area must form the goal of rehabilitation activities; • All surface infrastructure is to be removed and waste material disposed of at a registered dump	Increase in floral diversity and habitat integrity.	Can be reversed	No	National Biodiversity Assessment (NBA, 2018) National Threatened Ecosystems (2011) (GN 1002) National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA).

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance		Management Measures	Management objective	Mitigation Effect	Potential for residual risk	Compliance with Standards (where applicable)
					Score	Magnitude					
		Ultimately leading to a permanent loss of floral habitat, diversity and SCC, and a higher likelihood of edge effect impacts on adjacent and nearby natural vegetation of increased sensitivity.	WM	Negative	24	Low	site. Waste and remnant mine related material are not to be dumped or left within the focus area. • A bi-annual alien vegetation clearance programme should be implemented for up to 2 years after closure but preferably until all AIP species are under control and no risk of spread to adjacent, natural habitat remains; • Follow up with alien and invasive plant control measures for a period of 5 years post-closure; • Use of a nursery developed by the mine to cultivate indigenous/endemic floral species and floral SCCs with a focus on rehabilitation during the post-closure phase in conjunction with a suitably qualified specialist. This will assist in areas where regrowth is not to an acceptable standard; and • Continue monitoring of rehabilitation activities for a minimum period of 5 years following the mine closure or until an acceptable level of habitat and biodiversity re-instatement has occurred, in such a way as to ensure that natural processes and veld succession will lead to the re-establishment of the natural wilderness conditions which are analogous to the pre-mining conditions of the area.		Can be reversed	No	National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) (NEMBA).
Rehabilitation and restoration activities	Floral Habitat and Diversity	• Reinstatement of native floral communities due to rehabilitation of currently transformed and degraded habitat and AIP clearance within heavily infested areas. Return of ecological functioning that has been lost due to AIP proliferation and habitat transformation.	WOM	Positive	11	Negligible		Increase in floral diversity and habitat integrity.	Can be reversed	No	
			WM	Positive	60	Moderate			Can be reversed	No	
Biodiversity Assessment - Faunal Assessment											
Construction Phase											
Clearance of vegetation in the AIP-Dominated Habitat	Faunal habitat and species	• Loss of marginal faunal habitat where footprint areas extend into habitat unit. • Decrease in seasonal food resources provided by flowering and fruiting plants (AIPs). • Potential marginal decrease in faunal species abundances. • Alien plant proliferation likely to occur in disturbed areas.	WOM	Negative	60	Moderate	• At all times, ensure that sound environmental management is in place during the construction phase. • An AIP Management/Control Plan should be compiled for implementation prior to vegetation clearance and construction starting. • A Biodiversity Action Plan must be developed and implemented. • Should any SCC need to be removed (unlikely) the removal and/or rescue and relocation should be overseen by a MTPA-suitably qualified ecologist with all permits/authorisations in place. • Clearly demarcate the project footprints and ensure that no vegetation clearance or vehicle movement occurs beyond these demarcated areas. • Ensure that existing roads are used as far as possible and that limited development of new roads occurs. • Where linear infrastructure, notably fences etc encroaches into sensitive habitat, it is recommended that these structures be shifted so as to avoid the sensitive habitat. • All Freshwater crossing points are to be	Avoid AIP proliferation	Can be avoided, managed or mitigated	No	National Biodiversity Assessment (NBA, 2018) National Threatened Ecosystems (2011) (GN 1002) National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA). National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) (NEMBA).
			WM	Negative	50	Moderate				No	
Clearance of vegetation in the Riparian Forest	Faunal habitat and species	• Loss of faunal habitat where fence structure extends through a section of this habitat unit at Frankfort. • Possible proliferation and erosion from fence installation leading habitat degradation and sedimentation of the downslope habitat. • Potential loss of faunal SCC.	WOM	Negative	32	Low		Avoid degradation of faunal habitats	Can be avoided, managed or mitigated	No	
			WM	Negative	8	Negligible				No	

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance		Management Measures	Management objective	Mitigation Effect	Potential for residual risk	Compliance with Standards (where applicable)
					Score	Magnitude					
Clearance of vegetation in the Riparian Woodland	Faunal habitat and species	• Loss of faunal habitat where footprint areas extend into habitat unit, notably linear structures. • Potential marginal decrease in faunal species abundances due to fences limiting faunal species movement. • Alien plant proliferation likely to occur in disturbed areas. • Potential loss of faunal SCC.	WOM	Negative	55	Moderate	designed in such a way that they do no impact on the geomorphological or hydrological functioning of the systems. • No hunting/catching of faunal species or SCC is allowed by mining employees. • No informal fires by construction personnel are allowed. • Construction footprints must be regularly monitored for edge effects. • Smaller species such as scorpions and reptiles are likely to be less mobile during the colder period, as such should any be observed in the 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 the need for their conservation. Smaller scorpion species and harmless reptiles should be carefully relocated by a suitably nominated construction person or nominated mine official. For larger venomous snakes, a suitably trained mine official or specialist should be contacted to effect the relocation of the species, should it not move off on its own. • Areas of increased ecological sensitivity falling outside of the direct mine footprint should be designated as No-Go areas. • All old adits should not be close so as to ensure their continued use for bat species. Where these adits intercept the current mine operation and pose a safety risk, the should be sealed from the inside where the old adit meets the proposed working area. This will ensure that the roosting sights for bats are not closed off and they can continue to utilise these areas. • All external lights must be downward facing and with warm/yellow light emitting globes to minimise insect attraction. The bare minimum amount of external lighting in order to ensure personnel safety must be used.	Avoid degradation of faunal habitats	Can be avoided, managed or mitigated	No	
			WM	Negative	35	Low					
Linear crossings of the Watercourse Habitat	Faunal habitat and species	• Increased sedimentation due to runoff from haul roads and pipeline footprints altering bankside vegetation and instream faunal habitat. • Increased risk of hydrocarbons entering the watercourses as a result of leaks and spills from construction vehicles when crossing the watercourse habitat potentially impacting on the bankside and instream faunal species (amphibians). • Altered flow patterns and hydrological cycles impacting on water dependant faunal species both down and upstream of the crossing. • Potential loss of faunal SCC.	WOM	Negative	55	Moderate		Avoid degradation of faunal habitats	Can be avoided, managed or mitigated	No	
			WM	Negative	30	Low				No	
Clearance of vegetation in the Indigenous Forest	Faunal habitat and species	• Loss of faunal habitat where linear infrastructure is located within the Forest habitat. • Decreased faunal diversity due to disturbances to Forest habitat. • Increased risk of AIPs proliferating in the disturbed areas changing the vegetative composition of the forest. • Potential loss of faunal SCC.	WOM	Negative	48	Moderate		Avoid degradation of faunal habitats	Can be avoided, managed or mitigated	No	
			WM	Negative	12	Negligible				No	
Clearance of vegetation in the Degraded Woodland	Faunal habitat and species	• Loss of faunal habitat within the proposed footprint areas. • Displacement and potential loss of faunal species within the proposed footprint areas. • Edge effects as a result of poor management of construction activities leading to further habitat and faunal species loss.	WOM	Negative	60	Moderate		Avoid degradation of faunal habitats	Can be avoided, managed or mitigated	No	
			WM	Negative	55	Moderate				No	

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance		Management Measures	Management objective	Mitigation Effect	Potential for residual risk	Compliance with Standards (where applicable)
					Score	Magnitude					
Clearance of vegetation in the Intact Woodland	Faunal habitat and species	• Loss of faunal habitat where linear infrastructure is located within the woodland habitat. • Decreased faunal diversity due to disturbances to woodland habitat. • Increased risk of AIPs proliferating in the disturbed areas changing the vegetative composition of the woodlands. • Potential loss of faunal SCC.	WOM	Negative	60	Moderate		Avoid degradation of faunal habitats	Can be avoided, managed or mitigated	No	
			WM	Negative	50	Moderate				No	
Clearance of vegetation in the Valley Habitat	Faunal habitat and species	• Loss of faunal habitat within the proposed footprint areas. • Displacement and potential loss of faunal species within the proposed footprint areas. • Edge effects as a result of poor management of construction activities leading to further habitat and faunal species loss.	WOM	Negative	60	Moderate		Avoid degradation of faunal habitats	Can be avoided, managed or mitigated	No	
			WM	Negative	50	Moderate				No	
All construction related activities	Faunal habitat and species	• Edge effects impacting adjacent habitat e.g., the of alien vegetation and the loss of viable soils for re-establishment of indigenous species if soils are allowed to become compacted and / or eroded. • Snaring, poaching / hunting of faunal species by construction personnel. • Fauna mortalities from vehicle strikes. • Runaway fires may lead to habitat and species loss. • Too frequent / uncontrolled fires may lead to structural and plant species composition of habitats. • Potential loss of faunal SCC. • Movement of personnel into old adits disturbing roosting bats, notably SCC.	WOM	Negative	40	Low		Avoid degradation of faunal habitats	Can be avoided, managed or mitigated	No	
			WM	Negative	20	Negligible				No	
Operational Phase											
Movement of in vehicles	Faunal species	• Collisions with mine vehicles and fauna. • Spillage/leakage of chemicals, fuel and oils from equipment leading to hydrocarbon ingress into the soils affecting plant growth (faunal habitat and food resources) and soil organisms.	WOM	Negative	40	Low	• At all times, ensure that sound environmental management is in place during the operation phase. • An AIP Management/Control Plan should be in place and AIP control should be carried out as required. • A Biodiversity Action Plan must be	Avoid killing of faunal species	Can be avoided, managed or mitigated	No	National Biodiversity Assessment (NBA, 2018) National Threatened Ecosystems (2011) (GN 1002) National

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance		Management Measures	Management objective	Mitigation Effect	Potential for residual risk	Compliance with Standards (where applicable)
					Score	Magnitude					
		• Hydrocarbons may impact surrounding habitat as a result of water runoff or leaching into subterranean water sources during rainfall events	WM	Negative	28	Low	implemented. • Should any SCC need to be removed (unlikely) the removal and/or rescue and relocation should be overseen by a MTPA-suitably qualified ecologist with all permits/authorisations in place. • No vegetation clearance or vehicle movement should occur outside of the operational footprint area unless authorised. • Ensure that existing roads are used as far as possible and that limited development of new roads occurs. • All infrastructure is to be regularly inspected for erosion or environmental risks, notably the fence lines (erosion) and the freshwater crossings. • All pipelines are to be regularly inspected to ensure no leaks are present and that no contamination of the receiving environment has occurred. • Freshwater crossing points are to be checked and if need be debris cleared to main the hydrological functioning of the system. • No hunting/catching of faunal species or SCC is allowed by mining employees. • No informal fires by construction personnel are allowed. • Construction footprints must be regularly monitored for edge effects. • Smaller species such as scorpions and reptiles are likely to be less mobile during the colder period, as such should any be observed in the site during operational activities, they are to be carefully and safely moved to an area of similar habitat outside of the disturbance footprint. Personnel are to be educated about these species and the need for their conservation. Smaller scorpion species and harmless reptiles should be carefully relocated by a suitably nominated construction person or nominated mine official. For larger venomous snakes, a suitably trained mine official or specialist should be contacted to effect the relocation of the species, should it not move off on its own. • Areas of increased ecological sensitivity falling outside of the direct mine footprint should be designated as No-Go areas. • Old adits should not be closed at the entrance so as to ensure their continued use for bat species unless for health and safety reasons. • All external lights must be downward facing and with warm/yellow light emitting globes to minimise insect attraction. The bare minimum amount of external lighting in order to ensure personnel safety must be used. • It is recommended that a faunal monitoring program be put in place to monitor species diversity and the potential changes thereof during the life of mine.			No	Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA). National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) (NEMBA).
Mine operation - lighting	Faunal species	• Artificial lighting in dark landscapes impacts on natural behavioural patterns of nocturnal species, notably insects. Such impacts include alteration of breeding and foraging patterns which in the long term can affects population numbers. • Attraction to light sources also creates an unnaturally high abundance of insects in a single spot, with insectivores such as bats and reptiles capitalising on this. This may lead to increased predation on insects.	WOM	Negative	40	Low		Protect faunal movement patterns	Can be avoided, managed or mitigated	No	
			WM	Negative	35	Low				No	
Mining operations - edge effects	Faunal habitat and species	• Further loss of habitat and faunal species therein in the areas adjacent the mining activities. • Increased vehicle and personnel movement assists in the further spread of AIPs within the footprint areas as well as the surrounding habitats • Increased AIP proliferation in these disturbed footprints. • Unauthorised and/or planned clearance of vegetation outside of the footprint leading to further habitat disturbance.	WOM	Negative	60	Moderate		Avoid degradation of faunal habitats	Can be avoided, managed or mitigated	No	
			WM	Negative	28	Low				No	
Poor erosion control	Faunal habitat and species	• Increase erosion and sediment runoff impacting on habitat in the surrounding areas. • Degradation of Freshwater systems. • Sedimentation of Freshwater systems will impact upon amphibians and other aquatic species, potentially SCC.	WOM	Negative	48	Moderate		Avoid erosion and sediment runoff	Can be avoided, managed or mitigated	No	
			WM	Negative	20	Negligible				No	
Mine operation - personnel	Faunal habitat and species	• Increased risk of snaring / poaching of animals and possibly SCC. • Runaway fires causing damage to the surrounding vegetation types, leading to potential change in vegetation structure and faunal species diversity.	WOM	Negative	40	Low		Avoid killing of faunal species	Can be avoided, managed or mitigated	No	
			WM	Negative	20	Negligible				No	

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance		Management Measures	Management objective	Mitigation Effect	Potential for residual risk	Compliance with Standards (where applicable)
					Score	Magnitude					
Mine operation - noise	Faunal species	• Increased ambient noise from operational activities and facilities may drown out calls / communication of faunal species nearby. Increased ambient noise may lead to decreased breeding success or failure to hear nearby predator.	WOM	Negative	24	Low		Protect faunal movement patterns	Can be avoided, managed or mitigated	No	
			WM	Negative	22	Low				No	
Closure and Post Phase											
Rehabilitation	Faunal habitat and species	• Failure to reinstate degraded and impacted faunal habitat through rehabilitation activities. • Proliferation of AIPs in the disturbed areas post mining, replacing indigenous (and endemic) vegetation leading to long term loss of faunal habitat and species diversity. • Failure to remove and remedy all TSF and PCD structures so that no contamination of the surrounding habitat occurs.	WOM	Negative	60	Moderate	• Implement all recommendations as per the mine closure plan. • All surface infrastructure should be removed, and waste material disposed of at a registered dump site. Waste and remnant mine related material should not be dumped or left on site. • Where soils have been compacted, they are to be ripped and where necessary reprofiled in accordance with the rehabilitation plan. • Indigenous floral species are to be used for revegetation of disturbed areas with the end goal to achieve the same vegetation composition and similar structure as pre-mining conditions. • Continue with AIP control as per the AIP control and mine closure plan. • Continue monitoring of rehabilitation activities for a minimum period of 5 years following the mine closure or until an acceptable level of habitat and biodiversity reinstatement has occurred, in such a way as to ensure that natural processes and veld succession will lead to the re-establishment of the natural wilderness conditions which are analogous to the pre-mining conditions of the area.	Ensure habitat reinstatement post closure	Can be reversed	No	National Biodiversity Assessment (NBA, 2018) National Threatened Ecosystems (2011) (GN 1002) National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA). National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) (NEMBA).
			WM	Negative	22	Low				No	
Closure operations	Faunal habitat and species	• Failure to break down and remove all mining structures and rehabilitating the footprints to a pre-mining state leading to long term and potentially permanent habitat degradation and species diversity loss. • Poaching of faunal species by closure staff and contract workers leading to further loss of species diversity.	WOM	Negative	24	Low		Avoid long term and potentially permanent habitat degradation and species diversity loss.		No	
			WM	Negative	22	Low				No	
Freshwater- It should be noted that the impacts below have been reworked from the DWS risk assessment done by the specialist. The impacts by the specialist have only been rated WM and therefore provided as such below											
Pre-Construction Planning Phase											

