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VISUAL IMPACT ASSESSMENT REPORT AS PART OF THE ENVIRONMENTAL ASSESSMENT AND AUTHORISATION PROCESS FOR THE PROPOSED RIETKOL MINING OPERATION (RIETKOL PROJECT) NEAR DELMAS, MPUMALANGA PROVINCE

Prepared for:

Jacana Environmentals cc

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EXECUTIVE SUMMARY

Scientific Aquatic Services (SAS) was appointed to conduct a Visual Impact Assessment (VIA) as part of the environmental assessment and authorisation process for the proposed Rietkol Mining Operations (Rietkol Project). The Rietkol Mining Right Application (MRA) area is located within the Victor Khanye Local Municipality, Mpumalanga Province and covers an area of 221 hectares (ha) consisting of:

- Sixteen (16) Modder East Agricultural Holdings on the farm Olifantsfontein 196 IR, each approximately 4.1 ha in extent;
- Portion 71 of the farm Rietkol 237 IR; and
- A portion of Remaining Extent (RE) of portion 31 of the farm Rietkol 237 IR.

The MRA area is situated within a mixed land use area approximately 9km northwest of the town of Delmas and 5km north of the Eloff hamlet. The N12 highway is situated approximately 1km north of the MRA area, where it intersects the R50 regional road to the northeast. The R50 roadway runs approximately 2km to the east of the MRA area and the R555 4km to the south. Several local gravel roads, mainly used by local residents, visitors and workers and connecting the smaller settlements in the region, are also located within the vicinity of the MRA area.

The topography associated with the MRA area and the surrounding region is considered to be relatively flat with gentle undulations, and few distinguishing topographical features in the form of prominent hills or prominent outcrops present.

This report, after consideration and description of the visual integrity and characteristics of the MRA area and surrounds, must guide the proponent, authorities and Environmental Assessment Practitioner (EAP), by means of recommendations, as to the most appropriate way forward for further assessment of visual and aesthetic impacts associated with the proposed development for the intended mining land use. This report must furthermore serve to inform the planning, design and decision-making process as to the layout and nature of the proposed mining activities.

Description of the Receiving Environment

- Several dominant land uses have been identified within and in the vicinity of the MRA area, namely:
  - Residential;
  - Agricultural, in the form of cultivated lands;
  - Grazing land and open veld;
  - Livestock farming;
  - Cultivated orchards; and
  - Flower and vegetable cultivation tunnels.
- The MRA area in its present condition is not affected by mining activities and no mining activities are present within the immediate vicinity thereof, with the exception a few small-scale mining operations beyond 2km of the MRA area;
- The topography associated with the MRA area and the surrounding region is considered mostly level, with gentle undulations present. No prominent topographical features are present within the MRA area, although some low rocky outcrops are present towards the center thereof and various large pan wetlands are located to the south of the MRA area. The Koffiespruit River is situated approximately 3km northwest of the MRA area and the MRA area slopes slightly in this direction;
- The following visual and aesthetic aspects have been determined for the MRA area:
  - **Landscape character:** rural, undulating open grasslands, interspersed with cultivated fields, alien tree stands and low-density residential and light industrial development;
  - **VAC:** Medium - partially fits into the surroundings, but clearly noticeable;
  - **Landscape Quality:** Medium - exhibits a positive character, but some detracting features are present;
  - **Landscape Value:** The MRA area itself is likely to be most valued by local residents, farmers and workers and, as far as is known to the visual consultants at the current time, does not contain specific value for special interest groups, although some heritage features have been confirmed from the MRA area; and

- **Sense of Place:** The landscape character type is not unique to the MRA area and can also be found within the larger region. The sense of place associated with the MRA area, is therefore not highly significant when compared to its surroundings, but local diversity in landscape features, including alien tree stands and rocky outcrops within the centre of the MRA area, do provide some visual interest.

Visual Receptors

- The main visual receptors include local residents (including those of informal settlements), farmers, workers on farms within the immediate vicinity of the MRA area, as well as residents, farmers and farm workers located further away from the MRA area within areas from where the proposed project will also be visible;
- Other potential sensitive receptors are people travelling on the N12 to the north, the R50 to the northeast and the R555 to the south. The viewshed analysis indicates that the proposed project will be highly visible from the N12 and R50, but significantly less so from the R555;
- From the viewshed analysis, it was also found that the proposed project will not be visible from the town of Delmas, the most prominent town in the region.

Visual Exposure and Visibility

- From the viewshed analyses (which do not take vegetation and local topography into account), and as supported by the results of the Key Observation Point (KOP) and Line of Sight analyses it is evident that the proposed project will be highly visible from within 2km of the MRA area, with mainly the 2.4m high perimeter fence, conveyors and the processing plant being visible;
- The proposed project will be moderately visible to receptors within 2-5 kilometres of the MRA area, from areas with a clear line of sight towards the MRA area;
- The proposed project is further expected to be marginally visible beyond 5km of the MRA area and hardly visible beyond 10km, taking screening from existing vegetation and general infrastructure into account, and then only from areas with a clear line of sight towards the proposed infrastructure.

Night-time Lighting

Night lighting sources include lighting from existing residences and farming operations currently present within and adjacent to the MRA area, as well as vehicular light sources coming from gravel roads adjacent to the MRA area and the N12 highway to the north. The lighting environment of the MRA area is however considered consistent with Environmental Zone E2 – Low District Brightness. Overall, although limited night-time lighting is currently impacting on the MRA area, this area is still considered relatively dark at night. As the proposed Rietkol Project will operate during the night-time hours (with transporting of ore beyond the MRA area, being confined to daylight hours), substantial additional lighting will be contributed, which is potentially significant.

Impact Assessment

A summary of the impact assessment significance ratings is indicated in the table below.

Pre-Construction phase		
Impact	**WOM**	**WM**
1: Visual intrusion of mining activities on visual receptors	Low	Low
Construction phase		
Impact	**WOM**	**WM**
2: Impact on landscape character and sense of place	Low to Medium	Low
3: Visual intrusion of mining activities on visual receptors	Low to Medium	Low
Operational phase		
Impact	**WOM**	**WM**
4: Impact on landscape character and sense of place	Medium to High	Medium
5: Visual intrusion of mining activities on visual receptors	Medium to High	Medium
6: Visual impacts from night time lighting	Medium to High	Medium
Decommissioning Phase		
Impact	**WOM**	**WM**
7: Visual intrusion of mining activities on visual receptors	Medium Low	Low

Conclusion and Recommendations

- Should it be deemed appropriate to mine the resource, mitigation measures will have to be implemented in order to minimise the visual impacts, with specific reference to the consideration of material selection, making use of screening opportunities, effective management of night-time lighting and dust, as well as implementing good housekeeping measures during the operational phase of the project. Ongoing invasive floral species management should take place throughout all project phases. Upon decommissioning, the presence of residual aboveground infrastructure should be avoided, and all cleared areas should be ripped, topsoil applied and revegetated to blend in with the surroundings. In the case of the main open cast pit, which will only be partially backfilled due to an expected deficit in inert backfilling material available, this feature should be rehabilitated to have a natural appearance.
- From a visual perspective, the project is not considered to be fatally flawed and all potential impacts have the potential to be reduced though mitigation and it is the opinion of the specialist that the project be considered favourably, from a visual resource management perspective, provided that the required mitigation and management measures be implemented in support of Integrated Environmental Management (EIM) and that it is ensured that the best long-term use of the resources in the project area will be made in support of the principle of sustainable development.

DOCUMENT GUIDE

In terms of the NEMA 2014 EIA Regulations contained in GN R982 of 04 December 2014 (as amended in 2017) all specialist studies must comply with Appendix 6 of the NEMA 2014 EIA Regulations (GN R982 of 04 December 2014). The table below show the requirements as indicated above.

Section	NEMA Regulations (2014, amended 2017) - Appendix 6	Relevant section in report
1 (a)	details of—	
	(i) the specialist who prepared the report; and	Appendix J
	(ii) the expertise of that specialist to compile a specialist report including a curriculum vitae;	Appendix J
(b)	a declaration that the specialist is independent in a form as may be specified by the competent authority;	Appendix I
(c)	an indication of the scope of, and the purpose for which, the report was prepared;	Section 1.1
(cA)	an indication of the quality and age of base data used for the specialist report;	Section 4.1
(cB)	a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	Section 6
(d)	the duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment;	Section 4.2
(e)	a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used;	Section 4
(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 identifying site alternatives;	Section 5.3 – 5.7
(g)	an identification of any areas to be avoided, including buffers	Section 5.3 – 5.7
(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	Section 5.3 – 5.7
(i)	a description of any assumptions made and any uncertainties or gaps in knowledge	Section 1.3
(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 6
(k)	any mitigation measures for inclusion in the EMPr	Section 6.1
(l)	any conditions for inclusion in the environmental authorisation	Section 6.1
(m)	any monitoring requirements for inclusion in the EMPr or environmental authorisation	Section 6.7
(n)	a reasoned opinion	Section 7
	(i) as to whether the proposed activity or portions thereof should be authorised	Section 7
(o)	(iA) A reasoned opinion regarding the acceptability of the proposed activity or activities; and	Section 7
	(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 7
(p)	a description of any consultation process that was undertaken during the course of carrying out the study; and	Refer to EIA report
(q)	a summary and copies if any comments that were received during any consultation process.	Section 5.1
®	Any other information requested by the competent authority	None

GLOSSARY OF TERMS

Best practicable environmental option	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.
Characterisation	The process of identifying areas of similar landscape character, classifying and mapping them and describing their character.
Characteristics	An element, or combinations of elements, which make a contribution to landscape character.
Development	Any proposal that results in a change to the landscape and/ or visual environment.
Elements	Individual parts, which make up the landscape, for example trees and buildings.
Feature	Particularly prominent or eye-catching elements in the landscape such as tree clumps, church towers or wooded skylines.
Geographic Information System (GIS)	A system that captures, stores, analyses, manages and presents data linked to location. It links spatial information to a digital database.
Impact (Visual)	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.
Key characteristics	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.
Land cover	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.
Land use	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.
Landform	The shape and form of the land surface which has resulted from combinations of geology, geomorphology, slope, elevation and physical processes.
Landscape	An area, as perceived by people, the character of which is the result of the action and interaction, of natural and/ or human factors.
Landscape Character Type	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.
Landscape integrity	The relative intactness of the existing landscape or townscape, whether natural, rural or urban, and with an absence of intrusions or discordant structures.
Landscape quality	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.
Landscape value	The relative value that is attached to different landscapes by society. A landscape may be valued by different stakeholders for a variety of reasons.

