



**SCIENTIFIC AQUATIC SERVICES**

# Visual Impact Assessment

**FOR THE PROPOSED MR 83 UNDERGROUND (UG)  
TARGETS NEAR PILGRIM'S REST, MPUMALANGA  
PROVINCE**

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(TGME)  
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## EXECUTIVE SUMMARY

Scientific Aquatic Services (SAS) was appointed to conduct a Visual Impact Assessment (VIA) as part of the proposed Environmental Impact Assessment (EIA) and Water Use Licence (WUL) amendment process for the MR 83 UG targets near Pilgrims Rest, Mpumalanga.

The assessment included four sites which will henceforth collectively be referred to as the “MR 83 Underground (UG) Areas”; individually referred to as Dukes, Frankfort, Morgenzon, and Beta North. The MR 83 UG Areas are located within the Mpumalanga Province, with Dukes, Morgenzon, and Beta west and north-west of Pilgrim’s Rest and Frankfort approximately nine (9) km north of Pilgrim’s Rest.

TGME is proposing to undertake a redevelopment of its historical underground mines within the MR 83 mining area, i.e., the MR 83 UG Areas (as introduced previously). The MR 83 UG Areas include historical underground mining sections as well as an old TGME process and beneficiation plant. For the proposed underground mining project, additional surface infrastructure is required to augment the existing surface infrastructure – as is required to support the underground workings, the expansion of the current Tailings Storage Facility (TSF) and an upgrade of the old TGME process plant.

The objective of this study was to provide sufficient information on the visual environment of the area, together with other studies on the physical and socio-cultural environment, in order for the relevant authorities to apply the principles of Integrated Environmental Management (IEM) and the concept of sustainable development. The need for management of visual resources as well as the risks to other spheres of the physical and socio-cultural environment need to be compared and considered along with the need to ensure economic development of the country.

The sections below serve to summarise the findings of the assessment.

### Description of the Receiving Environment

The Pilgrim’s Rest area is well known for its historic mining activities (Gold rush in the late 19th century) and is seen as part of a major tourism area. Furthermore, the greater Mpumalanga Province is associated with various mines (coal and gold) and historic mining facilities are present within a 10 km radius of the MR 83 UG Areas. Mining is therefore not a new concept in the area, however historic mining activities in the area comprise predominantly of underground mining and artisanal small-scale mining. The proposed waste rock dumps, stockpiles and additional surface infrastructure associated with the MR 83 UG Area will however lead to a change in the scenic resources, landscape quality, sense of place and visual character of the receiving environment.

Based on the findings from both the desktop and the field assessments it is evident that the MR 83 UG Areas is located within a semi-rural and rural (Frankfort Area) mountainous area, with gentle to steep undulating terrain, which form distinguishing topographical features in the form of prominent hills, outcrops and steep cliffs that are interspersed with thicketed valleys where the Blyde River, streams (Peach Tree Stream) and ephemeral drainage lines are situated. The topography of the area is considered an important ecotourism attraction as tourists traveling on the scenic routes and passes within the area have a pleasant viewing experience.

The visual receptors present within a 5 km radius comprise the town of Pilgrim’s Rest, farmers, and several nature reserves of which the Mount Sheba Private Nature Reserve (NR) and its hiking trails are of importance due to the Lost City Hiking Trail having a clear line of sight towards the Beta North and Dukes Areas. Furthermore, the R533, Vaalhoek Road and several gravel roads are present within the vicinity of the MR 83 UG Areas. Permanent residents of the town of Pilgrim’s Rest, hikers and people camping in the Mount Sheba Private NR are considered high sensitive receptors. People at their place of work are considered low sensitive receptors, as they are likely to focus on the activities at hand and not the surrounding environment. Motorists and tourists traveling on the scenic roads are considered moderate to highly sensitive receptors, since tourists’ attention are focused towards the panoramic scenic landscape. Visual observations of the MR 83 UG Areas along the R533 however requires knowledge of the exact locations thereof, as such motorists will not directly observe the proposed mining activities in the landscape. Since the town of Pilgrim’s Rest is a popular tourist destination for both local



and international tourists, these tourist attractions (Pilgrim's Rest, God's Window etc.) are considered exceptionally high sensitive receptor areas.

Historic mining infrastructure such as old mine shafts, waste rock dumps and TSFs are present in the area, forming part of the heritage and tourism attraction of the area. No authorised mining is taking place within the MR 83 UG Areas, and the existing TGME metallurgical plant, offices and TSF at the Beta Area are still in use and will form part of the operational activities of the proposed project. However historic mining activities have taken place and illegal mining activities are currently taking place in the MR 83 UG Areas, which resulted in visual scarring of the terrain.

The Visual Absorption Capacity (VAC) of the area is considered high, indicating that the proposed project will be absorbed in the area, resulting in a moderate to low visual intrusion on the surrounding area. The vast mountainous terrain is the main contributing factor of the VAC, since the hills and mountains are blending, making it difficult to observe distinguishing features within the landscape, from significant distances. Additionally, the indigenous forests, commercial plantations and woodlands in the surrounding areas as well as tree lines along the roads, further assist in screening the proposed mining activities from sensitive receptors.

The landscape quality of the MR 83 UG Areas is considered high. The entire town of Pilgrim's Rest was declared a National Monument in 1986 as a living memory of the early gold rush days in South Africa during the late 1800s / early 1900s. The uniqueness of this historic village is evident in its museums and historic sites, offering the visitor a view into the past, and capturing the spirit of a bygone era of artisanal mining. Additionally, the mountainous terrain forms part of the natural beauty and panoramic scenery of the greater region. The Municipality Spatial Development Framework identifies Pilgrim's Rest and the surrounding area as a protected provincial heritage site and an important tourism node within its area of jurisdiction (SDP, 2007), which is richly imbued with a diversity of natural, cultural and historic gems. Thaba Chweu Local Municipality further hosts numerous events throughout the year that attracts both local residents and visitors to the area including the Long Tom Marathon, Subaru/Ashburton Sabie Classic Mountain Bike race and Sabie Forest Fair (Thaba Chweu, 2016).

Given the mountainous terrain, the vast landscape is appealing to one's visual senses, which may fill the observer with a sense of calmness, tranquillity and wellbeing. As such this landscape offers a sense of place which can be described as calm, tranquil and peaceful and being one with nature.

The lighting environment associated with the MR 83 UG Areas is considered intrinsically dark, while taking the larger region into consideration, the area is considered rural with low district brightness, due to the TGME offices and town of Pilgrim's Rest being sources of night time lighting and contributing to sky glow. The proposed project is expected to contribute to the effects of sky glow and artificial lighting in the region, particularly as a result of stationary lighting sources.

### **Impact Assessment Summary**

Based on the impact assessment, it was determined that the MR 83 UG Project will have a moderate visual impact on the receiving environment, even though it is situated within close proximity to the town of Pilgrim's Rest. With the proposed MR 83 UG Areas located at the foothills and in disturbed areas, and the mountainous backdrop, the sensitive receptors present is not likely to experience significant visual intrusion. As evident from the viewshed analysis and confirmed during the field assessment, only small portions within the town of Pilgrim's Rest and small stretches along the R533 will observe portions of the proposed mining activities.

Night-time lighting as a result of potential 24-hour mining operations will reduce the visibility of starry skies within the intrinsically dark to rural landscape. Should 24-hour mining activities take place, the night-time lighting associated with the MR 83 UG Areas will have a moderately high impact. With mitigation and management measures implemented, with particular reference to lighting design and placement, and mining activities taking place during the day 06:00 to 18:00 the impact of night-time lighting may result in the impact being reduced to moderately low levels.



## Conclusion

Should the project be authorised to proceed, it is imperative that all mitigation measures as stipulated in this report be strictly adhered to. Said mitigation measures would need to comprise concurrent rehabilitation throughout the construction and operational phases and effective management of dust generation.

It is the key objective of this study to provide detailed information to guide the proposed project activities in the vicinity of the sensitive aesthetic resources within the surrounding area of the MR 83 UG Areas , to ensure that the visual impacts are considered, such that local and regional environmental management objectives in the local area are supported while considering the need for sustainable economic development. This report provides sufficient detail on the relevant information to allow for decision making as part of the EIA process as required to fulfil the needs of Integrated Environmental Management.





## DOCUMENT GUIDE

The following table indicates the requirements for Specialist Studies as per Appendix 6 of Government Notice 326 as published in Government Notice 40772 of 2017, amendments to the Environmental Impact Assessment (EIA) Regulations, 2014 as it relates to the National Environmental Management Act, 1998 (Act No. 107 of 1998).

NEMA Regulations (2017) - Appendix 6		Relevant section in report
1a	Details of	
	(i) the specialist who prepared the report; and	Appendix K
	(ii) the expertise of that specialist to compile a specialist report including	Appendix K
b	a declaration that the specialist is independent in a form as may be specified by the competent authority;	Appendix K
c	an indication of the scope of, and the purpose for which, the report was prepared;	Section 1.4
cA	an indication of the quality and age of base data used for the specialist report	Section 3.2
cB	a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	Section 5
d	the duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment;	Section 3.2
e	A description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used	Section 3 and Appendix B to I
f	details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure, inclusive of a site plan	Section 4
g	an identification of any areas to be avoided, including buffers	Not applicable – findings from ecological assessment may be used to conserve natural visual resources
h	a map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	Not applicable – findings from ecological assessment may be used to conserve natural visual resources
i	a description of any assumptions made and any uncertainties or gaps in knowledge;	Section 1.6
j	a description of the findings and potential implications of such findings on the impact of the proposed activity including identified alternatives on the environment or activities;	Section 4 and 5
k	any mitigation measures for inclusion in the EMPr	Section 5
l	any conditions for inclusion in the environmental authorisation	Section 5
m	any monitoring requirements for inclusion in the EMPr or environmental authorisation;	Section 5.5
n	a reasoned opinion	
	(i) as to whether the proposed activity, activities or portions thereof should be authorised;	Section 6
	(1A) regarding the acceptability of the proposed activity or activities; and	Section 6
	(ii) if the opinion is that the proposed activity, activities or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan;	Section 5
o	a description of any consultation process that was undertaken during the course of preparing the specialist report;	Consultation with interested and affected parties (I&APs) will be undertaken as part of the project
p	summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	Comments and responses that are raised by I&APs will be included in the EIA report compiled by the EAP
q	any other information requested by the competent authority	No information requested at this time



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## GLOSSARY OF TERMS

<b>Best Practicable Environmental Option</b>	This is the alternative/option that provides the most benefit or causes the least damage to the environment as a whole, at a cost acceptable to society, in the long term as well as in the short term.
<b>Characterisation</b>	The process of identifying areas of similar landscape character, classifying and mapping them and describing their character.
<b>Characteristics</b>	An element, or combinations of elements, which make a contribution to landscape character.
<b>Development</b>	Any proposal that results in a change to the landscape and/ or visual environment.
<b>Elements</b>	Individual parts, which make up the landscape, for example trees and buildings.
<b>Feature</b>	Particularly prominent or eye-catching elements in the landscape such as tree clumps, church towers or wooded skylines.
<b>Geographic Information System (GIS)</b>	A system that captures, stores, analyses, manages and presents data linked to location. It links spatial information to a digital database.
<b>Impact (Visual)</b>	A description of the effect of an aspect of the development on a specified component of the visual, aesthetic or scenic environment within a defined time and space.
<b>Key characteristics</b>	Those combinations of elements which are particularly important to the current character of the landscape and help to give an area it particularly distinctive sense of place.
<b>Land cover</b>	The surface cover of the land, usually expressed in terms of vegetation cover or the lack of it. Related to but not the same as Land use.
<b>Land use</b>	What land is used for based on broad categories of functional land cover, such as urban and industrial use and the different types of agriculture and forestry.
<b>Landform</b>	The shape and form of the land surface which has resulted from combinations of geology, geomorphology, slope, elevation and physical processes.
<b>Landscape</b>	An area, as perceived by people, the character of which is the result of the action and interaction, of natural and/ or human factors.
<b>Landscape Character Type</b>	These are distinct types of landscape that are relatively homogeneous in character. They are generic in nature in that they may occur in different areas in different parts of the country, but wherever they occur, they share broadly similar combinations of geology, topography, drainage patterns, vegetation and historical land use and settlement pattern, and perceptual and aesthetic attributes.
<b>Landscape integrity</b>	The relative intactness of the existing landscape or townscape, whether natural, rural or urban, and with an absence of intrusions or discordant structures.
<b>Landscape quality</b>	A measure of the physical state of the landscape. It may include the extent to which typical landscape character is represented in individual areas, the intactness of the landscape and the condition of individual elements.
<b>Landscape value</b>	The relative value that is attached to different landscapes by society. A landscape may be valued by different stakeholders for a variety of reasons.
<b>Receptors</b>	Individuals, groups or communities who are subject to the visual influence of a particular project. Also referred to as viewers, or viewer groups.
<b>Sense of place</b>	The unique quality or character of a place, whether natural, rural or urban, allocated to a place or area through cognitive experience by the user. It relates to uniqueness, distinctiveness or strong identity and is sometimes referred to as <i>genius loci</i> meaning 'spirit of the place'.
<b>Sky glow</b>	Brightening of the night sky caused by outdoor lighting and natural atmospheric and celestial factors.
<b>Sky lining</b>	Siting of a structure on or near a ridgeline so that it is silhouetted against the sky.
<b>View catchment area</b>	A geographic area, usually defined by the topography, within which a particular project or other feature would generally be visible.
<b>Viewshed</b>	The outer boundary defining a view catchment area, usually along crests and ridgelines.



<b>Visibility</b>	The area from which project components would potentially be visible. Visibility is a function of line of sight and forms the basis of the VIA as only visible structures will influence the visual character of the area. Visibility is determined by conducting a viewshed analysis which calculates the geographical locations from where the proposed power line might be visible.
<b>Visual Absorption Capacity</b>	The ability of an area to visually absorb development as a result of screening topography, vegetation or structures in the landscape.
<b>Visual Character</b>	The overall impression of a landscape created by the order of the patterns composing it; the visual elements of these patterns are the form, line, colour and texture of the landscape's components. Their interrelationships are described in terms of dominance, scale, diversity and continuity. This characteristic is also associated with land use.
<b>Visual Exposure</b>	The relative visibility of a project or feature in the landscape. Visual exposure is based on distance from the project to selected viewpoints. Visual exposure or visual impact tends to diminish exponentially with distance.
<b>Visual Intrusion</b>	The nature of intrusion of an object on the visual quality of the environment resulting in its compatibility (absorbed into the landscape elements) or discord (contrasts with the landscape elements) with the landscape and surrounding land uses.
<b>Zone of visual influence</b>	An area subject to the direct visual influence of a particular project.

\*Definitions were derived from Oberholzer (2005) and the Institute of Environmental Management and Assessment (2013)





## LIST OF ACRONYMS

ARC	Agricultural Research Council
BLM	(United States) Bureau of Land Management
BPEO	Best Practicable Environmental Option
DEM	Digital Elevation Model
DMRE	Department of Mineral Resources and Energy
DTM	Digital Terrain Model
DWS	Department of Water and Sanitation
EAP	Environmental Assessment Practitioner
EIA	Environmental Impact Assessment
EIM	Integrated Environmental Management
GIS	Geographic Information System
GN	Government Notice
GPS	Global Positioning Systems
IAPs	Interested and Affected Parties
IDP	Integrated Development Plan
IEM	Integrated Environmental Management
KNP	Kruger National Park
KOP	Key Observation Point
LI IEMA	Institute of Environmental Management and Assessment
m.a.m.s.l.	Meters above mean sea level
MWP	Mining Work Program
NEMA	National Environmental Management Act (No. 108 of 1997)
NGL	Natural Ground Level
NHRA	National Heritage Resources Act
PNR	Private Nature Reserve
ROM	Run Of Mine
SACAD	South African Conservation Areas Database
SAHRA	South African Heritage Resources Agency
SANBI	South African National Biodiversity Institute
SAPAD	South African Protected Areas Database
SAS	Scientific Aquatic Services
SDF	Spatial Development Framework
TCLM	Thaba Chweu Local Municipality
TGME	Transvaal Gold Mining Estate
TMM	Trackless mobile machinery
UG	Underground
UNESCO	United Nations Educational Scientific and Cultural Organization
VAC	Visual Absorption Capacity
VIA	Visual Impact Assessment
VRM	Visual Resource Management
WHS	World Heritage Site
WRD	Waste Rock Dump
WUL	Water Use License



# 1 INTRODUCTION

## 1.1 Background

Scientific Aquatic Services (SAS) was appointed to conduct a Visual Impact Assessment (VIA) as part of the proposed Environmental Impact Assessment (EIA) and Water Use Licence (WUL) amendment process for the MR 83 UG targets near Pilgrims Rest, Mpumalanga.

The assessment included four sites which will henceforth collectively be referred to as the “**MR 83 Underground (UG) Areas**”; individually referred to as Dukes, Frankfort, Morgenzon, and Beta North. The MR 83 UG Areas are located within the Mpumalanga Province, with Dukes, Morgenzon, and Beta west and north-west of Pilgrim’s Rest and Frankfort approximately nine (9) km north of Pilgrim’s Rest (localities depicted in Figures 1 and 2).

A VIA entails a process of data collection, spatial analysis, visualisation and interpretation to describe the quality of the landscape prior to development taking place and then identifying possible visual impacts after development. Assessing visual impacts are difficult as it is very subjective due to a person’s perception being affected by more than only the immediate environmental factors (Oberholzer, 2005).

This report, after consideration and description of the present visual integrity of the MR 83 UG Areas and surroundings, must guide the proponent, authorities and Environmental Assessment Practitioner (EAP), by means of recommendations, as to the suitability of the MR 83 UG Areas for the intended land use, from a visual resource management and aesthetic point of view. This report should furthermore serve to inform the planning, design and decision-making process as to the refinement of the layout and nature of the proposed mining activities, should this be deemed necessary by the relevant authorities.

## 1.2 Description of the proposed project<sup>1</sup>

Transvaal Gold Mining Estates Limited (TGME), a subsidiary of Theta Gold Mines Limited, is the holder of an existing mining right with Department of Mineral Resources and Energy

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<sup>1</sup> Mining Work Programme submitted in support of an application for an amendment to a Mining Right as required in terms of Section 23 (a), (b) and (c) read together with Regulation 11(1) (g) of the Mineral and Petroleum Resources Development Act (Act No. 28 of 2002). This application is made in support of an amendment in terms of Section 102 of the Mineral and Petroleum Resources Development Act (Act No. 28 of 2002).





(DMRE) Reference Number: MP 30/5/1/2/2/MR 83 (MR 83) with effective date 16 October 2013.

TGME is proposing to undertake a redevelopment of its historical underground mines within the MR 83 mining area, i.e., the MR 83 UG Areas (as introduced previously). The MR 83 UG Areas include historical underground mining sections as well as an old TGME process and beneficiation plant. For the proposed underground mining project, additional surface infrastructure is required to augment the existing surface infrastructure – as is required to support the underground workings, the expansion of the current Tailings Storage Facility (TSF) and an upgrade of the old TGME process plant.

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

- Trackless mobile machinery (TMM) workshops;
- Fuel storage facilities;
- Oil storage facilities;
- Mining and engineering stores;
- First aid station;
- Mining waste sorting /management and salvage yard;
- Sewage handling facilities;
- Diesel generator sets;
- Power distribution transformers;
- Water supply and distribution infrastructure;
- Reservoir and water tanks;
- Surface water management infrastructure;
- Upgrading of river crossings and rehabilitation of Peach Tree stream;
- Site security and access control;
- Mining settling and collection dam (stormwater and pollution control);
- Emulsion storage tanks;
- Underground infrastructure;
  - Power supply by Generator at the shaft;
  - Water supply from the Blyde (Current Approved Permit);
  - Ore handling infrastructure (Ore passes, conveyors, incline winder with required shaft equipment); and
  - Dewatering system.



- Offices – mobile/prefabricated offices;
- Surface ore handling and load-out facilities;
- Dense Medium Separation (DMS) plant;
- Mine residue facility (waste rock)
- Run of Mine (RoM) stockpile area
- Conveyor from Beta North to the plant
- Single drum winder
- Steel rope haulage system.

A detailed depiction of the proposed activities to accompany the proposed underground mining activities are presented in Figures 3 – 7.

The Life of Project is currently estimated at 10 years (i.e., requested validity of the EIA) in which the construction phase is estimated at three years and the mining at seven years. Various alternatives have been assessed for the project at scoping level, and workshopped during specialist, applicant, and engineering team interactions. The alternatives were also influenced by the existing baseline environmental data and specialist inputs, and by discussions with authorities and with Interested and Affected Parties (I&APs).





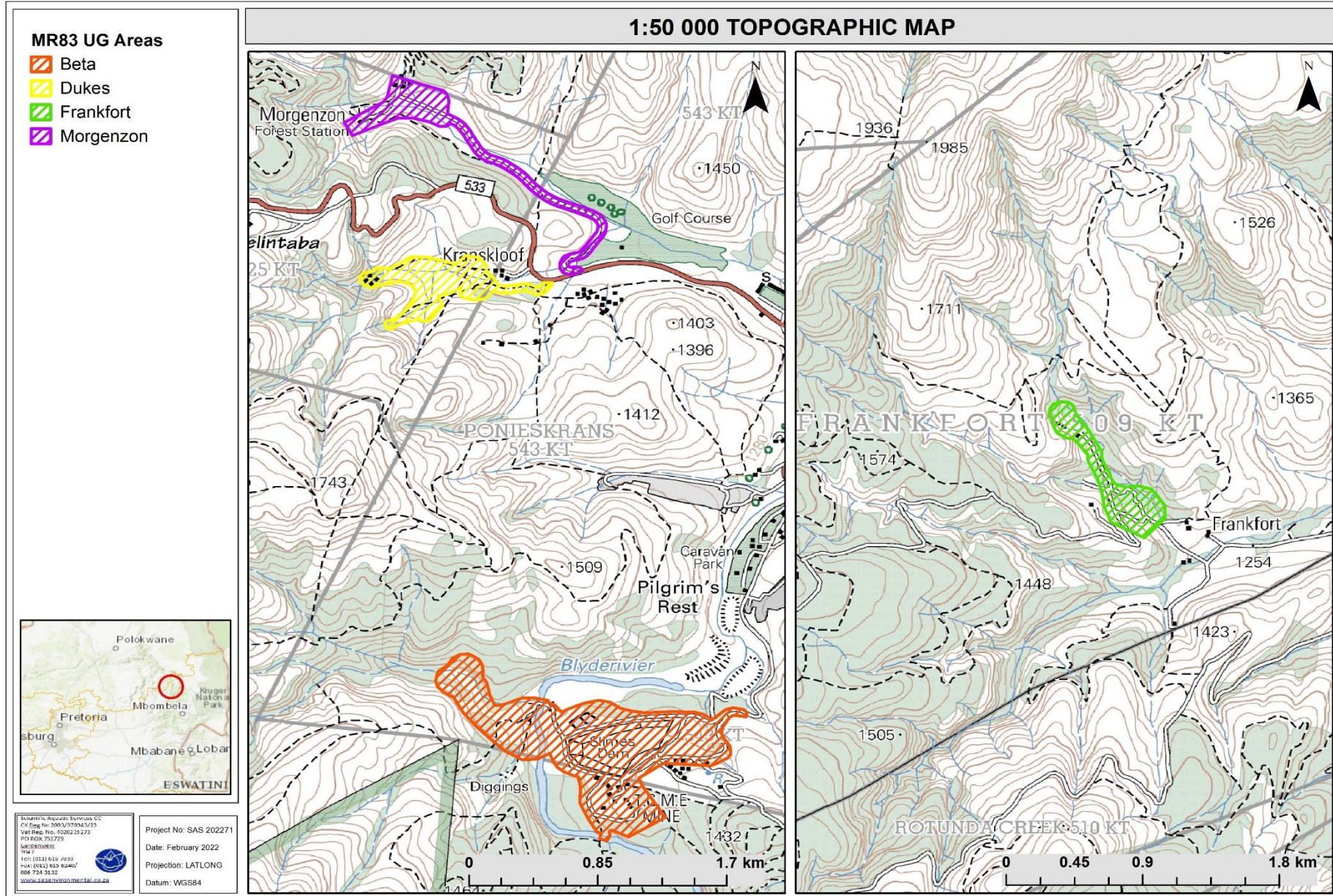


Figure 1: 1:50 000 Topographical map depicting the location of the MR 83 UG Areas in relation to the surrounding region.





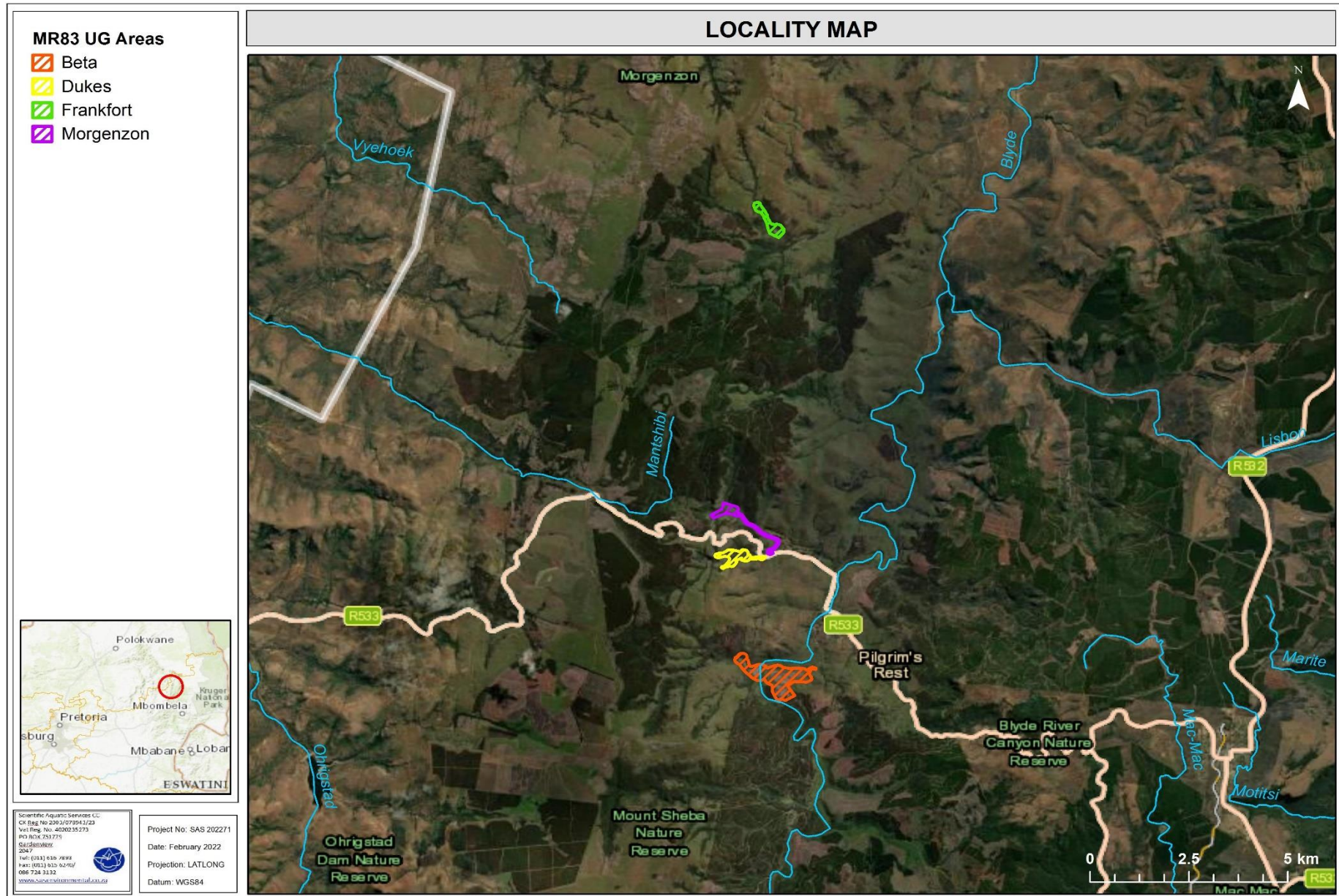


Figure 2: Digital satellite image depicting the location of the MR 83 UG Areas in relation to the surrounding region.





