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Application for amendment of the existing Environmental Authorisation related to the Greater TGME Mining Right (83MR) for the proposed Theta Hill Project: Rehabilitation & Closure Plan

Report Status – Final version

Report Reference – Theta Hill Project – R&C 2019

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Configuration

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Executive Summary

Introduction

Transvaal Gold Mining Estates Limited (TGME), through an engineering scoping and feasibility study, has identified the opportunity to mine gold bearing reefs via modified terrace mining and this has triggered the need to amend its current Environmental Authorisation (EA) linked to the MP 30/5/1/2/2/83MR right to include the new mining sections as terrace mining.[1]

To commence with operations within the environmental-legal compliance sphere, TGME has commissioned an independent Environmental Assessment Practitioner (EAP) to compile a new Environmental Impact Assessment (EIA) & Environmental Management Program Report (EMPR) for submission and consideration by the Department of Mineral Resources and Energy (DMR&E) in support of the application for amendment of the EA.

This report has been prepared in support of the above-mentioned application for the amendment of the EA and is prepared in line with the requirements of the newly promulgated Regulations Pertaining to the Financial Provision for Prospecting, Exploration, Mining and Production Operations (Government Notice R1147, November 2015, as amended).

The report is the product of a collaboration amongst three individual companies specialising in mine rehabilitation and closure planning. The companies are Habitat Architects, Skets Architects and Globesight Environmental.

Technical Context

Three mining areas were identified based on exploration and evaluation work done within the study area. The three areas are referred to as:

- Theta Pit;
- Browns Pit; and
- Iota Pit.

The proposed area of influence will be situated on Portion 42 of the farm Ponieskrans 543KT.

The mining method selected for this project is referred to as modified terrace mining. This mining method is suited to the mountainous profile of the current topography. The ore deposit is considered stratified and inclined. To overcome the steeply dipping orientation the ore will be extracted on a flat surface whereby all the reefs are extracted on the horizontal plane via a surface miner.

The modified terrace mining method allows for partial backfilling (where applicable) and landscaping of the waste material. The overburden or waste material will be removed with a combination of excavators and trucks with the assistance of Xcentric rippers and a dozer. The ore will then be mined utilising a combination of surface miner or conventional loading and haul techniques.

[1] Final Scoping Report, August 2019, Batho Earth Environmental Consulting

Conceptual Closure Strategy

The conceptual closure strategy provides a framework for developing an approach towards closure and rehabilitation requirements over the entire life-of-mine. The strategies are largely dictated by the potential impact on biodiversity, the sensitivity of the Blyde River system and the potential loss in localised ecosystem services as a result of the proposed mining practices. For any closure strategy to qualify, it should fit within the regulatory framework, adhere to the closure objectives and be practically achievable. Such strategies shall be based on site specific conditions and industry best practices that is available at the time.

The rehabilitation hierarchy (adopted from the Queensland Government Department of Environment and Science (2014), illustrated in Figure 6) describes different levels of rehabilitation from a *do-nothing* approach, to an *avoid-any-disturbance* approach. The avoidance scenario was extensively explored during the mine's design phase, and it resulted in partially excluding certain Critical Biodiversity Areas (CBA), however certain activities within the CBAs are simply unavoidable if feasible mining were to take place.

It is acknowledged that the proposed terrace mining activity will transform many of the biophysical characteristics of the landscape at a local scale. The most noteworthy will be the topography which will alter the surface hydrology, soils and geology for example. These will result in a permanent rearrangement of the biophysical elements.

Partial reinstatement of an altered biophysical scenario can be accomplished through careful mine planning/design, with closure in mind. The success of this closure strategy can only be accurately assessed during a detailed monitoring period.

Closure Objectives

The desired closure vision for TGME (83MR) Environmental Authorisation amendment application is to rehabilitate all the disturbed mining areas to an environmental condition that is aligned with best practice standards and, as a minimum, vegetate all disturbed areas with a resilient vegetation cover that can withstand normal environmental stresses.

The goal is to initiate the recovery of the disturbed areas and accelerate an ecological trajectory/pathway towards a pre-defined reference condition within an achievable timeframe. This requires a reconstructed system that aims to be functional, resilient and regenerative with respect to its established vegetation composition, achieve structural integrity (geotechnical, erosional and geochemical stability), to a point where it can be reintegrated with the larger context.

Objectives for mine closure should be suited to its context, practically achievable based on best practices and fit within the regulatory framework. As a minimum, four general closure objectives must be achieved namely:

- The post mining landscape must be safe for humans and animals over a long term;
- The post mining landscape must be stable (geotechnically, erosional and geochemically) and offer long-term resistance to normal environmental stresses and disturbances;
- Residual impacts, as a result of the mine, must not cause harm or pollute the environment in and around the mining footprint; and
- The post mining landscape must be vegetated to sustain an agreed post-closure land use or reinstate pre-determined land capabilities.

Rehabilitation Risk Indicators

The following indicators, that are most sensitive to potential risks, have been identified. The monitoring of such risks will be crucial with a view to informing the success and sustainability of rehabilitation and remediation activities:

- Geotechnical stability related to created and altered landforms
- Surface stability (i.e. erosion control)
- Surface water runoff control and sedimentation management
- Functional cover system design (layered growth medium for re-establishment of vegetation)
- Alien and invasive species management and control
- Seasonality of revegetation efforts and successful establishment
- Visual appearance and sense of place objectives
- Geochemical stability

Rehabilitation and Closure Plan

An integrated, holistic approach towards rehabilitation and closure is recommended. This is defined as an approach that is closure-orientated and should have its commencement in the pre-feasibility phase of the mine. It should influence all aspects of the mine's design, construction, operational and decommissioning phases, and ensure that it is aligned with the closure vision and objectives. Such an approach generates pre-emptive solutions that can result in a positive, pro-active action plan implementation for sustainable rehabilitation and closure.

The Rehabilitation and Closure Plan encompasses the following elements:

- Design and Construction Phase:
  - Search and Rescue Program
  - On-site nursery
  - Topsoil stripping and storing
  - Re-vegetation trials
- Operational Phase:
  - Landform design
  - Progressive rehabilitation
  - Overburden management
  - Cover system reconstruction
  - Re-vegetation
  - Continues alien and invader species eradication program
- Decommissioning Phase:
  - Infrastructure removal and transfer of ownership
  - Dams and surface water management
  - Surface and geotechnical stability management
- Aftercare and maintenance

Rehabilitation and Closure Cost Estimation

The closure costing is estimated through a method that equates to a high-level Bill of Quantities (BoQ). It lists actions or products required at the end of the first year of operation, followed by the specified *(quantity or duration) x (market related rate);* to determine sub-totals for each item. A contingency factor is added at the total.

It is setup to reflect the various actions required to rehabilitate the disturbed footprint at the end of the first year of operation. The strategy is to achieve as many of the closure objectives as possible during the operational phase and include it into the operation activities, thereby leaving a lesser risk at the end of the term.

The rehabilitation and closure cost estimate have been calculated as:

- R53,895,882.91 (excl. VAT); and as
- R61,980,265.34 (incl. VAT (15%)).

Declarations of Independence:

I, Ferdi Pieterse, declare that -

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

_____

Signature of the Specialist

I, Mader van der Berg, declare that -

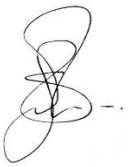
- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity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

_____

Signature of the Specialist

I, Stefan du Toit, declare that -

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



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Signature of the Specialist

1. Introduction

Transvaal Gold Mining Estates Limited (TGME) is situated in the Mpumalanga Province, within the vicinity of Pilgrim's Rest. Neighboring towns include Graskop and Sabie. TGME has been operational since 1895 and has since undergone various management changes, TGME is currently wholly owned by Theta Gold Mines Limited and is unique in the fact that it is the oldest gold mining company in production in South Africa and is situated on a now declared (Since 1986) Provincial Heritage Site.

TGME has an existing and approved mining right over the area, with DMR reference MP 30/5/1/2/2/83MR. This right allows the mining of gold ore, silver ore, copper ore and stone aggregate. The total 83MR area encompasses the following farms and cover a total area of some 9,413.3366 ha.:

- Frankfort 509KT: RE, Ptn 1, Ptn 2, Ptn 3, Ptn 4, Ptn 5;
- Krugers Hoop 527KT;
- Van der Merwes Reef 526KT: RE, Ptn 1;
- Morgenzon 525KT RE, Ptn 1, Ptn 2;
- Peach Tree 544KT and
- Ponieskrans 543KT: RE, Ptn 18, Ptn 42, Ptn 43, Ptn 44.

TGME, through an engineering scoping study and feasibility study, has identified the opportunity to mine gold bearing reefs via modified terrace mining and this has triggered the need to amend its current Environmental Authorisation (EA) linked to MP 30/5/1/2/2/83MR right to include the new mining sections as terrace mining.[2]

To commence with operations within the environmental-legal compliance sphere, TGME has commissioned an independent Environmental Assessment Practitioner (EAP) to compile a new EIA/EMPR for submission and consideration by the Department of Mineral Resources and Energy (DMR&E) in support of the application for amendment of the EA.

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2. Terms of Reference

Newly promulgated regulations (November 2015, as amended) pertaining to the Financial Provision for Prospecting, Exploration, Mining and Production Operations in terms of the National Environmental Management Act, 1998 (Act 107 of 1998) ("NEMA") prescribes the determination and making of Financial Provision for existing rights/permit holders Regulation 11 of GNR.1147). Importantly, the provisions in Section 24P of NEMA have been given effect through these newly promulgated regulations.

Accordingly, the following is required to satisfy the requirements for the determination of the Financial Provision and provides the basis to bring the application into alignment with the new regulations:

[2] Final Scoping Report, August 2019, Batho Earth Environmental Consulting

- The development of a Final rehabilitation, decommissioning and closure of the mining operations at the end of the life of the operations, as reflected in a Final Rehabilitation, Decommissioning and Closure Plan; and

The purpose of this report is to present the Final Rehabilitation Plan. This plan must be assessed annually hereafter to determine the mine's compliance in terms of rehabilitation commitments set.

3. About the Authors

3.1 The Companies

Globesight was established in early 2015 by Mr. Ferdi Pieterse, an environmental scientist by training and a consultant/advisor by occupation. Mr. Pieterse has 18+ years' experience in the related field. Globesight acts as a vehicle through which Mr. Pieterse conducts independent specialist work for a number of clients in various fields, most notably the African mining industry and the African Oil & Gas industry. Noteworthy is Globesight's vision of and commitment to skills development on the continent.

The company focusses on Advisory services to the mining and oil & gas sectors – specifically vis-à-vis environmental and sustainability design, planning, authorisations (permits and licenses) and compliance.

Consulting services range from compliance assurance via specialist auditing to rehabilitation and closure planning with associated financial provision determination.

Skets Architects and Planning was established in 2010 with a purpose to combine architectural and landscape architectural principles in the built environment. With a strong environmental backbone, projects are approached with sustainable, regenerative and harmonious goals, merging the requirements of humans, industries and ecologies in the final design. Mr. M van den Berg completed his Master's degree in Landscape Architecture (2004) on the topic of Sustainable Tailings Impoundment Landform Design and co-presented a paper at the Chamber of Mines Conference, 2005. He was since involved with numerous rehabilitation and landscape planning projects and has extensive theoretical and practical experience in the fields of landscape rehabilitation and ecological design. The most noticeable project is a 3 year involvement with a sand mining project on the farm Woodlands 407 near Parys, Free State Province. The project is unique as the property is in the early planning phases of an eco-estate. The parallel planning of a Master Plan and Mining Plan involves all bio-physical, socio-economic and engineering aspects to fulfil a post-closure vision.

Habitat Landscape Architects:

Who Are We: Our story is of a small core of individuals working as a team with a common passion, commitment and drive. We love to be creative, dream, and develop visions for the present and future. As a collective.

Our Profile: Habitat Landscape Architects is set up to be flexible and competitive by drawing on a range of multidisciplinary independent specialists and experts. We always take a strategic yet pragmatic perspective in selecting who we partner with to ensure that our core values remain.

Our team has extensive knowledge and experience of planning, design, environmental management, project management and implementation within the local, national and international context. Our team dynamic

enables excellence and is central to delivering on time and in budget. Habitat Landscape Architects consist of a mix of senior, experienced staff and junior staff to ensure continued learning and knowledge sharing.

Our History: From modest beginnings as an informal and later a formal partnership between Stefan du Toit and Siegwalt Küsel, Habitat Landscape Architects was founded in 2010 and has grown to a core team of 6 professionals. Collectively our team is made up of a diverse range of individuals carefully selected for their individual expertise, experience, character, commitment, drive and the core values that we share.

Services: At Habitat Landscape Architects we work both as lead consultants and as members of design and construction teams. We offer a comprehensive portfolio of landscape architectural, planning and design services. This portfolio includes a range of services from initial conceptualisation through to implementation. All our projects fit in to three broad categories namely Landscape Architecture, Environmental Planning and Design, and Heritage Management and Development.

We always apply a multidisciplinary, inclusionary and integrated approach to all projects, pursuing a structured and reiterative planning and design process. Throughout the project we meet regularly with the project team, communities, interested and affected parties and the client. We continuously benchmark with local, regional and international companies and institutions to ensure we remain current, apply best practice and strive for the best possible product.

We have a team bias for rural contexts, community projects and social aspects, tourism, heritage, rehabilitation, brownfield sites, urban renewal and open space design.

Our Commitment: Habitat Landscape Architects take pride in its commitment to deliver a professional service with integrity. We are committed to act ethically, protect the environment and create an inclusive, safe and healthy working environment. We are also committed to support and involve the communities around our projects, create economic benefits, select reputable suppliers and treat employees fairly and with respect.

3.2 Details of the Person(s) who prepared the Plan

Ferdi Pieterse: Ferdi has more than 18+ years' experience in the Environmental Management field. He has a strong background in providing environmental solutions, having completed numerous projects from concept and pre-feasibility phases to full completion and implementation phases. Ferdi has undertaken and completed projects in different sectors, including tourism, mining, manufacturing, energy and industrial. He also completed a year as an Environmental Manager in the Electricity Generation Industry (Eskom), specifically within the coal, water and gas resource sector where the focus was mining environmental management and compliance assurance.

Ferdi's main strengths are focused within the environmental management and sustainable development spheres. Significant experience within the primary, secondary and business economic sectors include strategic planning and advisory, project management and coordination, client interaction and management, capacity building, providing innovative solutions, compliance assurance and reporting, liability valuations, sound advice and objectivity. Ferdi has been extensively involved in projects in Lesotho, Zambia, Angola, Kenya, Namibia, Madagascar and Tanzania.

Ferdi is passionate about creating value and growth for people and projects on the African continent. He thrives on the challenge of integrating his experience and knowledge with new people and project teams and is

naturally motivated through the adventure, exploration, learning, engagement and travel, which is associated with the developing economies in Africa.

Mader van den Berg: Mader completed his Master's Degree in Landscape Architecture at the University of Pretoria at the end of 2004. He immediately joined an environmental consulting firm (Strategic Environmental Focus (Pty) Ltd) in Pretoria where he specialised in Visual Impact Assessments, Landscape Rehabilitation & Environmental Planning as well as developing Alien & Invader Eradication Programs. He operated as a sole proprietor from 2007 – 2010 until joining Skets Architects and Planning (previously named I-Dot Design Studios) where he further developed his skills in key environmental planning and design aspects.

Stefan du Toit: Stefan has been practicing and working as a Landscape Architect for more than 18 years. He has extensive experience in a range of projects from initial conceptualization through to implementation. This experience includes strategic planning, commissioning and managing of projects, project conceptualization, landscape design, master planning, contract administration, problem solving, design, quality control and monitoring of works. Stefan has extensive experience in Planning and Design conceptualization and development of various project types i.e. residential / commercial / retail / corporate / recreational / environmental rehabilitation. Stefan has experience in both the public and private sector and has been lead consultant on numerous projects for all three tiers of government and private sector.

Career highlights:

2010 – Current: Co – Founding of Habitat Landscape Architects in 2010 and steadily growing the firm form a staff compliment of two to six in 2016.

2015: Invited by the Department of Trade and Industry together with the Built Environment Export Council in 2015 to join a South African delegation on an outward selling mission to the World Bank, Washington DC, USA.

2013: Invited by the Department of Trade and Industry together with the Built Environment Export Council in 2013 to join a South African delegation on an outward selling mission to the African Development Bank, Tunis, Tunisia.

2009: Two of his projects was nominated and published (2009) in the International Publication: 1000 X Landscape Architecture (Braun Publishers) and also been selected to exhibit one of the projects at the III Landscape Architecture Exhibition in Belgrade, Serbia. (2009)

2007 – 2010: Successfully established and operated own firm, Green Contour Landscape Architects in 2007 up until 2010.

2006: Registered Professional Landscape Architect in South Africa, with 18 years' experience as a consultant in Landscape Planning, design and management.

2006 – 2007: Appointed Senior Landscape Architect at Insite Landscape Architects

2005 – 2006: Senior Landscape Architect and Design Division Manager at Eksklusiewe Tuine Landscape Architects, a member of BIDVEST

2003 – 2005: Appointed Landscape Architect at Strategic Environmental Focus

2001 – 2003: Appointed as Junior Landscape Architect at Uys & White Landscape Architects

Refer to the Curriculum Vitae's of Mr. Ferdi Pieterse, Mr. Mader van der Berg and Mr. Stefan du Toit in Annexure A.

3.3 Registrations, Affiliations and Experience

The following table presents the expertise of the Auditor(s) to carry out the evaluation and to prepare the plan.

Name	Position	Project Responsibility	Qualification	Professional Registrations / Affiliations	Experience
Ferdi Pieterse	Environmental and Rehabilitation Specialist	Project Director	B.Sc. (Honours) Environmental Management (RAU, now University of Johannesburg)	Member of the Environmental Law Association of South Africa Member of the International Association of Impact Assessors (South Africa)	18+ Years
Mader van den Berg	Landscape Architect	Senior Rehabilitation specialist	ML (Prof) Landscape Architecture (UP)	Member of the Land Rehabilitation Society of South Africa (LaRSSA)	14+ Years
Stefan du Toit	Registered Professional Landscape Architect	Senior Rehabilitation specialist and Landscape Architect	PrLArch BL(UP)	Member of the South African Council for the Landscape Architectural Profession Member of the Institute for Landscape Architecture in South Africa	18+ Years

4. Project Setting

4.1 Commercial Context[3]

TGME, through an engineering scoping study and an engineering feasibility study, has identified the opportunity to mine gold bearing reefs via modified terrace mining and this has triggered the need to amend its current Environmental Authorisation linked to MP 30/5/1/2/2/83MR right to include the new mining sections as terrace mining.

Three mining areas were identified based on exploration and evaluation work done within the study area. The three areas are referred to as:

- Theta Pit;
- Browns Pit; and
- Iota Pit.

The proposed area of influence will be situated on Portion 42 of the farm Ponieskrans 543KT.

The mining method selected for this project is referred to as modified terrace mining. This mining method is suited to the mountainous profile of the current topography. The ore deposit is considered stratified and inclined. To overcome the steeply dipping orientation the ore will be extracted on a flat surface whereby all the reefs are extracted on the horizontal plane via a surface miner.

The modified terrace mining method allows for partial backfilling (where applicable) and landscaping of the waste material. The overburden or waste material will be removed with a combination of excavators and trucks with the assistance of Xcentric rippers and a dozer. The ore will then be mined utilising a combination of surface miner or conventional loading and haul techniques.

The mine scheduling strategy is to target sufficient ore is produced to maintain a live ore stockpile (<2 months) which could feed the processing plant at 600 ktpa.

It is anticipated that the construction phase of the project will take approximately 10 months and the Life of Mine (LOM) is approximately 5 years. Mining will commence in phases with initial mining to commence on the Browns Pit followed by the Theta Pit and then Iota Pit last. Although a phased approach is scheduled, all three pits may be mined simultaneously. It should be noted that the mining durations overlap in order to ensure a continuous supply of ore (instances where more than one pit is mined at a time). Total Life of Mine (LoM) duration, including partial backfilling, of all pits is 49 months.

The modified terrace mining method commences mining at the outcrop and progresses into the hillside and is the most practical mining method for these surface orebodies.

The Mineral Resources were estimated by Minxcon in March 2019. The Mineral Resource declaration for the combined Theta Hill Project is declared at a cut-off of 0.35 g/t within the open cast pit shell. Depletions have been applied, tonnages have been discounted by 5% for Indicated and 10% for Inferred. Further discounting of

[3] Final Scoping Report, August 2019, Batho Earth Environmental Consulting

tonnages of 5% has been applied to the drilled area due to density uncertainty. The gold content conversion calculations utilise a conversion of 1kg = 32.15076 oz and all tonnages are reported in metric tonnes.

Inferred Mineral Resources have a low level of confidence and while it would be reasonable to expect that the majority of Inferred Mineral Resources would upgrade to Indicated Mineral Resources with continued exploration, due to the uncertainty of Inferred Mineral Resources, it should not be assumed that such upgrading will occur.

Table 4.1: Total Theta Project Mineral Resources as at 18 March 2019[4]

Mineral Resource Classification	Reef Grade	Reef Tonnes	Au Content	
	g/t	Mt	kg	koz
Measured	-	-	-	-
Indicated	2.09	4.74	9,935.75	319.44
Total M&I	**2.09**	**4.74**	**9,935.75**	**319.44**
Mineral Resource Classification	**Reef Grade**	**Reef Tonnes**	**Au Content**	
	g/t	**Mt**	**kg**	**koz**
Inferred	1.77	2.01	3,547.07	114.04
Total Inferred	**1.77**	**2.01**	**3,547.07**	**114.01**
Mineral Resource Classification	**Reef Grade**	**Reef Tonnes**	**Au Content**	
	g/t	**Mt**	**Kg**	**Koz**
Total M.I Inf	**2.00**	**6.75**	**13,482.81**	**433.48**

4.2 Project and Environmental Context

4.2.1 Approved Environmental Management Plans, Programmes and Licenses

TGME has been in operation since 1895. In that time there have been numerous changes in legislation which governs mining and associated operations as well as, more recently, environmental management associated with, inter alia, mining and industrial operations. The Greater TGME Project is in possession of an Environmental Management Program (EMP). Below is a list of approved and current EMPs as well as other permits/licenses applicable to the overall environmental compliance and management of the Greater TGME Project:

- Greater TGME Project – Environmental Impact Assessment (EIA) and Environmental Management Program (EMP), (GCS, October 2005);
- Water Use License (WUL), License number 24023343, (Ivuzi, March 2011).

4.2.2 Overview of the existing biophysical environment

Geology[5]

[4] Mining Work Programme – Submitted in support of an application for an amendment to a Mining Right- Minxcon – (MP) 30/5/1/2/2/83MR

[5] Geohydrological Study for the Theta Hill Project, Pilgrims Rest Region – MvB Consulting – MvB021/18/A017 – March 2019

The stratigraphy of the study area, from top to bottom, includes the Timeball Hill Formation (shales, which is not well developed or absent at Theta Hill and Browns Hill), the Bevetts' Unconformity (a combination of quartzite and chert conglomerate in a quartzite matrix) and the interface between of the Big Chert Marker (chert) and underlying Malmani dolomites.

The mineralisation in the area is principally "flat" bedding parallel shears located mainly on shale partings within Malmani Dolomites. However, mineralisation also occurs in other formations of the Transvaal Supergroup. The orebodies occur as narrow quartz-carbonate veins (reefs), which occupy bedding parallel faults and shears, and generally conform to the shallow regional dip of the strata. Gold mineralisation is accompanied by various sulphides of Fe, Cu, As and Bi. Gold-bearing reefs that are present at the Theta Hill project includes the following (Minxcon, 2019):

- Shale Reefs;
- Bevetts Reef;
- Upper Rho Reef;
- Lower Rho Reef;
- Upper Theta Reef;
- Lower Theta Reef; and
- Beta Reef.

The region is structurally complex. Two prominent faults dissect the study area, forming a geological feature referred to as the Frazer-Morgan Graben. Eastern boundary of the Browns Hill orebody is the Fraser Fault and the western boundary of the Theta Hill orebody is the Morgan Fault.

Karstic aquifers associated with the Malmani Dolomites are underlying the Theta Hill Project mining sites. Karst is a topography formed by the dissolution of soluble rocks such as limestone, dolomite and gypsum. It is characterized by underground drainage systems with sinkholes and caves.

Climate[6]

Pilgrims rest area falls within the summer rainfall area of South Africa. The average rainfall in the area is more than 1,200mm per annum. The majority of rainfall occurs between October and April, with the highest rainfall in January and February (170mm to 190mm per month). The average temperature ranges from 3°C to 32°C, with the warmest days in December and coldest nights in June. During winter, light to moderate frost is prevalent.

Topography[7]

The TGME Projects are located in the midst of the Drakensberg mountain range, with Pilgrims Rest at an elevation of 1,300m above mean sea level ("amsl"). The region is dissected by river erosion, with the Blyde River Canyon reaching a depth of over 770m.

[6] Stonewall mining – independent Competent Person's Report on Sabie-Pilgrims Rest Gold Projects – Minxcon Consulting – June 2019

[7] Stonewall mining – independent Competent Person's Report on Sabie-Pilgrims Rest Gold Projects – Minxcon Consulting – June 2019

Soils[8]

The Theta Project area resembles a Lithic and Anthropic catena, with Mispah/Glenrosa and Witbank (Anthrosols) being the dominant soil forms. Lithic soils such as Mispah/Glenroase are regarded as shallow soils, attributed to their shallow pedogenic and effective depth. The shallow nature of the dominant soil forms can be largely attributed to limited rock weathering or rejuvenation through natural erosion on steeper, convex slopes. Witbank soils have been extensively disturbed such that no recognisable diagnostic soil morphological characteristics could be identified, corresponding to Anthrosols in the international soil classification terminology. The remainder of the Study area comprises of Dundee (Alluvial soils) soil form which occupy approximately 3.47%, and residential areas mining and associated structures (i.e. mine plant complex, WRD, office areas, roads) which collectively occupy approximately 21,41% of the total area.

Table 4-1 Dominant soil forms occurring

Soil Form	Code	Diagnostic Horizon Sequence
Dundee	Du	Orthic/Alluvial (thick)
Mispah	Ms	Orthic/ Hard Rock
Glenrosa	Gs	Orthic/ Lithic
Witbank	Wb	Unspecified

* Infrastructural areas were not included in the table above since it is not considered in the land capability rating

Land Capability Classification[9]

The Theta Project area falls into Climate Capability Class 1, with local climate that is favourable for good yield for a wide range of adapted crops throughout the year. Identified soils were classified into land capability classes using the Scotney *et.Al*. Land Capability Classification system (Scotney et al., 1987).

Land capability of the identified soils forms ranged between Class V and VIII due to land use limitations related to anthropogenic activities and shallow effective rooting depth

Table 4-2 Land Capability classes for soil forms identified

Soil Form	Code	Diagnostic Horizon Sequence	Land Capability	Areal Extent (ha)	Percentage (%)
Mispah	Ms	Orthic/ Hard Rock	Grazing (Class VI)	417.9	72.7
Glenrosa	Gs	Orthic/Lithic			
Dundee	Du	Orthic/ Alluvial	Grazing (Class V)	19.91	3.47
Witbank	Wb	Unspecified	Wildlife (Class VIII)	15.5	2.69
TOTAL				574.35	100.00*

* Infrastructural areas (21,14%) were not included in the table above since they not considered in the land capability ratings

Grazing - Class V

[8] Soil, Land use and Land Capability assessment – Amendment to 83MR – Scientific Aquatic Services – May 2019 -Ref: SAS219037

[9] Soil, Land use and Land Capability assessment – Amendment to 83MR – Scientific Aquatic Services – May 2019 -Ref: SAS219037

The Dundee (Alluvial) soil form was identified as Grazing Class V land capability class. These soils are found at valley bottoms and gentle landscapes with a slope gradient <0.5%.

These soils are not ideal for cultivation due to the occurrence within watercourses. Also, the lack of soil structure and nutrients disqualifies it from commercial agriculture possibility. These soils are not considered to contribute significantly to local, provincial and/or national agricultural productivity.

The ecological functionality of these soils as an essential medium for supporting freshwater habitats is considered highly significant, recommendations and management measures from the Freshwater assessment should be considered and implemented.

Grazing -Class VII

The Mispah/Glenrosa soil form was identified as Grazing Class VII land capability class. These soils are found in very steep landscapes and consist of 0-35cm Orthic A and ≥ Hard rock/Lithic.

Occurrence of a relatively shallow depth of rocky layer hinders penetration of plant roots, and therefore limits the effective rooting for plants. The identified soil forms are considered to be of poor land capability and are not suitable for arable agricultural land use. These soils are, at best, suitable for natural pastures for light grazing and/or wilderness practices.

These soils are important for potential grazing opportunities, and implementation of rehabilitation and proposed integrated mitigation measures is aimed at reinstating the natural topography in certain areas of the post mining environment.

Wildlife/Wilderness (Class VIII)

Witbank (Anthrosols) were identified as Wildlife/Wilderness Class VIII land capability class. This soil types were found in highly disturbed areas. These soils are characterised by various limitation primarily the absence of soil as a growth medium.

These identified Witbank soils have very poor (Class VIII) land capability attributed to forestry and mining activities. Some of these soils have been subjected to long term compaction and erosion, 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 local scale.

Land Use[10]

Current land use activities in the Theta Project and surrounding areas are largely dominated by wilderness, forestry, grazing, residential and mining operation. No commercial agricultural activities were observed to be occurring.

[10] Soil, Land use and Land Capability assessment – Amendment to 83MR – Scientific Aquatic Services – May 2019 -Ref: SAS219037

Ecology: Flora[11]

The Theta Project area are floristically very diverse, and a broad range of floral SCC are present. The project area falls within the ecotone of below listed four vegetation types:

- **Mountain outcrops**
  - Cliff faces
  - Dolomite/quartzite outcrops; and
  - Forest-like Thickets associated with cliff faces
- **Montane Grassland**, encompassing rocky grasslands along mountain slopes with species represented by all three grassland vegetation types indicated for the focus area by the Mucina and Rutherford (2018 database), i.e. Long Tom Pass Montane Grassland, Northern Escarpment Quartzite Sourveld and Northern Escarpment Dolomite Grassland;
- **Freshwater Habitat**
  - Riparian vegetation; and
  - Drainage lines
- **Degraded Habitat**, including transformed/built-up areas and AIP-dominated vegetation
- **Remnants of the Northern Mistbelt Forest**, which was inaccessible due to safety concern (Iota WRD Option 2) and therefore no tangible specialist input can be provided for this vegetation type.

Apart from the Degraded Habitat unit, all other habitat units remain largely intact and their habitat integrity is only slightly compromised due to existing roads (i.e. habitat fragmentation) and some AIPs encroaching into natural areas. The potential for the various habitat units to support floral Species of Conservation Concern (SCC) also differ with the Mountain Outcrops harbouring the highest abundance and diversity of floral SCC, followed by Montane Grasslands.

Several floral SCC listed in the Mpumalanga Nature Conservation Act, 1998 (Act 10 of 1998) (MNC Act) were recorded

- Species falling within specific families
  - Orchidaceae: *Habenaria* sp, *Satyrium* sp., *Satyrium cristatum*, *Stenoglottis fimbriata*; and
  - Proteaceae: *Protea gaguedi* and *Protea caffra* subsp. *caffra*.
- Species falling within the specific genera:
  - Aloes: *Aloe alooides*, *Aloe arborescens*, *Aloe cooperi*, *Aloe davyana*, *Aloe deyri* and *Aloe transvaalensis*;
  - Arum lilies: *Zantedeschia albomaculata*;
  - Gladioli: *Gladiolus ecklonii* and *Gladiolus* sp.;
  - Olive trees: *Olea europaea* subsp. *africana*;
  - Pineapple flower: *Eucomis* sp.; and
  - Red hot pokers: *Knophofa* sp
- All species within the groups:
  - Paint brush species: *Haemanthus humilis* subsp. *Hirsutus* and *Scadoxus puniceus*
- Specific species:

[11] Faunal and Floral Baseline and Impact Assessment as part of the EIA process for the TGME Mine Development Project: Amendment to MR83 to include Theta Hill, Browns Hill and Iota Projects – Scientific Terrestrial Services – STS 190006 – May 2019

- *Boophone disticha*

The majority of SCC were found within the Mountain Outcrops, mostly concentrated on Theta Hill. The Montane Grasslands further harboured several floral SCC. The Degraded Habitat only supported a few SCC due to the disturbed conditions that are present within this habitat unit.

Several sections where Alien and Invasive Plant (AIP) species has severely proliferated, including the riparian zone of the Blyde River and immediate surrounding habitat was identified. The presence of AIPs was highest within the Degraded Habitat and Freshwater Habitat, although the Mountain Outcrops and Montane Grasslands are not devoid of AIPs.

The ecological sensitivity of the identified floral habitat units varies between High (Mountain Outcrops), Moderately High (Montane Grasslands), Intermediate (Freshwater Habitat) and Moderately Low (Degraded Habitat).

Ecology: Fauna[12]

The Theta Project area falls within several faunal habitat units; namely;

- **Montane Grassland**: offers ideal habitat for wide variety of species including mammals, reptiles and avifaunal species such as *Eupodotis senegalensis* (White-bellied Korhaan, VU), *Falco peregrinus* (Peregrine Falcon, VU), *Geronticus calvus* (Southern Bald Ibis, VU)
- **Mountain Outcrops**: offers ideal habitat for numerous reptile SCC and arachnid species which will take advantage of the crevices for shelter such as *Amblyodipsas concolor* (Natal Purple-glossed Snake, VU), *Bradypodion transvaalensis* (Northern Dwarf Chameleon, VU), there is also a high likelihood that *Panthera pardus* (Leopard, VU) would occur in this habitat unit;
- **Remnants of Northern Mistbelt**: provides good habitat for arboreal mammal and reptile species, there is a high likelihood that large raptors will also take advantage of the area for nesting purposes.
- **Freshwater Habitat**: ideal refuge for amphibian SCC such as *Hadromophryne natalensis* (Natal Ghost Frog), this species is generally associated with clean highly oxygentated perennial rivers and kloofs/gorges;
- **Degraded Habitat**: likely to support common avifaunal species, whereas the canopies of the eucalyptus plantations is likely to promote the nesting or roosting of larger raptor species.

Pelea caoreolus (Grey Rhebok) listed as Near Threatened (NT) by the IUCN (2019) was observed in the Study Area. In addition to the observed SCC, it is likely that several other SCC may be present in the area, both on a temporary and permanent basis.

[12] Faunal and Floral Baseline and Impact Assessment as part of the EIA process for the TGME Mine Development Project: Amendment to MR83 to include Theta Hill, Browns Hill and Iota Projects – Scientific Terrestrial Services – STS 190006 – May 2019

Freshwater[13]

Table 4-3 Desktop Assessment Results

Catchment	Resource	EIS	PESC	DEMC
B60A	Blyde River	Very High	Class C: Moderately Modified	A: Highly Sensitive System

EISC = Ecological Importance and Sensitivity Category; DEMC = Default Ecological Management Class;
PESC = Present Ecological Status Category; PES = Present Ecological State;
EI = Ecological Importance; ES = Ecological Sensitivity;
EC = Ecological Category; default based on median PES and highest of EI or ES means.

The various freshwater resources associated in the area are riparian systems with no wetland characteristics identified. The watercourses are considered to be in a largely natural to moderately modified condition, although historical mining and agricultural activities have had some impact on all the assessed freshwater resources, particularly in the lower reaches of the systems. Modifiers to the lower reaches of the freshwater resources that were assessed include clearing of riparian vegetation in order to increase available arable land for forestry and associated proliferation of alien invasive species, streambank incision and erosion, and the construction of flow-modifying structures (such as road crossings, bridge structures and weirs).

The assessed freshwater resources are deemed to provide moderately high to intermediate levels of ecological services and are particularly important for downstream areas. The Blyde River system is known for a high diversity of habitats and for supporting a diverse and sensitive assemblage of aquatic biota, including the critically endangered fish *Enteromius treurensis* in the local areas. These systems are thus considered to be of increased ecological importance and sensitivity. In addition to their moderately high ecoservices provision and biodiversity support functions, the Blyde River and associated tributaries contribute significantly to the overall tourism potential and value of the area. Thus, it is considered to be important on a local and regional scale. The results of the freshwater resource assessments are summarised in the table below.

Table 4-4 Summary of results of Watercourse assessment

Watercourse	PES	Ecoservices	EIS	REC / RMO / BAS
Blyde River [1]	B/C	Moderately High	High	REC: Category B RMO: Maintain BAS: Category B
Peach Tree Stream and associated tributaries [2]	B/C	Intermediate	High	REC: Category B/C RMO: Maintain / Improve BAS: Category B/C
Unnamed tributaries of Blyde: Browns and Theta Pit study areas [3]	B/C	Intermediate	Moderate	REC: Category C RMO: Maintain BAS: Category C
Unnamed tributaries of Blyde: Iota Pit study area [4]	C	Intermediate	Moderate	REC: Category C RMO: Maintain BAS: Category C

[1] Assessed October 2018 and March 2019 (water quality, VEGRAI, IHI, IHAS, SASS5, MIRAI, FRAI, EcoStatus determination – for a description of abbreviations see discussion below);

[13] Freshwater Resource Ecological Assessment as part of the EIA and Water Use Authorisation process for the TGME Mine Development Project: Amendment to 83MR to include Theta Hill, Browns Hill and Iota Projects – Scientific Aquatic Services - SAS 219038– May 2019

[2.] Assessed October 2018 (EcoStatus determinants as for 1 above);
[3.] Assessed October 2018 (VEGRAI, IHI, Ecoservices, EIS)
[4.] Assessed October 2018 (VEGRAI, IHI, Ecoservices, EIS)

Aquatic ecological assessment data

The water quality of the Blyde River may be considered largely natural during the March 2019 assessment. Electrical conductivity (EC) results show a significant increase in EC between the upstream site and the downstream site below the town of Pilgrim's Rest, yet adverse effects on the biota specific water quality of the Blyde River is limited as values comply with guideline recommendations at all sites. No potential adverse effects on the aquatic ecology is anticipated at any of the sites during the March 2019 assessment due to the risk associated with gold mining and the resulting effect of elevating the dissolved salt concentration of the surrounding aquatic environment. However, due to the noted elevated dissolved salt concentrations observed in the previous assessment (October 2018), the quality of the water must be closely monitored along with any impacts on aquatic biota and habitat in future.

The aquatic communities 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 system (affected by both natural seasonal variation as well as existing anthropogenic impact) with more significant influence from the changes in flow regime. Spatially, the aquatic macro-invertebrate community diversity of the Blyde River sites decreased in a downstream direction from the upstream to the downstream sites. The lack of diverse habitat variability (natural constraint) is likely a contributor to the lower SASS score downstream, as well as the potential anthropogenic impacts noted downstream (which potentially contributes to water quality changes/variability).

Groundwater and Geochemical Modelling[14]

The groundwater level underlying the Theta Hill project is deep (110m – 380m). None of the exploration boreholes intersected any water, and no water levels could be measured in any of these holes several weeks after they were drilled. Based on the monitoring boreholes in the area the groundwater level varies between 1 224.43 – 1240.52 mamsl.

Regionally a good correlation exists between the topography and the groundwater level suggesting that the groundwater level mimics the topography. On a local scale, however, this does not appear to be the case. Only a 56% correlation is noticeable (see Figure 4-2)

[14] Geohydrological study for the Theta Hill Project, Pilgrims Rest Region – Final Report – MvB Consulting – MvB021/18/A017

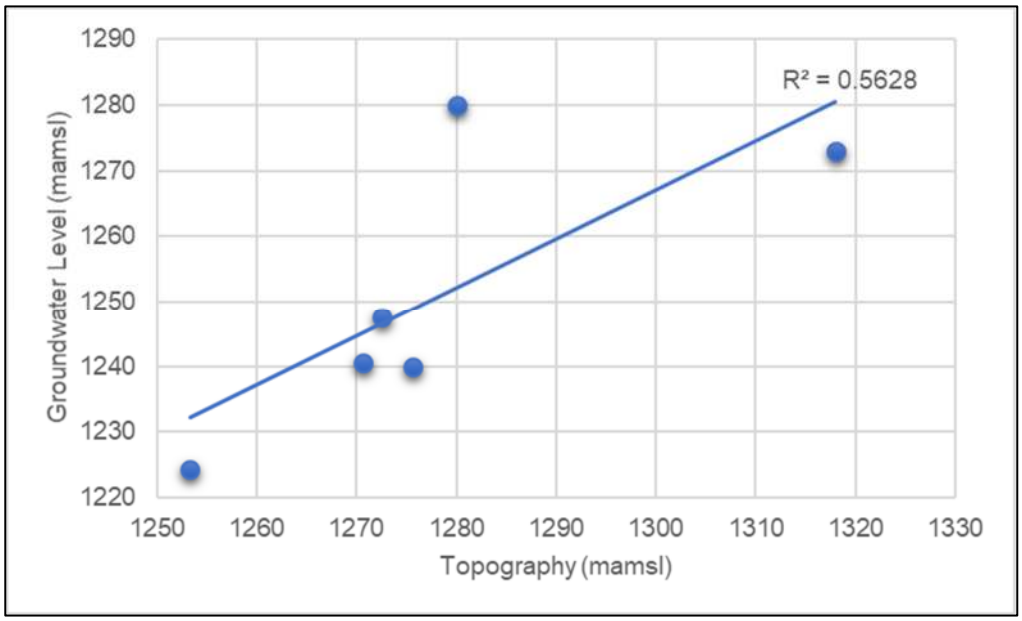


Figure 1: Correlation between topography and groundwater level – Theta Hill Project

The water table in the dolomitic aquifer is generally a flat surface due to high aquifer parameters, and it is assumed that it is the same in this area.

The following is observed regarding the groundwater quality:

- The groundwater quality is generally good and only a few parameters exceed the WUL limits.;
- Most of the pH values are higher (alkaline) than the WUL limits, but falls within the SANS 241 limits;
- With the exception of pH, none of the Blyde River samples exceed either the WUL or SANS 241 guideline limits;
- The TDS, calcium, magnesium and sodium concentrations are slightly elevated in boreholes BGW6 and BGW7. These boreholes are located close to the TGME TSF;
- The manganese concentrations are elevated in the groundwater. This is attributed to the dolomitic aquifer, which is commonly associated with elevated manganese concentrations; and
- The sulphate and calcium concentrations in the decant water from the Beta adit exceeds the WUL limit.

Waste Classification of Rock Material

A total of 32 rock samples were collected from various exploration boreholes on the Theta Hill, Browns Hill and Iota mining sites

- Results obtained from the Acid Based Accounting (ABA) analysis, only the shale sample is classified as a rock type two and thus have the potential to be acid forming.
- All other samples were classified as rock type three and have a low risk of forming acidic drainage.
- The shale sample will likely generate acidic drainage, however the Sulphide-S percentage fall below the 0.3% that is generally needed to sustain long term acid generation. The low Sulphide-S percentage (0.2%) suggest that if there is acid generation, it will only have short term significance.
- All the samples showed a final pH of above 5.5 in the Net Acid Generation (NAG) tests.

In Theta and Browns Hill there are no elements that exceed the leachable concentration threshold for Leachable Concentration Threshold Limits (LCTO). Several elements do however exceed the total concentration threshold Total Concentration Threshold Limits (TCTO). According to GNR635 waste must be classified as Type 3 waste based on the Total Concentration (TC) values fo Ba, Mn Cu, B and Ni exceeding their respective TCT) values. Mn is the element that show the highest total concentration in the majority of the samples. The XRD and XRF results suggest that Mn occur as an accessory element in the dominant minerals (dolomite and quarts) and the potential leachability of this element will depend on both physical and chemical parameters.

In the Iota Open-slot Chromium and Nickle is the only two parameters of concern. Mercury was present in the majority of the samples; this may indicate that its presence could be attributed to contamination from drilling. Barium, copper and arsenic showed elevated concentrations that exceeded the TCTO for the majority of the samples. According to the GNR 635, the waste must be classified as a Type 3 waste based on the TC values of the parameters that's exceeding their respective LCTO and TCTO values.

Static geochemical testing indicated that only one sample has the potential to generate acidic leachate and it is expected that if acid generation occur it will be for a short duration (less than 0.3% S) and there is enough neutralizing potential in the other material (dolomite) to mitigate the risk.

Geochemical[15]

The following main conclusions can be made:

- Initial geochemical findings indicate that waste rock disposal on surface and pit backfill have associated risks in terms of the likelihood of leachate containing contaminants exceeding regulatory guideline values and thus pose several risks in terms of metal(loid) mobilisation in the long-term.
- Adsorption is an important process in controlling metal(loid) mobility and may potentially immobilise metal(loid) contaminants in the site geologic lithologies. The risk however for the contamination of soil by metal(loids) may be significant.
- The risk for the development of acid mine drainage conditions for the Theta and Browns Hill, and Iota WRD material is very unlikely as sufficient alkalinity is provided by the carbonate minerals within the overburden materials to neutralise acidic species.
- The contamination of groundwater by leachate contaminants from the waste rock material in the post operational phase may be unlikely due to adsorptive processes.
- Pit backfilling may lead to reduced sulphate concentrations; however arsenic, mercury, chromium and nickel may reach concentrations higher than regulatory guidelines. However, due to adsorptive reactions, these metal(loid)s may be sorbed to secondary mineral precipitates.
- The initial assessment shows that risks are likely for shallow soil contamination below the on-surface waste rock facility, although natural mitigation processes negate the mobility of these contaminants.

Air quality[16]

Possible emissions sources identified in the project area that contribute towards the air quality status quo include mining, agriculture, vehicle tailpipe emissions along nearby roads as well as domestic fuel burning.

[15] Geohydrological study for the Theta Hill Project, Pilgrims Rest Region – Final Report – MvB Consulting – MvB021/18/A017

[16] Final Scoping Report, August 2019, Batho Earth Environmental Consulting

Mining is the predominant land use within the surrounding area, comprising of several underground and surface gold deposits that have historically been exploited and contain remnant mineral resources. Expected fugitive emissions from mining include wind erosion and material handling.

Additionally, agriculture is also one of the dominant land uses within the surrounding area. Emissions from agricultural activities are difficult to control due to the seasonality of emissions and the large surface area producing emissions (USEPA, 1995). Expected emissions resulting from agricultural activities include particulates associated with wind erosion, ploughing and burning of crop residue, chemicals associated with crop spraying and odiferous emissions resulting from manure, fertilizer and crop residue.

Dust associated with agricultural practices may contain seeds, pollen and plant tissue, as well as agrochemicals, such as pesticides. The application of pesticides during temperature inversions increases the drift of the spray and area of impact. Dust entrainment from vehicles travelling on gravel roads may also cause increase particulates in an area. Dust from traffic on gravel roads increases with higher vehicle speeds, more vehicles and lower moisture conditions.

These are the most likely contributors of fugitive emissions from agricultural activities. However, it is noted that fugitive emissions from agricultural activities generally have confined impacts near to the source, limiting the regional impacts

Atmospheric pollutants emitted from vehicles include hydrocarbons, CO, CO_2, NOx SO_2 and particulates. These pollutants are emitted from the tailpipe, from the engine and fuel supply system, and from brake linings, clutch plates and tyres. Possible contributors to mobile combustion emissions include access roads surrounding the site (R533). Neighbouring communities are likely to use these routes on a daily basis.

A significant portion of households still make use of gas, paraffin and wood as a fuel source. Pollutants released from these fuels include CO, NO_2, SO_2, inhalable particulates and polycyclic aromatic hydrocarbons. Particulates are the dominant pollutant emitted from the burning of wood. Smoke from wood burning contains respirable particles that are small enough in diameter to enter and deposit in the lungs. Polysyclic aromatic hydrocarbons are produced as a result of incomplete combustion and are potentially carcinogenic in wood smoke (Maroni et al., 1995). Main pollutants emitted from the combustion of paraffin are No_2, particulates, carbon monoxide and polycyclic aromatic hydrocarbons.

Domestic fuel burning shows a characteristic diurnal and seasonal signature. Periods of elevated domestic fuel burning, and hence emissions, occurs in the early morning and evening for space heating and cooking purposes. During the winter months, an increase in domestic fuel burning is recorded as the demand for space heating increases with the declining temperature.

Noise[17]

Activities in the Pilgrims rest area lead to significant noise levels but are locally confined. Activities that currently have an impact on noise pollution include the following:

Forestry:

- Trucking activities

[17] Final Scoping Report, August 2019, Batho Earth Environmental Consulting

- Chainsaws

Tourism:

- Buses
- Private motor vehicles

Cultural Heritage[18]

In 1974 the historic village of Pilgrim's Rest, situated on Portion 42 of the farm Ponieskrans 543KT (originally spelt as Ponieskrantz) was bought by the Transvaal Provincial Administration and developed as a National Monument under the National Monuments Act, No. 28 of 1969 (as amended). This was later extended to include the rest of the farm and in 1975 the part on which Alanglade (the house of the general manager) and where the golf course are situated, were also bought by TPA. However, with the promulgation of the National Heritage Act, No. 25 of 1999, the Pilgrim's Rest site lost its national status and reverted to be a site of provincial heritage status.

The following sites, features or objects of cultural significance were identified to be impacted on by the proposed development, only some of which are deemed to be conservation/documentation worthy. A number of these sites will not be directly impacted on but are viewed to be of high enough significance to be listed as sites to avoided.