Receptors	Individuals, groups or communities who are subject to the visual influence of a particular project. Also referred to as viewers, or viewer groups.
Sense of place	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 *genius loci* meaning 'spirit of the place'.
Sky glow	Brightening of the night sky caused by outdoor lighting and natural atmospheric and celestial factors.
Skylining	Siting of a structure on or near a ridgeline so that it is silhouetted against the sky.
View catchment area	A geographic area, usually defined by the topography, within which a particular project or other feature would generally be visible.
Viewshed	The outer boundary defining a view catchment area, usually along crests and ridgelines.
Visibility	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 project might be visible.
Visual Absorption Capacity	The ability of an area to visually absorb development as a result of screening topography, vegetation or structures in the landscape.
Visual Character	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.
Visual Exposure	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.
Visual Intrusion	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.
Zone of visual influence	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 AND ABBREVIATIONS

ARC	Agricultural Research Council
BLM	(United States) Bureau of Land Management
BPEO	Best Practicable Environmental Option
DEM	Digital Elevation Model
DMR	Department of Mineral Resources
DTM	Digital Terrain Model
EAP	Environmental Assessment Practitioner
EIA	Environmental Impact Assessment
GIS	Geographic Information System
GPS	Global Positioning Systems
ha	Hectares
IAPs	Interested and Affected Parties
IEM	Integrated Environmental Management
IEMA	Institute of Environmental Management and Assessment
IDP	Integrated Development Plan
KOP	Key Observation Point
LOM	Life of Mine
MAP	Mean Annual Precipitation
MAPE	Mean Annual Potential for Evaporation
MAT	Mean Annual Temperature
mbs	metres below surface
MRA	Mining Right Application
MRA area	Mining Right Application area
NBA	National Biodiversity Assessment
NEMA	National Environmental Management Act (Act 108 of 1997)
NPAES	National Protected Areas Expansion Strategy
RoM	Run of Mine
SANBI	South African National Biodiversity Institute
SACAD	South African Conservation Areas Database
SAPAD	South African Protected Areas Database
SAS	Scientific Aquatic Services
VAC	Visual Absorption Capacity
VIA	Visual Impact Assessment
VRM	Visual Resource Management
WM	With Mitigation
WOM	Without Mitigation

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1. INTRODUCTION

1.1 Background

Scientific Aquatic Services (SAS) was appointed to conduct a Visual Impact Assessment (VIA) as part of the environmental assessment and authorisation process for the proposed Rietkol Mining Operation (Rietkol Project). The proposed Rietkol Mining Right Application (MRA) area will be registered over an area of 221 hectares (ha) consisting of sixteen (16) Modder East Agricultural Holdings (Holdings 209 – 224 Modder East Orchards, Delmas, Mpumalanga) on the farm Olifantsfontein 196 IR, Portion 71 of the farm Rietkol 237 IR and a portion of the Remaining Extent (RE) of portion 31 of the farm Rietkol 237 IR, within the Victor Khanye Local Municipality, Mpumalanga Province.

The MRA area is situated within a mixed land use area approximately 9km northwest of the town of Delmas and 5km north of the Eloff hamlet (Figures 1 & 2). The N12 is situated approximately 1km north of the MRA area, where it intersects the R50 roadway to the northeast. The R50 regional road runs approximately 2km to the east of the MRA area. Several local gravel roads, mainly used by local residents, visitors and workers and connecting the smaller settlements and hamlets in the region, are also located within the vicinity of the MRA area. The land use in the vicinity and within the MRA area is dominated by agricultural activities including livestock farming, irrigated agriculture, cultivated orchards and flower and vegetable tunnel farming, while a large pan wetland feature dominates the southern portion of the MRA area. Low density developments are also scattered throughout the region.

The topography associated with the MRA area and the surrounding region is considered to be relatively flat, with gentle undulations, with few distinguishing topographical features in the form of prominent hills or prominent outcrops present. The lower-lying portion of the MRA area in the south is however characterised by a pan wetland feature.

The purpose of this report is:

- To determine the Category of Development for the project and Level of Assessment required 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 proposed project and the MRA area in its proposed 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 project;
- 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 project will have a potential visual impact;
- To prepare a photographic study and conceptual visual simulation of the proposed project 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 in order to minimise any potential visual impacts.

This report, after consideration and description of the visual integrity and characteristics of the MRA area and surrounds, must guide the proponent, authorities and Environmental Assessment Practitioner (EAP), by means of recommendations, as to the most appropriate way forward for further assessment of visual and aesthetic impacts associated with the intended mining within the MRA area. This report must furthermore serve to inform the planning, design and decision-making process as to the layout and nature of the proposed mining activities.

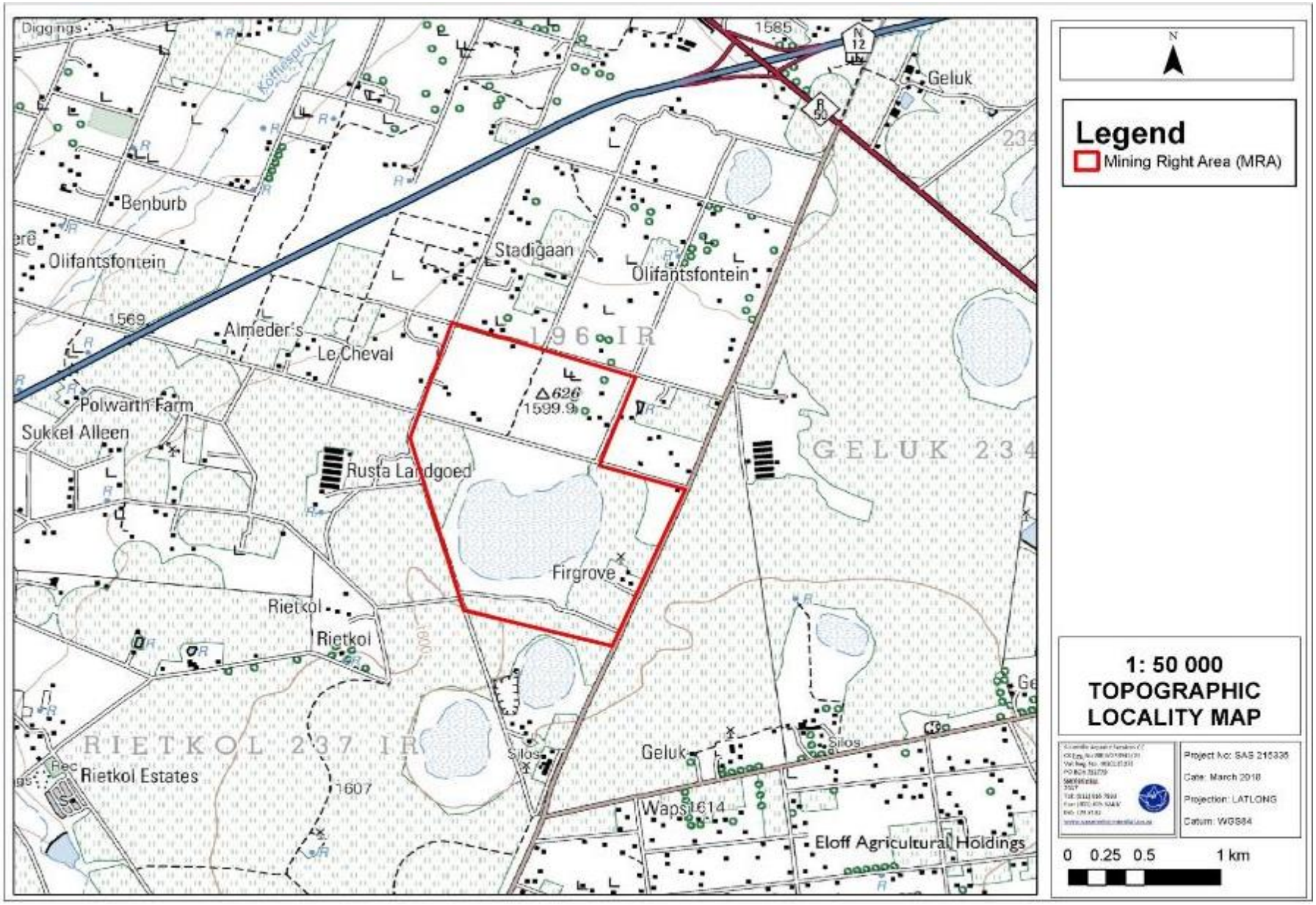


Figure 1: 1:50 000 Topographical map depicting the location of the MRA area in relation to the surrounding region.

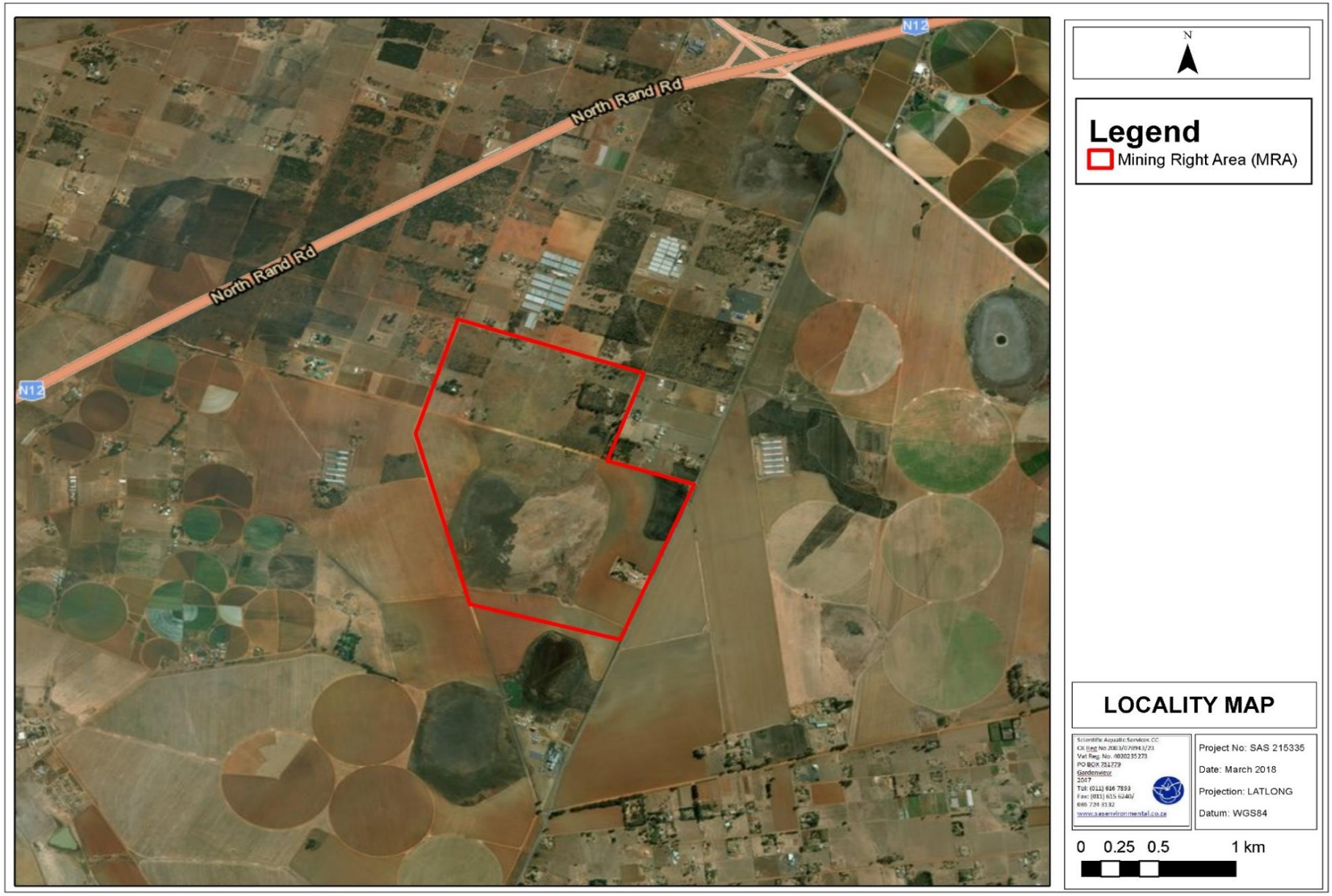


Figure 2: Digital satellite image depicting the location of the MRA area in relation to the surrounding region.

1.2 Site Sensitivity Verification Statement

Nhlabathi applied for a Mining Right to mine silica in February 2018 and commenced with the Environmental Impact Assessment (EIA) process as contemplated in the National Environmental Management Act 107 of 1998 (NEMA) and Government Notice (GN) No. R. 982-986 of 4 December 2014: NEMA: Environmental Impact Assessment Regulations, as amended (2014 EIA Regulations), for the Rietkol Project.