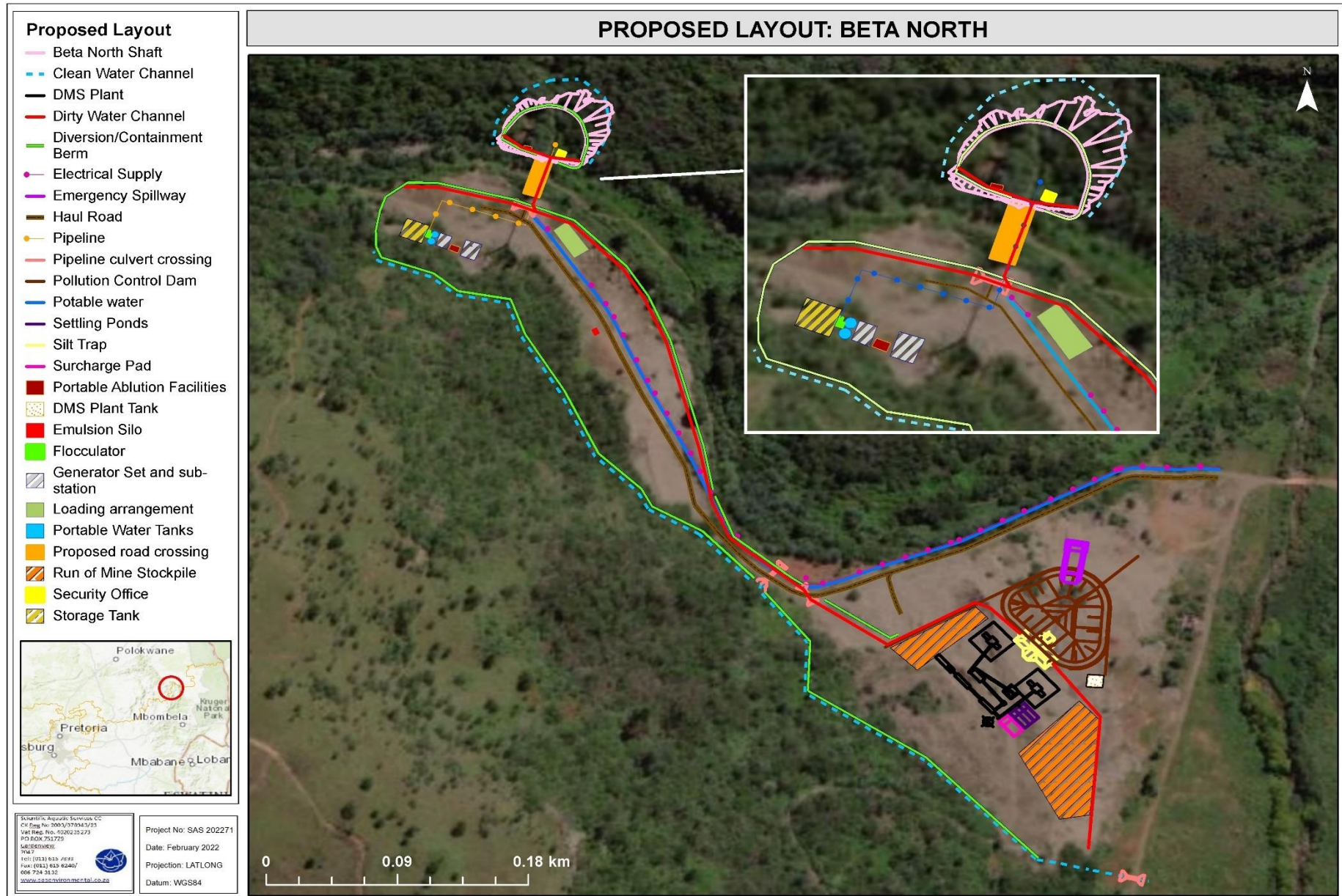


Figure 3: Proposed layout map for the northern portion of Beta.





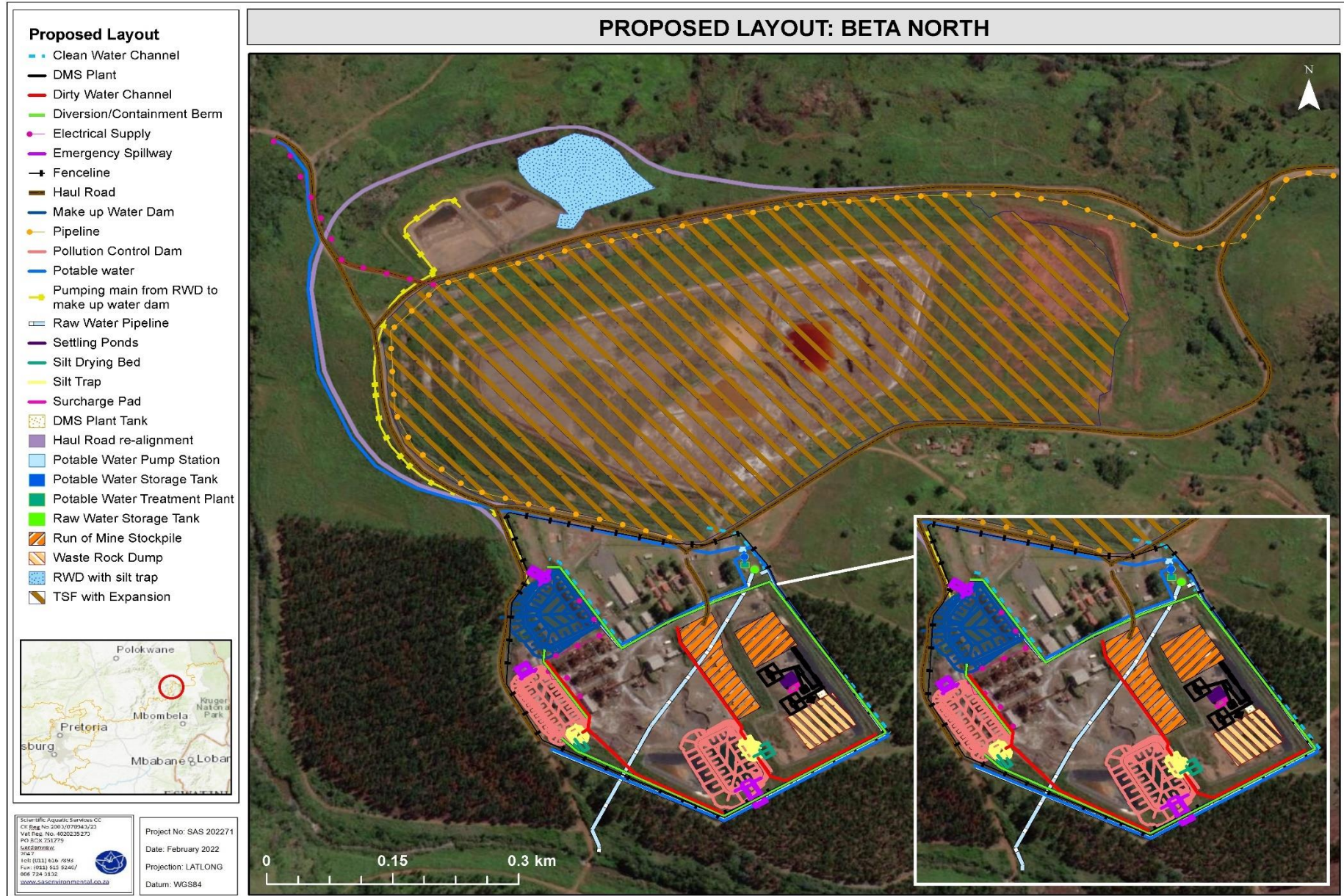


Figure 4: Proposed layout map for the southern portion of Beta.





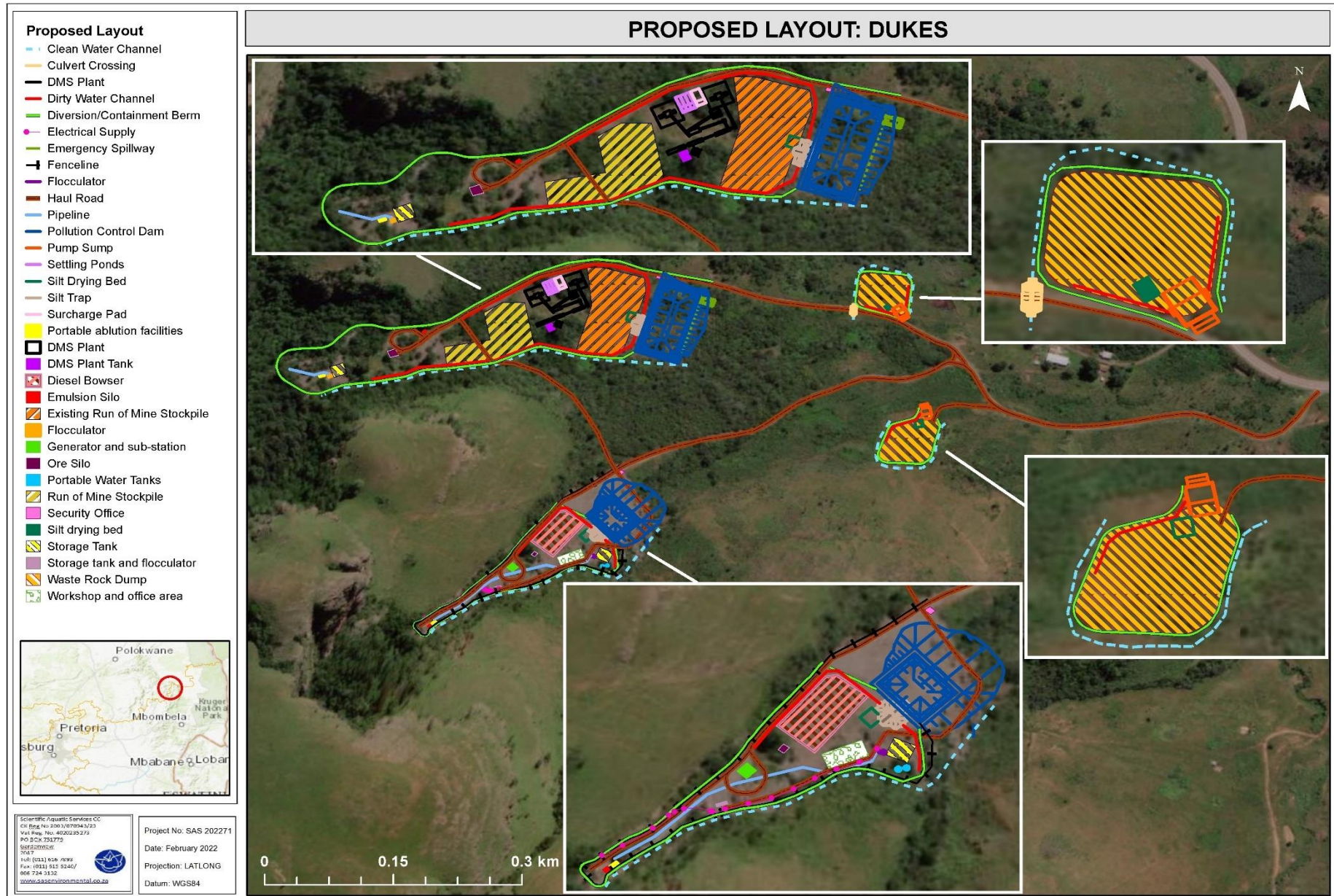


Figure 5: Proposed layout map for Dukes.





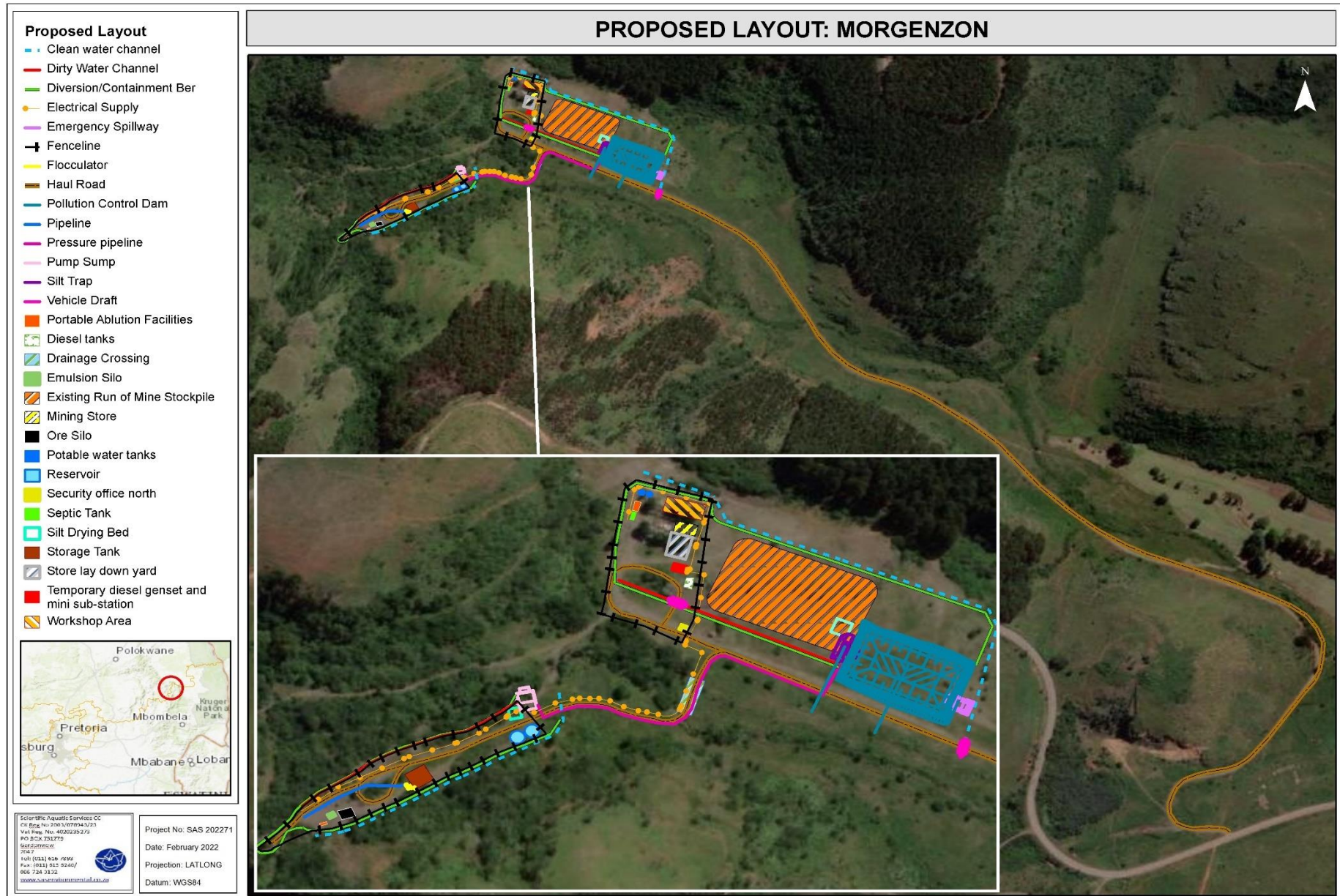


Figure 6: Proposed layout map for Morgenzon.





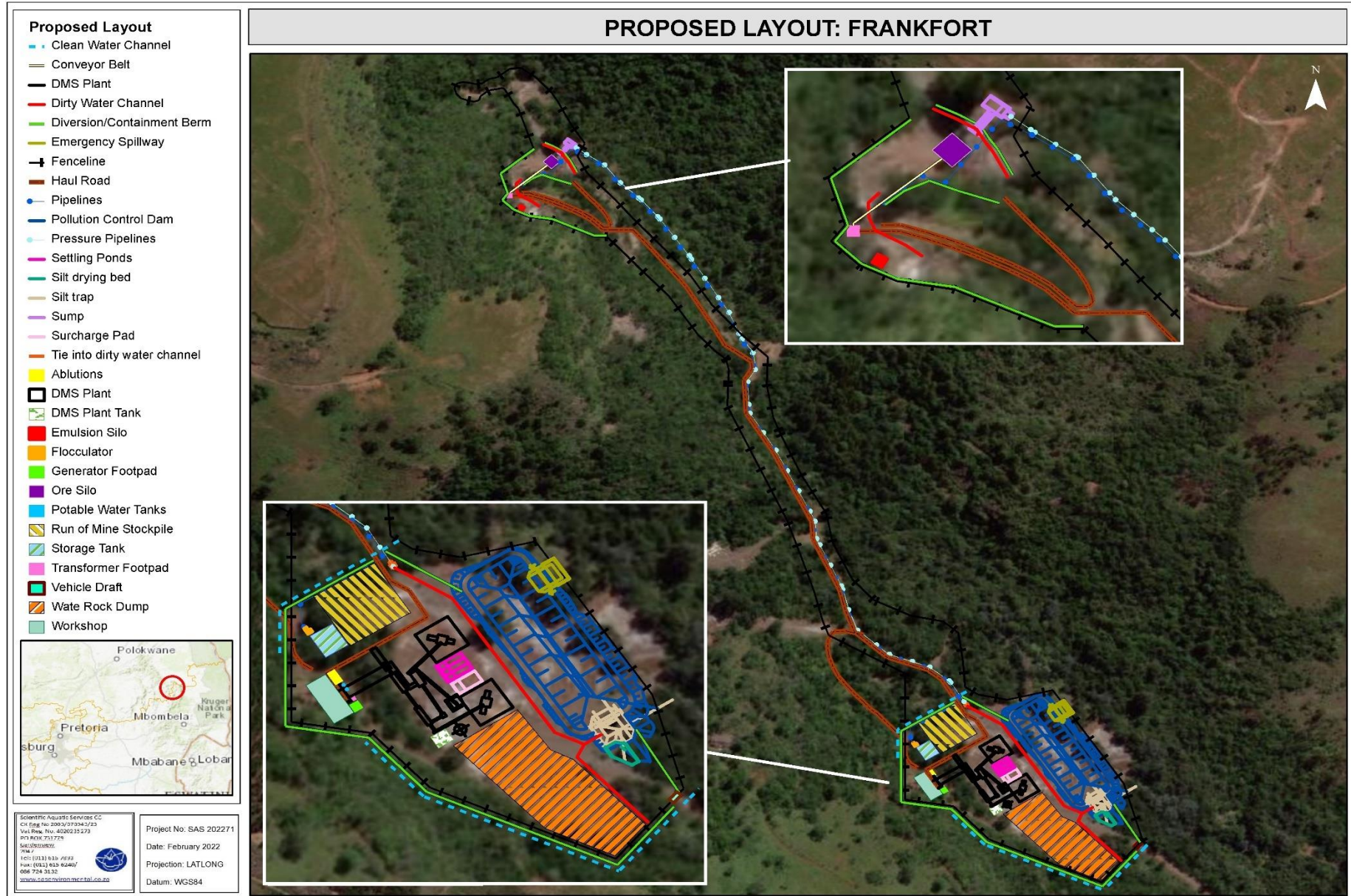


Figure 7: Proposed layout map for Frankfort.



### **1.3 Project Scope**

The purpose of this report is:

- To determine the Category of Development and Level of Assessment as outlined by Oberholzer (2005);
- To describe the receiving environment in terms of regional context, location and environmental and landscape characteristics;
- To describe and characterise the MR 83 UG Areas and the receiving environment in its envisioned future state;
- To identify the main viewsheds through undertaking a viewshed analysis, based on the proposed height of infrastructure components and the Digital Elevation Model (DEM), as a mechanism to identify the locations of potential sensitive receptors sites and the distance of these receptor sites from the MR 83 UG Areas ;
- To identify and describe potential sensitive visual receptors residing at or utilising receptor sites;
- To establish receptor sites and identify Key Observation Points (KOPs) from which the proposed MR 83 UG Areas will have a potential visual impact, if necessary;
- To prepare a photographic study and conceptual visual simulation of the proposed MR 83 UG Areas as the basis for the viewshed identification and analysis;
- To assess the potential visual impact of the proposed project from selected receptors sites in terms of standard procedures and guidelines; and
- To describe mitigation measures to minimise any potential visual impacts.

### **1.4 Principles and Concepts of VIAs**

Visual resources have value in terms of the regional economy and inhabitants of the region. Furthermore, these resources are often difficult to place a value on as they normally also have cultural or symbolic values. VIAs are to be performed in a logical, holistic, transparent and consistent manner. Oberholzer (2005) identifies the following concepts to form an integral part of the VIA process:

- Visual resources include the visual, aesthetic, cultural and spiritual aspects of the environment, which contribute toward and define an area's sense of place;
- Natural and cultural landscapes are inter-connected and must be considered as such;
- All scenic resources, protected areas and sites of special interest within a region need to be identified and considered as part of the VIA;
- All landscape processes such as geology, topography, vegetation and settlement patterns that characterise the landscape must be considered;



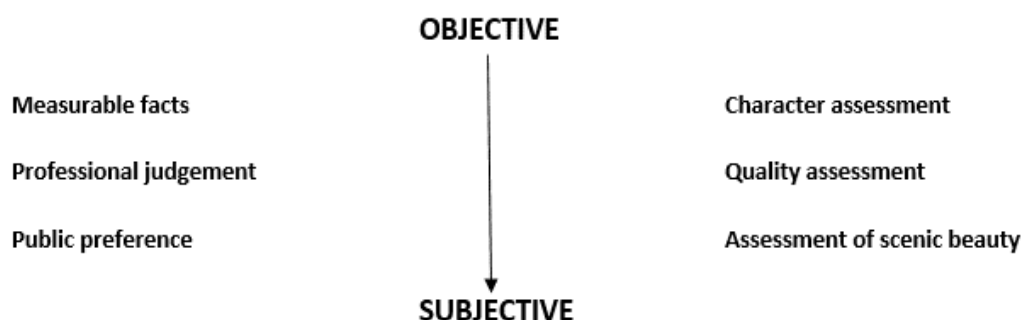
- Both quantitative criteria, such as 'visibility' and qualitative criteria, such as aesthetic value or sense of place has to be included as part the assessment;
- VIAs must inform the Environmental Impact Assessment (EIA) process in terms of visual inputs; and
- Public involvement must form part of the process.

The guideline furthermore recommends that the VIA process identifies the Best Practicable Environmental Option (BPEO) based on the following criteria:

- Long term protection of important scenic resources and heritage sites;
- Minimisation of visual intrusion on scenic resources;
- Retention of wilderness or special areas intact as far as possible; and
- Responsiveness to the area's uniqueness, or sense of place.

### 1.5 Assumptions and Limitations

- No specific national legal requirements for VIAs currently exist in South Africa. The assessment of visual impacts is required by implication when the provisions of relevant legislation governing environmental management are considered and when certain characteristics of either the receiving environment or the proposed project indicate that visibility and aesthetics are likely to be significant issues and that visual input is required (Oberholzer, 2005);
- Due to a lack of visual impact assessment guidelines within the Mpumalanga Province, the "Guidelines for Involving Visual and Aesthetic Specialists in the EIA Process" (Oberholzer, 2005), prepared for the Western Cape Department of Environmental Affairs & Development Planning, was used;
- All information relating to the proposed project as referred to in this report is assumed to be the latest available information. Additionally, best practice guidelines were taken into consideration and utilising the maximum expected heights of the infrastructure and the placement thereof in viewshed calculations as a precautionary approach; and
- Abstract or qualitative aspects of the environment and the intangible value of elements of visual and aesthetic significance are difficult to measure or quantify and as such





depend to some degree on subjective judgments. It is therefore necessary to differentiate between aspects that involve a degree of subjective opinion and those that are more objective and quantifiable, as outlined in the diagram below (The Landscape Institute and Institute of Environmental Management and Assessment (LI IEMA, 2002).

- The viewsheds resulting from the DEM and as illustrated in this report, indicate the areas from which the proposed project is likely to be visible and does not take local vegetation cover and man-made structures into account. Potential sensitive receptor sites, indicated to fall within the viewsheds have been ground truthed during the field assessment; and
- The Impact Assessment used is not specific to visual resource management. Some limitations in the accuracy of the description of impacts thus occur due to the inherent characteristics of the impact assessment supplied by the EAP and it is the opinion of the specialists that in some instances the impacts are over or underestimated.

## 2 LEGAL, POLICY AND PLANNING CONTEXT FOR VIAs

Oberholzer (2005) indicates that current South African environmental legislation governing the EIA process, which may include consideration of visual impacts if this is identified as a key issue of concern, is the National Environmental Management Act (NEMA) (Act 107 of 1998). This includes the 2014 NEMA EIA regulations as amended (published in General Notice (GN) No. R.982 as well as R 983 Listing Notice 1, R 984 Listing Notice 2 and R 985 Listing Notice 3).

In addition, the following acts and guidelines are applicable (Oberholzer, 2005):

### **National Environmental Management: Protected Areas Act (Act No. 57 of 2003)**

This act was developed in 2003 for the protection and conservation of ecologically viable areas representative of South Africa's biological diversity and its natural landscapes and seascapes

- Restricted activities involving national and protected parks:
- 48(1) Despite other legislation, no person may conduct commercial prospecting, mining, exploration, production, or related activities–
  - (a) in a special nature reserve, national park, or nature reserve
  - (b) in a protected environment without the written permission of the Minister and the Cabinet member responsible for minerals and energy affairs; or
  - (c) in a protected area referred to in section 9(b), (c) or (d).

### **National Heritage Resources Act (Act No. 25 of 1999)**



For this project, the National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA) are of importance and the following sites and features are protected:

- Archaeological artefacts, structures and sites older than 100 years;
- Ethnographic art objects (e.g. prehistoric rock art) and ethnography;
- Objects of decorative and visual arts;
- Military objects, structures and sites older than 75 years;
- Historical objects, structures and sites older than 60 years;
- Proclaimed heritage sites;
- Grave yards and graves older than 60 years;
- Meteorites and fossils; and
- Objects, structures and sites of scientific or technological value.

The national estate includes the following:

- Places, buildings, structures and equipment of cultural significance;
- Places to which oral traditions are attached or which are associated with living heritage; Historical settlements and townscapes;
- Landscapes and features of cultural significance;
- Geological sites of scientific or cultural importance;
- Archaeological and palaeontological importance;
- Graves and burial grounds;
- Sites of significance relating to the history of slavery; and
- Movable objects (e.g. archaeological, palaeontological, meteorites, geological specimens, military, ethnographic, books etc.).