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance		Management Measures	Management objective	Mitigation Effect	Potential for residual risk	Compliance with Standards (where applicable)
					Score	Magnitude					
Planning of proposed surface infrastructure layout.	The location of surface infrastructure directly within riverine resources (specifically linear infrastructure which traverses drainage systems) and within the floodline of the Blyde River (Beta north), or within the 32 m or 100 m zones of regulation according to the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA) and Government Notice (GN) 704 of the National Water Act, 1998 (Act No. 36 of 1998) (NWA).	Loss of catchment yield and surface water recharge, potential inadequate management of clean and dirty water separation, which can lead to a loss of general loss of aquatic and riparian biodiversity as well as SCCs, impaired water quality, loss of instream habitat integrity and overall EcoStatus as well as impacts to aquatic resources further downstream of the proposed mining activity.	WM	Negative	52	Moderate	1. Project footprint, infrastructure design and general construction phase • All activities should adhere to the design requirements of GN704 of the National Water Act, 1998 (Act No 36 of 1998) (NWA); • During the planning phase, the location of access roads should take into consideration the sensitivity maps provided in Section 7.1 of this report, and wherever possible, access roads should not be planned adjacent to, or traversing, any freshwater ecosystem. Should it be essential that access roads cross over any freshwater ecosystem, this should be planned at existing crossing points or points of existing disturbance within the river and/or riparian zone; • As far as possible no development of any geographically variable infrastructure should take place within the floodline of the Blyde River, its tributaries, or any other delineated freshwater ecosystem in line with regulation GN704 of the National Water Act as far as possible, while ensuring that mining is done safely and to optimise resource abstraction as far as possible without causing irreversible harm to the freshwater ecosystems of the region. Where positions within the regulated zone cannot be avoided, extra attention must be given to ensuring designs prevent the risk of contamination; • All road crossings over freshwater ecosystems must be kept to the bare minimum and are adequately designed to prevent impacts on habitat, instream flow, pattern and timing of water and water quality. • All mining infrastructure must remain out of the riparian zones and associated zones of regulation in line with the requirements of GN704 and GN509 of the NWA. Any mining infrastructure within the applicable zones of regulation in terms of GN704 and GN509 must be appropriately authorised; • Limit the footprint area of the construction activity to what is absolutely essential in order to minimise the loss of clean water runoff areas and catchment yield and the concomitant recharge of streams in the area; • Design of infrastructure should be environmentally and structurally sound and all possible precautions taken to prevent contamination of surface and resources present; • No dirty water runoff must be permitted to reach the freshwater ecosystems, in line with GN704 as it relates to the NWA and appropriate clean and dirty water separation and stormwater	Avoid loss of catchment yield and surface water recharge	Can be reversed	No	National WaterAct,1998(Act36o f1998)(NWA). Government Notice 509 as published in the Government Gazette 40229 of 2016 Government Notice 704 as published in the Government Gazette 20119 of 1999
Construction Phase											
Removal of topsoil from project footprint areas and stockpiling thereof for rehabilitation.	Topsoil removal and creation of temporary stockpiles.	• Increased risk of transportation of sediment from exposed soils in stormwater runoff, leading to increased turbidity of surface water, sedimentation of freshwater ecosystems and changing the characteristics of the stream beds, smothering of vegetation and/or altered vegetation composition, smothering of benthic taxa and/or destruction of suitable macro-invertebrate and fish habitats; • Excavation and denuding activities will alter the natural runoff and flow regime of the area. Altered flow regime may lead to destruction of suitable macro-invertebrate and fish habitat; • Loss of riparian habitat and functionality due to the disturbance of the activity; • Alteration of the chemical properties of	WM	Negative	52	Moderate		Reduce risk on the riparian habitat from increased sedimentation	Can be reversed	No	

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance		Management Measures	Management objective	Mitigation Effect	Potential for residual risk	Compliance with Standards (where applicable)
					Score	Magnitude					
Clearing of vegetation within the drainage systems in preparation for construction of linear infrastructure such as road crossings, diversion/containment berms and water related infrastructure.		the rivers / streams as a result of vegetation removal and deforestation; • Exposure of soils, leading to increased runoff and erosion, and thus increased sedimentation of the rivers / streams; • Increased sedimentation of the rivers / streams, leading to smothering of benthos, loss of rheophilic taxa, diverse biotopes and potentially altering surface water quality; • Increased hardened surfaces and compacted soils thus altering the pattern, timing and distribution of recharge which affects the freshwater ecosystems within the zone of influence; • Loss of foraging and breeding habitat [or hampering access to such suitable habitat (loss of connectivity)] and faunal migratory corridors; and • Proliferation of alien vegetation as a result of disturbances.	WM	Negative	48	Moderate	management controls must be developed as the first part of the construction activities of each project/mining unit; • It is deemed essential that the mine be designed in such a way as to ensure that decant is prevented for the life of the proposed mining activities and beyond closure unless measures to treat decant to background water qualities can be ensured until the quality of the decant naturally returns to these background levels; • Water quality, with special mention of pH and dissolved salts need to be managed, and monitored to ensure that reasonable water quality occurs downstream of the mined areas to allow for the on-going survival of a riparian and aquatic community in line with the REC and RMO, and in support of Resource Quality Objectives for the major freshwater ecosystems of the region and most notably the Blyde River; • Mine design and planning must ensure that connectivity of the freshwater ecosystems is maintained; • All proposed haul and access roads, fences and any additional linear infrastructure (e.g. PCD pump columns and Eskom power supply) must cross the freshwater ecosystems at the narrowest point and at a 90-degree angles. As much as possible, existing access roads and river crossings must be utilised (if necessary, upgraded) to minimise further disturbances to the freshwater ecosystems; • The substrate characteristics of the freshwater ecosystem and instream connectivity must be monitored by a suitably qualified freshwater ecologist and maintained in a condition that supports the REC;	Reduce rusk to the riparian habitat when removing vegetation	Can be avoided, managed or mitigated	No	
Construction of additional access roads, resurfacing of existing roads and refurbishment of existing buildings.	Altered drainage patterns due to increased impermeable surfaces. Installation of culverts/pipes as part of the construction of stream crossings.	• Increased water inputs to freshwater ecosystems, altering flow patterns and wetting patterns leading to further changes to vegetation and aquatic biota communities; • Contaminants from roads (e.g. oil spills) contained in runoff causing pollution to surface water within freshwater ecosystems with resulting potential direct impact on aquatic biota; • Possible incision and sedimentation of freshwater ecosystems due to increased water velocity (direct impact on biota in terms of smothering and indirect impact in terms of habitat destruction).	WM	Negative	22	Low		Avoid altering drainage paterns	Can be avoided, managed or mitigated	No	

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance		Management Measures	Management objective	Mitigation Effect	Potential for residual risk	Compliance with Standards (where applicable)
					Score	Magnitude					
Construction of surface infrastructure.	Risk of contaminated stormwater runoff (e.g. hydrocarbons, sediment, originating from impermeable surfaces).	• Possible contamination of the associated freshwater ecosystems downstream of the surface structures (water quality impact with associated direct impact on aquatic biota); • Possible erosion/incision of the freshwater ecosystems adjacent to surface infrastructure due to concentration of stormwater runoff; and • Erosion and sedimentation risk with associated impact on aquatic biota and suitable habitat).		Negative	52	Moderate	• Obstruction of flow should not take place or should only occur for very short periods, if absolutely essential; • Restrict construction of clean and dirty water systems and infrastructure within freshwater ecosystems (e.g. bridge crossings) to the drier winter months to avoid sedimentation of the freshwater ecosystems in the vicinity of the proposed mining project; • Vehicles to be serviced at the contractor laydown area and all refuelling is to take place outside of the freshwater ecosystems and applicable setback zones; and • Sanitation services must be provided for construction personnel, whereby at least one portable toilet will be provided per ten personnel and will be emptied and appropriately disposed of regularly. 2. Access control • During the construction phase no vehicles must be allowed to indiscriminately drive through the freshwater ecosystems and vehicles must remain on designated roadways; • New crossings of the freshwater ecosystems should be avoided. If new crossings are required, the substrate conditions of the freshwater ecosystems and stream connectivity must be maintained; • Permit only essential construction personnel beyond approved construction areas; and • All areas of increased ecological sensitivity (i.e. the freshwater ecosystems and areas which are important in terms of recharge) must be designated as "No-Go" areas and be off limits to all unauthorised vehicles and personnel during all phases of the proposed mining project. 3. Hydrological drivers and consumption management • If decant will occur, all water is to be treated to background water quality values prior to release into the receiving environment; • Measures to contain and reuse as much water as possible within the mine process water system must be sought, and very strict control of water consumption must take place. Detailed monitoring must be implemented and maintained to ensure that all water usage is continuously optimised; • No dirty water runoff must be permitted to reach the riverine resources during the entire life of mine, and clean and dirty water management systems must be put in place to prevent the contaminated runoff (suspended solids and salts and water with low pH) from entering the	Avoid contaminated runoff	Can be avoided, managed or mitigated	No	
	Stockpiling of topsoil and overburden, earthworks, movement of vehicles within the regulated zones associated with freshwater ecosystems.	• Sediment-laden runoff entering riparian habitat leading to altered water quality, and changes to aquatic habitat; and • Altered drainage/flow regimes, leading to altered runoff patterns and formation of preferential flow paths.		Negative	22	Low		Avoid sediment runoff into riparian areas	Can be avoided, managed or mitigated	No	
	Potential disposal of hazardous and non-hazardous materials in riverine areas.	• Altered water quality, possible changes to flow patterns as a result of blockages caused by solid waste/rubble.		Negative	22	Low		Ensure proper stormwater management	Can be avoided, managed or mitigated	No	
Operational Phase											

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance		Management Measures	Management objective	Mitigation Effect	Potential for residual risk	Compliance with Standards (where applicable)
					Score	Magnitude					
Alteration of the local hydrological regime due to potentially poorly managed stormwater, compaction of soil and increased extent of impermeable surfaces.	Altered drainage patterns, potentially leading to the formation of preferential flow paths and/or concentrated flows.	• Erosion of terrestrial areas as preferential flow paths are formed in the landscape, resulting in sedimentation of freshwater ecosystems, leading to altered channel competency, altered vegetation community structures, blanketing of benthos and loss of rheophilic taxa and suitable habitat.		Negative	52	Moderate	receiving aquatic environment. Clean and dirty water runoff systems must be constructed before construction of any other infrastructure takes place; • Any dirty water runoff containment facilities must, as far as practically possible considering topographic constraints and available space within existing disturbed areas, remain outside of the defined riparian areas and their buffers (setback zones / zones of regulation) as a measure to minimise the impact on the receiving environment; • Strict control of sewage water treatment must take place and the sewage system must form part of the mine's closed process water system; • All dirty water containment structures must be designed to contain a minimum storm event of a 1 in 50 year flood event; • All pollution control facilities must be managed in such a way as to ensure that storage and surge capacity is available if a rainfall event occurs; • Special attention needs to be paid to the use of the disposal of tailings generated and the lining of the facilities to be used according to the specifications of the National Environmental Management Waste Act, 2008 (Act No. 59 of 2008); • All new storage facilities (WRD, PCD, stockpiles) to be lined with appropriate liners to prevent seepage. Existing facilities which will be upgraded must be lined where feasible, or where this is not possible (e.g. existing WRDs which cannot be moved) must have appropriate stormwater and barrier systems in place to minimise the risk of seepage or spills to the receiving environment • Adequate stormwater management must be incorporated into the design of the proposed mining project in order to prevent erosion and the associated sedimentation of the riparian and instream areas. In this regard special mention is made of: - Sheet runoff from cleared areas, paved surfaces and access roads needs to be curtailed; - Runoff from paved surfaces should be slowed down by the strategic placement of berms; and - All overburden stockpiles and waste stockpiles must have berms and/catchment paddocks at their toe to contain runoff from the facilities. • The use of 'green' stormwater management techniques such as vegetated swales, constructed wetlands (attenuation ponds), and permeable paving (where practical, e.g. in parking areas) is strongly recommended. Such methods will assist in polishing stormwater runoff, thus minimising potential pollution of the receiving aquatic environment; • Stormwater trenches/berms must be	Avoid sediment runoff into riparian areas	May cause irreplaceable loss of resources	No	
Presence of clean and dirty separation infrastructure upstream of surface infrastructure.	Loss of catchment yield due to stormwater containment.	• Potential for erosion of terrestrial areas as a result of the formation of preferential flow paths, leading to sedimentation of the freshwater ecosystems; • Reduction in volume of water entering the freshwater ecosystems, leading to loss of recharge (and thus desiccation) of downstream system; and • Altered vegetation communities due to moisture stress.		Negative	52	Moderate		Ensure proper stormwater management	Can be avoided, managed or mitigated	No	
Deposition of tailings, waste rock, general operations of the mine.	Possible pollution of surface water as result of seepage/runoff from proposed infrastructure (e.g. water treatment facilities, ROM stockpiles, PCD, WRD, TSF and workshop/fuel storage areas). Potential groundwater pollution, leading to plumes, which may affect freshwater ecosystems downstream of the surface infrastructure for a long period of time until water	• Possible contamination of surface and ground water, leading to impaired water quality and salination of soils within riparian areas; • Sedimentation of freshwater ecosystems could lead to altered water quality, altered channel integrity and altered vegetation community structures; and • Changes to vegetation growth due to increased nutrients as a result of altered groundwater properties.		Negative	52	Moderate		Ensure proper stormwater management	Can be avoided, managed or mitigated	No	

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance		Management Measures	Management objective	Mitigation Effect	Potential for residual risk	Compliance with Standards (where applicable)
					Score	Magnitude					
	quality rebounds to the background values.						constructed, and water contained therein may be recycled and utilised within the mine water circuit (dust suppression), or pumped to a Pollution Control facility for evaporation; and • Monitor all potentially affected drainage systems for changes in riparian vegetation structure related to water stress should variation in the vegetation be observed 4. Waste and contamination management • No material may be dumped, disposed of or stockpiled within any of the freshwater ecosystems in the vicinity of the proposed mining project. If any spills occur, they must be immediately cleaned up; and • No dirty water (as defined by GN704) is to be released into the receiving environment 5. Geomorphological drivers and habitat management • All areas affected by construction or decommissioning activities must be rehabilitated upon closure of the mining expansion. All contaminated soils must be removed and disposed of at an appropriate facility. Affected areas must be reshaped to be free draining and reseeded with indigenous grasses should take place as required; • Ensure that all stockpiles are well managed and have measures such as berms and protection with hessian sheets or silt traps as deemed applicable by the project engineers implemented to prevent erosion, sedimentation and eutrophication (Reno mattresses, gabions, re-vegetation etc.), which may lead to transformation of riparian and/or aquatic habitat and lead to impaired water quality; • All erosion noted within any study area must be remedied immediately and included as part of an ongoing rehabilitation plan; • Strict supervision of all construction activities to ensure that edge effects are minimised and that development remains within the approved footprint; • During the construction and operational phases of the proposed TGME mining expansion, erosion berms should be installed to prevent the formation of erosion gullies as a result of the formation of any preferential surface flow paths, and the possible sedimentation of the assessed sites and surrounding freshwater systems; and • The following points serve to guide the placement of erosion berms when implementing erosion control: - Where the track has slope of less than 2%, berms every 50m should be installed; - Where the track slopes between 2% and 10%, berms every 25m should be installed; - Where the track slopes between 10%-15%,				
Operational activities including underground mining	• Increased risk of contamination of freshwater ecosystems with hydrocarbons in runoff due to vehicle impacts; • Increased run-off from altered hard surfaces may affect hydrological function in the freshwater ecosystems (e.g. altered flow patterns that may also alter in-stream habitat and result in bank erosion and instability); • Increased risk of sediment transport in surface runoff from surface infrastructure to freshwater ecosystems, leading to altered water quality and sedimentation of freshwater systems.			Negative	52	Moderate		Ensure proper stormwater management	Can be avoided, managed or mitigated		

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance		Management Measures	Management objective	Mitigation Effect	Potential for residual risk	Compliance with Standards (where applicable)
					Score	Magnitude					
							berms every 20m should be installed; - Where the track has slope greater than 15%, berms every 10m should be installed. 6. Vegetation • Implement alien vegetation control program within freshwater ecosystem areas with special mention of water loving tree species. Throughout the life of mine measures to control alien vegetation must be implemented and specific attention to riverine features should be paid; • Limit footprint of vegetation clearing to what is essential; • Retain as much indigenous vegetation as possible; and • Rehabilitation and re-vegetation of disturbed areas immediately after construction.				
Closure and Post Closure Phase											
Decant from shafts post-closure	• Increased risk of pollution of surface water as a result of decant from the adit post closure. • Increased risk of pollution of groundwater, potentially leading to the formation of a contaminated groundwater plume, which may decant to the surface infrastructure, thus possibly affecting the downgradient freshwater systems.	• Increased risk of pollution (AMD) entering the freshwater ecosystems; • Increased runoff volumes and formation of preferential surface flow paths as a result of compacted soil and unvegetated areas, leading to increased sedimentation, erosion, and increased water inputs to downgradient aquatic systems.		Negative	52	Moderate	7. Closure • The following recommendations must be considered in conjunction with the recommendations of the geohydrologist. The geohydrologist recommendations must take precedence over the recommendations presented below: - Strict monitoring throughout LOM and post-closure is required in order to ensure the health and functioning of freshwater ecosystems is retained and monitoring data must be proactively utilised to identify any possible pollutants entering the system. - Drilling of groundwater monitoring boreholes to monitor water levels and quality as the groundwater rebounds. • Demolition footprint must be clearly demarcated and no related activities, including the movement of vehicles, must be permitted to occur outside of the footprint area; • All related waste and rubble must be removed from site and disposed of according to relevant SABS standards. No waste must be permitted to	Ensure proper stormwater management	May cause irreplaceable loss of resources	Yes	