Several specialist studies were conducted within the Mining Right Application (MRA) area in support of the EIA process, and a comprehensive Public Participation process was initiated. The Final Scoping Report was submitted on 3 April 2018 and accepted by the Department of Mineral Resources and Energy (DMRE) on 26 April 2018. However, the MRA was rejected by the DMRE Mpumalanga Mine Economics Directorate on the basis that the MRA formed part of another right granted in terms of the MPRDA. This decision resulted in a delay in the EIA process, ultimately causing the application for Environmental Authorisation to lapse.

Nhlabathi has recently re-initiated the MRA process and applied for a Mining Right over the same farm portions in early 2020. The MRA was accepted by the DMRE on 21 January 2021 and Nhlabathi has since re-initiated the EIA process with Jacana Environmentals cc (Jacana) appointed as the independent Environmental Assessment Practitioner (EAP).

Several additional requirements when applying for Environmental Authorisation (EA) have emerged since the 2018 EIA process, including but not limited to:

1. Notice was given in Government Notice No. 960 (GN 960) dated 5 July 2019 of the requirement to submit a report generated by the National Web Based Environmental Screening Tool in terms of section 24(5)(h) of the NEMA and regulation 16(1)(b)(v) of the 2014 EIA Regulations. Such a Screening Rreport became compulsory when applying for an EA 90 days from publication of GN 960 (5 October 2019). The purpose of the Screening Report is to identify the list of specialist assessments that needs to be conducted in support of the EA application, based on the selected classification, and the environmental sensitivities of the proposed development footprint.
2. Government Notice No. 320 (GN 320) dated 20 March 2020 prescribes general requirements for undertaking site sensitivity verification and for protocols for the assessment and minimum report content requirements of environmental impacts for environmental themes for activities requiring EA in terms of sections 24(5)(a), (h) and 44 of NEMA. These procedures and requirements came into effect 50 days after publication of GN 320 (15 May 2020). The purpose of the site sensitivity verification is to verify (confirm or dispute) the current use of the land and the environmental sensitivity of the site under consideration as identified in the Screening Report. This

will determine the level of assessment required for each environmental theme, i.e. Specialist Assessment or Compliance Statement.

As indicated above, several specialist studies were commissioned for the Rietkol Project during 2016-2018 in support of the previous application, including:

- Soils, land use and capability, Hydropedology;
- Terrestrial / Aquatic Biodiversity;
- Groundwater;
- Air Quality;
- Ambient Noise;
- Blasting & Vibration;
- Traffic;
- Heritage and Cultural Resources;
- Palaeontology;
- Visual and Aesthetics;
- Social;
- Hazard Identification and Risk Assessment (HIRA); and
- Land Trade-off & Macro-Economic Analysis.

Comprehensive specialist assessments were conducted for all the environmental and social themes listed above, irrespective of the sensitivity identified by the specialist assessment (2018) or the Screening Report. Therefore, no site sensitivity verification has been done for this EA application as all themes have been considered to have a **high to very high sensitivity**, requiring a full Specialist Assessment.

The list of specialist assessments listed in the Screening Report and the extent to which it has been addressed in the re-application for EA for the Rietkol Project is indicated below. Where applicable, motivation is provided for the exclusion of certain specialist assessments.

GN 960 requirement	**Extent to which it is included in the Plan of Study**
Agricultural Impact Assessment	Soil and Land Capability Assessment by Scientific Aquatic Services.
Landscape/Visual Impact Assessment	Visual Impact Assessment by Scientific Aquatic Services.
Archaeological and Cultural Heritage Impact Assessment	Phase 1 Heritage Impact Assessment by R&R Cultural Resource Consultants.
Palaeontology Impact Assessment	Palaeontology Impact Assessment by ASG Geo Consultants (Pty) Ltd {Dr Gideon Groenewald}.

GN 960 requirement	**Extent to which it is included in the Plan of Study**
Terrestrial Biodiversity Impact Assessment	Faunal, Floral and Freshwater Assessment by Scientific Terrestrial Services.
Aquatic Biodiversity Impact Assessment	Faunal, Floral and Freshwater Assessment by Scientific Terrestrial Services.
Hydrology Assessment	Baseline Water Quality Assessment by Scientific Aquatic Services. Water Management Plan – Preliminary Design Report by Onno Fortuin Consulting.
Noise Impact Assessment	Environmental Noise Impact Assessment by Enviro Acoustic Research.
Radioactivity Impact Assessment	Waste Classification by Groundwater Complete. Analysis will include Uranium and Thorium to determine potential for radioactivity within the resource.
Traffic Impact Assessment	Traffic Impact Assessment by Avzcons Civil Engineering Consultant.
Geotechnical Assessment	A geotechnical assessment will be undertaken as part of the engineering package for the project, if required. This is not included in the application for EA.
Climate Impact Assessment	A greenhouse gas emissions statement is included in the Air Quality Impact Assessment by EBS Advisory.
Health Impact Assessment	Hazard Identification and Risk Assessment by AirCheck Occupational Health, Environmental & Training Services.
Socio-Economic Assessment	Socio-Economic Impact Assessment by Diphororo Development.
Ambient Air Quality Impact Assessment	Air Quality Impact Assessment by EBS Advisory.
Seismicity Assessment	A Blasting Impact Assessment is included and has been conducted by Blast Management Consulting. It deals extensively with the potential impact in

GN 960 requirement	Extent to which it is included in the Plan of Study
	respect of air blast and vibration from blasting operations.
Plant Species Assessment	Part of Terrestrial Biodiversity Impact Assessment.
Animal Species Assessment	Part of Terrestrial Biodiversity Impact Assessment.

Further studies that are not included in the GN 960 requirements, but were commissioned for the Rietkol Project, are:

- Hydropedological Assessment by Scientific Aquatic Services.
- Geohydrological Investigation by Groundwater Complete.
- Blasting Impact Assessment by Blast Management Consulting.
- Land Trade-off Study and Macro-Economic Impact Analysis by Mosaka Economic Consultants.
- Rehabilitation, Decommissioning and Closure Plan by Jacana Environmentals.

Where a specific environmental theme protocol has been prescribed by GN 320, the specialist assessment will adhere to such protocol. Where no protocol has been prescribed, the report will comply with Appendix 6 of the EIA Regulations.

1.3 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. Therefore, 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

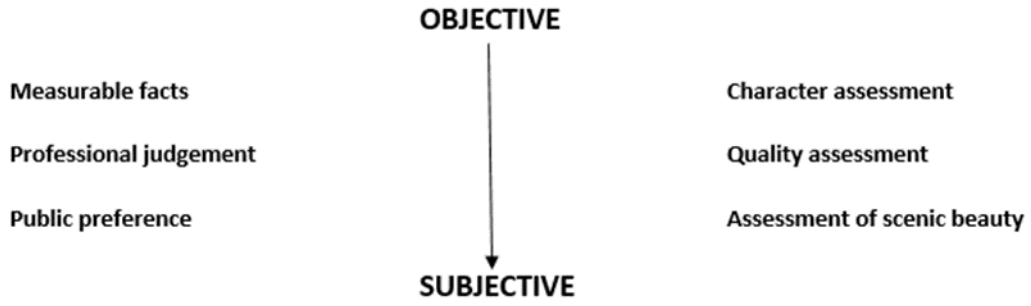
- Public involvement must form part of the process.

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.

1.4 Assumptions and Limitations

- No specific national legal requirements for VIAs currently exist in South Africa. However, the assessment of visual impacts is required by implication when the provisions of relevant acts 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 specialist 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, inclusive of the proposed infrastructure layout, infrastructure height, mining techniques and sequences, etc., is assumed to be the latest available information. No detailed information about building styles, colours and finishes and lighting types and positioning, etc. were available prior to completion of the assessment, and assumptions have been made regarding these elements taking industry standards and best practice guidelines into consideration;
- 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 therefore is 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 Institute of Environmental Management and Assessment (IEMA), 2002); and



- The viewsheds resulting from the DEM as illustrated in this report, indicate the areas from which the proposed project is likely to be visible and does not take local undulations and variations in topography, vegetation and man-made structures into account. Potential sensitive receptor sites, indicated to fall within the viewsheds, have therefore been groundtruthed during the field assessment.

2. LEGAL, POLICY AND PLANNING CONTEXT FOR VIAs

Oberholzer (2005) indicate 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 in 2017).

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

National Environmental Management: Protected Areas Act (Act 57 of 2003)

This act is intended to identify and protect natural landscapes.

National Heritage Resources Act (Act 25 of 1999)

This provides legislative protection for listed or proclaimed sites, such as urban conservation areas, nature reserves and proclaimed scenic routes.

Advertising on Roads and Ribbons Act (Act 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 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 MRA area falls within the Victor Khanye Local Municipality with the 2017 - 2021 Local Municipality IDP being the latest available IDP. The IDP document does not address landscape aesthetics specifically but does recognise an increase in mining and related activities within the Victor Khanye Local Municipality, with these activities mainly concentrated on coal and silica. About 3 million metric tons of coal and 2 million metric tons of silica are mined annually in the municipality, with the main mining areas being located around Delmas in the centre and also in the far north-eastern corner of the municipal area. The IDP further states that there is a growing urgency to establish an equitable and realistic trade-off that maximises the provincial benefits from mining and energy sectors while mitigating any environmental impacts.

Spatial Planning and Land Use Management Act (Act No. 16 of 2013)

Land development must be managed in line with the principles and guidelines included in the Spatial Planning and Land Use Management Act (Act 16 of 2013).

Other

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

3. DESCRIPTION OF THE PROPOSED PROJECT

Silica is planned to be mined by means of conventional opencast methods to a depth of between 30 and 50 meters below surface (mbs). The estimated Life of Mine (LOM) for the proposed Rietkol Project is 20 years. Further exploration drilling will be conducted during the operational phase, which may increase the LOM and mining depth if the resource proves viable.

The initial proposed infrastructure layout as proposed during the initial EIA phase in 2018, hereafter referred to as the “Initial Infrastructure Layout” encroached into the 100 m Zone of Regulation (GN704) of Pan 1 (SAS, 2018). The initial Rietkol application for Environmental Authorisation lapsed in 2020 due to administration issues within the Department of Mineral Resources (DMR). The layout was amended to ensure that the proposed infrastructure associated with the Rietkol mining operations does not encroach onto the zone of regulation of Pan 1, hereafter referred to as the “preferred infrastructure layout”. The extent of the initial infrastructure layout in relation to the zone of regulation and preferred infrastructure layout are indicated in Figure 3 below. This report has been updated to illustrate the impacts associated with the preferred infrastructure layout.

The proposed project includes the following mining and related infrastructure (Figure 4):

- Opencast pits;
- Processing plant (i.e. crushing, wash plant, screening, etc.);
- Product stockpiles (Run of Mine (ROM), sand, pebble, and waste rock);
- Administration office facilities (i.e. security building, administration and staff offices, reception area, ablution facilities, etc.);

- Production facilities (i.e. locker rooms, laboratory, workshops, stores, explosives magazine, ablution facilities, etc.);
- Access roads and haul roads; and
- Clean and dirty water management infrastructure.

From the R50, access to site will be via Provincial Road D1550, a paved secondary provincial road. This road will be upgraded to handle the additional traffic associated with the proposed mining project. From the D1550 the mine will be accessed via an existing gravel road turning off the D1550 just north of Holding 276. Similarly, this gravel road will be upgraded to carry the additional traffic load. Formal access will be constructed to the open cast pit and the infrastructure as the development progresses (Jacana Environmentals CC, 2021).