Section 34 of the NHRA deal with structures that are older than 60 years. Section 35(4) of the NHRA deals with archaeology, palaeontology and meteorites. Section 36 of the NHRA, deal with human remains older than 60 years. Unidentified/unknown graves are also handled as older than 60 years until proven otherwise. According to Regulation 38 of the NHRA, any development or other activity which will change the character of a site exceeding 5 000m<sup>2</sup> in extent requires notification to the South African Heritage Resources Agency (SAHRA).

#### **Advertising on Roads and Ribbons Act (Act No. 21 of 1940)**

Visual pollution is controlled, to a limited extent, by the Advertising on Roads and Ribbons Act (Act 21 of 1940), which deals mainly with signage on public roads.

#### **Municipal Systems Act (Act No. 32 of 2000)**

In terms of the Municipal Systems Act (Act 32 of 2000), it is compulsory for all municipalities to initiate an Integrated Development Planning (IDP) process in order to prepare a five-year



strategic development plan for the area under their control. The IDP process, specifically the spatial component is based in certain areas and provinces on a bioregional planning approach to achieve continuity in the landscape and to maintain important natural areas and ecological processes. The MR 83 UG Areas is situated within the Thaba Chweu Local Municipality (TCLM) (MP321), within the Ehlanzeni District for which the Final IDP 2017-2022 is available. According to the IDP document mining is one of the main economic sectors, contributing largely to employment opportunities within the TCLM. Additionally, mining investments has increased in the area and as such mining activities are considered important for economic growth in the future for the TCLM.

According to the Provincial Gazette Volume 23 No. 2635 of 2016, Section 81 states the “an applicant who wishes to develop on or change the land use purpose of communal land located in the area of a traditional council where such development will have a high impact, such as mining activities, on the community or such change requires approval in terms of the land use scheme applicable to such area, must apply to the Municipality”. General Application Procedures as stipulated in Chapter 6 of the Provincial Gazette must be adhere to.

#### **Other**

- Visual and aesthetic resources are also protected by local authorities, where policies and by-laws relating to urban edge lines, scenic drives, special areas, signage, communication masts, etc. have been formulated; and
- Other decision-making authorities such as the Department of Mineral Resources and Energy (DMRE), or the local authorities, in terms of their particular legislative frameworks, may also require VIAs to support informed decision-making.



## 3 METHOD OF ASSESSMENT

### 3.1 Desktop Assessment

The method of assessment for this report is based on a spatial analysis of the MR 83 UG Areas and the surrounding areas, using Geographic Information Systems (GIS) such as Planet GIS, ArcGIS, Global Mapper as well as digital satellite imagery, photographs, various databases and all available data on the planned infrastructure. The desktop assessment served to guide the field assessment through identifying preliminary areas of importance in terms of potential visual impacts.

The desktop study included an assessment of the current state of the environment of the area including the climate of the area, topography, land uses and land cover with data obtained from the websites of the South African National Biodiversity Institute (SANBI) and the Agricultural Research Council (ARC). All databases used were published within the last 5 years and contain up to date and relevant information.

During the desktop assessment, which took place prior to and in preparation of the field assessment, the 1:50 000 topographical map, as well as high definition aerial photographs were used to identify dominant landforms and landscape patterns. These resources together with digital elevation data were utilised to establish a parameter within which potential sensitive receptors were to be identified via Google Earth Pro. These parameters can henceforth be referred to as the visual assessment zone. Based on the mountainous terrain, the existing infrastructure in the area, the visual assessment zone encompasses a 2 km radius of the MR 83 UG Areas. The potentially sensitive receptors identified within the visual assessment zone during the desktop assessment was verified during the field assessment.

Detailed assessment methods used to determine the landscape characteristics of the receiving environment and potential visual impacts of the project are outlined in the relevant sections below as well as in Appendices A – J.

### 3.2 Field Assessment

A field assessment was undertaken during the summer season on 17<sup>TH</sup> of January to the 19<sup>th</sup> of January 2022 which is considered a suitable time period during which to conduct the VIA, due to natural vegetation being similar throughout the year. Early morning and evening mist is often associated with high altitude areas, thus affecting the visibility of the MR 83 UG Areas at different times of the day, particularly at further distances.





The field assessment included a drive-around and on-foot survey of the infrastructure areas, stockpiles and waste rock dumps within the MR 83 UG Areas and in the immediate vicinity thereof and a drive-around of the surrounds, in order to determine the visual context within which the proposed project is to be developed. Focus was placed on assessing areas identified as being potentially important observation points, including the Town of Pilgrim's Rest, villages / communities, nature reserves and prominent roads within the area. Points from where the proposed MR 83 UG Areas were determined to be visible were recorded (making use of Global Positioning Systems (GPS)) to confirm these aesthetically sensitive viewpoints and potential sensitive visual receptors in relation to the proposed project.

## **4 RESULTS OF INVESTIGATION**

### ***4.1 Public Involvement***

A public participation process will be initiated as part of the Environmental Impact Assessment process, at which time stakeholders are invited to provide input concerning the proposed development. Any concerns regarding visual impacts will be addressed through this process.

### ***4.2 Development Category and Level of Impact Assessment***

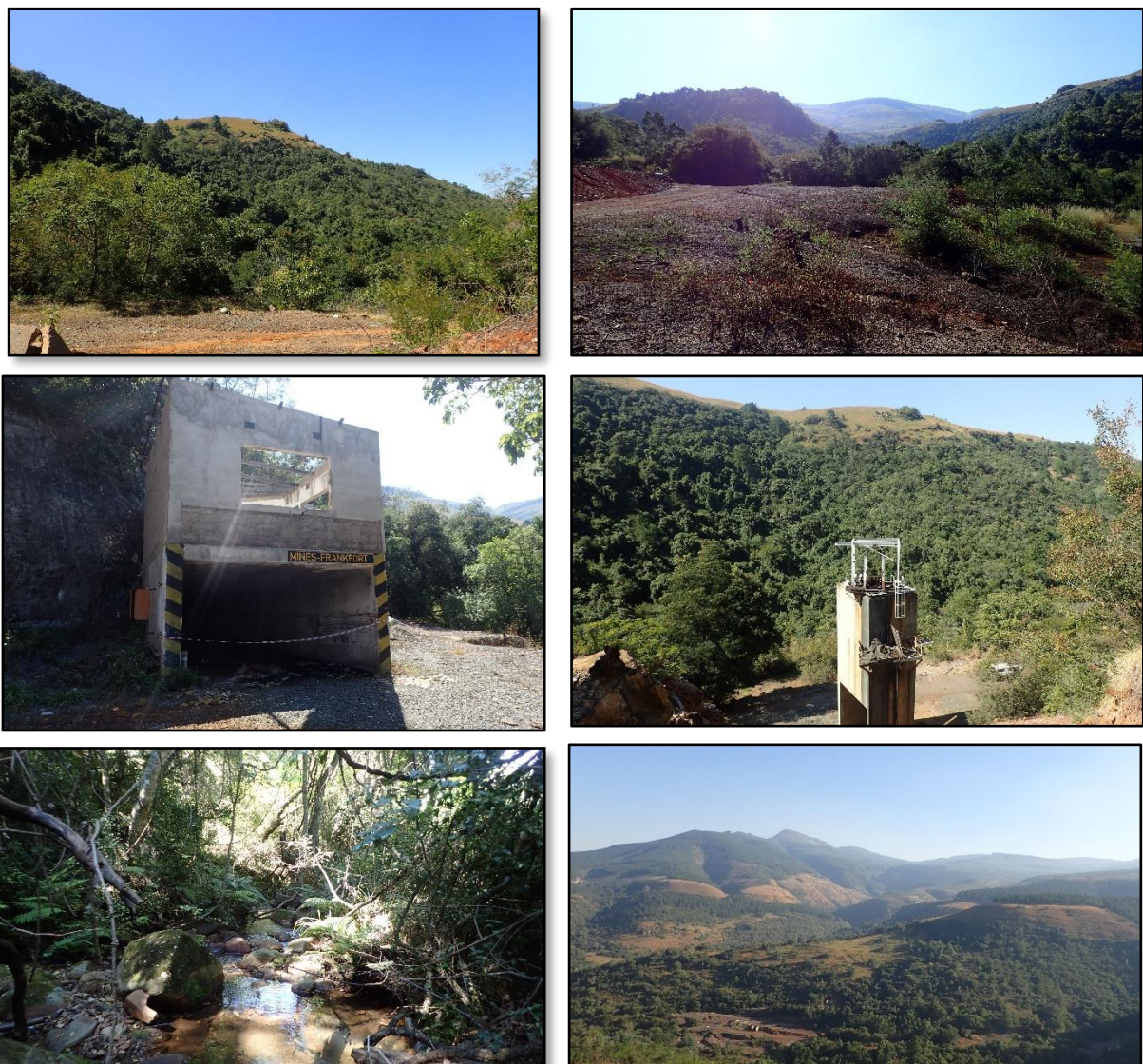
Through application of the VIA methods of assessment as presented in Appendix B, it was determined that the proposed project can be defined as a Category 5 development, which includes mining activities.

The Pilgrim's Rest area is well known for its historic mining activities (Gold rush in the late 19th century) and is seen as part of a major tourism area. Furthermore, the greater Mpumalanga Province is associated with various mines (coal and gold) and historic mining facilities are present within a 10 km radius of the MR 83 UG Areas. Mining is therefore not a new concept in the area, however historic mining activities in the area comprise predominantly of underground mining and artisanal small-scale mining. As such the proposed underground mining activities associated with the MR 83 UG Areas is in keeping with the historic mining practices and will not set a new mining method precedent in the area. The associated waste rock dumps, stockpiles and additional surface infrastructure will however lead to a change in the scenic resources, landscape quality, sense of place and visual character of the MR 83 UG Areas, in particular the Beta North Area. Given the mountainous terrain of the area, the proposed MR 83 UG Areas is not likely to display a highly significant visual impact on the surrounding landscape, therefore according to Oberholzer (2005), a moderate visual impact is expected. In line with the above, a Level 3 Assessment is required and undertaken in this report.



### 4.3 Description of the Receiving Environment

In order to holistically describe the receiving environment, this section of the report aims to determine the intrinsic value of the receiving landscape including aspects of the natural, cultural and scenic landscape, taking both tangible and intangible factors into consideration. The table below aims to describe the particular character, uniqueness, intactness, rarity, vulnerability and representability of the MR 83 UG Areas within its existing context. General views of the landscape associated with the MR 83 UG Areas and surrounds with respect to the undulating topography, existing development, and the overall character are indicated below.



**Figure 8: General view of the Frankfort Area indicating the surrounding mountainous terrain, remnants of historic mining infrastructure in this area, the hidden streams and overall vast mountainous landscape.**





**Figure 9: General view of the Morgenzon Area indicating the grassland and woody species, forest, plantations, the valley amongst the mountainous terrain and steep cliffs and scenic streams.**





**Figure 10: General view of the Dukes Area located in the valley, surrounded by mountainous terrain and dominated by grassland species on the mountain tops and trees in the valleys. The Dukes Area have disturbed areas from historic and current artisanal mining activities.**





**Figure 11: General view of the Beta North Area surrounded by mountainous terrain, the existing tailings storage facility, artisanal mining and plantations in the adjacent areas and forests and grasslands interspersed.**

**Table 1: Summary of the visual assessment of the MR 83 UG Areas .**

Climate	Topography
<p>As a result of climate variations throughout the year, the appearance and perception of the landscape within and surrounding the MR 83 UG Areas change with the seasons. The MR 83 UG Areas and its surroundings appear muted during the winter months, while it appears vibrant and green during the summer months. Seasonal variation may have some effect on the area from where project components would potentially be visible, with visibility expected to be marginally higher during the winter months when seasonal screening effects such as vegetation density and relative grass cover, is lower. During the dry winter months dust suspension is higher due to drier soil conditions and lower rainfall, resulting in atmospheric haziness, which will somewhat limit visibility of surrounding landscape. The visibility of the proposed project will also often be lower at dawn and dusk, due to fog and mist hanging in the mountainous area.</p>	<p>The topography associated with the MR 83 UG Areas and the surrounding region is considered to have a mountainous backdrop, with gentle to steep undulating terrain, which form distinguishing topographical features in the form of prominent hills, outcrops and steep cliffs that are interspersed with thicketed valleys where the Blyde River, streams (Peach Tree Stream) and ephemeral drainage lines are situated. The topography of the area is considered an important ecotourism attraction as tourists traveling on the scenic routes and passes within the area have a pleasant viewing experience.</p> <p>Based on the field verification and past experience in the area, the Beta North, Dukes and Morgenzon Areas will be partially visible from stretches along the R533 road and specifically the Beta North Area will be partially visible from the town of Pilgrim's Rest. Since the Beta North, Dukes and Morgenzon Areas will only be partially visible, with the mountainous backdrop being the prominent panoramic view and the momentary view of motorists traveling on the R533, the visual intrusion is considered moderate to low on motorists.</p> <p>The Frankfort Area is situated in a more remote area, where gravel roads, which are utilised infrequently, are the only receptors in the area, as such there are very limited receptors present to experience the proposed visual impact. Furthermore, with the mountainous terrain and distance from the town of Pilgrim's Rest and the R533 roadway, the proposed Frankfort mining activities will not be visually intrusive and visual impacts will be negligible.</p>
<b>Land Use and visual receptors (Appendix D)</b>	
<p>The dominant land use in the region is forestry activities. Several other land uses have been identified in the vicinity of the MR 83 UG Areas , namely: mining, agricultural activities although limited with some cattle grazing, old mining shaft infrastructure, recreational facilities (Pilgrim's Rest Golf Course, caravan park and hiking trails in Mount Sheba Private Nature Reserve) residential development and tourism related activities and accommodation facilities mainly centred in and around Pilgrim's Rest. Other tourist attractions and facilities in the greater Pilgrim's Rest area includes, but are not limited to: God's Window lookout, the Pinnacle Rock, Lisbon and Berlin Falls, Bourke's Luck Potholes, Three Rondawels, the Blyde River Canyon, hiking trails, horseback, golf, and fishing.</p> <p>Mining activities have been present in the Pilgrim's Rest area since 1875 when gold was first discovered near Pilgrim's Rest. By 1880 most of the underground mining activities were operated by small mining companies who installed stamp batteries and exploited oxide reserves. This continued until sulphide mineralisation was encountered at depth. Due to the resulting mineralogical problem, mining was discontinued in 2005.</p> <p>According to the South African Conservation Areas Database (SACAD Q3, 2021) the MR 83 UG Areas are situated within the Kruger to Canyons Biosphere Reserve. On the 20th of September 2001 the Kruger to Canyons (K2C) Biosphere Reserve was registered by United Nations Education, Scientific and Cultural Organisation (UNESCO) in Paris, as an official Biosphere Reserve within their Man and the Biosphere (MaB) Programme. Depending on the spatial zonation of a Biosphere Reserve (core area, buffer zone or transitional zone), these areas can either have legal protection or can be used for sustainable developments. Furthermore, the South African Protected Areas Database (SAPAD Q3, 2021), the National Protected Areas Expansion Strategy (2009) indicate the following nature reserves (NR) are located within 5 km of the MR 83 UG Areas :</p> <ul style="list-style-type: none"> <li>➤ Blyde Forest Nature Reserve (NR);</li> <li>➤ Henra Private NR;</li> <li>➤ Mac Mac Reserve (10km east; - Forest Nature Reserve</li> <li>➤ Morgenzon Forest Reserve;</li> <li>➤ Mount Sheba Private Nature Reserve;</li> <li>➤ Ohrigstad Dam NR;</li> <li>➤ Tweefontein Reserve – Forest Nature Reserve</li> <li>➤ Motlatse Canyon Provincial Nature Reserve; and</li> <li>➤ Mount Anderson Catchment NRI.</li> </ul>	



Additionally, the Mpumalanga Tourism and Parks Agency (MTPA) provides a database with provincially protected areas, much of which overlap with areas identified in the SAPAD and NPAES databases. The list includes the following provincially protected areas (Figure 16):

- Blyde River Canyon NR;
- Graskop Grasslands Unique Community;
- Hartebeesvlakte Reserve;
- Henra Private NR;
- Mac Mac Reserve;
- Mariepskop Conservation Area;
- Morgenzon Reserve;
- Mount Anderson Catchment NR;
- Mount Sheba Private NR;
- Ohrigstad Dam NR; and
- Tweefontein Reserve.

Based on digital satellite imagery sensitive receptors situated within a 10 km radius of the MR 83 UG Areas comprise predominantly of the Town of Pilgrim’s Rest, Pilgrim’s Rest Golf Course, Pilgrim’s Rest “old” caravan park, farmsteads and settlements. Furthermore, roads such as the:

- R533 road, otherwise known as the Bonnet Pass, is the main road leading into Pilgrim’s Rest from Graskop;
- The Vaalhoek Road (gravel road). Even though the Vaalhoek Road is considered a tourist route, it is used infrequently, with the majority of tourists utilising the R532 main road to get to Bourke’s Luck Potholes and Graskop and the R533 to get to Pilgrim’s Rest; and
- Several local gravel roads.

Permanent residents of the town of Pilgrim’s Rest and villages and people hiking, camping and lodging in the Mount Sheba Private NR are considered highly sensitive receptors, as they want to be one with nature and engulf as much as the panoramic landscape as possible. People at their place of work such as the TGME workers, cattle herders and in the town of Pilgrim’s Rest are low sensitive receptors, as they are likely to focus on the activities at hand and not the surrounding environment. Even though motorists traveling on the roads only have momentary views and experience of the receiving environment, the mountainous terrain attracts the eye and is considered of great scenic quality, thus motorists are considered moderate to highly sensitive receptors. Since the town of Pilgrim’s Rest is a popular tourist destination for both local and international tourists, the tourist attractions mentioned above are considered exceptionally highly sensitive receptor areas. Additionally, tourists are considered exceptionally highly sensitive receptors since their attention is focused towards the panoramic scenic landscape.

<b>Vegetation Cover (Appendix C)</b>	<b>Sense of Place</b>
<p>The majority of the MR 83 UG Areas falls within the Mesic Highveld Grassland Bioregion (within the Grassland Biome), with small sections of Dukes, Frankfort and Morgenzon, falling within the Zonal and Interzonal Forests Bioregions (within the Forest Biome). Based on the Mucina and Rutherford database (2012 and 2018), three vegetation types are associated with the MR 83 UG Areas, namely: Northern Escarpment Dolomite Grassland, Long Tom Pass Montane Grassland and the Northern Mistbelt Forest. The Northern Escarpment Dolomite Grassland (Endangered vegetation type) is the dominant vegetation type associated with the MR 83 UG Areas. During the field assessment, several areas of sensitive habitat were identified across the MR 83 UG Areas, most notably the montane grasslands, indigenous forest patches as well as the watercourses (with intact riparian vegetation) (STS, 2022). Various disturbances ranging from historic mining activities (i.e., old shafts and foundations, built-up areas, adits, waste rock dumps, and tailings storage facilities), current illegal artisanal mining activities, encroachment of alien vegetation and stretches of plantations are however also present (STS, 2022).</p>	<p>Sense of place is the unique value that is allocated to a specific place or area through the cognitive experience of the user or viewer. It is created by the land use, character and quality of a landscape, as well as by the tangible and intangible value assigned thereto. Given the mountainous terrain the vast landscape is appealing to one’s visual senses, which may fill the observer with a sense of calmness, tranquility and wellbeing. As such this landscape offers a unique sense of place which can be described as calm, tranquil and peaceful and being one with nature. The landscape character type is defined as semi - rural, mountainous area dominated by grassland, plantations and forest interspersed with watercourses, especially the Blyde River, the town of Pilgrim’s Rest and historic mining infrastructure.</p>





The Beta North Area has a relatively short vegetative cover, which is mostly dominated by grassland / transformed areas, as such the mining infrastructure will not be fully screened, potentially resulting in a high visual intrusion on the town of Pilgrim’s Rest. The Dukes, Morgenzon and Frankfort Areas are associated with more forest areas, as such the mining infrastructure is likely to be screened. Vegetation clearing will result in visual scarring of the landscape as it will contrast with the lush green surrounding vegetated area. However, due to the mountainous terrain, motorists traveling along the passes will not notice the proposed mining activities, unless these areas are known prior to traveling. Refer to the Biodiversity Assessment undertaken by STS (2022) for further detail on the floral diversity of the MR 83 UG Areas. The forestry plantations with their periodic harvesting, leaves the landscape with bare ground from time to time, potentially affecting the visibility of the proposed MR 83 UG Areas.

**Night Time Lighting (Appendix H)**

The MR 83 UG Areas, in its current state, contains limited sources of night-time lighting in the area associated predominantly with the TGME mine office. Furthermore, the close proximity of the town of Pilgrim’s Rest further contributes to the effects of skyglow and affects the intrinsically dark atmosphere of the area. With the Frankfort Area being remote, there are no sources of night-time lighting, as such the lighting environment can be described as intrinsically dark (Zone E1). The proposed mining activities at the Frankfort Area, is however likely to alter the environment by contributing to the effects of sky glow and artificial lighting in an intrinsically dark area.

The lighting environment associated with the MR 83 UG Areas directly is considered intrinsically dark (Zone E 1 [Natural]), while taking the larger region into consideration, the area is considered to fall within Environmental Zone E2 (Rural) with low district brightness, due to the TGME offices and town of Pilgrim’s Rest. The proposed project is expected to further contribute to the effects of sky glow and artificial lighting in the region, particularly as a result of stationary lighting sources. Generally, the impacts of vehicle mounted lighting sources in the areas will be confined to the local and sub-regional setting (up to 10km from the MR 83 UG Areas ) due to the effects of distance and intervening undulating topography, existing lighting sources in the town of Pilgrim’s Rest, and vegetation which restrict the potential impact on views from more distant regional points. It is deemed essential to mitigate impacts from night-time lighting.

**No – Go Alternative**

Should the proposed project proceed potential economic and social benefits for the area is expected however these will be short term due to the short Life of Mine (expected to be 10 years). Potential negative visual and environmental impacts are expected, which are likely to be permanent due to the nature of the project. Visual scarring from vegetation clearing is one of the main permanent visual impacts. Should the proposed project not take place, the status quo of no additional negative social, visual or environmental impacts than what is currently experienced is expected.

**Visual Exposure and Visibility and Key Observation Points (KOPs) (Appendix J)**

Based on the viewshed analysis the proposed Beta North TSF Expansion will be visible to receptors located within a 1 km radius, which includes a portion of the uptown part of Pilgrim’s Rest and the Lost City Hiking Trail within the Mount Sheba Private Nature Reserve, indicating that the proposed TSF expansion is in the foreground of the receptors. The viewshed further becomes scattered after 1 km, indicating that the undulating topography of the area limits the visual exposure of the proposed TSF expansion. A very small portion of the R533 falls within the viewshed of the proposed TSF expansion, indicating that motorists traveling along the R533 will have very limited exposure to the proposed TSF expansion, provided that the roadside vegetation does not obscure the view.

The viewshed analysis undertaken for the proposed WRDs and stockpiles indicates that these structures will be visible to receptors located within a 1 km radius of the Beta North Area and 500 m of the Dukes and Frankfort Areas. Based on the viewshed analysis the proposed WRDs and stockpiles will only be visible from a small section with the town of Pilgrim’s Rest, and along a small stretch of the R533 next to the Golf course. The WRD and stockpile associated with the Frankfort Area will only be visible to receptors located north north west and to the east, however as expressed earlier the only receptors present within a 3 km radius are the forestry gravel roads. The Morgenzon does not have a viewshed analysis for stockpiles and WRDs as there is already an existing RoM stockpile present.

Similarly the viewshed analysis of the proposed PCDs indicates that these structures will be visible to receptors located within a 1 km radius of the Beta North and within a 500 m radius of Dukes, Morgenzon and Frankfort Areas. Only a small portion in the uptown part of the town of Pilgrim’s Rest is likely to have visual exposure of the PCDs as well as a portion of the Golf course. According to the viewshed analysis hikers on the Lost City Hiking Trail is likely to observe the PCDs, WRDs, stockpiles and TSFs and associated infrastructure from the Beta North and Dukes Areas. It is important to note that the viewshed analysis does not take into account the vegetation and existing anthropogenic structures of the area, therefore the field assessment displays a more accurate outcome of the visual intrusion and visibility of the proposed project on the receiving environment.





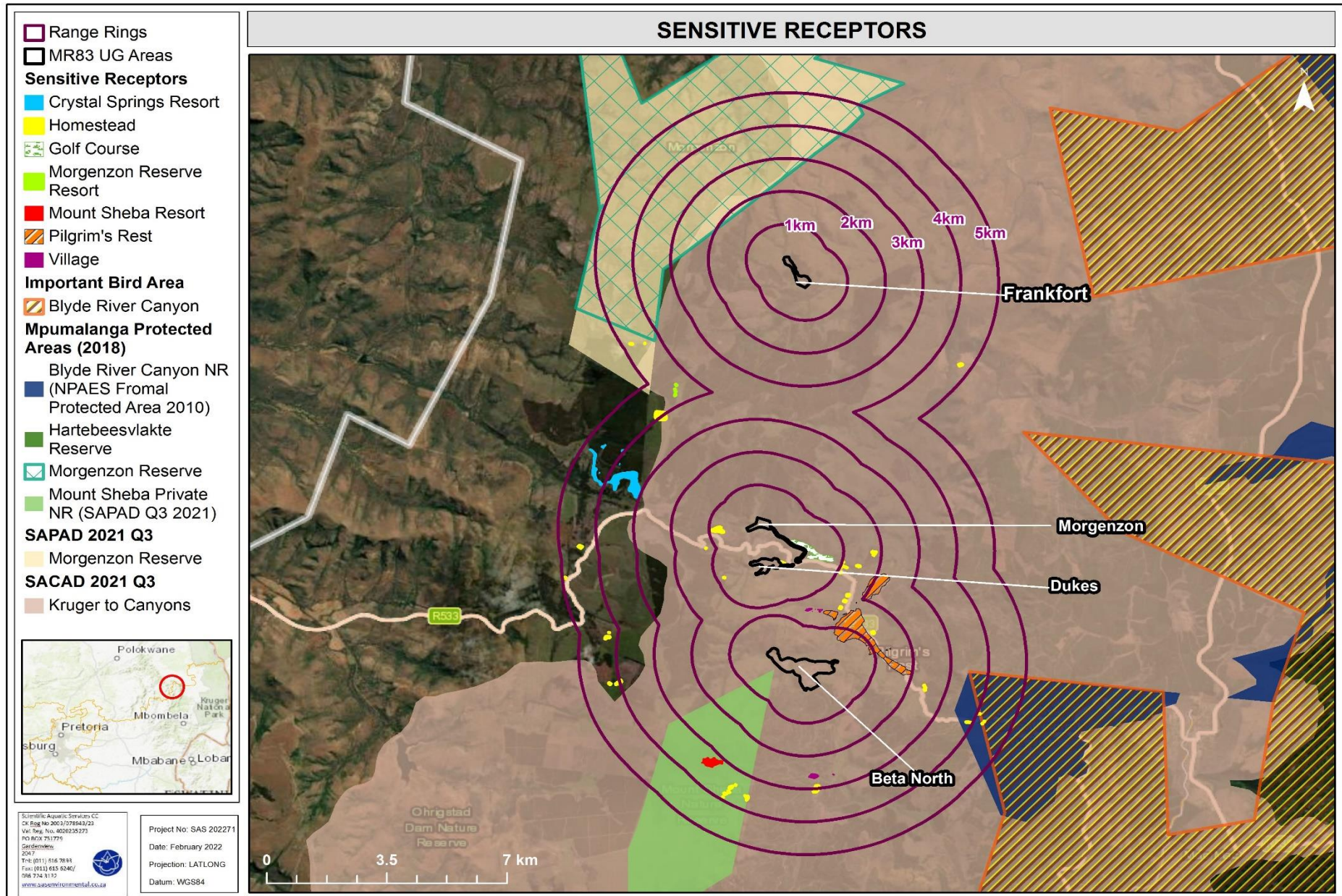


Figure 12: Sensitive receptors located within a 5 km radius of the MR 83 UG Areas .