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance		Management Measures	Management objective	Mitigation Effect	Potential for residual risk	Compliance with Standards (where applicable)
					Score	Magnitude					
Decommissioning / removal of surface infrastructure and sealing of shaft adits	Compacted soils, latent impacts of vegetation losses.	• Increased runoff volumes and formation of preferential surface flow paths as a result of compacted soil and unvegetated areas, leading to increased sedimentation, erosion, and increased water inputs to downgradient aquatic systems; • Proliferation of alien vegetation due to disturbances, which will impact natural flow regimes; and • Potential visual scars, affecting aesthetic features and faunal habitat.		Negative	52	Moderate	enter freshwater ecosystems; • Edge effects such as erosion must be monitored and managed as recommended during construction and operational phases; • All areas affected by stockpiling during the operational phase of the mine must be rehabilitated and stabilised using cladding or a suitable grass mix to prevent sedimentation of the freshwater ecosystems in the area; • Rehabilitation 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; • All areas must be resloped and an appropriate layer of topsoil reapplied and where necessary and reseeded with indigenous species; • It is critical that ongoing monitoring of alien vegetation is maintained post-closure, as proliferation of alien vegetation in the demolition areas is expected; and • Ongoing freshwater ecosystem (riparian) and aquatic biomonitoring must take place throughout the closure phase of the mine and must continue into the post closure phase for a period of at least ten years to define latent impacts that need to be mitigated.	Ensure proper management and rehabilitation to avoid latent impacts	Can be avoided, managed or mitigated	No	
Visual Impact Assessment											
Morgenzon, Dukes and Beta											
Site clearing of the project footprint areas associated with the shafts,WRDs, RoM Stockpiles, PCDs, DMS Plant, other supporting infrastructure, access roads and associated contractor laydown areas.	Visual	• Further removal of vegetation leading to visual contrast, potential loss of Visual Absorption Capacity of the landscape and visual intrusion on sensitive receptors especially the town of Pilgrim's Rest. • Erosion and loss of topsoil leading to visual contrast, and possible loss of Visual Absorption Capacity of the landscape. • Construction related earthworks activities resulting in increased dust suspension. • Increased vehicular movement in the vicinity of the study area. • Yellow construction vehicles visible from the lush green background, increasing the likelihood of motorists observing the proposed construction activities.	WOM	Negative	65	High	• It must be ensured that existing vegetation in the vicinity of 83MR Areas is retained during the construction phase to ensure that visual scarring of landscape and vegetation clearing does not occur beyond the mining footprint area. • Excavation is to be kept to a minimum and limited to essential areas. • Where mining infrastructure is sited within view of visually sensitive areas, vegetation around the mining footprints should be retained to assist in screening. In particular the areas around the WRDs of the Dukes mining activities. • Erosion, which may lead to high levels of visual contrast and further detract from the visual environment, must be prevented throughout the lifetime of the project by means of putting soil stabilisation measures in place and concurrent rehabilitation. • It must be ensured that topsoil, run of mine stockpiles and WRDs are not steeply sloped, so as to blend in with the undulating terrain. • The sites should be kept neat and tidy at all times. • The height of structures should be a low as possible, where this can be achieved without increasing the infrastructure footprint. • Painting or coating infrastructure components	Reduce negative visual contrast	Can be avoided, managed or mitigated	No	
			WM	Negative	48	Moderate			Can be avoided, managed or mitigated	No	

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance		Management Measures	Management objective	Mitigation Effect	Potential for residual risk	Compliance with Standards (where applicable)
					Score	Magnitude					
Construction and excavation activities related to the shafts, PCDs, WRDs, RoM Stockpiles and access roads.	Visual	• Excavation during construction of mining infrastructure will lead to visual intrusion and visual exposure of receptors. • Mine infrastructure including buildings, stockpiles and dumps being visible and creating contrast with the surrounding landscape. • An increase in construction vehicular and human activity in the area, leading to an increase in dust. • Excavation resulting in increased dust suspension. • Use of security lighting.	WOM	Negative	65	High	to match darker colours in the natural surroundings may reduce the distance required for effective screening. • Visually cluttered material storage yards and laydown areas should be screened through the use of material fencing, which will result in a more unified and tidy appearance. • Natural colours should be used in all instances and the use of highly reflective material should be avoided. Any metal surfaces should be painted to fit in with the natural environment in a colour that blends in effectively with the background. White structures are to be avoided as these will contrast significantly with the natural surroundings. • The identification of appropriate colours and textures for facility materials should take into account both summer and winter appearance. • The use of permanent signs and project construction signs should be minimised and visually unobtrusive. • During rehabilitation, the removal of infrastructure, ripping of roads and reshaping of impacted areas should take place. • The relevant exposed construction site areas and internal access roads should be irrigated on a regular basis, with just enough moisture to keep the dust down without creating undue runoff. • Construction activities should be restricted to daylight hours as far as possible, in order to limit the need to bright floodlighting and the potential for skyglow. • All lights used for illumination (except for lighting associated with security) should be faced inwards and shielded to avoid light escaping above the horizon. • As a safety precaution and due to illegal miners active in the area, the use of stationary security lighting at offices and the maintenance area are highly recommended.	Reduce negative visual intrusion	Can be avoided, managed or mitigated	No	
			WM	Negative	44	Moderate			Can be avoided, managed or mitigated	No	

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance		Management Measures	Management objective	Mitigation Effect	Potential for residual risk	Compliance with Standards (where applicable)
					Score	Magnitude					
On-going mining activities. Increase in trucks on the surrounding roads, transporting the material extracted.	Visual	• Continual stockpiling of material, including the resource, and potentially increasing heights of stockpiles and WRD during operational activities. • Generation of dust leading to visual intrusion, visual exposure of receptors and impacts on the overall landscape character. • Additional vehicular traffic impacting on the character of the region and leading to visual exposure of receptors further from the MR 83 UG Areas to mining activities. • Night time lighting due to security lighting, adding to the skyglow of the area.	WOM	Negative	44	Moderate	• The design and height increase of stockpiles must be monitored to ensure that these components relate to acceptable environmental standards in terms of slope and elevation. • All internal access roads will require effective dust suppression such as regular watering. • An effective dust management plan taking into account stockpile and dump areas, as well as internal access roads must be designed and implemented in order to mitigate the impact of dust on sensitive receptors throughout all mining phases. • Vehicle speed on unpaved roads must be reduced to limit dust generation. • As far as possible, existing roads are to be utilised, also for construction purposes, to prevent cumulative impacts from roads and traffic. • Transport of the mined resource should be optimised as far as possible to limit the number of additional vehicles on local and district roads. • As far as possible, operational activities should take place during the daylight hours, in order to limit the use of bright floodlighting and to avoid the use of additional night-time lighting which may add to skyglow. As underground mining activities will take place 24 hours 7 days a week, it must be ensured that up-lighting structures be avoided. • Outdoor lighting must be strictly controlled. • The use of high light masts and high pole top security lighting should be avoided along the periphery of the operations. Any high lighting masts should be covered to reduce sky glow. • Up-lighting of structures must be avoided, with lighting installed at downward angles that provide precisely directed illumination beyond the immediate surrounding of the mining infrastructure, thereby minimising the light spill and trespass. • Care should be taken when selecting luminaries to ensure that appropriate units are chosen and that their location will reduce spill light and glare to a minimum. Only "full cut-off" light fixtures that direct light only below the horizontal must be used on the building. • Censored and motion lighting may be installed at office areas, workshops and other buildings to prevent use of lights when not needed. • Minimum wattage light fixtures should be used, with the minimum intensity necessary to accomplish the light's purpose. • Vehicle-mounted lights or portable light towers are preferred over permanently mounted lighting for night-time maintenance activities. If possible, such lighting should be equipped with hoods or louvers and be aimed toward the ground to avoid causing glare and skyglow (BLM, 2013). • The use of low-pressure sodium lamps, yellow	Reduce negative visual intrusion	Can be avoided, managed or mitigated	No	
			WM	Negative	36	Low			Can be avoided, managed or mitigated	No	

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance		Management Measures	Management objective	Mitigation Effect	Potential for residual risk	Compliance with Standards (where applicable)
					Score	Magnitude					
							LED lighting, or an equivalent reduces skyglow and wildlife impacts. Bluish-white lighting is more likely to cause glare and attract insects, and is associated with other human physiological issues (BLM, 2013).				
Demolition of surface infrastructure	Visual	• Removal of infrastructure and general decommissioning and closure activities leading to potential visual intrusion on sensitive receptors. • Potential ineffective rehabilitation leading to landscape scarring, permanent visual contrast and a permanent alteration of the landscape character and sense of place within the region.	WOM	Negative	44	Moderate	• Decommissioning footprints and disturbed areas should be kept as small as possible and no further vegetation should be cleared or soils exposed for this purpose. • All areas where infrastructure is removed must be resloped to and revegetated as soon as possible. • Rehabilitation measures post construction and decommissioning must be strictly adhered to and disturbed areas must be rehabilitated as soon as possible by replacing topsoil and revegetating disturbed areas. • Indigenous and locally occurring plant species selected for use in re-vegetation should be selected taken quick growth rates into consideration in order to cover bare areas and prevent soil erosion. • Upon final rehabilitation, it must be aimed to remove as much surface infrastructure where practically feasible and to reshape the landscape to blend in with the surrounding mountainous terrain.	Reduce negative visual intrusion on sensitive receptors	Can be reversed	No	
			WM	Negative	28	Low			Can be reversed	No	
Frankfort											

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance		Management Measures	Management objective	Mitigation Effect	Potential for residual risk	Compliance with Standards (where applicable)
					Score	Magnitude					
Site clearing of the project footprint areas associated with the shafts, WRDs, RoM Stockpiles, PCDs, DMS Plant, other supporting infrastructure, access roads and associated contractor laydown areas.	Visual	• Further removal of vegetation leading to visual contrast, potential loss of Visual Absorption Capacity of the landscape and visual intrusion on sensitive receptors especially the town of Pilgrim's Rest. • Erosion and loss of topsoil leading to visual contrast, and possible loss of Visual Absorption Capacity of the landscape. • Construction related earthworks activities resulting in increased dust suspension. • Increased vehicular movement in the vicinity of the study area. • Yellow construction vehicles visible from the lush green background, increasing the likelihood of motorists observing the proposed construction activities in some instances and albeit from a distance.	WOM	Negative	44	Moderate	Same as above	Reduce negative visual contrast	Can be avoided, managed or mitigated		
			WM	Negative	22	Low			Can be avoided, managed or mitigated		
Construction and excavation activities related to the shafts, PCDs, WRDs, RoM Stockpiles and access roads.	Visual	• Excavation during construction of mining infrastructure will lead to visual intrusion and visual exposure of receptors. • Mine infrastructure including buildings, stockpiles and dumps being visible and creating contrast with the surrounding landscape. • An increase in construction vehicular and human activity in the area, leading to an increase in dust. • Excavation resulting in increased dust suspension. • Use of security lighting.	WOM	Negative	55	Moderate	Same as above	Reduce negative visual intrusion	Can be avoided, managed or mitigated		
			WM	Negative	44	Moderate			Can be avoided, managed or mitigated		
On-going mining activities. Increase in trucks on the surrounding roads, transporting the material extracted.	Visual	• Continual stockpiling of material, including the resource, and potentially increasing heights of stockpiles and WRD during operational activities. • Generation of dust leading to visual intrusion, visual exposure of receptors and impacts on the overall landscape character. • Additional vehicular traffic impacting on	WOM	Negative	44	Moderate	Same as above	Reduce negative visual intrusion	Can be avoided, managed or mitigated		

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance		Management Measures	Management objective	Mitigation Effect	Potential for residual risk	Compliance with Standards (where applicable)
					Score	Magnitude					
		the character of the region and leading to visual exposure of receptors further from the MR 83 UG Areas to mining activities. • Night time lighting due to security lighting, adding to the skyglow of the area.	WM	Negative	36	Low			Can be avoided, managed or mitigated		
Demolition of surface infrastructure	Visual	• Removal of infrastructure and general decommissioning and closure activities leading to potential visual intrusion on sensitive receptors. • Potential ineffective rehabilitation leading to landscape scarring, permanent visual contrast and a permanent alteration of the landscape character and sense of place within the region.	WOM	Negative	28	Low	Same as above	Reduce negative visual intrusion on sensitive receptors	Can be avoided, managed or mitigated		
			WM	Negative	28	Low			Can be avoided, managed or mitigated		
Noise Assessment											
Construction Phase											
Activities associated with the construction of the mines	Environmental Noise	Increase above 7 dBA above Rating Level	WOM	Negative	18	Negligible	Construction crew must conduct toolbox talks to educate their employees and ensure that they are aware of the legislation regarding noise. Should a noisy construction activity occur off the project footprint and near a receptor, the Environmental Coordinator should inform the receptor prior to the activity. Should noisy night-time activity occur (after 9pm, e.g. concrete pouring) the Environmental Coordinator should make receptors aware of the activity prior to the occurrence.	Keep noise levels below 7 dBA at receptors Rating Level	Can be avoided, managed or mitigated	No	National Government Notice (GN) R154 legislative requirements (Government Gazette 13717 of 10 January 1992)
			WM	Negative	10	Negligible			Can be avoided, managed or mitigated	No	
Operational Phase											
Activities associated with the operations of the mines	Environmental Noise	Increase above 7 dBA above Rating Level, increase of 61 dBA over a 24 hour period (at the boundary of the mine footprint).	WOM	Negative	48	Moderate	The introduction of berms or acoustical shields in key areas . The CMD layout near receptors R3 and R4 require acoustical screens/berms.	Keep noise levels below 7 dBA at receptors Rating	Can be avoided, managed or mitigated	No	National Government Notice (GN) R154 legislative requirements (Government Gazette

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance		Management Measures	Management objective	Mitigation Effect	Potential for residual risk	Compliance with Standards (where applicable)
					Score	Magnitude					
			WM	Negative	16	Negligible		Level. Keep noise levels below 61 dBA (24 hr) at the boundary of the project footprint.	Can be avoided, managed or mitigated	No	13717 of 10 January 1992)
Movement of vehicles on mine and haul roads	Environmental Noise	Increase above 7 dBA above Rating Level	WOM	Negative	48	Moderate	The project should consider reverse alarms that do not generate a high noise nuisance due to its tonality. Although heavy vehicle reverse alarms are exempt from noise legalisation (GN R154) and needs to meet occupational health and safety standards, certain reverse alarms are less intrusive (less tonal more broadband character etc.). Movement of heavy vehicles along haul routes (past receptors) towards municipal routes, should be minimised during night-times (receptor R3 and R4).	Keep noise levels below 7 dBA at receptors Rating Level	Can be avoided, managed or mitigated	No	National Government Notice (GN) R154 legislative requirements (Government Gazette 13717 of 10 January 1992)
			WM	Negative	16	Negligible			Can be avoided, managed or mitigated	No	
Underground mine ventilation stacks operations	Environmental Noise	Increase above 7 dBA above Rating Level, increase of 61 dBA over a 24 hour period (at the boundary of the mine footprint).	WOM	Negative	24	Low	The following could be considered: -Sonic lining - Sonic Liner reduces the sound transmission along the vent duct. - Silencers/sound attenuator, duct silencer, sound trap, muffler - Noise can be redirected or lowered by means of above-mentioned design implementation. - Direction (to be discussed with project engineers) – Diffraction in the temperature layers at night could redirect the noise levels back to a receptor. The ventilation outputs could be directed rather away (opposed to upwards) from receptors within 2 km by means as previously stated (Silencers/sound attenuator, duct silencer, sound trap, muffler). - Barrier/berm - If feasible vents could be obscured (acoustical berm or shield) The berm/acoustical barrier should consider the following: - The berms should be solid (aggregate, brick etc. no foliage e.g. trees). - The height should be a minimum of two (2) meters higher than top of the vent shaft. - The berm/barrier will assist in the spill over points (create an acoustical shadow at 900 due to vent noise spill over at 900) on the exit point of the vent, but not the return of noise levels due to refraction in the atmosphere temperature layers. - Berms or the selected acoustical barrier should enclose all sides of the vent exit port in relation to receptors -A berm or solid double brick wall could be implemented here. - The acoustical shield needs to be implemented as feasibly close as possible to the vents as possible.	Keep noise levels below 7 dBA at receptors Rating Level. Keep noise levels below 61 dBA (24 hr) at the boundary of the project footprint.	Can be avoided, managed or mitigated	No	National Government Notice (GN) R154 legislative requirements (Government Gazette 13717 of 10 January 1992)
			WM	Negative	16	Negligible			Can be avoided, managed or mitigated	No	