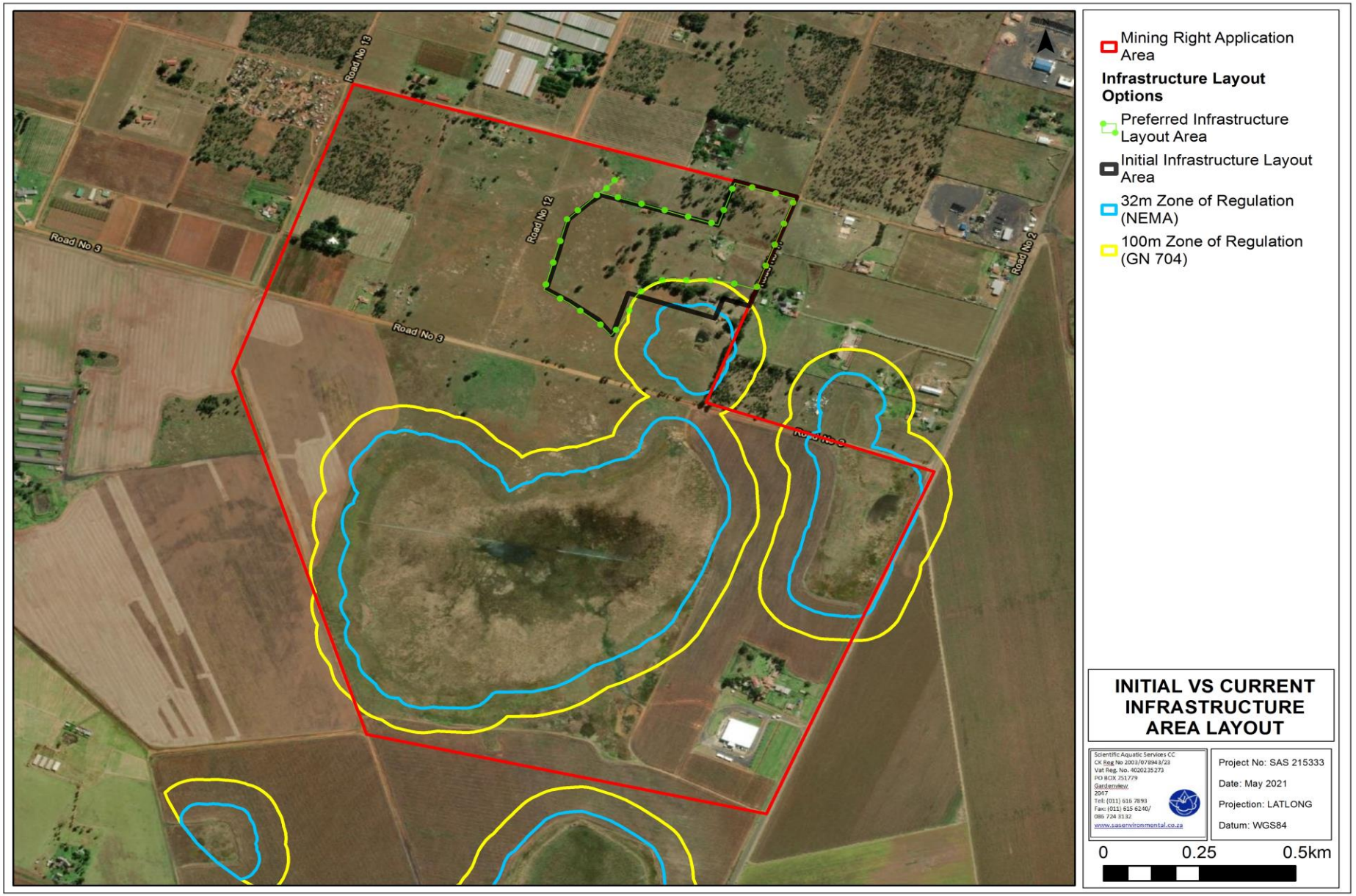


Figure 3: The extent of the initial infrastructure layout in comparison to the proposed infrastructure layout extent of the Rietkol Project.

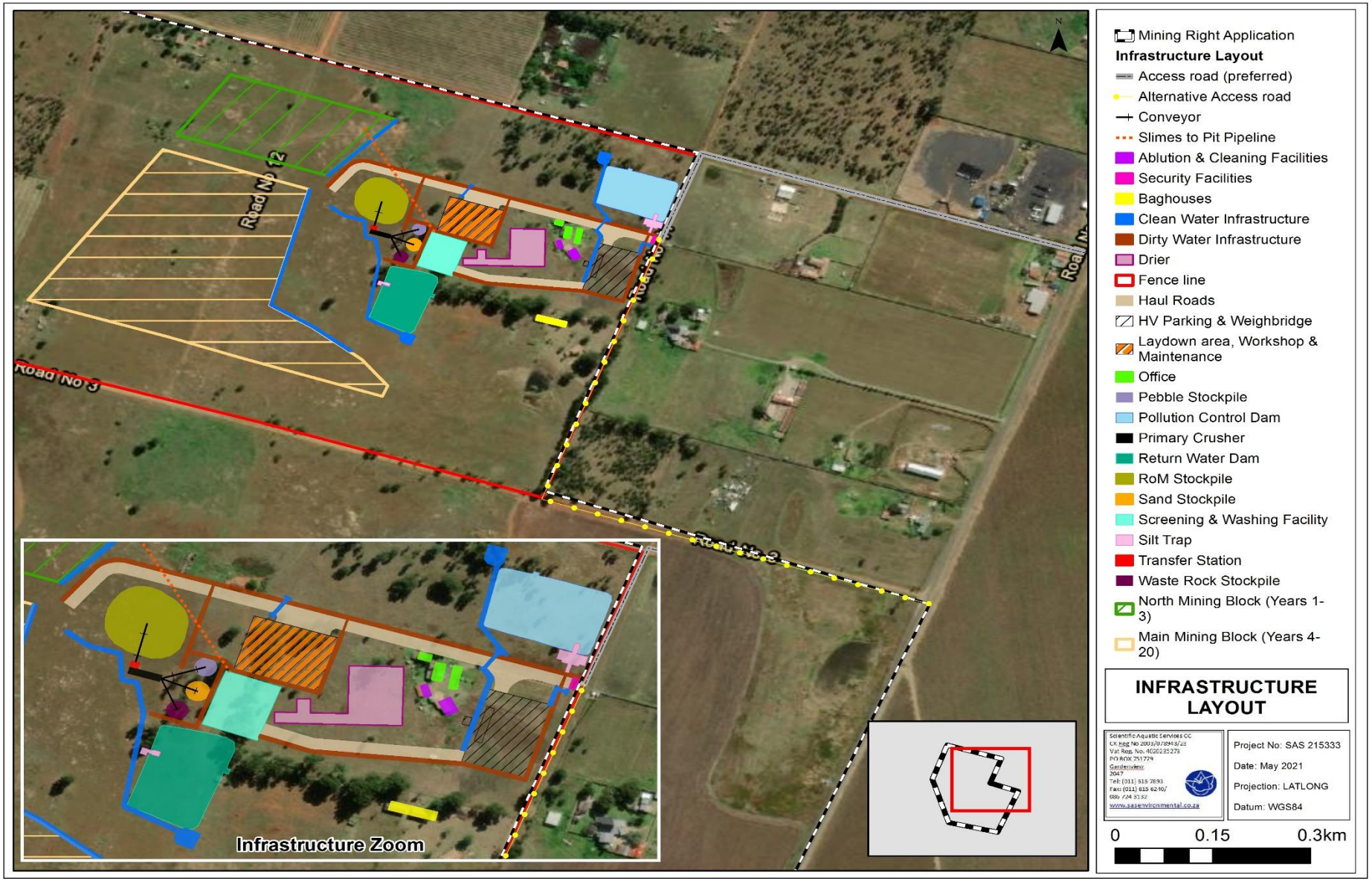


Figure 4: The proposed preferred infrastructure layout associated with the Rietkol Project.

4. METHOD OF ASSESSMENT

4.1 Desktop Assessment

The method of assessment for this report is based on a spatial analysis of the MRA area and surrounds, using Geographic Information Systems (GIS) such as Planet GIS, ArcGIS, Global Mapper as well as recent 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).

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 projected in GIS were utilised to generate a visual context map indicating the MRA area and the cumulative viewshed of the proposed project, based on the expected maximum heights of the various infrastructural components being considered (Table 1).

Table 1: Heights utilised as input data.

Infrastructure Component	Height (m)
Security office	3
Office	6
Office Parking	0m (ground level)
Laundry	3
Ablution and greenroom	3
Loading and Parking area -heavy vehicles	0m (ground level)
RoM stockpile	3
Crusher plant	10
Screening and washing facility	12
Drying facility	10
Baghouse	7
Weighbridge	8
Conveyors (x5)	At one meter higher than each applicable stockpile
Laydown, Workshop and Maintenance area	8
Open Cast Pits	0m (ground level)

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 – G.

4.2 Field Assessment

A field assessment was undertaken over one full day on 4 February 2016, which was considered to be a suitable time period during which to conduct the VIA. VIAs can successfully be undertaken during any time of year, however the prevailing dry climatic conditions at the time of assessment, allowed for further views across the landscape with lower seasonal screening effects such as vegetation density and relative surface grass cover, with the advantage of clear skies also present.

The field assessment included a drive-around and on-foot survey of the MRA area and 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 and included surrounding settlements, as well as prominent roads within the area. Points from where the proposed mining infrastructure was determined to be visible were recorded (making use of Global Positioning Systems (GPS)) in order to confirm aesthetically sensitive viewpoints and sensitive visual receptors in relation to the proposed project.

High-resolution photographs were taken with a wide-lens Canon Mark II camera from areas from where the proposed project will have the highest visual impact and these photographs serve as the basis from which to develop representative visual simulations, superimposed onto the MRA area, which will serve to indicate the visibility of the proposed project in relation to identified Key Observation Points (KOPs). The visual model and photographs were interpreted to provide an accurate indication of the visual impact that the proposed project will have on the aesthetic integrity of the surrounding areas.

5. RESULTS OF INVESTIGATION

5.1 Public Involvement

A public involvement process has been initiated as part of the EIA process by the EAP, whereby stakeholders are invited to provide input concerning the proposed mining activities. All comments by Interested and Affected Parties (IAPs) relating to visual and aesthetic impacts are outlined in Table 2 below:

Table 2: Comments relating to visual impacts from IAPs.

Comment	Response
Increased dust levels due to blasting, processing and vehicles.	Although the comments received from IAPs mostly considered dust-related impacts within a socio-economic context, dust generation is also likely to have a visual impact on the receiving environment, particularly where trucks utilise gravel roads and during blasting and processing activities. Mitigation measures to manage dust within the MRA area and surrounds are discussed as part of the mitigation measures included in Section 6.1, with further mitigations to be supplied by the Air Quality specialist. Ongoing dust monitoring will be implemented on granting of the mining right.
Aesthetics will be impacted, and the project will have a negative visual impact	The project is likely to alter the visual environment within the vicinity of the MRA area and will have an overall negative visual impact. Mitigation measures to manage potential negative impacts with regards to landscape character and sense of place, visual intrusion, exposure of sensitive visual receptors to the proposed project, as well as night time lighting are discussed in Section 5.7 and 6.1 of this report.
Well established indigenous trees will be lost	It is recommended that as many existing large trees as possible, particularly along the perimeter of the MRA area, be retained – particularly any indigenous trees that may be present. Where large alien trees are to be removed as part of alien plant species control measures, it is proposed that these be replaced with indigenous trees suitable to the region.
Constant lighting due to night time lighting	Lighting impacts are discussed in Section 5.7 and mitigation measures in this regard are included in Section 6.1.