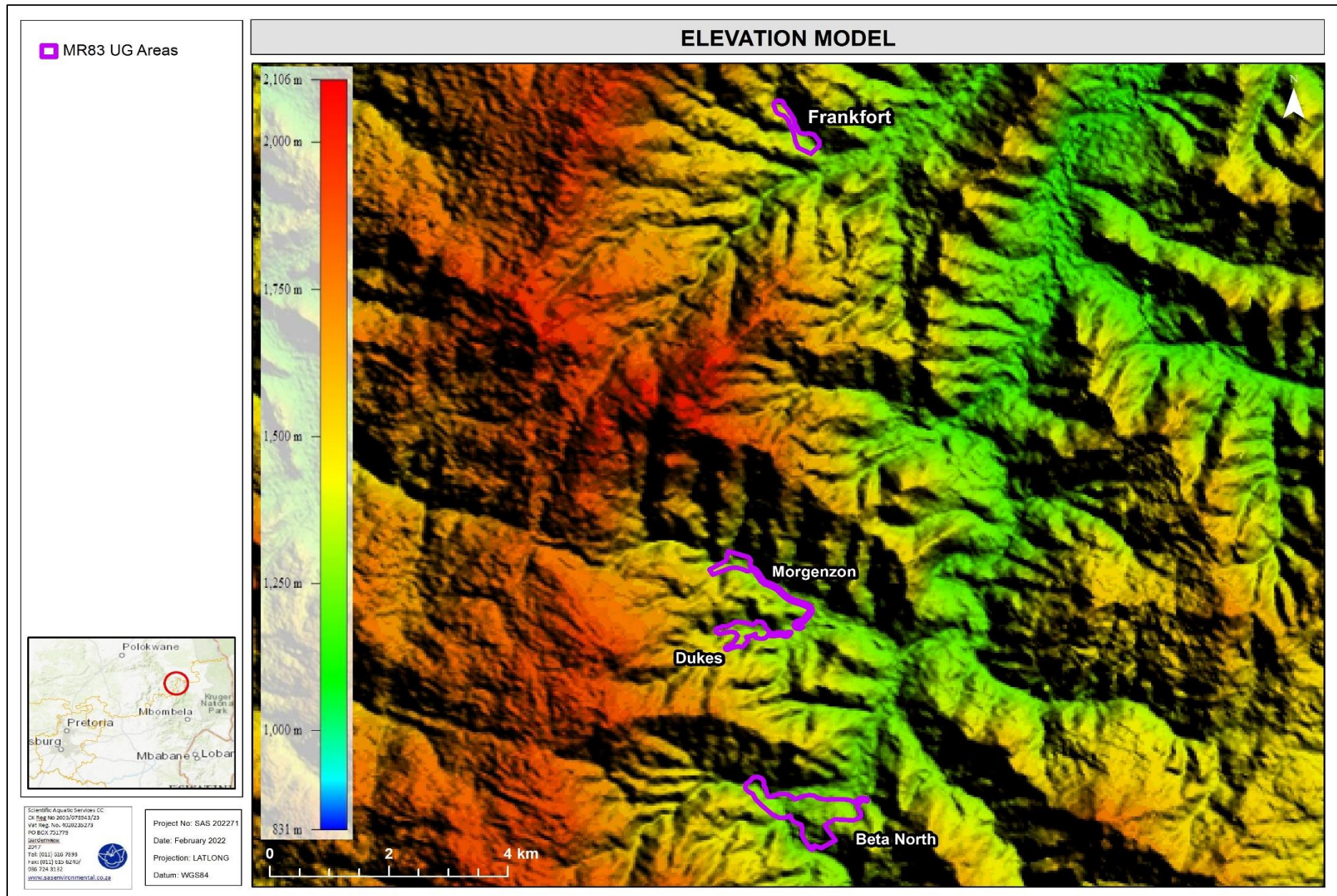


Figure 13: False colour elevation rendering depicting the topographical character of the MR 83 UG Areas.





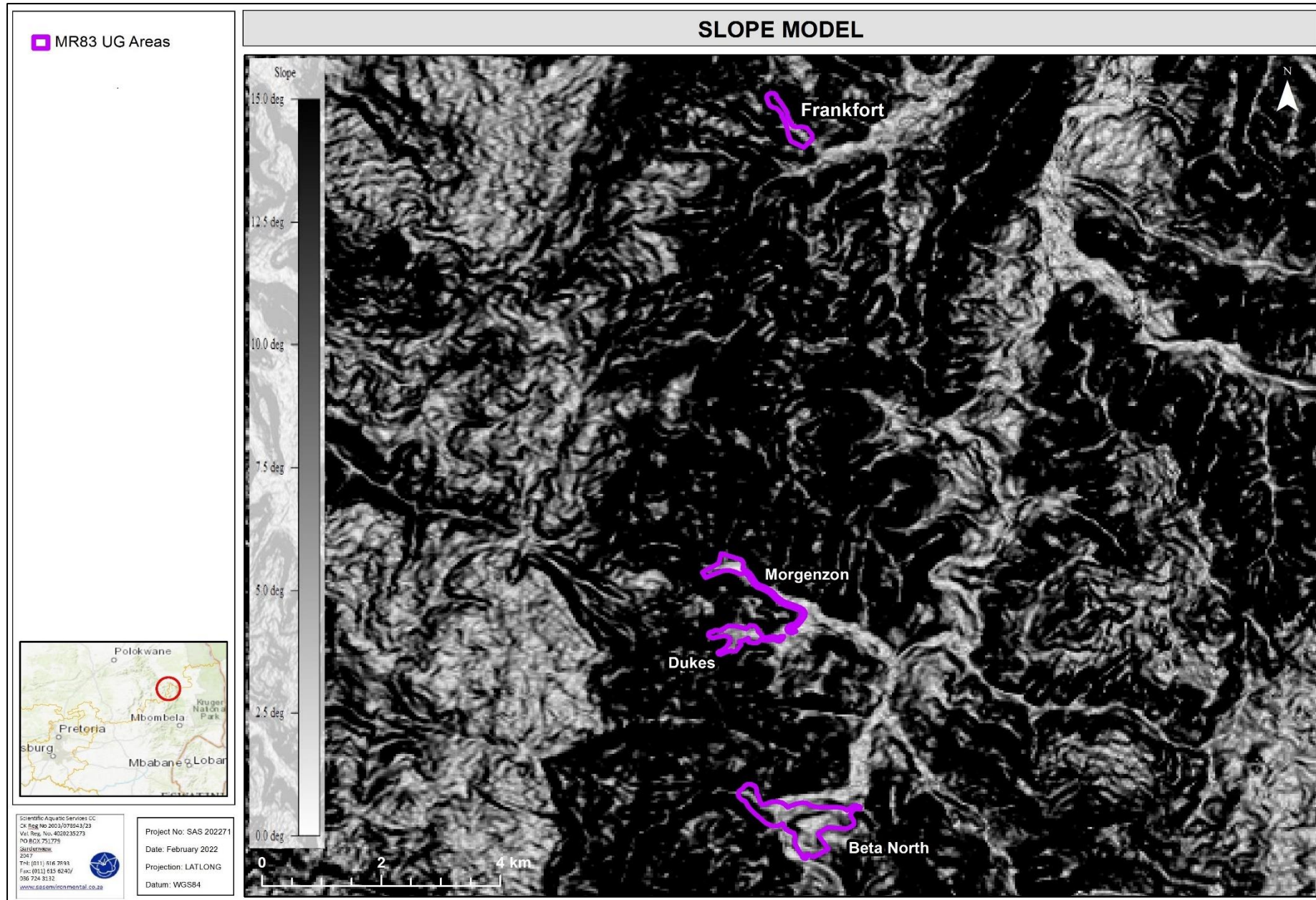


Figure 14: Monochromatic map indicating the general relief associated with the MR 83 UG Areas.





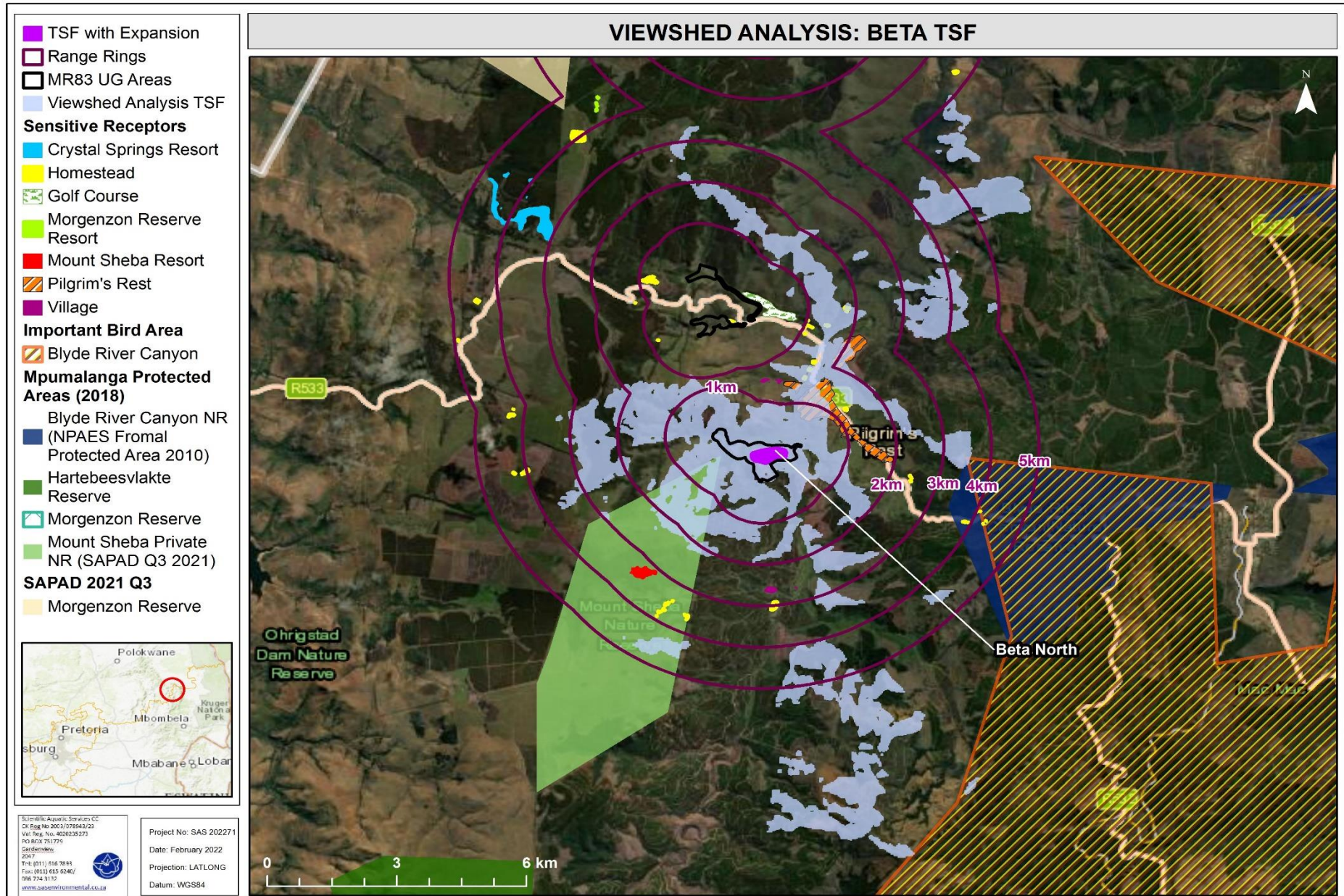


Figure 15: Viewshed of the proposed Beta North TSF Expansion overlaid onto digital satellite imagery.





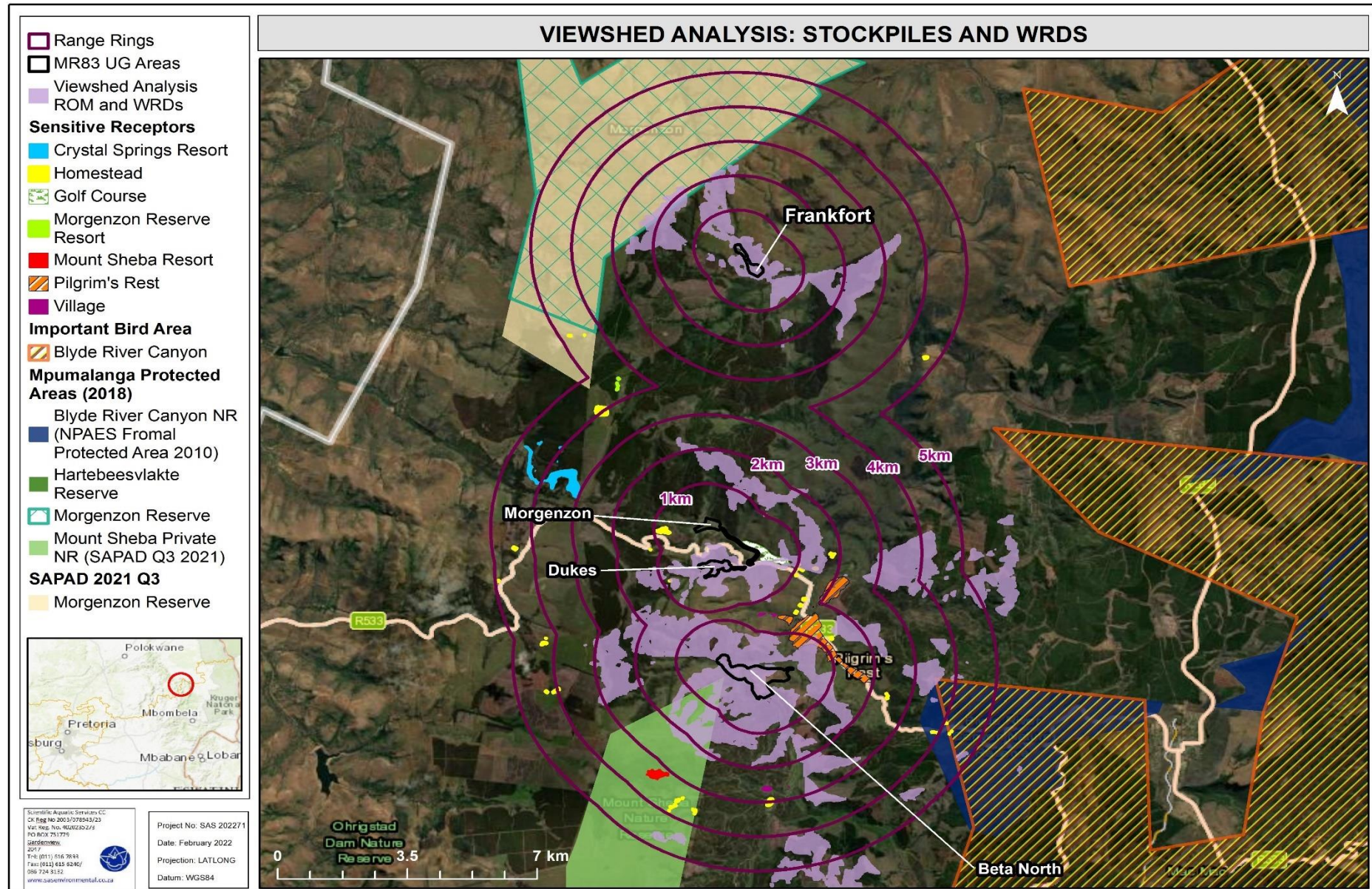


Figure 16: Viewshed of the proposed Waste Rock Dumps (WRD) and Run of Mine (ROM) Stockpiles of the MR 83 UG Area overlaid onto digital satellite imagery. Note the existing stockpiles are not included in the viewshed.





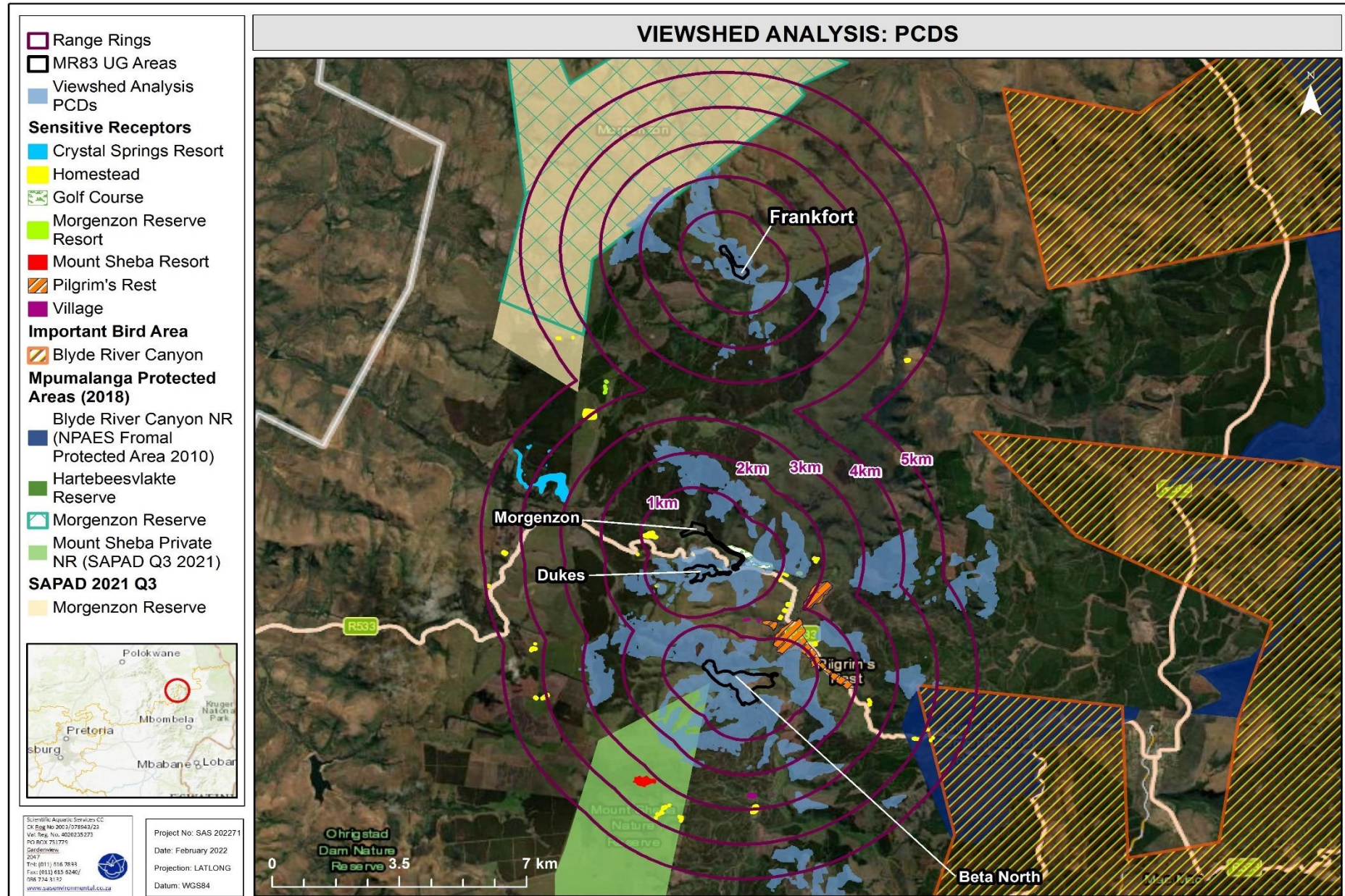


Figure 17: Viewshed of the proposed pollution control dams (PCDs) of the MR 83 UG Areas overlaid onto digital satellite imagery.



### 4.3.1 Landscape Character and Visual Absorption Capacity (VAC)

Since the MR 83 UG Areas have a similar surrounding visual environment the assessment thereof for the landscape character and VAC was consolidated. Should there be exceptions to a specific proposed mining area, this will be highlighted respectively.

The landscape character type associated with the MR 83 UG Areas can be described as semi-rural in character, with the exception of Frankfort which is considered rural and remote, and are characterised by a mountainous landscape, with open grassland, indigenous forests, woodlands, commercial forestry plantations and freshwater habitat such as the Blyde River and associated tributaries present in the landscape. The above mentioned characteristics along with the man-made elements provides significant visual variety and diversity within the greater Pilgrim's Rest area and within the MR 83 UG Areas.

Key aesthetic aspects of the landscape character associated with the MR 83 UG Areas are described in Table 2 below. It may be concluded that the landscape in its current state provides a positive viewing experience, with panoramic mountainous views, and that the proposed mining development may result in a reduction of this landscape character type within the local area, mostly to tourists driving along the paths. Visual observations of the MR 83 UG Areas however requires knowledge of the exact locations of the proposed MR 83 UG Areas, as such motorists will not directly observe the proposed mining activities in the landscape. Furthermore, the Mpumalanga Province is associated with existing mining activities, which already negatively affects the landscape character of the region on a provincial level. The Pilgrim's Rest area, however has fewer mining activities and more commercial forestry plantations which are periodically harvested, resulting in negative viewing experiences of bare ground, logs and tree stumps at various times throughout the year.

Furthermore, historic mining infrastructure such as old mining shaft infrastructure, PCDs, TSF, and waste rock dumps are present in the area, forming part of the heritage and tourism attraction of the area. No authorised mining is taking place within the MR 83 UG Areas, however illegal mining is currently taking place and the existing TGME metallurgical plant, offices and TSF at the Beta North Area are still in use and will form part of the operational activities of the proposed project. The proposed project will be in keeping with the historic artisanal and underground mining activities of the area, and the proposed surface infrastructure will be placed in already disturbed footprint areas.





**Table 2: Aesthetic and perceptual aspects of landscape character of the MR 83 UG Areas**

Aspect	MR 83 UG Areas
<b>Scale</b>	The scale of the landscape is considered <b>large</b> due to the significant distance one can see across the mountainous landscape. The mountainous topography and existing vegetation does however serve to screen certain views from potential receptors within the surrounding environment such as the R533 and Town of Pilgrim's Rest. With the town of Pilgrim's Rest situated in a valley the proposed mining activities will not be visually intrusive.
<b>Enclosure</b>	Since the MR 83 UG Areas are situated on the foothills and in the valleys the landscape is considered <b>enclosed</b> . Even though one can see a significant distance across the mountainous landscape, the valleys and foothills are not visible, as such the proposed mining activities are not significantly visible to the observer.
<b>Diversity</b>	The overall experience of the landscape is considered <b>diverse</b> , owing to the presence of varying natural elements (grassland, indigenous forests, the Blyde River and associated streams, mountains, cliffs, outcrops), man-made structures (historic mining surface infrastructure, powerlines, roads etc), village arrangements and the town of Pilgrim's Rest in the receiving environment.
<b>Texture</b>	The texture associated with the landscape is <b>rough</b> due to the diversity of vegetation, man-made structures and mountains and cliffs.
<b>Form</b>	The dominant form of the landscape is <b>rolling</b> and <b>sloping</b> due to the moderately to steeply undulating topography of the area. More gentle undulating topography is present within the greater region.
<b>Line</b>	When considering the larger area, the line landscape element is mostly <b>curved</b> due to the undulating and mountainous nature of the visual environment. Some linear man-made elements such as existing roads, buildings, fences, and power lines are present.
<b>Colour</b>	The colours associated with the landscape are <b>muted</b> , with vegetation and bare ground from the gravel roads forming the dominant colour palette of shades of green and brown. Some seasonal colour is however expected. The housing element associated with the town of Pilgrim's Rest is painted in muted/ natural tones – light yellow, ochre, and red-brown, although white is also present.
<b>Balance</b>	The landscape is considered <b>harmonious</b> in terms of the relationship between the vertical and horizontal landscape elements.
<b>Pattern</b>	The landscape pattern is <b>regular</b> , with elements being evenly spaced and well-balanced and some patterns being visible.
<b>Movement</b>	The level of movement within the MR 83 UG Areas is <b>calm</b> and <b>still</b> , with relatively low levels of pedestrian and vehicular movement. Illegal mining activities associated with the Dukes and Beta Area are extensive, with areas in the Morgenzon Area also impacted by illegal mining activities, to a lesser extent. As such there is more movement in these areas. The Frankfort Area however has no movement. Logging trucks, TGME workers farmers predominantly utilise the gravel roads within and in the vicinity of the MR 83 UG Areas. Human activity in the form of illegal artisanal mining is also present in the greater Pilgrim's Rest area.

Through applying the scoring categories as outlined in Appendix E, Table 3 below indicates the scores that have been calculated for the VAC for the MR 83 UG Areas .

**Table 3: VAC Scores achieved for the MR 83 UG Areas .**

Factor	MR 83 UG Areas
<b>Vegetation</b>	<b>Score 3:</b> The MR 83 UG Areas comprise a diversity of vegetation ranging from grassland of low to moderate heights, to forests with high heights. The MR 83 UG Areas are surrounded by sensitive forests, woodlands and grassland, which provides screening ability. With the exception of the remnants of historic mining surface infrastructure and the prospecting roads, there is a continuous vegetative cover present in the area.



Factor	MR 83 UG Areas
Soil contrast	<b>Score 2:</b> When viewing from a distance, the muted colours of the grasslands almost appear in shades of brown, and along with the periodic harvesting of the commercial plantations, the landscape is periodically negatively impacted by the presence of bare ground. In comparison to opencast mining activities, the proposed underground mining activities will have limited surface disturbance and exposure of bare ground. As such, surface disturbance and soil contrast is not expected to significantly detract from the natural state (muted grasslands appearing brown, cliffs with exposed shades of brown rock) and is not likely to create high levels of contrast in relation to the surrounding area.
Visual variety	<b>Score 3:</b> The landscape within which the proposed MR 83 UG Areas are situated exhibits a high degree of visual variety in terms of vegetation, topography – steep cliffs, outcrops, valleys and built-up areas.
Topographical diversity	<b>Score 3:</b> The prominent hills, steep cliffs and outcrops present within the MR 83 UG Areas and surrounding area, provides an overall high level of topographic variety.
Recovery time	<b>Score 2:</b> Due to the dominant vegetation within the infrastructure areas comprising grasslands surrounded by indigenous forests and woodlands, recovery time is expected to be moderate to high. With the proposed mining activities situated within the valleys where it is mostly riparian habitat – grass species and trees, recovery time is moderate.
<b>Total</b>	<b>High</b>

According to the calculation, the VAC of the area is considered **high**, indicating that the proposed project will be absorbed in the area. The main contributing factor of the high VAC is the vast mountainous terrain, obscuring most of the views down the valleys where the proposed mining activities are located. Additionally, the indigenous forests, commercial plantations and woodlands in the surrounding areas as well as tree lines along the roads, further assist in screening the proposed mining activities from sensitive receptors.