Table 4-5 Objects of cultural significance Identified

Name	Latitude	Longitude	Impact	Management
001 Fort	-24,91824	30,75706	Within 22m of Theta Pit	Avoid/Retain
002 Cemetery	-24,91814	30,74484	Outside development	Avoid/Retain
003 Burial site	-24,91806	30,74478	Outside development	Avoid/Retain
004 Burial site	-24,91792	30,74353	Outside development	Avoid/Retain
005 Graves	-24,91748	30,74682	Outside development	Avoid/Retain
019 Pump house	-24,90674	30,74701	Close to access road	Avoid/Retain
024 Cocopan bridge	-24,90787	30,74648	Integral part of remaining track	Avoid/Retain
025 Cocopan track (east)	-24,91013	30,74188	In proposed haul road	Document
026 Cocopan track (west)	-24,91006	30,73983	In proposed haul road	Document
032 Concrete structure	-24,91243	30,74408	Inside waste rock dump area	No further action
033 Foundations	-24,91222	30,74263	Inside waste rock dump area	No further action
034 Farmer's race	-24,91245	30,74267	Inside waste rock dump area	No further action
038 Foundations	-24,91383	30,73645	In proposed haul road	No further action
046 Informal settlement	-24,91581	30,74291	People to be relocated	Document
047 Compound	-24,91712	30,74277	Abandoned 1972	No further action
049 Concrete foundation	-24,90547	30,72938	In Iota waste rock dump	No further action

[18] Phase one – Cultural Heritage Assessment – 2019/JvS/042

Sensitive Receptors[19]

The following specific environmental features are present on site:

- According to the Mining and Biodiversity Guidelines database, the majority of the project footprint falls within an area considered to be of Highest Biodiversity Importance
- The entire project footprint is located within the Kruger to Canyons Biosphere Reserve. On the 20the of September 2001 the Kruger to Canyons (K2C) Biosphere Reserve was registered by UNESCO in Paris, as an official Biosphere Reserve within their Man and Biosphere (MaB) programme
- The project footprint is located within the remaining extent of the Malmani Karstlands endangered (EN) ecosystem (National Threatened Ecosystems database, 2011) (Figure 2)
- Various water catchment areas were identified within the study area, and the Blyde River traverse site
- The Blyde River is considered a Flagship River in terms of the National Freshwater Ecosystem Priority Areas, and therefore all activities should be located outside of the 1:100-year flood line
- From a heritage value the town of Pilgrims Rest dates back to 1873, with various historic appearances in and around the town.

[19] Final Scoping Report, August 2019, Batho Earth Environmental Consulting

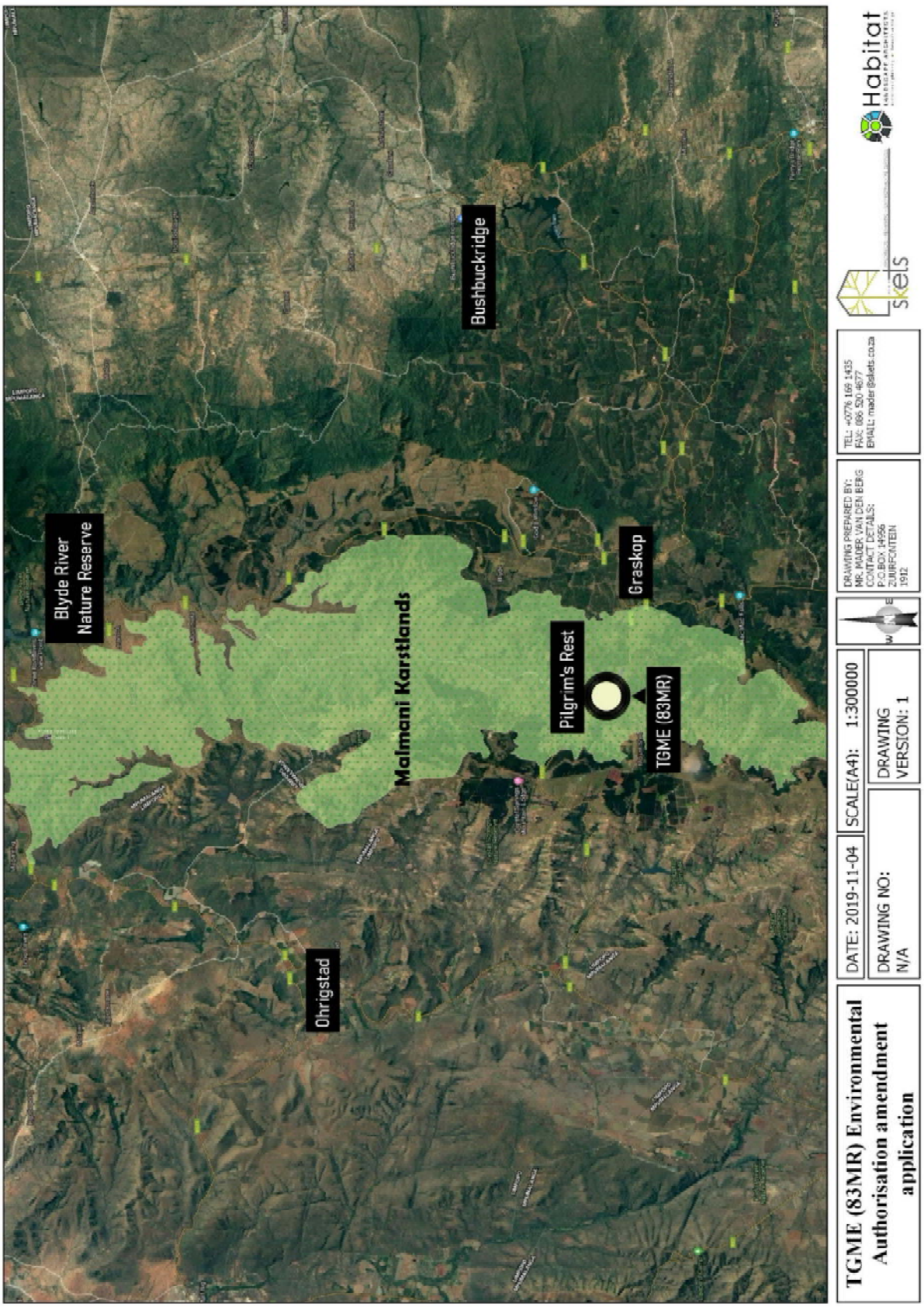


Figure 2: Malmani Karstlands and project location

Visual aspects[20]

The expected level of visual intrusion through the development of a mine within the TGME Theta Hill Project Area is considered high due to the proposed project situated on hilltops with short vegetation cover (majority grassland) (medium VAC), and its close proximity to the town of Pilgrim's Rest and the Lost City Hiking Trail within the Mount Sheba PNR. Due to the semi-rural nature of the landscape, there are a limited number of sensitive receptors within 5 km of the TGME Theta Hill Project Area. Even then, the visibility of some receptors are limited or no visibility is displayed due to the mountainous terrain of the surrounding landscape. Furthermore, the level of visual intrusion on the surrounding landscape reduces with the increasing distance from the TGME Theta Hill Project Area. Visual intrusion is also dependent on vegetation, terrain and man-made structures obscuring the view of the TGME Theta Hill Project Area.

Highly sensitive visual receptors have been determined to primarily comprise residents and tourists of the town of Pilgrim's Rest, moderate sensitive receptors are road users of the R533 and various gravel roads in and around the TGME Theta Hill Project Area, and people at their place of work. Visual exposure will take place directly as the TGME Theta Hill Project Area will be visible from 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 which will alter the visual environment. Additionally, impacts from clearing of vegetation, potential erosion as a result of bare soils, and alteration of landscape morphology (removal of hilltops at the Iota, Browns and Theta Pits) will also create a noticeable contrast in the landscape and will be visible to receptors.

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 impact, 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 TGME Theta Hill Project Area in its current state contains limited sources of night-time lighting with TGME mine office being the main lighting source within the TGME Theta Hill Project Area. Furthermore, the close proximity of the town of Pilgrim's Rest further contributes to the effects of skyglow and affects the intrinsically dark to rural atmosphere of the area. Due to the area being considered intrinsically dark to rural the landscape is considered visually sensitive to lighting, and thus the proposed mining activities will substantially contribute to the effects of sky glow and light trespass which will in turn reduce the visual quality of the environment. Generally, the impacts of vehicle mounted lighting sources in the area will be confined to the local and sub-regional setting (up to 10km from the TGME Theta Hill Project Area).

4.3 Social Context

Socio-economic aspects[21]

[20] Visual Impact assessment part of the Environmental Impact Assessment and Authorisation process for the Proposed Mine Development Project: Amendment to 83MR – Scientific Aquatic Services – SAS 219036 – May 2019

[21] Socio-economic Impact Assessment: Draft – Batho Earth and SED – May 2019

The Ehlanzeni District Municipality (EDM) is one of the three districts in Mpumalanga Province and is located in the Northern Eastern part of Mpumalanga. EDM covers an area of 27 895.47 km². It is bordered by both Mozambique in the east and Swaziland in the south.

The Thaba Chweu Local Municipality (TCLM) is one of four local municipalities under the jurisdiction of the Ehlanzeni District. It is located in the north-western region of the Mpumalanga province. The escarpment divides the district into eastern and western sections. The western section (Lydenburg area) is dominated by agricultural and farming activities, while forestry is the main economic activity of the eastern section (Sabie/Graskop area).

The following figure provide an outline of the TCLM, its main towns (Pilgrim's Rest, Graskop, Sabie and Lydenburg) and adjoining local municipalities under the jurisdiction of the EDM.

Figure 3: Thaba Chweu Local Municipality

The main economic sectors in the municipal area are mining, forestry, agriculture, business services, and tourism. Within the study area, forestry dominates the land-use and is an important contributor to the economy.

According to the TCLM IDP there has been a decline in tourists to Pilgrim's Rest's in the past few years. The majority of residents in the town are dependent on tourism. There has been an influx of people to the town in search of employment with the subsequent development of informal settlements and an increase in unemployment.

The affected ward within the study area for the project is Ward 13 of Thaba Chweu Local Municipality. Ward 13 includes an area from north of Simile (near Sabie) to Pilgrim's Rest. The main town in the area is Pilgrim's Rest. Other areas falling in this ward include the Ohrighstad Dam area, Spekboom and Boomplaats.

The proposed development (mining activities and infrastructure) falls on Ponieskrans 543 KT Portion 42. The landowner of this portion is the Department of Public Works.

The Maorabjang Communal Property Association (CPA) is the title deed holder of the following farms that fall within 83MR:

- Frankfort 509 KT: Ptn 4

- Frankfort 509 KT: Ptn 5
- Frankfort 509 KT: Remainder
- Ponieskrans 543 KT: Remainder

Other key landowners include South African Forestry Company Limited (SAFCOL), York Timbers (Pty) Ltd. and SAPPI.

Table 4-6: Sensitive receptors in the study areas less than 5km zone

RECEPTOR	DISTANCE FROM SITE	DESCRIPTION
Brown's Hill community	300 metres south of the existing TGME Metallurgical plant	This settlement consists of approximately six to seven family units that consist of approximately 10 mud and tin dwellings. The residents include ± six adults (mainly elderly women) and eleven children permanently residing there (total population of approximately 20 residents). The families have vegetable gardens and goats that roam free. There is no water and sanitation facilities and the residents are reliant on water supplied by tankers. The borehole is not in working order at the moment.
Dark's Gully	± 800 m north of the Iota Hill Pit and directly north of the proposed Iota Hill Option 1 Waste Rock Dump (WRD) ± 600 m northeast of Pilgrim's Rest Downtown	Residential area north of Pilgrim's Rest and west of the R533 road leading into Pilgrim's Rest. Consists of scattered homesteads (formal and informal). Dwellings are sub-let. Area is experiencing an influx of outsiders and illegal miners.
Schoonplaas/Newtown	± 800 m – 1 km northeast of Pilgrim's Rest town and east of R533 road leading to Pilgrim's Rest ± 1 km (nearest sections e.g. Iota) to 3 km (furthest e.g. Brown's Hill) northeast of the proposed development.	Residential area northeast of Pilgrim's Rest and east of the R533 road. Consists of relatively densely populated homesteads (formal and informal). Dwellings are sub-let. Area is experiencing an influx of outsiders and illegal miners. The Pilgrim's Rest Primary School is located in Schoonplaas/Newtown.
Pilgrim's Rest Town	The town is ± 2 to 2.5 km to the east / northeast of TGME's existing plant with Brown's Hill and Theta Hill in between. Iota Hill is approximately 1.5 km to the west of Pilgrim's Rest's Downtown area.	Pilgrim's Rest is located on the farm Ponieskrans 543 KT. Businesses and residential area of Pilgrim's Rest Town which includes inter alia the Royal Hotel, restaurants, guest houses, the Pilgrim's Rest Environmental Centre, a clinic and the Pilgrim's Rest Museum. The town was declared as a National Monument in 1986 and is under the management of the Mpumalanga

RECEPTOR	DISTANCE FROM SITE	DESCRIPTION
		Department of Public Works, Roads and Transport. The town consists of a Downtown area and an Uptown area with approximately 75 historical buildings.
TGME Metallurgical Plant and Tailings Storage Facility (TSF)	± 2 km to the west of Pilgrim's Rest	The existing TGME Metallurgical Plant and Tailings Facility are situated adjacent the TGME offices. These facilities are located to the west of Pilgrim's Rest (± 2 km) and are accessed via a tar road from the R533.
Former Pilgrim's Rest Caravan Park and Camping Site	± 2.3 km from the existing TGME Metallurgical plant. ± 500 m south of Dark's Gully and ± 300 m north of Pilgrim's Rest Downtown. ± 350 m east of the proposed Iota Hill Option 1 Waste Rock Dump (WRD)	The former Pilgrim's Rest Caravan Park and Camping Site is situated just north of the town of Pilgrim's Rest and just south of Dark's Gully along the banks of the Blyde River. The Caravan Park ceased operations in 2015 when the lessee terminated the contract. Buildings are in a deteriorated state and the area is not properly maintained. The Caravan Park falls under the management of the Mpumalanga Department of Public Works, Roads and Transport.
Pilgrim's Rest Hut Guest House	± 2.5 km to the east of the proposed development	Self-catering accommodation facility situated in downtown Pilgrim's Rest Hikers undertaking the Komatiland (SAFCOL) hiking tour can start or finish some of the hikes at this facility.
Grootfontein Village	± 2.7 km – south of the existing TGME Metallurgical plant	Village of approximately 150 residents working for York Timber. Formal dwellings Water and sanitation facilities are available Cattle roam free within the area surrounding Grootfontein Village
Mount Sheba Forever Lodge	± 4 km - southwest of the existing TGME Metallurgical plant	Facilities include: Accommodation at the lodge, caravan and camping sites, self-catering timeshare cottages, general recreational facilities, conference facilities, wellness centre and Wedding Venue. Activities include: General recreational activities (walking, swimming etc.), hiking trails and birdwatching.

RECEPTOR	DISTANCE FROM SITE	DESCRIPTION
Mount Sheba Private Nature Reserve	± 4 km and further - southwest of the existing TGME Metallurgical plant	Mount Sheba Lodge is situated within a private nature reserve.
Grazing areas	Surrounding and within the proposed development site	Community member's cattle are roaming free and grazing throughout the area surrounding Pilgrim's Rest.

Table 4-7: Receptors within 5-10km Zone

RECEPTOR	DISTANCE FROM SITE	DESCRIPTION
Crystal Springs Mountain Lodge	± 6 km - northwest of the northern section (Iota Hill)	Crystal Springs Mountain Lodge is situated on a 2 400 ha game farm. Facilities include: Accommodation and Recreational Facilities (restaurant and wellness centre), and Conference Facilities. Activities include: General recreational activities (walking, swimming etc.), game drives, hiking and birdwatching.
South African Forestry Company Limited (SAFCOL)	Varying distance due to distance of farms from proposed development (between 2.5 km to 20 km) Farms are mainly located to the north of the proposed development.	State owned company under the Department of Public Enterprises (DPE) involved in the commercial timber industry. Operating and/or leasing properties in the study area, namely: • Blackhill 528 KT (Property of TCLM leased by SAFCOL: Morgenzon Plantation); • Berlyn 506 KT (RSA Government Property leased by SAFCOL: Blyde Plantation); • Doornhoek 488 KT Ptn 2 (Morgenzon Plantation); • Frankfort 509 Ptn 1, Ptn 2 and Ptn 3 (RSA Government Property leased by SAFCOL); • Krugershoop 527 KT (RSA Government Property leased by SAFCOL); • Lisbon 531 KT RSA Government Property leased by SAFCOL: Blyde Plantation); • Morgenzon 525 KT RE (leased by SAFCOL);

RECEPTOR	DISTANCE FROM SITE	DESCRIPTION
		• New York 530 KT (RSA Government Property leased by SAFCOL: Blyde Plantation); • Peach Tree 544 KT Farm (RSA Government Property leased by SAFCOL); • Rotunda Creek 510 KT RSA Government Property leased by SAFCOL: Morgenzon Plantation); • Van der Merwes Reef 526 KT RE (leased by SAFCOL) Main activities include timber harvesting, timber processing and related activities.
York Timbers (Pty) Ltd.	Farms are located to the south and east of the proposed development Varying distance due to distance of farms from proposed development (between 2.5 km to 10 km)	Property owner (involved in the timber industry) of and/or leasing the following farms in the study area: • Grootfontein 562 KT RE; Ptn 1 and Ptn 2; • Driekop 546 KT (Government Property leased by York) Main activities include timber harvesting, timber processing and related activities.
SAPPI	± 6 – 10 km southwest of the proposed development	Property owner involved in the commercial timber industry (global producer of woodfibre, paper, paper pulp and wood pulp) in the study area, namely: • Breytenbachskraal 556 KT

Table 4-8: Receptors more than 10km zone

RECEPTOR	DISTANCE FROM SITE	DESCRIPTION
SAFCOL	Varying distance due to distance of farms from proposed development (between 2.5 km to 20 km) Farms are mainly located to the north of the proposed development.	Property owner and/or leasing properties in the study area, namely: • Blackhill 528 KT (Property of TCLM leased by SAFCOL: Morgenzon Plantation); • Berlyn 506 KT (RSA Government Property leased by SAFCOL: Blyde Plantation); • Doornhoek 488 KT Ptn 2 (Morgenzon Plantation); • Frankfort 509 Ptn 1, Ptn 2 and Ptn 3 (RSA Government Property leased by SAFCOL);

RECEPTOR	DISTANCE FROM SITE	DESCRIPTION
		• Krugershoop 527 KT (RSA Government Property leased by SAFCOL); • Lisbon 531 KT RSA Government Property leased by SAFCOL: Blyde Plantation); • Morgenzon 525 KT RE (leased by SAFCOL); • New York 530 KT (RSA Government Property leased by SAFCOL: Blyde Plantation); • Peach Tree 544 KT Farm (RSA Government Property leased by SAFCOL); • Rotunda Creek 510 KT RSA Government Property leased by SAFCOL: Morgenzon Plantation); Van der Merwes Reef 526 KT RE (leased by SAFCOL);
Maorabjang Communal Property Association	Varying distance due to distance of farms from proposed development (between 10 km to 25 km)	Maorabjang CPA is the title deed holder of the following farms that fall within 83MR: • Frankfort 509 KT: Ptn 4 • Frankfort 509 KT: Ptn 5 • Frankfort 509 KT: Remainder Ponieskrans 543 KT: Remainder
Blyde River Canyon Nature Reserves	15+ km east from the proposed development	The Blyde River Canyon Reserve extends along the Blyde River Canyon against the Greater Drakensberg escarpment and includes Bourke's Luck Potholes, the Three Rondavels, Pinnacle Rock and God's Window. Accommodation includes private lodges and guesthouses Main activities include: Hiking, horse riding, white water rafting, kloofing, hot-air ballooning, fly-fishing, biking, tours and boat trips on the Blyde Dam.

Ward 13, which is a typical rural area without large settlements only represents less than 3% of the total TCLM population (2 584 in 2011). Within Ward 13, there were 1 721 individuals living in the town of Pilgrim's Rest in 2011 (66% of Ward 13's population) with 68 persons per km^2, 630 households and an average household size of 2.6. (According to local sources the current (2019) population could the between 1 700 to 2 500 people – the majority population (between about 1500 – 2300 people) stay in the new township Newtown/Schoonplaas and Dark's Gully, close to the old town while a minority (around 200- 300 people) stay in the old historic part of the town.

The working age population group as well as percentage males are relatively higher in TCLM and Pilgrim's Rest than nationally. This corresponds with the relatively higher population growth rates and possible in-migration into the municipal and local area. In the case of Pilgrim's Rest, it could be due to sporadic and historic in-migration as discussed above.

Within the TCLM the younger population group (under 15 years of age) has increased from 25.2% in 2011 to 27.7% in 2016. The youth ratio is however still below the national average, signifying to the higher priority within Pilgrim's Rest to create job opportunities for the working age group.

Table 4-9: Age and Gender structure 2011

AREA	Young population (0.14 years)	Working population (15-64 years)	Elderly (65+)	Total	% Males
Pilgrim's Rest	26.7%	70.2%	3.1%	100%	53.1%
Thaba Chweu	25.2%	69.9%	4.9%	100%	52.6%
South Africa	29.2%	65.5%	5.3%	100%	49.0%

A relatively lower percentage of households in Pilgrim's Rest area (60%) had access to formal housing in 2011 compared to the municipal and national averages. The informal dwellings are mainly situated in the 'Newtown' (Schoonplaas) just outside the historic old town. According to local sources there is furthermore dolomite in the vicinity of 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.

Table 4-10: Access to housing and basic services

AREA		Pilgrim's Rest	TCLM	South Africa
% of households in formal dwellings	2011	60%	65%	62%
	2016	n.a.	70%	77%
% of households with tap inside dwelling	2011	60%	39%	46%
	2016	n.a.	33%	42%
% of households with flush toilets	2011	61%	68%	60%
	2016	n.a.	66%	58%
% of households with access to electricity	2011	75%	84%	85%
	2016	n.a.	90%	93%
% of households with regular waste collection services	2011	68%	57%	58%
	2016	n.a.	58%	57%

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. In 2011 Pilgrim's Rest still fared better than the municipality on average in terms of water provision and regular waste collection services as opposed to access to improved sanitation and electricity.

Within the public health care system of TCLM there are three district hospitals, ten clinics (operating for eight hours per day) and three mobile units (Ehlanzeni District Municipality, District health Plan 2018/19- 2020/21.

Pilgrim's Rest only has one clinic and the closest public hospital to the town is Sabie Hospital some 36km from Pilgrim's Rest.

Table 4-11 Public Health Care Facilities in Ehlanzeni District

Sub-Districts	Mobile Clinics	Clinics	Health Centre	District Hospitals	Regional Hospitals	Tertiary Hospitals	TB hospitals
Bushbuckridge	5	34	4	2	1	0	0
City of Mbombela	11	34	1	1	1	1	2
Nkomazi	8	26	5	2	0	0	0
TCLM	3	10	1	3	0	0	0
District total	27	105	15	8	2	1	2

It is estimated that some R 45million is needed to make the district's primary health care facilities and district hospitals compliant to ideal clinic and national core standards. In 2018 only 8% of Ehlanzeni's primary health care clinics were compliant with Ideal clinic standards compared to the 44% national average. Another challenge that faces Pilgrim's Rest in terms of health care services is the lack of Emergency Medical Services (EMS) as part of the primary health care services.

While crime is considered relatively low in Pilgrim's Rest with only 135 cased reported in 2016, the per capita crime rate is relatively high for this small town, i.e. close to 70 crimes per 1000 people in 2016. The presence of outsiders and illegal miners could have a negative impact on security in the municipal area. Between 2016 and 2018 reported crime rates could have increased with 19% from 135 in 2016 to 161 cases in 2018.

In 2016 the total gross value added (GVA) of the Thaba Chweu municipal economy was estimated at R15bn (current prices) contributing close to 5% of the GVA produced in Mpumalanga province and 18% of the GVA of Ehlanzeni District.

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. The contribution towards economic output could be significantly higher and is estimated to be between 45% and 50% of total economic production in 2013.

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 Steelpoort areas, producing mainly platinum. The mines range from: Xstrata, Mototolo, Impala Platinum, Anglo Platinum, Aquarius, Dwarsriver, Everest Platinum, junior miners and quarries.

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 elsewhere. This situation is reflected in the relatively low contribution of the manufacturing sector in the local economy.

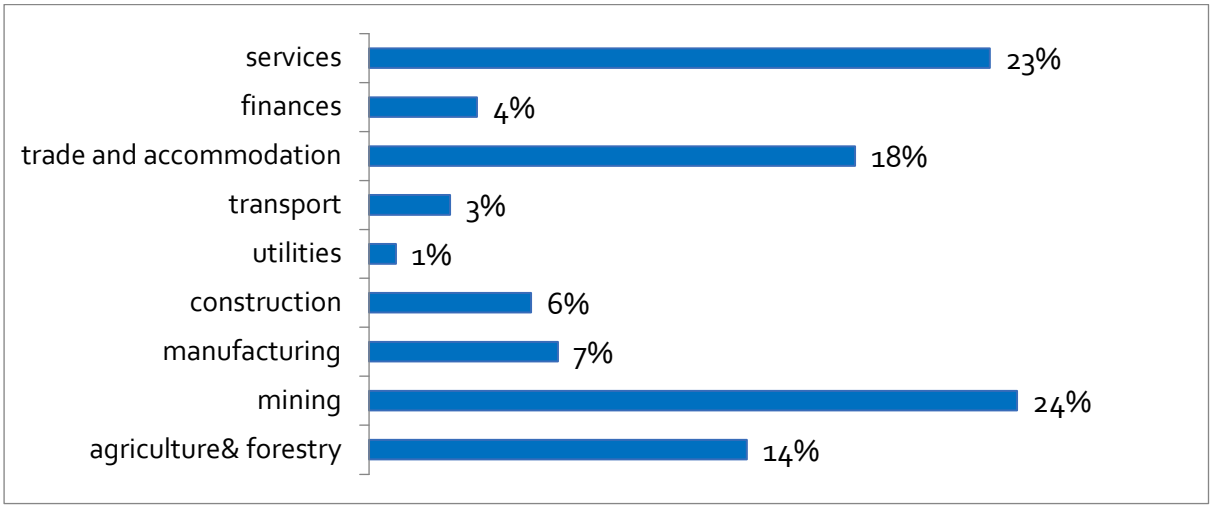


Figure 4: The Sector Distribution of Employment, Thaba Chweu, 2011

The economy of Pilgrim's Rest town (historic and Newtown/Schoonplaas) is dominated by tourism related activities including accommodation, restaurants/taverns and arts and craft shops. The Gross Value Added of the local economy could be in the region of R20 million (current 2019 prices), employing in the region of an estimates 250 people (including employment of unskilled staff at formal businesses, managers/entrepreneurs as well as 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.

Main tourism attractions in and close to Pilgrim's Rest include the historic town itself, gold panning tours, Pilgrim's Rest Ghost Tours, Crystal Springs Mountain Lodge, Mount Sheba Resort, hiking tours and mountain bike trails throughout the area as well as bird watching tours and trails.

High level estimates suggest that local employment is dominated by informal craft and arts traders that is accommodated in some 72 stalls in the historic town of Pilgrim's Rest. The Royal Hotel is the single largest employer in formal economy of Pilgrim's Rest and dominates the accommodation sector, providing more than 60 jobs in 2019.

Recent unemployment statistics for South Africa show that the national unemployment rate (official rate) has risen to close to 26% at the end of 2018. Mpumalanga Province had the third highest unemployment rate in South Africa in 2018 namely 34% (official /narrow unemployment) and 43% expanded definition – up from 30% (official rate) in 2011. The official TCLM unemployment rate was much lower at 21% than the provincial or national rate in 2011.

Table 4-12 Composition of the Pilgrims Rest Labour Force, 2019

Pilgrim's Rest labour force (2019)	2016	2019
Population	1,900	2,016
Population in economic active years (15-64)	1,330	1,411
Labour force participation rate (narrow)	71%	71%
Total labour force (narrow)	944	1,002
Formal employment (including management)	141	130
Informal employment	114	124
Unemployment	689	748

Unemployment rate	**73%**	**75%**

Source: Based on Stats SA 2011 Pilgrim' Rest Population, age groups and national population growth rates, employment estimates for the town as well as Stats SA (2011) labour force participation ratios for Ward 13

A relatively large portion of the labour force completed matric (35%) compared to 33% on a national level. Skilled labour is as scarce as on a national level with only 7% of the labour force with tertiary qualifications. The portion of the labour force with post matric qualifications are however higher in Pilgrim's Rest than in the municipal area or Mpumalanga province

Table 4-13 Highest Educational attainment of the Population age 20 Years and older, 2011

Level of education	Pilgrim's Rest	Thaba Chweu	Mpumalanga	South Africa
No schooling aged 20+	7%	10%	14%	9%
Some schooling but less than matric	51%	51%	48%	51%
Matric aged 20+	35%	34%	33%	33%
Higher education aged 20+	7%	5%	5%	7%
Total aged 20+	**100%**	**100%**	**100%**	**100%**

More than 42% of households in Thaba Chew fell below the lower bound poverty income line in 2011 - lower than the national average (45%) and the average for Mpumalanga Province (47%). In Pilgrim's Rest, the poverty rate was much higher than the municipal poverty rate and even higher than the provincial rate at 48% of households living below the lower bound poverty line. The percentage households that earned more than R 75 000 was also much less in Pilgrim's Rest (16%) than the municipal (21%) and national averages (24%).

With an estimated unemployment rate of 75% in 2019, it could be expected that poverty levels in Pilgrim's Rest would be much higher in 2019.

Table 4-14 Distribution of households according to income level, 2011

Income category	Pilgrim's Rest	Thaba Chweu	Mpumalanga	South Africa
R0	15.%	12.1%	14.6%	15.5%
Under R4800	7.22%	3.2%	5.2%	4.5%
R5k - R10k	13.7%	5.7%	8.7%	7.4%
R10k - R20k	11.3%	21.2%	18.5%	17.1%
R20k - R40k	19.6%	22.8%	19.9%	19.0%
R40k - R75k	16.7%	14.6%	13.3%	13.0%
R75k - R150k	10.4%	9.4%	8.8%	9.2%
R150k - R300k	3.7%	6.0%	6.1%	7.1%
R300k - R600k	1.1%	3.6%	3.4%	4.6%
R600k - R1.2M	0.3%	1.0%	1.0%	1.8%
R1.2M - R2.5M	0%	0.3%	0.3%	0.5%
Over R2.5M	0%	0.2%	0.2%	0.3%
Total	**100.0%**	**100%**	**100%**	**100%**
Lower than R20k	**48.1%**	**42.2%**	**47.0%**	**44.5%**

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. 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 tourism sectors, i.e. sectors that render it more vulnerable to external factors such as foreign tourism numbers and mining commodity prices

The Local Economic Development (LED) Strategy of Thaba Chweu Local Municipality (TCLM) has identified four priority areas including:

- Tourism Regeneration and Integration
- Development of Agriculture sector and Value Chain
- Business Development with a focus on SMMEs and BEE
- Creating an enabling Environment

Interested and affected Parties[22]

The stakeholder consultation process was initiated with the following steps:

- Identification of stakeholders
- In accordance with GNR982 Section 41(2) (a-b) a site notice was developed and placed at six locations, in order to inform surrounding communities and adjacent landowners of the proposed project, the site notices were placed on (05 July 2019) and at visible locations close to the site
- Key stakeholders, who included the following sectors, where directly informed of the proposed development by e-mail and fax through the submission of the Background Information Document and Registration Sheets:
    - Authorities
    - Municipalities
    - Residential Associations
    - Non-governmental organisations
    - General Public
    - Parastatals / Service providers, and
    - Adjacent Landowners
- In accordance with GN R982's Chapter 6, Regulations 41(2)(c) an advert was placed in the Lowvelder Newspaper on 05 July 2019

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

- Distribution of notification letters to key stakeholders via email and fax (where contact data is available);
- Initial Focus Group Meetings (FGM) were held during the first round of consultation with key stakeholders (10 April 2019 and 15 May 2019)
- Site visit and Focus Group Meeting was held on 31 July 219
- Public Open Day where all individuals or groups interested in, or potentially affected by the proposed project were invited to attend.

[22] Final Scoping Report, August 2019, Batho Earth Environmental Consulting

- Community meetings with representatives from Darks Gully, Browns Community and Schoonplaas/Newtown.

The public participation process produced certain specific comments and questions regarding the planned rehabilitation of the Theta Hill Project. Kindly refer to Table 4-15 below for a depiction of said comments as well as responses from the specialist team.

Table 4-15: I&AP comments and responses

COMMENT	ISSUE / RISK	ACTION / INFORMATION OUTSTANDING
When will rehabilitation start? (MTPA)	Rehabilitation process	Rehabilitation will follow a phased approach, starting already in the pre-mining period when red data species will be salvaged and relocated or maintained in a nursery for future transplanting. It is suggested that trials for revegetation are run on various growth mediums and should start as early as possible. Apart from the above, a progressive rehabilitation approach is suggested, which should start with preparations as soon as year 2 of operations. Pre-mining / construction: E.g. setting up of nursery. Training of locals or other workers involved to be indicated. Trials to be done on recommendations made for rehabilitation to start immediately during construction phase.
Request MTPA: A cost analysis for the rehabilitation of all the disturbed areas that include both the old and the new terrace mining areas. A complete rehabilitation plan needs to be commissioned	Cost analysis	Financial provisioning will be included for the amendment application along with the associated rehabilitation plan. Refer to section 10.
Grassland systems are notoriously difficult to rehabilitate to their original biodiversity state (k2c)	Grassland rehabilitation	Rehabilitation strategies were developed along with ecologist and by incorporating best practices in restoration ecology.
It is critical for SAFCOL to understand and comment on TGME's rehabilitation plan	Rehabilitation liaison	The Rehabilitation Plan will be made available to all registered interested and affected parties, including SAFCOL, for review and comment.

COMMENT	ISSUE / RISK	ACTION / INFORMATION OUTSTANDING
Would the stability of the soil during the construction, operation and decommissioning phased be assessed	Soil stability	Monitoring of soil stability is recommended as this is crucial for successful rehabilitation. Monitoring to be done – to be included as part of the EMP.
A rehabilitation plan must be submitted where the pits are backfilled and free drained (DWS / SAPPI SAFCOL)	Rehabilitation plan details	Refer to section 6.2.
Rehabilitation Plan must address old impacts as a separate section	Rehabilitation plan details	The Rehabilitation Plan focusses on the environmental authorisation amendment application for the Theta Hill Project. Further aspects fall outside of the scope of work for this application.
Budgets allocated to remedial action associated with mitigation of socio-ecological impacts, as well as Post Closure rehabilitation	Rehabilitation plan details and funding	Refer to section 10.
There is concern about the operational and post closure management of pits and PCDs. Filling up and overflowing may cause pollution of the receiving environment and vulnerable water sources.	Operational and post-closure	Clean water channels will be constructed on the upslope side of the pits. The purpose of the clean channels will be to divert clean runoff around the pits and into the nearest watercourse. Energy dissipation measures will be employed along steep sections as well as at the exits of the channels. This will remain in place during operations and post-closure. The lowest section of the pit will be operated as a sump, into which all dirty water runoff will report. Water from the pit sumps at the Browns and Theta Hill pits, will be pumped and stored in the Wishbone PCD, whilst at the Iota Pit, water from the sump will be pumped to the Iota PCD. Silt traps, which can be desilted regularly, will be installed to capture any siltation within the dirty water system. Water levels in PCD's will be monitored and maintained to ensure that sufficient freeboard is always available. The PCD's will remain in place until the rehabilitated WRD's and pit areas are stable, and the risk of siltation or dirty water runoff is removed.
The calculation of the quantum included an amount of R7,322,663.52 for	Rehabilitation plan details and funding	The items covered under 8 (C) are the Wishbone PCD (2.45ha), the Iota PCD (8.33ha) and the Balancing Dam (3.35ha). The allocation allows for

COMMENT	ISSUE / RISK	ACTION / INFORMATION OUTSTANDING
the rehabilitation of processing waste deposits and evaporation ponds (polluting potential) for a 14.13ha area. More information concerning this matter was requested, but no response yet has been received. If the rehabilitation relates to the historical Blyde River tailings dumps, the activities will most likely trigger a separate S102 Amendment of MR 83 and cannot be performed under the current application. Little provision has been made for water management. It is an essential activity which must be quantified.		the decommissioning and rehabilitation of these facilities at closure.

4.4 Mine Plan and Schedule[23]

Site establishment is planned to commence in 2021, with production planned to commence thereafter. The mine is to exploit the orebody with open pit mining conducted by the modified terrace mining method. The processing plant is planned to be commissioned in Q4 2020 or Q1 2021.

The reefs that will be mined at the three pits are the Beta, Upper Theta, Lower Theta, Bevetts, Rho and Shale Reefs. Refer to Figure 4 below for the Life of Mine plan per pit.

[23] Mining Work Programme – Submitted in support of an application for an amendment to a Mining Right- Minxcon – (MP) 30/5/1/2/2/83MR

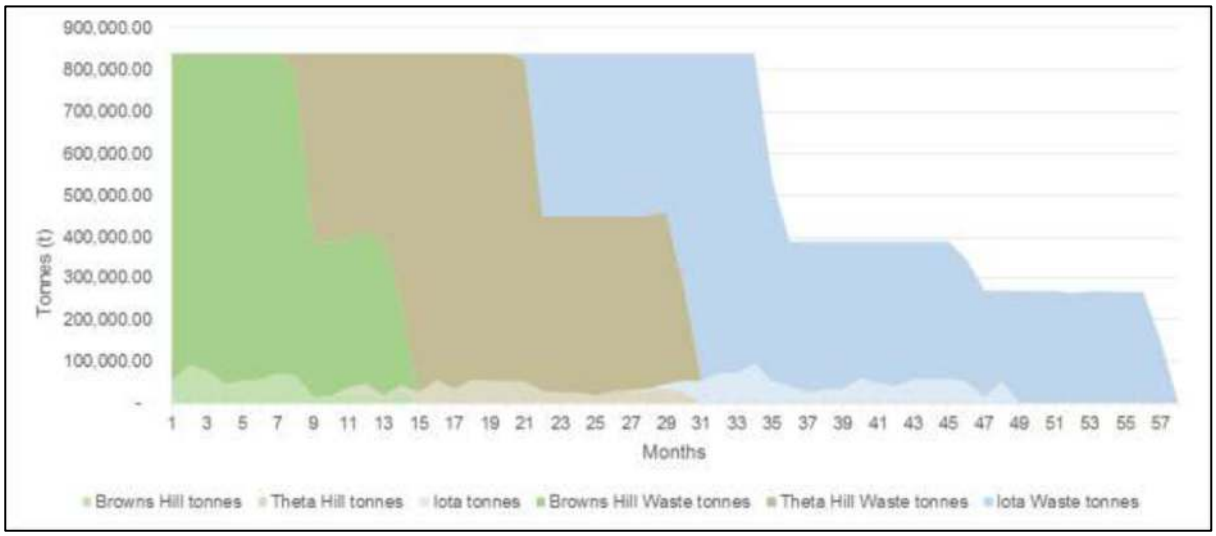


Figure 5: Life of Mine Plan per pit (source: Theta Project Feasibility Study – 4b. Mining Engineering,

5. Risk Assessment Findings

5.1 Risk Assessment Methodology[24]

The significance of all the identified impacts on the various environmental components was determined using the approach outlined below.

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

Table 5-1 Status of Impact

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

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

Table 5-2 Extent of Impact

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

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

Table 5-3 Duration of Impact

Rating	Description	Quantitative Rating
Low	Short term; Quickly reversible; Less than the project lifespan; 0 – 5 years	1

[24] Final Scoping Report, August 2019, Batho Earth Environmental Consulting

Medium	Medium term; Reversible over time; Approximate lifespan of the project; 5 – 17 years	2
High	Long term; Permanent; Extends beyond the decommissioning phase; >17 years	3

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

Table 5-4 Probability of Impact

Rating	Description	Quantitative Rating
Improbable	Possibility of the impact materializing is negligible; Chance of occurrence <10%	1
Probable	Possibility that the impact will materialise is likely; Chance of occurrence 10 – 49,9%	2
Highly Probable	It is expected that the impact will occur; Chance of occurrence 50 – 90%	3
Definite	Impact will occur regardless of any prevention measures; Chance of occurrence >90%	4
Definite and Cumulative	Impact will occur regardless of any prevention measures; Chance of occurrence >90% and is likely to result in cumulative impacts	5

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

Table 5-5 Intensity of Impact

Rating	Description	Quantitative Rating
Maximum Benefit	Where natural, cultural and/ or social functions or processes are positively affected resulting in the maximum possible and permanent benefit	+5
Significant Benefit	Where naturel, cultural and/ or social functions or processes are altered to the extent that it will result in temporary but significant benefit	+4
Beneficial	Where the affected environment is altered but natural, cultural and/ or social functions or processes continue, albeit in a modified, beneficial way	+3
Minor Benefit	Where the impact affects the environment in such a way that natural, cultural and/ or social functions or processes are only marginally benefited	+2
Negligible Benefit	Where the impact affects the environment in such a way that natural, cultural and/ or social functions or processes are negligibly benefited	+1
Neutral	Where the impact affects the environment in such a way that natural, cultural and/ or social functions or processes are not affected	0
Negligible	Where the impact affects the environment in such a way that natural, cultural and/ or social functions or processes are negligibly affected	-1

Minor	Where the impact affects the environment in such a way that natural, cultural and/ or social functions or processes are only marginally affected	-2
Average	Where the affected environment is altered but natural, cultural and/ or social functions or processes continue, albeit in a modified way	-3
Severe	Where natural, cultural and/ or social functions or processes are altered to the extent that it will temporarily cease	-4
Very Severe	Where natural, cultural and/ or social functions or processes are altered to the extent that it will permanently cease	-5

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

Table 5-6 Impact Magnitude and Significance Rating

Impact	Rating	Description	Quantitative Rating
Positive	High	Of the highest positive order possible within the bounds of impacts that could occur.	+ 12 – 16
	Medium	Impact is real, but not substantial in relation to other impacts that might take effect within the bounds of those that could occur. Other means of achieving this benefit are approximately equal in time, cost and effort	+ 6 – 11
	Low	Impacts is of a low order and therefor likely to have a limited effect. Alternative means of achieving this benefit are likely to be easier, cheaper, more effective and less time-consuming	+ 1 - 5
No Impact	No Impact	Zero Impact	
Negative	Low	Impact is of a low order and therefore likely to have little real effect. In the case of adverse impacts, mitigation is either easily achieved or little will be required, or both. Social, cultural, and economic activities of communities can continue unchanged.	-1 - 5
	Medium	Impact is real, but not substantial in relation to other impacts that might take effect within the bounds of those that could occur. In the case of adverse impacts, mitigation is both feasible and fairly possible. Social cultural and economic activities of communities are changed but can be continued (albeit in a different form). Modification of the project design or alternative action may be required.	-6 - 11

	High	Of the highest order possible within the bounds of impacts that could occur. In the case of adverse impacts, there is no possible mitigation that could offset the impact, or mitigation is difficult, expensive, time-consuming or a combination of these. Social, cultural and economic activities of communities are disrupted to such an extent that these come to a halt.	-12 - 16

5.2 Risk Indicators

The following indicators, that are most sensitive to potential risks, have been identified. The monitoring of such risks will be crucial with a view to informing the success and sustainability of rehabilitation and remediation activities:

- Geotechnical stability related to created and altered landforms;
- Surface stability (i.e. erosion control);
- Surface water runoff control and sedimentation management;
- Functional cover system design (layered growth medium for re-establishment of vegetation);
- Alien and invasive species management and control;
- Seasonality of revegetation efforts and successful establishment;
- Visual appearance and sense of place objectives; and
- Geochemical stability.

5.3 Conceptual Closure Strategy

The conceptual closure strategy provides a framework for developing an approach towards closure and rehabilitation requirements over the entire life-of-mine. The strategies are largely dictated by the potential impact on biodiversity, the sensitivity of the Blyde River system and the potential loss in localised ecosystem services as a result of the proposed mining practices. For any closure strategy to qualify, it should fit within the regulatory framework, adhere to the closure objectives and be practically achievable. Such strategies shall be based on site specific conditions and industry best practices that is available at the time.

The rehabilitation hierarchy (adopted from the Queensland Government Department of Environment and Science (2014), illustrated in Figure 6) describes different levels of rehabilitation from a *do-nothing* approach, to an *avoid-any-disturbance* approach. The avoidance scenario was extensively explored during the mine's design phase, and it resulted in partially excluding certain Critical Biodiversity Areas (CBA), however certain activities within the CBAs are simply unavoidable if feasible mining were to take place. Therefore, the next level of rehabilitation should be explored which involves the attempt to restore the ecosystem/s and reinstate certain functions and ecosystem services.

It is acknowledged that the proposed terrace mining activity will transform many of the biophysical characteristics of the landscape at a local scale. The most noteworthy will be the topography which will alter the surface hydrology, soils and geology for example. The mining activity will result in a permanent

rearrangement of the biophysical elements. Where backfilling is planned, stability of the artificial landform should be prioritised in conjunction with the planning of the topographic profile to facilitate effective surface water drainage and a vegetation cover. It can be expected that there will be a permanent altered landform which requires aftercare and maintenance for a period after closure.

If restoration is clearly not an achievable objective, the following strategies should be explored which entail development of an alternative land-use or land cover with increased land capability or merely the re-vegetation of the disturbed area in order to achieve some form of surface coverage and stability.

Fully restoring the entire disturbed area's biophysical elements as a closure strategy is not considered practically achievable, mainly due to the permanently altered geology and topography over parts of the mining site. Partial reinstatement of an altered biophysical scenario can be accomplished through careful mine planning/design, with closure in mind. The success of this closure strategy can only be accurately assessed during a detailed monitoring period.

Developing a lower value land use or land capability is the least accepted closure outcome. If this route is the only viable option, the low value land use and land capability has to be accepted by the end user and stakeholders. All risk indicators should still be adequately addressed in this level of rehabilitation.

The last option in the rehabilitation hierarchy should be avoided at all cost as this does not comply with environmental legislation and exaggerated risks may accumulate to catastrophic scenarios.

The conceptual closure strategy recognises a holistic approach to management and monitoring of all the phases of the mine. Closure is considered the longest phase and should therefore receive a fair level of acknowledgment. This conceptual closure strategy does not exclude future changes to its approach to echo advancements in knowledge, skill or technology.

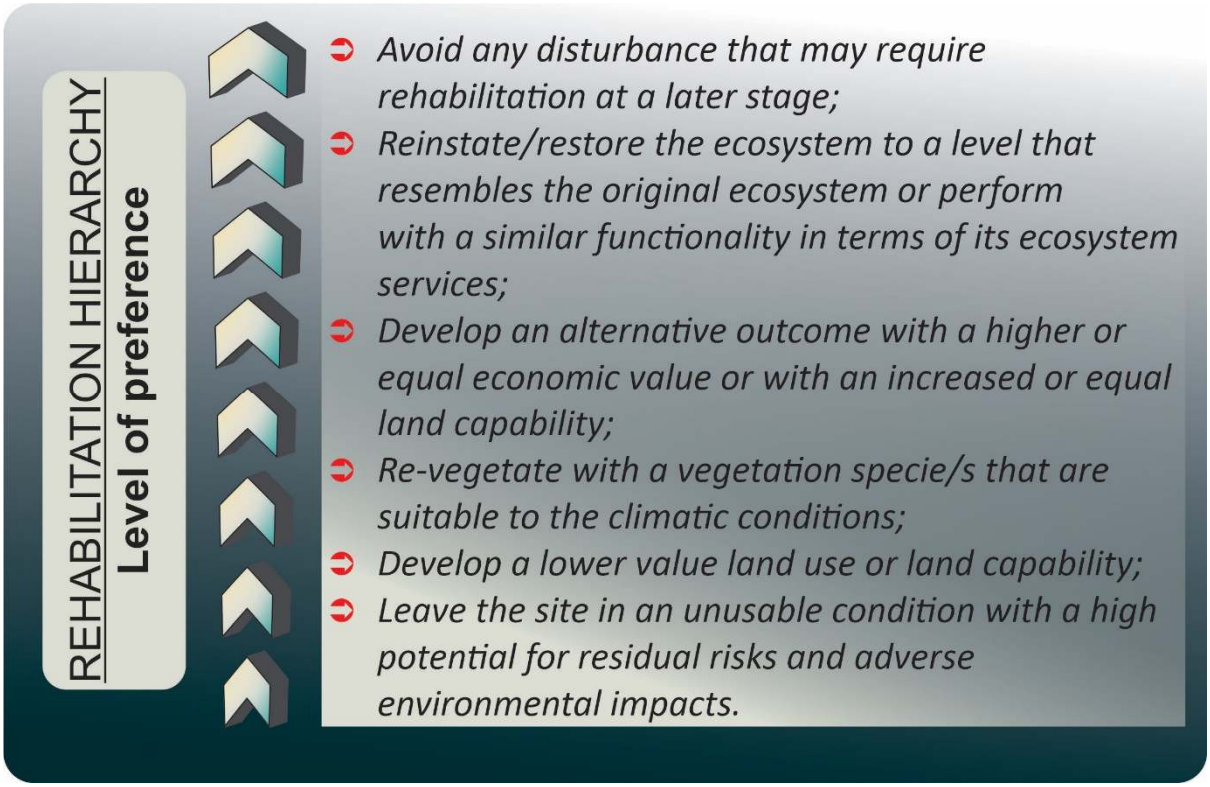


Figure 6: Rehabilitation hierarchy

6. Rehabilitation & Closure Design Principals

6.1 Legal and Governance Framework

On 20 November 2015 (amended in October 2016) in Government Gazette 39425, Notice Number GN R1147, the Minister of Environmental Affairs published the Regulations Pertaining to Financial Provision for Prospecting, Mining, Exploration and Production Operations (referred to as the Financial Provisioning Regulations, 2015) which came into effect on the date of publication in the Gazette. These Regulations repeal and replace the previous Mineral and Petroleum Resources Development Act, 2002 (MPRDA) regulations and introduce a far more onerous and detailed regulatory system in respect of financial provisions related to the extractives industry.

Under the new Regulations, an applicant or holder of a right or permit is required to make financial provision for rehabilitation and remediation on an annual basis (termed concurrent rehabilitation), for decommissioning and closure activities at the end of the operations, and for remediation and management of latent or residual environmental impacts which may become known in the future, including the pumping and treatment of polluted or extraneous water.

Determining the financial provision requires the preparation of three separate documents:

- An annual rehabilitation plan describing measures and costs of annual rehabilitation;
- A final rehabilitation, decommissioning and mine closure plan describing measures and costs for final rehabilitation and closure; and
- An environmental risk assessment report describing measures and costs for the remediation of latent or residual environmental impacts.

An applicant or holder of a permit or right must determine and make financial provision to guarantee the availability of sufficient funds for the rehabilitation and remediation of adverse environmental impacts to the satisfaction of the Minister responsible for Mineral Resources (the Minister).