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance		Management Measures	Management objective	Mitigation Effect	Potential for residual risk	Compliance with Standards (where applicable)
					Score	Magnitude					
Closure and Post closure											
Activities associated with the construction of the mines	Environmental Noise	Increase above 7 dBA above Rating Level	WOM	Negative	18	Negligible	Construction crew must conduct toolbox talks to educate their employees and ensure that they are aware of the legislation regarding noise. Should a noisy construction activity occur off the project footprint and near a receptor, the Environmental Coordinator should inform the receptor prior to the activity. Should noisy night-time activity occur (after 9pm, e.g. concrete pouring) the Environmental Coordinator should make receptors aware of the activity prior to the occurrence.	Keep noise levels below 7 dBA at receptors Rating Level	Can be avoided, managed or mitigated	No	National Government Notice (GN) R154 legislative requirements (Government Gazette 13717 of 10 January 1992)
			WM	Negative	10	Negligible			Can be avoided, managed or mitigated	No	
Heritage Impact Assessment											
Construction Phase											
	Heritage	Damage/destruction of high significance heritage resources in the Beta North Mining Area, Frankfort Mining Area and CDM Mining Area.	WOM	Negative	64	High	* Site Management Plan: Compile a heritage Site Management Plan (SMP) detailing a plan of action and measures for the long-term conservation and management of the heritage resource and its historical fabric. * Phase 2 Mitigation: Integrated and Legally compliant Phase 2 Study and assessment. * Site Monitoring: Strict monitoring (construction and commissioning) by the heritage consultant or an EO familiar with the heritage occurrences of the sites. * Site Declaration Status: Engage the relevant heritage authority(SAHRA, SAHRA Built Environment) in terms of site declaration status as Grade II Provincial Heritage Resources subject to the NHRA 1999 (Section 7). * Further Research: Engage with tertiary institutions, academics and relevant specialists to document and further research the Pilgrim's Rest and Ponieskrants historical horizon. * Site Monitoring: General site monitoring by informed EO on a biweekly basis during construction. * Burials - Avoidance: Implement a heritage conservation buffer of at least 100m around the graves / cemetery, redesign the project layouts to avoid the heritage resource and the proposed conservation buffer. * Fence all burial places and apply access control. * Implement a site management plan detailing strict site management conservation measures. * Burials - Site Management Plan: Compile a heritage Site Management Plan (SMP) detailing a plan of action and measures for the long-term conservation and management of the heritage resource and its historical fabric. * Burials - Grave Relocation: Relocation of burials and documentation of site, full social consultation with affected parties, possible conservation management and protection measures.	Mitigate heritage resources, manage and preserve historical fabric of the sites.	Can be avoided, managed or mitigated	No	
			WM	Negative	40	Low			Can be avoided, managed or mitigated	No	
			WOM	Negative	8	Negligible			Can be avoided, managed or mitigated	No	

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance		Management Measures	Management objective	Mitigation Effect	Potential for residual risk	Compliance with Standards (where applicable)
					Score	Magnitude					
							* Subject to authorisations and relevant permitting from heritage authorities and affected parties.				
Operational Phase											
	Heritage	Damage/destruction of high significance heritage resources in the Beta North Mining Area, Frankfort Mining Area and CDM Mining Area.	WOM	Negative	64	High	* Site Management Plan: Implement heritage Site Management Plan (SMP) detailing a plan of action and measures for the long-term conservation and management of the heritage resource and its historical fabric. * Phase 2 Mitigation: Integrated and Legally compliant Phase 2 Study and assessment. * Site Monitoring: Strict monitoring (construction and commissioning) by the heritage consultant or an EO familiar with the heritage occurrences of the sites. * Further Research: Engage with tertiary institutions, academics and relevant specialists to document and further research the Pilgrim's Rest and Ponieskrants historical horizon. * Site Monitoring: General site monitoring by informed EO on a bi weekly basis during construction. * Burials - Avoidance: Implement a heritage conservation buffer of at least 100m around the graves / cemetery, redesign the project layouts to avoid the heritage resource and the proposed conservation buffer. * Fence all burial places and apply access control. * Implement a site management plan detailing strict site management conservation measures. * Burials - Site Management Plan: Implement a heritage Site Management Plan (SMP) detailing a plan of action and measures for the long-term conservation and management of the heritage resource and its historical fabric.	Mitigate heritage resources, manage and preserve historical fabric of the sites	Can be avoided, managed or mitigated	No	
			WM	Negative	30	Low			Can be avoided, managed or mitigated	No	
			WM	Negative	32	Low			Can be avoided, managed or mitigated	No	
Closure & Post Closure Phase											
	Heritage	Damage/destruction of high significance heritage resources in the Beta North Mining Area, Frankfort Mining Area and CDM Mining Area.	WOM	Negative	16	Negligible	* Site Management Plan: Implement heritage Site Management Plan (SMP) detailing a plan of action and measures for the long-term conservation and management of the heritage resource and its historical fabric. * Site Monitoring: Strict monitoring (construction and commissioning) by the heritage consultant or an EO familiar with the heritage occurrences of the sites.	Mitigate heritage resources, manage and preserve historical fabric of the sites	Can be avoided, managed or mitigated	No	

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance		Management Measures	Management objective	Mitigation Effect	Potential for residual risk	Compliance with Standards (where applicable)
					Score	Magnitude					
			WM	Negative	14	Negligible	* Further Research: Engage with tertiary institutions, academics and relevant specialists to document and further research the Pilgrim's Rest and Ponieskrants historical horizon. * Burials - Site Monitoring: General site monitoring by informed EO on a bi-weekly basis during construction. * Burials - Avoidance: Implement a heritage conservation buffer of at least 100m around the graves / cemetery, redesign the project layouts to avoid the heritage resource and the proposed conservation buffer. * Burials -site Management Plan: Compile a heritage Site Management Plan (SMP) detailing a plan of action and measures for the long-term conservation and management of the heritage resource and its historical fabric.		Can be avoided, managed or mitigated	No	
			WOM	Negative	9	Negligible			Can be avoided, managed or mitigated	No	
Palaeontological Impact Assessment											
Re-mining of sites	Palaeontology	The damage or destruction of any palaeontological materials by proposed development	WOM	Negative	60	Moderate	* The EO for this project must be informed that the Palaeontological Sensitivity of the Timeball Hill Formation is High while that of the Malmani Subgroup (Transvaal Supergroup) is Very High. * If Palaeontological Heritage is uncovered during surface clearing and excavations the Chance find Protocol attached should be implemented immediately. Fossil discoveries ought to be protected and the ECO/site manager must report to South African Heritage Resources Agency (SAHRA) (Contact details: SAHRA, 111 Harrington Street, Cape Town. PO Box 4637, Cape Town 8000, South Africa. Tel: 021 462 4502. Fax: +27 (0)21 462 4509. Web: www.sahra.org.za) so that mitigation (recording and collection) can be carried out. * Before any fossil material can be collected from the development site the specialist involved would need to apply for a collection permit from SAHRA. Fossil material must be housed in an official collection (museum or university), while all reports and fieldwork should meet the minimum standards for palaeontological impact studies proposed by SAHRA (2012). * These recommendations should be incorporated into the Environmental Management Plan for the proposed mining Development.	Protecting Palaeontological findings	Can be avoided, managed or mitigated	Yes	
			WM	Negative	26	Low			Can be avoided, managed or mitigated	Yes	
Socio-Economic Impact Assessment											
Construction Phase											
Construction Activities	Socio-Economic	Positive Impact on Local Income and Employment	WOM	Positive	52	Moderate	• Prioritise local labour in the recruitment process as part of the company's own recruitment policy or as part of the contractor management plan • Provide up-skilling opportunities for elementary and semi-skilled local workers during the construction phase • If use is made of a contractor, explore the	Maximise local income and employment	Can be avoided, managed or mitigated	No	

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance		Management Measures	Management objective	Mitigation Effect	Potential for residual risk	Compliance with Standards (where applicable)
					Score	Magnitude					
			WM	Positive	60	Moderate	possibility of placement of up-skilled local workers in other projects • Explore possible placement of local construction workers in mining operations • Incorporate the mitigation measures worker related management plans and employment contracts as well as contractor management plans				
Construction Activities	Socio-Economic	Potential Influx of People Population Change	WOM	Negative	52	Moderate	• Prioritise recruitment of local labour as far as possible. • Access skills databases currently being drawn up by local community representatives such as ward counsellors and TCLM. • No recruitment to be undertaken on-site. • Enter into formal employment contracts with casual labour and the construction staff to ensure that they are aware that employment is for a limited period only and that it is unlikely that the mine will employ construction staff on the mine when in operation. • Communicate redeployment with current operational staff and in the media to prevent word spreading of new job opportunities at the mine. • Availability of accommodation facilities to be established prior to and during the construction phase	Avoid influx of people	Can be avoided, managed or mitigated	Yes	
			WM	Negative	44	Moderate					
Construction Activities	Socio-Economic	Increase in Nuisance Factors (Noise & Dust)	WOM	Negative	48	Moderate	• Mitigation measures with regards to noise impacts as per the EIA Report should be implemented. • All construction vehicles should be in a good condition and adhere to road-worthy standards. • Maintenance of vehicles and machinery should be done regularly. • Construction hours must preferably be limited to daylight day hours e.g., 6 am to 6 pm where possible. • Construction site management to adhere to the Theta SHEQ requirements • Dust control measures e.g., wetting of gravel roads to be implemented where feasible. • Dust monitoring to be undertaken at Brown's Hill • Public transport options to be provided to construction workers • Concurrent rehabilitation/cleaning of construction sites to be undertaken • Resettlement of Brown's Hill community members to be considered during this phase or prior to construction	Reduce and manage health effects on surrounding landusers	Can be avoided, managed or mitigated	No	
			WM	Negative	22	Low					

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance		Management Measures	Management objective	Mitigation Effect	Potential for residual risk	Compliance with Standards (where applicable)
					Score	Magnitude					
Construction Activities	Socio-Economic	Community Health	WOM	Negative	26	Low	• Prioritise recruitment of local labour as far as possible. • All construction vehicles should be in a good condition and adhere to road-worthy standards. • Maintenance of vehicles and machinery should be done regularly. • Construction site management to adhere to the Theta SHEQ requirement. • Dust monitoring to be undertaken at Brown's Hill settlement, Pilgrim's Rest, Darks Gully and Schoonplaas/Newtown • First aid and/or emergency supplies should be available at various points at the construction site • HIV/AIDS, TB, and Covid-19 awareness and support programmes to be supported and to be implemented as part of induction procedures • Safety measurements to be communicated to employees on a continuous basis • Covid-19 regulations to be adhered to and to be communicated to construction workers • The general health of construction workers should be monitored on an ongoing basis • Emergency action plans to be developed in consultation with localised health and emergency services • Resettlement of Brown's Hill community members to be considered during this phase or prior to construction	Avoid Health effects on surrounding landusers	Can be avoided, managed or mitigated	No	
			WM	Negative	18	Negligible					
Construction Activities	Socio-Economic	Community Safety	WOM	Negative	52	Moderate	• Recruitment of local labour must be prioritised. • Unauthorised entry to 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 operators must adhere to the speed limit parameters at all times. • Traffic control and direction indication, visible roadworks signs as well as pedestrian occurrence signs must be implemented	Ensure community safety with mining activities taking place	Can be avoided, managed or mitigated	Yes	

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance		Management Measures	Management objective	Mitigation Effect	Potential for residual risk	Compliance with Standards (where applicable)
					Score	Magnitude					
			WM	Negative	36	Low	• The South African Police Service (SAPS) and forums such as the Mpumalanga Illegal Mining Stakeholder Forum and the DMRE to curb illegal mining through their preventative measures that include: Demolishing illegal m mining infrastructure; confiscating gold-bearing material; arresting illegal miners; deporting illegal immigrants; introducing biometric scanners at mines; additional security guards at shaft entrances; inspection of material cars on shaft heads for food parcels and illegal entries; involving stakeholders, such as the surrounding communities at mines, businesses, and the local council, to participate in combating illegal mining; and establishing whistle-blower channels. • TGME developed a comprehensive security strategy dealing with the illegal miners in and around the proposed mining areas. This strategy will be implemented as part of the start-up phase of the mines. • A Fire/Emergency Management Plan and associated communication channels should be developed and implemented (in conjunction with neighbouring landowners and timber companies operating in the areas surrounding the construction sites). • Appropriate firefighting equipment should be on-site and construction workers should be appropriately trained for firefighting. • Visible policing in the settlements in close proximity to the construction sites is required. • Security teams to regularly patrol areas around construction sites. • Transparent procurement processes to be implemented with regards to potential vendors.				
Operational Phase											
Operational Activities	Socio-Economic	Positive Impact on Local Income and Employment	WOM	Positive	52	Moderate	• 100% recruitment of elementary (unskilled) labour from local communities, with the focus on Pilgrim's Rest, Newtown/Schoonplaas, and Darks Gully, and secondly from rural areas in Wards 10, 9, and 8 • Up-skilling of the local labour force as per the requirements of the SLP • Develop a database of goods and services that could potentially be outsourced to the local community • Establish a supplier development programme as part of the Local Economic Development component of the SLP. The programme should focus on small businesses in Pilgrim's Rest that	Maximise local income and employment	Can be avoided, managed or mitigated	No	

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance		Management Measures	Management objective	Mitigation Effect	Potential for residual risk	Compliance with Standards (where applicable)
					Score	Magnitude					
			WM	Positive	60	Moderate	could supply non-core mining goods and services to the mine (e.g., catering and cleaning) as well as larger businesses within the region. • Focus on the local supplier development programme on creating sustainable local businesses that could continue to operate after mine closure, e.g., by assisting local businesses in market diversification strategies • Participate in the development of a regional mine supplier hub to promote the development of a local supply base (e.g., the current enterprise hub in Lydenburg that was launched by Glencore) • Put a contractor management plan (including direct service providers) in place to ensure that the local employment and procurement targets of the operations are met. The targets should also be aligned with the Mining Charter of 2018.				
Operational Activities	Socio-Economic	Increase in Public Revenues	WOM	Positive	52	Moderate	• Develop an updated Local Economic Plan as part of an updated SLP for the project in consultation with the local community • Ensure that the current allocation as per TGME's Mine Works Programme for the updated SLP is in line with the targets of the Mining Charter of 2018 • Monitor and manage the social contribution of multinational suppliers (in-house as well as suppliers to contractor and direct service providers)	Assist with community upliftment	Can be avoided, managed or mitigated	No	
			WM	Positive	60	Moderate					

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance		Management Measures	Management objective	Mitigation Effect	Potential for residual risk	Compliance with Standards (where applicable)
					Score	Magnitude					
Operational Activities	Socio-Economic	Impact on Non-Mining Related Economic Activities	WOM	Negative	52	Moderate	• Engage on a regular basis with the business sector through the local business chambers (Sabie, Graskop, and Pilgrim's Rest) to address issues that could negatively impact on local businesses, specifically tourist businesses. • Mitigation measures as stipulated in the EMPr must be strictly adhered to, to avoid and minimise any environmental pollution Effective management of the mining activities to avoid any environmental pollution focusing on water, and dust pollution, and limiting any increase in noise levels as per the respective environmental management plans (high priority) • An integrated Fire/Emergency Management Plan should be developed and implemented. It would be important to regularly review the functionality and efficiency of such a plan in conjunction with the local emergency teams, mine management, forestry industry, and affected communities as well as neighbouring landowners • Pro-active security measures should be put in place to avoid unauthorised entry onto mining sections, as well as forestry and conservation areas • Specify the conduct of contract workers in worker related management plans and employment contracts • Security companies employed by the mining sector to develop an integrated security management plan with the focus on	Reduce impacts on non mining related economic activities	Can be avoided, managed or mitigated	Yes	

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance		Management Measures	Management objective	Mitigation Effect	Potential for residual risk	Compliance with Standards (where applicable)
					Score	Magnitude					
			WM	Negative	26	Low	unauthorised entries and issues associated with illegal mining. • 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 (e.g. 7 am until 5 pm) where possible • Heavy machinery and heavy vehicles should be kept in a good working order. Also, ensure that all vehicles and equipment comply with generally accepted noise levels and noise abatement regulations • Dust suppression measures should be applied if and when necessary • Sequence the operations phase to commence after the construction phase, if possible, to avoid negative cumulative impacts • TGME should proceed in facilitating the development of a detailed tourist strategy for Pilgrims Rest as part of its LED programme in close consultation with the local community and local tourism sector. Some ideas that could be explored further include: o Commitment from business visitors to the mine to use the overnight facilities in Pilgrim's Rest or the immediate surroundings o Caravan Park space development (one-part offices, the other ablution blocks, and ground clearance and maintenance for caravan standing areas) – TGME already assisting with the management of the golf course o Assist with maintenance of e.g. the road between Graskop and Pilgrim's (bush clearance and some repairs) o Museum support (gold panning) o Assist and liaise with SAFCOL in promoting and re-establishing their hiking trails o Facilitate the establishment of an ATM in town o Expanding their existing involvement in the Pilgrim's Rest Golf Club by assisting with the management and maintenance of the club, and by providing the impetus for capacity building and skills transfers • Liaise and assist with the promotion of Road safety on the R533 • Involve the SAPS and other relevant stakeholders (e.g. other business entities operating in the area, as well as Police Forums and Sector Forums) in the preventative security measures to be undertaken				
Operational Activities	Socio-Economic	Increased economic concentration of the local economy	WOM	Negative	60	Moderate	• Focus on the support of non-mining related activities in community development programmes • Focus on the development of the local tourist market in community development programmes • Focus the local procurement programme on non-core mining inputs in Pilgrim's Rest with a	Increase economic concentration of the local economy	Can be avoided, managed or mitigated	No	