By definition the Beta North Area is located in the further extent of the foreground of the town of Pilgrim’s Rest, and the Dukes and Morgenzon Area are located in the middle ground, due to its close proximity to the town, however with the town situated in a valley surrounded by hills, and local vegetation associated with the town, the proposed Beta North, Dukes and Morgenzon Areas are not visible from the majority of the town of Pilgrim’s Rest. It should however be noted that the entire Beta North Area will be highly visible from the Mount Sheba hiking trail, especially from the S3 viewpoint of the Lost City Hiking Trail, while portions of the Dukes and Morgenzon Areas are likely to be visible from there.

#### 4.3.2 Landscape Quality and Value

Through applying the scoring categories as outlined in Appendix F, the scores have been calculated for the MR 83 UG Areas and are tabulated below (Table 4).



**Table 4: Landscape Quality – Results and motivation for the MR 83 UG Areas .**

Factor	MR 83 UG Areas
<b>Landform</b>	<b>Score 5:</b> The MR 83 UG Areas is characterised by mountainous terrain with prominent hills, cliffs and rocky outcrops, leading to high visual interest.
<b>Vegetation</b>	<b>Score 5:</b> The MR 83 UG Areas has a variety of vegetation types ranging from grasslands, woodland, indigenous forests and commercial plantations, resulting in a diversity of vegetation of the area.
<b>Water</b>	<b>Score 3:</b> The Blyde River is present within the landscape, however due to the mountainous terrain the river situated within a valley therefore it is not considered a dominant factor in the landscape, as it is hidden from certain viewpoints in the surrounding landscape. Even though it is not dominant in the landscape, the Blyde River is a prominent feature in the Pilgrim's Rest area as it is part of a main tourist attraction – Bourke's Luck Potholes.
<b>Colour</b>	<b>Score 3:</b> Some intensity and variety in colours, especially shades of green (forest, grassland and commercial plantations) and contrast in soil and vegetation is present. The various shades of green along with the mountainous terrain forms part of the scenic element and beauty of the receiving environment.
<b>Adjacent Scenery</b>	<b>Score 5:</b> The adjacent scenery, with the same landscape character results in a cumulatively greater landscape viewing experience, greatly enhancing the visual quality of the area. Views across the MR 83 UG Areas and beyond is large from higher-lying areas.
<b>Scarcity</b>	<b>Score 3:</b> Even though the landscape character type is representative of the larger Pilgrim's Rest region and is not considered particularly scarce, the mountainous terrain and panoramic view of the area (Long Tom Pass Route) is still a tourist attraction.
<b>Cultural Modifications</b>	<b>Score 2:</b> Cultural modification such as villages, the town of Pilgrim's Rest and the historic mining areas serve to somewhat enhance the character of the region, while powerlines lines, gravel roads, and harvested areas in the greater region are considered to detract from scenic beauty.
<b>Total</b>	<b>High</b>

Based on the score obtained for the MR 83 UG Areas the quality of the landscape is considered high. This is due to the mountainous terrain associated with the MR 83 UG Areas forming part of the panoramic scenery and tourist attraction of the greater Pilgrim's Rest region. Since the town of Pilgrim's Rest and the Blyde River – Bourke's Luck Potholes is a main tourist attraction of the Mpumalanga Province it contributes to the high scenic landscape quality and value of the area.

The Municipality Spatial Development Framework identifies Pilgrim's Rest and the surrounding area as a protected provincial heritage site and an important tourism node within its area of jurisdiction (SDP, 2007), which is richly imbued with a diversity of natural, cultural and historic gems. It was the second of the Transvaal gold fields, attracting a rush of prospectors in 1873, soon after the MacMac diggings started some 5 km away. Alluvial panning eventually gave way to deeper ore mining. In the 1970s the town, not greatly changed, became a tourist destination. The entire town of Pilgrim's Rest was declared a National Monument in 1986 as a living memory of the early gold rush days in South Africa during the late 1800s / early 1900s. The uniqueness of this historic village is evident in its museums and





historic sites, offering the visitor a view into the past, and capturing the spirit of a bygone era of artisanal mining. The proposed mining activities might add to the tourism experience for certain tourists interested in mining, although these individuals are considered the minority.

The cultural landscape qualities of the region essentially consist of two components: the first is a limited pre-colonial (Stone Age and Iron Age) occupation. The second component is a rural area in which the human occupation consists of two elements. The first element discovery of gold during the late 19th century resulted in a flood of people entering the area, establishing gold mining activities all over the landscape. The second element is a rural farming community, which, since the early 20th century revolved around forestry, which altered the large portions of the landscape beyond recognition. These two elements led to the establishment of a number of smaller towns in the region, all which are now part of an ongoing tourism industry (TGME, 2019).

Additionally, Ehlanzeni District Municipality (EDM) plays a dominant role in tourism in Mpumalanga hosting popular tourist destinations including the Kruger National Park (KNP) in the Bushbuckridge Local Municipality as well as numerous prime tourism attractions located in Thaba Chweu Municipal area (e.g. Pilgrim 's Rest, God's Window in Blyde River Canyon, Three Rondawels, Bourke's Luck Potholes, Mac Falls). Thaba Chweu furthermore hosts numerous events throughout the year that attracts both local residents and visitors to the area including the Long Tom Marathon, Subaru/Ashburton Sabie Classic Mountain Bike race and Sabie Forest Fair (Thaba Chweu, 2016).

With reference to Appendix G, the MR 83 UG Areas is likely to be most valued by tourists, hikers, local residents within the town of Pilgrim's Rest and Graskop, as well as visitors to the Mount Sheba Nature reserve, particularly the Lost City hiking trail, businesses gaining monetary value from the tourists visiting the town, workers residing in villages and companies invested in the town. Since the area is of national cultural and heritage importance the landscape value of the area is considered high, and thus the proposed mining activities and mining infrastructure is likely to lower the landscape value of the area.



### 4.3.3 Key Observation Points

Key Observation Points (KOPs) were identified based on prominent viewpoints, where mostly uninterrupted views of the proposed MR 83 UG Areas are expected to occur. The KOPs were selected within 2 km of the proposed project, as visual receptors beyond this distance are unlikely to be affected. KOPs were also selected to be representative of a larger area, such as a section of a roadway or larger village, where required (IEMA, 2013).

Conceptual visual simulations were rendered from the KOPs selected for the proposed project with the location of KOPs indicated in Figure 25. All photographs were taken towards the proposed MR 83 UG Areas and the visual simulations are presented as the project is envisioned in its pre-mitigated state. With appropriate mitigation and management measures put in place as outlined in Section 5 of this report, with specific emphasis on limiting vegetation clearing wherever possible, implementing dust and lighting control measures, and ensuring that progressive rehabilitation takes place and considering overall appearance, the visual impact may be reduced.

A summary of the findings from the KOP analysis is included in Table 5.

**Table 5: Key Observation points (KOP) applicable to the MR 83 UG Areas .**

Key Observation Points (KOPs)				
	Location	Visibility	Receptor Sensitivity	Motivation
KOP1	Pilgrim's Rest Golf course, situated approximately 900 m south east of the Morgenzon Area	None	High – Golfers	The mining infrastructure associated with the Morgenzon Area will not be visible from the golf course due to the hills obscuring the view as well as the indigenous woodland vegetation associated with the valley.
KOP2	R533 roadway, approximately 1 km east and 1,5 km south south east of the Dukes and Morgenzon Areas respectively	Dukes – Partial Morgenzon - None	Moderate – motorists traveling along the R533	A portion of the Dukes infrastructure will be visible from this point along the R533, however of short duration due to motorists traveling and not being stationary. The hills in close proximity to the Dukes Area results in the majority of the proposed mining activities being screened. Furthermore, the Morgenzon mining activities will not be observed from this point along the R533, due to the
KOP3	The R533 roadway approximately 520 m north of the Dukes Area and 820 m south of Morgenzon Area	Dukes – Marginal Morgenzon - None	Moderate – road users with limited viewing time	In theory the proposed Dukes mining activities will be visible from this point along the R533. However, the motorist has to pull over and stand next to the road and have exact knowledge of the whereabouts of the proposed activities before it will be visible. As such the proposed Dukes mining activities are not significantly visually intrusive. The proposed Morgenzon mining activities will not be visible due to the undulating topography and roadside vegetation screening the view.





Key Observation Points (KOPs)				
	Location	Visibility	Receptor Sensitivity	Motivation
KOP4	Within the town of Pilgrim's Rest (downtown) situated approximately 1.4 km east of the Beta North Area	Moderate	High – permanent residents	The existing TSF is visible in the distance, however almost indistinguishable from the surrounding undulating terrain. From this point in the town only the proposed expansion of the TSF will be visible, as the undulating topography obscures the view of the associated infrastructure.
KOP5	Along the R533 and within the town of Pilgrim's Rest (downtown) situated approximately 2 km east of the Beta Area	None	High – permanent residents Moderate – Motorists traveling along the R533	The proposed Beta mining activities will not be present from this point within the town and along the R533 due to the hill completing screening the view.
KOP 6	Along a gravel forestry road approximately 2 km south of the proposed Frankfort mining activities	Moderate	Moderate to low – the odd forestry worker utilising the gravel road	The proposed Frankfort mining activities will be visible from in the distance from the forestry gravel road. It is however likely to blend in with the surrounding terrain, as such it will not display a high visual intrusion, and is likely to fall in the background. Again, a motorist has to pull over and look across the landscape to observe the proposed mining activities. As it is a forestry road, the use thereof is infrequent and limited to forestry workers.



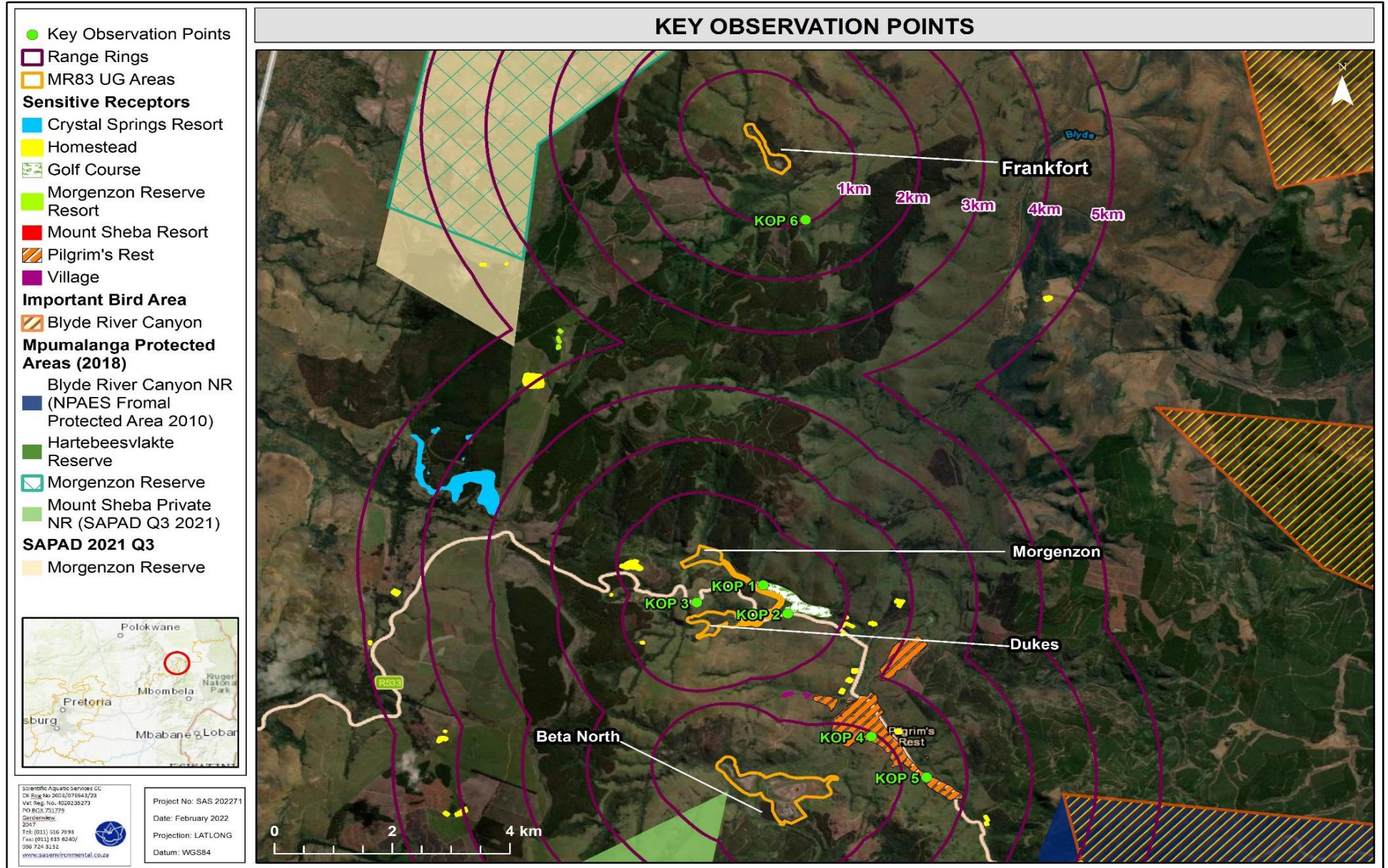


Figure 18: Location of the Key Observation Points overlaid onto digital satellite imagery.







**Figure 19: Conceptual rendering of the view from KOP1 where the Morgenzon Area (dashed red arrow) will not be visible from the Pilgrim’s Rest Golf Course, due to the hill providing screening.**



**Figure 20: Conceptual rendering of the view from KOP2 where the Dukes Area (red arrow in top photo) will be visible in the distance from the R533 road, however not significantly visually intrusive, due to it situated on the foothill, thus the mountainous terrain partially screens the view.**





**Figure 21: Conceptual rendering of the view from KOP2 where the Morgenzon Area (dashed red arrow) will not be visible in the distance from the R533 road.**



**Figure 22: Conceptual rendering of the view from KOP3 where the Dukes Area (red arrow) will be visible in the distance from this point on the R533 road. With the momentary view of motorists, the mountainous terrain and without the knowledge of the exact location, the Dukes mining activities will not be significantly visually intrusive on the R533 road.**





**Figure 23: Conceptual rendering of the view from KOP4 where the Beta TSF (existing and expansion) (red arrow) is visible from the downtown area of Pilgrim's Rest due to its close proximity. With the existing TSF already having well established vegetation the visual intrusion will be moderately low for the proposed expansion. The other mining infrastructure will however not be visible from this point due to the mountainous terrain.**



**Figure 24: Conceptual rendering of the view from KOP5 where the Beta Area will not be visible due to the hill obscuring the view of motorists traveling along the R533 going through the town of Pilgrim's Rest.**





**Figure 25: Conceptual rendering of the view from KOP6 where the Frankfort Area will be visible in the distance from the forestry road, particularly the waste rock dump, pollution control dam and the DMS plant.**

## 5 IMPACT ASSESSMENT

Potential impacts on the visual environment associated with the region surrounding the project area as a result of the proposed MR 83 UG mining activities and based on available information, are discussed in the sections below, according to the method outlined in Appendix B. This section presents an assessment of the significance of the impacts prior to mitigation and management measures being put in place and taking into consideration the available mitigatory measures, assuming that they are fully implemented.

After consideration of the findings of these assessments, recommendations and mitigation measures have been developed which will assist in minimising the proposed project's visual impact throughout the various development phases of the project. The mitigation measures outlined would serve to minimise the potential visual impacts identified to lower significance levels.

Since the Morgenzon, Dukes and Beta North Areas have a similar surrounding visual environment, the visual impacts are expected to be very similar, and therefore a consolidated impact assessment was undertaken for these Areas. As Frankfort Area is more remote with only forestry gravel roads present in the surroundings, as a form of receptor, the visual impact thereof will be lower as such a separate impact assessment was undertaken.

### 5.1 *Impact Discussion*

The sections below serve to summarise the significance of potential visual impacts that may occur as a result of the proposed project. The sections below present the results of the findings for each potential impact identified, as well as mitigation measures to be implemented during the various project phases.

#### 5.1.1 **Landscape Character and Sense of Place**

The proposed project may impact on the existing landscape and visual character of the region associated with the MR 83 UG Areas and its immediate surroundings. The character of the landscape associated with the MR 83 UG Areas can be described as semi-rural, with the exception of Frankfort which is considered rural and remote, and are characterised by a mountainous landscape, with open grassland, indigenous forests, woodlands, commercial forestry plantations and freshwater habitat such as the Blyde River and associated tributaries present in the landscape. The above mentioned characteristics along with the man-made





elements provides significant visual variety and diversity within the greater Pilgrim's Rest area and within the MR 83 UG Areas. Furthermore, the MR 83 UG Areas in its current undisturbed state provides calmness, tranquillity and peace of mind. The proposed mining activities will have a high negative visual impact on the sense of place of the area, especially for hikers utilising the Lost City Hiking Trail within the Mount Sheba Private Nature Reserve (PNR) and a moderate negative visual impact for people residing in and visiting the town of Pilgrim's Rest.

Historic mining activities have taken place in and around the MR 83 UG Areas, where remains of existing infrastructure, adits and tailings facilities are present. Thus, the surrounding area have been previously exposed to visual disturbance associated with mining activities. Additionally, current illegal artisanal mining activities at old adits in the Pilgrim's Rest and Sabie region are taking place.

It is important to note that due to the undulating terrain associated with the MR 83 UG Areas, and the vegetation cover (forests, woodland and commercial plantations) within the landscape, the distance from which the mining activities will be observed is restricted to sensitive receptors located within 0 – 2 km radius of the MR 83 UG Areas. Even then, the view of some sensitive receptors situated within that range are partially or completely obscured by local vegetation, terrain and man-made structures.

The change in landscape character and sense of place will definitely occur as the proposed mining activities will alter the land use within the area for the life of mine. Because there are only forestry gravel roads associated with the Frankfort Area, the visual impact expected will be low as a visual impact will only be experienced if there are people. Since the proposed mining activities are placed on the foothills or in the valley, the surrounding forests, woodlands and hills will mostly obscure the proposed mining activities from the surrounding receptors.

With the implementation of mitigation measures, such as concurrent rehabilitation the duration of the proposed impacts during the operational phase will be lowered. The duration of the impact, should mitigation measures not be implemented, may be long-term, however, should mitigation be effective, and the recovery of the landscape be actively sought post closure, the duration of the impact may be lowered.

### **5.1.2 Visual Intrusion and VAC**

The altered visual environment during the various phases of the proposed project may lead to increased levels of visual intrusion, with moderate levels of incompatibility with the surrounding



land uses as well as visual contrast and discord between the MR 83 UG Areas and its surroundings. However, because the areas were previously affected by historic mining activities the visual scarring thereof remained, especially bare ground from vegetation clearing for roads and foundation of infrastructure.

The expected level of visual intrusion through the development of a mine within the MR 83 UG Areas is considered moderate due to the proposed footprint areas situated on the foothills or in the valley, where the surrounding hills and associated forests and woodlands (high VAC) assist in absorbing the proposed mining activities. With the exception of the Lost City Hiking Trail within the Mount Sheba PNR, which is likely to observe the majority of the Beta North mining activities, resulting in a higher visual intrusion. Due to the semi-rural nature of the landscape (rural nature of the Frankfort Area), there are a limited number of sensitive receptors within 5 km of the MR 83 UG Areas (Frankfort Area only has forestry gravel roads). Even then, the visibility of some receptors as discussed in Section 4.3 are limited or no visibility is displayed due to the mountainous terrain and local vegetation of the surrounding landscape. Furthermore, the level of visual intrusion on the surrounding landscape reduces with the increasing distance from the MR 83 UG Areas. Visual intrusion is also dependent on vegetation, terrain and man-made structures obscuring the view of the MR 83 UG Areas.

### **5.1.3 Visual Exposure and Visibility**

This impact relates directly to the perception of sensitive visual receptors towards the proposed project. Highly sensitive visual receptors have been determined to primarily comprise residents and tourists of the town of Pilgrim's Rest, hikers on the Lost City Hiking Trail, while moderate sensitive receptors are road users of the R533 and various gravel roads in and around the MR 83 UG Areas, and people at their place of work are considered low sensitive receptors. Visual exposure will take place directly as portions of the Morgenzon, Dukes and Beta North Areas, which includes vegetation clearing and infrastructure, will be visible from certain vantage points within the town of Pilgrim's Rest, the R533 road and the Lost City Hiking Trail. Indirect visual exposure includes fugitive dust generated by construction and operation related activities, such as earthwork activities and construction and operational vehicles driving on dirt roads, altering the visual environment. Additionally, impacts from potential erosion as a result of bare soils, and alteration of landscape morphology will also create a noticeable contrast in the landscape and will be visible to receptors.

Once again, due to the undulating terrain of the area surrounding the MR 83 UG Areas as well as the vegetation cover (forests, woodlands and commercial plantations) within the landscape,





the visibility from where the mining activities will be observed is restricted within the town of Pilgrim's Rest, along the Lost City Hiking Trail within the Mount Sheba PNR, and motorists traveling along the R533. Even then, the view of some vantage points are partially or completely obscured by local vegetation, terrain and man-made structures.

#### **5.1.4 Night Time Lighting**

Lighting associated with the proposed mining project may be visible during both day and night, but lighting is only likely to have a visual impact during the night time. Lighting may be visible for significant distances and indirect lighting impacts, such as sky glow (the scattering of light in the sky) and glare may reduce the night sky quality at locations some distance from the light sources.

The MR 83 UG Areas, in its current state, contains limited sources of night-time lighting in the area associated predominantly with the TGME mine office. Furthermore, the close proximity of the town of Pilgrim's Rest further contributes to the effects of skyglow and affects the intrinsically dark atmosphere of the area. With the Frankfort Area being remote, there are no sources of night-time lighting, as such the lighting environment associated with the Frankfort Area can be described as intrinsically dark. The proposed mining activities at the Frankfort Area, is however likely to alter the environment by contributing to the effects of sky glow and artificial lighting in an intrinsically dark area to some degree.

The lighting environment associated with the MR 83 UG Areas directly is considered intrinsically dark, while taking the larger region into consideration, the area is considered to fall within the low district brightness zone, due to the TGME offices and town of Pilgrim's Rest. The proposed project is expected to further contribute to the effects of sky glow and artificial lighting in the region, particularly as a result of stationary lighting sources.

Night time lighting as a result of potential 24-hour mining operations will reduce the visibility of starry skies within the low district brightness landscape. The images below indicate lighting associated with a typical mining operation from a distance of approximately 1km and from a distance of approximately 100m. From these images, it is evident that the night time lighting impact will be significant from this range.





**Figure 26: Typical night-time lighting associated with mining activities. The image on the left was recorded from a distance of approximately 1km from the plant, while the image on the right was recorded from a distance of approximately 100m from the plant.**

The images below are examples of how night-time lighting from mining appears in the landscape at a distance of 6km as night time approaches (Figure 27). Within this example of the landscape setting, it is evident that night time lighting will be visible over moderate distances (within the local and sub-regional setting), particularly where infrastructure and roads are positioned on higher lying areas.





**Figure 27: Night-time lighting, as viewed from the surrounding environment.**

The pre-mitigated impacts in the Tables 6 and 7 are scored on the assumption that 24-hour mining activities are taking place, thus with effective implementation of mitigation measures pertaining to lighting, with particular reference to lighting design and placement, it may result in the lighting impact being reduced.

## **5.2 Impact Summary**

A summary of the impact assessment is provided below, taking into consideration all visual cues (landscape character, sense of place, VAC etc.) as discussed above when calculating the visual impacts of the various mining activities associated with the proposed MR 83 UG Project.