The applicant or holder of a right or permit must ensure that, at any given time, the available funds equal the sum of the actual costs of implementing the plans and reports for a period of at least 10 years forthwith.

The applicant or holder must make financial provision by one or a combination of a:

- Financial guarantee, which must comply with the format requirements set out in Appendix 1 to the regulations.
- Deposit into an account administered by the Minister; or
- A contribution to a trust fund established in terms of applicable legislation. Such contribution to a trust fund may only be in relation to financial provision made for the remediation of latent or residual environmental impacts, and not for annual rehabilitation or final rehabilitation, decommissioning and closure of the operation. This financial instrument may also not be used by an applicant/ holder for a mining permit in terms of the Mineral and Petroleum Resources Development Act 2002 (MPRDA). Furthermore, such contribution to a trust fund must be established by a deed of trust and must comply with the requirements set out in Appendix 2 of the regulations.

The general requirements of financial provision include, but are not limited to:

- The determination, review and assessment of the financial provision must be undertaken by a specialist;
- The financial provision liability may not be deferred against assets at the mine closure or the mine infrastructure salvage value;
- Where the making of or adjusting of the financial provision had been undertaken in terms of a financial guarantee, such undertaking must be accompanied by a verification of registration of the financial institution.
- Where the financial provision was undertaken by a deposit into an account administered by the Minister, if any interest is earned on the deposit, such interest must be used to defray bank charges and thereafter form part of the financial provision.
- Where the financial provision applies to the remediation of latent or residual environmental impacts which may become known in the future, upon the issuance of the Closure Certificate in terms of the MPRDA, such financial provision must be ceded to the Minister.

The holder of a right or permit must ensure that a review is undertaken in respect of the requirements for the financial provision made for annual rehabilitation, final rehabilitation and remediation of latent or residual environmental impacts.

Thereafter the holder must ensure that the adequacy of the financial provision is assessed and any adjustments to the financial provision are made accordingly. The results of the assessment must be audited by an independent auditor and submitted to the Minister for approval. The submission of the audit report must be accompanied by a declaration signed by the independent auditor reconciling the financial provision submitted for approval.

6.2 Closure Vision, Goals, & Objectives

The desired closure vision for TGME (83MR) Environmental Authorisation amendment application is to rehabilitate all the disturbed mining areas to an environmental condition that is aligned with best practice standards and, as a minimum, vegetate all disturbed areas with a resilient vegetation cover that can withstand normal environmental stresses.

The goal is to initiate the recovery of the disturbed areas and accelerate an ecological trajectory/pathway towards a pre-defined reference condition within an achievable timeframe. This requires a reconstructed system that aims to be functional, resilient and regenerative with respect to its established vegetation composition, achieve structural integrity (geotechnical, erosional and geochemical stability), to a point where it can be reintegrated with the larger context.

Objectives for mine closure should be suited to its context, practically achievable based on best practices and fit within the regulatory framework. As a minimum, four general closure objectives must be achieved namely:

- The post mining landscape must be safe for humans and animals over a long term;
- The post mining landscape must be stable (geotechnically, erosional and geochemically) and offer long-term resistance to normal environmental stresses and disturbances;
- Residual impacts, as a result of the mine, must not cause harm or pollute the environment in and around the mining footprint; and

- The post mining landscape must be vegetated to sustain an agreed post-closure land use or reinstate pre-determined land capabilities.

The rehabilitation vision, goal and objectives provide a framework for rehabilitation targets. It provides a reasonable basis for site-specific rehabilitation objectives and relinquishment criteria. These should also translate to an evaluation program for measuring the level of successes or failures, to be implemented as part of the monitoring phase. The ability to specify closure objectives is dependent on the accuracy and quality of both the environmental data collected at the time and the available engineering information. Assumptions and limitations are discussed in Section 11.

The specific objectives and targets to be achieved are directly related to the attainment of the post-mining land-use objective. Specific rehabilitation objectives for each domain (project components or issues) will be developed in the following sections.

6.3 Closure and Post Closure Period

Rehabilitation and closure activities should commence at the onset of the proposed project. Initial activities should start during the site establishment and construction phase and be maintained throughout the life of the proposed project.

The rehabilitation plan has been designed to reflect concurrent rehabilitation processes and should therefore be undertaken throughout the life of the project and should include a post-closure maintenance and monitoring programme as detailed in section 8.5.

7. Post Mining Land Use

7.1 Post mining land use categories

In order to logically address variations in post mining land uses that may be brought about by different closure objective and actions, the following categories will be discussed:

- Surface infrastructure
- Transportation infrastructure
- Equipment and electrical infrastructure
- Waste Rock Dumps
- Final voids, terrace cuts and/or pits
- Dams
- Stockpiles

7.2 Post mining land use objectives

The post mining land-use objective relates to the rehabilitation hierarchy illustrated in Figure 6. Complete avoidance or full restoration are not considered achievable objectives for the post mining landscape. Rather, a combination of the following can be implemented namely:

- Developing an alternative outcome with a higher or equal land capability;
- Re-vegetation with suitable species and
- Developing a lower value land use or land capability.

These objectives may adapt based on the practical implementation and knowledge, or research outcome at the time. For these land-uses to realise, the four primary closure objectives should be met (refer to Section 6). Specific objectives for each of the categories are described below:

- All surface infrastructures and their footprints shall be rehabilitated to a condition where:
    - All structures and their foundations are dismantled and removed;
    - The infrastructure sites are free of pollutants or sources of residual or latent environmental impacts;
    - Create a surface condition that is suitable for vegetation establishment and establish a vegetation cover with the main objective to accelerate an ecological trajectory towards a pre-defined reference condition; and
    - The rehabilitated sites interact with adjacent ecosystems in terms of organism migration, nutrient cycles and hydrological connections.
- The perimeter fence (approximately 9.2km) and security features (specifications unavailable at the time of reporting) should remain intact and active until all the terrace cuts/pits and WRDs are declared safe for humans and animals and until such time the Applicant does not require the security or access control. At the point when the above criteria are met, all features of the fence should be removed, and the disturbed surfaces rehabilitated through:
    - Preparation of the soils to form a seed bed; and

- Create a surface condition that is suitable for vegetation establishment and establish a vegetation cover with the main objective to accelerate an ecological trajectory towards a pre-defined reference condition.

- Approximately 5.9km haul roads and an indeterminate length of internal roads will be constructed in the mining area. All rehabilitated roads shall be:
  - Profiled to restore the natural topography and hydrological patterns; and
  - Capped with a suitable growing medium and vegetated with the main objective to accelerate an ecological trajectory towards a pre-defined reference condition.
- Those roads that will remain after closure as a result of pre-closure negotiations with landowners and stakeholders, shall be sufficiently upgraded to minimise the impacts of erosion and sedimentation on local water courses via the implementation of adequate stormwater management systems. Transfer of maintenance agreements with regards to the road surface and stormwater management infrastructure, should be formalised. Residual impacts and environmental risks should be assessed at that time to have the best basis for decision making, especially for those transport infrastructures that traverses sensitive ecosystems;
- The low water bridge over the Blyde River shall be removed and rehabilitated to:
  - Restore the natural flow path of the river;
  - Prevent scouring of the river profile at that particular point and downstream; and
  - The river embankments shall be revegetated with indigenous aquatic and riparian species that is representative of the vegetation in the river system.
- Pre-closure negotiations with landowners/stakeholders may find a beneficial use for the low water bridge. The health and integrity of the aquatic ecology and hydrological system should be considered as the primary stakeholder when making a final decision. This will require scrutiny of all the monitoring information and interpretation of the data by a qualified professional;
- Pumps and pipelines (dewatering and supply pump columns) are some of the equipment that will be installed at PCDs, pits etc., to manage water levels and balances across the site. Pumping equipment that manages potentially polluted water, should remain active after decommissioning until all risk of pollution is abated. Ultimately, when relinquishment criteria with regards to sediment loads, water quality and -balances have been achieved, this equipment shall be removed, and the sites rehabilitated by taking the necessary action to:
  - Demolish structures such as pump mountings etc. and remove foundations;
  - Restore the topography to blend in with the natural surroundings;
  - Capped with a suitable growing medium and vegetated with the main objective to accelerate an ecological trajectory towards a pre-defined reference condition.
- An overhead 6.6kV powerline shall be erected from the existing substation near Pilgrims Rest to the existing processing plant. This section of approximately 2.3 km will typically consist of gum pole structures supporting the power cables (detail design to be completed). Removal of the conductors, poles, foundations and other ancillary components shall be initiated when the powerline becomes redundant in terms of its use.
- The waste rock dumps (WRD) will be permanent landforms and must be designed and constructed with closure in mind. Structural profiling and contouring should occur in-situ as far as practically possible to minimise earthworks at a later stage. This approach should develop a landform that:
  - Blends with the natural topography by avoiding sharp corners, straight lines and unnatural intersections with the landscape;
  - Provides geotechnical, erosional and geochemical stability;

- Manages surface water in an effective way to facilitate long-term functionality;
- Is capped with a cover system that consists of a growth medium that can support a healthy vegetation cover;
- Is seeded and planted with indigenous vegetation with the main objective to accelerate an ecological trajectory towards a pre-defined reference condition; and
- Reduce the necessity for extended aftercare and maintenance actions by ensuring long-term stability and establishing a regenerative and self-sustaining ecology.

- The mine design suggests that partial backfilling will occur in parts of the pits. Some areas may remain as open cuts and pits that should be rehabilitated to achieve the following core objectives:

  - The terrace cut, in specific the high wall, must be made safe and stable as far as practically possible, minimising risks to the health and safety of humans and animals;
  - Where in-filling is suggested, the slopes should be stable and at a gradient that is accessible for equipment to perform rehabilitation;
  - Minimise the scale and height of the high wall through profiling, partial backfilling and by implementing sound stabilisation methods;
  - Profile the landform within reasonable and practical limits to merge with the natural terrain. A landform design should inform the operational phase to minimise actions at the closure phase;
  - Surface water should not accumulate in voids unless it can be demonstrated that it is beneficial to the environment, stakeholders or local industries and that no environmental impact may originate from it for example salinization, unacceptable catchment interference or a safety hazard. Retention of water should be subjected to the approval of the necessary licences;
  - Is capped with a cover system that consists of a growth medium that can support a healthy vegetation cover;
  - Is seeded and planted with indigenous vegetation with the main objective to accelerate an ecological trajectory towards a pre-defined reference condition;
  - Reduce the necessity for extended aftercare and maintenance actions by ensuring long-term stability and establishing a regenerative and self-sustaining ecology.

- All pollution control dams, balancing dams and associated surface water management structures (including diversion channels, silt traps etc.) shall remain actively monitored and maintained during the operational and closure phases and may only be decommissioned once all risk of pollution from the terrace cuts/pits and WRD are effectively dealt with. Once residual and latent risks have been sufficiently managed, the dams, diversion channels etc. shall be decommissioned and rehabilitated by:

  - Removing all structures such as silt traps, foundations, pump mountings, liners, etc., and dam walls;
  - Profiling and restoring the natural topography and hydrological patterns as far as practically possible, thereby reinstating a natural functioning and free-draining system that provides ecologically stable environments;
  - Cap with a suitable growing medium that is resistant to erosion in the early stages of vegetation establishment; and
  - Is seeded and planted with indigenous vegetation with the main objective to accelerate an ecological trajectory towards a pre-defined reference condition;

- Three topsoil stockpile areas (12.8 ha in total) and strategic ore stockpiles (location and size unknown at the time of reporting) are proposed. All topsoil stockpiles should be used in rehabilitation by spreading it over disturbed areas and vegetating it. It is assumed that strategic ore stockpiles will be sold or processed, leaving the footprint to be rehabilitated. All stockpile footprints shall be rehabilitated to a condition where:

- The shaping and profiling are done to blend with the natural topography;
- The rehabilitated sites are resilient to normal ranges of environmental stresses and or disturbances;
- The rehabilitated sites can sustain itself structurally and functionally;
- The surface is capped with a cover system that consists of a growth medium that can support a healthy vegetation cover;
- The surface is seeded and planted with indigenous vegetation with the main objective to accelerate an ecological trajectory towards a pre-defined reference condition; ; and
- The rehabilitated sites interact with adjacent ecosystems in terms of organism migration, nutrient cycles and hydrological connections.

Table 7-1: Project components estimated area value

Project component	Estimated Area (m²)
Haul roads	96 969
Contractors site	18 234
Balancing dam	38 976
Topsoil stockpiles	128 286
Iota Pit	255 288
Iota Northern WRD & Backfilling	441 460
Iota Southern WRD	166 609
Iota WRD PCD	83 258
Browns Pit	174 521
Theta Pit (Cumulative)	200 370
Wishbone WRD	236 457
Wishbone WRD PCD	27 406
Clean water channels	43 043
Dirty water channels	91 555

Figure 7: Proposed mine layout courtesy of Minelock

Figure 8: Proposed mine layout for Iota pit

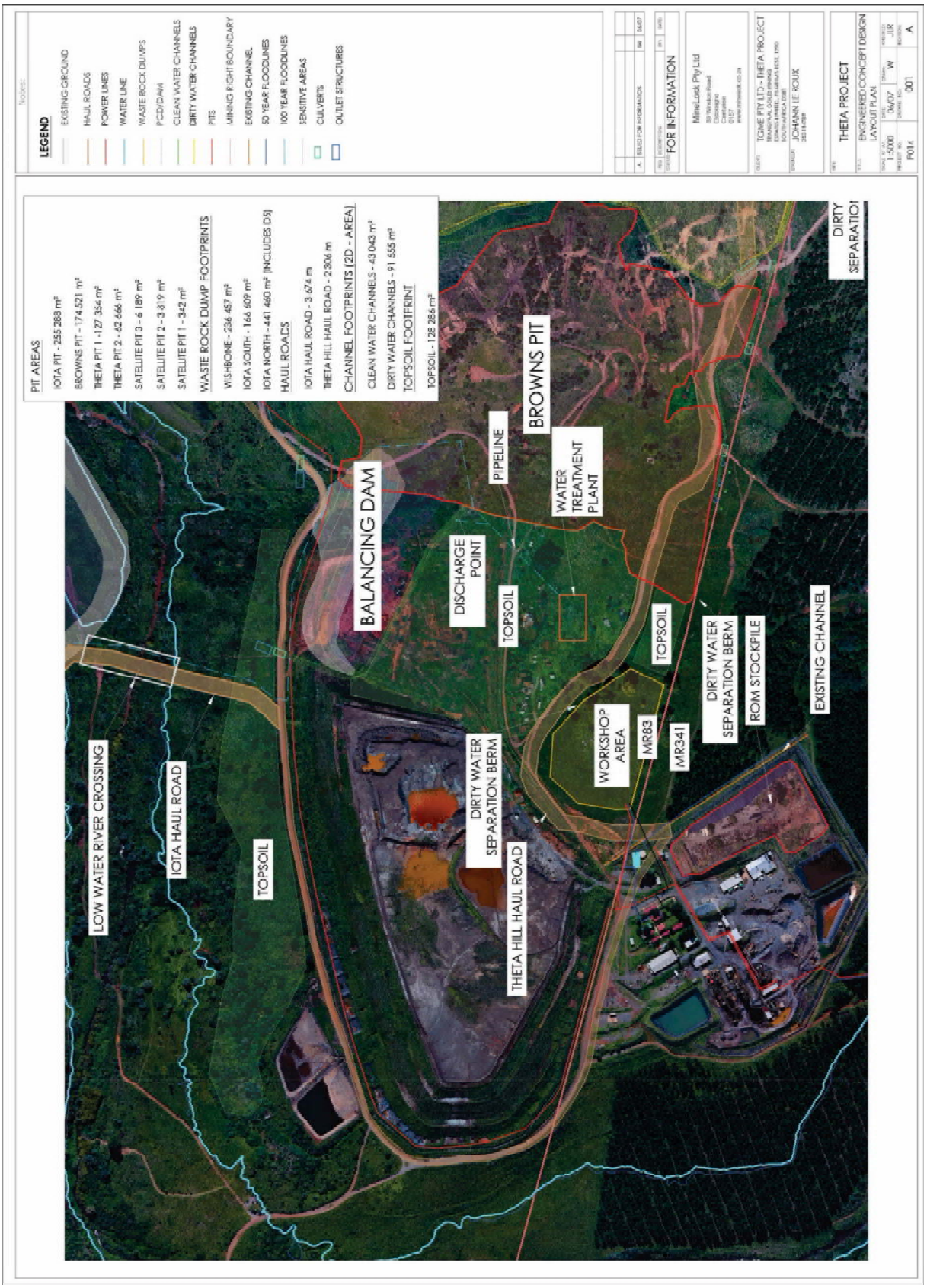


Figure 9: Proposed mine layout for Browns pit

Figure 10: Proposed mine layout for Theta pit

8. Rehabilitation and Closure Action Plan

8.1 Integrated and Holistic Approach

An integrated, holistic approach towards rehabilitation and closure is recommended. This is defined as an approach that is closure-orientated and should have its commencement in the pre-feasibility phase of the mine. It should influence all aspects of the mine's design, construction, operational and decommissioning phases, and ensure that it is aligned with the closure vision and objectives. Such an approach generates pre-emptive solutions that can result in a positive, pro-active action plan implementation for sustainable rehabilitation and closure.

8.2 Design and Construction Phase

Search and rescue program

As one of the first pre-mining site preparations, a search-and-rescue program should be implemented to salvage fauna and flora species of conservation concern prior to the commissioning of the mine. This should be executed for all potentially disturbed sites. Those species that occur within the mining perimeter but outside of the actively mined areas, should be identified and protected from accidental disturbance through clear marking or fencing of those sites for the entire duration of the mining activity. A search-and-rescue program is subject to the necessary permitting as well as the identification of a suitable relocation site or temporary holding facility.

On-site nursery

It is recommended that an on-site nursery be established which can harbour some/all of the salvaged plant species for propagation purposes and for future transplanting as part of the rehabilitation process. A site should be identified during the design and construction phase that is suitable for the size of the nursery and has access to water for irrigation purposes. The expertise of ecologists and horticulturalists should be acquired to recommend specific nursery practices.

Topsoil stripping and storing

Stripping and storing of the O- and A-horizon (i.e. topsoil) on the proposed mining footprints, is considered essential. A complete topsoil management program is required to regulate the depth of stripping on each of the areas in order to prevent mixing with the underlaying sub-soil layers. Ideally, topsoil should be stripped and directly applied as part of a progressive rehabilitation strategy, but in some instances, it is required to be stored for longer periods. A topsoil management program should address:

- The ideal location for short-and long term storing of the topsoil (short term < 6 months, long term > 6 months);
- The appropriate height of the stockpiles to maintain healthy soil chemistry, typically 2-3m;
- Erosion control measures for the duration of storage;
- Revegetation of the stockpile to encourage sub-surface soil microbial activities; and
- Alien and invasive control for the entire time of storage.

Re-vegetation trials

Re-vegetation trials can be invaluable in establishing more practical, successful rehabilitation methods, especially considering the location that falls within a CBA. Ideally, the re-vegetation trial should commence as soon as possible,

preferably at the same time as the search-and-rescue program commences and before active mining proceeds. However, these trails should continue as part of the progressive rehabilitation program.

Trial sites should be identified, potentially on previously disturbed areas near the project site that represent a near identical scenario, or on the first batter and benches from the WRDs. The trials should be purposed to test various growth mediums on different slope gradients in order to monitor the success of vegetation establishment, thereby developing achievable targets with respect to, vegetation coverage, erosion control and species diversity. The data should translate into the formulation of an appropriate cover system, erosion control measures and planting regimes.

Such trial programs should be done as scientific as possible and properly documented by a knowledgeable person in order to achieve the most value from the results.

8.3 Operational Phase

Landform design

A conceptual landform design for the WRD and final voids, i.e. the terraced cuts and pits, should be done prior to its construction in order to facilitate in-situ placing, contouring and grading with closure in mind. Traditional waste material design (i.e. terraced cuts and overburden dumps), proposes a geometric topography with linear gradients, separated with benches, which results in an angular, terraced appearance. Such rectilinear landforms often require long-term maintenance to manage erosion and surface stability due to its unnatural configuration. Surface instability is one of the direct causes of poor vegetation establishment.

Ideally, the design of the WRD and final voids, should aim at adhering to a three-dimensional shape that imitates a mature landform which has been subjected to geomorphic processes under existing environmental conditions (examples illustrated in Figure 11 & Figure 12, adopted from Mart'n Duque, et al (1998)). Analogues from the surrounding landscape should inform the final design of the new landform and feed into the following actions:

- Reconfiguration of the high wall, embankments and floor with stability as primary goal, but also to generate achievable visual harmony with the natural topography, for example avoiding sharp corners;
- Reconstruction of surface hydrology by allocating collection areas and flow paths to manage a degree of periodic flooding. In order to achieve this goal, the typical bench and batter profile may be beneficial as a measure to control stormwater runoff. The bench may be a surface water retention area that collects water at a specific point, and releases it through a controlled management system. This approach could be developed further in conjunction with a qualified waste rock and pit specialist;
- Developing biodiversity hotspots by providing a diversity of microhabitat networks and features. This may include, for example, depressions, boulder piles, rock faces etc., and should be considered along with planting schemes.

Landscape evolution can be predicted with software that models sheet, rill and gully erosion, and can be confirmed via trials. It is recommended to run such assessments prior to the final design of the WRD and terraced cuts and pits to limit potential failure.

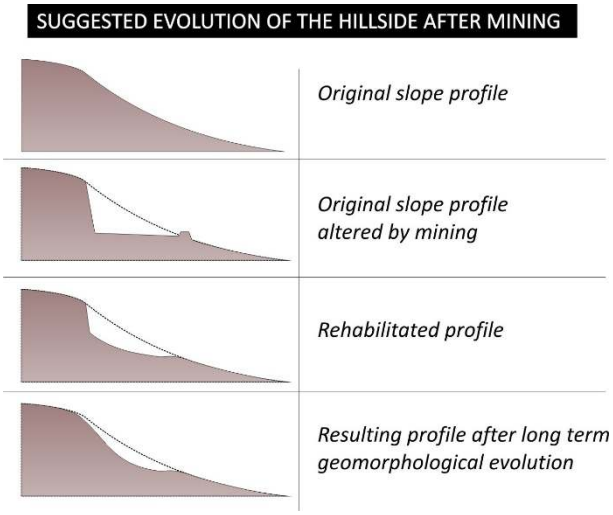


Figure 11: Suggested evolution of the hillside after mining

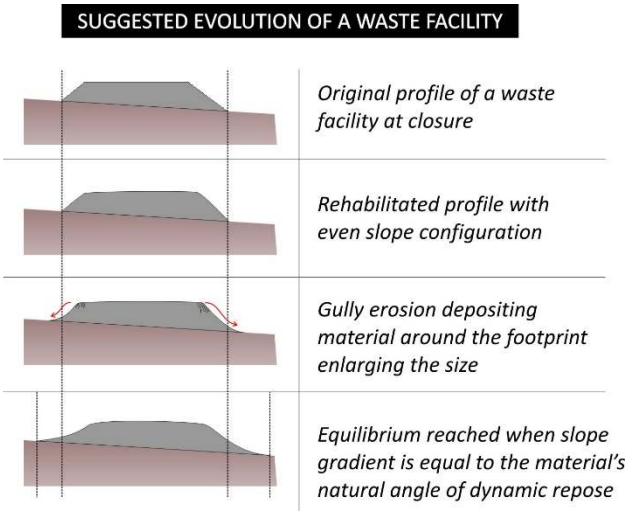


Figure 12: Suggested evolution of a waste facility

Progressive rehabilitation

Progressive rehabilitation is recommended as a management strategy for environmental liability. The mine plan should be cognisant of the rehabilitation objectives and integrate as much of the rehabilitation into its processes, as possible. This will include profiling and grading of the WRD and pits as part of the operations and the phasing of topsoil stripping and placement, to minimise double handling of material. A cover system should be installed immediately after profiling, along with temporary erosion control measure, after which it should be vegetated to limit erosion of the exposed surfaces.

Areas that are left exposed for extended periods should have surface water management structures in place to contain sedimentation until such time that it can be vegetated.

Cover system reconstruction

A relatively thin layer (Average 450-750mm) of soil, classified as oxidic soils, is present on the Iota, Browns and Theta Terrace cut areas, which can be considered as "topsoil", i.e. the O and A horizon (illustrated in Figure 13, Source: New Hope Group (2014)). This should be salvaged prior to mining, and managed appropriately to maintain its viability as a growth medium and cover system[25]. In addition to this, an organic component should preferably be added to increase the carbon content of the cover system that will enhance water absorption. Various sources of organic material can be utilised such as grass/brush cutting mulch, wood shavings or composted material.

[25] "Cover system" refers to reconstructed layer/s over disturbed areas that fulfil specific functions for example, capping acid forming overburden and providing a growth medium for vegetation.

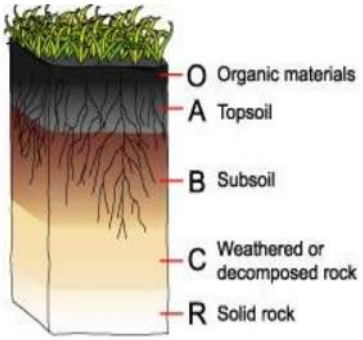


Figure 13: Soil profile description

The design of a suitable cover system should consider the following:

- A barrier layer between the waste material and the rhizosphere (between horizon C & B) if Potential Acid Forming (PAF) material is contained within the WRD. Geochemical test should suggest the thickness and composition of such a layer, if required;
- A reconstructed B-horizon that acts as a subsoil layer which contains a rooting media for deep penetrating root systems and functions as a moisture "store-and-release" layer to sustain plant growth during dry spells;
- An A-horizon layer which consists of a growth medium that has the necessary composition of air, minerals, sand-silt-clay medium and organic matter. It should be well draining (permeability at 10^{-6} to 10^{-8}), but with a sufficient moisture holding capacity. It should be able to support soil biota and a cover of vegetation during normal environmental stress scenarios; and
- An erosion protection layer consisting of a combination of organic-, inorganic material or bio-engineering elements (refer to Section 9.3).

Re-vegetation

The re-vegetation approach should find its basis in closure goal that is to initiate the recovery of the disturbed areas and accelerate an ecological trajectory/pathway towards a pre-defined reference condition within an achievable timeframe. The selection of the preferred vegetation composition should be informed through a comprehensive understanding of the vegetation communities that occur in the local area and comparing that with the type of vegetation communities that can be re-established on the disturbed landscape. Two distinct levels of disturbances are explored:

- **Transformed landforms** – The WRD and terrace cut/pits will transform the topography and result in a new landform that is different in many ways to the original landscape's biophysical elements. Differences include altered slope gradients, aspects, geology and soil structures for example. To rehabilitate these landforms, the altered or new characteristics should be understood, and translate into a rehabilitation strategy that suggests appropriate plant species that can fulfil the intended application.
- **Limited disturbed areas** – This scenario should aim to reinstate the original functionality of the disturbed areas by rehabilitating the topography, growth medium, hydrology and reintroducing indigenous vegetation species in order to blend the rehabilitated area seamlessly into the surrounding landscape by as much as possible.

Successful rehabilitation of other terrace mining projects in the region may have provided valuable techniques on the establishment of vegetation. No such rehabilitation analogues are known for direct comparison and therefore revegetation trials are recommended to formulate practical strategies through applied research. This should be prioritised as soon as authorisation is provided. Methods of re-establishing vegetation could potentially include:

- Re-introducing plant species and soil biota on disturbed sites through the careful handling of stripped topsoil as a growth medium. Where the topsoil is not considered enough or suitable, an alternative medium should be imported as a foundation to healthy plant growth;
- Direct seeding of locally sourced seeds or commercially available seed mixtures, suitable to the climatic region;
- Growing seedlings and cutting for transplanting in the rehabilitated areas;
- Direct transplanting from salvaged plants; and
- Through the creation of irregularities in the surface topography which will result in sub- or micro-habitats for faunal re-colonisation, thereby stimulating natural succession processes.

The following basic procedure for re-vegetation should be implemented, unless research from the trials suggests otherwise:

- Remove all contaminants, foreign material or material that may impede healthy growth from the disturbed site and discard in an appropriate manner;
- If disturbed area is heavily compacted, consider deep ripping or rotavating, parallel to the contour before covering with an appropriate growth medium;
- Ensure that the cover system is placed correctly on the disturbed surface, i.e. in the correct layering and depth as suggested by empirical research or industry best practice;
- Take soil tests to inform additional ameliorations if required;
- Plant a recommended seed mixture of indigenous seeds (Table), or a commercial seed mix, by exercising an appropriate cultivation and planting method (i.e. hand seeding, fine-seed planter or seed spreader). Alternatively, the hydroseeding method may be applied. Whichever method is implemented, ensure even distribution of the seeds at the correct concentration as recommended by a specialist;
- Planting of trees, shrubs and plugs by hand, should be managed and supervised in order to ensure the best planting method is implemented to increase success rates;
- Ensure that the species composition represents various successional stages;
- Install additional erosion control measures where necessary (typically on slopes steeper than 1:3). Erosion control measure may include a range of products or designs, but should be implemented according to the manufacturer's specifications;
- Seeding or planting should be done preferably during the rainy season when soil moisture content is optimal for seed germination and plant growth. If irrigation is provided, selective seeding and planting can occur in other seasons;
- Commence with a weed and alien eradication program soon after planting;
- Protect the rehabilitated site from fires in the early stages of development. Acquire the knowledge of a veld management expert to advise on management strategies to reach a healthy and diverse vegetation community; and
- Continue with monitoring until re-vegetation are successful (refer to Figure 23).

Table 8-1: Recommended grass species for rehabilitation

Priority rating	Grass species	Purpose
High	*Trachypogon spicatus*	Forms dense covering and probably plays an important role in protecting the soil against soil erosion in areas with a high rainfall.
High	*Microchloa caffra*	Plays a very important role in stabilising shallow soil in some areas.
High	*Eragrostis racemosa*	It is valuable for the protection of disturbed shallow soil and eroded areas.
High	*Panicum natalense*	Forms large dense tufts that probably play an important role in protecting topsoil in mountainous grassland from erosion.
High	*Melinis repens*	One of the most well-known pioneer grasses in southern Africa and plays an important role in stabilising disturbed soil.
High	*Diheteropogon filifolius*	Plays an important role to cover and protect topsoil in mountainous catchment areas.
Medium	*Andropogon eucomus*	A very important grass for stabilising disturbed moist soil.
Medium	*Digitaria monodactyla*	It plays an important role in stabilising the soil in mountainous regions with a high rainfall.
Medium	*Setaria sphacelata var. torta*	The rhizomes make this grass an excellent grass to protect disturbed soil from soil erosion.
Medium	*Fingerhuthia africana*	An important subclimax to climax grass in eroded places and plays an important role in stabilising the soil in such areas.
Medium	*Pennisetum sphacelatum*	It plays an important role in stabilising the soil in drainage areas.
Medium	*Aristida congesta subsp. Congesta*	It is a very hardy grass which can stabilise disturbed soil and bare patches under severe conditions. When common, it is a good indicator of veld degradation.
Medium	*Enneapogon scoparius*	A hardy grass and plays an important role in protecting soil in eroded sites.
Medium	*Enneapogon cenchroides*	Very useful as a pioneer grass that can quickly colonise and protect disturbed areas.
Medium	*Aristida canescens*	A hardy perennial grass that can survive exceptionally difficult growing conditions. Useful grass to stabilise eroded places.
Medium	*Agrostis lachnantha*	Valuable grass to stabilise damp soil.
Medium	*Eragrostis curvula*	It is used, often in a seed mix, to re-vegetate exposed soil.
Medium	*Eragrostis inamoena*	Its rhizomes play a very important role in stabilising topsoil in grainage areas, which are particularly susceptible to soil erosion.
Medium	*Leersia hexandra*	Its extended rhizome system plays an important role in protecting wet places against flooding. It is sometime a weed but not a major problem in southern Africa.
Medium	*Sporobolus festivus*	Like Sporobolus stapfianus, it probably plays an important role in stabilising shallow soil and building up a layer of topsoil.
Medium	*Arundinella nepalensis*	Has creeping rhizomes and is a useful grass to stabilise soil in wet areas.
Low	*Cynodon dactylon*	Creeping grass that is good with bank stabilization, but can become invasive.
Low	Imperata cylindrica	A very important stabiliser of soil along watercourses, but can become invasive.
Low	*Hyparrhenia hirta*	Used for erosion control, but can become invasive.

Continuous alien and invader eradication program

A continuous alien and invader eradication program should be followed on all rehabilitated areas. Alien species must be identified and treated using one, or a combination of the following methods:

- Mechanical removal by uprooting, slashing, cutting off at ground level, or ringbarking (most preferred technique);

- Chemical treatment by foliar spray or stump treatment of a registered herbicide (recommended only if mechanical removal is considered unpractical or unsuccessful); and
- Biological treatment by introducing natural enemy agents that target specific species only.

8.4 Decommissioning phase

Infrastructure removal and or transfer of ownership

All signage, fencing, concrete plinths, buildings, pipelines, pumps, electrical infrastructure, roads and all other foreign infrastructure to be removed and rehabilitated, unless relinquishment requires the transfer or return of ownership and maintenance to other parties that can demonstrate that they take full responsibility and liability associated with the transfer. Those areas that should be rehabilitated at decommissioning should follow these actions:

- Dismantle and remove all foreign or contaminated material by disposing it in the appropriate fashion;
- Asses the compaction of the surface and implement the necessary decompaction actions;
- Profile and shape the area to blend with the natural topography. Adhere to slope gradients less than 1:3 where possible;
- Reinstate a functional hydrological pattern that is suited to the volume of surface water by sizing and profiling drainage channels correctly;
- Provide and maintain erosion protection for a minimum of 3 years, or until vegetation establishment is sufficient to maintain surface stability;
- Apply a cover system, suitable to the application; and
- Revegetate with suitable plant species, preferably indigenous species.

Dams and Surface Water Management Structures

Once residual risks for pollution or sedimentation of natural watercourses is sufficiently abated, the PCDs, balancing dams and surface water management systems may be removed and rehabilitated. This should be done by:

- Removing all liners, stabilisation structures, silt traps etc.;
- Reprofiling the area to blend with the natural topography and form slope gradients that are less than 1:3 where possible;
- Reinstating a functional hydrological pattern that is suited to the volume of surface water by sizing and profiling drainage channels correctly;
- Providing initial erosion protective measures through bio-engineering methods, which manages scouring, erosion and sediment loads;
- Profiling and restoring the natural topography and hydrological patterns as far as practically possible, thereby reinstating a natural functioning and free-draining system that provides ecologically stable environments;
- Reintroducing a cover system that can support deep rooted and shallow rooted vegetation, of various species that is suitable to the micro climatic conditions; and
- Revegetate with plant species that supports the closure goal.

Surface and Geotechnical Stability Assessment

Surface and geotechnical stability is one of the most critical closure objectives that should be met. Geotechnical surveys and assessments should be done periodically on the WRDs, remaining highwalls and embankments. Surface stability relates to erosion which can be assessed with a visual assessment of all rehabilitated surfaces. Poor vegetation establishment is often a sign of instable surfaces, resulting in sheet, rill or gully erosion. Precautionary measures should be put in place to prevent surface or geotechnical instability, as proposed by a specialist.

8.5 Aftercare and Maintenance

The purpose of aftercare and maintenance is to assess the progression towards closure achievement and to take corrective and precautionary actions in those cases where the development trajectory is not aligned to the ultimate post mining land use and relinquishment criteria. This is an active involvement that commences at the first rehabilitation initiative and continuous until the closure phase, paralleled by a monitoring strategy.

Active monitoring commences during construction which is seen as an Adaptive Management & Monitoring phase (Figure 14: Adapted from Glencore (2017)) in which accumulated knowledge and best practice research influences the following phases of the mine. Regular data sourcing feeds back into the active rehabilitation efforts and mining operations. Proactive monitoring continuous with scheduled data sourcing at a less frequent interval, as environmental risk trajectories decline, and closure objectives are being reached. Reactive monitoring is in response to external forces for example floods, fires etc. It defines and quantifies the residual risks in order to facilitate custodial transfer if required.

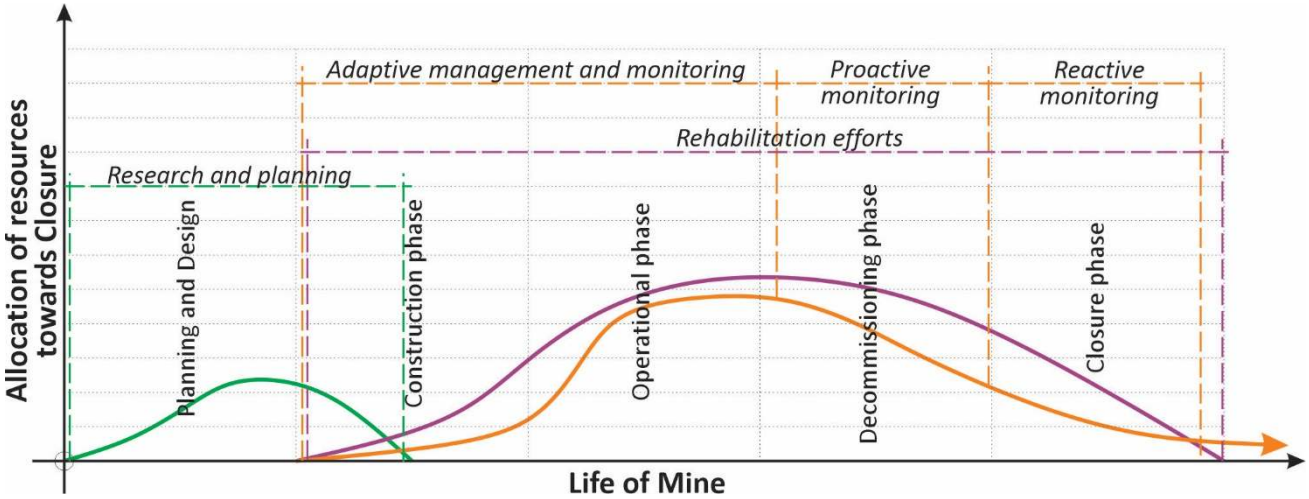


Figure 14: Proposed allocation of resources towards closure

Aspects that should form part of an aftercare and maintenance program are described below:

- Surface erosion on all rehabilitated areas: Assess type of erosion, source of erosion and take corrective measures to repair;
- Geotechnical stability on all WRDs, highwalls and embankments: Identify areas of instability, determine the cause and take corrective and preventative measures;
- Cover system performance in terms of ability to facilitate successional development of an ecosystem, resist excessive erosion, management of surface water run-off and ability to support nutrient cycles;

- Siltation of water courses: Identify source of sediment and take corrective and preventative measures;
- Surface and ground water quality: Ensure monitoring points are regularly maintained and data is collected and stored;
- Alien and invader species: Implement a continuous alien and invader eradication program by using mechanical, chemical or biological methods;
- Vegetation establishment on rehabilitated surface: Assess; species composition, its performance towards the reference condition, successional stage, root development, basal growth and leaf cover; and
- Visual integration into the natural landscape to minimise eyesores and visual impacts.

9. Rehabilitation and Closure Framework & Conceptual Design

9.1 Analysing analogues

The earth's surface has been shaped by forces of nature as well as by anthropogenic factors. The shaping is a result of the interaction between multiple forces, and the resistance provided by the physical features on which the forces are applied. Natural forces such as erosion or movement in the earth's crust, has the ability to cause geomorphic changes and can happen within varying timeframes. Anthropogenic factors, such as mining has the ability to cause rapid changes on a large scale. It is paramount to understand the implication of geomorphic changes on the natural processes as this is directly linked with soil formation and distribution, hydrological patterns, geochemistry dynamics and habitat development. Studying of analogue landforms and systems will provide details that can be incorporated in the design of the new landforms created by mining activity.

Geomorphology is the study of landforms (refer to full definition in Figure 15). Analysing the mountainous environment in and around the proposed mining site, provides insight in the natural processes and the connection of systems that ultimately shaped the features in the study area. Figure 15 - Figure 18 illustrate some of the typical features, slope configurations and slope gradients that are documented in or near the proposed mining area.

These images confirm that the natural tendency for most mountain features are to erode into a convex-concave configuration, starting with a rounded, convex crest, leading into a concave mountain slope towards the toe (Figure 19). This is considered a mature and stable slope configuration that has been exposed to erosive agents over a long period. Natural slope configurations are seldom as simple as illustrated in Figure 19. Because of complex geological sub strata, rocky outcrops and cliffs may appear as these are bedrock features that are more resistant to erosion. "Softer" material tends erode more easily and ends up on the lower foot slopes or valley basins.

Vegetation communities adapted to the conditions that are provided by geomorphic features and micro-climatic variations. Specific communities can be identified on the mountain summits, rocky outcrops, exposed slopes and valleys, which, in this case, consist of the threatened Northern Escarpment Dolomite Grassland and Northern Escarpment Quartzite Sourveld.

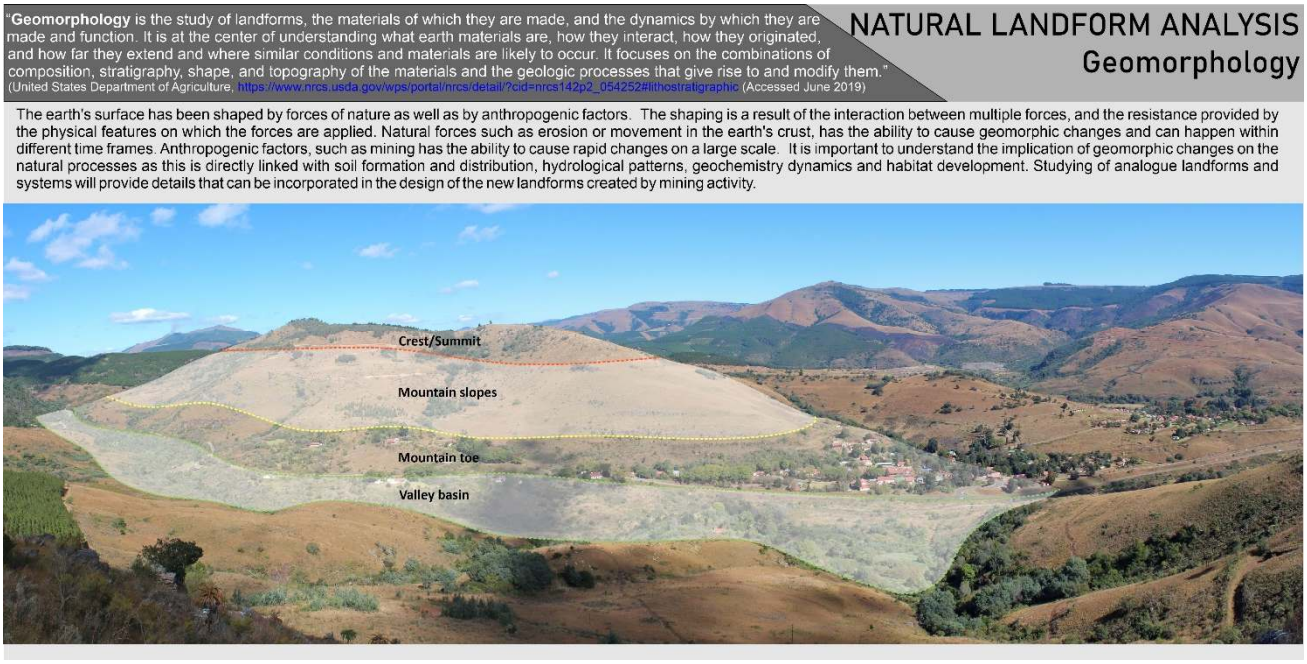


Figure 15: Geomorphology of natural landforms.

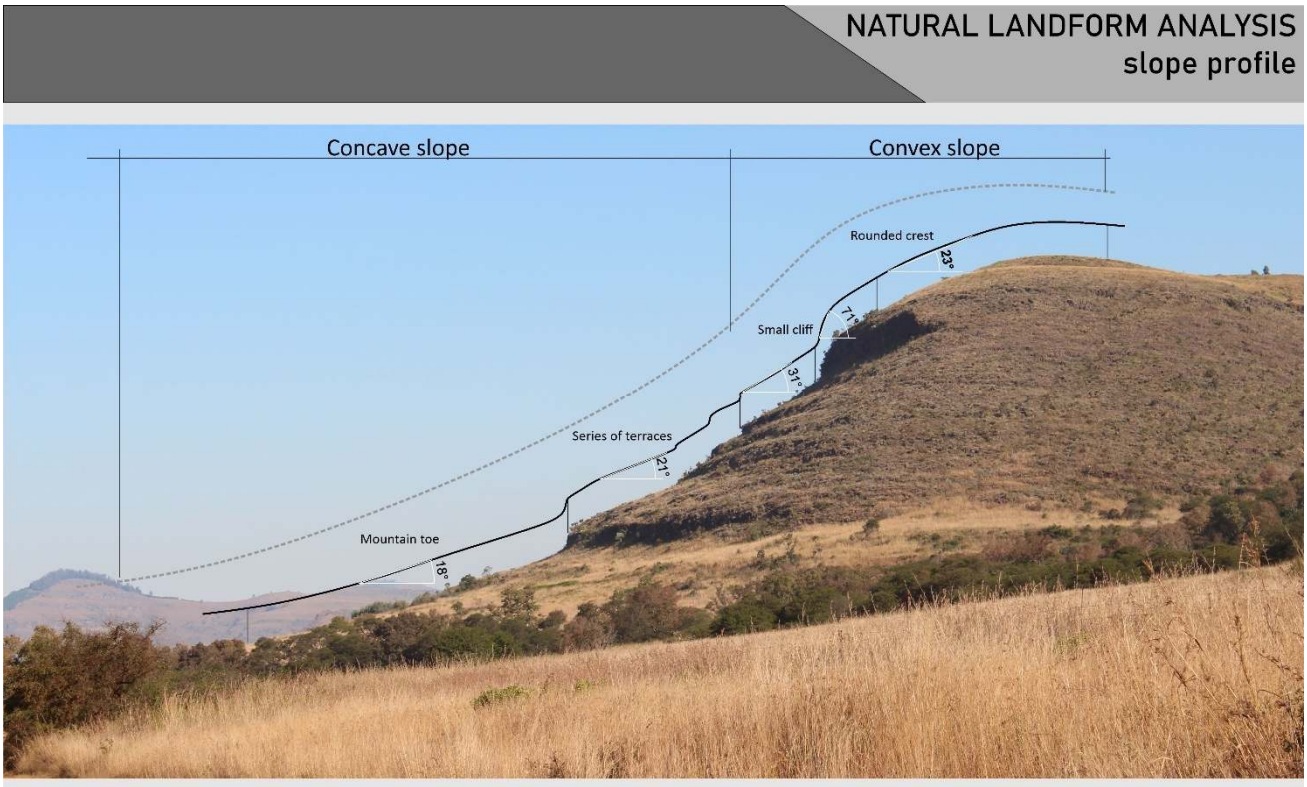


Figure 16: Natural landform analysis (1)

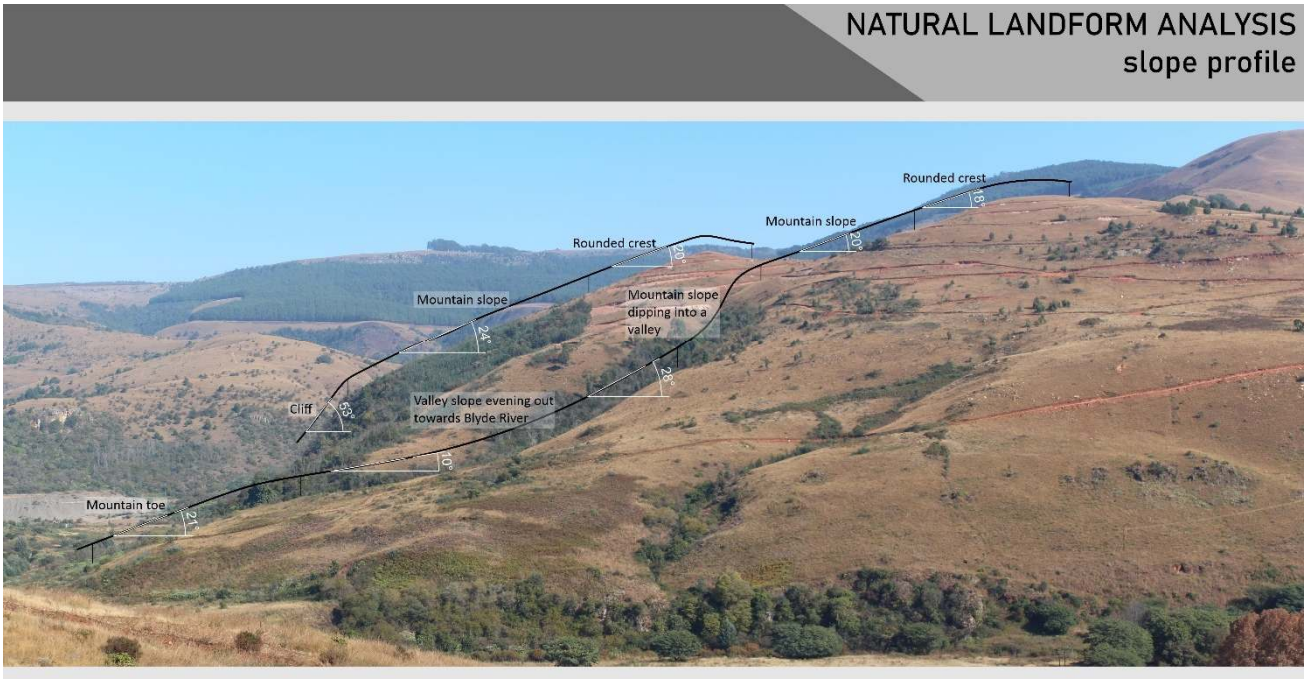


Figure 17: Natural landform analysis (2)

Figure 18: Natural landform analysis (3)

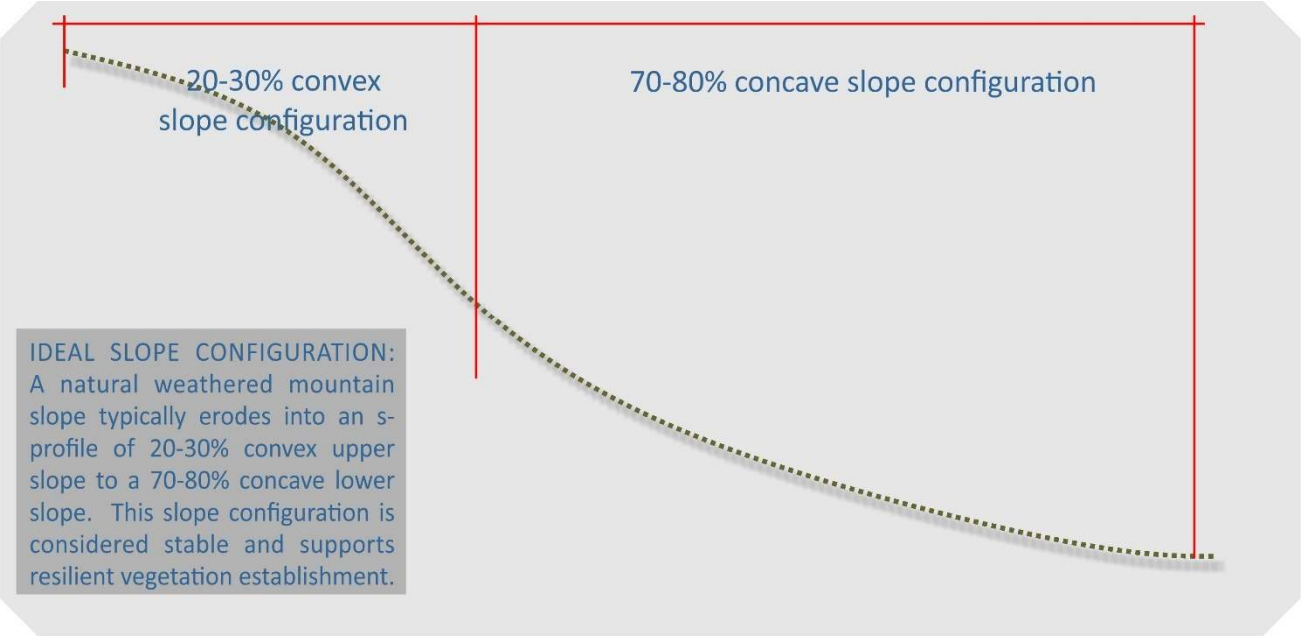


Figure 19: Mature slope configuration profile

Old tailings facilities are present between the proposed Iota and Browns pits along the Blyde River. It is unclear when these tailings were deposited and what method of rehabilitation were followed. An investigation indicated side slopes with gradients of 30° - 37°, heights of approximately 6m and well vegetated surfaces, although only with a couple of grass species (Figure 20). Rill erosion is noticeable on the side slopes, although the surface is kept largely intact by the vegetation. A relatively sizable gully and outer wall collapse are present on one of the tailings facilities of which the cause is unknown.