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance		Management Measures	Management objective	Mitigation Effect	Potential for residual risk	Compliance with Standards (where applicable)
					Score	Magnitude					
			WM	Negative	52	Moderate	broader regional market (e.g. catering, accommodation) • If a supplier development programme is established, focus the programme on non-core mining inputs in Pilgrim's Rest with a broader regional market				
Operational Activities	Socio-Economic	Increased use of scarce natural resources	WOM	Negative	52	Moderate	• TGME to develop a strategy to cause minimal disruptions to electricity supply in the local area. For example, continue discussions with ESKOM to resolve supply of energy to the mine and use off-grid solutions until agreement for stable local supply is reached • Develop a resource use plan with the specific objective to minimize the mining operations' energy and water use as far as practical. For example, treated discharge water could possibly be used for irrigation purposes e.g. at the golf course and caravan park if such a proposal adheres to environmental regulations. • Ensure that water quality and quantity issues are managed appropriately through engineering controls and through regular and required quality and quantity groundwater monitoring • Mitigation measures of the Geohydrology and Surface Water Hydrology Impact Assessments must be strictly implemented.	Management of services and natural resources	Can be avoided, managed or mitigated	No	
			WM	Negative	44	Moderate					
Operational Activities	Socio-Economic	Potential Influx of People Population Change	WOM	Negative	60	Moderate	• Prioritise recruitment of local labour as far as possible • Access skills databases currently being drawn up by local community representatives such as ward councillors and TCLM. • Develop a procurement strategy as well as a contractor management plan (if relevant) to ensure that local employment is enhanced as far as possible within the semi-skilled and skilled categories and that all elementary labour is recruited from local communities of the larger Pilgrim's Rest area, the larger Moremela area, Leroro, Mathibidi, Graskop and Sabie • Employment of locals would limit the negative impacts (e.g. Infrastructure requirements) associated with a sudden or additional population increase. • The local labour procurement strategy as well as proof of residence required should be clearly communicated through community structures well in advance. The communication strategy should ensure that unrealistic employment expectations are not created. • TGME to discuss the infrastructure requirements of the operational phase with the TCLM and DPWRT to pro-actively deal with the possible negative impacts • Maintenance of the roads frequently used by mine related traffic should be discussed and negotiated with the DPWRT. • TGME to assist permanent employees without existing accommodation to achieve	Avoid influx of people	Can be avoided, managed or mitigated	Yes	
			WM	Negative	52	Moderate					

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance		Management Measures	Management objective	Mitigation Effect	Potential for residual risk	Compliance with Standards (where applicable)
					Score	Magnitude					
							homeownership (e.g. through salary structures making provision for some form of housing allowance)				
Operational Activities	Socio-Economic	Increase in Nuisance Factors (Noise & Dust)	WOM	Negative	52	Moderate	• Mitigation measures with regards to noise impacts as per the EIA Report should be implemented. • All vehicles should be in a good condition and adhere to road-worthy standards. • Maintenance of vehicles and machinery should be done regularly. • Movement of mining-related vehicles to be scheduled outside peak traffic hours where possible. • Mining site management to adhere to the Theta SHEQ requirements • Dust control measures e.g. wetting of gravel roads to be implemented where feasible. • Public Transport options to be provided to the employees during the operational phase of the project • Positioning of lights to be carefully considered. • The mitigation measures proposed by the Visual Impact Assessment must be implemented.	Limited nuisance factors	Can be avoided, managed or mitigated	Yes	
			WM	Negative	36	Low					
Operational Activities	Socio-Economic	Community Health	WOM	Negative	52	Moderate	• Prioritise recruitment of local labour as far as possible. • Reduce vulnerability by providing and supporting HIV/AIDS, TB, and Covid-19 awareness and support programmes • Covid-19 regulations to be adhered to and to be communicated to workers • The general health of workers should be monitored on an ongoing basis • Emergency action plans to be developed in consultation with localised health and emergency services • Dust control measures e.g. wetting of gravel roads to be implemented where feasible • Mining site management to adhere to the Theta SHEQ requirements. • The mine could, through LED programmes and infrastructure development assist in improving the overall health services within the communities • Continuous water monitoring to be undertaken at specific locations as determined by the relevant specialist studies. • Reporting on the water monitoring and the findings must be regularly undertaken through formalised communication channels.	Avoid Health effects on surrounding landusers	Can be avoided, managed or mitigated	Yes	
			WM	Negative	26	Low					

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance		Management Measures	Management objective	Mitigation Effect	Potential for residual risk	Compliance with Standards (where applicable)
					Score	Magnitude					
Operational Activities	Socio-Economic	Community Safety	WOM	Negative	52	Moderate	• A comprehensive Resettlement Action Plan (RAP) must be developed in consultation with the affected inhabitants. This plan would include the number of dwellings and individuals to be affected, timeframes, and the availability of a site where resettlement could occur. • Representatives of the DPWRT and TGME must liaise with the inhabitants and local councillor with regard to the resettlement process and timeframes. This communication must further ensure that the correct information regarding this issue is portrayed to the community members. • It would be desirable to address issues relating to resettlement as a matter of urgency and also to provide definitive timeframes linked to any possible resettlement • Recruitment of local labour must be prioritised. • Unauthorised entry into the mining area must not be allowed. Access control should continue to be implemented. Mining areas must be secured and fenced. • Livestock should be moved to other grazing areas away from the mining activities. • The South African Police Service (SAPS) and forums such as the Mpumalanga Illegal Mining Stakeholder Forum and the DMR to curb illegal mining through their preventative measures that include: Demolishing illegal mining infrastructure; confiscating gold-bearing material; arresting illegal miners; deporting illegal immigrants; introducing of biometric scanners at mines; additional security guards at shaft entrances; inspection of material cars on shaft heads for food parcels and illegal entries; involving stakeholders, such as the surrounding communities at mines, businesses, and the local council, to participate in combating illegal mining; and establishing whistle-blower channels. • A Fire/Emergency Management Plan and associated communication channels should be developed and implemented (in conjunction with neighbouring landowners and timber companies operating in the areas surrounding the construction sites.) • Appropriate firefighting equipment should be on-site and workers should be appropriately trained for firefighting. • Visible policing in the settlements in close proximity to the mining sites is required. • Security teams to regularly patrol areas around mining sites.	Ensure community safety with mining activities taking place	Can be avoided, managed or mitigated	Yes	
			WM	Negative	32	Moderate					
Closure and Decommissioning Phase					0						

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance		Management Measures	Management objective	Mitigation Effect	Potential for residual risk	Compliance with Standards (where applicable)
					Score	Magnitude					
Closure Activities	Socio-Economic	Job losses due to scaling down of mining activities and mine closure	WOM	Negative	65	High	• As per the requirements of the SLP develop mechanisms to assist employees, prior to the retrenchment date in the transition phase and after the closure of the operations. This would include providing 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. • Focus on supporting non-core local supply links in procurement strategies as well as potential local enterprise development programmes during the operational phases of the mine to facilitate easier transitioning of local suppliers to other customers	Ensure social and economic sustainability	Can be reversed	Yes, the Workforce without alternative employment	
			WM	Negative	52	Moderate					
Closure Activities	Socio-Economic	Termination of local social funds	WOM	Negative	65	High	• Focus on community support programmes with that build local capacity and sustainability in the local community • Plan projects with an exit strategy and follow a clear communication strategy with beneficiaries	Ensure social and economic sustainability	Can be reversed	Yes, the Workforce without alternative employment	
			WM	Negative	55	Moderate					
Closure Activities	Socio-Economic	Loss of agricultural land	WOM	Negative	36	Low	• Dismantle infrastructure and rehabilitate as far as possible land to original land use	To return the area to original land use	Can be reversed	Yes	
			WM	Negative	18	Negligible					
Closure Activities	Socio-Economic	Nuisance Factors (Noise & Dust)	WOM	Negative	44	Moderate	• Dust control measures to be implemented on gravel roads during the active decommissioning phase • Mining areas should be rehabilitated as soon as the Mining Works Programme allows • The recommendations made by the Visual Impact Assessment should be adhered to • Mining infrastructure must be removed or where applicable should be maintained and incorporated into a mining tourism strategy • Re-vegetation and landscaping options should be considered but should aim to re-establish the area to its pre-mining state as far as possible. • The end land use should be determined in consultation with the local community and relevant government departments to determine what is required from an environmental perspective but to also address localised community needs. • On-going dust fall out monitoring must be undertaken to monitor emissions • Pollution control measures must be implemented over a long period of time • The TSF must be stabilised, rehabilitated or removed to prevent erosion	Reduce Nuisance Factors (Noise & Dust)	Can be avoided, managed or mitigated	Yes	
			WM	Negative	22	Low					

Activity	Aspect affected	Potential Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance		Management Measures	Management objective	Mitigation Effect	Potential for residual risk	Compliance with Standards (where applicable)
					Score	Magnitude					
Closure Activities	Socio-Economic	Community Safety	WOM	Negative	52	Moderate	• Rehabilitation and closure must ensure that the future risk of failure to the environment and public is reduced • The TSF must be rehabilitated to minimise the seepage of contaminated water to the surface and ground water sources • The TSF must be stabilised and rehabilitated to prevent erosion • Pollution control measures must be implemented over a long period of time • On-going dust fall-out monitoring must be undertaken to monitor emissions for at least five years after rehabilitation of the areas. • Long-term security measures must be implemented to avoid unauthorised entry to decommissioned sites and to prevent illegal miners from entering these areas.	Ensure community safety after closure	Can be avoided, managed or mitigated	Yes	
			WM	Negative	32	Low					
Blasting and Vibration											
Operational Phase											
Blasting at underground mining areas	Ground Vibration	Damage to houses or infrastructure not owned by the mine, upset people and occupants of houses	WOM	Negative	12	Negligible	There is no specific mitigations required for the underground blasting operations	N/A	N/A	No	Mine Health and Safety Act
			WM	Negative	12	Negligible		N/A	N/A	No	
Traffic Impact Assessment											
Construction Phase											
Traffic impact during the construction activity	Traffic	Traffic impact on the external road network	WOM	Negative	20	Negligible	No mitigation required	N/A	N/A		
Operational Phase											
Traffic impact during the production phase	Traffic	Traffic impact on the external road network	WOM	Negative	28	Negligible	No mitigation required	N/A	N/A		

36 FINANCIAL PROVISION

36.1 DETERMINATION OF THE AMOUNT OF FINANCIAL PROVISION

Refer to comments made within Section 25.

36.1.1 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

Refer to comments made within Section 25.

36.1.2 CONFIRM SPECIFICALLY THAT THE ENVIRONMENTAL OBJECTIVES IN RELATION TO CLOSURE HAVE BEEN CONSULTED WITH LANDOWNER AND INTERESTED AND AFFECTED PARTIES

Refer to comments made within Section 25.

36.1.3 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

Refer to comments made within Section 25.

36.1.4 EXPLAIN WHY IT CAN BE CONFIRMED THAT THE REHABILITATION PLAN IS COMPATIBLE WITH THE CLOSURE OBJECTIVES.

Refer to comments made within Section 25.

36.2 CONFIRM THAT THIS AMOUNT CAN BE PROVIDED FOR FROM OPERATING EXPENDITURE

The amount will be made available as a bank guarantee as done in previous years and updated as required.

37 MECHANISMS FOR MONITORING COMPLIANCE WITH AND PERFORMANCE ASSESSMENT AGAINST THE ENVIRONMENTAL MANAGEMENT PROGRAMME AND REPORTING THEREON

37.1 DETAILED MONITORING PROGRAMMES AS DESCRIBED FOR ACTIVITIES

37.1.1 AIR/DUST MONITORING PROGRAM

Dust deposition measurements should be carried out by method ASTM 1739- 98 recommended in GNR 827 and SANS 1929-2004. This involves exposure of a standard bucket for a month, with weighing (and chemical analysis, if necessary) of the dust collected.

It should be noted that TGME should be reporting the annual emissions on the NAEIS system and should continue to do so. Under Section 21 of the NEM:AQA it is compulsory to measure and report annually, PM, NOx expressed as NO_2, SO_2, HF, HCl, Cl_2 and NH_3 emissions from the smelter stacks; PM, NOx expressed as NO2, SO2.from the carbon-regeneration kiln stacks and requires the holder of an AEL to submit an emission report in the format specified by the National Air Quality Officer (AQO) or Licencing Authority. NEM:AQA does state that the Licencing Authority should establish the final sampling/monitoring and reporting requirements based on knowledge of the sensitivity of the area and the potential significance of the impact of the operations that would have a detrimental effect on the environment (all biophysical and socio-economic aspects).

It is recommended that the TGME current dustfall sampling, which is primarily around the TSF, be expanded and monthly dustfall reporting form part of the project's air quality management plan. The recommended dustfall network will comprise of 15 single dustfall units, with nine (9) located at Beta North, three (3) located at CDM and three (3) at Frankfort. All dustfall units should be open areas, free from obstacles higher than 1m within a 20m radius of the dust fallout stand.

- Beta North: the current dustfall units; TSF 2 West, TSF3 North and TSF4 East, should be moved further away from the TSF with five (5) additional dustfall units recommended to be installed: one at the shaft, one along the haul road, and 3 around the processing plant. These locations are shown in **Figure 146.**
- CDM: 3 dustfall units are recommended at CDM, with one at Dukes Upper shaft, one at Duke Lower shaft and one along the access road. The locations are shown in **Figure 147.**
- Frankfort: 3 dustfall units are recommended at CDM, with one at Dukes Upper shaft, one at Duke Lower shaft and one along the access road. The locations are shown in **Figure 148**.