**Table 6: Summary of the impact assessment undertaken as part of the assessment of the Morgenzon, Dukes and Beta Areas.**

Activity	Potential Impact	Without/With Mitigation	Nature (- or + Impact)	Probability		Duration		Scale		Magnitude/Severity		Significance		Management Measures
				Magnitude	Score	Magnitude	Score	Magnitude	Score	Magnitude	Score	Score	Magnitude	
Site clearing of the project footprint areas associated with the shafts, WRDs, RoM Stockpiles, PCDs, DMS Plant, other supporting infrastructure, internal access roads and associated contractor laydown areas.	<ul style="list-style-type: none"> <li>Further removal of vegetation leading to visual contrast, potential loss of Visual Absorption Capacity of the landscape and visual intrusion on sensitive receptors especially the town of Pilgrim's Rest.</li> <li>Erosion and loss of topsoil leading to visual contrast, and possible loss of Visual Absorption Capacity of the landscape.</li> <li>Construction related earthworks activities resulting in increased dust suspension.</li> <li>Increased vehicular movement in the vicinity of the study area.</li> <li>Yellow construction vehicles visible from the lush green background, increasing the likelihood of motorists observing the proposed construction activities.</li> </ul>	WOM	Negative	Definite	5	Long term	4	Regional	3	Medium	6	65	High	<ul style="list-style-type: none"> <li>It must be ensured that existing vegetation in the vicinity of MR 83 UG Areas is retained during the construction phase to ensure that visual scarring of landscape and vegetation clearing does not occur beyond the mining footprint area.                             <ul style="list-style-type: none"> <li>Excavation is to be kept to a minimum and limited to essential areas.</li> </ul> </li> <li>Where mining infrastructure is sited within view of visually sensitive areas, vegetation around the mining footprints should be retained to assist in screening. In particular the areas around the WRDs of the Dukes mining activities.</li> <li>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.</li> <li>It must be ensured that topsoil, run of mine stockpiles and WRDs are not steeply sloped, so as to blend in with the undulating terrain.                             <ul style="list-style-type: none"> <li>The sites should be kept neat and tidy at all times.</li> </ul> </li> <li>The height of structures should be as low as possible, where this can be achieved without increasing the infrastructure footprint.</li> <li>Painting or coating infrastructure components to match darker colours in the natural surroundings may reduce the distance required for effective screening.                             <ul style="list-style-type: none"> <li>Visually cluttered material storage yards and laydown areas should be screened through the use of material fencing, which will result in a more unified and tidy appearance.</li> </ul> </li> <li>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.</li> <li>The identification of appropriate colours and textures for facility materials should take into account both summer and winter appearance.</li> <li>The use of permanent signs and project construction signs should be minimised and visually unobtrusive.</li> <li>During rehabilitation, the removal of infrastructure, ripping of roads and reshaping of impacted areas should</li> </ul>
		WM	Negative	Highly Probable	4	Medium term	3	Regional	3	Medium	6	48	Moderate	



Activity	Potential Impact	Without/With Mitigation	Nature (- or + Impact)	Probability		Duration		Scale		Magnitude/Severity		Significance		Management Measures
				Magnitude	Score	Magnitude	Score	Magnitude	Score	Magnitude	Score	Score	Magnitude	
Construction and excavation activities related to the shafts, PCDs, WRDs, RoM Stockpiles and intern access roads.	<ul style="list-style-type: none"> <li>Excavation during construction of mining infrastructure will lead to visual intrusion and visual exposure of receptors.</li> <li>Mine infrastructure including buildings, stockpiles and dumps being visible and creating contrast with the surrounding landscape.</li> <li>An increase in construction vehicular and human activity in the area, leading to an increase in dust.</li> <li>Excavation resulting in increased dust suspension.</li> <li>Use of security lighting.</li> </ul>	WOM	Negative	Definite	5	Long term	4	Regional	3	Medium	6	65	High	<p style="text-align: center;">take place.</p> <ul style="list-style-type: none"> <li>The relevant exposed construction site areas and internal access roads should be irrigated on a regular basis, with just enough moisture to keep the dust down without creating undue runoff.</li> <li>Construction activities should be restricted to daylight hours as far as possible, in order to limit the need to bright floodlighting and the potential for skyglow.</li> <li>All lights used for illumination (except for lighting associated with security) should be faced inwards and shielded to avoid light escaping above the horizon.</li> <li>As a safety precaution and due to illegal miners active in the area, the use of stationary security lighting at offices and the maintenance area are highly recommended.</li> </ul>
		WM	Negative	Highly Probable	4	Medium term	3	Site	2	Medium	6	44	Moderate	
On-going mining activities. Increase in trucks on the surrounding roads, transporting the material extracted.	<ul style="list-style-type: none"> <li>Continual stockpiling of material, including the resource, and potentially increasing heights of stockpiles and WRD during operational activities.</li> <li>Generation of dust leading to visual intrusion, visual exposure of receptors and impacts on the overall landscape character.</li> <li>Additional vehicular traffic</li> </ul>	WOM	Negative	Highly Probable	4	Medium term	3	Site	2	Medium	6	44	Moderate	<ul style="list-style-type: none"> <li>The design and height increase of stockpiles must be monitored to ensure that these components relate to acceptable environmental standards in terms of slope and elevation.                             <ul style="list-style-type: none"> <li>All internal access roads will require effective dust suppression such as regular watering.</li> </ul> </li> <li>An effective dust management plan taking into account stockpile and dump areas, as well as internal access roads must be designed and implemented in order to mitigate the impact of dust on sensitive receptors throughout all mining phases.                             <ul style="list-style-type: none"> <li>Vehicle speed on unpaved roads must be reduced to limit dust generation.</li> </ul> </li> <li>As far as possible, existing roads are to be utilised, also for construction purposes, to prevent cumulative impacts from roads and traffic.</li> <li>Transport of the mined resource should be optimised as far as possible to limit the number of additional vehicles on local and district roads.</li> <li>As far as possible, operational activities should take place during the daylight hours, in order to limit the use of bright floodlighting and to avoid the use of additional night-time lighting which may add to skyglow. As</li> </ul>





Activity	Potential Impact	Without/With Mitigation	Nature (- or + Impact)	Probability		Duration		Scale		Magnitude/Severity		Significance		Management Measures
				Magnitude	Score	Magnitude	Score	Magnitude	Score	Magnitude	Score	Score	Magnitude	
	impacting on the character of the region and leading to visual exposure of receptors further from the MR 83 UG Areas to mining activities. <ul style="list-style-type: none"> <li>Night time lighting due to security lighting, adding to the skyglow of the area.</li> </ul>	WM	Negative	Highly Probable	4	Short term	1	Site	2	Medium	6	36	Low	underground mining activities will take place 24 hours 7 days a week, it must be ensured that up-lighting structures be avoided. <ul style="list-style-type: none"> <li>Outdoor lighting must be strictly controlled.</li> <li>The use of high light masts and high pole top security lighting should be avoided along the periphery of the operations. Any high lighting masts should be covered to reduce sky glow.</li> <li>Up-lighting of structures must be avoided, with lighting installed at downward angles that provide precisely directed illumination beyond the immediate surrounding of the mining infrastructure, thereby minimising the light spill and trespass.</li> <li>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.</li> <li>Censored and motion lighting may be installed at office areas, workshops and other buildings to prevent use of lights when not needed.</li> <li>Minimum wattage light fixtures should be used, with the minimum intensity necessary to accomplish the light’s purpose.</li> <li>Vehicle-mounted lights or portable light towers are preferred over permanently mounted lighting for night-time maintenance activities. If possible, such lighting should be equipped with hoods or louvers and be aimed toward the ground to avoid causing glare and skyglow (BLM, 2013).</li> <li>The use of low-pressure sodium lamps, yellow LED lighting, or an equivalent reduces skyglow and wildlife impacts. Bluish-white lighting is more likely to cause glare and attract insects, and is associated with other human physiological issues (BLM, 2013).</li> </ul>



Activity	Potential Impact	Without/With Mitigation		Probability		Duration		Scale		Magnitude/Severity		Significance		Management Measures
		Nature (- or + Impact)	Magnitude	Score	Magnitude	Score	Magnitude	Score	Magnitude	Score	Score	Magnitude		
Demolition of surface infrastructure	<ul style="list-style-type: none"> <li>Removal of infrastructure and general decommissioning and closure activities leading to potential visual intrusion on sensitive receptors.</li> <li>Potential ineffective rehabilitation leading to landscape scarring, permanent visual contrast and a permanent alteration of the landscape character and sense of place within the region.</li> </ul>	WOM	Negative	Highly Probable	4	Medium term	3	Site	2	Medium	6	44	Moderate	<ul style="list-style-type: none"> <li>Decommissioning footprints and disturbed areas should be kept as small as possible and no further vegetation should be cleared or soils exposed for this purpose.</li> <li>All areas where infrastructure is removed must be resloped to and revegetated as soon as possible.</li> <li>Rehabilitation measures post construction and decommissioning must be strictly adhered to and disturbed areas must be rehabilitated as soon as possible by replacing topsoil and revegetating disturbed areas.</li> <li>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.</li> <li>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.</li> </ul>
		WM	Negative	Highly Probable	4	Medium term	3	Site	2	Low	2	28	Low	





**Table 7: Summary of the impact assessment undertaken as part of the assessment of the Frankfort Area (mitigation measure same as above, therefore not included).**

Activity	Potential Impact	Without/With Mitigation	Nature (- or + Impact)	Probability		Duration		Scale		Magnitude/Severity		Significance	
				Magnitude	Score	Magnitude	Score	Magnitude	Score	Magnitude	Score	Score	Magnitude
Site clearing of the project footprint areas associated with the shafts, WRDs, RoM Stockpiles, PCDs, DMS Plant, other supporting infrastructure, internal access roads and associated contractor laydown areas.	<ul style="list-style-type: none"> <li>Further removal of vegetation leading to visual contrast, potential loss of Visual Absorption Capacity of the landscape and visual intrusion on sensitive receptors especially the town of Pilgrim's Rest.</li> <li>Erosion and loss of topsoil leading to visual contrast, and possible loss of Visual Absorption Capacity of the landscape.                             <ul style="list-style-type: none"> <li>Construction related earthworks activities resulting in increased dust suspension.                                     <ul style="list-style-type: none"> <li>Increased vehicular movement in the vicinity of the study area.</li> </ul> </li> <li>Yellow construction vehicles visible from the lush green background, increasing the likelihood of motorists observing the proposed construction activities in some instances and albeit from a distance.</li> </ul> </li> </ul>	WOM	Negative	Highly Probable	4	Medium term	3	Site	2	Medium	6	44	Moderate
		WM	Negative	Probable	2	Medium term	3	Site	2	Medium	6	22	Low
Construction and excavation activities related to the shafts, PCDs, WRDs, RoM Stockpiles and internal access roads.	<ul style="list-style-type: none"> <li>Excavation during construction of mining infrastructure will lead to visual intrusion and visual exposure of receptors.                             <ul style="list-style-type: none"> <li>Mine infrastructure including buildings, stockpiles and dumps being visible and creating contrast with the surrounding landscape.</li> </ul> </li> <li>An increase in construction vehicular and human activity in the area, leading to an increase in dust.                             <ul style="list-style-type: none"> <li>Excavation resulting in increased dust suspension.                                     <ul style="list-style-type: none"> <li>Use of security lighting.</li> </ul> </li> </ul> </li> </ul>	WOM	Negative	Definite	5	Medium term	3	Site	2	Medium	6	55	Moderate
		WM	Negative	Highly Probable	4	Medium term	3	Site	2	Medium	6	44	Moderate
On-going mining activities. Increase in trucks on the surrounding roads, transporting the material extracted.	<ul style="list-style-type: none"> <li>Continual stockpiling of material, including the resource, and potentially increasing heights of stockpiles and WRD during operational activities.</li> <li>Generation of dust leading to visual intrusion, visual exposure of receptors and impacts on the overall landscape character.                             <ul style="list-style-type: none"> <li>Additional vehicular traffic impacting on the character of the region and leading to visual exposure of receptors further from the MR 83 UG Areas to mining activities.                                     <ul style="list-style-type: none"> <li>Night time lighting due to security lighting, adding to the skyglow of the area.</li> </ul> </li> </ul> </li> </ul>	WOM	Negative	Highly Probable	4	Medium term	3	Site	2	Medium	6	44	Moderate



Activity	Potential Impact	Without/With Mitigation		Probability		Duration		Scale		Magnitude/Severity		Significance	
		Without/With Mitigation	Nature (- or + Impact)	Magnitude	Score	Magnitude	Score	Magnitude	Score	Magnitude	Score	Score	Magnitude
		WM	Negative	Highly Probable	4	Short term	1	Site	2	Medium	6	36	Low
Demolition of surface infrastructure	<ul style="list-style-type: none"> <li>Removal of infrastructure and general decommissioning and closure activities leading to potential visual intrusion on sensitive receptors.</li> <li>Potential ineffective rehabilitation leading to landscape scarring, permanent visual contrast and a permanent alteration of the landscape character and sense of place within the region.</li> </ul>	WOM	Negative	Highly Probable	4	Medium term	3	Site	2	Low	2	28	Low
		WM	Negative	Highly Probable	4	Medium term	3	Site	2	Low	2	28	Low



### **5.3 Cumulative Impacts**

The MR 83 UG Areas is located in an area where commercial forestry, historic and existing mining activities, agricultural activities, villages and the town of Pilgrim’s Rest are present in the landscape. Cumulative impacts as a result of these land uses results in the loss of the intrinsic value of the natural vegetation associated with the aesthetically pleasing mountainous terrain.

Due to the abovementioned land uses, the panoramic landscape can no longer be referred to as unspoilt and natural in terms of vegetation, especially due to the periodic contrast in soil from exposure of bare ground during the logging of plantations. The proposed MR 83 UG Project has the potential to further contribute to soil contrast, thus affecting the quality and character of the landscape. The cumulative impact of additional traffic on the local and regional roads as well as combined impacts from night-time lighting will also affect the sense of place of the larger region.

Furthermore, if all surface infrastructure is not removed post closure and the stripped areas are not shaped and revegetated to a condition similar to the surrounding mountainous landscape, long term impacts on the terrain, landscape character and quality, and sense of place may occur. This is likely to further contribute to cumulative impacts on the visual environment, leading to further loss of the mountainous scenic landscape.

It should be noted that the proposed MR 83 UG Project is a “pilot” project and may be the catalyst for additional gold mining within the greater Pilgrim’s Rest area. Thus, whilst the cumulative impacts associated with the proposed MR 83 UG Project are not expected to be extensive, the cumulative impacts associated with future mining activities in the greater area, should such projects come to fruition, may have a regional and potentially provincial influence on the receiving visual environment.

### **5.4 Residual Impacts**

Despite the relatively small footprint areas of concern it is possible that after all surface infrastructure have been removed scarring of the terrain may remain present post-closure, especially if the rehabilitated and revegetated areas post decommissioning and closure is not similar to that of the pre-mining environment. The possibility exists that rehabilitation efforts, including revegetation of impacted areas are unsuccessful with residual areas of bare ground, alien vegetation and altered topography, which will lead to a long-term visual impact in the area.





## 5.5 Monitoring

A visual monitoring programme, to ensure that mitigation measures regarding visual impacts are implemented and maintained, should be designed for implementation throughout all development phases. This programme would largely be based on visual reconnaissance at ground level and it must be noted that the monitoring plan must be continually updated and refined for site-specific requirements. The following points aim to guide the design of the monitoring plan:

- Development and implementation of a decommissioning and site revegetation plan in order to ensure that the area's pre-development scenic quality and integrity is restored and that the project area is visually integrated into the surrounding landscape setting. Important aspects addressed should include requirements that most aboveground and near-ground structures be removed, that the project site be re-graded, and that indigenous vegetation be re-established to be consistent with the surrounding landscape;
- The plan should include provisions for monitoring the effectivity of the proposed mitigation measures and determining compliance with the project's visual impact mitigation requirements;
- The method of monitoring must be designed to be objective and repeatable in order to ensure consistent results;
- Should it be feasible, the selected KOPs should be used over the life of the project to review the success of the mitigation plan;
- Predevelopment visual conditions and the visual quality rating and scenic integrity should be reviewed after construction;
- The visual monitoring programme should be based on the following parameters:
  - Airborne dust (in line with air quality assessment)
  - Visibility of lights at night from surrounding receptors;
  - Number of lights visible;
  - Vegetation cover and height; and
  - Disturbance to receptors.
- At closure the success of rehabilitation would be based on the extent and percentage of vegetation recovery as well no mining infrastructure or traces thereof being present. Monitoring is to continue beyond mine closure to ensure that the rehabilitation is successful and that the vegetation is self-sustaining;



- Maintenance of mining infrastructures and operations must be monitored throughout the operational phase of the project, to ensure that deterioration of the infrastructure does not occur, in turn affecting the aesthetics of the area;
- Results of the monitoring activities must be taken into account during all phases of the proposed mining development and allow for adaptive management. Action must be taken to mitigate impacts as soon as negative effects from mining related activities become apparent.

## 6 CONCLUSION

The Pilgrim's Rest area is well known for its historic mining activities (Gold rush in the late 19th century) and is seen as part of a major tourism area. Furthermore, the greater Mpumalanga Province is associated with various mines (coal and gold) and historic mining facilities are present within a 10 km radius of the MR 83 UG Areas. Mining is therefore not a new concept in the area, however historic mining activities in the area comprise predominantly of underground mining and artisanal small-scale mining. The proposed waste rock dumps, stockpiles and additional surface infrastructure associated with the MR 83 UG Area will however lead to a change in the scenic resources, landscape quality, sense of place and visual character of the receiving environment.

Based on the findings from both the desktop and the field assessments it is evident that the MR 83 UG Areas is located within a semi-rural and rural (Frankfort Area) mountainous area, with gentle to steep undulating terrain, which form distinguishing topographical features in the form of prominent hills, outcrops and steep cliffs that are interspersed with thicketed valleys where the Blyde River, streams (Peach Tree Stream) and ephemeral drainage lines are situated. The topography of the area is considered an important ecotourism attraction as tourists traveling on the scenic routes and passes within the area have a pleasant viewing experience.

The visual receptors present within a 5 km radius comprise the town of Pilgrim's Rest, farmers, and several nature reserves of which the Mount Sheba Private Nature Reserve (NR) and its hiking trails are of importance due to the Lost City Hiking Trail having a clear line of sight towards the Beta North and Dukes Areas. Furthermore, the R533, Vaalhoek Road and several gravel roads are present within the vicinity of the MR 83 UG Areas. Permanent residents of the town of Pilgrim's Rest, hikers and people camping in the Mount Sheba Private NR are considered high sensitive receptors. People at their place of work are considered low sensitive receptors, as they are likely to focus on the activities at hand and not the surrounding environment. Motorists and tourists traveling on the scenic roads are considered moderate to



highly sensitive receptors, since tourists' attention are focused towards the panoramic scenic landscape. Visual observations of the MR 83 UG Areas along the R533 however requires knowledge of the exact locations thereof, as such motorists will not directly observe the proposed mining activities in the landscape. Since the town of Pilgrim's Rest is a popular tourist destination for both local and international tourists, these tourist attractions (Pilgrim's Rest, God's Window etc.) are considered exceptionally high sensitive receptor areas.

Historic mining infrastructure such as old mine shafts, waste rock dumps and TSFs are present in the area, forming part of the heritage and tourism attraction of the area. No authorised mining is taking place within the MR 83 UG Areas, and the existing TGME metallurgical plant, offices and TSF at the Beta Area are still in use and will form part of the operational activities of the proposed project. However historic mining activities have taken place and illegal mining activities are currently taking place in the MR 83 UG Areas, which resulted in visual scarring of the terrain.

The VAC of the area is considered high, indicating that the proposed project will be absorbed in the area, resulting in a moderate to low visual intrusion on the surrounding area. The vast mountainous terrain is the main contributing factor of the VAC, since the hills and mountains are blending, making it difficult to observe distinguishing features within the landscape, from significant distances. Additionally, the indigenous forests, commercial plantations and woodlands in the surrounding areas as well as tree lines along the roads, further assist in screening the proposed mining activities from sensitive receptors.

The landscape quality of the MR 83 UG Areas is considered high. The entire town of Pilgrim's Rest was declared a National Monument in 1986 as a living memory of the early gold rush days in South Africa during the late 1800s / early 1900s. The uniqueness of this historic village is evident in its museums and historic sites, offering the visitor a view into the past, and capturing the spirit of a bygone era of artisanal mining. Additionally, the mountainous terrain forms part of the natural beauty and panoramic scenery of the greater region. The Municipality Spatial Development Framework identifies Pilgrim's Rest and the surrounding area as a protected provincial heritage site and an important tourism node within its area of jurisdiction (SDP, 2007), which is richly imbued with a diversity of natural, cultural and historic gems. Thaba Chweu Local Municipality further hosts numerous events throughout the year that attracts both local residents and visitors to the area including the Long Tom Marathon, Subaru/Ashburton Sabie Classic Mountain Bike race and Sabie Forest Fair (Thaba Chweu, 2016).





Given the mountainous terrain, the vast landscape is appealing to one's visual senses, which may fill the observer with a sense of calmness, tranquillity and wellbeing. As such this landscape offers a sense of place which can be described as calm, tranquil and peaceful and being one with nature.

The lighting environment associated with the MR 83 UG Areas is considered intrinsically dark, while taking the larger region into consideration, the area is considered rural with low district brightness, due to the TGME offices and town of Pilgrim's Rest being sources of night time lighting and contributing to sky glow. The proposed project is expected to contribute to the effects of sky glow and artificial lighting in the region, particularly as a result of stationary lighting sources.

Based on the impact assessment, it was determined that the MR 83 UG Project will have a moderate visual impact on the receiving environment, even though it is situated within close proximity to the town of Pilgrim's Rest. With the proposed MR 83 UG Areas located at the foothills and in disturbed areas, and the mountainous backdrop, the sensitive receptors present is not likely to experience significant visual intrusion. As evident from the viewshed analysis and confirmed during the field assessment, only small portions within the town of Pilgrim's Rest and small stretches along the R533 will observe portions of the proposed mining activities.

Should the project be authorised to proceed, it is imperative that all mitigation measures as stipulated in this report be strictly adhered to. Said mitigation measures would need to comprise concurrent rehabilitation throughout the construction and operational phases and effective management of dust generation.

It is the key objective of this study to provide detailed information to guide the proposed project activities in the vicinity of the sensitive aesthetic resources within the surrounding area of the MR 83 UG Areas , to ensure that the visual impacts are considered, such that local and regional environmental management objectives in the local area are supported while considering the need for sustainable economic development. This report provides sufficient detail on the relevant information to allow for decision making as part of the EIA process as required to fulfil the needs of Integrated Environmental Management.



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## APPENDIX A – METHOD OF ASSESSMENT

### Level of Assessment

The following methods of assessment for determining the level of detail of the assessment was utilised in this report (Oberholzer, 2005):

**Table A1: Categories of development and impact severity.**

Type of environment	Category 1 development	Category 2 development	Category 3 development	Category 4 development	Category 5 development
Protected/wild areas of international, national or regional significance	Moderate visual impact expected	High visual impact expected	High visual impact expected	Very high visual impact expected	Very high visual impact expected
Areas or routes of high scenic, cultural, historical significance	Minimal visual impact expected	Moderate visual impact expected	High visual impact expected	High visual impact expected	Very high visual impact expected
Areas or routes of medium scenic, cultural, historical significance	Little or no visual impact expected	Minimal visual impact expected	Moderate visual impact expected	High visual impact expected	High visual impact expected
Areas or routes of low scenic, cultural, historical significance/disturbed	Little or no visual impact expected, possible benefits	Little or no visual impact expected	Minimal visual impact expected	Moderate visual impact expected	High visual impact expected
Disturbed or degraded sites/run down areas/wasteland	Little or no visual impact expected, possible benefits	Little or no visual impact expected, possible benefits	Little or no visual impact expected	Minimal visual impact expected	Moderate visual impact expected

The following key provides an explanation to the categories of development:

**Category 1 development:**

e.g. nature reserves, nature-related recreation, camping, picnicking, trails and minimal visitor facilities.

**Category 2 development:**

e.g. low-key recreation / resort / residential type development, small-scale agriculture / nurseries, narrow roads and small-scale infrastructure.

**Category 3 development:**

e.g., low-density resort / residential type development, golf or polo estates, low to medium-scale infrastructure.

**Category 4 development:**

e.g. medium density residential development, sports facilities, small-scale commercial facilities / office parks, one-stop petrol stations, light industry, medium-scale infrastructure.

**Category 5 development:**

e.g. high density township / residential development, retail and office complexes, industrial facilities, refineries, treatment plants, power stations, wind energy farms, power lines, freeways, toll roads, large scale infrastructure generally. Large-scale development of agricultural land and commercial tree plantations. Quarrying and mining activities with related processing plants.

The following box explains the nature of the impacts:





<p><b>Very high visual impact expected:</b> Potentially significant effect on wilderness quality or scenic resources; Fundamental change in the visual character of the area; Establishes a major precedent for development in the area.</p> <p><b>High visual impact expected:</b> Potential intrusion on protected landscapes or scenic resources; Noticeable change in visual character of the area; Establishes a new precedent for development in the area.</p> <p><b>Moderate visual impact expected:</b> Potentially some effect on protected landscapes or scenic resources; Some change in the visual character of the area; Introduces new development or adds to existing development in the area.</p> <p><b>Minimal visual impact expected:</b> Potentially low level of intrusion on landscapes or scenic resources; Limited change in the visual character of the area; Low-key development, similar in nature to existing development.</p> <p><b>Little or no visual impact expected:</b> Potentially little influence on scenic resources or visual character of the area; Generally compatible with existing development in the area; Possible scope for enhancement of the area.</p>
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From the above, the severity of the impact determines the level of the assessment:

**Table A2: Impact assessment level of input determination.**

Approach	Little or no visual impact expected	Minimal visual impact expected	Moderate visual impact expected	High visual impact expected	Very high visual impact expected
Level of visual input recommended	Level 1	Level 2	Level 3	Level 4	

The following box explains the inputs required at each level of assessment. As indicated in Section 5.2, a Level 4 assessment is required for the proposed project (Oberholzer, 2005).

<p><b>Level 1 input:</b> Identification of issues, and site visit; Brief comment on visual influence of the project and an indication of the expected impacts / benefits.</p> <p><b>Level 2 input:</b> Identification of issues raised in scoping phase, and site visit; Description of the receiving environment and the proposed project; Establishment of Receptor Site area and receptors; Brief indication of potential visual impacts, and possible mitigation measures.</p> <p><b>Level 3 assessment:</b> Identification of issues raised in scoping phase, and site visit; Description of the receiving environment and the proposed project; Establishment of Receptor Site area, view corridors, viewpoints and receptors; Indication of potential visual impacts using established criteria; Inclusion of potential lighting impacts at night; Description of alternatives, mitigation measures and monitoring programmes. Review by independent, experienced visual specialist (if required).</p> <p><b>Level 4 assessment:</b> As per Level 3 assessment, plus complete 3D modelling and simulations, with and without mitigation. Review by independent, experienced visual specialist (if required).</p>
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## APPENDIX B – IMPACT ASSESSMENT METHODOLOGY (OMI Methodology)

The Impact Assessment Methodology is as per the OMI Solutions methodology.

<b>Probability: This describes the likelihood of the impact actually occurring.</b>	
Improbable	The possibility of the impact occurring is very low, due to the circumstances, design or experience.
Probable	There is a probability that the impact will occur to the extent that provision must be made therefore.
Highly Probable	It is most likely that the impact will occur at some stage of the development.
Definite	The impact will take place regardless of any prevention plans, and there can only be relied on mitigatory actions or contingency plans to contain the effect.
<b>Duration: The lifetime of the impact.</b>	
Short term	The impact will either disappear with mitigation or will be mitigated through natural processes in a time span shorter than any of the phases.
Medium term	The impact will last up to the end of the phases, where after it will be negated.
Long term	The impact will last for the entire operational phase of the project but will be mitigated by direct human action or by natural processes thereafter.
Permanent	Impact that will be non-transitory. Mitigation either by man or natural processes will not occur in such a way or in such a time span that the impact can be considered transient.
<b>Scale: The physical and spatial size of the impact.</b>	
Local	The impacted area extends only as far as the activity, e.g., footprint
Site	The impact could affect the whole, or a measurable portion of the above-mentioned properties.
Regional	The impact could affect the area including the neighbouring residential areas.
<b>Magnitude/ Severity: Does the impact destroy the environment or alter its function.</b>	
Low	The impact alters the affected environment in such a way that natural processes are not affected.
Medium	The affected environment is altered, but functions and processes continue in a modified way.
High	Function or process of the affected environment is disturbed to the extent where it temporarily or permanently ceases.
<b>Significance: This is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required.</b>	
Negligible	The impact is non-existent or unsubstantial and is of no or little importance to any stakeholder and can be ignored.
Low	The impact is limited in extent, has low to medium intensity; whatever its probability of occurrence is, the impact will not have a material effect on the decision and is likely to require management intervention with increased costs.
Moderate	The impact is of importance to one or more stakeholders, and its intensity will be medium or high; therefore, the impact may materially affect the decision, and management intervention will be required.
High	The impact could render development options controversial or the project unacceptable if it cannot be reduced to acceptable levels; and/or the cost of management intervention will be a significant factor in mitigation.
<b>Mitigation Effect: Degree to which the impact can be managed following mitigation</b>	
Can be reversed	Can be avoided, managed or mitigated in such a way that natural processes are not affected and returned to natural state
Can be avoided, managed or mitigated	Can be avoided, managed or mitigated to the degree that functions and processes continue in a modified way)
May cause irreplaceable loss of resources	Irreversible impact (may cause irreplaceable loss of resources). Function or process of the affected environment is disturbed to the extent where it temporarily or permanently ceases.



Aspect	Description	Weight
Probability	Improbable	1
	Probable	2
	Highly Probable	4
	Definite	5
Duration	Short term	1
	Medium term	3
	Long term	4
	Permanent	5
Scale	Local	1
	Site	2
	Regional	3
Magnitude	Low	2
	Medium	6
	High	8
Significance	Negligible	<=20
	Low	<=40
	Moderate	<=60
	High	>60

## Mitigation Measure Development

The following points present the key concepts considered in the development of mitigation measures for the proposed development.

- *Mitigation and performance improvement measures* and actions that address the risks and impacts<sup>2</sup> are identified and described in as much detail as possible.
- Measures and actions to address negative impacts will favour avoidance and prevention over minimisation, mitigation, or compensation.
- Desired outcomes are defined and have been developed in such a way as to be *measurable events with performance indicators, targets and acceptable criteria* that can be tracked over *defined periods*, with estimates of the *resources* (including human resource and training requirements) *and responsibilities for implementation*.

## Recommendations

Recommendations were developed to address and mitigate impacts associated with the proposed development. These recommendations also include general management measures which apply to the proposed development as a whole. Mitigation measures have been developed to address issues in all phases throughout the life of the operation from planning, through to construction and operational and decommissioning phases.