It is assumed that these artificial landforms are relatively young and that consistent exposure to natural forces will eventually result in a landform as illustrated in Figure 12. It is not surprising that only a few plant species, mostly pioneer species, have established on the tailings as the surface configuration and "soil" composition is simple and consistent. In contrast, natural landforms are complex and offer variation which is required to support biodiversity.

Figure 20: Old tailings facility landform analysis

9.2 Gradient categories in WRD design

WRD slope configurations are typically designed with a 5m bench and a 9m batter height. The overall slope gradient is 26.5°. Figure 21 discusses the ease of rehabilitation on the various slope gradients, linking it to erosion control measures that is recommended to maintain a stable surface. These guidelines are based on industry references, but a site-specific analysis of the WRD material is required to determine the true stability angles and appropriate erosion control measures/cover system design.

Degrees	Ratio	Percentage
10	1:5,6	17,6
11	1:5,1	19,4
12	1:4,7	21,3
13	1:4,3	23,1
14	1:4	24,9
15	1:3,7	26,8
16	1:3,4	28,7
17	1:3,7	30,6
18	1:3	32,5
19	1:2,9	34,4
20	1:2,7	36,4
21	1:2,6	38,4
22	1:2,4	40,4
23	1:2,3	42,4
24	1:2,2	44,5
25	1:2,1	46,6
26	1:2	48,8
27	1:1,9	51
28	1:1,88	53,2
29	1:1,8	55,4
30	1:1,7	57,7
31	1:1,66	60,1
32	1:1,6	62,5
33	1:1,5	64,9
34	1:1,48	67,5
35	1:1,42	70
36	1:1,37	72,7
37	1:1,32	75,4
38	1:1,28	78,1
39	1:1,23	81
40	1:1,19	83,9

Gradient categories

Acceptable gradient range for revegetation within the industry.
Advantages include:

- Accessible with traditional implements and equipment;
- Erosion potential lower for decreasing gradients, therefore requiring less engineering and slope stabilisation;
- Less maintenance expected; and
- Achieving stability and vegetation cover targets sooner.

Maximum recommended gradient for revegetation.
Disadvantages include:

- Accessible with specialised equipment only;
- Complex erosion control and slope stabilisation recommended;
- Extended period of maintenance expected; and
- Risk of failure increasing with steeper gradients.

Proposed overall slope angle for WRD. Disadvantages include:

- Accessibility difficult with standard and specialised equipment;
- Complex erosion control and slope stabilisation required;
- Structural engineering solutions recommended similar to embankment stabilisation;
- Extended period of maintenance required to maintain safety and stability; and
- Risk of failure increasing with steeper gradients.

Proposed bench angle. (bench angle 38.7° with 5m bench width and 9m vertical between benches) Disadvantages include:

- Accessibility difficult with standard and specialised equipment;
- Complex erosion control and slope stabilisation required;
- Structural engineering solutions recommended similar to embankment stabilisation;
- Extended period of maintenance required to maintain safety and stability; and
- Risk of failure increasing with steeper gradients.

WRD slope configurations

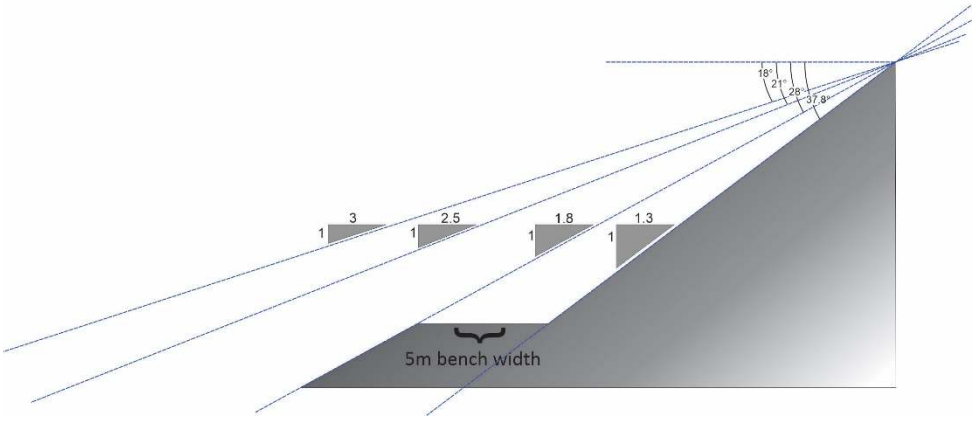


Figure 21: Gradient categories

9.3 Cover system designs

Different parts of the mine site may require a specific design in reference to the cover system (Figure 22). The cover system design is largely determined by the characteristics of the material it is placed upon[26], the functional requirements, the climatic conditions, gradient and aspect.

The barrier layer has the function of sealing off potentially acid forming (PAF) material to minimise/prevent water ingress or oxygen exchange. The thickness and consistence are subject to specialist input and recommendation. This layer may not be needed and can be excluded from the cover system if specialist studies agree.

The reconstructed B-horizon has the specific function of acting as a store-and-release layer. This is particularly important for vegetation establishment as the B-horizon forms part of the rhizosphere and should allow root penetration. This layer does not have an organic component but can be constructed with a well-graded, inert waste rock with a soil permeability (10^{-6} to 10^{-8}) that can act as a sponge during rain events and thereafter release moisture to the roots and growth medium during dry spells. This also acts as a sub-surface storage zone that allows infiltration, thereby minimising surface water runoff. The reconstructed B-horizon shall be installed on sites where a B-horizon is absent or significantly altered. The terrace cuts, pit floor and WRD will require a reconstructed B-horizon, while other disturbed sites may only need a specific type of intervention to restore the existing B-horizon.

The growth medium (A-horizon) should consist of a variation of particle sizes of which the bulk should range between micro particles (<1mm) and small stones (<5mm). Ideally, the growth medium should be an uncompacted sandy-loam, consisting of 5-10% organic matter. Typically, the stripped topsoil shall be utilised as a growth medium.

The characteristics of the growth medium (A-horizon) is important as it is seen as the foundation for sustaining a healthy vegetation cover. It should be applied in a layer no less than 200mm thick (areas where subsoil layers are still intact after disturbance), but preferably >300mm (where geology and/or topography are severely transformed). This is the layer that shall receive plants and seeds and should be able to sustain nutrient cycles and support a regenerative vegetation cover in the long term (Above guidelines to be implemented and tested during trails).

A cover system can only be effective if it remains stable. Therefore, erosion protection is required in most instances, but in varying degrees of complexities, depending on the gradient and erosive potential of the material. The most basic form of erosion control is to place an organic mulch layer over the growth medium, for example straw, or brush cuttings. This protects the soil from raindrop impact and provides a protective layer for seed germination while conserving soil moisture. Inorganic mulch refers to a stone layer (stone chips >19mm to <150mm) spread evenly over the surface in a thickness less than (<) 100mm. It fulfils a similar function as organic mulch, but is typically applied in areas where a permanent mulch layer is required to combat recurring erosion.

Soft-engineering refers to methods of controlling erosion via temporary measures that provide protection for vegetation during its establishment phase. This is typically associated with bio-degradable netting or haybales. It is recommended to use in conjunction with other protective measures on slopes exceeding 1:3 (18°).

Bio-engineering includes innovative measures of controlling erosion and surface water using hardwearing materials of a natural source, for example stone or timber. This is specifically applied in scenarios where high erosion yields may be experienced, for example in drainage channels or highly erodible surfaces. Some bio-engineering products are useful in

[26] To be evaluated when detail designs address the potential of barriers and liners to manage PAF conditions.

creating micro-habitats and add to the variation needed to reinstate certain ecosystem services. This should be designed mindfully to fulfil multiple functions.

Structural engineering methods include the installation of permanent structures to ensure long-term stability in particular scenarios. This is considered an expensive solution and should only be installed in extreme cases where none of the other solutions provide effective results.

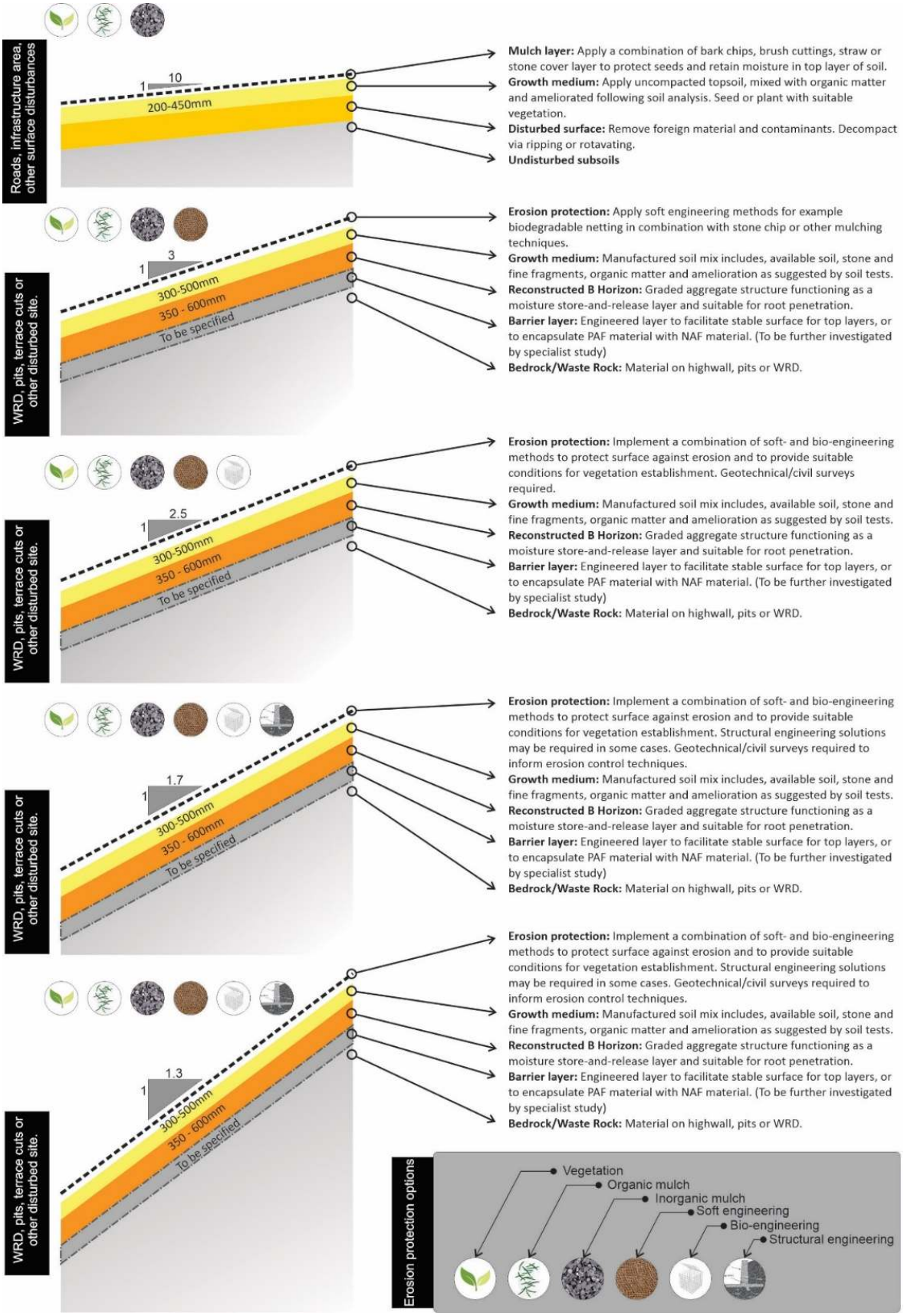


Figure 22: Conceptual cover designs for various gradients

10. Closure Cost Estimation

10.1 Methodology to determine closure costs

The closure costs were determined by using the Guideline document for the Evaluation of the Quantum of Closure-related Financial Provision Provided by a Mine (DME, January 2005).

10.2 Rehabilitation and Closure Costs

CALCULATION OF THE QUANTUM

Applicant: **TGME**
Evaluators: **Minelock / Globesight / OMI solutions**

No.	Description	Unit	A Quantity	B Master Rate	C Multiplication factor	D Weighting factor 1	E=A*B*C*D Amount (Rands)
1	Dismantling of processing plant and related structures (including overland conveyors and powerlines)	m3	70 000.00	14.71	1	1	1 029 700.00
2 (A)	Demolition of steel buildings and structures	m2	517.24	204.96	1	1	106 013.51
2 (B)	Demolition of reinforced concrete buildings and structures	m2	1 322.76	302.05	1	1	399 539.66
3	Rehabilitation of access roads	m2	119 600.00	36.68	1	1	4 386 928.00
4 (A)	Demolition and rehabilitation of electrified railway lines	m		355.99	1	1	0.00
4 (B)	Demolition and rehabilitation of non-electrified railway lines	m		194.18	1	1	0.00
5	Demolition of housing and/or administration facilities	m2		408.93	1	1	0.00
6	Opencast rehabilitation including final voids and ramps	ha	63.02	214 888.54	1	1	13 542 275.79
7	Sealing of shafts adits and inclines	m3		110.03	1	1	0.00
8 (A)	Rehabilitation of overburden and spoils	ha	84.45	143 259.03	1	1	12 098 225.08
8 (B)	Rehabilitation of processing waste deposits and evaporation ponds (non-polluting potential)	ha		178 426.53	1	1	0.00
8 (C)	Rehabilitation of processing waste deposits and evaporation ponds (polluting potential)	ha	14.13	518 235.21	1	1	7 322 663.52
9	Rehabilitation of subsided areas	ha		119 957.86	1	1	0.00
10	General surface rehabilitation	ha	12.83	113 485.31	1	1	1 456 016.53
11	River diversions	ha		113 485.31	1	1	0.00
12	Fencing	m	3299	126.45	1	1	417 158.55
13	Water management	ha	13.46	43 150.31	1	1	580 803.17
14	2 to 3 years of maintenance and aftercare	ha	187.89	15 102.61	1	1	2 837 629.39
15 (A)	Specialist study	Sum		0		1	0.00
15 (B)	Specialist study	Sum		0		1	0.00
					Sub Total 1		44 176 953.20
1	Preliminary and General		5301234.38		weighting factor 2 1		5 301 234.38
2	Contingencies		4417695.32				4 417 695.32
					Subtotal 2		53 895 882.91
					VAT (15%)		8 084 382.44
					Grand Total		**61 980 265.34**

10.3 Cost Assumptions

The following assumption and exclusions were made after consultation with the applicant:

- The cost of sourcing and transporting of cover system material to the site where rehabilitation will occur, is excluded as it is regarded as an operational element that will be part of progressive rehabilitation activities. It is therefore assumed that the correct volume of material will be available at the site where rehabilitation will take place. The

rehabilitation cost commences at the handling of the material to spread and fine grade it to specific thicknesses and compaction;

- The cost of purchasing plants such as trees, shrubs or plugs are excluded under the assumption that an on-site nursery will be established and operated. The costing does allow for the labour required to physically install the plants;
- The PCD's and surface water management infrastructure is recommended to remain intact to manage and monitor water quality from the WRD and cuts/pits. There is an allowance made to maintain the structures but not for the removal and rehabilitation of the footprints;
- The entire cost of rehabilitating the infrastructure area is excluded as this will be a contractual obligation captured in the service agreement between the applicant and the contractor; and
- Aftercare and maintenance costs are calculated for a 1-year period and it is suggested that the provision be adapted annually due to the predicted dynamic variability during aftercare and maintenance.

11. Identification of Gaps

The following gaps are highlighted for further action prior to the next annual re-evaluation of the Environmental Risk and subsequent compilation of the Annual Rehabilitation Plan and the Final Rehabilitation Plan for the Theta Terrace Mining Project review period:

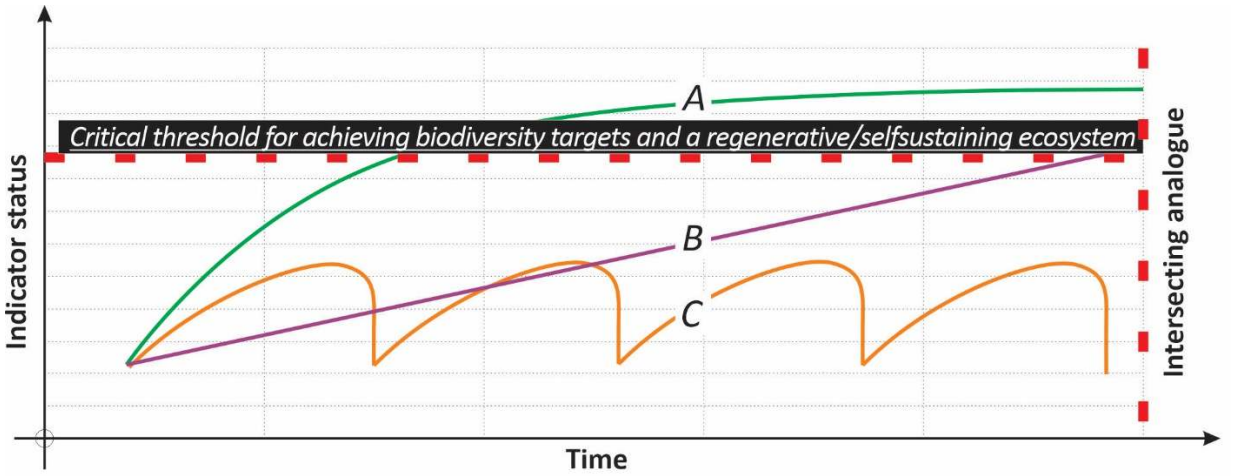
- A geotechnical survey and report are required of the highwall to determine the stability and the material characteristics of the bedrock at the end of the terraces. This may impact on the rehabilitation strategy for the highwalls.
- At the time of compiling this report, the final mine scheduling (sequencing plan) was still being developed. Certain assumptions related to this were therefore made.

12. Relinquishment Criteria

Relinquishment criteria should be closely associated with closure- and post-mining land use objectives. They are evidence-based measures that indicate when specific closure targets have been achieved. Relinquishment criteria can be prescriptive, or performance based. Relinquishment occurs at the point where the holder of the right has achieved all agreed standards and completion criteria for the decommissioning and rehabilitation of the project site. All parties should be satisfied that the site does not pose any danger to public health and safety nor to environmental health. Reports on monitoring results and closure performance should be issued to stakeholders for review. The final relinquishment criteria would in this case be the receipt of a Closure Certificate in terms of Section 43 of the MPRDA (as amended).

The most basic relinquishment criteria should achieve:

- Long-term landform and surface stability of the site (the property on which the mining right was authorised) in order to ensure safety for humans and animals;
- Non-polluting residual and latent impacts that will not cause harm to the environment;
- A resilient and regenerative landscape that can effectively deal with normal environmental stresses;
- A restructured ecosystem that demonstrates a desired trajectory of progress towards a critical threshold as defined by the post mining land use objectives and vegetation cover targets (Figure 23 adopted from Corbett, 1999);
- Legal transfer rights to property owner or stakeholders as an outcome of negotiations.



Trajectory development can occur in three ways according to Tongway et al (1997). Curve A is the desired trajectory that is characterised by a steep initial development, followed by a steady incline, before intersecting the status of the reference ecosystem. Curve B represents a linear progression towards the analogue scenario but remains vulnerable and susceptible to failure for a relatively long period until reaching the critical threshold. Curve C is a system that easily collapses under normal environmental stresses and requires frequent remedial intervention and long-term maintenance.

Figure 23: Rehabilitation trajectory scenarios

13. Monitoring, Auditing and Reporting Requirements

13.1 Audit Schedule

The following table presents the audit schedule to be followed:

Table 13.1: Audit Schedule as it pertains to the Theta Hill Project

Audit	Timeframe	External Responsibility	Internal Responsibility
MPRDA Performance Assessments	Once every year	To be appointed	Environmental Superintendent
NWA Performance Assessment	Once every year	To be appointed	Environmental Superintendent
Financial Provision Assessment	Once every year	To be appointed	Environmental Superintendent
Annual Rehabilitation Plan	Once every year	To be appointed	Environmental Superintendent
Internal Assessment of Annual Rehabilitation Plan	Quarterly	SHEQ Department	Environmental Superintendent

13.2 Reporting Requirements

The following table presents the reporting requirements to be followed:

Table 13.2: Reporting Requirements as it pertains to the Theta Hill Project

Audit	Timeframe	Timeframe in which to submit	Regulatory Authority	Comment
MPRDA Performance Assessments	Once every year	30 days after finalisation	DMR&E	These reports should be presented to Stakeholders during a feedback forum in the event that the findings of the audits detect that the approved measures are no longer suitable to address the activities of the mine and that stakeholders may be negatively impacted as a result. Or Upon instruction of the DMR&E.
NWA Performance Assessment	Once every year	30 days after finalisation	DWS	
Financial Provision Assessment	Once every year	Once audited by external financial auditors	DMR&E	
Annual Rehabilitation Plan	Once every year	Once audited by external financial auditors	DMR&E	
Internal Assessment of Annual Rehabilitation Plan	Quarterly	Upon Departmental Request	DMR&E	

13.3 Monitoring Plan

The monitoring plan as it relates to the realised risks, the legal requirements and knowledge gaps in terms of respective biophysical and social parameters are extensive and is detailed in the individual monitoring sections contained in the draft Environmental Management Plan.

Monitoring of specific indicators should start as soon as concurrent rehabilitation activities have commenced. The following specific aspects will require monitoring:

1. Performance against vegetation establishment targets;
2. Surface and geotechnical stability;
3. Hydrology and sedimentation control;
4. Surface and ground water quality monitoring; and
5. Plant species establishment.

14. Organisational Capacity

14.1 Organisational Structure

14.2 Responsibilities

It is the responsibility of the Environmental Superintendent to ensure that the requirements of the plan are maintained, implemented and then annually reviewed in line with the requirements, procedures and legal requirements as set by the regulator.

The Finance Manager must always ensure that sufficient funds are allocated to enable the implementation of this plan.

15. Conclusion and Reasoned Opinion

The development of the rehabilitation and closure plan, with its associated cost estimate, has been conducted carefully and with due consideration for best practice, legal compliance and operational effectiveness.

The authors recognise the complexity of the proposed project and the inherent challenge of merging the need for feasible mining practices with the responsibility to rehabilitate and restore the affected areas to a suitable and sustainable post-mining land use.

This document outlines the objectives, approach, risks, estimated costs and monitoring protocols required to achieve said post-mining land use objective.

The opportunity to attain successful and sustainable rehabilitation and closure lies in the integration of the rehabilitation plan with the mine plan. This is where most of the gains can be made at the initiation of the project and throughout the project which would create the basis for achieving the rehabilitation and closure objectives.

It is the view of the authors that the rehabilitation plan presented herein, if implemented in accordance with all recommendations and specifications, could achieve a stable and sustainable geochemical, geotechnical and ecological post-mining land use.

16. References

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- Final Scoping Report, August 2019, Batho Earth Environmental Consulting
- Mining Work Programme – Submitted in support of an application for an amendment to a Mining Right- Minxcon – (MP) 30/5/1/2/2/83MR
- Geohydrological Study for the Theta Hill Project, Pilgrims Rest Region – MvB Consulting – MvB021/18/A017 – March 2019
- Stonewall mining – independent Competent Person's Report on Sabie-Pilgrims Rest Gold Projects – Minxcon Consulting – June 2019
- Soil, Land use and Land Capability assessment – Amendment to 83MR – Scientific Aquatic Services – May 2019 -Ref: SAS219037
- Faunal and Floral Baseline and Impact Assessment as part of the EIA process for the TGME Mine Development Project: Amendment to MR83 to include Theta Hill, Browns Hill and Iota Projects – Scientific Terrestrial Services – STS 190006 – May 2019
- Freshwater Resource Ecological Assessment as part of the EIA and Water Use Authorisation process for the TGME Mine Development Project: Amendment to 83MR to include Theta Hill, Browns Hill and Iota Projects – Scientific Aquatic Services - SAS 219038– May 2019
- Geohydrological study for the Theta Hill Project, Pilgrims Rest Region – Final Report – MvB Consulting – MvB021/18/A017
- Phase one – Cultural Heritage Assessment – 2019/JvS/042
- Visual Impact assessment part of the Environmental Impact Assessment and Authorisation process for the Proposed Mine Development Project: Amendment to 83MR – Scientific Aquatic Services – SAS 219036 – May 2019
- Socio-economic Impact Assessment: Draft – Batho Earth and SED – May 2019
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- Tongway D, Kearns A, Hindley N & Barnett G 1997. Indicators of ecosystem rehabilitation success and selection of demonstration sites – ACMER Ecosystem Indicators Project, Final Report, CSIRO Mine Site Rehabilitation Research Program, Adelaide.

Annexure A: CV’s

Name **Ferdi Pieterse**
Date of birth **1 May 1979**
Citizenship **Republic of South Africa**
Gender **Male**

Personal Branding	***Ferdi has more than 15 years' experience in the Environmental Management field. He has a strong background in providing environmental solutions, having completed numerous projects from concept and pre-feasibility phases to full completion and implementation phases. Ferdi has undertaken and completed projects in a variety of sectors including tourism, mining, manufacturing, energy, oil & gas and industrial.*** ***Ferdi's main strengths are focused within the environmental management and sustainable development spheres. Significant experience within the primary, secondary and business economic sectors include strategic planning and advisory, project management and coordination, client interaction and management, capacity building, providing innovative solutions, compliance assurance and reporting, liability valuations, sound advice and objectivity. Ferdi spent the past 8 years developing markets and solutions on the African continent and have been involved extensively in projects in Lesotho, Zambia, Angola, Kenya, Namibia, Madagascar, Tanzania, Argentina, Mali and Ghana.*** ***Ferdi is passionate about creating value and growth for people and projects on the African continent. He thrives on the challenge of integrating his experience and knowledge with new people and project teams and is naturally motivated through the adventure, exploration, learning, engagement and travel which is associated with the developing economies in Africa.***

Educational qualifications	***B.Sc Geography, Environmental Science and Informatics: Rand Afrikaans University, Johannesburg, South Africa*** ***B.Sc Hons Geography and Environmental Management: Rand Afrikaans University, Johannesburg, South Africa***

Employment history & experience

Employment History (Organisation and final position held):

September 2014 – Present	***Founder and Managing Director of Globesight (Pty) Ltd***
June 2009 – August 2014	***Director at GCS Water and Environment (Pty) Ltd***
March 2009 – June 2009	***Senior Environmental Scientist at Zitholele Consulting (Pty) Ltd***
Sept 2007 – Sept 2008	***Environmental Manager at Eskom Holdings Limited's Primary Energy Division***
Jan 2004 – Aug 2007	***Project Manager at GCS Water and Environment (Pty) Ltd***
Jan 2002 – Dec 2003	***Junior Environmental Scientist at Digby Wells & Associates (Pty) Ltd***

SPECIALIZATION

- *Project Management and technical input into complex and integrated projects (concept, pre-feasibility, feasibility [Detailed and Bankable], implementation/execution and closure);*
- *Application of Equator Principals, World Bank and IFC Standards within South Africa and abroad;*
- *Advisor and external reviewer on national and international projects;*
- *Management of strategic partnerships;*
- *Reporting according to international stock exchange requirements;*
- *Prospecting and Mining Rights;*
- *Public/Stakeholder Participation;*
- *Environmental Management Plans;*
- *Environmental Impact Assessment and Management Programmes;*
- *Environmental Reporting on compliance targets and performance;*
- *Environmental Due Diligence Assessments and Reporting;*
- *Mine Closure Planning and Cost Estimations;*
- *ISO 14001 Audits; and*
- *Environmental Compliance Auditing.*

COUNTRIES WORKED IN

- *South Africa*
- *Lesotho*
- *Angola*
- *Swaziland*
- *Namibia*
- *Zambia*
- *Madagascar*
- *Mali*
- *Ghana*
- *Argentina*

Environmental & Social Permitting related project experience:

Energizer Resources – Environmental and related permitting for the Molo Graphite Mine, Fotadrevo, Madagascar (ongoing)

Stonewall Resources – Environmental and Social Impact Assessment and Environmental Authorisation application for the SABIE Project (2017), Mpumalanga, South Africa

Stonewall Resources – Environmental and Social Impact Assessment and Environmental Authorisation application for the TGNE Project (2017), Mpumalanga, South Africa

PMG Mining (Pty) Ltd – Paling Manganese Mine, Prefeasibility Study and environmental & social permitting (2016)

Scorpion Mineral Processing – AEMR Iron Ore Mine, Huila Province, Angola (2012-2013)

Gem Diamonds, Letseng Diamond Mine – Project Kholo – TSF Site Selection and Environmental Sensitivity Study (2011-2012)

Simmer & Jack Mines Limited – Tau Lekoa Gold Mine, North West Province (2009)

PTM – Ngonyama Platinum Mine, North-West Province (2007)

Total Coal – Dorstfontein Coal Mine Expansion, Mpumalanga (2006 – 2007)

Somkhele Anthracite Mine (Phase 1), Kwazulu-Natal (2005 – 2006)

Exxaro, Matla Colliery (coal) EMPR Amendment for Underground shortwall mining and E'Tingweni Section, Mpumalanga (2004 – 2007)

Somkhele Anthracite Mine (Phase 1), EMPR Amendment for opencast anthracite mine, Kwazulu-Natal (2006 – 2007)

Springlake Colliery (coal) EMPR Amendment for Besterdale Section opencast operations, Kwazulu-Natal (2005)

Kangra Coal, EMPRs for Umgala/Knights Hill, Klipspruit and Aasvoëlkrans Collieries, Kwazulu Natal (2006)

NuCoal Mining, EMPR Amendment for Klipbank Opencast Section, Mpumalanga (2006 – 2007)

Harmony Kalgold EMPR Amendment and Re-alignment, North-West Province (2006 – 2007)

KAO Diamond Mine EMPR, Lesotho (2004 – 2005)

Apollo Brick EMPR Re-alignment, Gauteng (2007)

TGME – Hermansburg Opencast Gold Mine, Mpumalanga, (2009)

TGME – Rietfontein Underground Gold Mine, Mpumalanga (2009-2010)

TGME – Glynn's Lydenburg Heap Leach Pad Project, Mpumalanga (2009)

TGME - Pilgrems Trend Deposits, Mpumalanga (2009)

TGME – EIA/EMP Amendment (Pad 1), Mpumalanga (2009)

Simmer & Jack – Tau Lekoa Mine Section 11, Section 102 & EIA/EMP, North West Province (2009)

First Uranium – Mine Waste Solutions: Tailings Reclamation Project, North West Province, (2009-2010)

TGME – Integrated Water Use License Application, Rietfontein Underground Gold Mine, Mpumalanga (2011)

TGME – Integrated Water Use License Application, Glynn's Lydenburg Heap Leach Pad Project, Mpumalanga (2011)

TGME – Integrated Water Use License Application, Pad 1 & Pilgrems Trend Deposits, Mpumalanga (2011)

TGME – Integrated Water Use License Application, Beta Mine, Mpumalanga (2011)

Shanduka, Springlake Colliery, Consolidated EIA/EMP and IWULA, Kwazulu-Natal (2010/2011)

Auditing and Compliance Assurance related project experience:

Environmental & Water Compliance Audits for Stonewall Mining's TGME & Bosveld Operations (2017 & 2018)

Environmental, Water, Waste & Air Quality Compliance Audits for ASA Metals & Dilokong Chrome Mine (2016)

EHS Risk Assessments and Management Plans for the Molo Graphite Project's Bankable Feasibility Study (IFC, World Bank and Equator Principals) and legal permitting (in country), Madagascar (2014 - date);

SD-HSSE Gap Analysis for Barrick Gold's Lama Gold Mining Project in Argentina and Chile (IFC, World Bank and Equator Principals, ISO, corporate) (2016);

Environmental & Water Compliance Audits for Stonewall Mining's TGME & Bosveld Operations (2015)

Environmental, Water and Waste Compliance Audits for Mpact's Piet Retief Operation (2013 & 2014)

Environmental Due Diligence Investigation on ERPM, Gauteng (2014)

AECOM GmbH (Germany) PPG EHS/PSM Development of Audits and Protocols on OPIC, Equator Principals, Word Bank and IFC Standards (2012 – 2013)

Environmental Compliance Review in terms of OPIC, Equator Principals, Word Bank and IFC Standards on the Bumbuna Hydroelectric Power Project, Sierra Leone (2013)

Environmental Due Diligence Investigation on BHP Billiton's Bayside Smelter, Richards Bay, KwaZulu-Natal (2013)

Environmental Due Diligence Investigation on Petrex Grootvlei Mine, Gauteng (2006)

Environmental Due Diligence Investigation on Mashala Delta Coal, Mpumalanga, (2006)

Environmental Compliance Assessment of Booysendal Platinum Mine, Limpopo (2011 - 2012)

Environmental Compliance Assessment of Modikwa Platinum Mine, Limpopo (2012 - 2013)

Environmental Compliance Review on the sealed section of the Gautrain System in support of a court case, Gauteng (2012)

Environmental Compliance Assessment of Village Main Gold Mine, Gauteng (2004)

Group Environmental Compliance Assessment of Stonewall Mining, Mpumalanga and KwaZulu-Natal (2009 - 2014)

Lear Sewing Environmental Compliance Audit, East London, Eastern Cape Province (2011)

ArcelorMittal, Vanderbijlpark Works, Main Water Treatment Plant Record of Decision (RoD) Compliance audit (2011)

African Rainbow Minerals – Group SHE Audit, Northern Cape, Kwazulu-Natal, Mpumalanga and Limpopo Province (2007)

Sumo Coal Opencast Rehabilitation Audit, Mpumalanga (2007)

Legal Compliance Audit for Pinnacle Micro, Gauteng (2006)

Total Coal ISO 14001 Implementation Pre-certification Audit and Compliance Assessment, Dorstfontein and Forzando Mines (2006)

Anglo Coal Bank Colliery EMP Performance Audit, Mpumalanga (2005)

Environmental Compliance Assessment for General Electric, Gauteng (2006)

Environmental Compliance Assessment for Delphi Catalytic Converters, Eastern Cape (2006)

Environmental Compliance Assessment for Peterstow Aquapower, Swaziland (2007)

Environmental Compliance Assessment for Tech Ink, Western Cape (2006)

Rehabilitation and Closure Evaluation related project experience:

Financial Provision Evaluation for Assmang's Beeshoek Iron Ore Mine, Northern Cape Province (2016, 2017 & 2018);

Financial Provision Evaluation for Assmang's Khumani Iron Ore Mine, Northern Cape Province (2016, 2017 & 2018);

Financial Provision Evaluation for ASA Metals & Dilokeng Chrome Mine, Limpopo Province (2016, 2017 & 2018);

Mine Rehabilitation and Closure assessment and costing for Resolute Mining's Syama Gold Mine in Mali, West Africa (2017);

Mine Rehabilitation and Closure assessment and costing for Resolute Mining's Bibiani Gold Mine in Ghana, West Africa (2017);

Environmental Liability Assessment for Stonewall Resources' TGME and Bosveld Gold Mining Projects, Mpumalanga Province (2015, 2016, 2017 & 2018).

Environmental Liability Assessment for the Feasibility Study for the Energiser Resources Molo Graphite Mine, Madagascar (2014 & 2017).

Environmental Liability Assessment for the Donkerhoek Quarry, Gauteng, 2011.

Environmental Liability Assessment for Assmang Black Rock Manganese Mine, Northern Cape Province (2011).

Environmental Liability Assessment for Assmang's Khumani Iron Ore Mine, Northern Cape Province, 2010;

Environmental Liability Assessment for Assmang's Beeshoek Iron Ore Mine, Northern Cape Province, 2010;

Environmental Liability Assessment for the Greater TGME Gold Mine, Mpumalanga, 2010

Environmental Liability Assessment for Simmer & Jack's Buffelsfontein Gold Mine, North West Province, 2009;

Environmental Liability Assessment for First Uranium's Mine Waste Solutions Mining Operations, North West Province, 2009;

Environmental Liability Assessment for Assmang Black Rock Manganese Mine, Northern Cape Province (2005 – 2007);

Environmental Liability Assessment for Assmang Beeshoek Iron Ore Mine, Northern Cape Province (2007);

Long Term Environmental Liability Assessment (15 years) for Mine Waste Solutions and First Uranium, North West Province (2007);

Environmental Liability Assessment for Simmer & Jack Buffelsfontein Gold Mine, North West Province (2007);

Due Diligence Investigation on Petrex Grootvlei Mine, Gauteng (2006);

Due Diligence Investigation on Mashala Delta Coal, Mpumalanga, (2006);

	Environmental Liability Assessment for Assmang Khumani Iron Ore Mine, Northern Cape Province (2005); *Environmental Assessment of Village Main Gold Mine, Gauteng (2004);*

Hobbies	**Outside of work Ferdi recharges and gets energised via the following activities:** **Sailing & other water sports** **Travelling (locally and abroad)** **Reading for knowledge and / or skills improvement** **Hunting and outdoors** **Mountain biking** **Working with his hands**

CURRICULUM VITAE

Name: **Mader Johan van den Berg**
Qualification: Qualified Landscape Architect
Date of Birth: 17 September 1980
ID No: 800917 5002 081
Nationality: South African
Marital Status: Married
Languages: Afrikaans (mother tongue), English

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EDUCATIONAL QUALIFICATIONS

- ML(Prof) (Landscape Architecture), University of Pretoria, Pretoria (2004)
- B.SC Hons (Landscape Architecture), University of Pretoria, Pretoria (2003)
- B.Sc, (Landscape Architecture), University of Pretoria, Pretoria (2002)

PREVIOUS EMPLOYMENT EXPERIENCE

- Currently employed by Skets Architects and Planning from end of 2017. Responsibilities entail:
  - Proposals and quotations
  - Visual Impact Assessment
  - Landscape Master Planning and Design
  - Landscape Rehabilitation & Environmental Planning
  - Graphic design and photography
  - GIS map generation and interpretation of spatial data
  - Financial management and general business administration;
- Employed by I-Dot Design Studio CC from 2010 providing Landscape and Architectural services as well as environmental planning;
- Self Employed from January 2007 – March 2010;
- Employed as a Qualified Landscape Architect at Strategic Environmental Focus (Pty) Ltd (Feb 2005 – Dec 2006). Specialist responsibilities entailed:
  - Visual Impact Assessment

- Landscape Design
- Landscape Rehabilitation & Environmental Planning
- Invader Vegetation Eradication Programming;

- Research assistant on the subject of human's visual perception with regards to mine Tailings Disposal Facilities – University of Pretoria (2004).

KEY COMPETENCIES

- Visual Impact Assessment (VIA)
- Rehabilitation Planning and Specifications for Disturbed Landscapes
- Environmental Planning and Design
- Landscape Master Planning and Design
- Computer Aided Design (CAD)
- VIA related GIS data interpretation
- GIS analysis and mapping
- Graphic Design

SPECIALIST WORKING EXPERIENCE

VISUAL IMPACT ASSESSMENT (2015-2019)

- Eskom Holdings Ltd, Visual Impact Opinion report for the proposed Bosplaat – Boshof Battery Storage Facility south of Hertzogville, Free State Province – Envirolution Consulting (2019);
- Ideal Consulting, Scoping / EIA Visual Impact Assessment report for the proposed Wildealskloof Mixed Use Development north of Bloemfontein, Free State Province – Envirolution Consulting (2018);
- Johannesburg Roads Agency, Visual Impact Assessment report fore the proposed upgrading of the Jan Smuts Road to dual carriage way from Erlswold Way to Bolton Rd and from 8th Ave to Kent Rd, Rosebank, Johannesburg, Gauteng Province – Envirolution Consulting (2018);
- Eskom Holdings Ltd, Visual Impact Assessment report for the proposed Etna – Quatro Double Circuit 400kV Transmission line and Quatro Substation Between Ennerdale and Orlando in the south of Johannesburg, Gauteng Province – Envirolution Consulting (2018)
- Eskom Holdings Ltd, Visual Opinion reports for Basic Assessment of 4 Chikadee loop-in, loop out power lines named, Boshmanskop, Leeufontein, Reabetswe and Woestalleen, all in Mpumalanga Province – Envirolution Consulting (2017-2018);
- Eskom Holdings Ltd, Visual Impact Assessment report for the proposed construction and operation of the Fochville 132kV Power Line West of the town of Fochville, North West Province – Envirolution Consulting (2017)
- Eskom Holdings Ltd, Visual Impact Opinion report for the proposed Bokamoso Substation and associated 88kV Loop in/Loop out Bersfort-Marang Power line near Rustenburg, North West

Province – Envirolution Consulting (2017);

- Eskom Holdings Ltd, Visual Impact Assessment report for the proposed Diepsloot East and Blue Hills Substations and the associated 88kV distribution lines between Lulamisa and Crowthorne Substations – Envirolution Consulting (2017);
- Eskom Holdings Ltd, Visual Opinion report for the proposed Quattro Substation on the Goudkoppies Water Treatment Works, Rivasdale, Soweto – Envirolution Consulting (2016-2017);
- Eskom Holdings Ltd, Visual Impact Assessment report for the 90km proposed Aggeneis Paulputs 400kV DC transmission line and Paulputs Substation upgrade, Northern Cape Province - Mokgope Consulting (2016-2017);
- Eskom Holdings Ltd, Visual Impact Assessment report for the Blanco-Droërivier 400kV Transmission line, Eastern and Western Cape Provinces - Envirolution Consulting (2015-2016);
- Eskom Holdings Ltd, Visual Impact Assessment report for the Blanco Gourikwa 400kV Transmission line, Western Cape Province - Envirolution Consulting (2015-2016);
- Eskom Holdings Ltd, Visual Impact Assessment report for the Crowthorne-Lulamisa 88kV line rebuilt, Gauteng Province - Envirolution Consulting (2015-2016);
- Eskom Holdings Ltd, Visual Impact Assessment report for the Rhinosterfontein 132kV power line and substation, Gauteng Province - Envirolution Consulting (2015-2016);
- SANParks, Visual Impact Assessment report for the proposed Shangoni Gate development near Shingwedzi, Limpopo Province – Envirolution Consulting (2016);
- Eskom Holdings Ltd, Visual Impact Assessment report for the Westgate-Ntshona 132kV power line, Gauteng Province - Envirolution Consulting (2015);
- Eskom Holdings Ltd, Visual Impact Assessment report for the Tarlton-Westgate-SAR Millsite 132kV power line, Gauteng Province - Envirolution Consulting (2015);
- Eskom Holdings Ltd, Visual Impact Assessment report for the Postmasburg - Boichoko 132kV power line, Northern Cape Province - Envirolution Consulting (2015);
- Eskom Holdings Ltd, Visual Impact Assessment report for the Kathu-Tshipi E Borwa 132kV power line, Northern Cape Province - Envirolution Consulting (2015);
- Eskom Holdings Ltd, Visual Impact Assessment report for the Plaatjies Substation and rebuild of a power line in Roodepoort, Gauteng. – Envirolution Consulting (2015);
- Eskom Holdings Ltd, Visual Impact Assessment report for the Kgabalatsane – Wesglass Substations and associated loop-in and loop-out power lines in the Winterveld area, City of Tshwane. – Envirolution Consulting (2015);
- Cradle of Malelane (Pty) Ltd, Visual Impact Assessment Report for the Radisson Blu Safari Resort in the Kruger National Park near Malelane Gate, Mpumalanga – V&L Landscape Architects (2014-2015), Mpumalanga. – NuLeaf Planning and Environmental (Pty) Ltd (2015);

LANDSCAPE REHABILITATION

Mine Closure Cost Quantification:

- Goosebay Farm (Pty) Ltd, Rehabilitation and closure costing quantification for sand quarry operations on the three portions of Remaining extent of Portion 1, Remaining Extent and Portion 3 of the farm Woodlands 407, Parys, Free State in association with the lead consultant -SLR Consulting (2016-2017);
- Platinum Australia – Kalplats, for the quantification of closure costs as part of a Bankable Feasibility Study based on the Department of Minerals and Energy closure quantum determination best practice guidelines and in association with Arbol Consulting. Located near Stella, North West Province (2008);
- Xtrata Alloys – Thorncliffe and Helena Chrome mines, for the quantification of closure costs of both active mines based on the Department of Minerals and Energy closure quantum determination best practice guidelines and in association with Arbol Consulting. Located between Roossenekal and Steelpoort, Limpopo Province (2007);

Alien Vegetation Management Program:

- Vini's International Trading (Pty) Ltd, for the proposed establishment of the township Paulshof ext. 78, on holding 6 Airdlin Agricultural Holdings (A.H.), Sunninghill, Johannesburg (2006);
- Zuara Investments, For the establishment of the township Barbeque Downs ext. 29 Bothasfontein 408-JR, Midrand (2006);

Resource Management and Planning:

- Department of Water Affairs and Forestry (DWAF), Inyaka Dam Resource Management Plan, Bushbuck Ridge, Mpumalanga (2006):
    - Source baseline data and information;
    - Compile sections of the Encumbrance Report;
    - Attend Technical Task Team meetings; and
    - Compile sections of the Draft Resource Management Plan;

Environmental Management Planning:

- City of uMhlathuze, Relocation of Biodiversity Assets and Rehabilitation, KwaZulu Natal, Richards Bay, (2006):
    - Compile section of the Environmental Management Plan (EMP);
    - Compile Tender Specifications;

Landscape Rehabilitation:

- Monte Cristo Commercial Park (Pty) Ltd, Provide specialist input, generate GIS maps, presentations, flow diagrams, internal reports, resource statement, mining works program and sit on panels during public participations events for the Mining Right Application on the three portions; Remaining extent of Portion 1, Remaining Extent and Portion 3 of the farm Woodlands 407, Parys, Free State (2018-2019);
- Goosebay Farm (Pty) Ltd, Update and refine the rehabilitation reports and monitoring programs for 3 permit areas on the three portions; Remaining extent of Portion 1, Remaining Extent and Portion 3 of the farm Woodlands 407, Parys, Free State (2017);
- Goosebay Farm (Pty) Ltd, Rehabilitation reports and monitoring programs for 3 permit areas on the three portions; Remaining extent of Portion 1, Remaining Extent and Portion 3 of the farm Woodlands 407, Parys, Free State (2016);
- Goosebay Farm (Pty) Ltd, Rehabilitation monitoring of 3 permit areas on the three portions; Remaining extent of Portion 1, Remaining Extent and Portion 3 of the farm Woodlands 407, Parys, Free State (2013 - 2019);
- Ceramic Industries Ltd, Bank stabilisation and irrigation installation at new Gryphon factory at Vereeniging plant, Vereeniging, Gauteng (2015-2016);
- Ceramic Industries Ltd; Re-vegetation and implementation of a 1 ha disturbed area at the Pegasus Export Facility, Vereeniging, Gauteng (2008);
- Ceramic Industries Ltd, Landscape rehabilitation (design and supervision) of the existing Steelpark clay quarry, Vereeniging, Gauteng (2005-2006);
- Highveld Crushers, Landscape rehabilitation program for the proposed expansion of the stone aggregate quarry, Standerton, Mpumalanga (2006);

LANDSCAPE MASTER PLAN AND DESIGN

Landscape Site Development Plan:

- Gateway Capital Limited, Landscape Site Development Plan and Installation Management of Brinant Head Office Complex – 366 Rubenstein Road Moreletta Park (2009);
- Gateway Capital Limited, Landscape Site Develpoment Plan and Installation Management of office complex – 324 Rubenstein Road Moreletta Park (2009);
- Gateway Capital Limited, Landscape Site Develpoment Plan for Delta Park Office Complex – 366 Rubenstein Road Moreletta Park (2009);
- Emerald Auto, Landscape Site Development Plan for the upgrade of Emerald Auto Cnr of HF Verwoerd Street and Swemmer Street, Gezina (2008).