5.2 Development Category and Level of Impact Assessment

Through application of the VIA methods of assessment as presented in the sections above, it was determined that the proposed project can be defined as a Category 5 development, since the proposed activities involve the development of opencast mining facilities, including related processing plants within an area not previously or currently affected by mining.

According to Oberholzer (2005), a high visual impact is therefore expected, with potentially significant impacts on scenic resources and changes to the visual character of the area expected. A Level 4 Assessment is therefore required.

5.3 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. This section furthermore aims to describe the particular character, uniqueness, intactness, rarity, vulnerability and representability of the MRA area within its existing context. General views of the landscape associated with the MRA area and surrounds with respect to the relatively flat topography and overall rural character are indicated in Figure 5 below.

Figure 5: General views of the MRA area and the surrounding region.

5.3.1 Climate

The MRA area falls within a predominantly summer-rainfall region, with a Mean Annual Precipitation (MAP) ranging between 650 to 900mm, and very dry winters. Incidences of frost have been recorded in the area but are most common at higher elevations. The Mean Annual Temperature (MAT) and Mean Annual Potential for Evaporation (MAPE) averages are 14.7°C and 1,926mm respectively and the region is considered to be a relatively water-stressed area (Mucina & Rutherford, 2006).

As a result of seasonal climate variations, the appearance and perception of the landscape within and surrounding the MRA area changes with the seasons. The MRA area and its surroundings are expected to appear muted during the winter months, while it appears more vibrant and green during the summer months. Seasonal variation may have an effect on the area from where project components would potentially be visible, with visibility of the

proposed project expected to be higher during the winter months when seasonal screening effects such as vegetation density and relative cover is lower.

5.3.2 Land Use

Several dominant land uses have been identified in the vicinity of the MRA area (Figure 6), namely:

- Agricultural, in the form of cultivated lands;
- Commercial and industrial structures;
- Arable land for grazing and open veld;
- Livestock farming;
- Cultivated orchards;
- Flower and vegetable tunnels;
- Residential, which includes low-density residential dwellings associated with individual farms. Several smallholdings and agricultural holdings are located within a 10km of the MRA area, including Eloff, Breswol, Botleng and the larger town of Delmas;
- Urban residential areas located further from the MRA area, including Benoni, Brakpan, and Springs southwest of the MRA area, Bronkhorstpruit to the north and Ogies to the east; and
- According to the National Biodiversity Assessment (NBA; 2011) no formally or informally Protected Areas are located in the vicinity of the MRA area, while the South African Protected Areas Database (SAPAD; 2020) indicates provincial and local nature reserves to be present in the larger region. These include the National Protected Areas Expansion Strategy (NPAES) formally protected Bronkhorstspruit Municipal Nature Reserve (approximately 24km north of the MRA area) and the Marievale Bird Sanctuary Provincial Nature Reserve (23km southeast of the MRA area), while the South African Conservation Areas Database (SACAD; 2020) indicates the Blesbokspruit, located approximately 16km southwest of the MRA area, as a conservation area (Figure 7).

The dominant land use within the MRA area itself is cultivation and grazing. A number of main roads are present in the vicinity of the MRA area, including:

- The N12 highway located approximately 1km to the north;
- The R50 roadway approximately 2km to the northeast;
- The R555 roadway approximately 4km to the south; and
- Numerous local gravel roads, one road forming the northern boundary of the MRA area and the other forming the southern border of the MRA area.

The MRA area in its present state has not been impacted by mining and industrial activities and therefore the proposed mining activities will lead to a noticeable change in land use of the area. Light industrial activities are however common in the immediate vicinity of the MRA area and a few smaller mining operations are situated within 5km of the MRA area boundary.

5.3.3 Topography

The topography associated with the MRA area and the surrounding region is considered mostly level, with some undulations present. No prominent topographical features are present within the MRA area, although some low rocky outcrops are situated towards the center of the MRA area and various large pan wetlands are located to the south. The lower-lying Koffiespruit River is situated approximately 3km North West of the MRA area and the proposed project area slopes somewhat in this direction.

The elevation, general relief and slopes as occurring within the MRA area are indicated in Figures 8 & 9 below.

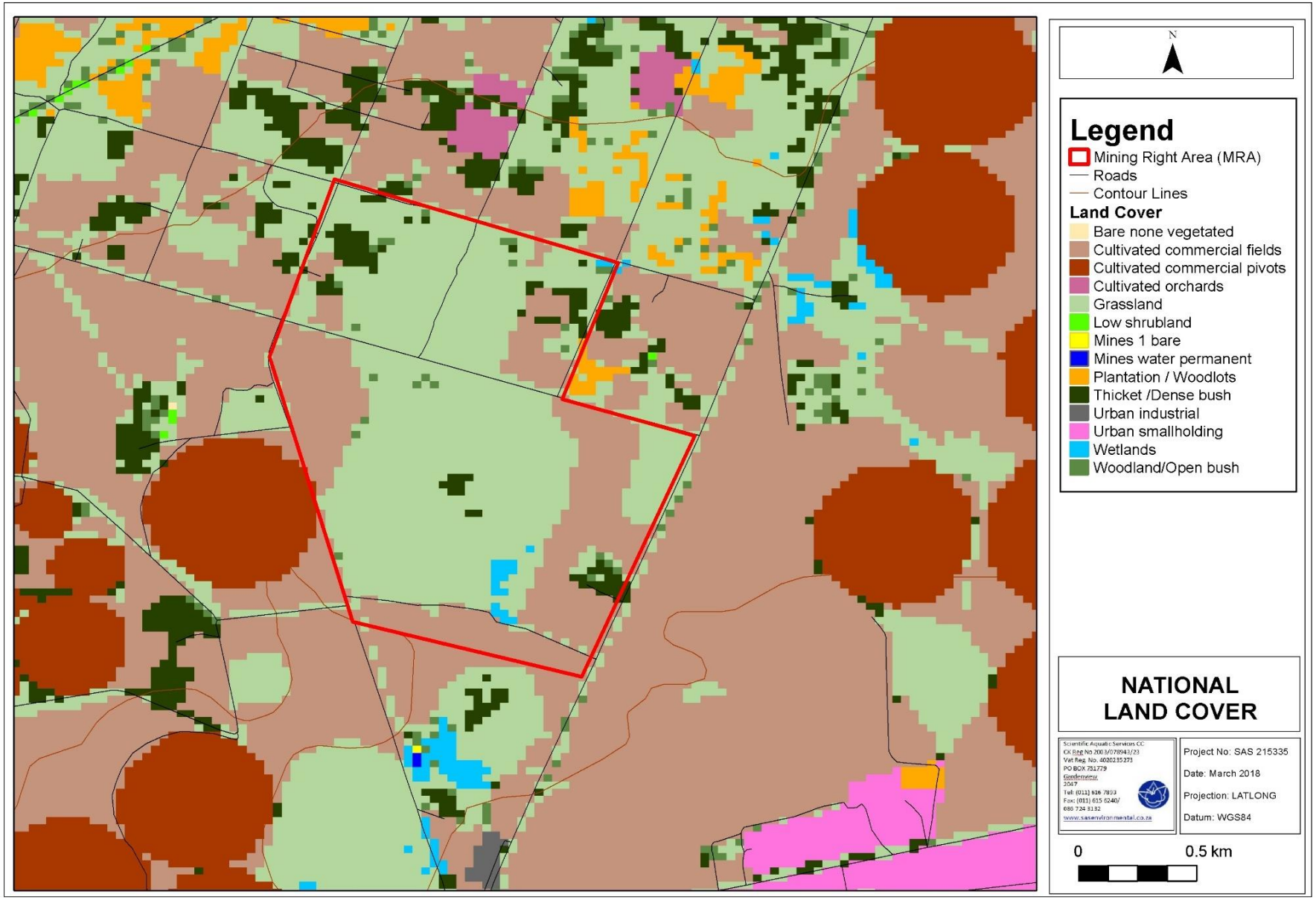


Figure 6: Land cover map indicating the main land use within and surrounding the MRA area.

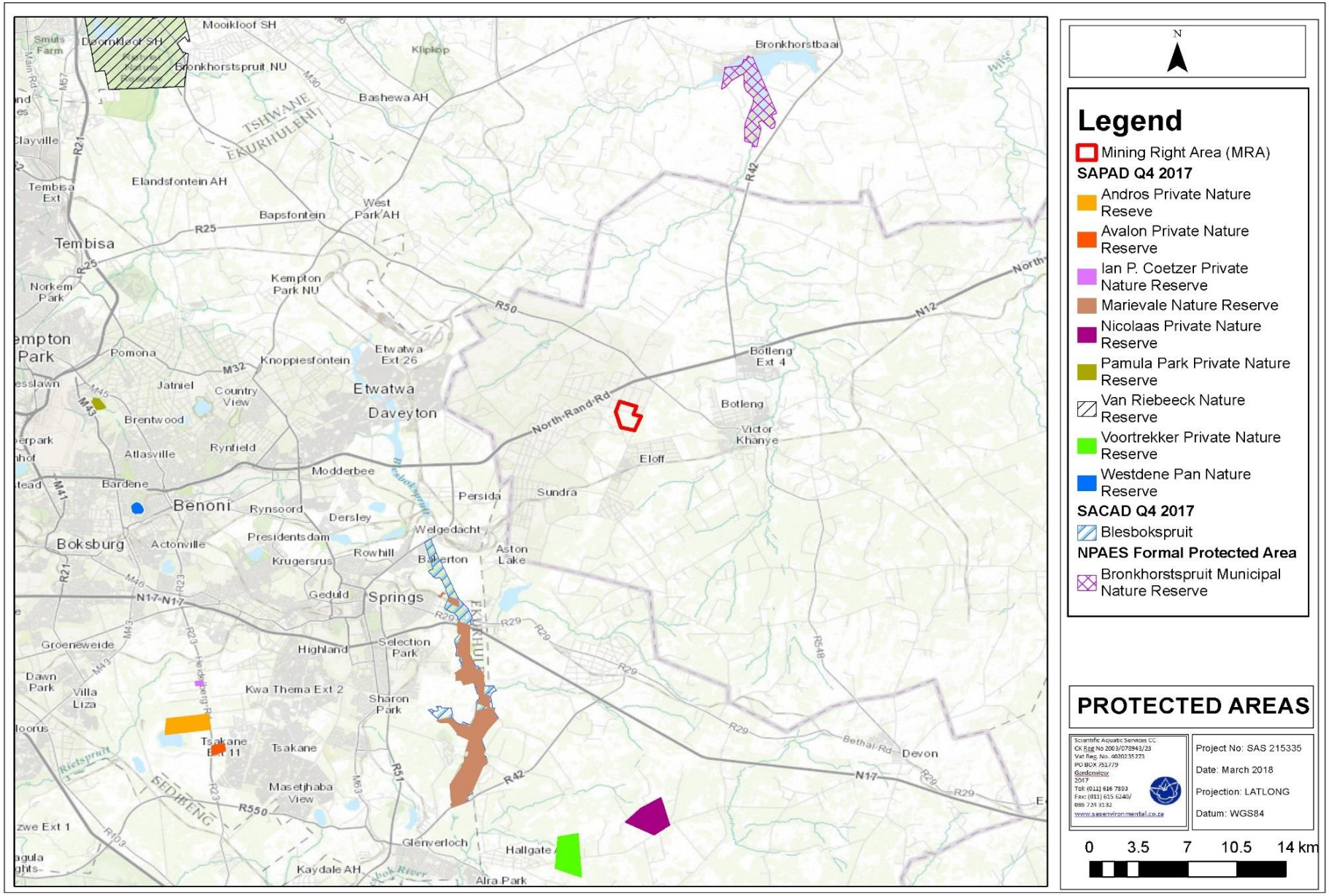


Figure 7: The location of SAPAD (2017), SACAD (2017) and NPAES protected areas in relation to the MRA area.