<sup>2</sup> Mitigation measures should address both positive and negative impacts





## APPENDIX C – VEGETATION TYPES

**Table C1: Vegetation type descriptions according to Mucina & Rutherford (2006)**

Vegetation Type	GM 31 Long Tom Pass Montane Grassland	Gm 22 Northern Escarpment Dolomite Grassland	FOz 4 Northern Mistbelt Forest			
Climate Information	Climate is a seasonally arid temperate region with hot summers reaching 22°C and cool and dry winters with average July temperatures as low as 4°C.	Summer rainfall. Most of this unit occurs in the mistbelt, with increased precipitation. Warm-temperate climate, with low frequency of frost.	No available information in Mucina and Rutherford			
	<b>MAP* (mm)</b>	1067	<b>MAP* (mm)</b>	1034	<b>MAP* (mm)</b>	1084
	<b>MAT* (°C)</b>	14.3	<b>MAT* (°C)</b>	16.5	<b>MAT* (°C)</b>	16.7
	<b>MFD* (Days)</b>	14	<b>MFD* (Days)</b>	5	<b>MFD* (Days)</b>	-
	<b>MAPE* (mm)</b>	1864	<b>MAPE* (mm)</b>	1905	<b>MAPE* (mm)</b>	1946
	<b>MASMS* (%)</b>	14	<b>MASMS* (%)</b>	67	<b>MASMS* (%)</b>	-
Altitude (m)	1500 m - 1650 m	1 000–1 620 m	1 050 to 1 650 m			
Distribution	Occurring along the escarpment east of Lydenburg, from Morgenzon Reserve just north of Crystal Springs Mountain Lodge, Pilgrim's Rest, southwards to the Schoemanskloof.	Mpumalanga Province: From the high-lying dolomite grasslands of the Abel Erasmus Pass and Motlatse (Blyde) River (Vaalhoek) areas in the north, it extends southwards in a broad dolomite band along the Northern Escarpment, to as far south as the vicinity of Kaapsehoop.	Limpopo and Mpumalanga as well as in Swaziland: Occurring along the Soutpansberg from Blouberg in the northwest to the Samandou Plateau in the northeast and further southwards (along the Northern Escarpment) from Abel Erasmus Pass (Olifants River) to the surroundings of Badplaas and Barberton.			
Geology <sup>3</sup> , Soils & Hydrology	The geology forms part of the Pretoria Group, which predominantly consists of shale and quartzite in the Rooihoogte, Timeball Hill and Boshhoek Formations, and the distinctive volcanic elements of the Hekpoort Andesite Formations which are on the summits of the highest lying areas.	Malmali dolomites of the Chuniespoort Group (Transvaal Supergroup) which overlies the Black Reef Quartzite Formation. Soils usually have a high pH, are rich in calcium and magnesium, and with low phosphorus status. Deep Hutton and Griffin soil forms are common. Land types Fa, Ab and Ac.	Highly weathered, clayey soils mainly of Avalon and Hutton soil forms, derived from shales (Pretoria Group), quartzite (Black Reef Formation), dolomite (Chuniespoort Group), granite (Nelspruit Basement) and diabase (Mokolian intrusives).			

<sup>3</sup> Land types refer to a class of land with specified characteristics. In South Africa it has been used as a unit denoting land at 1:250 000 scale, over which there is a marked uniformity of climate, terrain form and soil pattern. Land type Bd refers to non-red soils (Hu, Bv <33%) that are usually more dystrophic/mesotrophic than they are eutrophic, Land type Bc refers to upland duplex and marginal soils that have a Plinthic catena less than 10%, Land type Ae refers to Red (yellow soils <10%) that are more eutrophic than dystrophic/mesotrophic, and Land type Ia refers to a miscellaneous soil class.



Vegetation Type	GM 31 Long Tom Pass Montane Grassland	Gm 22 Northern Escarpment Dolomite Grassland	FOz 4 Northern Mistbelt Forest
<b>Conservation</b>	<p>Listed as <b>Vulnerable (VU)</b> in Mucina and Rutherford (2006) but listed as <b>Near Threatened (NT)</b> in the updated 2018 Final Vegetation Map of South Africa, Lesotho and Swaziland.</p> <p>As much as 60.1% of this unit is still natural where a large proportion of this unit has been afforested (39%) or cultivated (0.6%).</p> <p>This unit is well protected where its target of 27% has been met in the current reserve network. However gold mining is still a threat as this unit contains a few current gold mines and many abandoned shafts and mine dumps.</p>	<p>Listed as <b>Endangered (EN)</b> in Mucina and Rutherford (2006) but listed as <b>Vulnerable (VU)</b> in the updated 2018 Final Vegetation Map of South Africa, Lesotho and Swaziland.</p> <p>Conservation target 27%. Only 2% protected within the Blyde River Canyon National Park, but larger portion protected in private Driekop Caves and London heritage sites in the north and in the Mooifontein and Mondi Cycad Reserve heritage sites in the south. More than half of this unit has been transformed (52%), mainly by plantations (47%) and cultivated lands (5%). Erosion potential very low (17%), low (51%) and moderate (28%).</p>	<p><b>Least threatened (LC)</b>. Conservation target 30%. About 10% statutorily conserved in Blyde River Canyon, Leggalameetse, Songimvelo, Makobulaan, Malalotja, Nelshoogte, Barberton, and Starvation Creek Nature Reserves. More than 25% enjoys protection in privately owned nature reserves, including for instance Wolkberg Wilderness Area, In-De-Diepte, Sudwala, Mac, Buffelskloof, Mount Sheba etc. Below the escarpment between Mariepskop and Graskop, the natural forest has expanded into former grassland areas due to the protection of the timber plantations against fire.</p>
<b>Vegetation landscape features &amp;</b>	<p>The landscape has a diverse physiography, which includes subalpine peaks, level terraces and rolling plains in the higher lying areas with steeply sloping mountain slopes. The highest point is Mount Anderson (2280 m), occurring just north of Long Tom Pass.</p>	<p>Very species-rich grasslands that occur along the Escarpment dolomite belt. The grasslands are characterised by a very diverse shrub layer which varies in height and density. The herbaceous component becomes more dense northwards as the climate becomes drier.</p>	<p>Tall, evergreen afrotemperate mistbelt forests occurring primarily in east-facing fire refugia such as subridge scarps and moist sheltered kloofs where they form small, fragmented patches.</p>



### GM 31 Long Tom Pass Montane Grassland

The Long Tom Pass Montane Grasslands have links to Zimbabwean flora (e.g. *Disa zimbabweensis*, *Morella microbracteata*, *Helichrysum swynnertonii*) as well as the southern Drakenberg (e.g. *Polypodium vulgare*, *Helichrysum melanacme*). It is also sharing a few endemics with the adjacent Steenkampsberg Montane Grasslands to the west (*Indigofera hedyantha* subsp. *steenkampsbergensis*).

**Remarks:** A floristic analysis of the vegetation supports the recognition of a new centre of plant endemism (Lydenburg Centre) with the proposal of two subcentres of plant endemism, namely the Long Tom Pass Subcentre and the Steenkampsberg subcentre. Total species richness for the Lydenburg centre is around 2266 species and 51 endemic plant species. The Long Tom Pass subcentre has at least 19 plant taxa endemic to this unit.

**Table C2: Important taxa associated with the Long Tom Pass Montane Grassland (Mucina & Rutherford, 2006).**

Woody Layer	
<b>Small Trees</b>	<i>Apodytes dimidiata</i> , <i>Protea roupelliae</i> subsp. <i>roupelliae</i> (d), <i>Protea caffra</i> subsp. <i>caffra</i> , <i>Faurea galpinii</i> , <i>Hypericum revolutum</i> , <i>Myrsine africana</i> , <i>Buddleja auriculata</i> , <i>Buddleja salviifolia</i> , <i>Searsia tumulicola</i> var. <i>tumulicola</i> , <i>Searsia pyroides</i> , <i>Syncolostemon eriocephalus</i> , <i>Passerina montana</i> .
<b>Low Shrubs</b>	<i>Protea parvula</i> (d), <i>Phymaspermum acerosum</i> (d), <i>Psoralea latifolia</i> (d), <i>Erica drakensbergensis</i> , <i>Cliffortia repens</i> , <i>Cliffortia nitidula</i> subsp. <i>pilosa</i> (d), <i>Erica woodii</i> (d), <i>Rothea hirsuta</i> , <i>Lasiosiphon caffer</i> , <i>Berkheya echinacea</i> , <i>Pelargonium dispar</i> , <i>Aeschynomene rehmannii</i> var. <i>leptobotrya</i> , <i>Erica cerinthoides</i> var. <i>cerinthoides</i> , <i>Hebenstretia comosa</i> , <i>Anisopappus smutsii</i> , <i>Euryops pedunculatus</i> , <i>Clutia abyssinica</i> .
<b>Succulent Shrubs</b>	<i>Aloe arborescens</i> , <i>Crassula sarcocaulis</i> subsp. <i>sarcocaulis</i> , <i>Lopholaena disticha</i> .
Forb layer	
<b>Herbs</b>	<i>Helichrysum wilmsii</i> (d), <i>Helichrysum acutatum</i> , <i>Helichrysum glomeratum</i> (d), <i>Helichrysum spiralepis</i> (d), <i>Helichrysum subluteum</i> (d), <i>Helichrysum polycladum</i> , <i>Helichrysum pilosellum</i> , <i>Sopubia cana</i> (d), <i>Eriosema kraussianum</i> (d), <i>Drosera burkeana</i> , <i>Selago atherstonei</i> (d), <i>Gladiolus longicollis</i> var. <i>platypetalus</i> (d), <i>Gerbera ambigua</i> , <i>Monsonia transvaalensis</i> , <i>Oxalis obliquifolia</i> , <i>Pseudopegoletia thodei</i> , <i>Psammotropha myriantha</i> (d), <i>Xysmalobium acerateoides</i> (d), <i>Pearsonia obovata</i> , <i>Pearsonia sessilifolia</i> subsp. <i>sessilifolia</i> , <i>Cycnium racemosum</i> , <i>Berkheya radula</i> , <i>Helichrysum coriaceum</i> , <i>Helichrysum nudifolium</i> var. <i>pilosellum</i> , <i>Syncolostemon albiflorus</i> , <i>Syncolostemon subvelutina</i> (d), <i>Diclis reptans</i> , <i>Hypoxis filiformis</i> , <i>Inezia integrifolia</i> , <i>Kohautia amatymbica</i> , <i>Senecio coronatus</i> , <i>Senecio glaberrimus</i> , <i>Senecio scitus</i> , <i>Pentanisia prunelloides</i> subsp. <i>latifolia</i> , <i>Nidorella auriculata</i> , <i>Pteridium aquilinum</i> , <i>Sebaea bojeri</i> , <i>Hilliardiella hirsuta</i> , <i>Alepidea peduncularis</i> , <i>Alepidea setifera</i> , <i>Rhynchosia monophylla</i> , <i>Craterocapsa tarsodes</i> , <i>Geranium wakkerstroomianum</i> , <i>Cyphia elata</i> var. <i>elata</i> , <i>Wahlenbergia lycopodioides</i> . <i>Trachyandra saltii</i> , <i>Chlorophytum cooperi</i> .
<b>Succulent Herbs</b>	<i>Anthospermum herbaceum</i> .
Grass layer	
<b>Graminoids</b>	<i>Andropogon schirensis</i> (d), <i>Festuca costata</i> var. <i>costata</i> (d), <i>Themeda triandra</i> , <i>Alloteropsis semialata</i> subsp. <i>eckloniana</i> (d), <i>Ctenium concinnum</i> (d), <i>Loudetia densispica</i> (d), <i>Microchloa altera</i> (d), <i>Microchloa caffra</i> (d), <i>Monocymbium ceresiiforme</i> , <i>Sporobolus centrifugus</i> , <i>Bromus firmior</i> , <i>Andropogon appendiculatus</i> , <i>Diheteropogon filifolius</i> (d), <i>Harpochloa falx</i> (d), <i>Koeleria capensis</i> (d), <i>Panicum ecklonii</i> , <i>Panicum natalense</i> , <i>Sporobolus centrifugus</i> , <i>Tristachya leucothrix</i> , <i>Agrostis lachnantha</i> var. <i>lachnantha</i> , <i>Eragrostis racemosa</i> , <i>Trachypogon spicatus</i> , <i>Scleria dieterlenii</i> (d), <i>Cyperus semitrifidus</i> , <i>Cyperus obtusiflorus</i> var. <i>flavissimus</i> , <i>Restio schoenoides</i> . <i>Xyris capensis</i>

(d) = dominant species

(The genus for all *Searsia* spp. was formerly *Rhus*)



**Table C3: Biogeographically important taxa associated with the Long Tom Pass Montane Grassland (Mucina & Rutherford, 2006).**

BIOGEOGRAPHICALLY IMPORTANT TAXA (REGIONAL ENDEMIC)	
<b>Woody Layer</b>	
Shrubs	<i>Morella microbracteata</i> .
<b>Forb layer</b>	
Herbs	<i>Helichrysum swynnertonii</i>
Geophytic herbs	<i>Brachystelma stellatum</i>
Succulent Herbs	<i>Aloe affinis</i> , <i>Khadia alticola</i>

*(d) = dominant species***Table C4: Endemic taxa associated with the Long Tom Pass Montane Grassland (Mucina & Rutherford, 2006).**

ENDEMIC TAXA	
<b>Woody Layer</b>	
Low Shrubs	<i>Callilepis normae</i> , <i>Erica atherstonei</i> , <i>Erica revoluta</i> , <i>Erica subverticillaris</i> , <i>Helichrysum summo-montanum</i> .
<b>Forb layer</b>	
Herbs	<i>Helichrysum-aureum</i> sp nov., <i>Streptocarpus cyaneus</i> subsp. <i>long-tommi</i> , <i>Streptocarpus hilburtii</i> .
Geophytic Herbs	<i>Disa amoena</i> , <i>Disa clavicornis</i> , <i>Disa vigilans</i> , <i>Hesperantha saxicola</i> , <i>Gladiolus calcaratus</i> , <i>Gladiolus exiguus</i> , <i>Ledebouria mokobulanensis</i> , <i>Watsonia wilmsii</i>

*(d) = dominant species*

### Gm 22 Northern Escarpment Dolomite Grassland

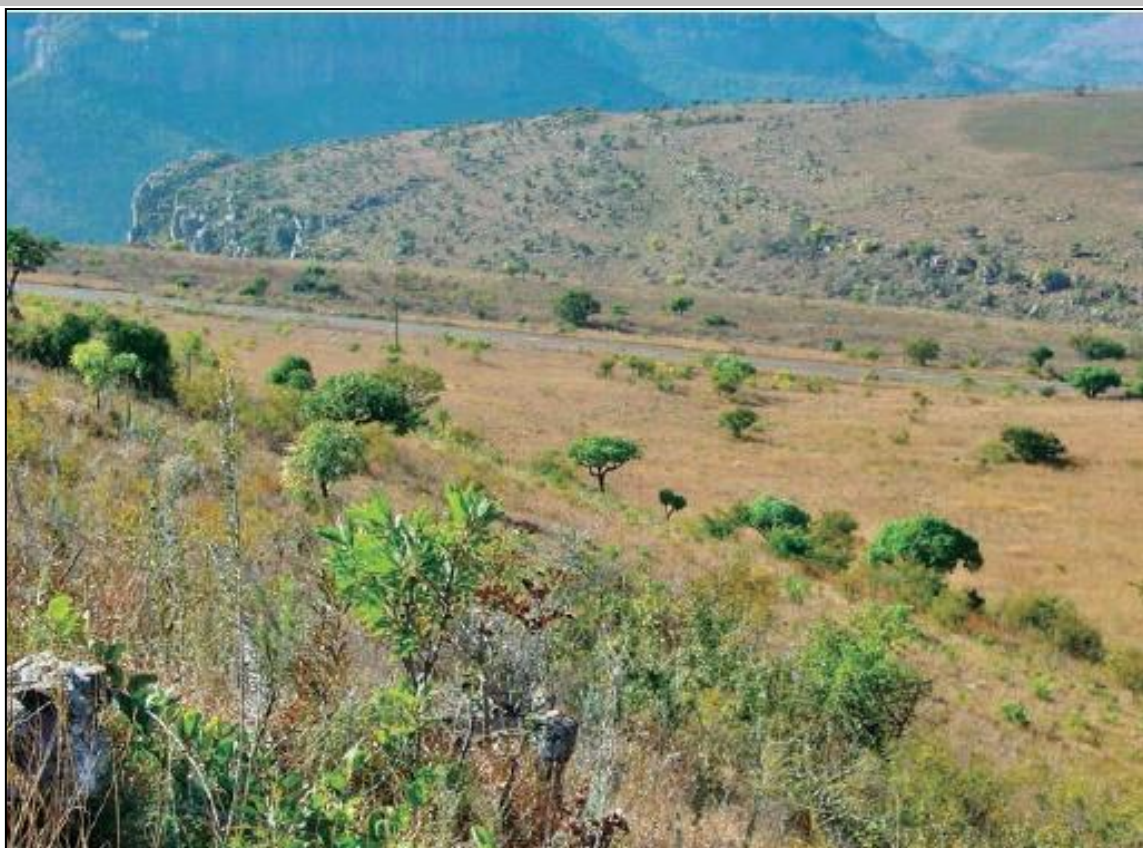


Figure C1: Gm 22 Northern Escarpment Dolomite Grassland: Rocky dolomite grassland on the Farm Dientjie (Blyde River Canyon National Park, Mpumalanaga) with the grass *Loudetia simplex* and scattered woody species such as *Cussonia paniculata*, *Protea caffra*, *Ziziphus mucronata* and *Smilax kraussiana*. Mucina and Rutherford (2006) page 409.

**Remarks:** Large variation in altitude and rainfall results in differences in species composition. These dolomites support species usually associated with the Wolkberg Centre of Plant Endemism, although some species are also shared with the Sekhukhune Centre of Plant Endemism (e.g. *Dombeya autumnalis*).

**Table C5: Important taxa associated with the Northern Escarpment Dolomite Grassland (Mucina & Rutherford, 2006).**

Woody Layer	
Small Trees	<i>Seemannaralia gerrardii</i> (d), <i>Cussonia natalensis</i> , <i>Faurea rochetiana</i> , <i>Faurea saligna</i> , <i>Hippobromus pauciflorus</i> , <i>Ozoroa albicans</i> , <i>Protea caffra</i> subsp. <i>caffra</i> , <i>Protea roupelliae</i> subsp. <i>roupelliae</i> .
Tall Shrubs	<i>Pavetta lanceolata</i> (d), <i>Diospyros lycioides</i> subsp. <i>sericea</i> , <i>Protea gagedi</i> , <i>Searsia rehmanniana</i> , <i>Tarchonanthus parvicapitulatus</i> .
Low Shrubs	<i>Argyrobolium transvaalense</i> , <i>Athrixia arachnoidea</i> , <i>Chaetacanthus burchellii</i> , <i>Erica drakensbergensis</i> , <i>Helichrysum splendidum</i> , <i>Pelargonium dolomiticum</i> , <i>Phymaspermum acerosum</i> , <i>Searsia tumulicola</i> var. <i>meeuseana</i> , <i>Schistostephium rotundifolium</i> , <i>Stoebe plumosa</i> , <i>Tenrhynea phyllicifolia</i> .
Forb layer	
Herbs	<i>Hypodematium crenatum</i> (d), <i>Barleria ovata</i> , <i>Conostomium natalense</i> , <i>Dicoma anomala</i> , <i>Helichrysum miconiifolium</i> , <i>Helichrysum thapsus</i> , <i>Pearsonia sessilifolia</i> subsp. <i>marginata</i> , <i>P. sessilifolia</i> subsp. <i>sessilifolia</i> , <i>Rhynchosia monophylla</i> , <i>Senecio panduriformis</i> , <i>Hilliardiella aristata</i> , <i>Xerophyta retinervis</i> .
Geophytic Herbs	<i>Cheilanthes pentagona</i> (d), <i>Pteris vittata</i> (d).
Succulent Herbs	<i>Aloe fouriei</i> , <i>Crassula sarcocaulis</i>
Grass layer	
Graminoids	<i>Cymbopogon caesius</i> (d), <i>Cymbopogon nardus</i> (d), <i>Elionurus muticus</i> (d), <i>Eragrostis capensis</i> (d), <i>Hyparrhenia filipendula</i> (d), <i>Loudetia simplex</i> (d), <i>Monocymbium ceresiiforme</i> (d), <i>Schizachyrium sanguineum</i> (d), <i>Trichopteryx dregeana</i> (d), <i>Tristachya leucothrix</i> (d), <i>Alloteropsis semialata</i> subsp. <i>eckloniana</i> , <i>Andropogon schirensis</i> , <i>Digitaria maitlandii</i> , <i>Diheteropogon filifolius</i> , <i>Eragrostis plana</i> , <i>Eragrostis racemosa</i> , <i>Festuca costata</i> , <i>Melinis nerviglumis</i> , <i>Melinis repens</i> subsp. <i>repens</i> , <i>Microchloa altera</i> , <i>Sporobolus africanus</i> , <i>Sporobolus pectinatus</i> , <i>Stiburus alopecuroides</i> , <i>Themeda triandra</i> .

(d) = dominant species

(The genus for all *Searsia* spp. was formerly *Rhus*)

**Table C6: Biogeographically important taxa associated with the Northern Escarpment Dolomite Grassland (Mucina & Rutherford, 2006).**

BIOGEOGRAPHICALLY IMPORTANT TAXA ( <sup>N</sup> Northern sourveld endemic, <sup>W</sup> Wolkberg endemic)	
Woody Layer	
Low Shrubs	<i>Berkheya pauciflora</i> <sup>W</sup> , <i>Heteromorpha pubescens</i> <sup>N</sup> .
Forb layer	
Herbs	<i>Syncolostemon transvaalensis</i> <sup>N</sup> (d), <i>Phymaspermum argenteum</i> <sup>N</sup> , <i>Scabiosa transvaalensis</i> <sup>W</sup> .

(d) = dominant species

**Table C7: Endemic taxa associated with the Northern Escarpment Dolomite Grassland (Mucina & Rutherford, 2006).**

ENDEMIC TAXA	
Woody Layer	
Small Trees	<i>Ozoroa</i> sp. nov. ('laetans').
Low Shrubs	<i>Salvia dolomitica</i> (d), <i>Pelargonium album</i> .
Succulent Shrubs	<i>Aloe alooides</i> .
Semiparasitic Shrub	<i>Thesium davidsonae</i> .
Forb layer	
Geophytic Herbs	<i>Gladiolus macneilii</i> , <i>G. pavonia</i> , <i>Ledebouria parvifolia</i> .

(d) = dominant species



## FOz 4 Northern Mistbelt Forest



Figure D2: FOz 4 Northern Mistbelt Forest: Strand of tree fern *Cyathea capensis* on the edge of mistbelt forest in a shady gully below the escarpment near Graskop (Mpumalanga). Mucina and Rutherford (2006) page 601.

**Remarks:** These forests border on sourveld grasslands on their upper boundary, whereas they often border on bushveld on their lower boundary. The Northern Mistbelt Forests are typically species rich, containing a mixture of afrotemperate elements and species of subtropical provenience, indicating a floristic (and possibly also biogeographic-evolutionary) link of these forests to the Scarp Forests. This phenomenon is clearly observed along the Northern Escarpment below God's Window and Marieskop, and in the Barberton region (Morgenthal & Cilliers 1999).

Table C8: Important taxa associated with the Northern Mistbelt Forest (Mucina & Rutherford, 2006).

Woody Layer	
Tall Trees	<i>Brachylaena transvaalensis</i> (d), <i>Combretum kraussii</i> (d), <i>Curtisia dentata</i> (d), <i>Drypetes gerrardii</i> (d), <i>Kiggelaria africana</i> (d), <i>Ocotea kenyensis</i> (d), <i>Olea capensis</i> subsp. <i>macrocarpa</i> (d), <i>Podocarpus latifolius</i> (d), <i>Psyrax obovata</i> subsp. <i>elliptica</i> (d), <i>Searsia chirindensis</i> (d), <i>Schefflera umbellifera</i> (d), <i>Syzygium gerrardii</i> (d), <i>Xymalos monospora</i> (d), <i>Aphloia theiformis</i> , <i>Chionanthus battiscombei</i> , <i>Chionanthus foveolatus</i> subsp. <i>major</i> , <i>Maytenus acuminata</i> , <i>Pterocelastrus galpinii</i> , <i>Rapanea melanophloeos</i> , <i>Rothmannia capensis</i> , <i>Trichilia dregeana</i> .
Small Trees	<i>Cassipourea malosana</i> (d), <i>Oxyanthus speciosus</i> subsp. <i>gerrardii</i> (d), <i>Englerophytum magalismsontanum</i> , <i>Gymnosporia harveyana</i> , <i>Mackaya bella</i> , <i>Ochna arborea</i> var. <i>oconnorii</i> , <i>Peddiea africana</i> , <i>Rinorea angustifolia</i> .
Woody Climber	<i>Senegalia ataxacantha</i> (d), <i>Keetia gueinzii</i> (d), <i>Rhoicissus rhomboidea</i> (d), <i>Bauhinia galpinii</i> , <i>Dalbergia armata</i> .



<b>Tall Shrubs</b>	<i>Psychotria capensis</i> (d), <i>Canthium kuntzeanum</i> , <i>Carissa bispinosa</i> subsp. <i>zambesiensis</i> , <i>Pavetta kotzei</i> , <i>Sclerochiton harveyanus</i> .
<b>Soft Shrubs</b>	<i>Galopina circaeoides</i> , <i>Hypoestes triflora</i> .
<b>Forb layer</b>	
<b>Herbs</b>	<i>Begonia sonderiana</i> , <i>Plectranthus rubropunctatus</i> , <i>Plectranthus tetragonus</i> , <i>Streptocarpus meyeri</i> , <i>Streptocarpus pentherianus</i> .
<b>Geophytic Herbs</b>	<i>Dietes iridioides</i> (d), <i>Asplenium aethiopicum</i> , <i>Asplenium boltonii</i> , <i>Asplenium splendens</i> , <i>Crocsmia aurea</i> , <i>Dryopteris inaequalis</i> , <i>Elaphoglossum acrostichoides</i> , <i>Polypodium polypodioides</i> subsp. <i>ecklonii</i> , <i>Polystichum macleanae</i> , <i>Pteris catoptera</i> .
<b>Grass layer</b>	
<b>Climbing Graminoids</b>	<i>Prosphytochloa prehensilis</i> (d).
<b>Graminoids</b>	<i>Carex spicato-paniculata</i> (d), <i>Cyperus albostrigatus</i> (d), <i>Oplismenus hirtellus</i> (d).

(d) = dominant species

(The genus for all *Searsia* spp. was formerly *Rhus*)

(The genus for all *Senegalia* was formerly *Acacia*)

**Table C9: Biogeographically important taxa associated with the Northern Mistbelt Forest (Mucina & Rutherford, 2006).**

<b>BIOGEOGRAPHICALLY IMPORTANT TAXA (<sup>S</sup>Southern distribution limit, <sup>B</sup>Endemic of Barberton Centre)</b>	
<b>Woody Layer</b>	
<b>Tall Trees</b>	<i>Anthocleista grandiflora</i> <sup>S</sup> , <i>Faurea galpinii</i> .
<b>Tall Shrubs</b>	<i>Psychotria zombamontana</i> <sup>S</sup> (d), <i>Coptosperma rhodesiacum</i> <sup>S</sup> .
<b>Soft Shrubs</b>	<i>Duvernoia adhatodooides</i> <sup>B</sup> . Megaherbs: <i>Ensete ventricosum</i> <sup>S</sup> , <i>Strelitzia caudata</i> <sup>S</sup> .
<b>Forb layer</b>	
<b>Herbs</b>	<i>Plectranthus swynnertonii</i> <sup>S</sup> , <i>Sphaerocionium capillare</i> <sup>S</sup> .