Landscape Master Plan Development:

- Van Wyk Land Development Corporation, Landscape Master Plan for a private cemetery on Portion 505 of the farm Driefontein 85IR, Boksburg (2018)
- Helgardt Muller, Landscape Master Plan Development, Sketch plan development and implementation management for Wonderfontein 350 security complex, Sasolburg, Free State (2013-2015);
- Ceramic Industries Ltd, Landscape design and Implementation for Pegasus Canteen and Laboratory, Vereeniging, Gauteng (2010);
- The Church of Jesus Christ of Latter-Day Saints, Landscape Design and project management of new church facility in C.R. Swart Drive, Randpark Ridge (2010-2011);
- Ceramic Industries Ltd, Landscape design and Implementation for Ceramic Exports, Vereeniging, Gauteng (2008);
- Burrie Smit Developers, Cashan X7 Residential Development on the Remainder of Portion 43 of the farm Waterval 306JQ in Rustenburg, North West Province (2006);

Landscape Development Guidelines:

- Mr. Howard Walker, The Proposed Establishment of a Resort on Portion 38 of the farm Lunsklip 105JT (2006);

PUBLICATIONS

- Van Deventer, H and Van den Berg, M. 2006. *Using GIS visibility analysis in visual impact assessments*. Position IT July/Aug 2006. pp. 33-35.
- Sustainable Tailings Impoundment Landform Design: Rational Decision Making for the Sustainable Configuration of Tailings Impoundments (Paper and presentation at Chamber of Mines Conference, 2005)

Stefan Du Toit
(Landscape Architect)

Name:	Stephanus Jacobus Du Toit	**English Fluency:**	Excellent
Discipline:	Landscape Architecture	**Nationality:**	South African
Education:	BL	**Age:**	40
Project Position:	Landscape Architect	**Years' experience:**	18

School	Date of Attendance	Degree/Certification
University of Pretoria	1997 - 2000	B.L. Landscape Architecture

Certificates and courses:

2015 – 2017: NYIP – New York Institute of Photography - Professional Photography certificate
2005: NQF 5 & 7 Course in Labor Intensive Construction
2004: JBCC Principal Building Agreement & JBCC N/S Subcontract Agreement

Professional affiliation:

Member of South African Council for the Landscape Architectural Profession
(Pr LArch 2006). Member no. 20152
Institute for Landscape Architecture in South Africa

Career highlights:

- 2010 – Current: Co – Founding of Habitat Landscape Architects in 2010 and steadily growing the firm form a staff compliment of two to six in 2016.
- 2015: Invited by the Department of Trade and Industry together with the Built Environment Export Council in 2015 to join a South African delegation on an outward selling mission to the World Bank, Washington DC, USA.
- 2013: Invited by the Department of Trade and Industry together with the Built Environment Export Council in 2013 to join a South African delegation on an outward selling mission to the African Development Bank, Tunis, Tunisia.
- 2009: Two of his projects was nominated and published (2009) in the International Publication: 1000 X Landscape Architecture (Braun Publishers) and also been selected to exhibit one of the projects at the III Landscape Architecture Exhibition in Belgrade, Serbia. (2009)
- 2007 – 2010: Successfully established and operated own firm, Green Contour Landscape Architects in 2007 up until 2010.

- 2006: Registered Professional Landscape Architect in South Africa, with 18 years' experience as a consultant in Landscape Planning, design and management.
- 2006 – 2007: Appointed Senior Landscape Architect at Insite Landscape Architects
- 2005 – 2006: Senior Landscape Architect and Design Division Manager at Eksklusiewe Tuine Landscape Architects, a member of BIDVEST
- 2003 – 2005: Appointed Landscape Architect at Strategic Environmental Focus
- 2001 – 2003: Appointed as Junior Landscape Architect at Uys & White Landscape Architects

Stefan has been practicing and working as a Landscape Architect for more that 15 years. He has extensive experience in a range of projects from initial conceptualization through to implementation. This experience include strategic planning, commissioning and managing of projects, project conceptualization, landscape design, master planning, contract administration, problem solving, design, quality control and monitoring of works. Stefan has extensive experience in Planning and Design conceptualization and development of various project types i.e. residential / commercial / retail / corporate / recreational / environmental rehabilitation. Stefan has experience in both the public and private sector and has been lead consultant on numerous projects for all three tiers of government and private sector.

Experience:

Position: **Co-Founder & Principal Landscape Architect** **Duration:** **6 years**

Date of employment: 2010 to present

Employer:

Habitat Landscape Architects (Pty) Ltd., South Africa

Type of Projects:

Landscape Architecture planning and design/ Environmental Planning / Tourism planning and design / Feasibility assessments / Rehabilitation Planning and design /

Scope of Employer's Contract:

Experience in the Republic of South Africa

Co-founder and director of Habitat Landscape Architects. Responsible for all aspects from business development, systems development and quality control.

Specific Duties and Responsibilities/ Scope of Work:

- Business development, management and control
- Human resource and financial management
- Marketing
- Landscape Planning, Conceptualization, Design Development, Project Management and quality control.
- Strategic Planning
- Environmental planning and assessment
- Tourism planning, feasibility, development and assessment

- Rehabilitation planning, feasibility, detail design and monitoring

Some recent projects include:

YEAR	PROJECT NAME	RESPONSIBILITIES/DESIGNATION	LOCATION
Current	Sol Plaatjes University – 3 year as-and-when Framework Agreement	Project principal & landscape architect	Kimberley, Northern Cape
Current	DPW – New Provincial Offices for South African Police Services	Project principal & landscape architect	Maitland, Western Cape
Current	Northern Cape Tourism Route Development	Project Principal	Northern Cape
Current	SANBI Kwelera National Botanical Gardens Master Plan	Project principal & landscape architect	East London, Eastern Cape
Current	EMM_EPMO Contract for parks and cemetery projects on an as and when basis: Arla Park Cemetery	Project principal & landscape architect	Nigel, Gauteng
2017	Pinnacle Project – master plan and guidelines for new proposed tertiary institution	Project principal & landscape architect	Igbonna, Nigeria
2017	Simonstown Penguin master plan and rehabilitation plan	Project principal & landscape architect	Simonstown, Western Cape
2016	Ekurhuleni Murray Park Phase 3	Project principal & landscape architect	Springs, Gauteng
2016	Karoo Battlefields	Client liaison, concept development	Southern Freestate
2016	GR 47	Concept Development	Pretoria, Gauteng
2016	Sanparks – Pafuri Border Camp upgrade (pro bono)	Professional Landscape Architect	Limpopo
2016	Sanparks – Russell House Guesthouse redevelopment (pro bono)	Professional Landscape Architect	Limpopo
2015-2016	Government residence master plan, sketch plan and conceptual design	Professional Landscape Architect	Pretoria, Gauteng
2015-2016	Cradock 4 landscape development and conceptual design	Landscape Architect	Cradock, Eastern Cape
2015-2016	Worcester Church Square	Project principal & landscape architect	Worcester, Western Cape
2015-2016	Murray Park Phase 2 Resort Development for Ekurhuleni Metropolitan Municipality	Project principal & landscape architect	Springs, Gauteng
2015 - 2016	Phake, Actonville, Atlasvlei and Dersley Community parks for Ekurhuleni Metropolitan Municipality	Landscape Architect	Ekurhuleni, Gauteng
2015	Sekhukhune Cultural Village for the National Department of Tourism	Project principal & landscape architect	Ga-Nkoane, Limpopo
2015	Bohlabela Cultural Village for the National Department of Tourism	Project principal & landscape architect	Hazyview, Mpumalanga
2015	Sir Drummond Chaplin Park	Project principal & landscape architect	Johannesburg, Gauteng

2015	Northern Cape Recreational Parks in both Hopetown and Strydenburg	Project principal & landscape architect	Hopetown, Strydenburg, Northern Cape
2014	ES and E Sasol Secunda Building Landscape Development, detail design	Project principal	Secunda
2014	Development of tourism route for the Northern Cape Economic Development Agency (Tsantsebane)	Landscape architect	Northern Cape
2014	Rocky Park Integrated Residential Development landscape design, technical resolution and site inspection	Project principal & landscape architect	Stanger, KwaZulu Natal
2014	Apies River Rehabilitation Plan, master plan and technical resolution	Landscape architect	Pretoria, Gauteng
2014-2017	De Aar Referral Hospital landscape design, technical resolution and site inspection	Project principal	De Aar, Northern Cape
2014	Waterval Park community park development landscape and detail design	Project principal	Johannesburg, Gauteng
2014	Wuppertal Trails historic town square development, landscape and detail design	Project principal	Wuppertal
2013	Matjiesfontein Community Food Garden detail design and construction monitor	Project principal & landscape architect	Matjiesfontein, Western Cape
2013	UFS Botanical Gardens PH 2 concept development and detail design	Landscape architect	Bloemfontein, Free State
2013	Lehae Park landscape design , detail design and implementation management	Project principal, Landscape Architect	Johannesburg, Gauteng
2013	SANParks Groenkloof Entrance landscape design, detail design and implementation management	Project principal & landscape architect	Pretoria, Gauteng
2013	Mandela Park School concept and landscape development and implementation management	Project principal, Landscape Architect	Umtata, Eastern Cape
2012	Dinokeng Tourism Route Development, community beneficiation assessment & public participation	Landscape architect	Dinokeng, Gauteng
2012	Dihlabeng Shopping Mall landscape design, technical resolution and implementation management	Landscape architect	Bethlehem, Free State
2011	UFS Botanical Gardens PH 1 concept development, detail design and construction monitor	Landscape architect	Bloemfontein, Free State
2010	Egg Rock Karoo Garden heritage route, feasibility study and implementation monitor	Project principal & landscape architect	Cradock, Eastern Cape
2010	Eerste Rivier Clinic planning, design, contract documentation and implementation management	Landscape architect	Cape Town, Western Cape
2009	Mamelodi Primary School master planning, details design and implementation management	Project principal & landscape architect	Pretoria, Gauteng
2009	2010 Turnkey Projects – Town Entrances, on site design and implementation management	Landscape architect	East Rand, Gauteng
2008	Summerville Golf Estate landscape master planning		Lagos, Nigeria

2008	Vredenburg Reservoir & Community Park master planning, design and project management	Project principal & landscape architect	Vredenburg, Western Cape
2008	Tiny Town Heritage Site planning, design, contract documentation and implementation management		Pretoria, Gauteng
2008	Centenary Building planning, design, contract documentation and implementation management	Project principal & landscape architect	Pretoria, Gauteng
2007	Silverstar Casino master plan, oversee landscape design and implementation management		Krugersdorp, Gauteng
2007	Inanda Greens Office Park landscape design, documentation and implementation management	Project principal & landscape architect	Sandton, Gauteng
2006	The Emperor Hotel Site development plan, landscape design and project management		Johannesburg, Gauteng
2006	Serengeti Golf and Wildlife Estate master planning, documentation and landscape design		Johannesburg, Gauteng
2006	GMSA Head Office site development plan, landscape design, contract management and project management	Landscape architect	Johannesburg, Gauteng
2006	Vodacom Corporate Head Office Phase 5 site development plan, landscape design and implementation management		Midrand, Gauteng
2005	Bruma Lake & River Rehabilitation, river rehabilitation master plan and project management		Johannesburg, Gauteng
2005	Fourways River Rehabilitation, river rehabilitation master plan and project management		Fourways, Gauteng

Position: **Founder and Principal Landscape Architect** **Duration:** **3 years**

Date of employment: 2007 to 2010

Employer:

Green Contour Landscape Architects, South Africa

Type of Project:

Landscape Architecture / Environmental Planning

Scope of Employer's Contract:

Experience in the Republic of South Africa

As sole proprietor and Principle Landscape Architect, all functions of a running consulting business were performed. Projects ranged from small residential, retail / commercial / corporate / environmental rehabilitation / recreational and municipal infrastructure developments.

Specific Duties and Responsibilities/ Scope of Work:

- Develop and build new working relationships clients.
- Marketing

- Financial management
- Planning, Conceptualization, Design Development, Design Documentation, Construction documentation and specification as well as Project management and quality control.

Position:	**Senior Landscape Architect**	**Duration:**	**1 year**

Date of employment: 2006 - 2007

Employer:

Insite Landscape Architects, South Africa

Type of Project:

Landscape Architecture

Scope of Employer's Contract:

Experience in the Republic of South Africa

Appointed as Senior Landscape Architect to perform full scope of services with associated roles and responsibilities on all the various projects – corporate / retail / commercial / large-scale residential and recreational developments. Oversee junior staff compliment in the design office. Develop and build new working relationships with specialist sub-consultants as well as clients.

Specific Duties and Responsibilities/ Scope of Work:

- Planning, Conceptualization, Design Development, Design Documentation, Construction documentation and specification as well as Project management and quality control of numerous projects.

Position:	**Senior Landscape Architect**	**Duration:**	**1 year**

Date of employment: 2005 - 2006

Employer:

Exclusive Gardens, member of Bidvest Group

Type of Project:

Landscape Architecture

Scope of Employer's Contract:

Experience in the Republic of South Africa

Appointed as Senior Landscape Architect to perform full scope of services with associated roles and responsibilities on all the various projects linked with the Landscape Architecture department within the company structure. Also Design Office manager to oversee all design staff and financial management.

Specific Duties and Responsibilities/ Scope of Work:

- Planning, Conceptualization, Design Development, Design Documentation, Construction documentation and specification as well as Project management and quality control of various commercial / retail / recreational projects.
- Business development
- Marketing
- Financial management

- Build and sustain client relations

Position:	**Landscape Architect**	**Duration:**	**2 years**

Date of employment: 2003 - 2005

Employer:

Strategic Environmental Focus

Type of Project:

Landscape Architecture

Scope of Employer's Contract:

Experience in the Republic of South Africa

Appointed as Landscape Architect to perform full scope of services with associated roles and responsibilities on all the various projects linked with the Landscape Architecture department within the company structure. Also support function to the various environmental departments within the company. Tasked with development of environmental rehabilitation strategies and plans as well as conducting visual impact assessments (VIA) on large-scale developments. Develop and build new working relationships with specialist sub-consultants as well as clients.

Specific Duties and Responsibilities/ Scope of Work:

- Planning, Conceptualization, Design Development, Design Documentation, Construction documentation and specification as well as Project management and quality control of various commercial / retail / recreational projects.
- River rehabilitation design, documentation, project management and quality control.
- Visual impact assessment studies and reporting.

Position:	**Junior Landscape Architect**	**Duration:**	**2 years**

Date of employment: 2001 - 2003

Employer:

Uys and White Landscape Architects, South Africa

Type of Project:

Landscape Architecture

Scope of Employer's Contract:

Experience in the Republic of South Africa

Appointed as Junior Landscape Architect to perform design office support function on numerous planning and design projects of multiple scales.

Specific Duties and Responsibilities/ Scope of Work:

- Sketch Plan development and presentation material
- Graphic design and 3D renderings
- Providing Computer Aided Design (CAD) drawings and rendering
- Material design and selection for Soft Landscape as well as Hard landscape elements.
- Setting up Bill of Quantities, Working Drawings and Specification Documentation for construction and implementation.

Theta Project Biodiversity Offset and Compensation- Revised Report

Mark Botha

And
Christien Steyn
Stephen van Staden

August 2020

Report Title: Theta Project Biodiversity Offset and Compensation Recommendations Report

Date: August 2020

Version: Version 03

Document type: Version for Submission to Competent Authority

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Client: Theta Gold Mines
Principle funding agent: TGME/Theta Gold Mines
Citation: Botha M, Steyn C & van Staden S (2020). *Theta Project Biodiversity Offset and Compensation Recommendations Report.* Report prepared for TGME/Theta for submission to DMR&E along with the Revised EIR for the Theta Hill Project, August 2020.

Declaration: We are independent specialist service providers that have been engaged to design and negotiate this biodiversity offset. We have no interest in Theta Gold Mines or TGME or its agents or operations, beyond fair remuneration for services rendered and declare that we act independently and without influence from any party.

18 August 2020

Contents

Acronyms

83MR	Mining Right 83		IDP	Integrated Development Plan
BNR	Blyde River Canyon Nature Reserve		LUS	Land Use Scheme
CBA	Critical Biodiversity Area		MRA	Mining Rights Area
CR	Critically Endangered		MTPA	Mpumalanga Tourism & Parks Agency
DARDLEA	Mpl Dept Agriculture, Rural Development, Land and Environmental Affairs		NEMA	National Environmental Management Act
DFFE	Dept Forestry, Fisheries & Environment		NEMPA	NEM: Protected Areas Act
DMRE	Dept Mineral Resources & Energy		PA	Protected Area
DWS	Dept Water & Sanitation		PBO	Public Benefit Organisation
EA	Environmental Authorisation		RQO	Resource Quality Objectives
EIR	Environmental Impact Report		SDF	Spatial Development Framework
EMF	Environmental Management Framework		TGME	Transvaal Gold Mining Estates
FEPA	Freshwater Ecosystem Priority Area		WfW	Working for Water – now a part of the Natural Resource Management in DFFE
FPA	Fire Protection Association		WULA	Water Use Licence Application
IAPs	Invasive Alien Plants		WWTW	WasteWater Treatment Works

The entrance to Buffelsfontein farm, with a cordial welcome sign from the Maorabjang CPA.

1. Executive Summary

The proposed Theta mine project will impact on threatened ecosystems and result in a significant loss of critical biodiversity areas. Around 69 ha of irreplaceable CBA (demanding a compensation ratio of 30:1) and 48 ha of optimal CBA (requiring a ratio of 20:1) will be lost to the revised mine footprint development (see Figure 1). A 10% buffer was applied to these areas to cater for unforeseen eventualities and potential infrastructure creep. There will also likely be impacts on small areas of indigenous forest, although these are rather degraded and are heavily infested with invasive alien plants. To remedy these losses, a biodiversity offset and suite of compensation measures will be required.

Calculations indicate a required offset of 3336 ha. This offset must be located in the Northern Escarpment Dolomite Grassland vegetation type and ideally within the Malmani Karstland Listed Ecosystem and cover a substantial portion of the related Critical Biodiversity Areas (CBA), preferably in the B60B quaternary catchment. Several properties have been identified that, in combination, meet the offset requirements. After negotiation with the owners, the final sites will have to be declared as Nature Reserves and the applicant will fund their management for a period of at least 30 years.

As compensation for any loss of indigenous forest, it is proposed to protect and rehabilitate indigenous forest in the Peachtree Stream catchment and invest in the management and rehabilitation of the proposed addition to the Morgenzon Forest Nature Reserve West of the proposed Theta project. The objective is to reduce the loss of forest to invasive alien plants (IAPs) and injudicious wild fires and return a measure of ecosystem and hydrological functioning to the catchment.

The impact is also adjacent to a CBA river and a River Freshwater Ecosystem Priority Area (FEPA) and both affected Quaternary catchments (B60A & B60B) are identified as 'CR' fish sanctuaries although no species-specific offset measures were proposed (SAS 2019; SAS 2020). No (or only insignificant) wetlands were found to be impacted. While there are potential impacts on water quality of the Blyde River system due to failure of mitigation measures in the mining areas, it seems possible to mitigate some of the impacts through catchment-wide measures to contribute to meeting the required Resource Quality Objectives (RQOs). This mitigation will be framed as 'compensation'.

It is very difficult to accurately gauge what an appropriate level compensation may be, as the impacts and desired outcomes often are relatively unrelated or measured using different variables. One approach (adopted here) is to replenish the licenced abstraction volume (which is far greater than that which will actually be used by the mine) by removing the equivalent evapo-transpiration of an area of invasive trees by clearing them. TGME has a permit to abstract 469,025m^3/a. Calculations indicate that clearing the invasive tree (primarily *Acacia* and *Eucalyptus* species) infestations in the Stanley Bush Kop section of the Blyde River Canyon Nature Reserve and Peachtree Stream catchment effectively compensate for this volume. Further, the replenishment should contribute most during the dry season to maintain flows, improve dilution effects and provide refugia for sensitive species in the Blyde River.

The primary contribution to mitigating the freshwater ecosystem impacts and potential water quality issues is through controlling invading alien plants and sediment run off. This will be

approached through catchment-scale and site-scale interventions. At a quaternary catchment scale, the applicant will:

- Fund the development of rehabilitation plans to align and integrate as much IAP control and fire management as possible among large land owners and users.
- Fund the development and implementation of a biocontrol program to control the most insidious invasive plants (*Acacia dealbata*) to leave a long-term legacy contribution to improving water resources.

At a site scale, the applicants will:

- Invest in substantial IAP control and fire management, through a 12-year program, in the Stanley Bush Kop section of the Blyde River Canyon Nature Reserve (to rehabilitate at least 254 ha of dense infestations in this reserve);
- Invest in substantial IAP control, fire management and forest rehabilitation in 46 ha of the Peachtree Stream catchment to the West of the Theta project, including adjacent to the 263 ha proposed new Morgenzon Forest Nature Reserve and remaining indigenous forest;
- implement sediment and erosion control after IAP clearing through revegetation and simple physical barriers (e.g. contour brush packing);
- manage new agricultural impacts on riparian zones and sedimentation in quaternary catchment B60B (primarily on the farms Willemsoord 476, Manx 475 and Vaalhoek 474), through notarial agreements with the owners, promoting compliance with agricultural and water resource protection regulations;
- measure sedimentation runoff at current monitoring points to verify the efficacy of actions.

To ensure that the offset and compensation outcomes are achieved, financial and institutional arrangements are proposed that provide the funds, governance and oversight of implementation. These matters will be codified in an agreement with the Mpumalanga Tourism and Parks Agency (MTPA), and the applicant has expressed the desire to have the conclusion of this agreement be made a prerequisite prior to - or a suspensive condition of - any environmental authorisation or water use licence.

2. Introduction

This document sets out the required biodiversity offset and compensation measures for the proposed Theta project (Ponieskrans 543KT, MP30/5/1/2/3/21/83EM). It builds on the initial study conducted on offset requirement, quantum and potential availability (STS 2019), revised flora (STS 2020) and freshwater studies (SAS 2020) and the initial Offset and Compensation Study (Botha, Steyn, van Staden February 2020). The details herein can be used to frame appropriate conditions of authorisation, should this project be approved (in whatever form, the mitigation can be scaled appropriately). It also sets out the required offset and compensation parameters for the proposed "Implementation Agreement" between TGME, MTPA, and, if necessary, any implementing agent.

This study does not elaborate on how the mitigation hierarchy has been exhausted, which is provided in the final revised EIR compiled by Batho Earth (2020). This study also does not lay out the detailed specific biodiversity (terrestrial and aquatic) impacts or parameters of the hydrological and surface water studies. Please refer to the relevant specialists' reports in the EIR – the offset-relevant sections are included here. The authors are unable to pronounce on whether the mitigation hierarchy has been adequately exhausted by the final application for

authorisation, as there are impacts on irreplaceable biodiversity caused by activities which are apparently required for the project to be viable.

This study is designed to synthesise and augment the biodiversity- and ecosystem-relevant mitigation measures suggested in the existing biodiversity, freshwater and surface flow studies compiled as part of the EIA. It also responds to several questions raised by commenting authorities on the draft EIR. An objective of the study is to enable the competent authority to arrive at an informed decision on the suitability and sufficiency of the offset-type mitigation proposed below.

The Phase 1 Offset study (STS 2019) specified the initial impacts and metrics, and assessed land availability to satisfy the offset. This study builds on the phase 1 report and initial Offset and Compensation study (February 2020), establishes the suitability of a range of potential offset properties and assumes that, given the relationship between the applicant (TGME) and the landowners of the majority of the offset sites (Maorabjang CPA), there is a high likelihood of the latter agreeing to the offset being declared a protected area. This agreement is however, not guaranteed, and therefore requires the declaration of the site to be a suspensive condition of the environmental authorisation for the Theta project (see Suggested Mitigation conditions for inclusion in the EA:).

The identification/establishment and funding of responsible implementers is vital to achieve successful implementation and a net positive outcome for biodiversity and ecosystem services in the local region and broader catchment. Given the lack of implementing agent candidates in this region, timelines to conclude such implementation agreements within the one-environmental system process, and the need for a funding and performance guarantee to cover the costs, suggestions are provided for possible institutional and financial arrangements.

Lastly, an optimal study would calibrate the compensation requirements accurately based on the specific impact metrics. In this case, most of the compensation is based on counterbalancing potential (and not certain or known) impacts on water quality due to failure of carefully designed mine works and rehabilitation programmes. These impacts are unlikely to manifest, but if they do, it is unclear to what extent the compensation would remedy the resultant impact. Further compensation is based on replenishing the abstraction from the Blyde River under a valid water use licence, although this is not strictly required in law. However, this replenishment is a key component in addressing many of the concerns of I&APs regarding the project. What is proposed below represents a suite of measures designed to do what is possible to remedy the known and potential future impacts.

3. Disclaimers and Assumptions:

- The authors are not in a position to comment on whether additional avoidance of impacts on irreplaceable biodiversity features is possible, and specifically whether underground mining is a preferable alternative. The proponents and their engineers insist that the project is not viable if further avoidance is demanded in this 83MR application. We do not have the expertise to pass judgment on this assertion and must trust the range of specialists that have been involved in the project to date that they have extracted commitments to all possible avoidance and minimisation of impacts.

- Further, it is unclear whether other mining right-linked opportunities adjacent to 83MR (such as on 341MR) may be preferable to pursue from a biodiversity impact perspective (even if they may have other challenges). This is beyond this study's brief, but bears investigation. However, even if this were the case, it is unlikely that the recommended mitigation measures in this report would be different in any way beyond an applicable reduction in scale associated with a reduced impact.
- The full extent of likely impacts from all existing operations and potential mineral rights development should be clarified and used as a context of potential likely cumulative impact for this offset and compensation study. This is not yet available to the authors in sufficient detail.
- We must base estimations and proposals on data and conclusions drawn by other specialist studies. There is no reason to doubt the veracity of these conclusions, and where prudent have included "swell factors" to cater for any potential uncertainty.
- Legacy impacts relating to recent or historic non-compliance should be quantified and, if necessary, used to augment the compensation measures.
- The prospecting roads constructed on areas that may not form part of the final pits should be rectified through the appropriate process, and the rehabilitation plan compiled must be implemented and aligned with the quaternary catchment rehabilitation plan before commencement of the listed activities. The authors have not had sight of this plan. Any footprint impacts of these roads not covered by an eventual pit or other authorised infrastructure should be quantified and used to augment the offset requirement. This is beyond our brief.
- For 83MR, Irreplaceable Critical Biodiversity Areas (CBAs) will be impacted, hence mitigation must comprise both an offset (for non-irreplaceable biodiversity) and compensation (for irreplaceable components). Several recommended mitigation measures can feasibly be judged to be an offset or biodiversity compensation. Thus, any inadvertent reference in this report to 'offset' includes the various other 'biodiversity compensation' mechanisms.
- The scope, sensitive receptors and scale of likely, indirect and potential induced (as well as unknown potential future) impacts requires a thorough and risk-averse offset quantum and design. The lack of applicable metrics from some potential impacts (especially on water quality) complicates this.
- The accepted offset practice of setting aside and protection/management of pristine areas should be augmented by rehabilitation of degraded grassland and riparian areas (in addition to investing in good practice rehabilitation across the entire Mining Rights Area (MRA)).
- The authors have had no engagement with the landowners in the broader catchment where the offset and compensation will need to be realised due to time constraints and potential sensitivities. Their participation and support (and sometimes consent) are critical to success. While the offset and compensation are intended to align with their objectives (or regulatory duty-of-care) in the landscape, the applicant will need to bring these key role players to the table urgently.
- As irreplaceable CBAs are impacted, and trading-up is not possible, it seems appropriate to focus offset actions on the most important proximate conservation priorities in the most closely related CBAs and vegetation types and to augment this with compensation

measures aimed at reducing the background rate of loss of these biodiversity features and CBAs due to invasive plants and contributing to meeting water resource quality objectives. This implies direct Protected Area (PA) expansion where possible, and the creation of new PAs on the Mining Rights Area (MRA). PAs on MRAs will require novel arrangements with DFFE and DMRE on declarations over MRs and will require policy engagement at high level with DFFE and DMRE. Requiring the declaration of a Nature Reserve (or equivalent designation) over certain portions of the MRA, with strict controls over future mineral exploitation on the offset site(s) is critical for the success of this offset and compensation package.

- Given the complexities of the offset and compensation, it seems imperative that an implementation agreement (beyond the tools in NEMA) is concluded with the provincial biodiversity authorities (MTPA) to provide assurance for implementation and achieving outcomes.
- New PAs and compensation mechanisms will require an endowment and ongoing funding model, coupled to an institutional model (Trust or similar) that can oversee implementation of a progressive offset, adaptively manage/deploy investments and independently verify performance. Although it is unwise to stipulate HOW an applicant should meet its obligations in recommendation, it seems appropriate that some guidance and explicit outcomes be provided for consideration by all involved authorities.
- Freshwater and hydrological offsets/compensation potentially required by DWS can be combined with Biodiversity offset/compensation if suitable alignment between EIA and IWULA processes can be found. It is currently unclear what this additional specific mitigation might be, if any.
- Performance bonds (for both Biodiversity and Water impacts) should be included, and held in a suitable vehicle (such as a financial institution guarantee, or an escrow account in a mutually acceptable legal practice willing to do so). Such bonds should be in favour of the proposed Trust (or similar vehicle) to implement the required offset and compensation outcomes. Bond amounts should escalate until full impact is realized, and be recalculated every second year to cater for new information. Required biodiversity outcomes from deployment of the bonds needs to be explicitly determined in the offset and mitigation agreement, and captured unambiguously as conditions in the EA, and codified in any offset implementation agreement.
- A revised layout was provided by the client to the various specialists involved in the impact assessment process on 21 April and again on 18 June 2020. This layout had a significantly larger footprint impact than the previous layouts considered during scoping and the initial EIA phase. Although the mine planners invested significant effort to avoid and plan around the site-based features of high biodiversity importance, there is no escaping the greater loss of irreplaceable CBAs. This necessitated a revision of the offset and compensation metrics. Repeated iterations of the layout were still being examined at time of writing and may be marginally larger than indicated below. We cannot be held responsible for the accuracy of figures reported herein if the layout changes substantially, and have catered for increases by adopting a 10% swell factor in our impact calculations.

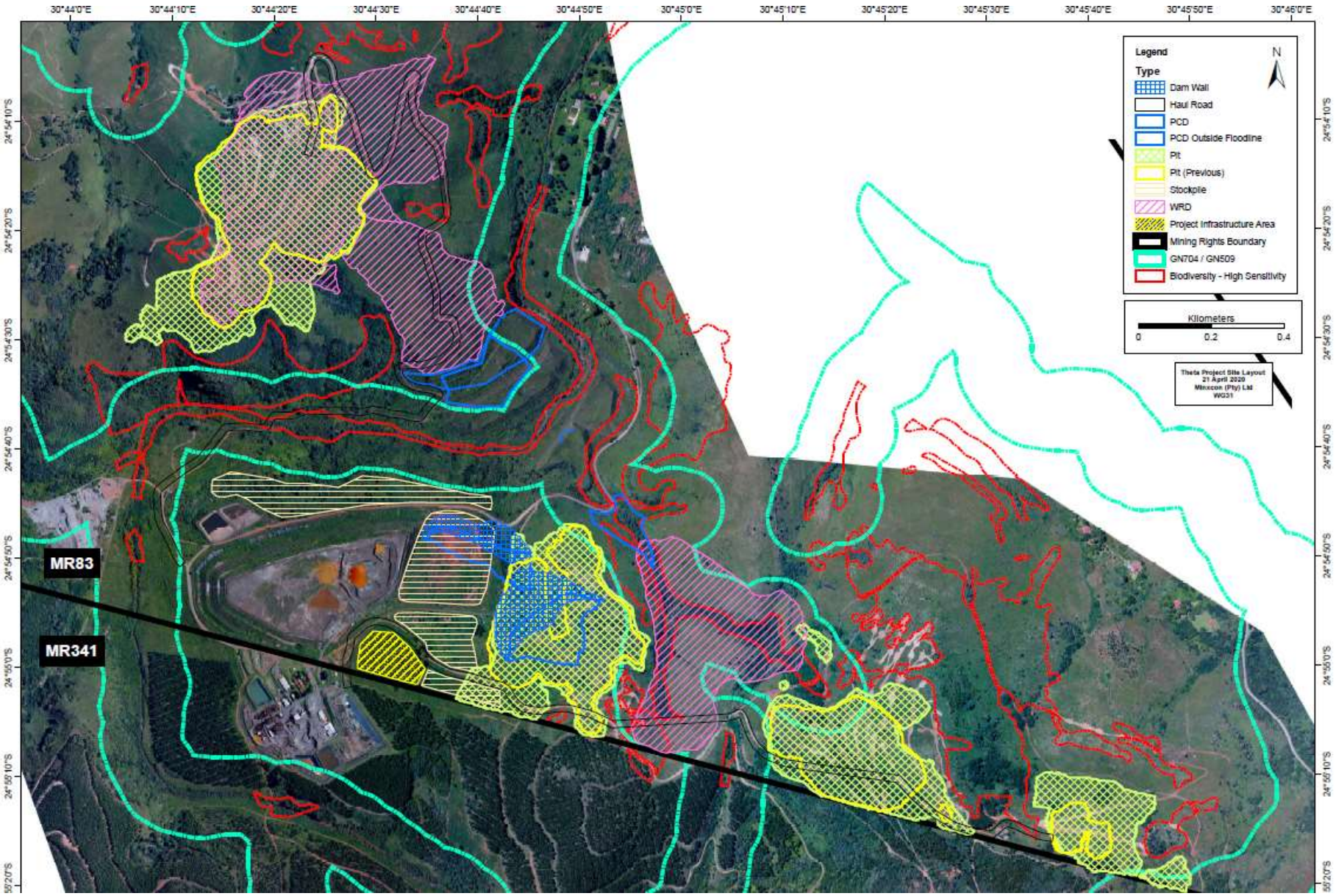


Figure 1. The revised 4th layout of 21April 2020 indicating the increased pit and waste rock dump footprints. Red lines indicate extent of site-specific biodiversity receptors of high importance, which have mostly been avoided. The 5th iteration of 18 June is slightly larger for Iota pit and WRD.

A note on terminology: Technically it is not possible to 'offset' a biodiversity component that is vital for meeting biodiversity targets, (termed "irreplaceable"). A more appropriate term for this would be 'compensation'. Hence, it is not possible to 'offset' impacts on irreplaceable CBAs – mitigation would require pursuing appropriate compensation instead, which results in long term net positive outcomes for the affected biodiversity.

Similarly, it is often not possible to 'offset' water-mediated impacts, but mitigation can include 'compensation' for potential or anticipated impacts by addressing unrelated biodiversity features (or stressors) that result in improved freshwater ecosystem status and functioning, and thus make a significant contribution to meeting the Resource Quality Objectives (RQOs) that maintain the desired classification of the affected water resource (the Blyde River should be maintained as a Class B (also noted as Class 1) resource).

There is a lack of clarity as to the appropriate approach to manage impacts on indigenous forests, and whether these can be 'offset' or are better framed as 'compensation'. Technically all forests are protected by law and thus not "offsetable". We have adopted the 'compensation' terminology in this study.

4. Offset and compensation scope.

4.1 Terrestrial Biodiversity Offset required.

Approximately 129 ha (117ha + 10% buffer) of Northern Escarpment Dolomite Grassland, Long Tom Pass Montane Grassland, and Northern Escarpment Quartzite Sourveld will be impacted (STS 2020). Traditionally, offset metrics would be calculated per vegetation type, but as there is some interdigitation and gradation between these types on site, and the fact the presence of CBAs will dominate the offset metrics, we have opted to base offset metrics on CBA impacts going forward. Around 69 ha of irreplaceable CBA (demanding an offset ratio of 30:1) and 48 ha of optimal CBA (requiring a ratio of 20:1) will be lost to the revised mine footprint development (see Figure 1.) A 10% buffer was applied to these areas to cater for unforeseen eventualities and potential infrastructure creep. The specific impacts from different listed activities on the three primary biodiversity components with attendant offset requirements is given in Table 1.

The extent of impact on indigenous forest is complicated by the fact that almost the entire impacted area (<2ha) at Iota is heavily disturbed and invaded with Acacia and other invasive plants. To what extent Forest impact can be considered significant or offsetable must be discussed with DFFE. No species-specific offset or mitigation measures were recommended by the specialist consultants, although on-going field work is being conducted to assess this (STS – pers comm 24 January 2020).

Table 1. The impacts from various listed activities of the Theta project (5th Layout – June 18th 2020) on different components of biodiversity, the applicable ratios, and the resultant offset required.

Biodiversity Feature	Total Potential Loss (ha)	Applicable Offset Ratio (DEA, 2017)	Offset Target (ha)
CBA Irreplaceable (4th Layout)		30:1	
Linear Developments (Haul roads, Power lines, diversion trenches)	4		
Open Pits & Waste Rock Dumps	65.3		
Total: CBA Irreplaceable	**69.3**		2079
CBA Optimal		20:1	
Linear Developments (Haul roads, Power lines, diversion trenches)	1		
Dams	1		
Open pits & Waste Rock Dumps	45.6		
Total: CBA Optimal	**47.6**		952
Endangered Ecosystems		20:1	
Linear Developments	0.1		
Total: Endangered Ecosystems	**0.1**		2
5th Layout TOTALS	**117**		3033
Include a factor for uncertainty		**10%**	**3336**

In all cases, ratios and uncertainty factors have been set at the highest level where required.

To counterbalance the loss of the biodiversity in the footprint of the activities applied for, an offset of at least **3336 ha** is required. To ensure a like-for-like outcome, this offset must be located in the Northern Escarpment Dolomite Grassland vegetation type, ideally within the Malmani Karstland Listed Ecosystem and cover a substantial portion of the related Critical Biodiversity Areas, preferably in the B60B quaternary catchment.

A suite of potential offset target properties was assessed for suitability. These properties are all located North of the proposed mine as most surrounding properties are either state-owned or already declared protected. Most of the potential offset target areas are held under mining right 10167 by TGME and are owned by the Maorabjang Communal Property Association.

It would seem inevitable that at least 3336 ha of these properties would need to be selected as an offset for the impacts under the Theta project. These would need to be declared as a nature reserve in perpetuity to safeguard the biodiversity features (see Figure 2). Mining or prospecting right information for two properties (Ledovine and Doornboom) was not available at time of submission.

Table 2. The five top priority sites for securing the requisite biodiversity offset, with their constituent biodiversity components and the PAs they are adjacent to. Note, Buffelsfontein 452 is functionally contiguous to Blyderivierspoort NR (<2km away over pristine mountain grasslands). Granite Hill 477 is state owned and not an offset target, but should be declared as a Nature Reserve at the same time as the offset site(s).

Farm Portions	CBA Irreplaceable (ha)	CBA Optimal (ha)	Malmani Karstlands (ha)	Linking Protected Area	Total size (ha)
BUFFELSFONTEIN 452	1768	217	29	Blyderivierspoort Nature Reserve	**2813**
DOORNBOOM 478	917	158	322	Morgenzon Forest Nature Reserve	**1663**
GRANITE HILL 477	193	50	38	-	**306**
HERMANSBURG 495	404	508	605	Blyderivierspoort Nature Reserve	**1517**
LEDOVINE 507	329	820	1011	Blyde Forest Nature Reserve*	**2701**
VAALHOEK 474	1196	188	50	Morgenzon Reserve	**1825**
Total: Potential Target Areas	4807	1941	2055		10825
Total: Required Offset					**3336**

* The intention to declare this Forest Nature Reserve, to which Ledovine would link, is currently pending (June 2020)

To assist further with offsetting the loss of CBAs and natural habitat in the Northern Escarpment Dolomite Grassland, and specifically, the Malmani Karstland Listed ecosystem, TGME will undertake to control Invasive Alien Plants[1] (IAPs) on land it does not own, thereby slowing or even reversing future loss of the impacted vegetation type. While control of IAP invasions and restoring basic grassland cover will not sufficiently offset the impacts on its own, it will improve ecosystem function and contribute to mitigation of other impacts (through contributing to meeting Resource Quality Objectives for the Blyde River and to reduce risk of further loss of grassland and forest vegetation).

To secure the outcomes of restoring functionality and avoided loss of grasslands, the control of IAPs will be focused on the Stanley Bush Kop section of the Blyde River Nature Reserve (an 'unvalidated' protected area[2]) and key parts of the Peachtree Stream Catchment. The rehabilitation gains will need to be secured and protected through approved management plans, and land use control and notarised conservation servitudes (see below).

[1] Most of the species of concern are trees, and this is where the focus should be. Herbaceous IAPs are present, but need to be controlled differently, and kept from re-invading areas cleared of invasive trees by repeated control and the establishment of indigenous vegetation.
[2] The Stanley Bush Kop section of Blyde River Nature Reserve is recognized and vested with MTPA but doesn't appear in the official SA Register of Protected Area.

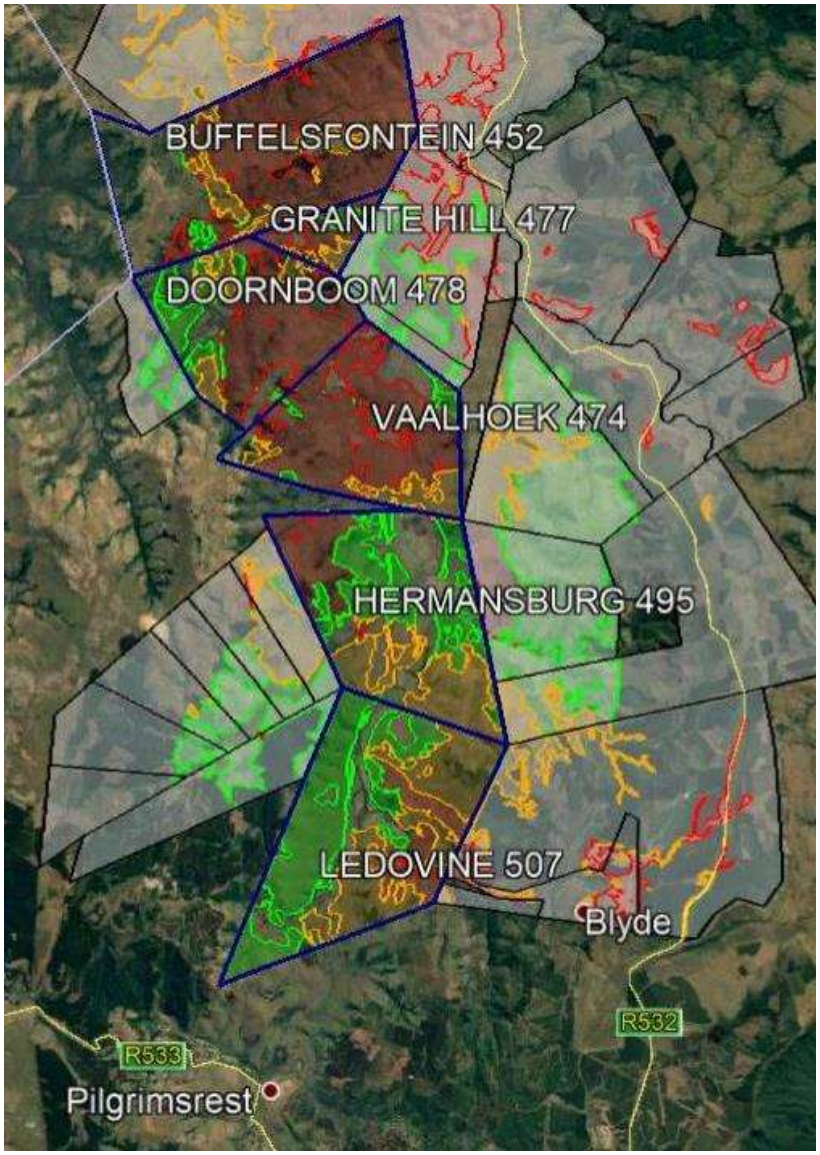


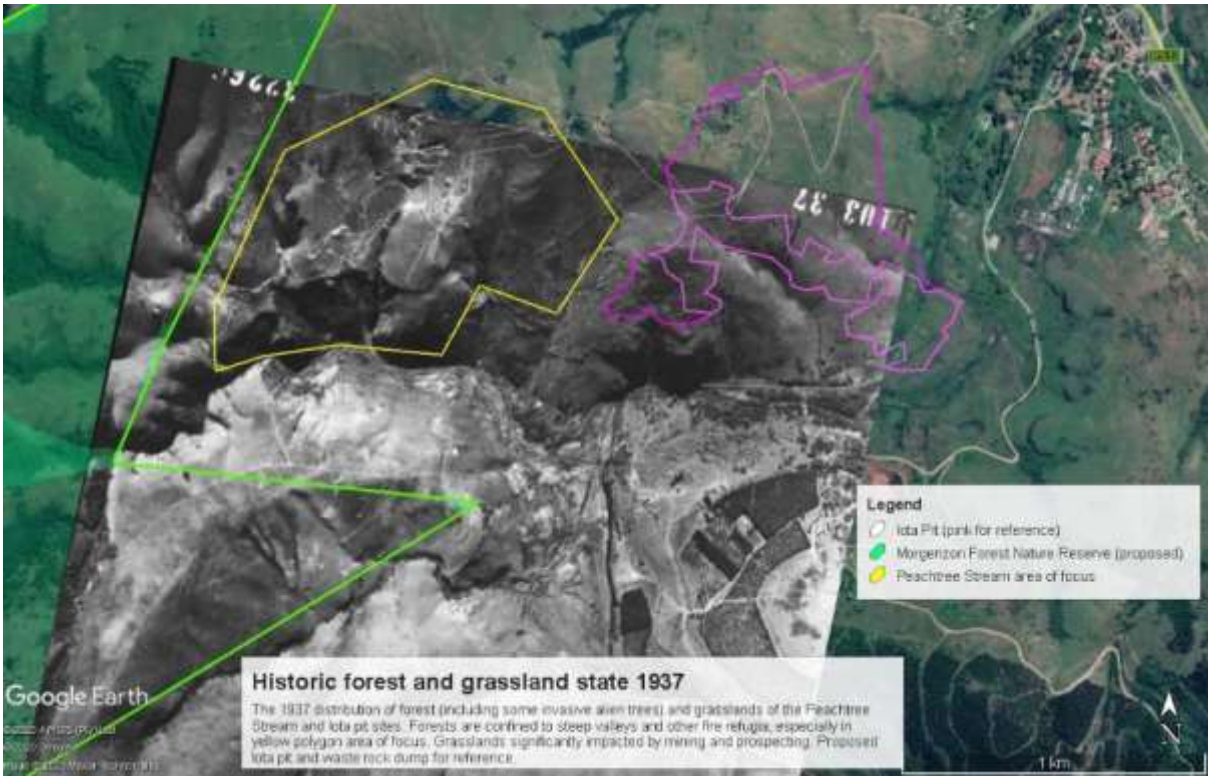
Figure 2. Potential sites that meet (individually or in combination) the offset criteria for the Theta project. At its closest point, Buffelsfontein is 23km from the mine site and <1.3km from Blyderivierspoort Nature Reserve.

4.2 Forest compensation

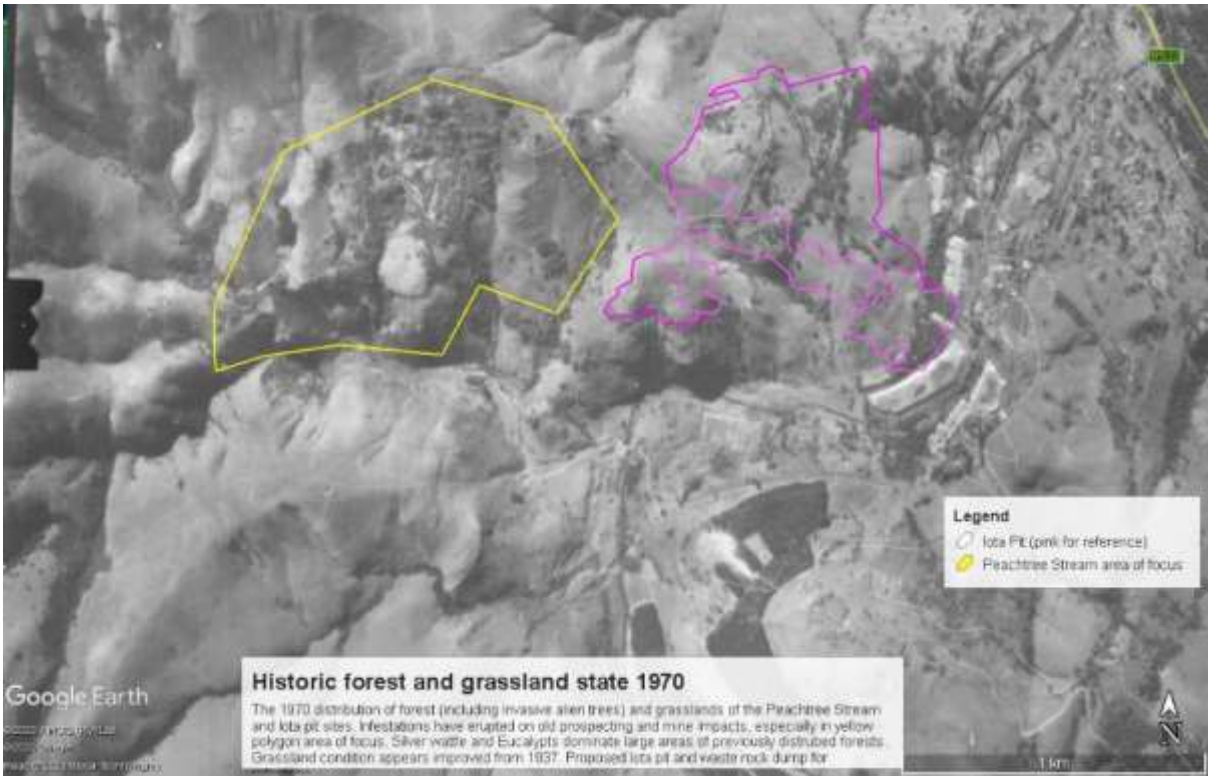
Many of the forest patches around the proposed Theta project are in poor condition (see Figure 3 and STS 2020), having been historically impacted by over a century of mining, harvesting, injudicious fire and invasive plants. Further West, large areas of the main Peachtree Forest block are similarly invaded, allowing fire to encroach into the remnant indigenous forest. This forest is heavily invaded, has extensive old mine workings and has recently been significantly impacted by illegal artisanal mining (see Figure 4).