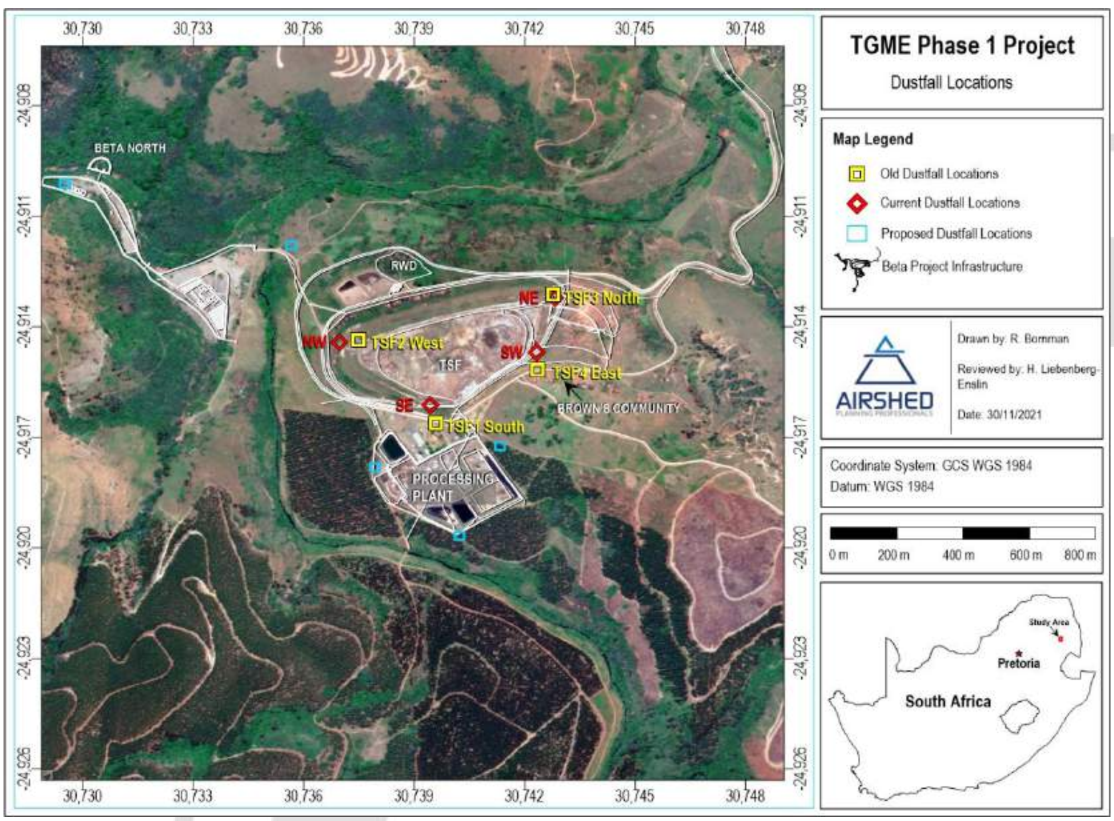


Figure 146: Beta North recommended Dustfall monitoring network

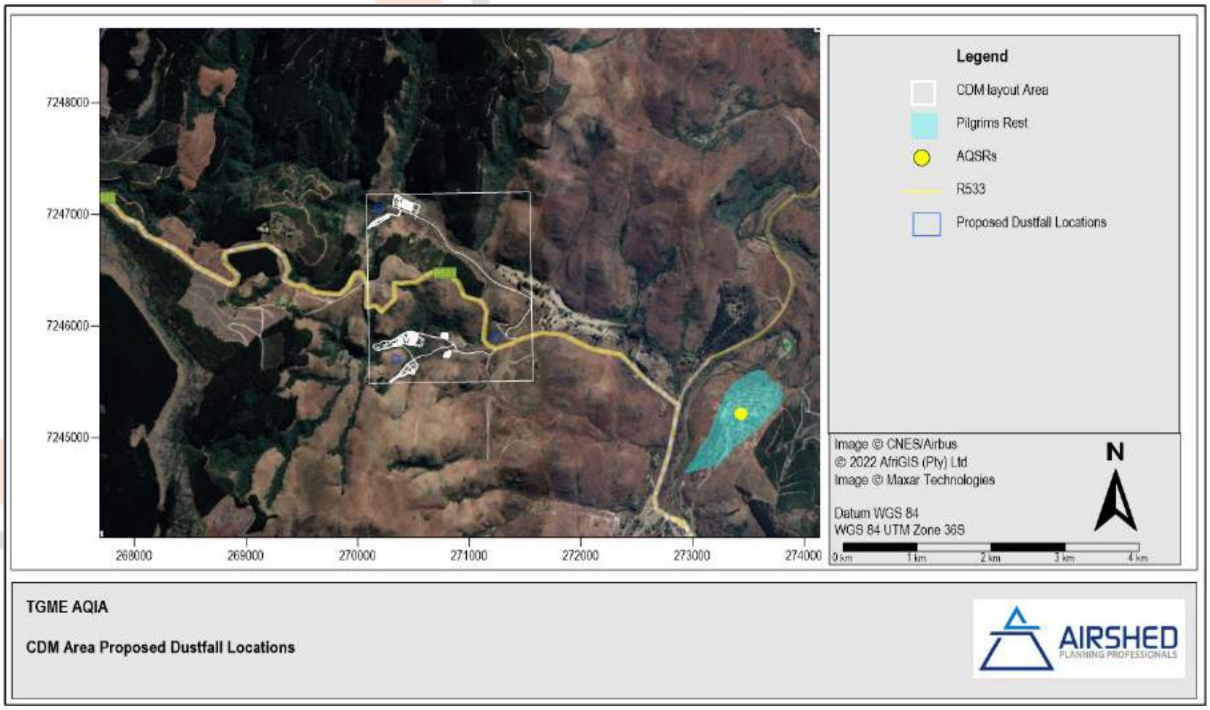


Figure 147: CDM recommended Dustfall monitoring network

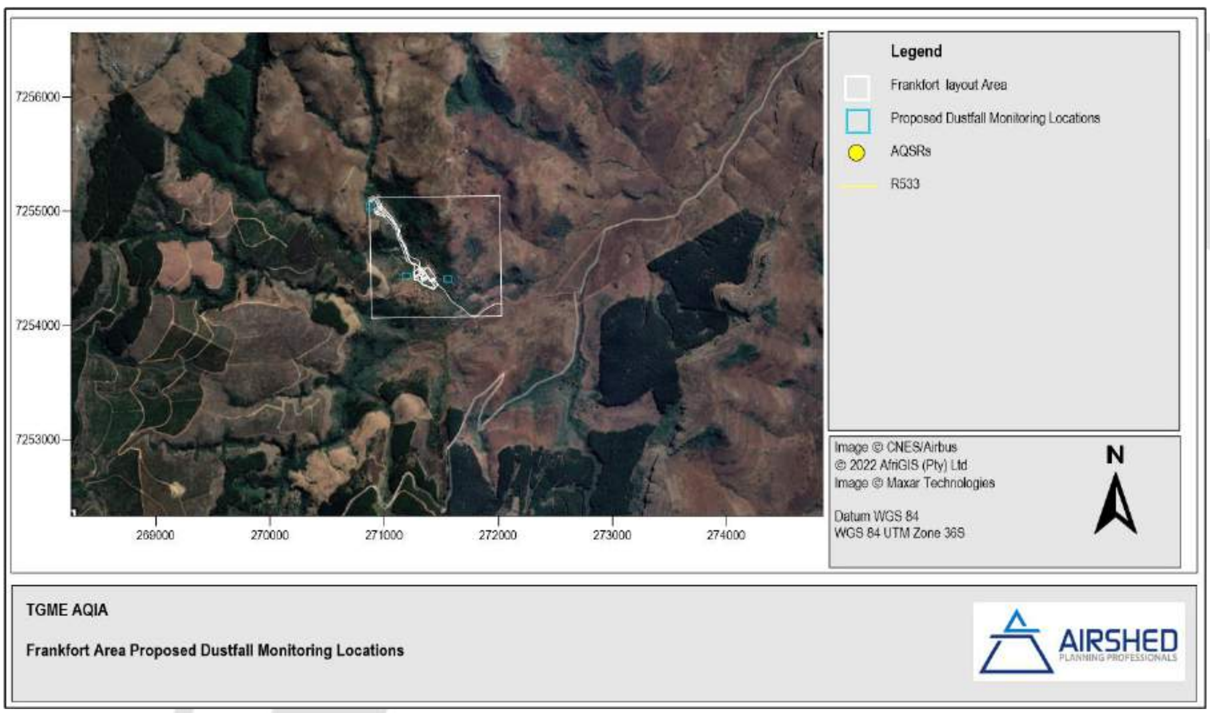


Figure 148: Frankfort recommended Dustfall monitoring network

Dustfall collected monthly, should be analysed, and reported on providing as a minimum the following:

- Dustfall results on a monthly basis should be reported on as a mass per area per time (mg/m²/day).

- The monitoring results are compared to the NDCR, which in this case would need to comply with the Non-residential limit of 1 200 mg/m²/day since none of the areas where dustfall units are located are within a residential zoned area.
- The results should be presented in a tabular format as well as graph, which will indicate dustfall levels across all 15 dustfall units, which will provide an overview of where potential problems may be.
- Should any of the dustfall units result in high dust fallout (above the NDCR) for two consecutive months, the cause for high dustfall should be investigated and mitigation measures identified and implemented.

37.1.2 GEOLOGY, SOIL AND EROSION MONITORING PROGRAMME

Soil monitoring will involve the inspection of soil which has been disturbed, compacted, contaminated or eroded. Soil monitoring will assist in determining where soils have not been sufficiently rehabilitated.

Where soils have contaminated by the spillage of hydrocarbon, monitoring must take place on a weekly basis for at least four (4) weeks or until the soil is considered sufficiently rehabilitated. Soils samples should be taken and submitted to a laboratory to test for contaminant content if it is considered necessary.

Soil monitoring should be undertaken during the following periods:

- Areas which have been rehabilitated;
- After remediation soils which have been contaminated by spillages during the operational phase; and
- After the closure and decommissioning phase.

Monitor and Manage soil contamination in accordance with procedures for the Mine operations.

All watercourses or riparian areas requiring re-vegetation should be monitored for signs of erosion. In addition, all of the following areas should also be monitored:

- All stormwater discharge points;
- All clean water diversion discharge points; and
- All road and conveyor crossings.

Monitoring activities should consist of fixed-point photography, as well as a walk-through survey to observe for signs of erosion in the field. Monitoring should be done as specified and at the end of the rainy season. Any erosion damage observed should be repaired immediately.

37.1.3 SURFACE AND GROUND WATER MONITORING PROGRAMME

A water monitoring network should contain monitoring positions which can assess the water status at certain areas.

A monitoring network should be dynamic. This means that the network should be extended over time to accommodate the migration of contaminants through the aquifer as well as the expansion of infrastructure and/or addition of possible pollution sources. An audit on the monitoring network should be conducted annually.

37.1.3.1 SURFACEWATER MONITORING

The following water quality parameters are relevant for the sampling.

Table 73: The following variable shall be analysed for surface water monitoring

Variable	Variable	Variable
pH – Value at 25°C	Electrical Conductivity at 25°C	Total Dissolved Solids (mg/l)
Chloride (mg/l)	Sulphate (mg/l)	Magnesium (mg/l)
Calcium (mg/l)	Potassium (mg/l)	Aluminium (mg/l)
Manganese (mg/l)	Iron (mg/l)	Suspended Solids (mg/l)
Ammonium (mg/l)	Orthphosphate (mg/l)	Nitrate (NO3) (mg/l)
Free Cyanide (mg/l)	Total Cyanide (mg/l)	Nitrite (NO2) (mg/l)
Arsenic (mg/l)	Sodium (mg/l)	Zinc (mg/l)
Total Alkalinity (mg/l)	Copper (mg/l)	Mercury (mg/l)
Turbidity (NTU)	Lead (mg/l)	Nickel (mg/l)
Fluoride (mg/l)		

Monthly samples need to be taken of all surface water monitoring locations. The mine takes weekly readings at each monitoring location using probes/field instruments. The readings taken are pH, temperature, and EC. Data from 2012 to October 2019 was provided for each surface water location around the TGME plant area.

The mine collects surface water samples on a monthly basis and send to a SANAS Accredited Laboratory and meets the requirements of ISO/IEC 17025

Table 74: Surface water monitoring locations

Site ID	Name used by TGME	Co-ordinates	Description
S3	Plant causeway	-24.920173 30.738801	Point in Blyde River upstream of Plant
S4	Beta/Peachtree confluence	-24.911948 30.735136	Point in tributary of Blyde River downstream of Beta
S5	Beta causeway	-24.911658 30.734271	Point in Blyde River downstream of plant
S6	Caravan Park	-24.90574 30.745933	Sampling point downstream of historic mine dumps inside the Caravan Park
S12	Molototsi waterfall	-24.801455 30.733983	Point in tributary of Molototse river upstream of Frankfort mine
S14	Hostel	-24.810108 30.743515	Point in Molototse river downstream of Frankfort mine
S13	Vaalhoek	-24.789272 30.774027	Downstream point in tributary of Molototse near Vaalhoek road
S1	Morgenzon	-24.87478 30.72430	Point upstream of infrastructure at Morgenzon mine
S2	Lower Clewer	-24.87453 30.72618	Downstream of Morgenzon and Clewer Mine
S15	Bevetts stream	-24.811176 30.741912	Point in Molototse spruit upstream of point S14
S16	Theta stream	-24.806142 30.736448	Point in tributary of Molototse river
BSW27	Dukes Upper	-24.885944 30.724999	Point at Dukes Upper mine

Site ID	Name used by TGME	Co-ordinates	Description
BSW30	Dukes Lower	-24.885401 30.731297	Point at Dukes Lower mine
S19	Historic Mine Dump	-24.910300 30.738175	Surface water monitoring point between slimes dam and old historical tailings dumps
S20	Peach Tree	-24.910081 30.730078	Surface water monitoring point upstream of Beta mine waste rock dump in tributary of Blyde river
BSW13	Morgenzon Adit	-24.8743 30.7244	Morgenzon adit decant at Wilgerboom

37.1.3.2 GROUNDWATER MONITORING

In the operational phase and closure phase, biannual monitoring of groundwater quality and groundwater levels is recommended. Quality monitoring should take place during the wet and dry seasons, i.e. during June and December. It is important to note that a groundwater-monitoring network should also be dynamic. This means that the network should be extended over time to accommodate the migration of potential contaminants through the aquifer as well as the expansion of infrastructure and/or addition of possible pollution sources.

The identification of the monitoring parameters is crucial and depends on the chemistry of possible pollution sources. They comprise a set of physical and/or chemical parameters (e.g. groundwater levels and predetermined organic and inorganic chemical constituents). Once a contaminant indicator has been identified it can be used as a substitute to full analysis and therefore save costs. The use of pollution indicators should be validated on a regular basis in the different sampling positions. The parameters should be revised after each sampling event; some metals may be added to the analyses during the operational phase, especially if the pH drops.

The groundwater monitoring points shown in **Figure 149** to **Figure 151** is adequate and no further expansion of the network is recommended.

Table 75: Groundwater monitoring variables

Parameter	Parameter
pH	Calcium as Ca
Conductivity in mS/m at 25ºC	Magnesium as Mg
Total dissolved solids at 180ºC	Arsenic as As
Alkalinity as $CaCO_3$	Barium as Ba
Ammonia as N	Cadmium as Cd
Nitrate as N	Total chromium as Cr
Chloride as Cl	Copper as Cu
Sulphate as SO_4	Iron as Fe
Boron as B	Lead as Pb
Fluoride as F	Manganese as Mn
Phosphate as P	Mercury as Hg
Sodium as Na	Chemical Oxygen Demand
Potassium as K	