(d) = dominant species

**Table C10: Endemic taxa associated with the Northern Mistbelt Forest (Mucina & Rutherford, 2006).**

<b>ENDEMIC TAXA</b>	
<b>Woody Layer</b>	
<b>Tall Trees</b>	<i>Cryptocarya transvaalensis</i> (d), <i>Ochna gamostigmata</i> .
<b>Small Trees</b>	<i>Dombeya pulchra</i> , <i>Heteropyxis canescens</i> .
<b>Tall Shrubs</b>	<i>Pavetta barbertonensis</i> (d).
<b>Forb layer</b>	
<b>Herbs</b>	<i>Streptocarpus davyi</i> , <i>Streptocarpus fenestra-dei</i> , <i>Streptocarpus micranthus</i> , <i>Streptocarpus parviflorus</i> , <i>Streptocarpus roseo-albus</i> , <i>Streptocarpus wilmsii</i> .
<b>Epiphytic Herbs</b>	<i>Mystacidium brayboniae</i> .
<b>Geophytic Herbs</b>	<i>Clivia caulescens</i> (d).

(d) = dominant species



## APPENDIX C – VISUAL RECEPTORS

The number of observers and their perception of the proposed project will have an impact on the VIA and also on the perceived sensitivity of the landscape. The perception of viewers is difficult to determine as there are many variables to consider, such as cultural background, state of mind, reason for the sighting and how often the project is viewed within a set period. It is therefore necessary to identify areas of high viewer incidence and to classify certain areas according to the observer's visual sensitivity towards the project. It is also necessary to generalise the viewer sensitivity to the proposed project to some degree (Oberholzer, 2005).

The IEMA (2002) identifies a number of potential sensitive receptors that may be affected by a proposed development, namely:

- Users of recreational landscapes/ public footpaths and bridleways, including tourists and visitors;
- Residents;
- Users of public sports grounds and amenity open space;
- Users of public roads and railways;
- Workers; and
- Views of or from within valued landscapes.

The sensitivity of visual receptors and views will depend on:

- The location and context of the viewpoint;
- The expectation and occupation or activity of the receptor; and
- The importance of the view.

The most sensitive receptors may include:

- Users of outdoor recreational facilities, including public rights of way, whose attention or interest may be focused on the landscape;
- Communities where the development results in changes in the landscape setting or valued views enjoyed by the community; and
- Occupiers of residential properties with views affected by the development.

Other receptors include:

- People engaged in outdoor sport or recreation (other than appreciation of the landscape, as in landscape of acknowledges importance or value);
- People travelling through or past the affected landscape in cars on trains or other transport routes;
- People at their place of work.



## APPENDIX D – LANDSCAPE CHARACTER

Landscape character, from an aesthetic perspective, is mainly defined by natural determinants, such as vegetation, geology and topography, as well as cultural factors including land use, settlement patterns and the manner in which humans have transformed their natural surroundings. According to Swanwick (2002), landscape character may be defined as a distinct, recognisable and consistent pattern of elements in the landscape that makes it unique and provides it with a particular sense of place. Individual “landscape elements” that contribute to landscape character include hills, rolling plains, valleys, woods, trees, water bodies, as well as buildings and roads. “Landscape features” are those elements that are prominent or eye-catching.

Landscapes may be divided into landscape character types, which are defined as distinct types of landscape that are relatively homogeneous in character. Such landscape character types are generic in nature and may occur in different areas in different parts of the country, but wherever they occur, they share broadly similar combinations of geology, topography, drainage patterns, vegetation, land use and settlement patterns (Swanwick, 2002).

Key aesthetic aspects of the landscape are described in the table below, according to the method prescribed by Swanwick (2002).

**Table D1: Aesthetic and perceptual aspects of landscape character.**

Aspect	Characteristics			
Scale	Intimate	Small	Large	Vast
Enclosure	Tight	Enclosed	Open	Exposed
Diversity	Uniform	Simple	Diverse	Complex
Texture	Smooth	Textured	Rough	Very rough
Form	Vertical	Sloping	Rolling	Horizontal
Line	Straight	Angular	Curved	Sinuous
Colour	Monochrome	Muted	Colourful	Garish
Balance	Harmonious	Balanced	Discordant	Chaotic
Pattern	Random	Organised	Regular	Formal
Movement	Dead	Still	Calm	Busy

In addition to the above, other aspects of landscape perception, such as perception of beauty and scenic attractiveness also play a role in defining landscape character. These aspects are more subjective and responses thereto are personal and based on the experience and preference of the observer. Factors simultaneously perceived by senses other than sight, such as noisiness, tranquillity, exposure to the elements and sense of safety, further influence landscape character.





## APPENDIX E – VISUAL ABSORPTION CAPACITY

Visual Absorption Capacity (VAC) refers to the inherent ability of a landscape to accommodate change without degeneration of the visual quality and without resulting in an overall change of the identified landscape character type. A high VAC rating implies a high ability to absorb visual impacts and manmade structures and the ability of natural features such as trees or higher-lying areas to screen or hide an object where it would have visible otherwise (Oberholzer, 2005), while a low VAC rating implies a low ability to absorb or conceal visual impacts.

The factors that have been considered during the VAC analysis are listed and explained in the table below, according to the methodology prescribed by the United States Bureau of Land Management (BLM, 2004) and as adapted to the South African context (Table F1). Five factors have been considered, namely vegetation, soil contrast, visual variety, topographical diversity and recovery time.

**Table E1: VAC Factors and Rating table.**

Factors	Rating Criteria and Score		
<b>Vegetation</b>	Low, uniform vegetation or sparse vegetative cover, typically less than 1m in height, lacking in variety, uniform colour, minimal screening capability, typically low scrub or grass type vegetation. <b>Score: 1</b>	Vegetation of moderate height (1 – 2m), some species variety (2 to 3 types), some variation in colour, mostly continuous vegetative cover, effectively screens low-profile projects such as low-profile surface disturbance, scrub/grass, and intermingled shrubs. <b>Score: 2</b>	Higher vegetation (>2m height), lush, continuous vegetative cover; some variety of vegetative types is typical but not mandatory, provides significant screening capability of projects up to 4 – 6m in height, woodlands. <b>Score: 3</b>
<b>Soil contrast</b>	Surface disturbance would expose a high degree of contrast in colour with surrounding soil, rock and vegetation. <b>Score: 1</b>	Surface disturbance would expose a medium degree of contrast in colour with surrounding soil, rock and vegetation. <b>Score: 2</b>	Surface disturbance would expose only a low degree of contrast in colour with surrounding soil, rock and vegetation. <b>Score: 3</b>
<b>Visual variety</b>	Rating unit exhibits a low degree of visual variety in terms of the landscape character elements of form, line and texture and may also exhibit minimal variety in landforms, vegetation, or colour. <b>Score: 1</b>	Rating unit exhibits a medium degree of visual variety in terms of the landscape character elements of form, line, and texture and may also exhibit medium variety in landforms, vegetation, or colour. <b>Score: 2</b>	Rating unit exhibits a high degree of visual variety in terms of the landscape character elements of form, line, and texture and may also exhibit high degree of variety in landforms, vegetation, or colour. <b>Score: 3</b>
<b>Topographical diversity</b>	Landform has low amount of topographic diversity and variety. <b>Score: 1</b>	Landform has moderate amount of topographic diversity and variety. <b>Score: 2</b>	Landform has high amount of topographic diversity and variety. <b>Score: 3</b>
<b>Recovery time</b>	Long-term recovery time (greater than 5 years) <b>Score: 1</b>	Medium recovery time (3 to 5 years) <b>Score: 2</b>	High (rapid) recovery time (1 to 2 years) <b>Score: 3</b>

Scores, when added, amounting to between 5 and 7 are categorised as Low, scores between 8 and 11 as Medium and between 12 and 15 as High.

VAC is further closely related to visual intrusion, which refers to the physical characteristics and nature of the contrast created by a project on the visual aspects of the receiving environment. It is also, as with VAC, a measure of the compatibility or conflict of a project with the existing landscape and surrounding land use. The visual intrusion ratings are listed in the table below.

**Table E2: Visual intrusion ratings.**

Rating	Explanation
High visual intrusion	Results in a noticeable change or is discordant with the surroundings.
Moderate visual intrusion	Partially fits into the surroundings, but clearly noticeable.
Low visual intrusion	Minimal change or blends in well with the surroundings.

Through applying the scoring categories as outlined above, the following scores have been calculated for the proposed project area, which have similar landscape characteristics:



## APPENDIX F – LANDSCAPE QUALITY

Landscape visual quality, integrity or 'scenery beauty' relates primarily to human impact on a landscape and the physical state of the landscape in terms of intactness from visual, functional and ecological perspectives (Swanwick, 2002). It also serves as an indication of the condition of landscape elements and features (as outlined in Section 5.3.5), which in turn depends largely on an observer's visual perception through either increasing or reducing the visual quality of a landscape. Visual quality is thus a factor of an observer's emotional response to physical landscape characteristics and therefore assigning values to visual resources is a subjective process.

According to the BLM Visual Resource Management (VRM) system (1984), a system specifically developed for minimising the visual impacts of surface-disturbing activities and maintaining scenic values for the future, landscape, visual and scenic quality evaluation may be determined based on seven key factors, as outlined in the tables below and adapted to the South African environment. It is important to note that there may be cases where a separate evaluation of each of the key factors does not give a true picture of the overall scenic quality of an area, however within the context of the proposed project, this method of assessment is deemed suitable as an indication of landscape quality.

**Table F1: Landscape Quality - Explanation of Rating Criteria.**

Factor	Definition
<b>Landform</b>	Topography becomes more interesting as it gets steeper or more massive, or more severely or universally sculptured. Outstanding landforms may be monumental or they may be exceedingly artistic and subtle.
<b>Vegetation</b>	Give primary consideration to the variety of patterns, forms, and textures created by plant life. Consider short-lived displays when they are known to be recurring or spectacular. Consider also smaller scale vegetation features, which add striking and intriguing detail elements to the landscape.
<b>Water</b>	That ingredient which adds movement or serenity to a scene. The degree to which water dominates the scene is the primary consideration in selecting the rating score.
<b>Colour</b>	Consider the overall colour(s) of the basic components of the landscape (e.g., soil, rock, vegetation, etc.) as they appear during seasons or periods of high use. Key factors to use when rating "colour" are variety, contrast, and harmony.
<b>Adjacent Scenery</b>	Degree to which scenery outside the scenery unit being rated enhances the overall impression of the scenery within the rating unit. The distance which adjacent scenery will influence scenery within the rating unit will normally range from 0-8 kilometres, depending upon the characteristics of the topography, the vegetative cover, and other such factors. This factor is generally applied to units that would normally rate very low in score, but the influence of the adjacent unit would enhance the visual quality and raise the score.
<b>Scarcity</b>	This factor provides an opportunity to give added importance to one or all of the scenic features that appear to be relatively unique or rare within one physiographic region. There may also be cases where a separate evaluation of each of the key factors does not give a true picture of the overall scenic quality of an area. Often it is a number of not so spectacular elements in the proper combination that produces the most pleasing and memorable scenery - the scarcity factor can be used to recognize this type of area and give it the added emphasis it needs.
<b>Cultural Modifications</b>	Cultural modifications in the landform/water, vegetation, and addition of structures should be considered and may detract from the scenery in the form of a negative intrusion or complement or improve the scenic quality of a unit. Rate accordingly.



**Table F2: Scenic Quality - Rating Criteria and scoring system.**

Factor	Rating Criteria and Score		
<b>Landform</b>	High vertical relief as expressed in prominent cliffs, spires, massive rock outcrops, areas of severe surface variation, highly eroded formations, dune systems or detail features that are dominant and exceptionally striking and intriguing. <b>Score: 5</b>	Steep canyons, mesas, buttes, interesting erosional patterns, landforms of variety in size and shape or detail features, which are interesting though not dominant or exceptional. <b>Score 3</b>	Low rolling hills, foothills, or flat valley bottoms or few or no interesting landscape features. <b>Score: 1</b>
<b>Vegetation</b>	A variety of vegetative types as expressed in interesting forms, textures, and patterns. <b>Score: 5</b>	Some variety of vegetation, but only one or two major types. <b>Score: 3</b>	Little or no variety or contrast in vegetation. <b>Score: 1</b>
<b>Water</b>	Clear and clean appearing, still, or cascading white water, any of which are a dominant factor in the landscape. <b>Score: 5</b>	Flowing, or still, but not dominant in the landscape. <b>Score: 3</b>	Absent, or present, but not noticeable. <b>Score: 0</b>
<b>Colour</b>	Rich colour combinations, variety or vivid colour; or pleasing contrasts in the soil, rock, vegetation, water or snowfields. <b>Score: 5</b>	Some intensity or variety in colours and contrast of the soil, rock and vegetation, but not a dominant scenic element. <b>Score: 3</b>	Subtle colour variations, contrast, or interest; generally mute tones. <b>Score: 1</b>
<b>Adjacent Scenery</b>	Adjacent scenery greatly enhances visual quality <b>Score: 5</b>	Adjacent scenery moderately enhances overall visual quality. <b>Score: 3</b>	Adjacent scenery has little or no influence on overall visual quality. <b>Score: 0</b>
<b>Scarcity</b>	One of a kind, unusually memorable or very rare within region. Consistent chance for exceptional wildlife or wildflower viewing, etc. <b>Score: 5</b>	Distinctive, though somewhat similar to others within the region. <b>Score: 3</b>	Interesting within its setting, but fairly common within the region. <b>Score; 1</b>
<b>Cultural Modifications</b>	Modifications add favourably to visual variety while promoting visual harmony. <b>Score: 2</b>	Modifications add little or no visual variety to the area, and introduce no discordant elements <b>Score: 0</b>	Modifications add variety but are very discordant and promote strong disharmony. <b>Score: -4</b>

Scores, when added, amounting to less than 11, are categorised as Low, scores between 12 and 18 as Medium and scores more than 19 as High.

Through applying the scoring categories as outlined above, the following scores have been calculated for the proposed project area:





## APPENDIX G – LANDSCAPE VALUE

Landscape value is concerned with the relative value that is attached to different landscapes. Landscape values are described as the environmental or cultural benefits, including services and functions that are derived from various landscape attributes (Department of the Environment and Local Government, Ireland (DoE, 2000). A landscape may be valued by different communities for many different reasons without any formal designation, recognising, for example, perceptual aspects such as scenic beauty, tranquillity or wildness, special cultural associations, the influence and presence of other conservation interests, or the existence of a consensus about importance, either nationally or locally (DoE, 2000). These attributes include the components and image of the landscape as already established in the assessment of landscape character, including aesthetic and ecological components, but also includes historical and socio-cultural associations, as well as religious and mythological dimensions.

In determining landscape value, the people or groups of people who could be affected by the proposed development should be considered, due to landscapes being valuable to people in different ways. In this regard, consideration is given to:

- People who live and work in an area may have a different perception of the landscape to that held by visitors because of their more regular contact with the landscape and the ongoing changes within it;
- Special interest, for example the ecological, cultural or historic value of the landscape, as knowledge of these issues can often affect people's perception and appreciation of a landscape; and
- Landscapes valued by a public wider than the local population, because they have a strong image or are well known and valued nationally and internationally.



## APPENDIX H – NIGHT TIME LIGHTING

In order to understand the potential visual impacts from night lighting, it is important to understand the existing lighting levels. The Institute of Lighting Engineers (ILP) (2011) identifies five environmental zones for exterior lighting control and with which to describe the existing lighting conditions within the landscape (Table I1). These environmental zones are supported by design guidance for the reduction of light pollution, which can then inform proposed mitigation measures and techniques. Where an area to be lit lies on the boundary of two zones the obtrusive light limitation values used should be those applicable to the most rigorous zone.

**Table H1: Environmental zones for night-time lighting.**

Environmental Zone	Surrounding	Lighting Environment	Examples
E0	Protected	Dark	UNESCO Starlight Reserves, IDA Dark Sky Parks
E1	Natural	Intrinsically Dark	National Parks, Areas of Outstanding Natural Beauty etc.
E2	Rural	Low District Brightness	Village or relatively dark outer suburban locations
E3	Suburban	Medium District Brightness	Small town centres or suburban locations
E4	Urban	High District Brightness	Town/city centres with high levels of night-time activity

Stationary lights facing upward are significant contributors to light pollution and causes sky glow and glare, while light facing in a horizontal direction can be visible for long distances, lead to light trespass (light falling outside the desired area of illumination) and be disturbing to viewers and vehicles. Sky glow refers to the night-time brightening of skies, caused by the scattering and redirecting of light in the atmosphere, by water droplets and dust in the air, back towards the ground. Such stray light mostly comes from poorly designed and improperly aimed light, and from light reflected from over-lit areas (ASSA, 2012). Lighting from vehicles within rural areas will generally be more intrusive than in urban settings and, therefore, will have a potentially greater impact due the general lack of existing ambient light within areas further away from the MRA.

The ILP (2011) recommends that, in order to maintain the night-time setting, lighting within the identified zone should have minimal illumination into the sky as well as to adjacent viewpoints.

## APPENDIX I – VISUAL EXPOSURE AND VISIBILITY

Visual exposure refers to the geographic area from which the proposed project will be visible and is defined by the degree of visibility of a proposed project from various receptors sites. Visibility, in turn, is determined by distance between the components of a proposed project and the viewer.

Visual exposure is determined by the zone of visual influence or the “viewshed”. A viewshed is the topographically defined area that includes all the major observation sites from where a proposed development will be visible. The boundary of the viewshed tends to connect high points in the landscape through following ridgelines and demarcates the zone of visual influence. The zone of visual influence usually fades out beyond 5km distance and the further away from an observer the project is, the less visible it would be. It is also important to note that the actual zone of visual influence of the proposed project may be smaller than indicated because of screening by existing vegetation and infrastructure, which may partially or totally obscure a view.

General visibility classes, as applicable to the proposed infrastructure are indicated in the table below.

**Table I1: Visibility classes (IEMA, 2002).**

Class	Description
Highly visible	Clearly noticeable within the observer’s view frame 0 to 5km
Moderately visible	Recognisable feature within observer’s view frame 5 to 7.5km
Marginally visible	Not particularly noticeable within observer’s view frame 7.5 to 10km
Hardly visible	Practically not visible unless pointed out to observer beyond 10km

Three distance zones have been identified (BLM, 1984) based on visibility from travel routes and observation points. These have been determined and confirmed through field verification.

- Foreground – includes local and sub-regional areas visible from main roads, farm houses, residential areas such as towns and villages, industrial/commercial areas and gravel farm roads, and any other viewing locations which are up to 1 kilometre away.
- Middle ground – includes local and sub-regional areas visible from main roads, residential areas such as towns and villages, isolated houses, industrial/commercial areas, accommodation at nature reserves and gravel farm roads, or other viewing locations which are up to 3 kilometres away.
- Background – includes sub-regional areas barely visible further than 3 kilometres away.

### Line of Sight Analysis

A line of sight and elevation profile analysis has been conducted through drawing of a graphic line between two points on a surface that shows where along the line the view is obstructed. In Google Earth Pro a series of cross-sections have been evaluated, extending from various points of the project area, towards possible receptor sites. The visibility of each point along the cross section was calculated through the use of the Google Earth Pro Elevation Profile function. Emphasis was placed on confirming whether the proposed development areas will be visible from sensitive receptors in the vicinity. Various cross sections, selected to traverse a variety of receptor sites, were investigated to supplement information provided by the KOP analysis. The function only evaluates the topography of the area with land cover and vegetation not being taken into account. To ensure the line of sight is fully assessed the height of the proposed infrastructure have been incorporated through the use of conceptual block models based on the site layout and the heights provided by the project professional team.





## **Viewshed Analysis**

The viewshed analysis calculates the geographical locations from where the proposed project might be visible. This potential visual exposure of the project has been modelled by creating a Digital Terrain Model (DTM) from 1m contour data, and applying a viewshed analysis using GIS software, with all areas with a line of sight towards the proposed project is indicated. It must be noted that the heights of existing infrastructure and vegetation are not included in the calculation of the viewshed and it is, therefore, important to bear in mind that the proposed development will not be visible from all points within the viewshed, as views may be obstructed by visual elements, where such intervening objects will modify the viewshed at ground level.

## **Key Observation Points**

Key Observation Points (KOPs) were identified based on prominent viewpoints, where uninterrupted views of the proposed project and related infrastructure is expected to occur and at points where positive viewshed areas intersect with potential receptors. The KOPs were selected within 5km of the proposed project, as visual receptors beyond this distance are unlikely to be significantly affected. The KOP analyses have been conducted by investigating the visual influence of the proposed infrastructure as per the available layout, taking into account that at a distance from the project area, the visibility of the proposed infrastructure will be reduced.

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## APPENDIX J – INDEMNITY AND TERMS OF USE OF THIS REPORT

The findings, results, observations, conclusions and recommendations given in this report are based on the author's best scientific and professional knowledge as well as available information. The report is based on survey and assessment techniques which are limited by time and budgetary constraints relevant to the type and level of investigation undertaken and SAS CC and its staff reserve the right to, at their sole discretion, modify aspects of the report including the recommendations if and when new information may become available from ongoing research or further work in this field, or pertaining to this investigation and if deemed necessary by the authors.

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## APPENDIX K – SPECIALIST INFORMATION

### Details of the specialist who prepared the report

Stephen van Staden MSc Environmental Management (University of Johannesburg)  
 Sanja Erwee BSc Zoology (University of Pretoria)

### The expertise of that specialist to compile a specialist report including a curriculum vitae

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Registration / Associations	Registered Professional Scientist at South African Council for Natural Scientific Professions (SACNASP) Accredited River Health practitioner by the South African River Health Program (RHP) Member of the South African Soil Surveyors Association (SASSO) Member of the Gauteng Wetland Forum		

### Specialist Declaration

I, Stephen van Staden, 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







**SAS ENVIRONMENTAL GROUP OF COMPANIES –  
SPECIALIST CONSULTANT INFORMATION  
CURRICULUM VITAE OF **STEPHEN VAN STADEN****

### PERSONAL DETAILS

Position in Company	Group CEO, Water Resource discipline lead, Managing member, Ecologist, Aquatic Ecologist
Joined SAS Environmental Group of Companies	2003 (year of establishment)

### MEMBERSHIP IN PROFESSIONAL SOCIETIES

Registered Professional Scientist at South African Council for Natural Scientific Professions (SACNASP)  
Accredited River Health practitioner by the South African River Health Program (RHP)  
Member of the South African Soil Surveyors Association (SASSO) Member of the Gauteng Wetland Forum  
Member of the Gauteng Wetland Forum;  
Member of International Association of Impact Assessors (IAIA) South Africa;  
Member of the Land Rehabilitation Society of South Africa (LaRSSA)

### EDUCATION

#### Qualifications

MSc Environmental Management (University of Johannesburg)	2003
BSc (Hons) Zoology (Aquatic Ecology) (University of Johannesburg)	2001
BSc (Zoology, Geography and Environmental Management) (University of Johannesburg)	2000
Tools for wetland assessment short course Rhodes University	2016
Legal liability training course (Legricon Pty Ltd)	2018
Hazard identification and risk assessment training course (Legricon Pty Ltd)	2013

#### Short Courses

Certificate – Department of Environmental Science in Legal context of Environmental Management, Compliance and Enforcement (UNISA)	2009
Introduction to Project Management - Online course by the University of Adelaide	2016
Integrated Water Resource Management, the National Water Act, and Water Use Authorisations, focusing on WULAs and IWWMPs	2017

### AREAS OF WORK EXPERIENCE

South Africa – All Provinces  
Southern Africa – Lesotho, Botswana, Mozambique, Zimbabwe Zambia  
Eastern Africa – Tanzania Mauritius  
West Africa – Ghana, Liberia, Angola, Guinea Bissau, Nigeria, Sierra Leona  
Central Africa – Democratic Republic of the Congo

### SELECTED PROJECT EXAMPLES OUT OF OVER 2000 PROJECTS WORKED ON

- 1 Mining: Coal, Chrome, PGM's, Mineral Sands, Gold, Phosphate, river sand, clay, fluorspar
- 2 Linear developments
- 3 Energy Transmission, telecommunication, pipelines, roads



- 4 Minerals beneficiation
- 5 Renewable energy (wind and solar)
- 6 Commercial development
- 7 Residential development
- 8 Agriculture
- 9 Industrial/chemical

## **KEY SPECIALIST DISCIPLINES**

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### **Biodiversity Assessments**

- Floral Assessments
- Biodiversity Actions Plan (BAP)
- Biodiversity Management Plan (BMP)
- Alien and Invasive Control Plan (AICP)
- Ecological Scan
- Terrestrial Monitoring
- Protected Tree and Floral Marking and Reporting
- Biodiversity Offset Plan

### **Freshwater Assessments**

- Desktop Freshwater Delineation
- Freshwater Verification Assessment
- Freshwater (wetland / riparian) Delineation and Assessment
- Freshwater Eco Service and Status Determination
- Rehabilitation Assessment / Planning
- Maintenance and Management Plans
- Plant species and Landscape Plan
- Freshwater Offset Plan
- Hydropedological Assessment
- Pit Closure Analysis

### **Aquatic Ecological Assessment and Water Quality Studies**

- Habitat Assessment Indices (IHAS, HRC, IHIA & RHAM)
- Aquatic Macro-Invertebrates (SASS5 & MIRAI)
- Fish Assemblage Integrity Index (FRAI)
- Fish Health Assessments
- Riparian Vegetation Integrity (VEGRAI)
- Toxicological Analysis
- Water quality Monitoring
- Screening Test
- Riverine Rehabilitation Plans

### **Soil and Land Capability Assessment**

- Soil and Land Capability Assessment
- Soil Monitoring
- Soil Mapping

### **Visual Impact Assessment**

- Visual Baseline and Impact Assessments
- Visual Impact Peer Review Assessments
- View Shed Analyses
- Visual Modelling

### **Legislative Requirements, Processes and Assessments**

- Water Use Applications (Water Use Licence Applications / General Authorisations)
- Environmental and Water Use Audits
- Freshwater Resource Management and Monitoring as part of EMPR and WUL conditions.





**SAS ENVIRONMENTAL GROUP OF COMPANIES –  
SPECIALIST CONSULTANT INFORMATION  
CURRICULUM VITAE OF SANJA ERWEE**

### PERSONAL DETAILS

Position in Company	GIS Technician and Visual Specialist
Joined SAS Environmental Group of Companies	2014

### EDUCATION

#### Qualifications

BSC Zoology (University of Pretoria)	2013
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#### Short Courses

Global Mapper	2015
SANBI BGIS Course	2017
Global Mapper Lidar Course	2017
ESRI MOOC ARCGIS Cartography	2018

### AREAS OF WORK EXPERIENCE

**South Africa** – Gauteng, Mpumalanga, North West, Limpopo, KwaZulu-Natal, Northern Cape, Western Cape Free State

### KEY SPECIALIST DISCIPLINES

#### Freshwater Assessments

- Desktop Freshwater Delineation
- Plant species and Landscape Plan

#### Visual Impact Assessment

- Visual Baseline and Impact Assessments
- Visual Impact Peer Review Assessments
- View Shed Analyses
- Visual Modelling

#### GIS

- Mapping and GIS for various sectors and various disciplines (biodiversity, freshwater, aquatic, soil and land capability).