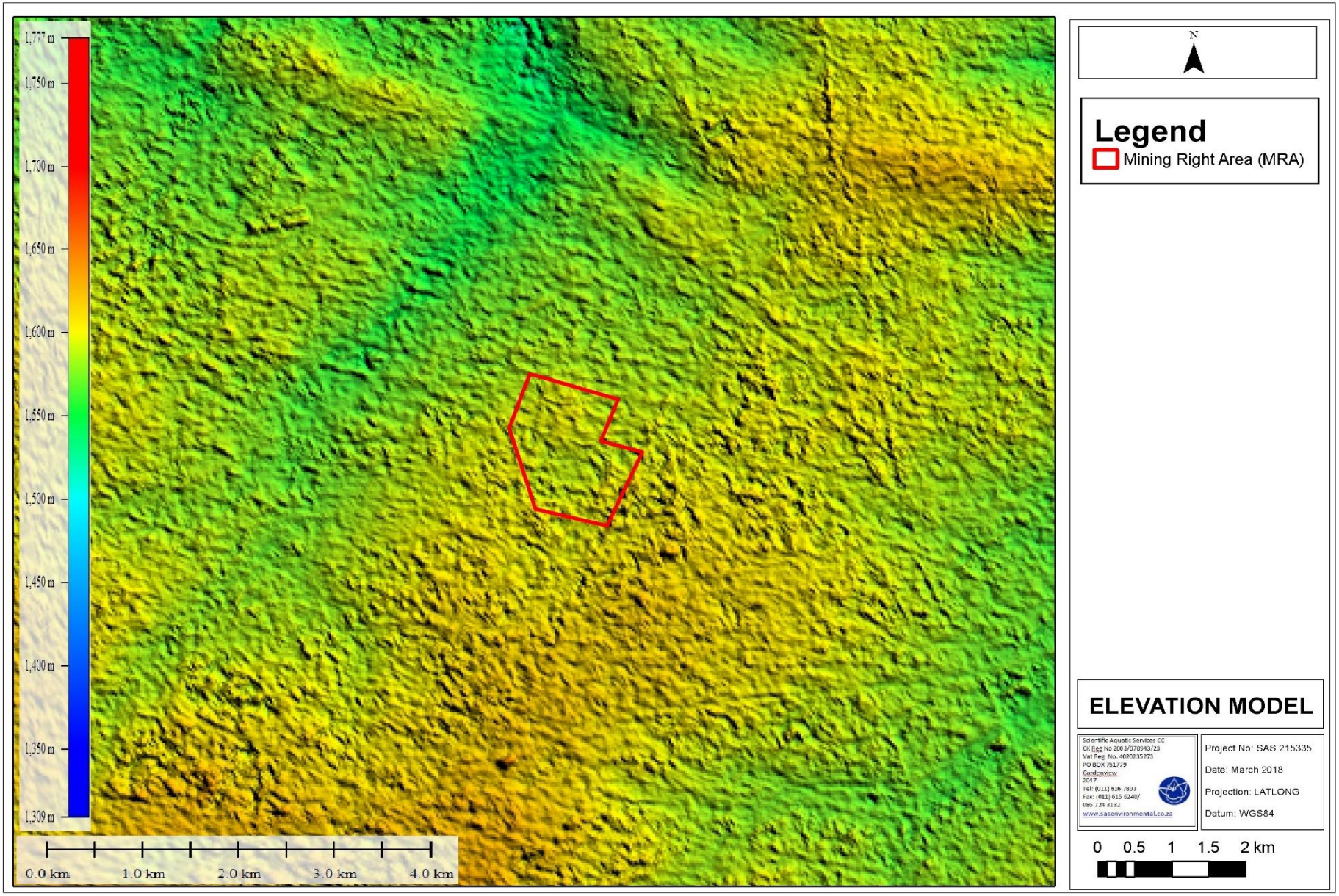


Figure 8: False colour elevation rendering depicting the topographical character of the MRA area and surrounding region.

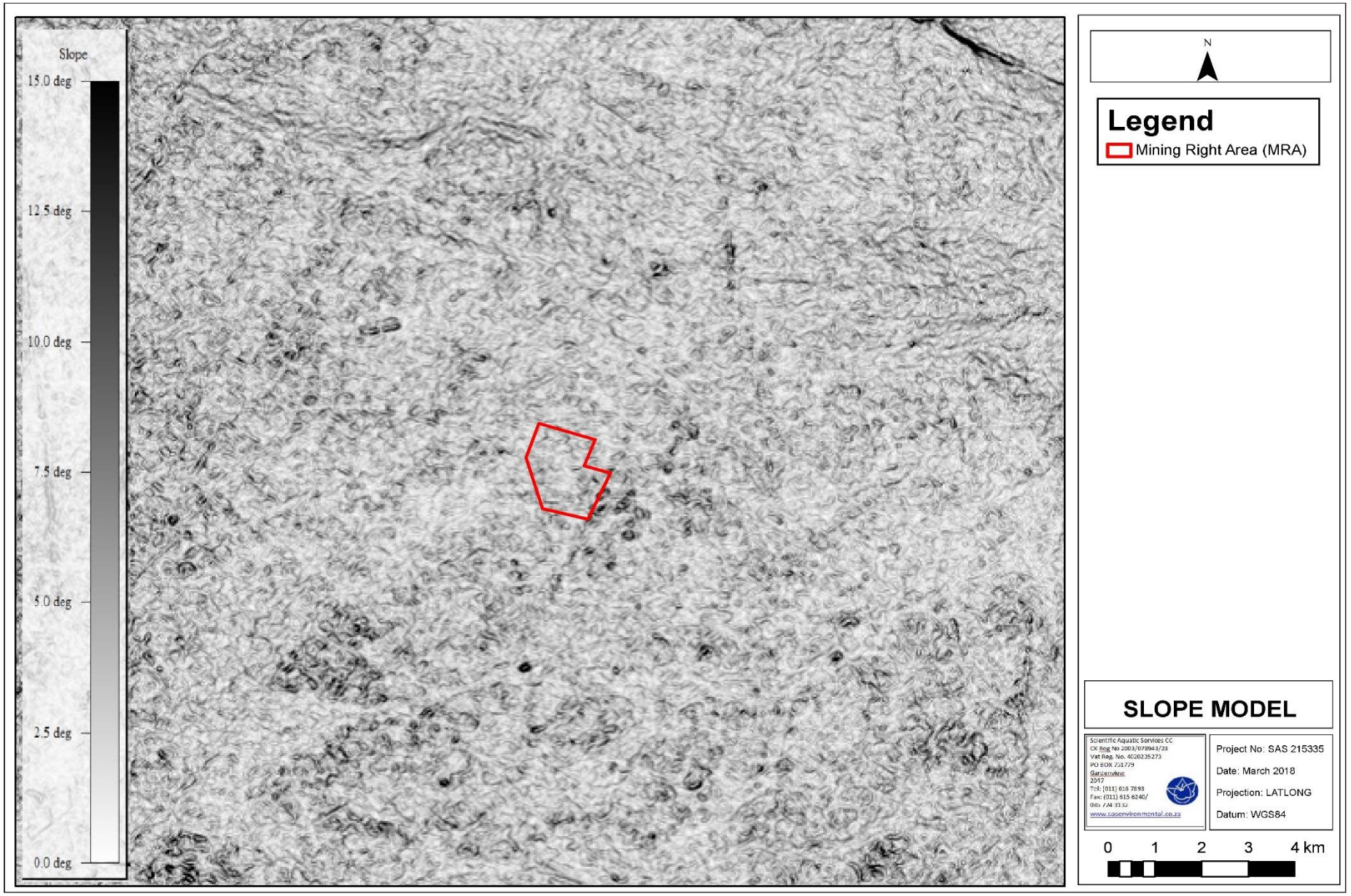


Figure 9: Monochromatic map indicating the general relief associated with the MRA and surrounding area.

5.3.4 Vegetation Cover

The MRA area falls within the Grassland Biome, the Mesic Highveld Grassland Bioregion and is situated within the Eastern Highveld Grassland vegetation type. The Eastern Highveld Grassland vegetation type occurs on slightly too moderately undulating plains including some low hills and pan depressions. The vegetation is short dense grassland dominated by a typical Highveld grass composition (*Aristida* spp., *Digitaria* spp., *Eragrostis* spp., *Themeda* spp., and *Tristachya* spp.) including small, scattered rocky outcrops providing habitat for wiry, sour grasses and some woody species such as *Vachellia caffra, Celtis africana, Diospyros lyciodes* subsp. *lyciodes, Parinari capensis, Protea caffra, P. welwitschii* and *Searsia magalismontana* subsp. *magalismontana*.

The majority of the vegetation associated with the MRA area has been transformed by agricultural activities, with remnant patches of natural, undisturbed grassland present, including rocky outcrop areas as well as wetland features, which are also utilised as grazing for livestock. Stands of mainly alien trees are mostly present in the vicinity of homesteads and vegetation of low height in the form of grassland dominates the vegetation. The occurrence of bare and exposed soils is limited.

Vegetative cover and vegetation integrity influence the Visual Absorption Capacity (VAC) of a development site and may also impact on the degree of visibility and visual intrusion of a project.

5.3.5 Landscape Character

Key aesthetic aspects of the landscape associated with the project area are described in Appendix B. As described, the landscape associated with the project area exhibits an overall common discernible pattern which may be attributed to the rural nature of the area, undulating thicket and grassland vegetation interspersed with irrigated farmland.

The landscape associated with the MRA area and its immediate surroundings exhibit a common, discernible pattern, is considered to have broadly similar landforms, vegetation and settlement configurations, and thus comprise a single landscape character type. This landscape character type can be described as rural, gently undulating open grassland, interspersed with cultivated fields, alien tree stands and low-density development (Figure 10).

Figure 10: Landscape character of the region associated with the MRA area, indicating grassland, alien tree clumps and low density development.

In addition to the aspects described in Appendix B, 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. Although these aspects are hard to quantify, it can be said that the landscape in its current state exhibits a positive viewing experience and mining within the MRA area will result in partial loss of this landscape character type within the region.

5.3.6 Visual Absorption Capacity (VAC)

Through applying the scoring categories as outlined in Appendix C, the scores as shown in Table 3 below have been calculated for the MRA area.

Table 3: VAC Scores achieved.

Factor	Score obtained	Motivation
Vegetation	**2**	Vegetation is low and continuous with overall good cover. Bare soils are periodically present where cultivated fields are cleared and tall trees association with alien tree clumps are present.
Soil contrast	**2**	Due to bare soils being periodically visible within cultivated fields, surface disturbance and soil contrast would be less detracting within such area than within natural grassland areas.
Visual variety	**2**	The vegetation within MRA area is largely homogeneous when viewed from a distance, but visual variety is present due to local landforms and steep slopes.
Topographical diversity	**2**	Undulating slopes, rocky outcrops and wetland features are present within the MRA area, with an overall moderate level of topographic variety.
Recovery time	**2**	Due to the dominant vegetation within the MRA area comprising grassland, the recovery time of the environment is considered to be of medium duration.
Total	**10**	**Medium**

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. The total score for the Rietkol MRA areaarea added to 10, which defines the VAC as medium.