Figure 3. The eastern section of the Peachtree Stream forest that will be affected by the Iota pit and waste rock dump. This satellite image from November indicates the extent of degradation of the forest and invasion by IAPs, mainly silver wattle (*Acacia dealbata*) indicated by the dark grey-brown areas. Note that the pit and waste rock dump shells outlined here are slightly larger in the 5th layout.

A.


Legend
Iota Pit (pink for reference)
Morgenzon Forest Nature Reserve (proposed)
Peachtree Stream area of focus
Historic forest and grassland state 1937
The 1937 distribution of forest (including some invasive alien trees) and grasslands of the Peachtree Stream and Iota pit sites. Forests are confined to steep valleys and other fire refugia, especially in yellow polygon area of focus. Grasslands significantly impacted by mining and prospecting. Proposed Iota pit and waste rock dump for reference.
Google Earth
1 km
N

B.


Legend
Iota Pit (pink for reference)
Peachtree Stream area of focus
Historic forest and grassland state 1970
The 1970 distribution of forest (including invasive alien trees) and grasslands of the Peachtree Stream and Iota pit sites. Infestations have erupted on old prospecting and mine impacts, especially in yellow polygon area of focus. Silver wattle and Eucalypts dominate large areas of previously disturbed forests. Grassland condition appears improved from 1937. Proposed Iota pit and waste rock dump for
Google Earth
1 km
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C.

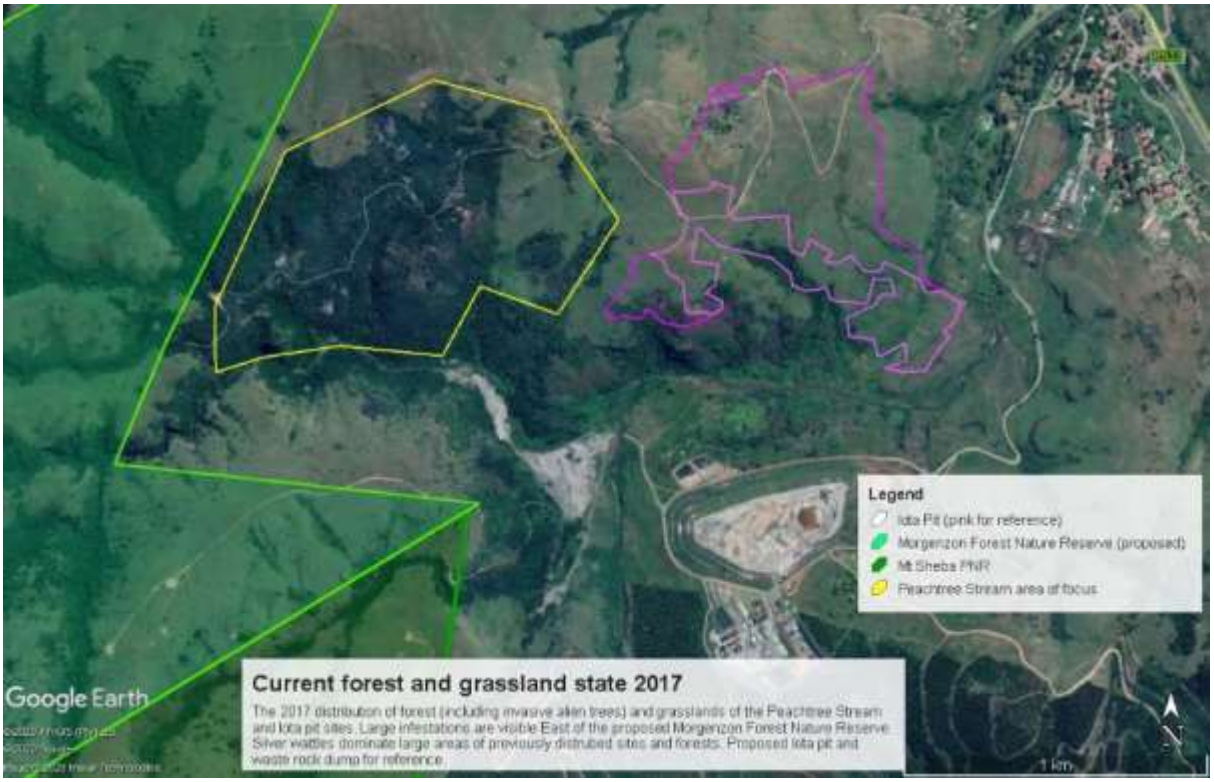

Figure 4A, B & C. The historic distribution and state of forests and grasslands of the Peachtree Stream catchment, west of Pilgrims Rest and the Proposed Theta project. The historic impacts on grasslands visible (**A** & **B**) due to mining, prospecting (and presumably frequent fires and heavy grazing) are being colonised by invasive silver wattle and eucalyptus (**C**). Indigenous forests were historically confined to steep valleys and other fire refugia (**A**). The proposed Iota pit and an area of focus are provided for reference. The area of focus indicates a large degraded and infested area bordering and surrounding pockets of indigenous Northern Mistbelt Forest. Rehabilitation measures for offsetting and compensation will need to balance forest protection and ecosystem functioning and hydrological outcomes (presumably a stable grass sward with high basal cover).

To compensate for impacts in Northern Mistbelt Forest by the Wishbone Waste Rock Dump and Iota Pit, and promote indigenous forest regeneration and forest ecosystem function, TGME will extend an IAP control program to manage the infestation in the Peachtree Stream catchment, including the proposed 263 ha addition to Morgenzon Forest Nature Reserve, and the remaining indigenous forest areas of the 803 ha Peachtree Stream Catchment (see Figure 5). It is not sensible to extend this IAP control into the afforested areas managed for timber at the top of the Peachtree Stream catchment, as this is the responsibility of the forestry companies.

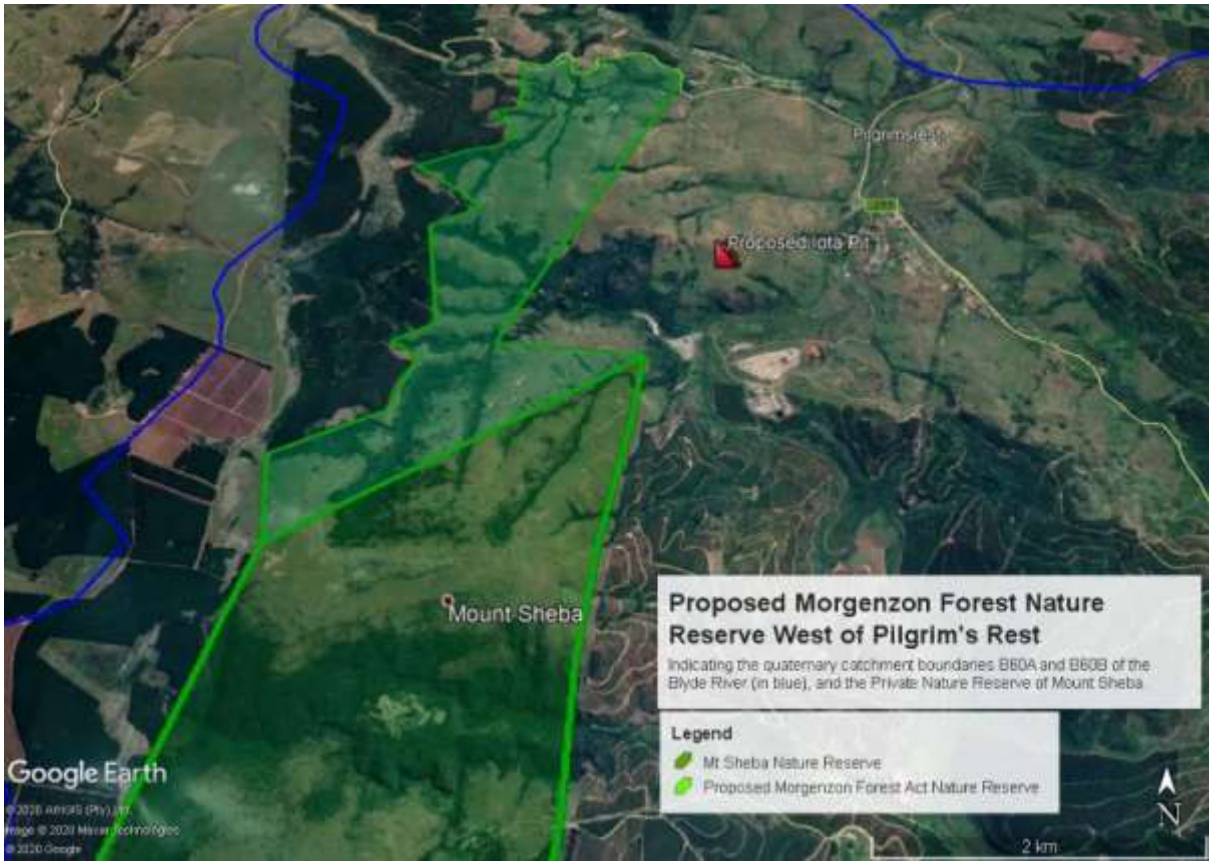

Figure 5. The Proposed Morgenzon Forest Nature Reserve protecting the middle reaches of the Peachtree Stream tributary of the Blyde River. This Reserve if declared would have no management authority or operational budget. It is proposed that this Reserve and surrounding catchment be adopted, rehabilitated and managed for 12 years by TGME as compensation for any forest related impacts associated with the Theta project.

4.3 Freshwater Biodiversity and water ecosystem scope and considerations

The impact is within a CBA river, a River FEPA and both Quaternary catchments (B60A & B60B) are identified as CR fish sanctuaries (SAS 2019). No (or only insignificant) wetlands were found to be impacted, and hence there is no likelihood for employing the wetland offset calculator of DWS to inform the offset.

The entire area is listed as a Strategic Water Source Area and important for 'Freshwater Resource Protection' in the Mpumalanga Provincial SDF, requiring careful engineering mitigation measures, as well as broader catchment management plans and rehabilitation of IAP infestations with the aim of improving ecological infrastructure (MP COGTA 2019).

While it appears that direct impacts on listed species are unlikely, SAS (2019) also found that mitigation must result in:

- "*Resource Quality Objectives for these drainage systems to be met (to improve to or keep as Class B*[3]*);*
- *no change in 'EcoStatus';*
- *long term and/or irreversible impacts on the watercourses of the area being avoided; and*
- *a very well managed monitoring program considering water quality, habitat and aquatic biota must be maintained and executed by well qualified experts"*

SAS (2019) found that "*Further, consideration may need to be given to offsetting residual impacts likely to be associated with the project*". It seems that reference to 'offsets' in this context may not be technically accurate and that 'compensation' would be a better descriptor. A particular challenge is that, by its nature, it is difficult to determine the appropriate quantum of compensation. Although an actual amount of water abstraction has been licenced, and could be compensated for by reducing equivalent losses elsewhere, finding relevant metrics for water quality impacts to calibrate compensation is complicated.

This study assumes that compensation for water ecosystem impacts should prioritise interventions that improve outcomes for biodiversity and align with terrestrial biodiversity management requirements as far as possible. This does not preclude other forms of compensation (for instance reducing risk of failure in the Pilgrim's Rest WWTW) for potential water impacts. Improved dry season flows, reduced storm runoff and lower sedimentation will aid in maintaining the RQOs for freshwater ecosystems and dependant species in B60A and B60B.

The nature of the terrain and the surface water assessment indicate that sedimentation is a risk to the system (not just from mine development) and needs to be controlled through careful site water management, rehabilitation and revegetation measures proposed in the EIR (Hydrospatial 2019). This control should be augmented by reducing sedimentation in the broader landscape through, *inter alia*, restoration of indigenous basal cover following IAP control and control of pre-existing erosion features and anthropogenic disturbances such as the effects of artisanal mining.

Thus, to compensate for water abstraction from the Blyde River, reduce sedimentation and potential loss of, or future impacts on, climate refugia (e.g. pools in the mainstem of the Blyde and key ecological corridors allowing plant and animal dispersal) the mine will need to underwrite and anchor significant catchment rehabilitation measures. This will require alignment and close cooperation with other large landowners, and effective leverage of other rehabilitation investments (such as NRM program funds) through a coordinated planning exercise. The target area for locating biodiversity offset and compensation measures is well defined by the two impacted quaternary catchments B60A & B60B.

[3] Note. Class 1 is equivalent to Class B. The current Class drops from B to C at monitoring sites downstream of Pilgrims Rest. Existing infrastructure and likely anticipated impacts from the proposed mine are seemingly not responsible for this drop in state. However, the objective of the proposed compensation is to contribute to the system re-attaining a Class B. Other interventions are required to ensure this, primarily regarding sanitation services in town and refurbishment of the Waste water treatment works.

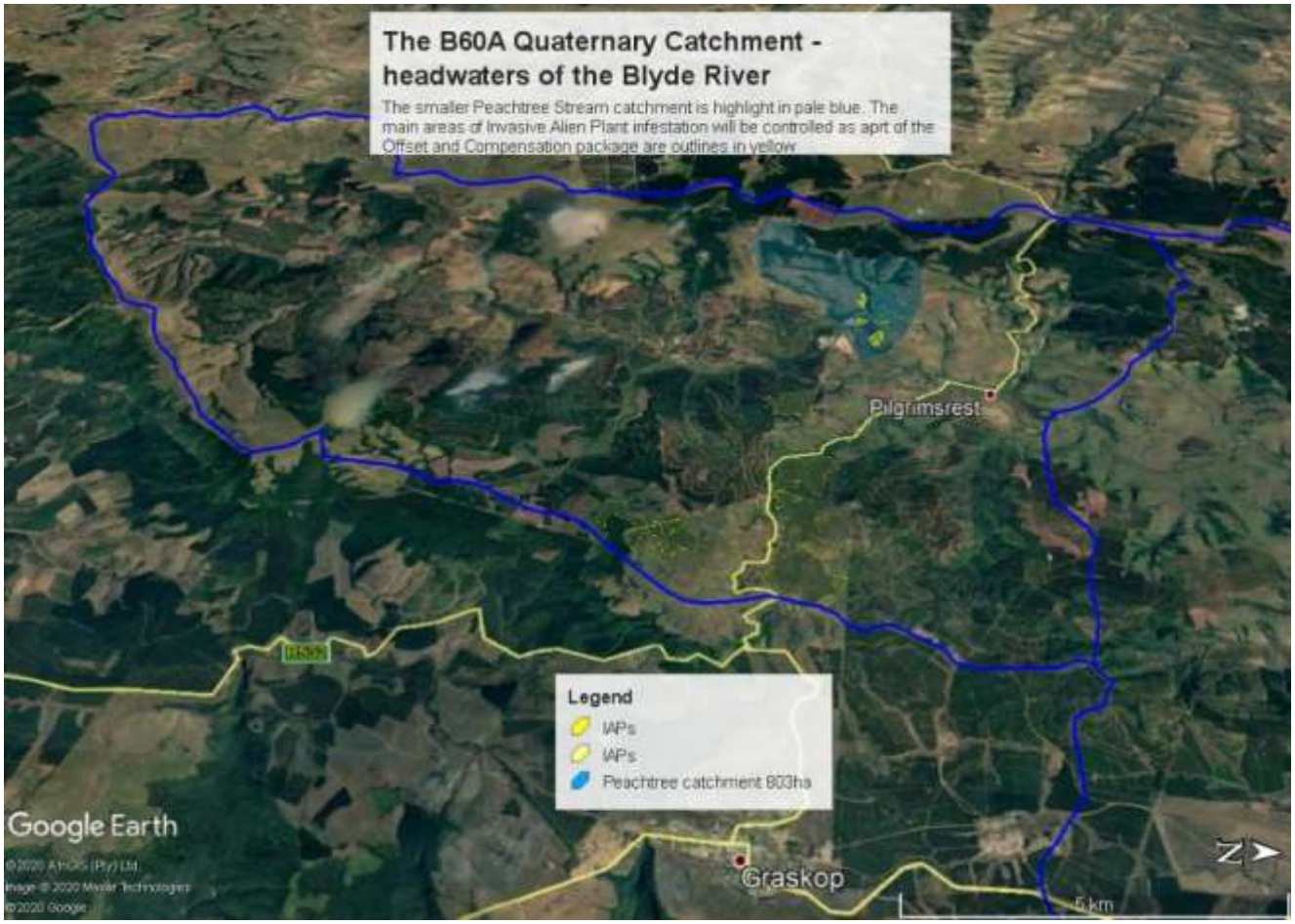

Figure 6. Quaternary catchment B60A, the Blyde River headwaters. TGME will fund the development of an integrated catchment rehabilitation plan to control invasive plants, and reduce wild fire damage and sedimentation impacts. TGME will be responsible for implementing specific sections of the plan in the delineated infestations in the Peachtree stream catchment and the Stanley Bush Kop section of Blyde Canyon Nature Reserve.

4.4 Indirect Offset and Compensation Rationale

The IAPs are spreading and fundamentally impacting the listed ecosystem, remnant Northern Mistbelt Forest, and CBAs. The exact rate of loss is unknown and difficult to quantify, but clearly occurring (see Figure 4). Existing control measures are not keeping pace, evidenced by substantial historical and current Working for Water (WfW) investment, from which the gains on Stanley Bush Kop section of Blyde NR are now almost completely lost. Controlling them in the two headwater catchments would result in biodiversity gains by reducing or even reversing the background rate of loss. Coupled with the direct offset of 3336 ha for the direct impacts (even if 69 ha are on irreplaceable CBA), this is proposed to be compensation for the 117 ha lost and associated other impacts.

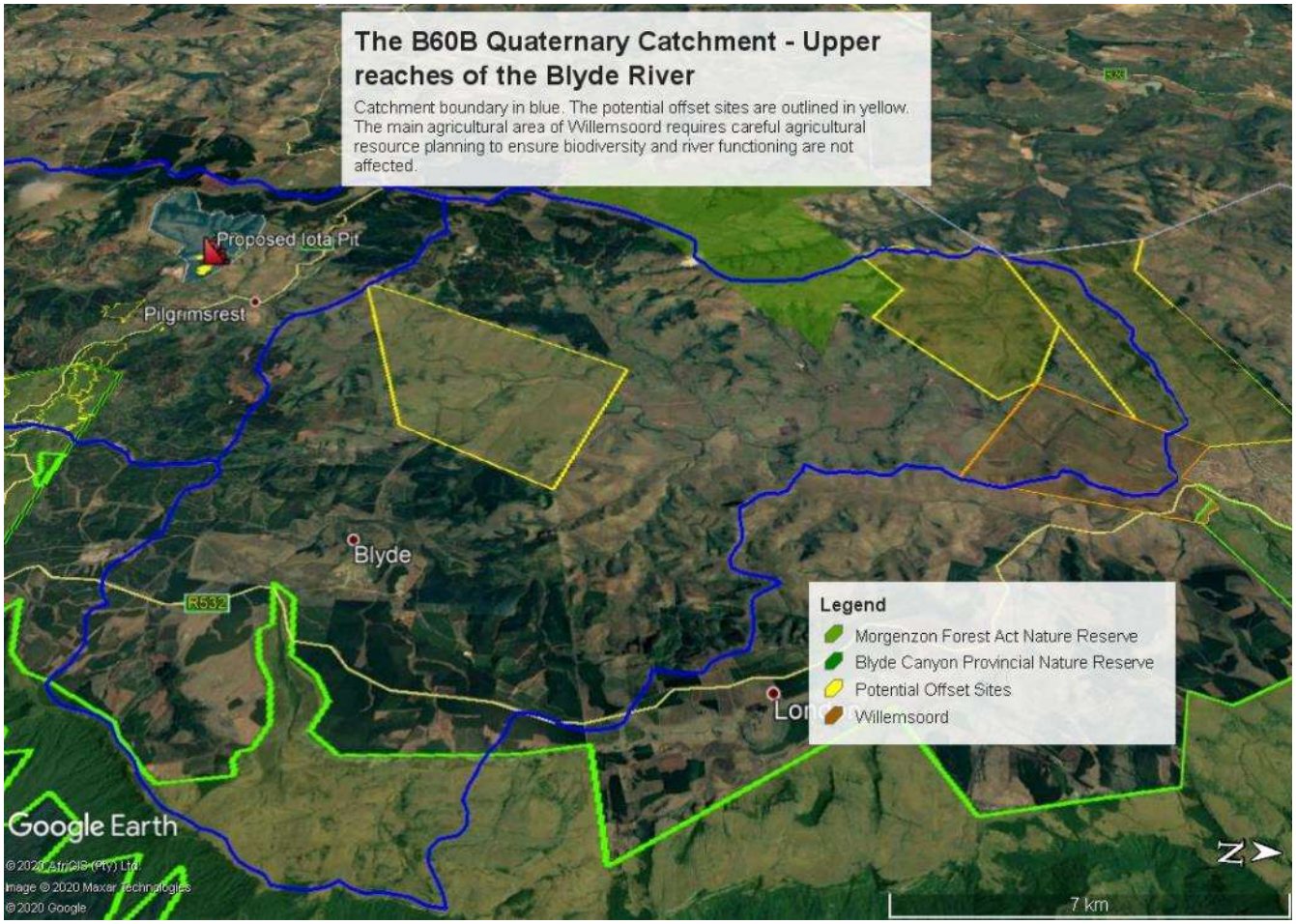

Figure 7. Quaternary catchment B60B, the upper reaches of the Blyde River. The landuse and rehabilitation plan for this catchment will focus on managing agricultural impacts on riparian zones and grasslands, as well as integrate IAP control and offset site management plan actions.

IAP infestations are spreading uncontrolled (despite historical WfW investments) down the Pilgrims Rest Stream and Peachtree Stream towards the Blyde River. Effective control of IAPs is proposed to compensate for the potential loss of Northern Mistbelt Forest as well as the licenced abstraction of water from the Blyde by TGME.

Controlling IAPs will contribute to the RQOs and water quality compensation by improving dry season flows and dilution. In addition, the removal of >254 ha dense, mostly mature (>10 yrs old) IAP infestations (in the Blyde NR) and at least 46 ha (Peachtree Stream) will yield a significant dry season water dividend. Calculations indicate that clearing the dense infestations on the Stanley Bush Kop section of the Blyde River Nature Reserve and Peachtree Stream would release a similar volume of water (475 000m^3) to the licenced abstraction of TGME (469 000m^3) (Andy Pirie *Pers comm* April 2020).

The threats to the RQOs in the river (beyond the impacts from the WWTW in town and mercury and nitrate contamination from illegal mining) are from sedimentation and lack of dilution in the dry season from an afforested and degrading catchment. Fallow old fields along the river in B60B are being re-ploughed (*personal observation Jan 2020*), contributing to water loss and sedimentation. Therefore, removing IAPs, fixing erosion under densely invaded stands and other gullies, curtailing

irresponsible agriculture and restoring riparian zones would contribute to reduced sedimentation and increased dry-season flows, although precise outcome metrics are difficult to quantify. As the impacts from the mine were not considered to be highly significant, barring some catastrophic failure, this is proposed, in conjunction with the other required mitigation, as sufficient compensation for water quality impacts.

4.5 Summary of Offset and Compensation Outcomes required

- Sufficient area must be effectively protected as an **offset** (**3336 ha** for the Theta project), with potential to expand and/or effectively link protected areas. The area must be declared as a Protected Area under S20 or 23 of the NEMPA. The selected site should be able to be expanded to cater for future potential impacts of subsequent activities.
- The **effective rehabilitation and management of the offset** site is the liability of TGME for a minimum of **30 years or until 10 years after a closure** certificate has been issued for the mine.
- Develop - and contribute to implementation of - an integrated conservation, forestry and agriculture land use and **rehabilitation plan for the Quaternary Catchment B60B** including the offset site, within 2 years of the issue of the Environmental Authorisation. In this plan, all future potential agricultural land uses must be:
    - located on previously disturbed/ploughed areas away from water courses,
    - stocking rates and livestock impacts must be below regulated standards.
- The Offset area management plan develop for submission to the responsible authority must be integrated into the Rehabilitation plan for B60B
- Develop - and contribute to implementation of - an integrated conservation, forestry and **rehabilitation plan for the Quaternary Catchment B60A** within 2 years of the issue of the Environmental Authorisation.
- As a key part of the rehabilitation plan for B60A, **Control a minimum of 339 ha of dense IAPs** (>75% canopy cover) to a stand with no seed-bearing individuals and with a total density of <1%, and basal cover of indigenous vegetation >30% after 5 years. This should focus on the infestations on **Stanley's Bush Kop section** of the Blyde Nature Reserve, the **Peachtree Stream Catchment** and the proposed addition to **Morgenzon Forest Nature Reserve**.
- As a key part of the rehabilitation plan for B60A, **Control all invasive alien trees** on the areas subject to **MR 83 on the farms Ponieskrans 543 and Peachtree 544,** to a level of no adult seed-bearing trees and a density of <1% canopy cover. Repeated control in the medium term is required to maintain this state. An optimal way to achieve this is for the applicant to fund the process of sourcing, selecting, testing, and/or approving for release (whichever are applicable), the most promising biocontrol agents for the most damaging invasive non-commercial tree species (e.g. Silver Wattle – *Acacia dealbata*) as required.
- There must be concomitant **restoration of basal cover of indigenous vegetation** on all areas cleared of invasive plants to achieve at least a 30% coverage within 5 years of initial clearing. In the interim, sediment traps or similar must be used to avoid new and reduce current sediment runoff by 25% below previous levels.
- **Fire belts** need to be implemented at least every second year in areas indicated by or agreed with the responsible FPA, around all TGME infrastructure, the offset area and the remnant indigenous forest in the Peachtree Stream catchment. The fire management measures must be incorporated into the rehabilitation plans for B60A and B60B.
- Define baseline sediment loads and pursue Class B RQOs through **reducing sedimentation runoff** by at least 25% (below baseline) from mine land, the areas subject to MR 83 on the

farms Ponieskrans 543 and Peachtree 544, and rehabilitated land in Stanley's Bush Kop section of the Blyde Nature Reserve and Peachtree Stream in catchments B60A and B60B.

- Maintain sufficient **set back lines of well-vegetated, uninvaded buffers strips along all riparian areas** and water resources in the two quaternary catchment rehabilitation plans. For agricultural fields in B60B this must be at least 32m and promoted through a notarised agreement with the relevant landowners.
- **Indicate likely future extent of new mining impacts** in the land use plans for B60A and B60B (and submit as part of a strategic assessment, EMF or similar environmental management tool) before applying for future environmental authorisations for any of the MRs located in these catchments.

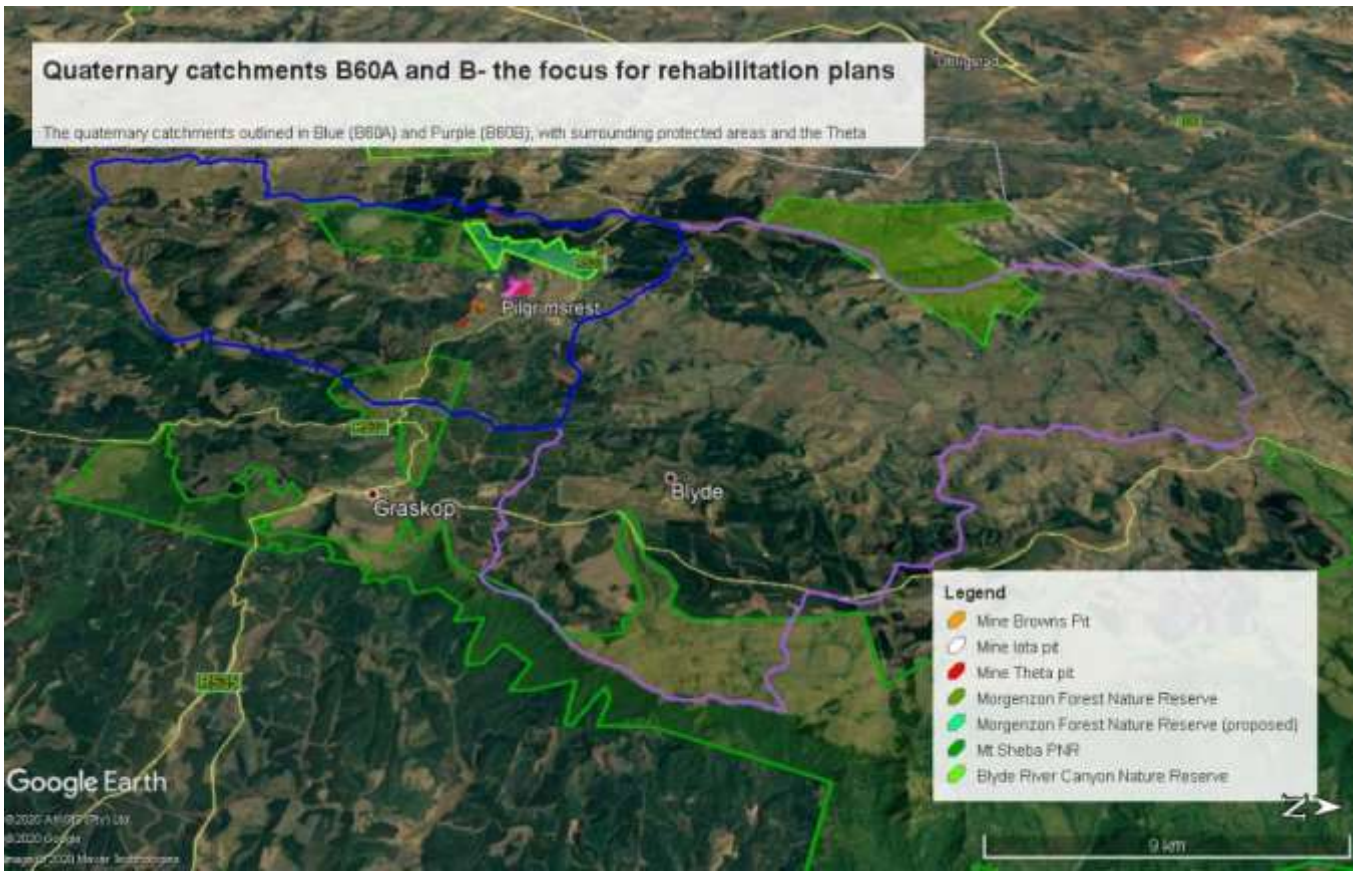

Figure 8. The boundaries of the two Quaternary Catchments (B60A in the South (blue outline), B60B in the North (purple outline)) for which Rehabilitation Plans must be compiled, coordinated, and partially implemented as compensation for potential hydrological and water quality impacts.

It is worthwhile noting that the proposed offset and compensation mitigation measures carry a very low risk of causing additional impact, and consist of good practice land management interventions.

5. Suggested Mitigation conditions for inclusion in the EA:

The proposals are made to guide the regulators with regard to the specifics and detail of the requisite mitigation conditions for the Theta project. Ideally, they operate as a package and should remain as a holistic unit. Care has been taken with their construction to ensure that they can be complied with technically, legally and operationally.

5.1 Biodiversity offset

- As an offset for the biodiversity footprint impacts of the project, the applicant must secure an area of not less than 3336 ha of primarily Northern Escarpment Dolomite Grassland, within the Malmani Karstland listed ecosystem and containing as great a proportion of CBAs (set out in the MBSP 2014) as possible.
- The applicant must procure the necessary consents, permissions and other administrative and management authority agreements for the offset area for declaration to the relevant authority as a Nature Reserve (or a part of an existing Nature Reserve) under Section 23 of the NEMPA. The required consents (*inter alia* land owners, beneficial occupiers, management authority and other rights holders) and other administrative measures to secure this declaration must be submitted to the relevant MEC (or failing that the Minister of Environment, Forestry and Fisheries) for consideration for the declaration, before the mining activities may commence.
    - The requisite Protected Area Management Plan for the Offset property(ies) must be drawn up, in consultation with MTPA (and/or DFFE if applicable), within 1 year of the submission of the documents noted above, and submitted to the MEC for consideration.
    - The applicant must be responsible for all costs of declaration, establishment and the procurement of and implementation of the management plan for the offset site protected area for a minimum of 30 years or until 10 years post the issue of a closure certificate for the mining operations covered by 83 MR, whichever is the later.
    - The applicant must procure an independent auditing of management performance of the offset site protected area every 5 years, with the audit report being submitted to MTPA, DARDLEA, DFFE and the DMRE. The applicant is required to comply with the independent audit recommendations, failing which the specified portion of the guarantee or performance bond required below will become due and payable to the institution established to safeguard the offset and compensation.

5.2 Biodiversity-related compensation for potential water and sedimentation impacts

- To compensate for existing licenced abstraction of water in this Strategic Water Source Area, as well as for potential impacts on water ecosystems and associated biodiversity through sedimentation and altered flows, the applicant must develop two rehabilitation plans, and implement those components of the plans outlined below, to achieve the requisite outcomes.
- The applicant must develop, in conjunction with MTPA, DARDLEA, the Thaba Chweu Municipality, large landowners (>1000ha), the FPA, DWS and DFFE an integrated conservation, forestry and agriculture land use and rehabilitation plan for the Quaternary Catchment B60B with 2 years of the issue of the EA (The Rehabilitation Plan for B60B).
    - This plan must set out priority areas for rehabilitation, deployment of biocontrol and other effective means of long-term control of invasive species, existing lawful agricultural (ploughing) use, and be able to inform future land use planning instruments (IDP, SDF and LUS) of the municipality;
    - The plan must provide for alignment of all investments in natural resource management, including but not limited to, Invasive Alien Tree control and biocontrol, wetland and riparian restoration, erosion and sedimentation control, and forest and grassland rehabilitation. It may provide for alignment with fire management plans produced by the relevant FPA, if appropriate;

    - The plan must be signed off by MTPA before finalization, and lodged with the operational divisions of all applicable resource management entities (DFFE NRM, FPA, Thaba Chweu LM, DARDLEA); and
    - The plan must be revised every five years after initial lodging, and again after every major fire or other significant disturbance.
- The applicant must develop, in conjunction with MTPA, the Thaba Chweu Municipality, large landowners, DARDLEA, DWS and DFFE an integrated Conservation and Forestry land use and rehabilitation plan for the Quaternary Catchment B60A with 2 years of the issue of the EA (The Rehabilitation Plan for B60A).
    - The plan for B60A must include, where relevant, similar components and requirements to that for B60B.
- The applicant must fund the Coordination, Management and Reporting Structures for the implementation of both the rehabilitation plans for a period of not less than 12 years from the submission of the plan (5-year Life of Mine + 7 years follow up).
    - The applicant must at least be responsible for reaching the rehabilitation targets of the Rehabilitation Plans for its mining rights area (83MR) and for the portion of land in the Rehabilitation Plans within the Stanley Bush Kop section managed as part of the Blyderivierspoort Nature Reserve (BNR)[4] which is equivalent to 338 ha of condensed invasive alien tree infestation; and
    - The rehabilitation target of the for the 'Stanley Bush Kop' section of the Blyderivierspoort Nature Reserve, the proposed Morgenzon Forest Nature Reserve and the infested areas of the Peachtree Stream catchment shall not be less than the maintenance, for a minimum of 5 years, of the Reserve at:
        - an invasive alien tree density of <1%;
        - with no mature, seed-bearing trees;
        - a basal cover (as measured on a random 10 square metre sample plot) of at least of 30% indigenous vegetation; and
        - sedimentation runoff reduced by at least 25% compared to a baseline prior to the activities' commencement.

- All land owned by the applicant within quaternary catchments B60B and B60A outside the mine works areas shall comply with the stipulations set out in the rehabilitation plans and related regulations for natural resource management (viz. *Maintain natural vegetation for 5 years at <1% Invasive Alien tree cover, with indigenous basal cover >30%, and measured sedimentation runoff at least <25% of pre-commencement levels*).

5.3 Safeguards for offset and biodiversity compensation

- As a suspensive condition of this Environmental Authorisation, an implementation agreement must be concluded with the MTPA describing the specifics of the offset site(s), the steps for compiling the quaternary catchment Rehabilitation Plans, the institutional and financial arrangements for achieving the requisite outcomes of the full scope of required offset and compensation, and other relevant matters.
- This agreement is to be concluded with MTPA and submitted to the relevant DMRE office and the DFFE before commencement can begin.
- The applicant is expressly prevented from applying for any new Environmental Authorisations (except those under Section 24G for rectification of impacts prior to the

[4] This is the portion of BNR bisected by the Graskop/Pilgrim's rest road R533, whose declaration as a PA has not yet been validated, but which is managed and assessed by MTPA to be a Provincial Nature Reserve.

issuance of this Authorisation) until such time as the offset declaration is complete and management plan approved by the responsible authority, the Rehabilitation Plans are developed and submitted to MTPA and DARDLEA, and the financial guarantees to the implementing party are in place to the satisfaction of the MTPA.

- Given the scope of potential impacts in the receiving environment, the applicant is required to provide a bank guarantee or performance bond lodged in an escrow account of an entity mutually agreed with the MTPA (or an alternative financial mechanism to the satisfaction of the MTPA and the Trust) of an amount sufficient to cover the applicant's offset and compensation obligations for 30 years. The guarantee must be used exclusively to achieve the outcomes of the offset and compensation, and if they have already been reached, then to further the objectives of the offset and compensation measures set out herein.
    - If the applicant fails to comply with the Offset Condition, then 30% of the guarantee becomes immediately payable to an entity able to implement the offset
    - If the applicant fails to reach the targets set out in the rehabilitation plans then 60% becomes immediately payable to an entity able to pursue reaching these targets.
    - Notwithstanding the bank guarantees being made available to the Trust, the applicant is still liable for complying with all conditions pertaining to the offset and compensation set out herein.

6. Conclusion

There are significant impacts on irreplaceable biodiversity and listed ecosystems, as well as a Class B catchment in a Strategic Water Source Area. While significant consideration has been given to avoid and minimise these impacts where possible, residual impacts remain. If the project is approved, a substantial suite of offset and compensation mechanisms will be required to counterbalance the impacts. It is difficult to accurately quantify the sufficiency of the compensation proposed here on the potential water quality impacts due to the lack of suitable metrics and the various likelihood and severity parameters of the impacts. However, the proposed replenishment of water into the Blyde River, and long-term focus on ecological health of the catchment should compensate substantially for any potential impacts.

With these cautions, presented herein are a suite of offset proposals to protect and manage a significant part of the listed Malmani Karst Grasslands ecosystem and this Class B water resource (Upper Blyde River) and to reduce the background rate of loss of the various ecosystems to invasive alien infestations and injudicious agriculture. Further, substantial investment and coordination is proposed to address water quality and quantity impacts in the two affected quaternary catchments as direct compensation for potentially increased sedimentation and abstraction.

Aspects of the desired institutional and financial arrangements to safeguard the offset and compensation are proposed. These include the performance guarantees and alternative institutional arrangements if the applicants fail to deliver on the requisite offset and mitigation. Finally, a range of carefully constructed mitigation conditions of authorisation to give effect to the offset compensation, and implementation safeguards, are provided for consideration by the competent authority.

7. References

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Activity	Aspects Affected	Potential Impacts	Status	Extent	Duration	Intensity	Probability	Significance Before Mitigation	Mitigation Measures	Status	Extent	Duration	Intensity	Probability	Significance After Mitigation
NO-GO ALTERNATIVE															
No-Go alternative: Project is not approved and therefore none of the proposed activities take place	Watercourse Ecology	No impact other than the existing impacts from other factors in the area	0					0		0					0
PRE-CONSTRUCTION PLANNING															
Planning of proposed surface infrastructure layout and proposed open pit mining areas. [The location of infrastructure occur directly within watercourses (especially in the case of linear infrastructure which traverse several drainage systems) and within the 32m or 100m zones of regulation according to the NEMA and GNR 704 of the NWA.]	Watercourse Ecology	• Loss of catchment yield and surface water recharge, potential creation of seepage (from the WRD) within the active drainage systems 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.	-1	2	3	3	3	-11	• Ensure that as far as possible all infrastructure is placed outside of aquatic resources. In particular, mention is made of the need to not encroach on the Blyde River and Peach Tree Stream and to protect these two systems from the impact of adjacent mining; • It must be ensured that the design and construction of all infrastructure prevents failure; • In addition, very clear separation of clean and dirty water areas must be included in the design of the mine in such a way as to ensure the mine is fully compliant with Regulation GN704; and • Refer to specialist groundwater ecology report for detailed mitigation measures.	-1	2	3	3	3	-11
Iota Pit	Fauna	Impact on faunal habitat, species diversity and SCC	-1	3	3	4	5	-15	• Good planning of infrastructure placement and designs should take place with the guidance of the sensitivity maps and proposed mitigation measures within the specialist assessment reports; • A Biodiversity Action Plan, Alien Invasive Management and rehabilitation Plan must be compiled; and • No open pits, topsoil stockpiles, overburden dumps or surface infrastructure should be placed within the sensitive faunal habitat units.	-1	2	3	4	3	-12
Browns Pit			-1	3	3	4	5	-15		-1	2	3	4	3	-12
Theta Pit			-1	3	3	4	5	-15		-1	2	2	4	2	-10
Iota WRD			-1	3	3	4	5	-15		-1	2	2	4	2	-10
Theta Wishbone WRD			-1	3	3	5	5	-16		-1	2	3	4	3	-12
Stockpiles and Project Infrastructure			-1	3	3	4	5	-15		-1	2	2	4	2	-10
Iota Dam			-1	3	3	5	5	-16		-1	2	2	4	2	-10

Activity	Aspects Affected	Potential Impacts	Status	Extent	Duration	Intensity	Probability	Significance Before Mitigation	Mitigation Measures	Status	Extent	Duration	Intensity	Probability	Significance After Mitigation
Browns Dam			-1	3	3	5	5	-16		-1	2	2	4	2	-10
Linear Development (Powerlines, Haul Roads, Access roads, Diversion Trenches)			-1	2	3	4	5	-14		-1	2	2	4	2	-10
Iota Pit	Flora	Impact on floral habitat, species diversity and SCC	-1	4	3	5	5	-17	**Floral Habitat and Diversity** Minimise loss of indigenous vegetation where possible through planning and suitable layouts. Limit placement of infrastructure within habitat of intermediate to high sensitivity. The following changes to the current layouts are recommended: • Changes to the design of the proposed Iota Pit and Iota WRD should be considered to ensure that the footprint area falls outside of the Department of Agriculture, Forestry and Fisheries (DAFF) recommended 30 m buffer around natural forests; Based on the findings of the Freshwater report (SAS 219038), it is considered imperative that during the planning phase, very careful consideration be given to the locality and layouts of surface infrastructure, to ensure that watercourses and their associated zones of regulation (in terms of both GN704 and GN509 as they relate to the National Water Act 1998 (Act No. 36 of 1998)) are avoided as much as possible; All stockpiles and WRDs must be designed in such a manner that runoff is contained; Prior to the commencement of construction activities, an AIP Management/Control Plan should be compiled for implementation: • Removal of alien invasive species should preferably commence during the pre-construction phase and continue throughout the construction, operational,	-1	3	2	4	5	-14
Browns Pit			-1	2	3	2	3	-10		-1	1	1	2	2	-6
Theta Pit			-1	4	3	5	5	-17		-1	3	2	4	5	-14
Iota WRD			-1	4	3	5	5	-17		-1	3	2	4	5	-14
Theta Wishbone WRD			-1	4	3	5	5	-17		-1	3	2	5	4	-14
Stockpiles and Project Infrastructure			-1	2	2	2	3	-9		-1	1	1	1	2	-5
Iota Dam			-1	4	3	3	4	-14		-1	2	1	3	2	-8
Browns Dam			-1	4	3	3	4	-14		-1	2	1	3	2	-8
Linear Development (Powerlines, Haul Roads, Access roads, Diversion Trenches)			-1	2	2	3	3	-10		-1	1	1	2	2	-6

Activity	Aspects Affected	Potential Impacts	Status	Extent	Duration	Intensity	Probability	Significance Before Mitigation	Mitigation Measures	Status	Extent	Duration	Intensity	Probability	Significance After Mitigation
									decommissioning and post-closure phase. AIPs should be cleared within areas where infrastructure is planned before any construction activities commence, thereby ensuring that no AIPs are spread, or soils contaminated with AIP seeds, during construction phases; and • An AIP Management/Control Plan should be implemented by a qualified professional. No chemical control of AIPs to occur without a certified professional. Prior to the commencement of construction activities on site, a rehabilitation plan should be developed for implementation throughout the development phases; and Due to the potential for residual impacts on sensitive habitat, a biodiversity offset investigation process should be initiated as part of the planning phase and before any construction commences. **Floral SCC** Before any construction activities can occur a detailed walk down of the area must take place, during which all floral SCC should be identified and marked by a suitably qualified specialist approved by the Mpumalanga Tourism and Parks Agency (MTPA). Surveys to be overseen by MTPA and would need to be conducted within the correct flowering season for all potentially occurring SCC – thus throughout the year over various seasons. A once-off walk-down will not suffice; Prior to construction activities, floral SCC that will be directly impacted upon need to be removed to suitable similar habitat or to a nursery as part of a rescue and relocation plan. It is thus recommended that a nursery be set up to cultivate indigenous floral species for rehabilitation as well as to aid in the rescue and relocation of floral SCC. A nursery permit						

Activity	Aspects Affected	Potential Impacts	Status	Extent	Duration	Intensity	Probability	Significance Before Mitigation	Mitigation Measures	Status	Extent	Duration	Intensity	Probability	Significance After Mitigation
									would be required. The removal and/or rescue and relocation should be overseen by a MTPA• appointed ecologist, in association with a suitably qualified horticulturist; Permits from the relevant authorities, i.e. MTPA and DAFF, should be obtained before removal, cutting or destruction of protected species or floral SCC before any proposed mining activities may take place; and Due to the potential for a higher diversity of floral SCC occurring within the focus area than what was found during the field investigation, together with the fact that many montane SCC are only visible for a few weeks in the year when they are in flower, marking and/or rescue and relocation activities would need to take place over several seasons to coincide with the flowering period of all potentially occurring SCC.						
CONSTRUCTION															
Mine infrastructure construction and mining development: land clearing, drilling, ground excavation and cut and fill operations	Air quality: dust fall-out	Dust from construction work	-1	2	1	3	3	-9	Avoid dust generating works during very windy conditions (especially winds potentially transporting dust towards receptors) Limit the number of simultaneous activities to a minimum as far as possible Use water sprays where practicable	-1	1	1	2	2	-6
		Dust from vehicle movement on haul roads and other unpaved roads	-1	2	1	3	3	-9	Dust suppression • water and chemical stabilisation	-1	1	1	2	2	-6
		Dust from vehicle movement on unpaved roads	-1	2	1	3	3	-9	Dust suppression • water and chemicals; Early paving of permanent roads	-1	1	1	2	2	-6
		Dust from stockpiles and material handling	-1	2	1	3	3	-9	Implement wet suppression and wind speed reduction (e.g. screens and berms) Cover loads when hauling off-site Cover dormant areas of stockpiles	-1	1	1	2	2	-6

Activity	Aspects Affected	Potential Impacts	Status	Extent	Duration	Intensity	Probability	Significance Before Mitigation	Mitigation Measures	Status	Extent	Duration	Intensity	Probability	Significance After Mitigation
	Air quality: Pollution	Vehicle tailpipe emissions	-1	2	1	3	3	-9	Servicing of vehicles, ensuring exhaust systems, brakes etc are in good working order	-1	1	1	2	2	-6
Combustion of diesel in mobile equipment/vehicles [direct GHG emissions]	Climate Change	Greenhouse gas (especially Carbon) emissions which contribute to climate change	-1	4	3	2	2	-11	Optimise vehicle routes and usage and ensure vehicles are in good running order, thereby limiting Carbon emissions	-1	4	3	2	2	-11
Construction of mine infrastructure using concrete and steel	Climate Change	Greenhouse gas (especially Carbon) emissions which contribute to climate change	-1	4	3	2	2	-11	No mitigating actions considered	-1	4	3	2	2	-11
Removal of topsoil from project footprint and stockpiling thereof for rehabilitation.	Watercourse Ecology	• Increased risk of transportation of sediment from exposed soils in stormwater runoff, leading to increased turbidity of surface water, sedimentation of watercourses 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;	-1	2	3	5	5	-15	Prior to bulk earthworks the entire clean and dirty water management system must be developed to ensure that all "dirty water" areas can be managed as they are created; and	-1	1.5	2	3	2	-8.5

Activity	Aspects Affected	Potential Impacts	Status	Extent	Duration	Intensity	Probability	Significance Before Mitigation	Mitigation Measures	Status	Extent	Duration	Intensity	Probability	Significance After Mitigation
		• Loss of riparian areas due to the disturbance of the activity; • Alteration of the chemical properties of the river as a result of vegetation removal and deforestation; • Exposure of soils, leading to increased runoff and erosion, and thus increased sedimentation of the river; • Increased sedimentation of the river, 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 watercourses within the zone of influence;							Refer to specialist groundwater ecology report for detailed mitigation measures.						
Clearing of vegetation in proximity to the drainage systems for contractor laydown areas and construction of surface infrastructure, including preparation of open pits (outside of drainage lines).	Watercourse Ecology	• Loss of foraging and breeding habitat [or hampering access to such suitable habitat (loss of connectivity)] and faunal migratory corridors; and	-1	3	3	5	5	-16	Refer to specialist groundwater ecology report for detailed mitigation measures.	-1	3	2	3	2	-10

Activity	Aspects Affected	Potential Impacts	Status	Extent	Duration	Intensity	Probability	Significance Before Mitigation	Mitigation Measures	Status	Extent	Duration	Intensity	Probability	Significance After Mitigation
Clearing of vegetation within the drainage systems in preparation for construction of various linear developments; loss of vegetation within the drainage line directly impacted by the Wishbone WRD.		• Proliferation of alien vegetation as a result of disturbances.	-1	3	3	5	4	-15		-1	2	3	3	2	-10
Construction of additional access and haul 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.	Watercourse Ecology	• Increased water inputs to watercourses, 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 resources with resulting potential direct impact on aquatic biota; • Possible incision and sedimentation of freshwater resources due to increased water velocity (direct impact on biota in terms of smothering and indirect impact in terms of habitat destruction).	-1	2	2	3	3	-10	Refer to specialist groundwater ecology report for detailed mitigation measures.	-1	2	1	2	2	-7
Construction of surface infrastructure (e.g. additional mine	Watercourse Ecology	• Possible contamination of the associated watercourses	-1	2	3	3	2	-10	Refer to specialist groundwater ecology report for detailed mitigation measures.	-1	2	2	3	2	-9