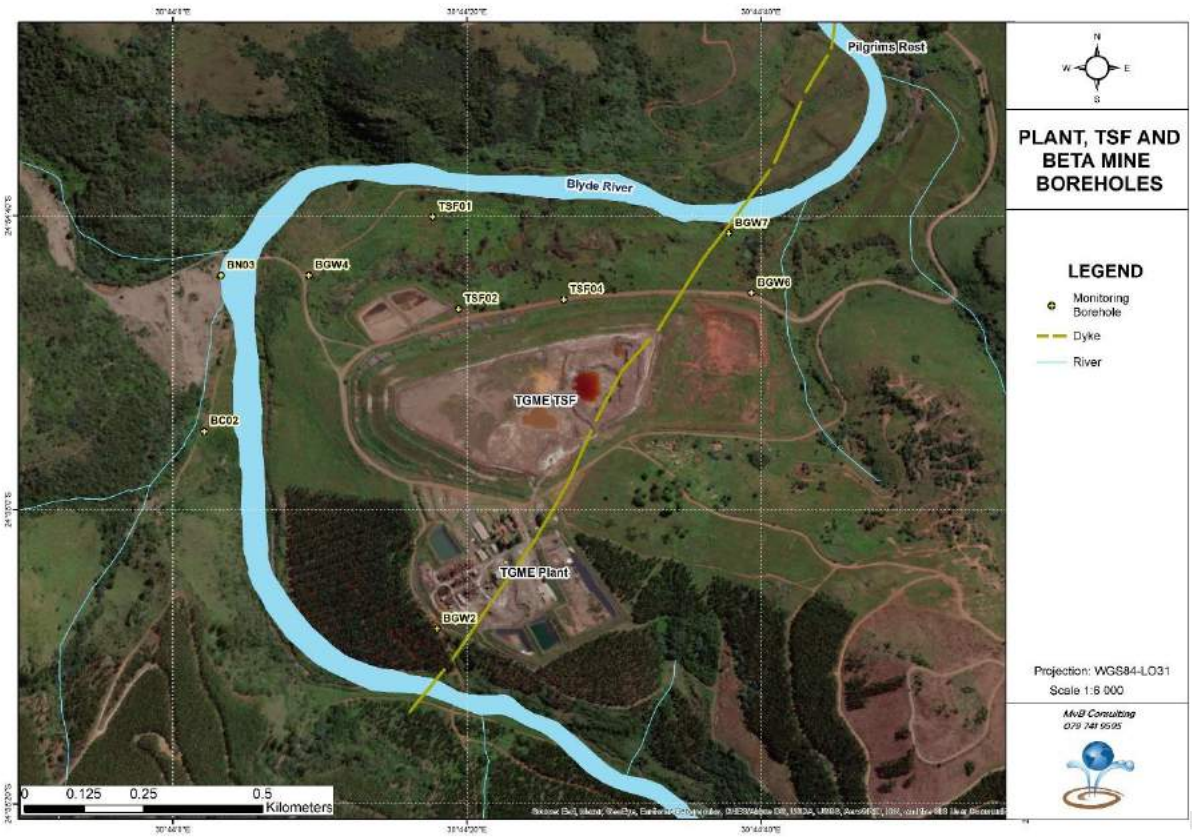


Figure 149: Monitoring borehole locality – Plant, TSF and Beta Mine

Figure 150: Monitoring borehole locality – CDM Mine

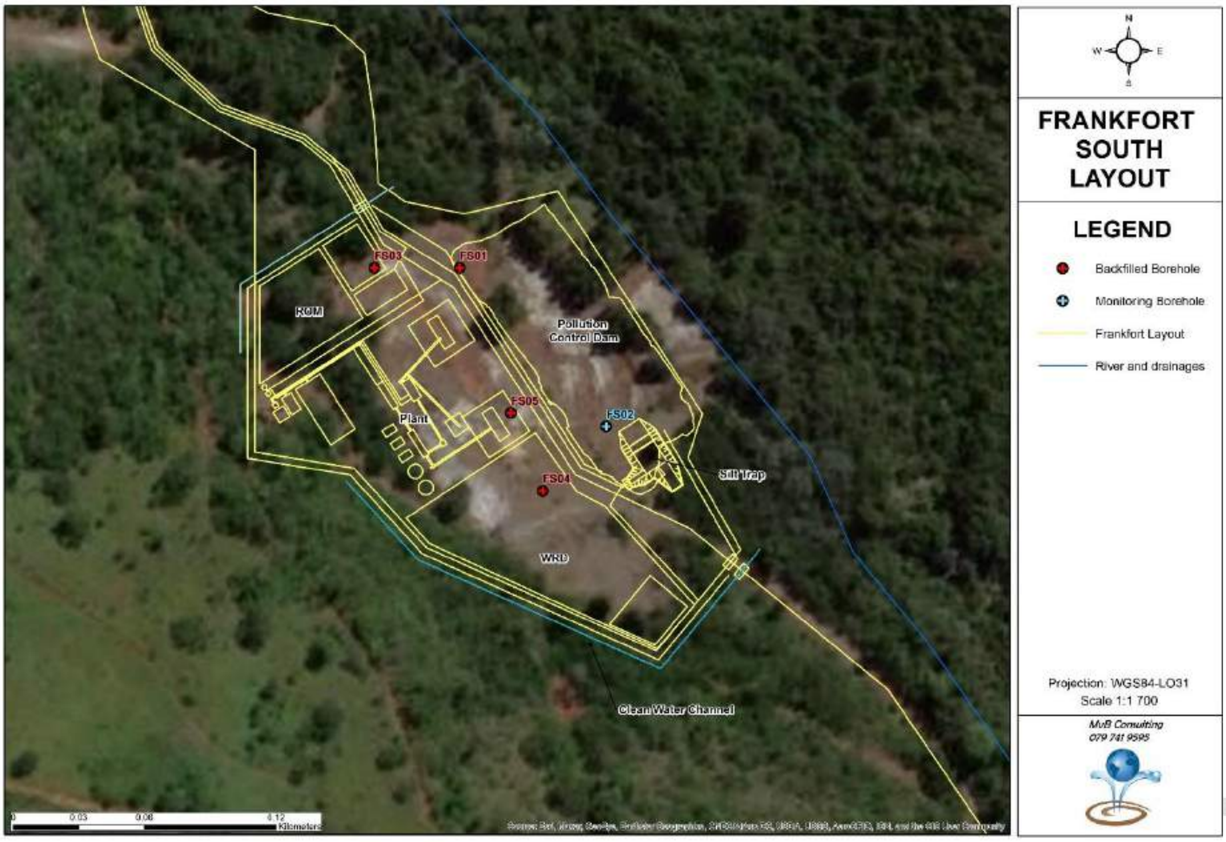


Figure 151: Monitoring borehole locality – Frankfort Mine

37.1.4 FRESHWATER AQUATIC MONITORING

The following monitoring recommendations are intended to be implemented throughout all phases of the proposed 83MR project:

- Any areas where active erosion is observed must be rehabilitated and a system of berms and swales must be utilised to slow movement of water;
- Freshwater ecosystems need to be monitored using the assessment protocols as defined below unless updated and/or more appropriate methods are developed in future:
    - PES according to the IHI method (Kleynhans, 2008) as applicable;
    - Riparian zonation monitoring to determine whether impacts on base flow levels are occurring;
    - Water quality monitoring as part of the mine's water quality monitoring program; and
    - Monitoring of the riparian vegetation assemblage, in particular alien vegetation. Where applicable, VEGRAI should be used as part of the monitoring process.
- Ongoing monitoring of the trends in ecological integrity of the assessed sites in the vicinity of the existing and proposed TGME 83MR areas is deemed essential, in order to monitor the impacts of the mining activities of these very sensitive and ecologically important systems. Aquatic biomonitoring must take place on a bi-annual basis by a SA RHP Accredited assessor, in order to identify any emerging issues in the receiving environment using the following indices in the assessment:
    - Habitat assessments using IHAS (6 monthly) and the IHIA (annually);
    - Aquatic macro-invertebrates using SASS5 and the MIRAI EcoStatus tool (6 monthly);
    - Fish community integrity using the FRAI EcoStatus tool (Annually in summer); and

  - Diatoms and the application of the SPI index (6 monthly).

- Close monitoring of water quality (surface water, groundwater and process water) must take place. Monitoring of water quality must take place monthly, during which time basic parameters such as pH, Dissolved Oxygen (DO) and Electrical Conductivity (EC) are measured;
  - Should EC or pH values reach an undesirable level, suitable mitigation measures must be implemented;
  - Sediment monitoring at selected sites along the Blyde River should take place concurrently with the aquatic biomonitoring to monitor pollution levels in sediments over time;
  - Toxicity testing of the mine's process water facilities, the groundwater and surface water resources must take place concurrently with the biomonitoring program, in order to monitor the toxicological risk of the process water system to the receiving environment and in particular the groundwater resources. These ongoing toxicological tests must be compared to baseline data to monitor and manage any emerging impacts over time. Tests must include the following test organisms as a minimum:
    - *Vibrio fischeri;*
    - *Poecilia reticulata;* and
    - *Daphnia pulex.*
- Should emergency discharge from any process water system be required, definitive toxicological testing according to the Direct Estimation of Ecological Effect Potential (DEEEP) protocol must take place, in order to define safe discharge volumes and ensure sufficient dilution;
- Results of future assessments must be compared spatially and temporally to the results of this study. If it is observed through biomonitoring information and toxicological assessments that significant negative changes are taking place in ecological integrity (Change of Class), it should be taken as an indication that the system is suffering stress and mitigatory actions should be identified and where possible, implemented; and
- Biomonitoring results very strongly rely on the competency level of the assessor. All future biomonitoring studies must be undertaken by an accredited assessor and it would be preferable to utilise the same assessor in subsequent studies in order to allow for more accurate comparison of data over time.

37.1.5 NOISE MONITORING PROGRAM

Frequency and locality:

- Bi-annual noise measurements to be conducted at for R1 to R5 (see figure below).
- The Environmental measurements should be conducted at I&APs i.e., farmsteads, receptors, communities. Should the receptors be relocated, the measurement locality be investigated to be removed.
- Monitoring at the plant footprint boundary needs to be conducted. There are receptors at the plant boundary, and the noise spill over extent into neighbouring properties must be assessed.
- Measurements should be conducted during all phases including construction, operational and closure phases.

EMPr Monitoring Programme:

- Measurements should be conducted in terms of LA_{Ieq} equivalent values (impulse), with statistical and octave data logged (if uncertain about LA_{Ieq} or due to limitations). Meteorological (wind) conditions should be logged. International (fast) measurements could be considered for comparison with the International Finance Corporation requirements (if required).
- Where feasible longer term (+24 hours) unattended or 10-minute measurements should be attempted to represent a maximum capacity of evaluated scenario, and at/near receptors (or project footprint).

- (Recommended but not required) If feasible Engineering test should be conducted during Environmental measurements to identify any noisy equipment requiring enclosures, or equipment where maintenance is required.
- The quarterly measurement report should be reviewed after the first 2 years of monitoring.
- Reporting should be compiled and submitted to the relevant authorities. The terms of reference of the report should include SANS10103:2008 methodologies in it, with the Noise Control Regulations limits applied.
- Reports should be made available to receptors with the frequency and platform decided by the project team.
- Each measurement should be conducted during a "worst-case scenario" (identify, discuss operations, ensure what is been measured is relevant for a moderate operational protocol or higher), and to minimise limitations of measuring only every quarterly period.

Target Criterion:

- The methodology as proposed by SANS10103:2008 should be used. Compliance with the Noise Control Regulations should be met (no increase of +7dBA from identified Rating level of 45/35 dBA day/night).
- The boundary of the property/farm portion/mining rights area should not be exceeded by 61 dBA 24 hour or similar (controlled zone).

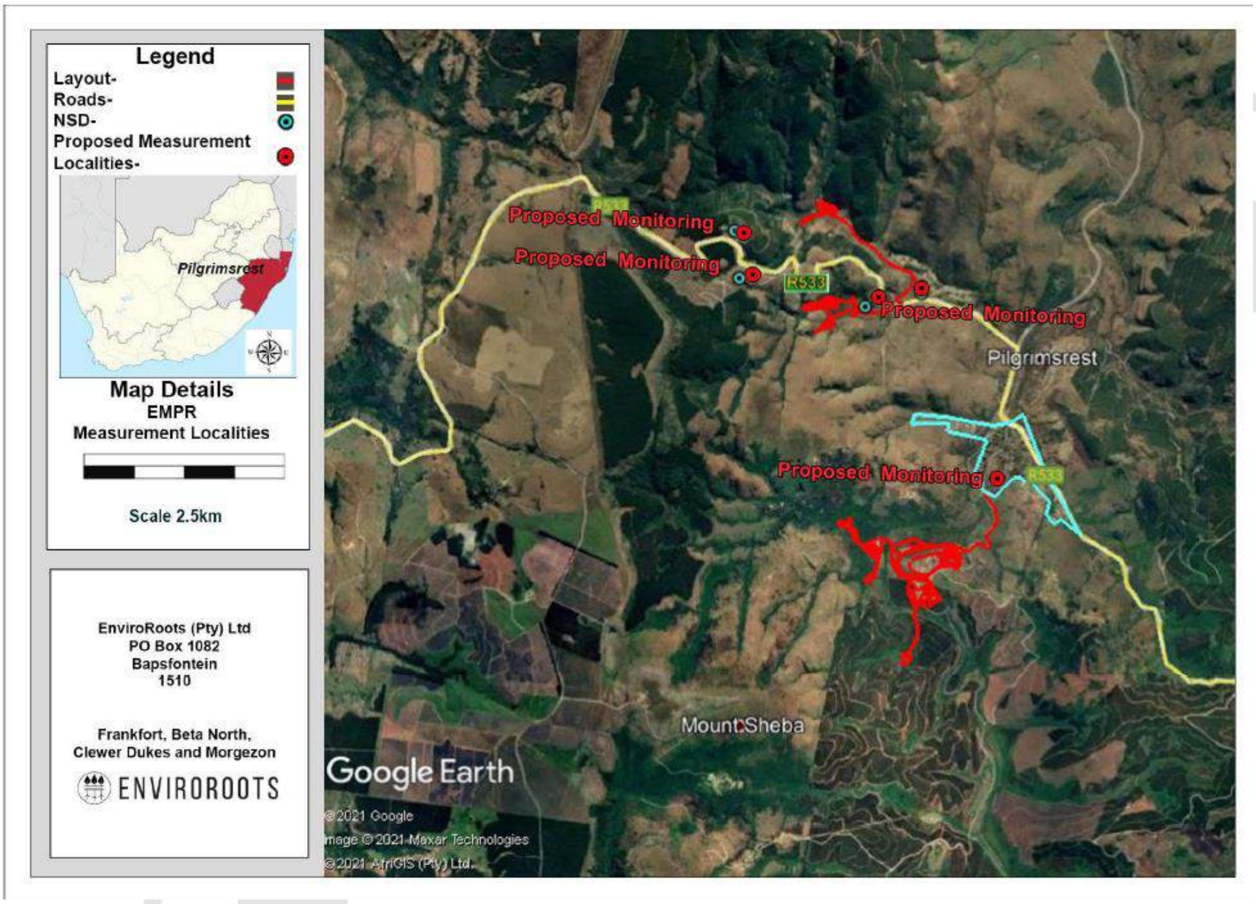


Figure 152: Noise monitoring locations

37.1.6 BLASTING MONITORING PROGRAMME

No specific monitoring with regards to ground vibration will be required.

37.1.7 HERITAGE MONITORING PROGRAM

For the grave site near CDM the site should be monitored on a weekly basis during initial site clearing and earth moving activities by an EO familiar with the sensitivity of receptors, or the Heritage Consultant in order to detect any impact at the earliest opportunity.

Cemeteries and graves situated in close proximity of proposed mining developments should be monitored on a frequent basis during initial site clearing and earth moving activities by an EO familiar with the sensitivity of receptors, or the Heritage Consultant in order to detect any impact at the earliest opportunity. Monthly monitoring of burial sites is recommended during operational stages of the development, the details of which should be stipulated in the Site Conservation Management Plan. The developer should carefully liaise with the heritage specialist and the SAHRA Burial Ground and Graves (BGG) Unit with regards to these recommended management measures.

A careful watching brief monitoring process is recommended whereby an informed EO inspect the construction site on regular basis in order to monitor possible impact on heritage resources. Should any previously undetected paleontological, archaeological or historical material, heritage resources, graves or human remains be exposed during construction activities, the operations in the affected area must be suspended and a qualified archaeologist be contacted for an assessment of the find.

It would be advisable to conduct regular blast vibration monitoring during the initial stages of mining at the Beta North site to assess potential effects of blasting on the nearby rock art. This measure should include frequent site monitoring by a suitably qualified Rock Art Specialist. Should it be established that the site is deteriorating or the adjacent geological feature is destabilizing due to mining activities the possibility of relocation of the rock art site must be considered and investigated.

37.1.8 WASTE MONITORING

The following wastes needs to be monitored for the project:

- Waste disposed of at landfill sites- waybills should be kept;
- The volumes of waste deposited from the underground sections (All Residue Stockpiles); and
- The volume of water removed and disposed;

37.2 ENVIRONMENTAL MONITORING AND AUDITING

Department of Environmental Affairs and Tourism defines environmental auditing as “a process whereby an organisation’s environmental performance is tested against its environmental policies and objectives.” Monitoring and auditing is an essential environmental management tool which is used to assess, evaluate and manage environmental and sustainability issues.

In order to ensure that the objectives of sustainable development and integrated environmental management are met and in order to obtain data which can inform continuous improvement of environmental practices at the site (adaptive management), monitoring and reporting will be an essential component of the operations.

Monitoring and management actions associated with the project are contained in Section 37.2 of this report as well as in the various specialist reports associated with this project. This section provides a summary of the critical monitoring aspects per specific environmental field.

37.3 GENERAL MONITORING AND MANAGEMENT

The appointment of a suitably qualified on-site Environmental Officer (EO) is essential to the successful implementation and management of this project, although this role can be fulfilled by the SHE

Representative. The EO will be responsible for the implementation of the EMPR, applicable environmental legislation and any stipulations/conditions set by the relevant competent authorities (including but not limited to the DMR and DWS). The EO will conduct formal monthly site inspections and conduct an internal annual audit during the phases of the development.

An external Environmental Auditor should also be appointed to conduct annual audits for the duration of the project. The auditor should monitor the success and effective implementation of the environmental management measures stipulated by applicable legislation, the EIA/EMPR, and any conditions set by the competent authorities. Following each site visit, the auditor should submit a report to the DMR documenting the success/failure of the implementation of the management measures at the operations.

37.3.1 SPECIFIC MONITORING REQUIREMENTS

Monitoring of the development (both on site and where appropriate in the surrounding environments) should be considered a high priority and should be conducted in accordance with the relevant specialist recommendations as summarized below:

37.3.2 MONITORING PROTOCOL

It is essential that during the implementation and operational phase of the development that the monitoring of certain elements are carried out to ensure compliance with regulatory bodies. A monitoring protocol will be required. The monitoring only includes those activities identified in the EMPr and excludes any monitoring that should take place according to the water use license and compliance in terms of the WUL and WML is essential.

37.3.3 MONITORING REQUIREMENTS AND RECORD KEEPING

To ensure that the procedures outlined throughout the EMPR are implemented effectively, it will be necessary to monitor the implementation of the EMPR and evaluate the success of achieving the objectives listed in the EMPR. To ensure that all personnel on site are aware of their obligation to protect the environment, induction training will also include environmental awareness.

The audit procedure will include a Compliance audit, conducted by the ECO. Where the objectives of the EMPR are not being met the reasons will be determined and remedial action or variation to the tasks will be recommended. Major residual effects shall be documented in a Non-Conformance Report, during the remaining phases of the project. Follow-up audits will be conducted as per the audit protocol in the EMPR.

37.3.3.1 IMPLEMENTATION PHASE

The following monitoring needs to be conducted:

- The amendment and current monitoring will provide enough baseline data for comparison against future monitoring of the activities if re-opening occurs, especially since no significant change in monitoring is prescribed; and
- All monitoring should commence at full scale as soon as re-opening is envisaged to ensure recent data for comparison against the operational phase.

37.3.3.2 OPERATIONAL PHASE

The following monitoring must be conducted: Please refer to Section 37 and also **Table 66** regarding mitigation outcomes for mechanisms for monitoring. Adherence to all conditions and monitoring frameworks as prescribed in Section 37.1.

37.3.4 AUDIT PROTOCOL

It is essential that during the current and future phases of the development, the monitoring and auditing of certain elements are carried out to ensure compliance with regulatory bodies. An Audit Protocol for both the current phase and the actual operational phase will be required. The auditing only includes those activities identified in the EIA/EMPR and excludes any auditing that should take place according to the water use license or any other legislative authorization process if and when they will be authorized.

The following audits need to be completed (valid for this EMPR):

- EMPR compliance (Continuously): to be checked by an on-site EO, SHEQ representative or EM;
- An external audit in terms of regulation 34 of the EIA Regulations (2014 as amended) must be conducted every second year to be checked by an independent EO, SHEQ representative or EM.