Due to the nature of the project and its location within a region currently unaffected by significant mining activity, the proposed project will lead to a moderate level of visual intrusion on the landscape and is expected to be clearly noticeable in relation to its surroundings. However, the undulating landscape, the overall limited height of the proposed surface infrastructure and the inherent VAC of the MRA area, will serve to somewhat limit such intrusion from certain receptor sites. In addition, the MRA area is somewhat screened by the vegetation and existing infrastructure, and existing light industrial activities are present in the region.

5.3.7 Landscape Quality

Through applying the scoring categories as outlined in Appendix D, the following scores have been calculated for the MRA area:

Table 4: Scenic Quality – Results and motivation.

Factor	Score obtained	Motivation
Landform	**1**	The MRA area contains no prominent hills, steep slopes or vertical areas, but is characterised by gently undulating topography.
Vegetation	**3**	Little variety in vegetation is present as land cover is dominated by grasslands and cultivated fields, however large stands of alien trees are also present.
Water	**3**	Water is present within the landscape, but does not visually dominant in the MRA area.
Colour	**1**	The colours associated with the landscape are generally muted with subtle contrast.
Adjacent Scenery	**3**	Adjacent scenery, with the same landscape character results in a cumulatively greater landscape viewing experience.
Scarcity	**1**	The landscape character type is representative of the larger region and is not considered to be particularly scarce.
Cultural Modifications	**0**	Cultural modifications and modern, man-made structures are largely absent from the MRA area.
Total	**12**	Medium

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. The total score for the MRA area calculated as 12, and thus the overall landscape is considered to have medium scenic quality and is considered to exhibit a mostly positive character, although some detracting features are present.

5.3.8 Landscape Value

With reference to Appendix E, the MRA area itself is likely to be most valued by local residents and workers and, as far as is known, does not contain specific value for special interest groups and is not known to be of provincial, national or international cultural historical importance.

In terms of heritage value, the heritage consultant for the project noted isolated Middle Stone Age flakes within the MRA area, but no intact primary site or stone knapping sites were recorded and no formal tools were observed. In addition, an informal graveyard consisting of about 20 graves (which are expected to be of value to next of kin), as well as a number of ruins, of which two were homesteads and the other related to farming activities, exist within the project area (R&R Cultural Resource Consultants, 2017).

The proposed project may lower the landscape value of the MRA area through the direct loss of natural vegetation and historical and cultural artefacts.

5.3.9 Sense of Place

Sense of place is the unique value that is allocated to a specific place or area through the cognitive experience of the user or viewer. It is created by the land use, character and quality of a landscape, as well as by the tangible and intangible value assigned thereto. The landscape character type, defined as rural, undulating open grasslands, interspersed with cultivated fields and low-density development, is not unique to the MRA area and can also be found within the larger region. The sense of place associated with the MRA area, is therefore not highly significant when compared to its surroundings, but the rocky outcrops towards the centre of the MRA area and local landscape diversity in combination with the calm nature of the site, do provide some visual interest.

5.4 Visual Receptors

With reference to Appendix F, the main visual receptors include highly sensitive visual receptors such as local residents of towns, informal settlements and hamlets, farmers, workers on farms and smallholdings within the immediate vicinity of the MRA area, as well as residents, farmers and workers on farms located further away from the MRA area within areas from where the proposed project will also be visible. The immediate region associated with the MRA area is not specifically known to be a tourist area, however birders are known to visit the greater area as part of the Bapsfontein District birding loop. Moderately sensitive visual receptors include road users travelling past the area on the N12 to the north, the R50 to the northeast and the R555 to the south (as well as on less prominent roads) *en route* to other destinations, who will only be exposed to the proposed infrastructure for limited periods of time. The location of the various receptors is indicated in Figure 11.

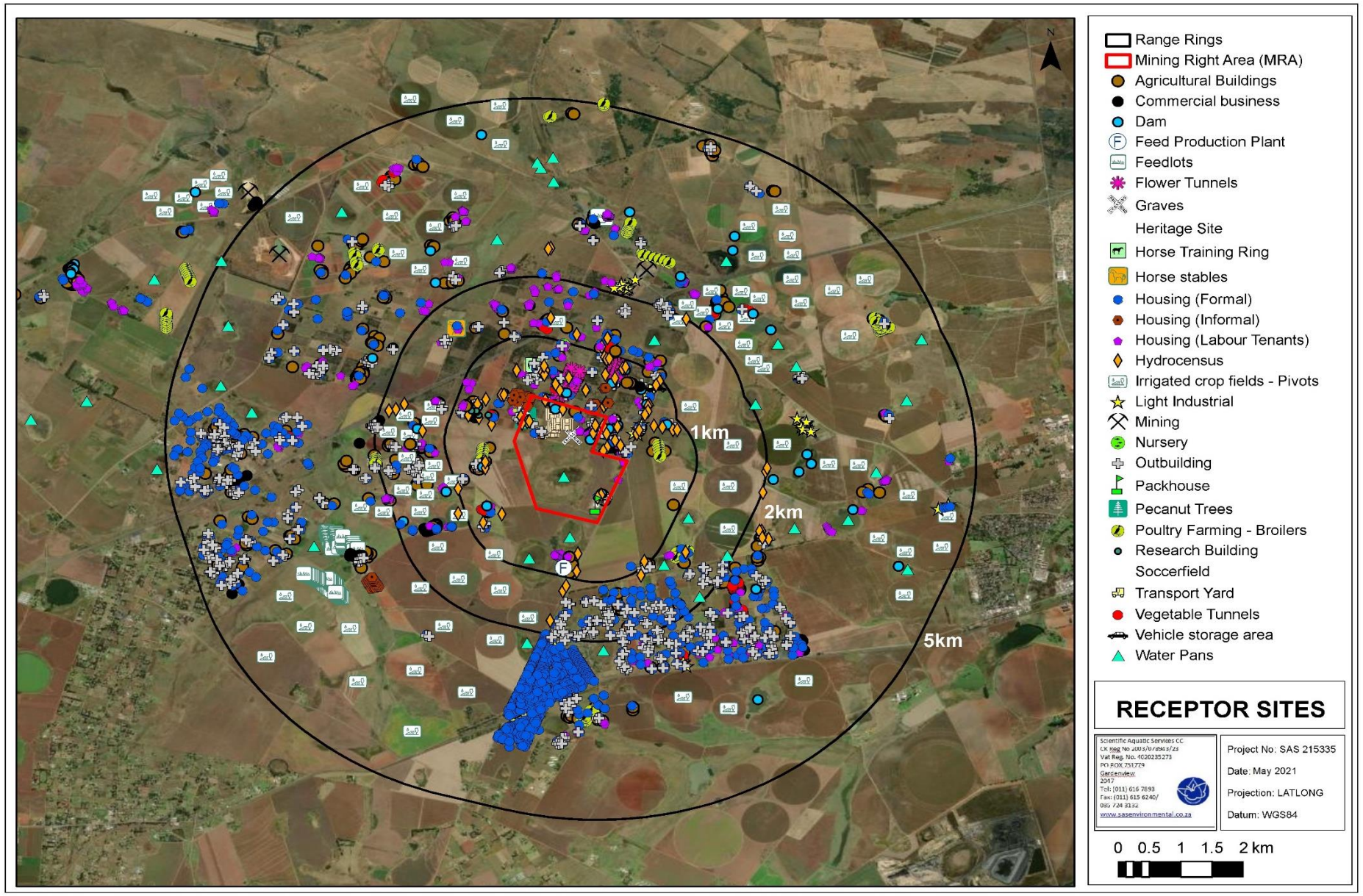


Figure 11: Receptor sites location within 5km of the MRA area.

5.5 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 (refer to Section 5.4 and 5.6). Visibility, in turn, is determined by distance between the components of a proposed project and the viewer and tends to diminish exponentially with distance.

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 are indicated in the table below.

Table 5: 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 10 to 15km+

Three distance zones have been identified (adapted from 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 highways, rivers, or other viewing locations which are less than 2 km away;
- Middleground – includes sub-regional areas located less than 5km away
- Background – includes sub-regional areas located between 5km and 10km away; and
- Seldom seen – includes areas that are not part of the foreground-middle ground or the background and that are generally hidden from view further than 10km away.

Figure 12 below indicates the receptors located within 5km of the proposed mining infrastructure and operations. The proposed project is expected to be highly visible to

receptors present within 2km thereof, as these areas fall within the high visibility zone as well as within the foreground of viewers – this is further supported by the results of the line of sight and KOP analysis and taking the proposed project heights into consideration. The proposed project will be moderately visible to receptors within 2-5 kilometres of the MRA area, from areas with a clear line of sight towards the MRA area.

Based on findings from both the desktop and field analyses, the proposed project is further expected to be marginally visible beyond 5km of the MRA area and hardly visible beyond 10km, taking screening from existing vegetation and general infrastructure into account, and then only from areas with a clear line of sight towards the proposed infrastructure.

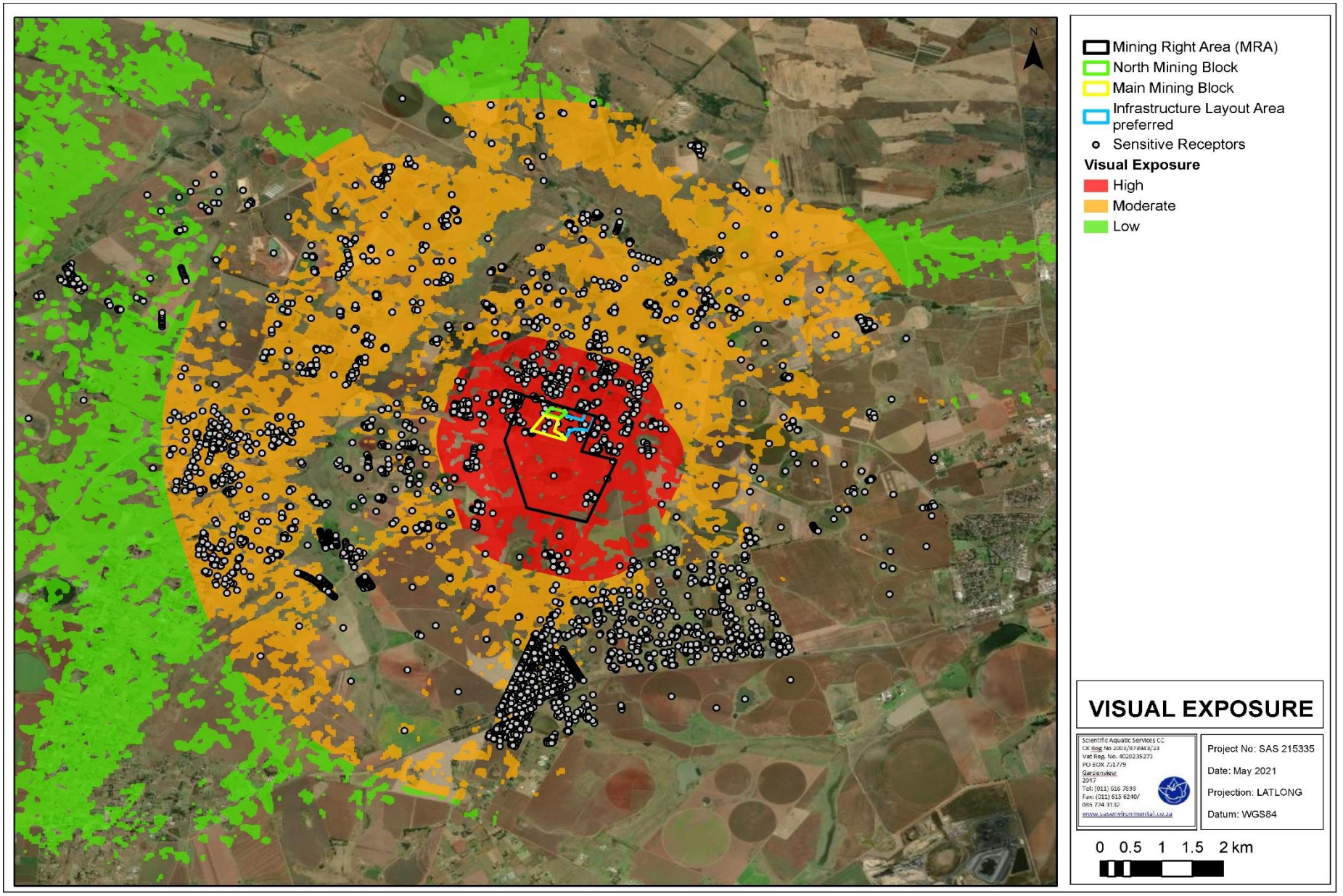


Figure 12: Visual exposure map.