Activity	Aspects Affected	Potential Impacts	Status	Extent	Duration	Intensity	Probability	Significance Before Mitigation	Mitigation Measures	Status	Extent	Duration	Intensity	Probability	Significance After Mitigation
offices, ablutions, stormwater management systems, etc.): • Risk of contaminated stormwater runoff (e.g. hydrocarbons, sediment, originating from impermeable surfaces); • Stockpiling of topsoil and overburden, earthworks, movement of vehicles within lower reaches of drainage systems. • Potential disposal of hazardous and non-hazardous materials in riverine areas.		downstream of the surface structures (water quality impact with associated direct impact on aquatic biota);													
		• Possible erosion/incision of the drainage systems adjacent to surface infrastructure due to concentration of stormwater runoff													
		*Erosion and sedimentation risk with associated impact on aquatic biota and suitable habitat).													
		• Sediment-laden runoff entering riparian habitat leading to altered water quality, and changes to aquatic habitat; and	-1	2	3	3	2	-10	Refer to specialist groundwater ecology report for detailed mitigation measures.	-1	2	2	3	2	-9
		• Altered drainage/flow regimes, leading to altered runoff patterns and formation of preferential flow paths.													
		• Altered water quality, possible changes to flow patterns as a result of blockages caused by solid waste/rubble.	-1	1	2	3	1	-7	No waste may be disposed of within any riverine habitat, and all waste must be removed to an appropriate disposal facility	-1	1	1	3	1	-6
Construction of surface infrastructure within drainage systems: Wishbone WRD, dam, linear developments including but not limited to haul and	Watercourse Ecology	As for other construction activities listed above	-1	5	3	3	3	-14	Refer to specialist groundwater ecology report for detailed mitigation measures.	-1	5	1	3	2	-11

Activity	Aspects Affected	Potential Impacts	Status	Extent	Duration	Intensity	Probability	Significance Before Mitigation	Mitigation Measures	Status	Extent	Duration	Intensity	Probability	Significance After Mitigation
access roads, perimeter fence, diversion trench and so forth.															
Opening of pits by means of dozer ripping (strip mining method).	Watercourse Ecology	Potential sedimentation of watercourses, leading to altered channel competency, altered vegetation community structures, blanketing of benthos and loss of rheophilic taxa and suitable habitat.	-1	1	2	2	2	-7	Strict adherence to the requirements of GN704 as it relates to the NWA in order to prevent contamination of salts and CPC's to the freshwater and aquatic systems. Refer to specialist groundwater ecology report for detailed mitigation measures.	-1	1	1	1	2	-5
Construction and mine development	Sites of archaeological and cultural interest	None expected • no sites identified within the mine site	0					0	Should archaeological sites or graves be exposed in other areas during construction work, it must immediately be reported to a heritage practitioner so that an investigation and evaluation of the finds can be made.	0					0
Removal of vegetation and the exposure of soils during construction. Excavation of channels and trenches and the construction of berms. Stripping and stockpiling of topsoil. Widening of roads.	Surface water quality	Erosion of exposed soils leading to increased siltation and sedimentation of downslope watercourses impacting on water quality.	-1	3	2	3	4	-12	Vegetation clearance should be kept to an absolute minimum. Vegetation should only be cleared before mining each open cut and not for the entire open pit area. Temporary erosion measures such as sediment nets must be used during construction at the roads, pits, WRDs, channels, berms and Topsoil Stockpile areas. The nets should only be moved once the exposed area has been stabilised, after which the area should be vegetated. Runoff from temporarily exposed areas must be managed appropriately through the implementation of measures such as berms which should guide runoff towards silt traps. The clean diversion channels and berms must be vegetated immediately after construction. The Topsoil Stockpiles must be vegetated as soon as possible. Silt traps are proposed downslope of the Topsoil Stockpiles. Energy dissipation measures such as rock riprap must be implemented along steep	-1	1	1	2	2	-6

Activity	Aspects Affected	Potential Impacts	Status	Extent	Duration	Intensity	Probability	Significance Before Mitigation	Mitigation Measures	Status	Extent	Duration	Intensity	Probability	Significance After Mitigation
									sections and exists of the channels in order to prevent erosion. Monitoring of the Blyde River upstream and downstream of the operation, as per the recommended monitoring plan provided in this report.						
Use of heavy machinery, trucks and vehicles for construction purposes.	Surface water quality	Potential hydrocarbon spillages washed into downslope watercourses impacting on water quality.	-1	2	2	2	3	-9	Machinery, trucks and vehicles must be well maintained and serviced regularly as per the recommended service guide. Refuelling must be undertaken over hard park bunded areas that adequately capture and contain spillages. Machinery and vehicles should be parked on appropriately lined areas. Drip trays must be used under leaking machinery. Spillages should be reported immediately, and spill kits should be readily available at all times. Monitoring of the Blyde River upstream and downstream of the operation, as per the recommended monitoring plan provided in this report.	-1	1	1	2	1	-5
Construction of the Blyde River bridge crossing.	Surface water quality	Increased erosion, suspended solids, turbidity and sedimentation. Alteration of the natural river flows.	-1	3	2	4	4	-13	Construction must take place during the low flow months preferably between July • October. The river must be appropriately diverted around working areas as per an approved method statement. Sediment nets to trap sediment immediately downstream of working areas must be employed. Disturbed areas must be appropriately rehabilitated. The bridge must be designed to alter the natural river flows in the least possible way, taking into consideration the high and low flows. The river geomorphology and aquatic fauna and flora must be considered in the design, construction and operation of the bridge. Monitoring of the Blyde River upstream and downstream of the operation, as per	-1	2	1	2	2	-7

Activity	Aspects Affected	Potential Impacts	Status	Extent	Duration	Intensity	Probability	Significance Before Mitigation	Mitigation Measures	Status	Extent	Duration	Intensity	Probability	Significance After Mitigation
									the recommended monitoring plan provided in this report.						
Implementation and operation of the stormwater management plan.	Surface water quality	Loss of contributing catchment area impacting on water quantity in the Blyde River. The pits, WRDs and plant area will be operated as a closed system. Runoff from these areas will be captured and contained.	-1	3	2	4	2	-11	There are no mitigation measures for the loss of contributing catchment area, as dirty water runoff from the mine must be captured, contained and reused in accordance with GN704 regulations. Clean upslope runoff will be diverted around the dirty areas. The annual loss of runoff in quaternary catchment B60A was calculated to be 0.4 mcm in comparison to the catchments MAR of 78.3 mcm. This is approximately 0.5 % of the quaternary catchment runoff which is not considered to be significant.	-1	3	2	4	2	-11
All activities related to the construction of the mine infrastructure and development of the mining areas	Socio-Economic: Direct and flow-on employment and income opportunities	• Employment opportunities for local people • Up-skilling of local people • Increased spending in the region • Sourcing of goods and services from suppliers in the region	1	3	1	3	3	10	***ENHANCEMENT:*** • Prioritise local labour in the recruitment process as part of the company's own recruitment policy or as part of contractor management plan • Provide up-skilling opportunities for unskilled and semi-skilled local workers during the construction phase • If use is made of a contractor, explore possibility of placement of up-skilled local workers in other projects • Sequence the operations phase to commence after the construction phase if possible, to avoid negative cumulative impacts • Explore possible placement of local construction workers in mining operations • Prioritise the recruitment of unskilled local (Pilgrim's rest) labour if there is a risk of cumulative pressure in the demand of semi-skilled and skilled labour sources (i.e. other employers losing skilled/semi-skilled workers to the mine and then having to recruit and train)	1	3	1	4	3	11
Formal/structured and Informal/unstructured in-migration (job-seekers	Socio-Economic: Local resources, health &	• Pressure on local accommodation, increased potential of land invasion and informal settlement on	-1	2	3	3	3	-11	• Employment of locals • Wide communication of the local labour procurement strategy • in the local community and broader regional media • long before the construction phase	-1	2	3	3	2	-10

Activity	Aspects Affected	Potential Impacts	Status	Extent	Duration	Intensity	Probability	Significance Before Mitigation	Mitigation Measures	Status	Extent	Duration	Intensity	Probability	Significance After Mitigation
looking for economic opportunities into the area)	safety, social interaction	nearby landowners • Pressure on other public services due to influx of newcomers to local area • Health and safety risks • crime, HIV/AIDS etc • Social conflict between newcomers and the local community							• Creation of temporary accommodation facilities could be implemented as part of this project although not preferred option; due to the small population in-migration of workers will be necessary. Such a facility on site must be managed in a secured, environmentally and socially acceptable manner • Contractors to ensure that workers outside the local area reside in suitable facilities and not establish informal houses • Proper management of informal vending "stations" selling food and small goods, to avoid littering, safety risks and possible environmental pollution • On-site construction workers should be supervised at all times • First aid and/or emergency supplies should be available at various points at the construction site • Continue and extend the current HIV/AIDS awareness and support programmes, with specific focus on those in and nearby the construction site • Monitor the general health of construction workers on an on-going basis • A contractor management plan must be drawn up and implemented • The Department of Public Works and community-based representatives in the area could be informed of the construction schedules and activities. • Ensure that a proper emergency plan that fits with the Municipal Disaster Management Plan is in place • developed in conjunction with IAPs • TGME to discuss other infrastructure requirements of the construction phase with the Department of Public Works, and TCLM to pro-actively deal with the possible negative impacts • Sequence the operations phase to commence after the construction phase if						

Activity	Aspects Affected	Potential Impacts	Status	Extent	Duration	Intensity	Probability	Significance Before Mitigation	Mitigation Measures	Status	Extent	Duration	Intensity	Probability	Significance After Mitigation
									possible, to avoid negative cumulative impacts						
Construction activities	Socio-Economic: Sense of place	• Visible construction sites • Possible storage of material and equipment • Disruption of the soil and vegetation due to the infrastructure footprints and new access routes	-1	2	1	2	2	-7	• The construction site should be kept litter free • Site rehabilitation on sections of the site should occur as soon as the construction process allows • Where heritage sites could potentially be affected the legal requirements related to heritage sites should be adhered to and a clear communication strategy should be followed with local stakeholders • The recommendations made by the Visual Impact Assessment should be adhered to • The measures above should form part of the contractor management plan	-1	2	1	2	2	-7
Construction activities	Socio-Economic: Safety and Health	• Safety at and around the different construction sites, including fire risks • The construction site could pose risks of injury for community members and workers • Increased traffic on the local roads and access road could have possible negative impacts on road safety	-1	2	1	3	2	-8	• The construction area should be fenced or access to the area should be controlled to avoid unauthorised entry • The construction sites should be clearly marked, and "danger" and "no entry" signs should be erected • Ensure that sufficient safety and security measures are in place in the areas surrounding the mining sites • Employ permanent security personnel for the duration of the construction period. The TGME security team can thus be re-deployed and expanded which would result in security improvements in the area • On-site operational safety risks to which construction workers would be exposed to should be addressed in accordance with the Mines Health and Safety Act • A Fire/Emergency Management Plan should be developed and implemented as soon as construction phase commences. The functionality and efficiency of the plan must be regularly reviewed • jointly by the local emergency teams, mine management, affected communities and neighbouring landowners	-1	2	1	2	2	-7

Activity	Aspects Affected	Potential Impacts	Status	Extent	Duration	Intensity	Probability	Significance Before Mitigation	Mitigation Measures	Status	Extent	Duration	Intensity	Probability	Significance After Mitigation
									• Appropriate fire-fighting equipment should be on site and construction workers should be appropriately trained for fire-fighting • Open fires for cooking/body warmth and related purposes should not be allowed on site • All construction vehicles should be in a good condition and adhere to the road worthy standards • The construction of additional access roads should be limited • Speeds of construction vehicles must be strictly monitored • Speed limits on the local roads surrounding the construction sites should be enforced • Should local road users be affected by the movement of construction vehicles or by the construction of access roads, sufficient warning signs should be erected • All construction vehicles should be in a good condition and adhere to the road worthy standards						
Construction activities	Socio-Economic: Nuisance factors (Noise and dust)	• Dust and noise due to the inflow of workers, general construction activities and heavy vehicle movement. • Different nuisance impacts during the day and night on those within the construction site and possibly on nearby settlements or dwellings.	-1	2	1	2	2	-7	• The mitigation measures of the Noise and Air Quality Impact Assessments are relevant • Construction vehicles should be in a good working order • 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	-1	2	1	2	2	-7
Construction activities, including vehicle and people movement	Socio-Economic: Other local economic sectors	• Construction vehicles could pose a threat to livestock grazing along the roads in the area. moving the livestock away/fencing the areas off could impact on the cattle owners'	-1	3	1	3	2	-9	• The construction area should be fenced to avoid unauthorised entry by animals onto the mining area • Communicate the construction schedule and vehicle movements to livestock owners, representative organisations and neighbouring property owners • Movement of construction workers	-1	3	1	2	2	-8

Activity	Aspects Affected	Potential Impacts	Status	Extent	Duration	Intensity	Probability	Significance Before Mitigation	Mitigation Measures	Status	Extent	Duration	Intensity	Probability	Significance After Mitigation
		unauthorised/opportunistic use of the land for grazing. • Construction workers trespassing on private properties, including forestry and conservation areas and increasing the risk of fires. • Construction activities could impact negatively on tourism • Recruiting informally skilled workers from local employers could increase the replacement training and recruiting costs for the local agricultural and forestry sector.							should be confined to the work site as far as possible, to avoid any trespassing on forestry and privately-owned areas. • No fires should be allowed on site. • Facilitate the establishment of a business forum and/or communication forum for local businesses and community representatives • Introduce a complaints register at the mine where concerns/complaints can be voiced. • The construction site should be kept litter free • Site rehabilitation should occur as soon as the construction process allows • The recommendations made by the Visual Impact Assessment should be adhered to in order to limit any possible negative impacts on the tourism industry. • Dust suppression methods should be strictly implemented if and where required • Sufficient warning signs should be erected around vehicle movement • 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 • Prioritise recruiting unskilled workers among the unemployed. • Align unskilled wages to other sectors (tourism, agriculture, forestry) in the local economy • Specify the conduct of contract workers in worker related management plans and employment contracts.						
Iota Pit	Fauna	Impact on faunal habitat, species diversity and SCC	-1	3	3	5	5	-16	**Faunal Habitat and Diversity** All construction personnel should undergo a basic environmental induction, to ensure no poaching of local fauna or possibility of a fire occurs; All areas of increased ecological	-1	2	3	4	3	-12
Browns Pit			-1	3	3	5	5	-16		-1	2	3	4	3	-12
Theta Pit			-1	3	3	5	5	-16		-1	2	2	4	3	-11
Iota WRD			-1	3	3	5	5	-16		-1	2	2	4	3	-11

Activity	Aspects Affected	Potential Impacts	Status	Extent	Duration	Intensity	Probability	Significance Before Mitigation	Mitigation Measures	Status	Extent	Duration	Intensity	Probability	Significance After Mitigation
Theta Wishbone WRD			-1	3	3	5	5	-16	sensitivity falling outside of the direct mine footprint should be designated as No-Go areas and be off limits to all unauthorised construction vehicles and personnel. This includes the Mountain Outcrops, Remnants of Northern Mist belt Forest, Montane Grasslands and the Freshwater Habitat; The construction process should be phased to limit the extent of exposed areas at any one time and ensure that the time between initial disturbance and completion of construction is as short as possible; Site clearance must be limited to the project footprint areas only, with disturbance limited as far as possible; Vehicles should be restricted to travelling only on designated roadways to limit the ecological footprint of the construction activities. Additional road construction should be limited to what is absolutely necessary, and the footprint thereof kept minimal; Adequate speed limits should be adhered to in order to curb the possibility of roadkill; Construction of topsoil stockpiles and other surface infrastructure should be restricted to the transformed habitat unit; and The Biodiversity Action Plan and Alien Invasive Plant Management Plan must be initialled in this phase. **Faunal SCC** If any potential faunal SCC are encountered during the construction phase, a suitably qualified ecologist should be contacted immediately for relocation purposes; and Any unauthorised collection of faunal species, especially faunal SCC, by construction personnel should be strictly prohibited.	-1	2	3	4	3	-12
Stockpiles and Project Infrastructure			-1	3	3	5	5	-16		-1	2	2	4	3	-11
Iota Dam			-1	3	3	5	5	-16		-1	2	2	4	3	-11
Browns Dam			-1	3	3	4	5	-15		-1	2	2	4	3	-11
Linear Development (Powerlines, Haul Roads, Access roads, Diversion Trenches)			-1	3	3	4	5	-15		-1	2	2	4	3	-11

Activity	Aspects Affected	Potential Impacts	Status	Extent	Duration	Intensity	Probability	Significance Before Mitigation	Mitigation Measures	Status	Extent	Duration	Intensity	Probability	Significance After Mitigation
									Disposal of construction related material 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. **Increased personnel on site** 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; and 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 in areas of existing high disturbance, and not encroach upon sensitive habitats.						
Iota Pit	Flora	Impact on floral habitat, species diversity and SCC	-1	3	3	5	5	-16	**Floral Habitat and Diversity** All areas of increased ecological sensitivity falling outside of the direct mine footprint should be designated as	-1	2	2	4	4	-12
Browns Pit			-1	2	3	3	4	-12		-1	1	3	2	4	-10
Theta Pit			-1	3	3	4	5	-15		-1	1	2	3	3	-9

Activity	Aspects Affected	Potential Impacts	Status	Extent	Duration	Intensity	Probability	Significance Before Mitigation	Mitigation Measures	Status	Extent	Duration	Intensity	Probability	Significance After Mitigation
Iota WRD			-1	3	3	5	5	-16	No-Go areas and be off limits to all unauthorised construction vehicles and personnel. This includes the Mountain Outcrops, Montane Grasslands and the Freshwater Habitat; The construction process should be phased to limit the extent of exposed areas at any one time and ensure that the time between initial disturbance and completion of construction is as short as possible; Site clearance must be limited to the project footprint areas only, with disturbance limited as far as possible; Vehicles should be restricted to travelling only on designated roadways to limit the ecological footprint of the construction activities. Additional road construction should be limited to what is absolutely necessary, and the footprint thereof kept minimal; and Edge effects of all construction activities, which may affect floral habitat within surrounding areas, are to be strictly managed, e.g. implement an AIP Management and 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 and reduce sediment loads to the Freshwater Habitat (Blyde River and its tributaries); An AIP Management and Control Plan should be implemented, and an AIP monitoring programme followed during the construction phase in order to prevent the re-establishment of AIPs. • Ongoing alien and invasive plant monitoring and clearing/control should take place throughout all phases of the development, and the project perimeters should be regularly checked for AIP	-1	2	2	4	4	-12
Theta Wishbone WRD			-1	3	3	4	4	-14		-1	2	2	4	4	-12
Stockpiles and Project Infrastructure			-1	1	2	1	2	-6		-1	1	1	1	1	-4
Iota Dam			-1	2	2	3	3	-10		-1	1	2	2	2	-7
Browns Dam			-1	2	2	3	3	-10		-1	1	2	2	2	-7
Linear Development (Powerlines, Haul Roads, Access roads, Diversion Trenches)			-1	2	2	3	3	-10		-1	1	1	2	2	-6

Activity	Aspects Affected	Potential Impacts	Status	Extent	Duration	Intensity	Probability	Significance Before Mitigation	Mitigation Measures	Status	Extent	Duration	Intensity	Probability	Significance After Mitigation
									proliferation and to prevent spread into surrounding natural areas; and • AIP management for construction-phase activities should be focused on limiting their spread, e.g. roadsides should be monitored, as they serve as common corridors along which AIP species are introduced and dispersed, and disturbed areas should regularly be monitored for AIP recruitment until successfully rehabilitated; All soils compacted as a result of construction activities falling outside of development footprint areas should be ripped and profiled. Special attention should be paid to alien and invasive control within these areas; and A rehabilitation plan must be in place and implemented within disturbed areas where work has been completed. **Floral SCC** All floral SCC within the construction footprint should have been rescued and relocated, or removed, where permits were obtained, before construction commences; and Any unauthorised collection or harvesting of floral material, especially floral SCC, by construction personnel should be strictly prohibited. **Disposal of construction related material** 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. **Increased personnel on site** No illicit fires must be allowed during any phases of the proposed mining						

Activity	Aspects Affected	Potential Impacts	Status	Extent	Duration	Intensity	Probability	Significance Before Mitigation	Mitigation Measures	Status	Extent	Duration	Intensity	Probability	Significance After Mitigation
									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; and 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 in areas of existing high disturbance, and not encroach upon sensitive habitats.						
Iota, Browns and Theta Pits	Visual Aspects	• Site clearing, including the removal of topsoil and vegetation • Construction of general surface infrastructure and transportation of materials and stockpiling • Altering the topography of the area through the creation of stockpiles and WRD higher than the proposed heights • Potential erosion and loss of topsoil leading to higher visual contrast • An increase in construction vehicular and human activity in the area, leading to an increase in dust suspension • Earthworks resulting in increased dust suspension • Construction of additional access roads. Cut and fill of slopes for the	-1	2	2	4	4	-12	• The development footprints and disturbed areas should be kept as small as possible and the areas of natural vegetation and topsoil removal must be kept to a minimum. • The extent of all surface infrastructure footprint areas and permanent structures must be minimised to what is absolutely essential. • It must be ensured that existing vegetation in the vicinity of TGME Theta Hill Project Area is retained during the construction phase to ensure that visual scarring of landscape and vegetation clearing does not occur beyond the mining footprint area. • 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 and strategic ore stockpiles are not steeply sloped, so as to blend in with the undulating terrain. • The berms should be vegetated with indigenous grass species, to reduce the visual impact of the soil contrast from the open pits. • The relevant exposed construction site areas and access and haul roads must be	-1	2	2	4	4	-12
Iota WRD 1 and 2			-1	2	2	4	4	-12		-1	2	1	4	4	-11
Theta Wishbone WRD			-1	2	2	4	4	-12		-1	2	1	4	4	-11
Surface Infrastructure and Linear Development (Powerlines, Haul Roads, Stockpiles, PCDs etc)			-1	2	2	3	3	-10		-1	2	1	3	3	-9

Activity	Aspects Affected	Potential Impacts	Status	Extent	Duration	Intensity	Probability	Significance Before Mitigation	Mitigation Measures	Status	Extent	Duration	Intensity	Probability	Significance After Mitigation
		construction of the access roads will become highly visible if not re-vegetated and shaped to blend in with the existing topography • Vegetation damage, scarring of the terrain, and altering of landforms or contours • Increased amount of human activity, construction vehicles, and other equipment • Use of security lighting during the construction phase							irrigated on a regular basis, with just enough moisture to keep the dust down without creating undue runoff. • Rubble must be removed from site on a regular basis. • Litter and dust management measures should be in place at all times. • The sites should be kept neat and tidy at all times. • On site mining activities will be limited to be undertaken between 6am and 6pm. • Excavated areas are to be infilled with available material concurrently during operational phase, decommissioning and closure. • Excavation is to be kept to a minimum and limited to essential areas. • The height of structures should be as low as possible, where this can be achieved without increasing the infrastructure footprint. • The height of the stockpiles and WRDs should not exceed the proposed heights, to ensure that the skyline of the landscape is not affected, beyond what is anticipated. • The identification of appropriate colours and textures for facility materials should take into account both summer and winter 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 use of permanent signs and project construction signs should be minimised and visually unobtrusive. • During rehabilitation, the removal of infrastructure, complete backfilling into						

Activity	Aspects Affected	Potential Impacts	Status	Extent	Duration	Intensity	Probability	Significance Before Mitigation	Mitigation Measures	Status	Extent	Duration	Intensity	Probability	Significance After Mitigation
									open cast areas, ripping of roads and reshaping of impacted areas to blend in with the surrounding mountainous terrain should take place.						
Theta Hill Project area	Night-time lighting	Light nuisance/disturbance	-1	3	2	4	4	-13	• A lighting engineer may be consulted to assist in the planning and placement of light fixtures for the mining infrastructures in order to reduce visual impacts associated with glare and light trespass; • Security flood lighting and operational lighting should only be used where absolutely necessary and carefully directed, preferably away from sensitive viewing areas, i.e. away from settlements, villages, towns, and the main roads. • Wherever possible, lights should be directed downwards so as to avoid illuminating the sky; • The use of high light masts and high pole top security lighting should be avoided along the periphery of the TGME 10167 study areas. Any high lighting masts should be covered to reduce glow; • As far as possible, construction activities should be restricted to daylight hours, in order to limit the need to bright floodlighting and the potential for skyglow and to avoid the use of additional night-time lighting for security purposes; • Outdoor lighting in the vicinity of the proposed infrastructure areas must be strictly controlled; • 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; • Minimum wattage light fixtures should be used, with the minimum intensity necessary to accomplish the light's purpose; • The use of low-pressure sodium lamps,	-1	2	2	4	3	-11

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									yellow LED lighting, or an equivalent should be considered to reduce skyglow (BLM, 2013) • Censored and motion lighting may be installed at office areas to prevent use of lights when not needed; • 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						
OPERATION															
Mine operation	Air quality: Dust fall-out	Dust from mining operations, including loading haultrucks	-1	2	1	2	4	-9	Avoid dust generating works during very windy conditions (especially winds potentially transporting dust towards receptors)	-1	2	1	1	3	-7
									Limit the number of simultaneous activities to a minimum as far as possible						
									Use water sprays where practicable						
		Dust from vehicle movement on haul roads and other unpaved roads							Dust suppression • water and chemical stabilisation						
		Dust from vehicle movement on unpaved roads							Dust suppression • water and chemicals; Early paving of permanent roads						
		Dust from stockpiles and material handling							Implement wet suppression and wind speed reduction (e.g. screens and berms)						
									Cover loads when hauling off-site						
									Cover stockpiles when inactive • e.g. topsoil stockpile						
	Air quality: pollution	Vehicle tailpipe emissions	-1	2	1	2	4	-9	Servicing of vehicles, ensuring exhaust systems, brakes etc are in good working order	-1	2	1	1	3	-7
Combustion of diesel in mobile equipment/vehicles [direct GHG emissions]	Climate Change	Greenhouse gas (especially Carbon) emissions which contribute to climate change	-1	2	3	2	4	-11	Optimise vehicle routes and usage and ensure vehicles are in good running order, thereby limiting Carbon emissions	-1	2	3	2	4	-11

Activity	Aspects Affected	Potential Impacts	Status	Extent	Duration	Intensity	Probability	Significance Before Mitigation	Mitigation Measures	Status	Extent	Duration	Intensity	Probability	Significance After Mitigation
All aspects of operation • goods purchased, electricity consumption, municipal waste generation, product transport, employee commuting etc [sources of indirect GHG emissions]	Climate Change	Greenhouse gas (especially Carbon) emissions which contribute to climate change	-1	2	3	2	4	-11	Optimise energy consumption to reduce electricity usage. Mitigation on other aspects not in the project's control	-1	2	3	2	4	-11
Alteration of the local hydrological regime due to potentially poorly managed stormwater and compaction of soils and increased extent of impermeable surfaces.	Watercourse Ecology • soil erosion	• Erosion of terrestrial areas as preferential flow paths are formed in the landscape, resulting in sedimentation of watercourses, leading to altered channel competency, altered vegetation community structures, blanketing of benthos and loss of rheophilic taxa and suitable habitat.	-1	2	2	4	3	-11	Refer to specialist groundwater ecology report for detailed mitigation measures.	-1	2	2	4	3	-11
Presence of clean and dirty separation infrastructure upstream of surface infrastructure; Presence of diversion trench around perimeter fence • loss of catchment yield due to stormwater containment.	Watercourse Ecology: reduction in stormwater entering watercourses	• Potential for erosion of terrestrial areas as a result of the formation of preferential flow paths, leading to sedimentation of the watercourses; • Reduction in volume of water entering the watercourses, leading to loss of recharge (and thus desiccation) of downstream system; and • Altered vegetation communities due to moisture stress.	-1	1	2	4	3	-10	Pollution prevention through infrastructure design, in order to prevent, eliminate and/or control potential groundwater pollution plumes, in accordance with any recommendations made in geohydrological specialist study; Refer to specialist groundwater ecology report for detailed mitigation measures.	-1	1	2	4	3	-10

Activity	Aspects Affected	Potential Impacts	Status	Extent	Duration	Intensity	Probability	Significance Before Mitigation	Mitigation Measures	Status	Extent	Duration	Intensity	Probability	Significance After Mitigation
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).	Watercourse Ecology: changes to groundwater properties	• Possible contamination of surface and ground water, leading to impaired water quality and salination of soils within riparian areas; • Sedimentation of watercourses 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.	-1	2.5	2	5	1	-10.5	No dirty water (as defined by GN704 as it relates to the NWA) is to be released into the receiving environment; Special attention needs to be paid to the use of the existing TSF and the lining thereof according to the specifications of the National Environmental Management Waste Act, 2008 (Act No. 59 of 2008); Water treatment facilities to be implemented prior to the commencement of activities and to be maintained throughout the LOM to the minimum specifications of GN704 as it relates to the NWA	-1	2.5	2	5	1	-10.5
Deposition of tailings, waste rock, general operations of the mine	Watercourse Ecology: altered water quality and sedimentation of freshwater systems.	Increased risk of sediment transport in surface runoff from surface infrastructure to watercourses, leading to altered water quality and sedimentation of freshwater systems.	-1	1.25	2	3	2	-8.25	Refer to specialist groundwater ecology report for detailed mitigation measures.	-1	1.25	2	3	2	-8.25
Blasting of rock to access the geological resource.	Watercourse Ecology	• Eutrophication of the receiving environment as a result of excess nitrates contained in surface water runoff, causing possible eutrophication resulting in loss of biotic integrity and potable water within the catchment; and • Possible sedimentation of watercourses, leading	-1	1.25	1	3	3	-8.25	Refer to specialist groundwater ecology report for detailed mitigation measures.	-1	1.25	1	3	3	-8.25

Activity	Aspects Affected	Potential Impacts	Status	Extent	Duration	Intensity	Probability	Significance Before Mitigation	Mitigation Measures	Status	Extent	Duration	Intensity	Probability	Significance After Mitigation
		to altered channel competency, altered vegetation community structures, blanketing of benthos and loss of rheophilic taxa and suitable habitat.													
Water extraction for mining operations	Watercourse Ecology: Groundwater levels	• Potential formation of a cone of depression, resulting in loss of baseflow in river, in turn potentially resulting in altered riparian vegetation community structures; and • Potential for groundwater and surface water contamination, leading to loss of biotic integrity and potable water within the catchment.	-1	1	1	1	2	-5	Refer to specialist groundwater ecology report for detailed mitigation measures.	-1	1	1	1	2	-5
Opencast Mining	Groundwater Level	Water flow into the mine resulting in the draining of the aquifer and potential lowering of the regional groundwater level	-1	1	1	1	1	-4	The proposed mining will take place above the groundwater table and no impact is expected.	-1	1	1	1	1	-4
	Groundwater Quality (from the mining operation)	Water flow into the mine resulting in water quality contamination	-1	1	1	2	5	-9	Collect inflow water as close as possible to source to prevent prolonged contact with rock Clean and dirty water separation.	-1	1	1	1	5	-8
Waste Rock Dumps & waste rock material used for stormwater berms	Groundwater Quality	Groundwater contamination from waste bodies	-1	2	2	1	2	-7	Assessment of the waste material which indicated low potential risk Geochemical modelling that showed sufficient neutralising and adsorption capacity to prevent contaminants from reaching the groundwater table Management measures such as compaction and the installation of a drain system at the base of the waste pile	-1	1	2	1	1	-5

Activity	Aspects Affected	Potential Impacts	Status	Extent	Duration	Intensity	Probability	Significance Before Mitigation	Mitigation Measures	Status	Extent	Duration	Intensity	Probability	Significance After Mitigation
									Monitoring to assess the impact						
Mining activities	Sites of archaeological and cultural interest	None expected • no sites identified within the mine site	0					0	Should archaeological sites or graves be exposed in other areas during construction work, it must immediately be reported to a heritage practitioner so that an investigation and evaluation of the finds can be made.	0					0
Open pit mining through non-perennial drainage lines as well as the deposition of waste rock in drainage lines.	Surface water quality	Loss of hydrological connection and function (note that the non-perennial drainage lines in the project area are not fed by wetlands or groundwater). Loss of water quantity reporting to the Blyde River. Alteration of surface water drainage patterns. Damming/ponding of water upslope of the WRDs	-1	3	2	4	3	-12	Diversion of upslope clean runoff around the pits and WRDs as per the SWMP. Concurrent backfilling and rehabilitation of the pits as per the rehabilitation plan, which will return some of the previously lost contributing catchment area. Restoration of the drainage lines where possible. Diversion of upslope water around the WRDs as the footprints of the WRDs expand.	-1	**3**	**2**	**2**	2	-9
Open pit mining, development of the WRDs and stockpiles, and operation and management of the PCDs and other dirty water dams.	Surface water quality	Runoff and spills from the mine infrastructure impacting on the water quality of the Blyde River. Parameters of concern include elevated suspended solids, turbidity, dissolved salts (TDS), heavy metals and pH (it must be noted that the geochemical assessment indicated an unlikely potential for AMD).	-1	3	2	3	4	-12	Implementation of the proposed SWMP to capture, contain and reuse dirty water runoff from the mine in a closed system. Daily inspections and careful management of the water levels within the PCDs and other dirty dams, to ensure that sufficient freeboard is available at all times, in accordance GN704. Frequent desilting of the proposed channels and silt traps, as per the monitoring plan outlined in the report. Any excess water within the closed dirty system must be adequately and appropriately dealt with, in agreement with the DWS. Monitoring of the Blyde River at upstream and downstream positions, as per the proposed monitoring plan in this report.	-1	**1**	**2**	**2**	2	-7
Abstraction of water from the Blyde	Surface water quality	During the dry months, approximately 20 000 m3/month of water	-1	3	2	3	3	-11	It is recommended that water is sourced from the PCDs and other dirty water sources prior to abstractions from the	-1	**3**	**2**	**2**	2	-9

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River for use at the plant.		may need to be abstracted from the Blyde River, which will result in a loss of quantity flowing downstream. The mean monthly runoff during the dry months for quaternary catchment B60A is approximately 2 mcm. 20 000 m3/month is less than 1 % of the mean monthly runoff.							Blyde River. Should sufficiently sized PCDs be constructed, then minimal water will be required from the Blyde River. The Blyde River should be a last option in terms of obtaining makeup water for the plant. It is also recommended that surrounding flooded historical adits in the area are investigated, as possible sources of water for the plant during the dry season.						
Use of heavy machinery, trucks and vehicles during the operational phase.	Surface water quality	Potential hydrocarbon spillages washed into downslope watercourses impacting on water quality.	-1	2	2	2	3	-9	Machinery, trucks and vehicles must be well maintained and serviced regularly as per the recommended service guide. Refuelling must be undertaken over hard park bunded areas that adequately capture and contain spillages. Machinery and vehicles should be parked on appropriately lined areas. Drip trays must be used under leaking machinery. Spillages should be reported immediately, and spill kits should be readily available at all times. Monitoring of the Blyde River upstream and downstream of the operation, as per the recommended monitoring plan provided in this report.	-1	**1**	**1**	**2**	1	-5
Use of heavy machinery, trucks and vehicles during the operational phase.	Surface water quality	Erosion along roads leading to increased suspended solids and sedimentation of downslope watercourses impacting on water quality.	-1	3	2	3	3	-11	Berms placed at appropriate spacings across the roads as discussed in the proposed SWMP. Regular inspections and maintenance of roads.	-1	**1**	**2**	**2**	2	-7
Eccentric ripper activities	Noise	Noise increase at the boundary of the open pit mine footprint and at the abutting residential areas	-1	2	2	3	3	-10	• All noise sources exceeding 85.0dBA to be identified and acoustically screened off if practical. • Monthly noise surveys to be done; after one year change frequency to quarterly if	-1	2	2	2	3	-9

Activity	Aspects Affected	Potential Impacts	Status	Extent	Duration	Intensity	Probability	Significance Before Mitigation	Mitigation Measures	Status	Extent	Duration	Intensity	Probability	Significance After Mitigation
									the prevailing ambient noise levels at the boundaries of the different open cast pits are within the threshold level of 7.0dBA above the prevailing ambient noise level.						
Crushing activities at the ripper	Noise	Noise increase at the boundary of the open pit mine footprint and at the abutting residential areas	-1	2	2	3	3	-10	• All noise sources exceeding 85.0dBA to be identified and acoustically screened off if practical. • Monthly noise surveys to be done; after one year change frequency to quarterly if the prevailing ambient noise levels at the boundaries of the different open cast pits are within the threshold level of 7.0dBA above the prevailing ambient noise level.	-1	2	2	2	3	-9
Pit activities	Noise	Noise increase at the boundary of the open pit mine footprint and at the abutting residential areas	-1	2	2	3	3	-10	• All noise sources exceeding 85.0dBA to be identified and acoustically screened off if practical. • Monthly noise surveys to be done; after one year change frequency to quarterly if the prevailing ambient noise levels at the boundaries of the different open cast pits are within the threshold level of 7.0dBA above the prevailing ambient noise level.	-1	2	2	2	3	-9
ROM	Noise	Noise increase at the boundary of the open pit mine footprint and at the abutting residential areas	-1	2	2	3	3	-10	• All noise sources exceeding 85.0dBA to be identified and acoustically screened off if practical. • Monthly noise surveys to be done; after one year change frequency to quarterly if the prevailing ambient noise levels at the boundaries of the different open cast pits are within the threshold level of 7.0dBA above the prevailing ambient noise level.	-1	2	2	2	3	-9
Hauling of material to the processing plant	Noise	Noise increase at the boundary of the open pit mine footprint and at the abutting residential areas	-1	2	2	3	2	-9	• All noise sources exceeding 85.0dBA to be identified and acoustically screened off if practical. • Monthly noise surveys to be done; after one year change frequency to quarterly if the prevailing ambient noise levels at the boundaries of the different open cast pits are within the threshold level of 7.0dBA above the prevailing ambient noise level.	-1	2	2	2	2	-8
Hauling of waste rock to the waste rock dump	Noise	Noise increase at the boundary of the open pit mine footprint and	-1	2	2	3	3	-10	• All noise sources exceeding 85.0dBA to be identified and acoustically screened off if practical. • Monthly noise surveys to be done; after	-1	2	2	2	3	-9

Activity	Aspects Affected	Potential Impacts	Status	Extent	Duration	Intensity	Probability	Significance Before Mitigation	Mitigation Measures	Status	Extent	Duration	Intensity	Probability	Significance After Mitigation
		at the abutting residential areas							one year change frequency to quarterly if the prevailing ambient noise levels at the boundaries of the different open cast pits are within the threshold level of 7.0dBA above the prevailing ambient noise level.						
Additional traffic	Noise	Noise increase at the boundary of the open pit mine footprint and at the abutting residential areas	-1	2	2	3	2	-9	• All noise sources exceeding 85.0dBA to be identified and acoustically screened off if practical. • Monthly noise surveys to be done; after one year change frequency to quarterly if the prevailing ambient noise levels at the boundaries of the different open cast pits are within the threshold level of 7.0dBA above the prevailing ambient noise level.	-1	2	2	2	2	-8
Emergency generator	Noise	Noise increase at the boundary of the open pit mine footprint and at the abutting residential areas	-1	2	2	2	3	-9	• All noise sources exceeding 85.0dBA to be identified and acoustically screened off if practical. • Monthly noise surveys to be done; after one year change frequency to quarterly if the prevailing ambient noise levels at the boundaries of the different open cast pits are within the threshold level of 7.0dBA above the prevailing ambient noise level.	-1	2	2	2	2	-8
Employment of permanent and contract workers, and procurement of goods and services	Socio-Economic: Direct and flow-on employment and income opportunities	• Employment opportunities for local people • Up-skilling of local people • Increased spending in the region • Sourcing of goods and services from suppliers in the region	1	3	2	4	3	12	***ENHANCEMENT:*** • 100% recruitment of unskilled labour from local communities, with focus on Pilgrim's Rest, Schoonplaas/Newtown and Darks Gully • Provide up-skilling opportunities for unskilled and semi-skilled local workers as per SLP • Explore possible placement of local construction workers in mining operations • Prioritise the recruitment of unskilled local (Pilgrim's rest) labour if there is a risk of cumulative pressure in the demand of semi-skilled and skilled labour sources (i.e. other employers losing skilled/semi-skilled workers to the mine and then having to recruit and train) • Put a contractor management plan (including direct service providers) in place to ensure that the local employment and procurement targets of the operations	1	3	2	4	3	12

Activity	Aspects Affected	Potential Impacts	Status	Extent	Duration	Intensity	Probability	Significance Before Mitigation	Mitigation Measures	Status	Extent	Duration	Intensity	Probability	Significance After Mitigation
									are met. The targets should also be aligned to the Mining Charter of 2018 • Plan the operational phase to commence after the construction phase to prevent cumulative impacts in terms of local labour demand, in-migration and related challenges • 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 • Participate in the development of a regional mine supplier hub to promote the development of a local supply base (e.g. the enterprise hub in Lydenburg, launched by Glencore)						
Procurement of goods and services; payment of taxes and royalties; contributions under SLP	Socio-Economic: Increase in public revenue	• 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 affected mining community close to the project, will be the focus of the Local Economic Development Fund that forms part of the SLP	1	4	2	4	3	13	***ENHANCEMENT:*** • 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)	1	4	2	4	3	13
Formal/structured and Informal/unstructured in-migration (job-seekers looking for economic opportunities into the area)	Socio-Economic: Local resources, health & safety, social interaction	• Pressure on local accommodation, increased potential of land invasion and informal settlement on nearby landowners • Pressure on other public services due to influx of newcomers to local area	-1	2	3	4	3	-12	• Employment of locals • Wide communication of the local labour procurement strategy • in the local community and broader regional media • long before the operational phase commences • Mine management, contractors and service providers should ensure that workers outside the local area should reside in suitable facilities and not	-1	2	3	3	3	-11

Activity	Aspects Affected	Potential Impacts	Status	Extent	Duration	Intensity	Probability	Significance Before Mitigation	Mitigation Measures	Status	Extent	Duration	Intensity	Probability	Significance After Mitigation
		• Health and safety risks • crime, HIV/AIDS etc • Social conflict between newcomers and the local community							establish informal houses • Continue with plans to provide accommodation facilities for mine workers on land belonging to the old Caravan Park. The involvement of the Department of Public Works is critical in this regard. • Should temporary accommodation be established at the Caravan Park, this facility must be managed in an environmentally and socially acceptable manner to avoid any social conflict and environmental pollution • Security measures to avoid unauthorised access at the Caravan Park should be established • Proper management of informal vending "stations" selling food and small goods, to avoid littering, safety risks and possible environmental pollution • Continue and extend the current HIV/AIDS awareness and support programmes, with specific focus on those in and nearby the construction site • Monitor the general health of construction workers on an on-going basis • All the requirements above should form part of the contractor management plan • Maintenance of the roads frequently used by workers travelling from outside places (e.g. Sabie, Graskop) should be discussed and negotiated with the Mpumalanga Department of Public Works, Road and Transport • Assist the TCLM and provincial department with the planning and implementation processes of IDP priority projects in Pilgrim's rest. Align these priorities with the SLP and the needs of the local community members. • Establish a forum, with representatives of TGME and local stakeholders for discussing potential issues of community conflict • Sequence the operations phase to						

Activity	Aspects Affected	Potential Impacts	Status	Extent	Duration	Intensity	Probability	Significance Before Mitigation	Mitigation Measures	Status	Extent	Duration	Intensity	Probability	Significance After Mitigation
									commence after the construction phase if possible, to avoid negative cumulative impacts						
Mining operations	Socio-Economic: Sense of place	• Visible mining sites • Possible storage of material and equipment • Disruption of the soil and vegetation due to the infrastructure footprints and new access routes	-1	2	3	3	3	-11	• 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 • Operational mining activities with potential noise impacts should be mitigated and noise generating activities should be kept to normal working hours where possible • The recommendations made by the Noise Impact Assessment should be adhered to • The measures above should form part of the contractor management plan	-1	2	3	3	2	-10
Mining operations	Socio-Economic: Safety and Health	• Safety at and around the different construction sites, including fire risks • The construction site could pose risks of injury for community members and workers • Increased traffic on the local roads and access road could have possible negative impacts on road safety	-1	2	2	3	2	-9	• Mining areas should be fenced, and permanent security should be in place • Access roads should be fitted with security cameras and equipped with a controlled barrier. • Workers should not be allowed to leave the designated mining areas during working hours. • A Health and Safety Plan should be implemented, and all managers should take First Aid and other relevant safety courses • Ensure that sufficient safety and security measures are in place in the areas surrounding the mining sites • Employ permanent security personnel for the duration of the construction period. • On-site operational safety risks to which construction workers would be exposed to should be addressed in accordance with the Mines Health and Safety Act (MHSA) • A Fire/Emergency Management Plan should be developed and implemented as soon as construction phase commences, and regularly reviewed • jointly by the	-1	2	2	2	2	-8

Activity	Aspects Affected	Potential Impacts	Status	Extent	Duration	Intensity	Probability	Significance Before Mitigation	Mitigation Measures	Status	Extent	Duration	Intensity	Probability	Significance After Mitigation
									local emergency teams, mine management, affected communities and neighbouring landowners • Appropriate fire-fighting equipment should be on site and construction workers should be appropriately trained for fire-fighting • Implement safety measures to limit fire hazards and implement fire breaks where possible. • Open fires for cooking/body warmth and related purposes should not be allowed on site • All construction vehicles should be in a good condition and adhere to the road worthy standards • The construction of additional access roads should be limited • Speeds of construction vehicles must be strictly monitored • Speed limits on the local roads surrounding the construction sites should be enforced • Should local road users be affected by the movement of construction vehicles or by the construction of access roads, sufficient warning signs should be erected • All construction vehicles should be in a good condition and adhere to the road worthy standards • Access from gravel roads to local main roads should be in line with the road standard and requirements to accommodate the traffic load and traffic patterns. • Set up a platform whereby community members and miners can report any illegal mining activities • Involve the SAPS and other relevant stakeholders in the preventative security measures to be undertaken in terms of illegal mining • Contract a private security company (or existing security) to prevent illegal miners						

Activity	Aspects Affected	Potential Impacts	Status	Extent	Duration	Intensity	Probability	Significance Before Mitigation	Mitigation Measures	Status	Extent	Duration	Intensity	Probability	Significance After Mitigation
									from accessing mined areas. • The mine could assist in implementing a community and employee health awareness plan • The general health of employees should be monitored on an on-going basis through local health care services • The mine could, through LED programmes and infrastructure development assist in improving the overall health services within the communities.						
Mining operations	Socio-Economic: Nuisance factors (Noise and dust)	• Dust and noise due to the inflow of workers, general mining activities and heavy vehicle movement. • Different nuisance impacts during the day and night on those within the mining site and possibly on nearby settlements or dwellings.	-1	2	1	3	3	-9	• The mitigation measures of the Noise and Air Quality Impact Assessments should be adhered to • Operational mining activities with potential noise impacts should be mitigated and should be kept to normal working hours 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 • Personnel should be equipped with the necessary noise protection equipment • 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	-1	2	1	3	2	-8
Mining operations	Socio• Economic: Impact on local tourism sector	• Negative impacts due to the change in the town's character (see also sense of place), especially on nature-based tourist activities • Nuisance and safety issues related to increased traffic on the R533 • Health and safety	-1	2	3	3	3	-11	• Site rehabilitation should occur as soon as the mining process allows • The mining site should be kept litter free • The recommendations made by the Visual Impact Assessment should be adhered to. • The mitigation measures of the Noise and Air Quality Impact Assessments should be adhered to • Operational mining activities with potential noise impacts should be	-1	2	3	3	2	-10

Activity	Aspects Affected	Potential Impacts	Status	Extent	Duration	Intensity	Probability	Significance Before Mitigation	Mitigation Measures	Status	Extent	Duration	Intensity	Probability	Significance After Mitigation
		concerns • possible increase in crime targeting tourists • Nuisance factors associated with noise and dust • The mining project might crowd out tourism jobs, hence negatively affecting tourism in the long term							mitigated and should be kept to normal working hours 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 developing and implementing 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: • Commitment from business visitors to the mine to use the overnight facilities in Pilgrim's Rest or the immediate surroundings • Develop old adits in tourist spots with view point to contrast with modern mining • Caravan park space development (one-part offices, the other ablution blocks and ground clearance and maintenance for caravan standing areas) – TGME already took over the golf course • Development of old TGME stall/space that sells memorabilia • Assist with maintenance of e.g. the road between Graskop and Pilgrim's (bush clearance and some repairs) • Museum support (gold panning) • Assist and liaise with SAFCOL in promoting and re-establishing their hiking trails • Facilitate the establishment of an ATM in town • Provide support by sponsoring						

Activity	Aspects Affected	Potential Impacts	Status	Extent	Duration	Intensity	Probability	Significance Before Mitigation	Mitigation Measures	Status	Extent	Duration	Intensity	Probability	Significance After Mitigation
									transaction advisors to develop local SMMEs in vacant business areas • Liaise directly with Mount Sheba resort and other business that might be negatively affected by the mining operations • 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 • Any other recommendations above that relate to mitigating the negative impacts of in-migration also applies to this impact • Other mitigation measures discussed under the other economic impacts below also applies to this impact • Facilitate the establishment of a local Business and Tourism Chamber for Pilgrim's Rest. Regional tourism chambers could assist in this regard. • Engage on a regular basis with the tourism 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. • Once established, assist the local business chamber and/or tourism forum to become a member of the regional organisations/forums • TGME can assist in changing the negative perception among South Africans, and possibly among international tourists of Pilgrim's Rest not being a						