37.3.5 ENVIRONMENTAL INCIDENTS

An environmental incident is defined as any unplanned event that results in actual or potential damage to the environment, whether of a serious or non-serious nature. An incident may involve non-conformance with environmental legal requirements, the requirements of the EMPR, or contravention of written or verbal orders given by the EO or relevant authority.

All details regarding Environmental Incidents and procedures have been described within Section 0 above and should be handled accordingly.

37.3.6 PENALTIES AND FINES FOR NON-COMPLIANCE OR MISCONDUCT

This EMPR forms part of the contract agreement between the Client and the Principal contractor. As such, non-compliance with conditions of the EMPR will amount to a breach of contract. Penalties will be issued directly to the contractor by the applicant in the event of non-compliance to the EMPR specifications. The issuing of a penalty will be preceded by a verbal warning by the applicant, as well as strict instruction in at least one monthly EO report to rectify the situation. The EO and applicant will communicate with regards to realistic time-frames for possible rectification of the contravention, and possible consequences of continued non-compliance to the EMPR.

Penalties incurred do not preclude prosecution under any other law. Cost of rehabilitation and/or repair of environmental resources that were harmed by the actions of the contractor, if such actions were in contravention of the specifications of the EMPR will be borne by the contractor himself. Penalties may be issued over and above such costs. The repair or rehabilitation of any environmental damage caused by non-compliance with the EMPR cannot be claimed in the Contract Bill, nor can any extension of time be claimed for such works. Penalty amounts shall be deducted from Certificate payments made to the Contractor.

The following categories of non-compliance are an indication of the severity of the contravention, and the fine or penalty amounts may be adjusted depending on the seriousness of the infringement:

- Category One: Acts of non-compliance that are unsightly, a nuisance or disruptive to adjacent landowners, existing communities, tourists or persons passing through the area.
- Category Two: Acts of non-compliance that cause minor environmental impact or localized disturbance.
- Category Three: Acts of non-compliance that affect significant environmental impact extending beyond point source.
- Category Four: Acts of non-compliance that result in major environmental impact affecting large areas, site character, protected species or conservation areas.

37.3.7 ENVIRONMENTAL AWARENESS PLAN

Environmental awareness training is critical for two primary reasons:

- The workforce must understand how they can play a role in achieving the objectives specified in the EMPR; and
- The workforce must understand their obligations in terms of the implementation of the EMPR and adherence to environmental-legislative requirements.

This environmental awareness plan is aimed at ensuring that employees, contractors, subcontractors and other relevant parties are aware of and able to meet their environmental commitments. This plan is to be updated on a yearly basis during the phases of the project in light of operational changes, learning experiences and identified training needs.

All full-time staff and contractors are required to attend an induction session when they start, which session should include environmental aspects.

It is, therefore, recommended that the EO/EM be involved in induction training. As the induction and entry will be located on the existing premises, the induction sessions may be modified/adapted based on the audience attending the specific session, but it should ensure that all employees gain a suitable understanding of:

- Environmental requirements of the project, and how these will be implemented and monitored;
- Including each Employee’s responsibilities with respect to environmental issues;
- Contents and commitments of the EMPR, including no-go areas, employee conduct, pollution prevention (prohibitions against littering, unauthorized fires, loud music, entry to adjacent properties, road conduct etc.);
- Environmentally sensitive areas on and around the development sites, including why these are deemed important and how these are to be managed. Employees will also be made aware of protected species found on the existing and surrounding site and how these are to be conserved, as well as alien invasive species potentially found on the site and how these should be managed; and
- Incident identification, remediation and reporting requirements: what constitutes an environmental incident (spillages, fire, etc.) and how to react when such an incident occurs.

Environmental training will not be restricted to induction training sessions alone but will be conducted on an on-going basis throughout the lifecycle of the project as and when required. Records are to be kept of the type of training given (matters discussed and by whom), date on which training was given and the attendees of each training session.

The mine will compile and implement an Environmental Emergency Response Plan and Emergency Preparedness Plan.

37.3.7.1 RESPONSIBLE PERSONS

Compliance with the emergency response plan and ensuring individual safety will be responsibility of all employees and contractors on the mine. Record keeping, investigation and management of emergencies will be the responsibility of the following persons:

- Mine Manager;
- Environmental Management Representative- this includes the SHE managers and officers;
- Mining Engineer; and
- Site Manager(s).

37.3.7.2 DEFINING AN ENVIRONMENTAL 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 Environmental Emergency Response Plan. The plan should be disseminated to all employees and contractors and in the event of an emergency, it should be consulted.

This Environmental Emergency Response Plan should be used together with the Emergency Preparedness Plan placed on the mine where it will be easily viewed. The Emergency Response Plan should contain a list of procedures, evacuation routes and a list of emergency contact numbers.

If the environmental 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 on the mine. A checklist of emergency response units must be consulted and the relevant units notified.

The checklist includes:

- Fire department;
- Police;
- Emergency health services such as ambulances, paramedic teams, poisons centres;
- Hospitals, both local and further afield, for specialist care;
- Public health authorities;
- Environmental agencies, especially those responsible for air, water and waste issues;
- Other industrial facilities in the vicinity with emergency response facilities;
- Public works and highways departments, port and airport authorities; and
- Public information authorities and media organisations.

37.3.7.3 PROCESS FOR IDENTIFYING ENVIRONMENTAL EMERGENCY PROCEDURES

The process that will be used to identify emergency situations at the mining operations will be conducted in terms of the Aspects Registers and may include the following emergencies:

- Safety risks and subsidence in underground sections;
- Safety risks associated with the Processing Plants;
- Dam Overflow;
- Dam Breach (on-site);
- Residue Stockpile Failures and Risks;
- Berm Breach/Drain Overflow;
- Hydrocarbon Spill (diesel, oil, grease, etc.); and
- Veld Fires.

The necessary actions required, as well as the responsible person for ensuring that the actions are followed through and the reporting requirements are adhered to, to ensure effective and efficient response to each of the environmental emergency situations listed above are set out in this procedure.

37.3.7.4 MOST LIKELY POTENTIAL ENVIRONMENTAL EMERGENCIES

The following define the most likely potential environmental emergencies:

- Accidents;
- Fires;
- A major hydrocarbon spill or leak;
- A major spill or leak of process water;
- Flooding;
- Subsidence; and
- Explosions.

37.3.7.5 ACCIDENTS

In the case of a medical accident or problem, refer to the Emergency Preparedness Plan.

37.3.8 INDICATE THE FREQUENCY OF THE SUBMISSION OF THE PERFORMANCE ASSESSMENT REPORT

Bi- Annual (every two years) performance assessment reports are recommended. Refer to details on Auditing procedures (Section 37.3.4).

37.3.9 MANNER IN WHICH RISKS WILL BE DEALT WITH IN ORDER TO AVOID POLLUTION OR THE DEGRADATION OF THE ENVIRONMENT

Refer to Table 72 for the recommended mitigation measures to limit environmental impacts. A suitable risk matrix may be used to evaluate operational risks during any stage of the development. Ensure compliance with all existing procedures and that they be updated.

37.4 SPECIFIC INFORMATION REQUIRED BY THE COMPETENT AUTHORITY

The Immediate Closure Provision, as calculated, will be updated yearly as part of the annual liability assessment required by GNR 1147 in terms of the NEMA, once operations commence. The Final Rehabilitation plan will need to be formalised as soon as Closure planning commences (this should comply with Closure rehabilitation and will include the sealing of the shafts/declines utilised. The decommissioning of the Processing infrastructure (Plant) and the rehabilitation of the TSF should also be addressed adequately.

38 UNDERTAKING

The EAP herewith confirms

- the correctness of the information provided in the reports ☒
- the inclusion of comments and inputs from stakeholders and I&APs ; ☒
- the inclusion of inputs and recommendations from the specialist reports where relevant; ☒and
- the acceptability of the project in relation to the finding of the assessment and level of mitigation proposed; ☒

38.1 UNDERTAKING REGARDING CORRECTNESS OF INFORMATION

I, Reneé Kruger, herewith undertake that the information provided in the foregoing report is correct, and that the comments and inputs from stakeholders and Interested and Affected parties has been correctly recorded in the report.

Hard copy to be signed	18 April 2022
Signature of the EAP	Date

38.2 UNDERTAKING REGARDING LEVEL OF AGREEMENT

I, Reneé Kruger, herewith undertake that the information provided in the foregoing report is correct, and that the level of agreement with interested and Affected Parties and stakeholders has been correctly recorded and reported herein.

Hard copy to be signed	18 April 2022
Signature of the EAP	Date

39 BIBLIOGRAPHY

Airshed. (2022). *Air Quality Impact Assessment for the Theta Gold Mines Existing Underground Mine Redevelopment Project near Pilgrims Rest.*

de Villiers, M. (2016). *The deterioration of the historical town of Pilgrim's Rest in https://lowvelder.co.za/329421/the-deterioration-of-pilgrims-rest/ Accessed 24 September 2017.*

Department of Environmental Affairs. (2016). *Ehlanzeni District Municipality: climate change vulnerability assessment and response plan. Department of Environmental Affairs, Local Government Climate Change Support Program (LGCCSP), Pretoria, South Africa.*

Department of Environmental Affairs. (2017). *South Africa's Third National Communication under the United Nations Framework Convention on Climate Change.* Pretoria, South Africa: Department of Environmental Affairs.

Dirisa. (accessed 2019). Retrieved from http://sarva2.dirisa.org/atlas/environmental-health

Eco Elementum. (2021). *TGME Phase 1 Storm Water Management Plan Design Report.*

Ehlanzeni District Municipality. (2016a). *Integrated Development Plan. Ehlanzeni District Municipality, Mbombela, South Africa.* Mbombela, South Africa.

Ehlanzeni District Municipality. (2016b). *Climate Change Vulnerability Assessment and Response Plan. Ehlanzeni District Municipality, Mbombela, South Africa.* Mbombela, South Africa.

GCS. (2005). *Environmental Impact Assessment and Management Report in terms of the Mineral and Petroleum Resources Development Act (No. 28 of 2002).*

GCS. (2005). *Environmental Management Programme (EMPR) with DMR REF: MP 30/5/1/2/3/2/1 (83) EM, dated October 2005 .*

Greenbook. (accesed 2019). *Green Book Risk profile for Thaba Chweu Local Municipality*. Retrieved from https://riskprofiles.greenbook.co.za/

IFC. (2012). *Performance Standard 3 Resource Efficiency and Pollution Prevention.* Retrieved from International Finance Corporation: https://www.ifc.org/wps/wcm/connect/25356f8049a78eeeb804faa8c6a8312a/PS3_English_2012.pdf?MOD=AJPERE

Inglesi-Lotz, R. a. (2011). Estimating the price elasticity of demand for electricity by sector in South Africa" in South African . *Journal of Economic and Management Sciences, Department of Economics, Stats SA Pretoria*, Vol. 14 no 4.

IPCC. (2007). *Intergovernmental Panel on Climate Change 4th Assessment Report.* Retrieved from Intergovernmental Panel on Climate Change: http://www.ipcc.ch/pdf/assessment-report/ar4/syr/ar4_syr_appendix.pdf

IPCC. (2013). *Intergovernmental Panel on Climate Change 5th Assessment Report.* Retrieved from Intergovernmental Panel on Climate Change: https://www.ipcc.ch/report/ar5/

MvB Consulting. (2022). *Geohydrological Assessment for the Proposed Re-operationalization of Mining Activities, Pilgrims Rest.*

MvB Consulting. (2022). *Geohydrological Assessment for the Proposed Re-operationalization of Mining Activities, Pilgrims Rest.*

NEM:WA. (2013). *National Environmental Management Waste Act, Act No. 59 of 2008, National Norms and Standards for the Assessment of Waste for Landfill Disposal (Regulation 36784).*

NOAA. (2017, August). *Earth System Research Laboratory Global Monitoring Division.* Retrieved from National Oceanic and Atmospheric Administration: https://www.esrl.noaa.gov/gmd/ccgg/trends/global.html

NPI. (2008). *National Pollutant Inventory - Emission Estimation Technique Manual for Combustion Engines. Version 3.* Australian Depertment of the Environment.

NPI. (2012). *Emission Estimation Technique Manual for Mining. Version 3.1.* Australian Government Department of Sustainability, Environment, Water, Population and Communities.

Oberholzer, B. (2005). Guideline for involving visual & aesthetic specialists in EIA processes: Edition 1. . Republic of South Africa, Provincial Government of the Western Cape, Department of Environmental Affairs & Develo. *CSIR Report No. ENV-S-C 2005 053 F*.

Ollis, D. S. (2013). Classification System for Wetlands and other Aquatic Ecosystems in South Africa. User Manual: Inland Systems. *SANBI Biodiversity Series 22.* Pretoria: South African Biodiversity Institute.

Peregrine Geoconsultants (Pty) Ltd. (2021). *GEOTECHNICAL INVESTIGATION REPORT.* Pretoria: Eco Elementum Engineering (Pty) Ltd.

Pirie, A. (2020). *Surface Water Hydrological Study for the Proposed Theta Mine Project. Hydrospatial (Pty) Ltd, Project No. BTE 002.*

Ravin, A., & Raine, T. (2007). Best Practices for Including Carbon Sinks in Greenhouse Gas Inventories. *16th Annual International Emissions Annual International Emissions.* Raleigh: United States Environmental Protection Agency.

SAS (a). (2022). *Freshwater Assessment as part of the Environmental Impact Assessment (EIA) Process for the TGME 83MR Underground Mining Project Near Pilgrim's Rest, Mpumalanga Province.*

SAS (b). (2022). *Visual Impact Assessment for the TGME 83MR Underground Mining Targets near Pilgrim's Rest, Mpumalanga Province.*

Scotney et al. (1987). *Land Capability Classification system.*

STS (a). (2022). *Biodiversity Assessment as part of the Proposed EIA and WUL Amendment Process for the MR83 UG Targets near Pilgrims Rest, Mpumalanga PART A - Background Information.*

STS (b). (2022). *Biodiversity Assessment as part of the Proposed EIA and WUL Amendment Process for the MR83 UG Targets near Pilgrims Rest, Mpumalanga – PART B: Floral Assessment.*

STS (c). (2022). *Biodiversity Assessment as part of the Proposed EIA and WUL Amendment Process for the MR83 UG Targets near Pilgrims Rest, Mpumalanga – PART C: Faunal Assessment.*

STS (d). (2022). *Soil, Land Use and Land Capability Assessment as part of the EIA and Authorisation Process for the Proposed Underground Mining within the 83MR Mining Area.*

The Public Protector. (2014). Poisoned Processes: Report on an Investigation into an Allegation of Maladministration by the Department of Public Works, Roads and Transport in Mpumalanga in the Awarding of tenders for Shop Leases in Pilgrim's Rest. Report No 20 of 2013/14.

U.S. EPA. (2006). *Compilation of Air Pollution Emission Factors (AP-42) - Unpaved Roads.* U.S. Environmental Protection Agency.

US EPA. (2006). *AP42, 5th Edition, Volume I, Chapter 13: Miscellaneous Sources, 13.2.2 Introduction to Fugitive Dust Sources, Unpaved Roads.* Retrieved from https://www3.epa.gov/ttn/chief/ap42/ch13/final/c13s0202.pdf

USEPA. (1998). *AP-42 Section 1.3: Fuel Oil Combustion.* Triangle Park, North Carolina: U. S. Environmental Protection Agency.

End of Report

ANNEXURE A EAP'S QUALIFICATIONS AND COMPANY PROFILE

ANNEXURE B PREVIOUS AUTHORISATION

ANNEXURE C LOCALITY MAPS OF THE PROJECT AREA

ANNEXURE D LAYOUT MAPS

ANNEXURE E PUBLIC PARTICIPATION

ANNEXURE F DRAFT IWWMP REPORT

ANNEXURE G CIVIL ENGINEERING DESIGNS AND STORMWATER MANAGEMENT

ANNEXURE H FINANCIAL PROVISION FOR PROJECT

ANNEXURE I AIR QUALITY IMPACT ASSESSMENT

ANNEXURE J SOIL AND LANDUSE ASSESSMENT

ANNEXURE K SURFACE WATER QUALITY BASELINE ASSESSMENT

ANNEXURE L GEOHYDROLOGICAL IMPACT ASSESSMENT

ANNEXURE M TERRESTRIAL IMPACT ASSESSMENT

ANNEXURE N AQUATIC IMPACT ASSESSMENT

ANNEXURE O VISUAL IMPACT ASSESSMENT

ANNEXURE P NOISE IMPACT ASSESSMENT

ANNEXURE Q HERITAGE AND PALAEONTOLOGICAL IMPACT ASSESSMENTS

ANNEXURE R SOCIO-ECONOMIC IMPACT ASSESSMENT

ANNEXURE S TRAFFIC IMPACT STUDY

ANNEXURE T BLASTING STUDY

ANNEXURE U NNR LETTER

ANNEXURE V PROPOSED ECOLOGICAL COMPENSATION PLAN