Activity	Aspects Affected	Potential Impacts	Status	Extent	Duration	Intensity	Probability	Significance Before Mitigation	Mitigation Measures	Status	Extent	Duration	Intensity	Probability	Significance After Mitigation
									popular tourist destination to a highly ranked tourism destination						
Mining activities, including vehicle and people movement	Socio-Economic: Other local economic sectors	• Mining vehicles could pose a threat to livestock grazing along the roads in the area. moving the livestock away/fencing the areas off could impact on the cattle owners' unauthorised/opportunistic use of the land for grazing. • Mine workers trespassing on private properties, including forestry and conservation areas and increasing the risk of fires. • Mining activities could impact negatively on tourism • Recruiting informally skilled workers from local employers could increase the replacement training and recruiting costs for the local agricultural and forestry sector.	-1	3	3	4	2	-12	• 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) • 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 • Workers should not be allowed to leave the operations site while on duty • A fire hazard management plan on and off site is required • Set up a grievance mechanism by introducing a complaints register at the mine where concerns/complaints with regards to e.g. noise related to construction activities can be voiced. • Prioritise recruiting unskilled workers among the local unemployed • Align unskilled wages to other sectors (tourism, agriculture, forestry) in the local economy • The active mining area should be fenced to avoid unauthorised entry by animals onto the mining area • Specify the conduct of contract workers in worker related management plans and employment contracts.	-1	3	3	3	2	-11
Contribution of mining to local economy	Socio-Economic: Local economic diversity and economic stability	Lack of diversification of economic sectors in the region	-1	3	3	3	2	-11	• Focus on the support of non-mining related activities in community development programmes • Focus on the develop 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)	-1	3	3	3	2	-11

Activity	Aspects Affected	Potential Impacts	Status	Extent	Duration	Intensity	Probability	Significance Before Mitigation	Mitigation Measures	Status	Extent	Duration	Intensity	Probability	Significance After Mitigation
									• If a supplier development programme is established, focus the programme on non-core mining inputs in Pilgrim's Rest with a broader regional market						
Mining activities, especially the use of water and energy	Socio-Economic: Intensity of water and energy consumption	• No negative impacts are anticipated on the water quantity or quality, provided mitigation measures followed • refer water-related aspects • Possible risk of sedimentation from dirty water run-off • Sedimentation around water courses resulting from mining activities	-1	3	2	3	3	-11	• Develop a resource use plan with the specific objective to minimize the mining operations' energy and water use as far practical • 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. • Treated discharge water could possibly be used for irrigation purposes e.g. at the golf course and caravan park if such a proposal adhere to environmental regulations	-1	3	2	3	2	-10
Mining activities around Brown's Hill Pit and the Theta/Browns WRD (Wishbone)	Socio-Economic: Brown's Hill Settlement (inhabitants ±10)	• Visual impact • Noise and dust • Safety risks	-1	2	1	4	4	-11	• 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 DPW and TGME must liaise with the inhabitants and local councillor with regards 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.	1	2	3	3	3	11
Iota Pit	Fauna		-1	3	3	4	5	-15		-1	2	3	3	4	-12

Activity	Aspects Affected	Potential Impacts	Status	Extent	Duration	Intensity	Probability	Significance Before Mitigation	Mitigation Measures	Status	Extent	Duration	Intensity	Probability	Significance After Mitigation
Browns Pit		Impact on faunal habitat, species diversity and SCC	-1	3	3	4	5	-15	**Faunal Habitat and Diversity** All areas of increased ecological sensitivity (i.e. Mountain Outcrops, Remnants of Northern Mist belt Forest, Montane Grasslands and Freshwater Habitat) should be designated as No-Go areas and be off limits to all unauthorised vehicles and personnel. Vehicles should be restricted to travelling only on designated roadways to limit the ecological footprint of the proposed development activities; No additional habitat is to be disturbed during the operational phase of the development. Stockpiles, WRDs and Dams, and their expansion as the material is deposited, should be restricted to the footprint area that is authorised. Weekly monitoring and recording of the footprint areas must be done; Well defined standard operating procedures should be established and implemented to minimise the adverse impacts on fauna associated with the Freshwater Resource Habitat Unit; Adequate speed limits should be adhered to, to limit the likelihood or roadkill; No uncontrolled or unsanctioned fires are allowed. A Fire Management Plan should be in place; and Rehabilitation of the disturbed areas should be conducted during the operational phase to re–introduce indigenous vegetation and faunal habitat and food availability where areas become available. **Faunal SCC** As part of a Biodiversity Action Plan (BAP), faunal monitoring should be done annually during operational activities. Please also refer to the monitoring guidelines in section 5.4. **Ongoing AIP Management** AIPs must be monitored and must be removed throughout the operational	-1	2	3	3	5	-13
Theta Pit			-1	3	3	4	5	-15		-1	2	2	3	3	-10
Iota WRD			-1	3	3	4	5	-15		-1	2	2	3	3	-10
Theta Wishbone WRD			-1	3	3	4	5	-15		-1	2	3	3	4	-12
Stockpiles and Project Infrastructure			-1	3	3	4	5	-15		-1	2	2	3	3	-10
Iota Dam			-1	3	3	5	5	-16		-1	2	2	3	3	-10
Browns Dam			-1	3	3	5	5	-16		-1	2	2	3	3	-10
Linear Development (Powerlines, Haul Roads, Access roads, Diversion Trenches)			-1	3	3	4	5	-15		-1	1	2	3	3	-9

Activity	Aspects Affected	Potential Impacts	Status	Extent	Duration	Intensity	Probability	Significance Before Mitigation	Mitigation Measures	Status	Extent	Duration	Intensity	Probability	Significance After Mitigation
									phase of the project to prevent their spread beyond the development footprint areas; Alien plant seed dispersal within the top layers of the topsoil within footprint areas, that will have an impact on future rehabilitation, must be controlled; and Clearing of the AIPs, with specific emphasis on Category 1b alien species, encountered within the footprint area (preferably within the entire project perimeter), including the immediate surrounds, must take place in order to comply with existing legislation (NEMBA: Alien and Invasive Species Regulations (Notice number 864 of 29 July 2016 in Government Gazette 40166)). **Waste, discharge and pollution** No operational-related waste material is to enter natural habitats; It must be ensured that the mine process water system is managed in such a way as to prevent discharge to the receiving environment; In the event of a vehicle breakdown, maintenance of vehicles must take place with care and the recollection of spillage should be practiced near the surface area to prevent ingress of hydrocarbons into topsoil and subsequent habitat loss; and Any waste or toxic spills from vehicles or mining infrastructure must be dealt with immediately in accordance with the waste management plan.						
Iota Pit	Flora	Impact on floral habitat, species diversity and SCC	-1	3	3	4	4	-14		-1	2	2	3	3	-10
Browns Pit			-1	2	1	2	2	-7		-1	1	1	1	1	-4
Theta Pit			-1	2	2	3	3	-10		-1	1	1	2	2	-6
Iota WRD			-1	3	3	4	4	-14		-1	2	2	3	3	-10
Theta Wishbone WRD			-1	2	3	4	4	-13		-1	1	2	3	2	-8

Activity	Aspects Affected	Potential Impacts	Status	Extent	Duration	Intensity	Probability	Significance Before Mitigation	Mitigation Measures	Status	Extent	Duration	Intensity	Probability	Significance After Mitigation
Stockpiles and Project Infrastructure			-1	1	1	2	2	-6		-1	1	1	1	1	-4
Iota Dam			-1	1	1	2	2	-6		-1	1	1	1	1	-4
Browns Dam			-1	1	1	2	2	-6		-1	1	1	1	1	-4
Linear Development (Powerlines, Haul Roads, Access roads, Diversion Trenches)			-1	2	2	3	3	-10		-1	1	1	1	1	-4
Iota, Browns and Theta Pits	Visual Aspects	• On-going mining activities, including removal of ore, transportation thereof and potentially increasing the height of the stockpiles and WRDs • Potential increased introduction and proliferation of alien plant species leading to further change in landscape character • Continued opencast mining and vehicular movement leading to increased dust suspension • Disturbance of soils and ongoing erosion due to mining operational activities • Ground excavation leading to increased dust suspension • Increased amount of human activity and presence of mining vehicles on local roads • Ongoing vegetation clearing, scarring of the terrain and altering	-1	2	3	5	5	-15	• It is recommended that stockpiles and berms be vegetated with indigenous grasses in order to blend more easily into the existing landscape and for screening purposes of the open pits and infrastructure. • The design and height increase of stockpiles and WRDs must be monitored to ensure that these components relate to acceptable environmental standards in terms of slope and elevation. • Direct loss of or damage to valuable natural visual resources such as watercourses (Blyde River) in the area should be actively avoided, with specific mention of erosion, stream bank damage and further disturbance to wetland vegetation. • Stockpiles and WRDs are ideally to be shaped at an adequate slope from the commencement of the project to ensure that it integrates more successfully into the natural topography of the visual landscape. • It is recommended that the proposed opencast mining activities occur in a phased manner, i.e. the pits do not get mined simultaneously, so as to reduce the extent of the negative visual impact on the surrounding landscape. • Any new roads are to follow the contours of the landforms in order to make it less visually prominent and to reduce the need	-1	2	2	4	4	-12
Iota WRD 1 and 2			-1	2	3	5	5	-15		-1	2	2	4	4	-12
Theta Wishbone WRD			-1	2	3	5	5	-15		-1	2	2	4	4	-12
Surface Infrastructure and Linear Development (Powerlines, Haul Roads, Stockpiles, PCDs etc)			-1	2	2	3	4	-11		-1	2	1	3	3	-9

Activity	Aspects Affected	Potential Impacts	Status	Extent	Duration	Intensity	Probability	Significance Before Mitigation	Mitigation Measures	Status	Extent	Duration	Intensity	Probability	Significance After Mitigation
		of landforms or contours • Exterior lighting around the offices, parking areas as well as associated infrastructure and opencast footprint areas • Lighting at night from operational vehicles • Security and other lighting around and on support structures could also contribute to light pollution • Maintenance activities conducted at night							for cut and fill activities. Siting of roads should avoid steep side slopes. Areas where additional access and haul roads are required, the design of the slopes should be as gradual as possible. A slope of 1:2 or 1:3 is preferred. Where the reserve width requires a slope steeper than 1:2 the cut face or fill slope must be stabilised by means of a retaining wall that should allow for planting. A slope of 1:2 and steeper has the potential of soil erosion during heavy rain events, hampering the growth of the covering vegetation. • All haul roads will require effective dust management such as regular watering. • An effective dust management plan taking into account stockpile and dump areas, as well as haul 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. • It must be ensured that all buildings fit its surroundings through the appropriate use of colour and material selection in order to lower the visibility of the proposed project. Olive greens and tans can be used at the base of buildings, fading to lighter						

Activity	Aspects Affected	Potential Impacts	Status	Extent	Duration	Intensity	Probability	Significance Before Mitigation	Mitigation Measures	Status	Extent	Duration	Intensity	Probability	Significance After Mitigation
									colours, with the top section of the buildings painted a light grey to merge with the skyline. Roofs of buildings must be painted with a 'dirty' grey or light blue. Lighter tones attract an observer while darker shades recede from the viewer, therefore pure whites and bright colours should be avoided. • In the town of Pilgrim's Rest where the residents are directly affected by the proposed mining activities, the landowners should be contacted to discuss possible mitigation measures such as berms, screen planting or walls. Roadside vegetation, in the form of tall trees should be considered along the R533 road, so as to minimise the effect on tourists and motorists utilising the road. • 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 where required and through concurrent rehabilitation.						
Theta Hill Project area	Night-time lighting	Light nuisance/disturbance	-1	3	2	4	4	-13	• A lighting engineer may be consulted to assist in the planning and placement of light fixtures for the mining infrastructures in order to reduce visual impacts associated with glare and light trespass; • Security flood lighting and operational lighting should only be used where absolutely necessary and carefully directed, preferably away from sensitive viewing areas, i.e. away from settlements, villages, towns, and the main roads. • Wherever possible, lights should be directed downwards so as to avoid illuminating the sky; • The use of high light masts and high pole top security lighting should be avoided along the periphery of the TGME 10167 study areas. Any high lighting masts	-1	2	2	4	3	-11

Activity	Aspects Affected	Potential Impacts	Status	Extent	Duration	Intensity	Probability	Significance Before Mitigation	Mitigation Measures	Status	Extent	Duration	Intensity	Probability	Significance After Mitigation
									should be covered to reduce glow; • As far as possible, construction activities should be restricted to daylight hours, in order to limit the need to bright floodlighting and the potential for skyglow and to avoid the use of additional night-time lighting for security purposes; • Outdoor lighting in the vicinity of the proposed infrastructure areas must be strictly controlled; • 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; • Minimum wattage light fixtures should be used, with the minimum intensity necessary to accomplish the light's purpose; • The use of low-pressure sodium lamps, yellow LED lighting, or an equivalent should be considered to reduce skyglow (BLM, 2013) • Censored and motion lighting may be installed at office areas to prevent use of lights when not needed; • 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						
CLOSURE AND LATENT IMPACTS															

Activity	Aspects Affected	Potential Impacts	Status	Extent	Duration	Intensity	Probability	Significance Before Mitigation	Mitigation Measures	Status	Extent	Duration	Intensity	Probability	Significance After Mitigation
Decommissioning / removal of surface infrastructure.	Watercourse Ecology: Compacted soils, latent impacts of vegetation losses.	• Increased runoff volumes and formation of preferential surface flow paths as a result of compacted soils and unvegetated areas, leading to increased sedimentation, erosion, and increased water inputs to downgradient aquatic systems (watercourses); • Proliferation of alien vegetation due to disturbances, which will impact natural flow regimes; and • Potential visual scars, affecting aesthetic features and faunal habitat.	-1	5	3	5	3	-16	Ensure that soils are replaced in the correct layers, ripped and re-reprofiled post-closure, and that vegetation is restored to a point where succession will lead to the same conditions as the pre-mining state as a minimum; Rehabilitation measures must be implemented. Implementation must be overseen by a suitably qualified Environmental Site Officer (ESO) with freshwater experience and the ESO must sign off the rehabilitation before the relevant contractors leave site; Minimum of ten years' post-closure monitoring to be undertaken; and Refer to Table 27; Aspect 4, 7 and 8 for detailed mitigation measures.	-1	2	3	3	3	-11
Opencast Mining	Groundwater Level	Water flow into the mine resulting in the draining of the aquifer and potential lowering of the regional groundwater level	-1	1	1	1	1	-4	The proposed mining will take place above the groundwater table and no impact is expected.	-1	1	1	1	1	-4
	Groundwater Quality (within the rehabilitated mine workings)	Water seep through the mining waste used in the rehabilitation, becomes contaminated and impact on the groundwater	-1	1	3	1	3	-8	Waste assessment indicated that the rock to be returned into the pit will not have an adverse impact on the water quality	-1	1	3	1	2	-7
Waste Rock Dumps & waste rock material used for stormwater berms	Groundwater Quality	Groundwater contamination from waste bodies	-1	2	3	1	2	-8	Assessment of the waste material which indicated low potential risk Geochemical modelling that showed sufficient neutralising and adsorption capacity to prevent contaminants from reaching the groundwater table Management measures such as compaction and the installation of a drain system at the base of the waste pile	-1	1	2	1	1	-5

Activity	Aspects Affected	Potential Impacts	Status	Extent	Duration	Intensity	Probability	Significance Before Mitigation	Mitigation Measures	Status	Extent	Duration	Intensity	Probability	Significance After Mitigation
									Rehabilitation including shaping, capping and vegetation						
Closure and rehabilitation of the pits and WRDs and long-term impacts on water quality	Surface water quality	At closure, the WRDs will be capped and vegetated. The pits will mostly be backfilled; however, voids will remain. These voids will fill with water from rainfall. The plant will no longer require water for processing, and therefore, no abstractions will take place from the Iota and Wishbone PCDs. Due to the high rainfall of the area, over time, it is likely that the remaining pit voids and PCDs will fill and spill. The quality of water in the voids and PCDs in the long-term is likely to be similar to that described in the geochemical assessment in the Geohydrological Study for Scenario 2. The water quality will be alkaline, with moderate to fairly high levels of salinity, with an unlikely risk of AMD. However, elevated metals namely arsenic, chromium, mercury and nickel are likely to occur. The climate change study indicated that there will be a general	-1	3	3	3	3	-12	Exposed areas such as the WRDs must be vegetated to prevent erosion. The WRDs should be designed to avoid steep slopes as far as possible. Diversion of upslope runoff around the voids and PCDs, once rehabilitation measures have been successfully implemented. Use of water from the voids and PCDs for irrigation of vegetation established on the WRDs as part of the rehabilitation plan. Should the plant be used for further future projects, then water can be sourced from the PCDs and voids. Monitoring of the Blyde River post-mine closure, as per the recommended monitoring plan provided in this report. The stormwater management plan must be revised near mine closure. It is recommended that sustainable long-term solutions are investigated, such as a paddock retention system along the toe of the WRDs, which will capture runoff and settle out sediment	-1	2	3	2	3	-10

Activity	Aspects Affected	Potential Impacts	Status	Extent	Duration	Intensity	Probability	Significance Before Mitigation	Mitigation Measures	Status	Extent	Duration	Intensity	Probability	Significance After Mitigation
		decrease in rainfall, but that extreme rainfall events will increase.													
Removal of infrastructure	Noise	Noise increase at the boundary of the open pit mine footprint and at the abutting residential areas	-1	2	1	1	1	-5	Demolition activities involving heavy duty machinery to be limited to daytime working hours problem.	-1	2	1	1	1	-5
Backfill of disturbed areas	Noise	Noise increase at the boundary of the open pit mine footprint and at the abutting residential areas	-1	2	1	1	1	-5	Activities involving heavy duty machinery to be limited to daytime working hours	-1	2	1	1	1	-5
Planting of grass/vegetation of rehabilitated areas	Noise	Noise increase at the boundary of the open pit mine footprint and at the abutting residential areas	-1	2	1	1	1	-5	Planting of grass and vegetation to be done during daytime working hours.	-1	1	1	1	1	-4
Theta Hill project closure	Socio-Economic: Loss of direct and flow-on jobs due to closure	Job losses	-1	3	3	3	4	-13	• Ensure that the mine develops additional resources and increase its LoM in order to maintain and promote job security • As per the requirements of the SLP develop mechanisms to assist employees prior to the retrenchment date in the transition phase and after 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	-1	3	3	3	2	-11
Theta Hill project closure: end of social and economic development period	Socio-Economic: Decrease/termination of community investment	The risk exists that projects and local government structures become dependent on the funding that they receive from the	-1	2	3	4	4	-13	• Ensure that the mine develops additional resources and increase its LoM in order to maintain and promote job security • Focus on community support programmes with that build local capacity and sustainability in the local community	-1	2	3	3	2	-10

Activity	Aspects Affected	Potential Impacts	Status	Extent	Duration	Intensity	Probability	Significance Before Mitigation	Mitigation Measures	Status	Extent	Duration	Intensity	Probability	Significance After Mitigation
	funds to local communities	proponent and that projects and local governance will fail due to the decrease in funding.							• Plan projects with an exit strategy of which beneficiaries are aware of						
Illegal mining	Socio-Economic: Increase in Illegal Mining Activities	Negative impacts of illegal mining which could spill over into the forestry and conservation areas	-1	2	3	3	3	-11	• Adhere to modern mining designs that makes it more difficult for illegal miners to enter mining areas after closure • Close any openings to underground mining sites in the vicinity • Allocate funds to implement security measures to remove illegal miners from the local areas for another 5 years after closure	-1	2	3	3	2	-10
Closure and rehabilitation	Socio-Economic: Sense of Place Impact	If the rehabilitation is not successful, negative permanent visual impacts would remain	-1	2	3	4	4	-13	• 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	-1	2	3	3	2	-10
Iota Pit	Fauna	Impact on faunal habitat, species diversity and SCC	-1	4	3	4	5	-16	**Faunal Habitat and Diversity** 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 within the focus area;	-1	3	2	3	4	-12
Browns Pit			-1	4	3	4	5	-16		-1	4	3	5	4	-16
Theta Pit			-1	4	3	4	5	-16		-1	2	2	3	4	-11
Iota WRD			-1	4	3	4	5	-16		-1	2	2	3	4	-11
Theta Wishbone WRD			-1	4	3	4	5	-16		-1	3	2	3	4	-12

Activity	Aspects Affected	Potential Impacts	Status	Extent	Duration	Intensity	Probability	Significance Before Mitigation	Mitigation Measures	Status	Extent	Duration	Intensity	Probability	Significance After Mitigation
Stockpiles and Project Infrastructure			-1	4	3	4	5	-16	Where soils have been compacted, they are to be ripped and where necessary reprofiled; Indigenous grass species are to be used for revegetation of disturbed areas. Due to the proposed layouts falling within CBAs, the end-goal of rehabilitation would need to aim to achieve the pre-mined condition as far as possible; 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 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. **Ongoing AIP Management** A bi-annual alien vegetation clearance programme should be implemented for up to 2 years after closure. Where areas are disturbed during decommissioning activities, proliferation of alien invasive species within these areas should be continually monitored and controlled.; and Follow-up with alien and invasive plant control measures for a period of at least 5 years post-closure.	-1	2	2	3	4	-11
Iota Dam			-1	4	3	4	5	-16		-1	2	2	3	4	-11
Browns Dam			-1	4	3	4	5	-16		-1	2	2	3	4	-11
Linear Development (Powerlines, Haul Roads, Access roads, Diversion Trenches)			-1	4	3	4	5	-16		-1	2	2	3	4	-11
Iota Pit	Flora	Impact on floral habitat, species diversity and SCC	-1	4	3	5	5	-17	**Floral Habitat and Diversity** 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 within the focus area; Where soils have been compacted, they are to be ripped and where necessary reprofiled; Indigenous grass species are to be used for revegetation of disturbed areas. Due to	-1	2	3	3	4	-12
Browns Pit			-1	2	1	2	2	-7		-1	1	1	0	1	-3
Theta Pit			-1	4	2	4	3	-13		-1	2	2	3	3	-10
Iota WRD			-1	4	3	5	5	-17		-1	2	3	3	4	-12
Theta Wishbone WRD			-1	4	3	4	4	-15		-1	2	2	3	3	-10
Stockpiles and Project Infrastructure			-1	2	1	2	2	-7		1	1	1	3	1	6
Iota Dam			-1	3	2	3	2	-10		1	1	1	2	2	6
Browns Dam			-1	3	2	3	2	-10		1	1	1	2	2	6

Activity	Aspects Affected	Potential Impacts	Status	Extent	Duration	Intensity	Probability	Significance Before Mitigation	Mitigation Measures	Status	Extent	Duration	Intensity	Probability	Significance After Mitigation
Linear Development (Powerlines, Haul Roads, Access roads, Diversion Trenches)			-1	3	2	2	2	-9	the proposed layouts falling within CBAs, the end-goal of rehabilitation would need to aim to achieve the pre-mined condition as far as possible; 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 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. **Floral SCC** Floral SCC, if encountered within the decommissioning footprint areas, are to be handled with care and the relocation of sensitive plant species to suitable similar habitat is to be overseen by a suitably qualified botanist/horticulturist in association with a MTPA recommended ecologist; and Monitoring of relocation success of rescued and relocated floral SCC should continue for up to 2 years after closure or until a suitably qualified botanist/horticulturist determines the relocation activities to be successful. **Ongoing AIP Management** A bi-annual alien vegetation clearance programme should be implemented for up to 2 years after closure. Where areas are disturbed during decommissioning activities, proliferation of alien invasive species within these areas should be continually monitored and controlled.; and Follow-up with alien and invasive plant control measures for a period of at least 5 years post-closure.	-1	1	1	2	1	-5
Iota, Browns and Theta Pits	Visual Aspects	• Demolition, removal of infrastructure and	-1	2	2	4	3	-11	• Decommissioning footprints and disturbed areas should be kept as small as	-1	1	1	3	3	-8

Activity	Aspects Affected	Potential Impacts	Status	Extent	Duration	Intensity	Probability	Significance Before Mitigation	Mitigation Measures	Status	Extent	Duration	Intensity	Probability	Significance After Mitigation
Iota WRD 1 and 2		partial backfilling of opencast pits leading to further dust generation, erosion and changes in the visual character of the project area • Ineffective rehabilitation leading to poor vegetation cover with bare areas remaining present, opencast pit areas not being completely backfilled and surface infrastructure remaining • Ongoing proliferation of alien vegetation • Potential ineffective rehabilitation leading to extensive areas of bare soil scarring the landscape • Stationary and vehicle mounted lighting during the • Partial backfilling resulting in voids remaining within the opencast pits leading to altered contours and mountainous terrain.	-1	2	2	4	3	-11	possible and no further indigenous vegetation should be cleared or soils exposed for this purpose. • All areas where infrastructure is removed must be shaped to resemble the pre-development landscape and revegetated as soon as possible. • The open pits must be backfilled, shaped and revegetated to resemble the surrounding mountainous landscape as far as is feasible. • Concurrent/ progressive rehabilitation must be implemented and disturbed areas must be rehabilitated as soon as possible and as soon as areas become available 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.	-1	1	1	3	3	-8
Theta Wishbone WRD			-1	2	2	4	3	-11		-1	1	1	3	3	-8
Surface Infrastructure and Linear Development (Powerlines, Haul Roads, Stockpiles, PCDs etc)			-1	2	2	3	3	-10		-1	1	1	3	2	-7
Theta Hill Project area	Night-time lighting	Light nuisance/disturbance	-1	3	2	4	4	-13	• A lighting engineer may be consulted to assist in the planning and placement of light fixtures for the mining infrastructures in order to reduce visual impacts associated with glare and light trespass; • Security flood lighting and operational lighting should only be used where absolutely necessary and carefully directed, preferably away from sensitive viewing areas, i.e. away from settlements, villages, towns, and the main roads.	-1	2	3	4	3	-12

Activity	Aspects Affected	Potential Impacts	Status	Extent	Duration	Intensity	Probability	Significance Before Mitigation	Mitigation Measures	Status	Extent	Duration	Intensity	Probability	Significance After Mitigation
									• Wherever possible, lights should be directed downwards so as to avoid illuminating the sky; • The use of high light masts and high pole top security lighting should be avoided along the periphery of the TGME 10167 study areas. Any high lighting masts should be covered to reduce glow; • As far as possible, construction activities should be restricted to daylight hours, in order to limit the need to bright floodlighting and the potential for skyglow and to avoid the use of additional night-time lighting for security purposes; • Outdoor lighting in the vicinity of the proposed infrastructure areas must be strictly controlled; • 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; • Minimum wattage light fixtures should be used, with the minimum intensity necessary to accomplish the light's purpose; • The use of low-pressure sodium lamps, yellow LED lighting, or an equivalent should be considered to reduce skyglow (BLM, 2013) • Censored and motion lighting may be installed at office areas to prevent use of lights when not needed; • 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						

Activity	Aspects Affected	Potential Impacts	Status	Extent	Duration	Intensity	Probability	Significance Before Mitigation	Mitigation Measures	Status	Extent	Duration	Intensity	Probability	Significance After Mitigation
Final rehabilitation and closure plan	All environmental aspects	• Geotechnical stability related to created and altered landforms • Surface stability (i.e. erosion control) • Surface water runoff control and sedimentation management • Functional cover system design (layered growth medium for re-establishment of vegetation and biodiversity) • Alien and invasive species management and control • Seasonality of revegetation efforts and successful establishment • Visual appearance and sense of place objectives • Geochemical stability							• The monitoring of the identified potential impacts will be crucial with a view to informing the success and sustainability of rehabilitation and remediation activities • The opportunity to attain successful and sustainable rehabilitation and closure lies in the integration of the rehabilitation plan with the mine plan. This is where most of the gains can be made at the initiation of the project and throughout the project which would create the basis for achieving the rehabilitation and closure objectives. • It is the view of the authors that the rehabilitation plan presented herein, if implemented in accordance with all recommendations and specifications, could achieve a stable and sustainable geochemical, geotechnical and ecological post-mining land use.						

Activity	Aspects Affected	Potential Impacts	Status	Extent	Duration	Intensity	Probability	Significance Before Mitigation	Mitigation Measures	Status	Extent	Duration	Intensity	Probability	Significance After Mitigation
CUMULATIVE IMPACTS															
Cumulative impacts of the project as well as other potential future projects and developments in the Blyde River	Surface water quality	The mine proposes to abstract approximately 20 000 m3/month during the dry season months. This was calculated to be a small portion of quaternary catchment B60As	-1	3	3	2	3	-11	Maximum use of runoff captured from the mines dirty water system. Use of water from flooded historical adits in the area. Construction of large enough PCDs to store runoff from the wet season for use during the dry season months.	-1	2	3	2	2	-9

Activity	Aspects Affected	Potential Impacts	Status	Extent	Duration	Intensity	Probability	Significance Before Mitigation	Mitigation Measures	Status	Extent	Duration	Intensity	Probability	Significance After Mitigation
catchment, on water quantity.		mean monthly runoff over the dry months. The loss of runoff due to the containment of dirty areas was also calculated to be small. The mine has a life of mine of approximately 5 years, however, assuming that the plant will be used in the future, as well as other potential projects in the catchment, the cumulative impact on water quantity could potentially become significant. However, any future projects requiring abstractions from the Blyde River catchment, would need to be licenced with the DWS, and it is not expected that the DWS would unsustainably over allocate water within a known strategic water source catchment.													
Cumulative impacts of the project as well as other potential future projects and developments in the Blyde River catchment, on water quality.	Surface water quality	The water quality within the Blyde River has been shown to be good. The impact of this project alone, will to a large degree, be buffered by the relatively high flow volumes and dilution capacity of the Blyde River. However, it should be noted that sensitive aquatic species do occur in	-1	3	3	5	5	-16	Containment of dirty water runoff from the mine through the implementation of the SWMP. Management of water levels within the pit voids and PCDs post mine closure.	-1	2	3	2	3	-10

Activity	Aspects Affected	Potential Impacts	Status	Extent	Duration	Intensity	Probability	Significance Before Mitigation	Mitigation Measures	Status	Extent	Duration	Intensity	Probability	Significance After Mitigation
		vicinity of the project. Should further projects and developments be established within the Blyde catchment, and mitigation measures not adhered to, then the cumulative impact on water quality has the potential to become significant.													

mineral resources
Department:
Mineral Resources
REPUBLIC OF SOUTH AFRICA

Private Bag X7279, Emalahleni, 1035, Tel: 013 653 0500, Fax: 013 656 1474
1st floor Saveways Crescent Centre, Mandela Drive, Emalahleni 1035

Enquiries: Mr M. Mulaudzi **Email**: Mashudu.mulaudzi@dmr.gov.za
Ref number : (MP) 30/5/1/2/3/2/1 (83) EM
Directorate: Mine Environmental Management: Mpumalanga Region

BY REGISTERED MAIL

The Director(s)

Transvaal Gold Mining Estate Limited

P.O Box 21

Pilgrim's Rest

1290

Attention: Mr George Jenkins **Fax no:** 013 768 1272

ACCEPTANCE OF THE SCOPING REPORT SUBMITTED IN TERMS OF REGULATION 22 (a) OF THE ENVIRONMENTAL IMPACT ASSESSMENT (EIA) REGULATIONS, 2014 AS AMENDED FOR AN APPLICATION FOR AN INTEGRATED ENVIRONMENTAL AUTHORISATION (IEA) LODGED IN TERMS OF REGULATION 16 OF THE EIA REGULATIONS 2014 (AS AMENDED) FOR ACTIVITIES TO BE CONDUCTED ON PORTION 42 OF THE FARM PONIESKRANTZ 543 KT, SITUATED IN THE MAGISTERIAL DISTRICT OF PILGRIM'S REST.

The Scoping Report (SR) and Plan of Study for Environmental Impact Assessment submitted on the **16th of August 2017** and acknowledged by the Department on **05th of October 2017** refer.

The Department has evaluated the submitted SR and Plan of Study for Environmental Impact Assessment dated **the said SR is hereby accepted with conditions in terms of** in terms of Regulation 22(a) of the NEMA EIA Regulations, 2014 as amended and :

a) You may proceed with the environmental impact assessment process in accordance with the tasks contemplated in the Plan of study for environmental Impact assessment as required in terms of the NEMA EIA regulations, 2014 as amended.

b) It should be noted that the Department requires the following to be provided/included and form part of the Environemntal Impact Assessment report (EIAr) and Environmental Management Programme (EMPr) to be submitted.

- **All information required as per Annexture 3 and 4 or the DMR template must be provided without reffering to other sections of the report.**
- **All information that the EAP committed to provide in the EIAr and EMPr must be provided as stated in the scoping report.**
- The **draft EIAr and EMPr** must be made available to the interested and affected parties (I&Aps) for comments as required in tems of regulation 40 (1) of the EIA Regulations, 2014 as amended.
- The provisions of regulation 41 (2) (e) must be used in order to reach the nearby community (ies).
- All maps must be in A3 with a clear legend in order for this office to get a clear view of the area applied for.
- The maps to be attached must show a 500m blasting buffer from any structures and 100m mining buffer form any structures near the proposed area.
- The report must also be clear on the distance from the railway, road, houses and any other structure in the vicinity of the proposed area.
- The description of the process followed to reach the proposed preferred site mut be detailed in the EIAr and EMpr.
- Give motivation why open cast mining is the preferred mining method rather than underground since the area is sensitive.
- Since the proposed mining methods includes open cast and deposition area, you are required to include a detailed plan to avoid or minimize AMD formation and potential decanting during mining after mining.
- The final layout plan must be attached in the EIAr and EMPr.
- Details on the technology to be used and the operational aspects of the activity must be detailed and included in the EIAr .
- A windeed report must be attached in order for this Department to verify the landowners of the said property (ies).

- All issues raised must be summarized in the table provided for such in the EIAr, the table must not be manipulated.
- The following studies must be conducted:
  - Wetland study;
  - Aquatic ecology assessment;
  - Storm water management;
  - Ecological study;
  - Terrestrial impact assessment;
  - Heritage, Achaeological and Palaeontology impact assessment;
  - Ground water study;
  - Surface water study;
  - Geo-hydrological study;
  - Blasting and Vibration impact;
  - Air Quality impact assessment;
  - Noise impact assessment;
  - Soil study, land use and land capability study;
  - Social impact assessment –this must include the assessment of the community adjacent to the mining area.
- Kinldy note that it is the responsibility of the EAP to go on site and identify all relevant studies to be conducted on site. The screening tool can also be used to identify the relevant specialist reports. Studies must cover the area to be affected and the said studies must be recent.
- A final site map that excludes sensitive areas as recommended by specialists must be attached.
- The South African Heritage Resources Agency must be consulted through the SAHRIS online system and proof and results of such must be attached in the EIAr.
- All possible impacts must be outlined in the EIAr and EMPr .
- The possible mitigation measures that could be applied and the level of risk must be outlined in detail.
- All tables as per the DMR template must be included in the EIAr and EMPr.
- Please ensure that comments from all relevant stakeholders including the responses must be submitted to the Department with the Environmental Impact Assessment Report (EIAr). **This includes but is not limited to the Department of Agriculture, Forestry and Fisheries (DAFF), Department of Water and Sanitation (DWS), Mpumalanga Tourism and Parks**

Agency (MTPA), Municipality etc. Proof of correspondence with the various stakeholders must be included in the EIAr. Should you be unable to obtain comments, proof of the attempts that were made to obtain comments should be submitted to the Department. Please note that the above mentioned comments and responses from public participation must be regarding the EIAr and not the scoping report.

- Address issues raised in the SR by MTPA, DAFF, Maorababjang CPA, SAFCOL, K2C, ESKOM, etc.
- A copy of a visible site notice must be attached in order for this office ascertain the information given to I&Aps.
- Furthermore, it must be reiterated that, should an application for Environmental Authorisation be subjected to any permits or authorisations in terms of the provisions of any Specific Environmental Management Acts (SEMAs), proof of such application will be required.
- Any other matters required in terms of Appendix 3 (3) and Appendix 4 of the EIA Regulation 2014 must be included in the EIAr .

c) The final EIAr and EMPr must be submitted within the timeframes as stipulated in the EIA Regulations, 2014 as amended.

d) Your attention is brought to Section 24F of the NEMA which stipulates "that no activity may commence prio to an environmental authorisation being granted by the competent authority".

For any enquiry regarding this application please contact the above mentioned Official

Yours faithfully

.....

REGIONAL MANAGER: MINERAL REGULATION

MPUMALANGA REGION

DATE.07/11/2019

Bentley Geology (Pty) Ltd
9A Trilby Street
Oaklands
Johannesburg 2192
South Africa
+27 83 603 7126
E bgeolconsult@gmail.com

Attention: Diana Verster
BATHO EARTH
20 August, 2020

NOTE FOR THE RECORD REGARDING URANIUM OCCURRENCES IN THE SABIE-PILGRIMS REST GOLDFIELD

The Sabie – Pilgrims Rest Goldfield ("SPRG") is a notable historic producer of gold (approximately 6 milion Au Oz) located in the northeastern part of Mpumalanga Province (Figure1).

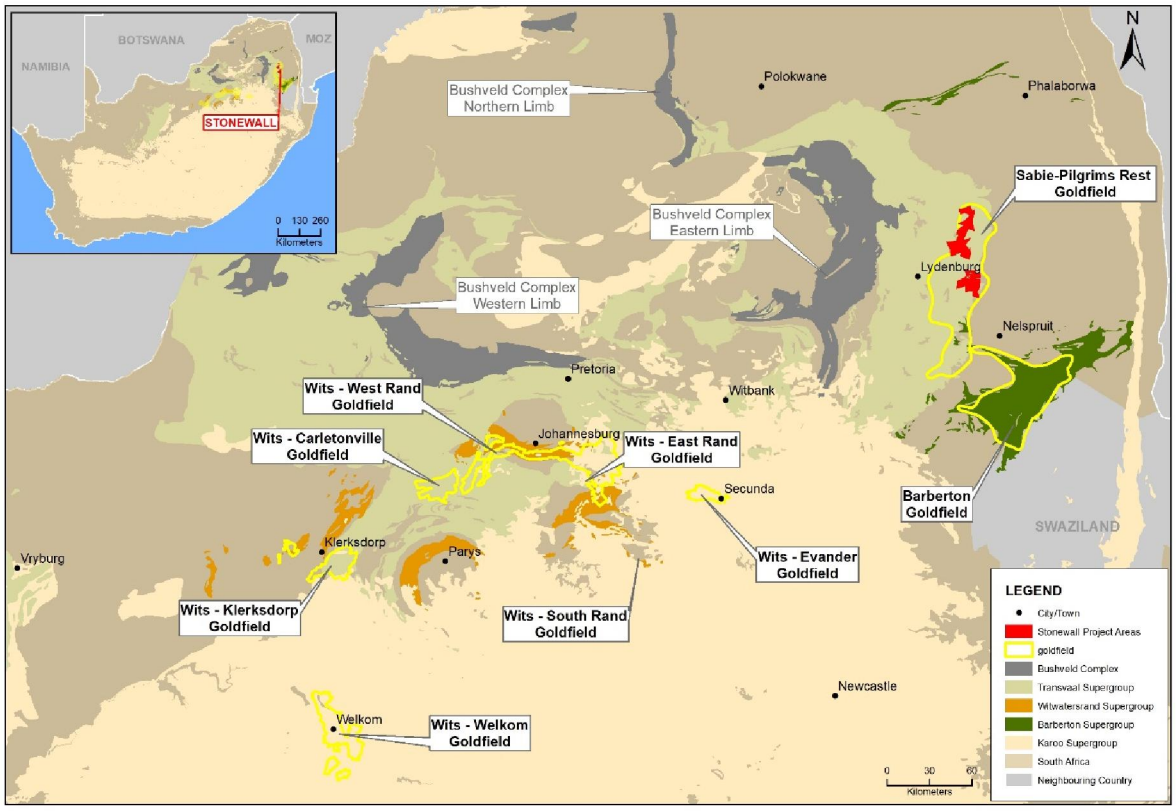

Figure 1: Regional Geological setting of the Sabie-Pilgrims Rest Goldfield.

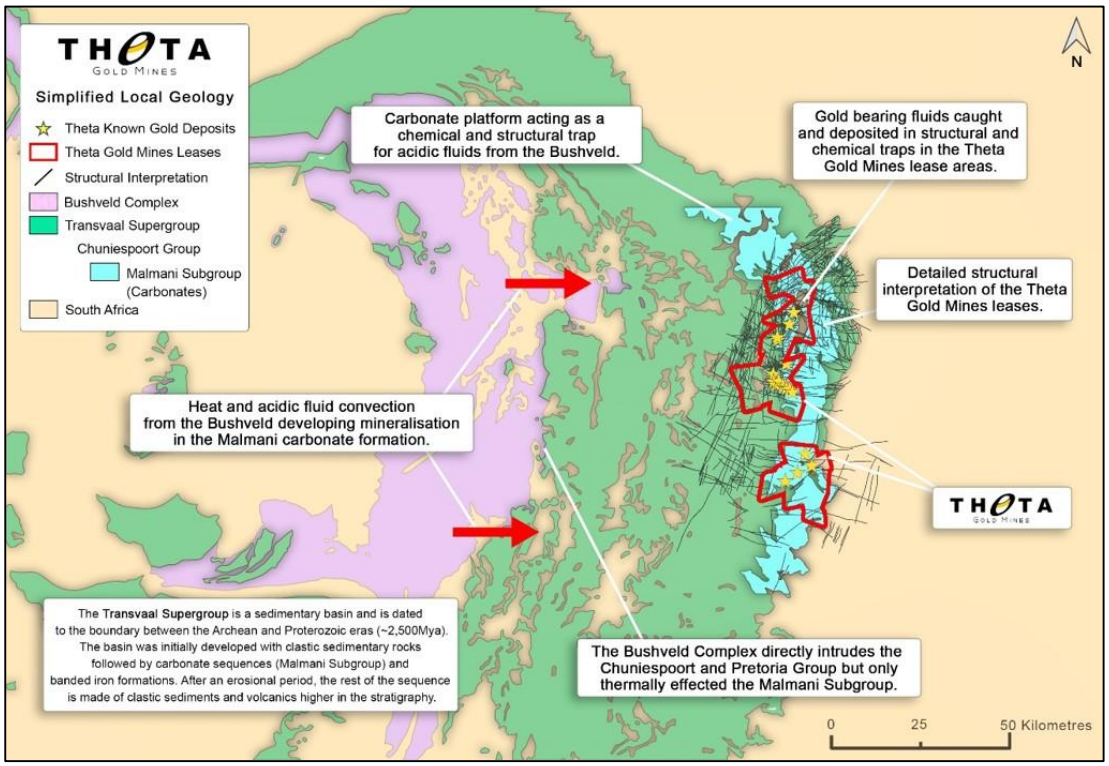

Figure 2: Sabie-Pilgrims Rest Regional Geology and extent of Stonewall Mineral Rights

There are in the order of 40 significant mines, excavations and old workings within the Goldfield (main mine sites shown in Figures 2 and 3).

Gold mineralization predominantly manifests as quartz-carbonate veins that develop as sheeted orebodies locating on bedding plane thrusts on interbedded shale horizons within the Malmani Dolomite subgroup, as well as on rheological contacts of sills, quartzite-shale, quartzite - dolomite and shale-dolomite interfaces. Locally quartz stockworks and breccias develop. There are also subvertical veins hosted in Archean granite as well as adjacent to predominantly NNE trending dykes.

The predominant dolomite host rock has a significant buffering effect on mine water drainage and general very pure ground water quality.

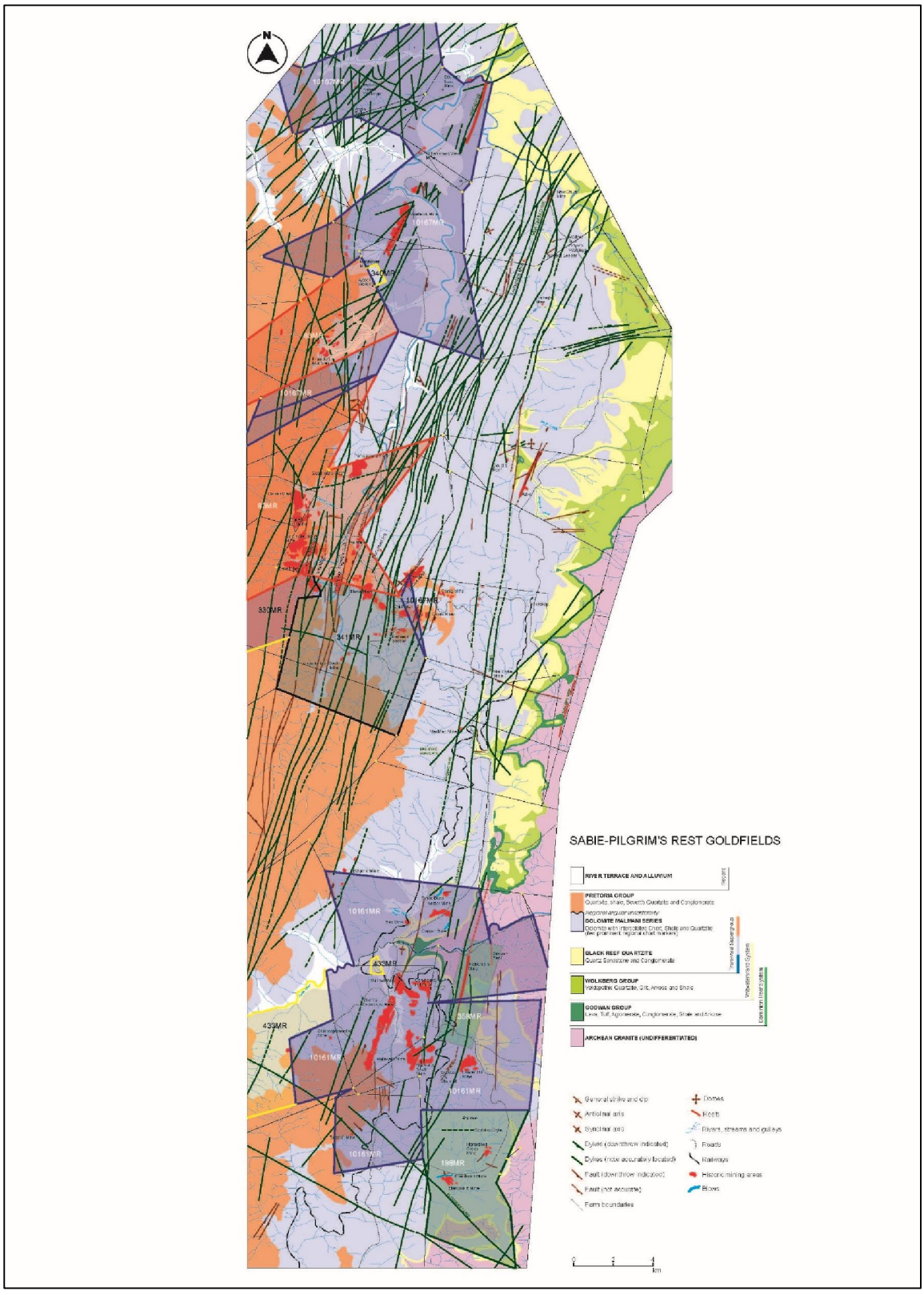

Figure 3: Sabie-Pilgrims Rest goldfield and locality of principal historic mining operations.

The ore mineralogy of the more significant occurrences and producers is shown in the Tables below.

MINERALOGY OF SPRG MAIN GOLD-BEARING OREBODIES

UG Mine	Reef	Mineralogy
Beta	Beta Ind	Py-Cpy-Tt-Bis
Vaalhoek	Vaalhoek	Py-Cpy
Frankfort	L Theta (Rho?)	Py-Tt-Asp
Clew er-Dukes-Morgenzon	Rho	Py-(Cpy-Tt-Asp)
Frankfort*	Bevett's	Py-(Asp)
Glynn's Lydenburg	Glynn's	Py-(Cpy)
Ponieskrantz	Portuguese	Py-(Cpy)
Olifantsgeraamte	Olifantsgeraamte	Py-(Cpy)
Rietfontein*	Rietfontein	Py-Cpy
Nestor	Sandstone	Py-(Cpy)
Theta	L Theta	Py-(Cpy-Tt)

TGME MINERALOGY OF GOLD MINERALISATION

Reef	Py	Cpy	Tt	Asp	Bis	Sp	Bi	Ga	Po	St	Sch
Formosa	X	O		O							
Button	X	O		X							
Columbia Hill shale	X							O			
Frankfort Bevetts	X	O	O	X	O	O					
Frankfort L Theta (Rho?)	X	O	X	X		O			O	O	
Clewer Rho	X	X	X	X	O	O	O	O		O	
Theta Hill U Theta	X	X	X	O	O						
Theta Hill L Theta	X	X	X	O	O	O	O				
Beta	X	X	X	O	X				O		
Portuguese	X	X	O	O	O		O	O			
Olifantsgeraamte	X	X				O					
Elandshoogte	X	O	O	O	O	O	O				
Vaalhoek	X	X		O							O
Trixie Leaders	X	O			X						
Ledouphine	O			X	O		O				
Glynn's	X	X		O	O		O				
Nestor Sandstone	X	X									
Rietfontein	X	X	O	O							

X	major constituent		**O**	minor constituent				
Py	Pyrite FeS_2		**Cpy**	Chalcopyrite $CuFeS_2$		**Asp**	Arsenopyrite FeAsS	
Tt	Tetrahedrite $(Cu,Fe,Zn,Ag)_{12}(Sb,As)_4S_{13}$					**Sch**	Scheelite $CaWO_4$	
Bis	Bismuthinite Bi_2S_3		**Po**	Pyrrhotite FeS		**Bi**	Bismuth Bi	
Sp	Sphalerite (Zn,Fe)S		**St**	Stannite Cu_2FeSnS_4		**Ga**	Galena PbS	

Historic documentation and ore mineralogy studies by researchers such as EGRU (University of the Witwatersrand) do not indicate any uraniferous minerals in the Goldfield. As can be seen above the mineralized horizons are largely pyritic quartz-carbonate veins with variable contents of copper, arsenic and bismuth.

It is emphasised that the geological setting of mineralisation (Proterozoic ~ 2.0 billion year old shear hosted quartz carbonate veins) with the main source of gold linked to the Bushveld Igneous Complex to the west of the SPRG) is not favourable for uranium deposition, and therefore cannot be compared to

- The Witwatersrand uriniferous modified placer conglomerates;
- Sedimentary "roll-front" uranium deposits in highly reducing settings;
- Uraniferous alaskite intrusives eg as in Namibia;
- Uraniferous porphyry intrusives eg Colorado USA

Yours sincerely

Phil Bentley
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