5.5.1 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 available contour data, and applying a viewshed analysis using GIS software, whereby 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, whereby such intervening objects will modify the viewshed at ground level.

The viewsheds created by the proposed project infrastructure are illustrated in Figures 13 – 15 below, with 1km, 2km, 5km and 10km distance radii or buffers also indicated.

Figure 13 indicates the viewshed analysis of the proposed 2.4m high concrete palisade perimeter fence, with Figure 14 showing the combined viewshed of all the proposed aboveground infrastructure areas, including the processing plant, weighbridge, screening facilities, offices, laydown areas, stockpiles etc. The viewshed generated by parking areas, internal access roads and the open cast pit is not included in the assessment, since those areas will be screened from view by the perimeter fence surrounding the 20-year mining area. Figure 15 indicates the combined viewsheds of the perimeter fence and all infrastructure components higher than 2.4m, with the heights used is the calculations as set out in Section 4.1.

From the viewshed analyses (which does not take into account vegetation and local topography), it is evident that the proposed project will be highly visible from within 1km of the MRA area, mainly as a result of the perimeter fence and the infrastructure components of increased height such as the various stockpiles and conveyors, the processing and crusher plant as well as screening, washing and drying facilities. The proposed mining infrastructure will be mostly visible from the north and west of the MRA area up to a distance of 5km. Beyond 5km it is unlikely that the perimeter fence will be highly visible, however the processing plant and other facilities may be visible from the southwest, west and northwest at a distance further than 5km. Although the viewshed may extend beyond 10km of the MRA area to the northwest, it is important to note that at a distance further than 10km from a development, visual exposure and visibility is expected to significantly decrease due to objects being difficult to distinguish from the background at such significant distances.

The viewshed analysis further indicates that the proposed project will be highly visible from the N12 and R50 in the vicinity of the MRA area but will not be highly visible from the R555. The proposed project is likely to only be intermittently visible from these main roads due to screening from existing infrastructure and vegetation, and due the limited duration of road users' visual exposure to the Rietkol Project.

From the viewshed analysis, it was also found that the proposed project will not be visible from the town of Delmas, the most prominent town in the region.

It is important to note that the visual impact from mining infrastructure is not expected to be permanent, provided that grading and final rehabilitation of impacted areas, including the main open cast pit, take place to blend in with the surroundings, and that the mine processing plant and related will be demolished upon mine closure.

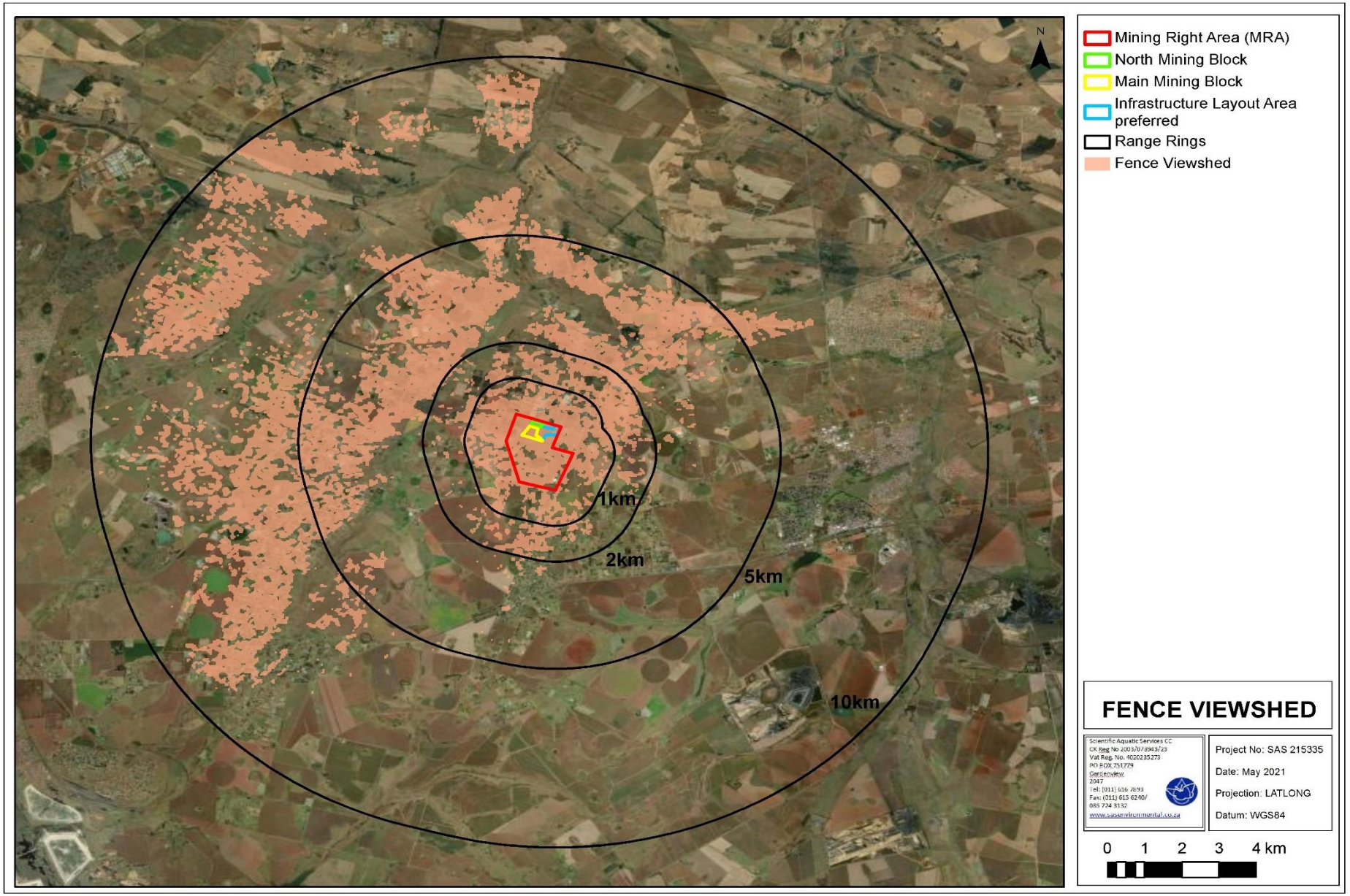


Figure 13: Viewshed (indicated as shaded areas) of the proposed perimeter fence (2.4m) overlaid ontodigital satellite imagery.

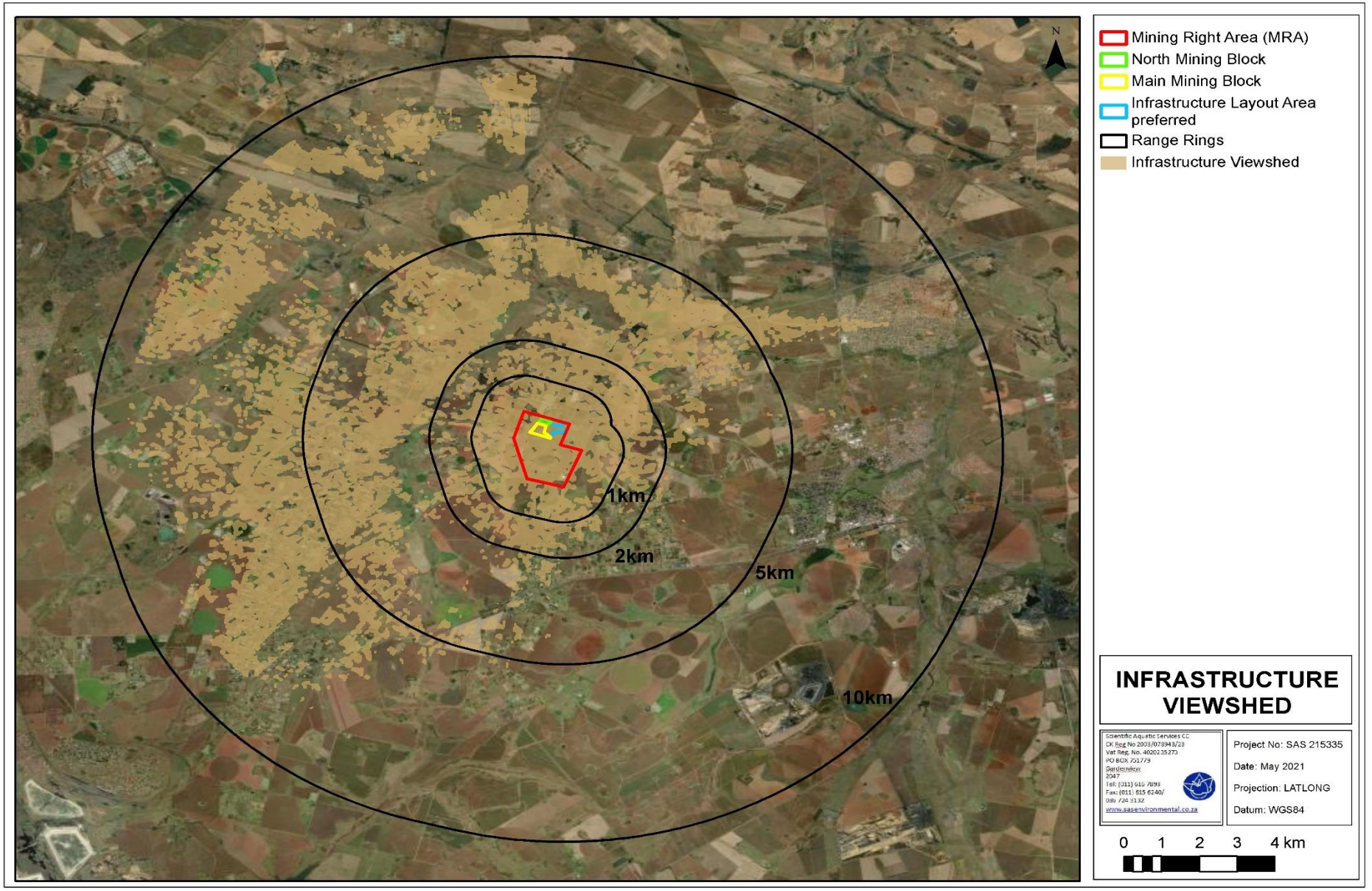


Figure 14: Combined viewshed (indicated as shaded areas) of all proposed surface infrastructure components of various heights overlaid onto digital satellite imagery.

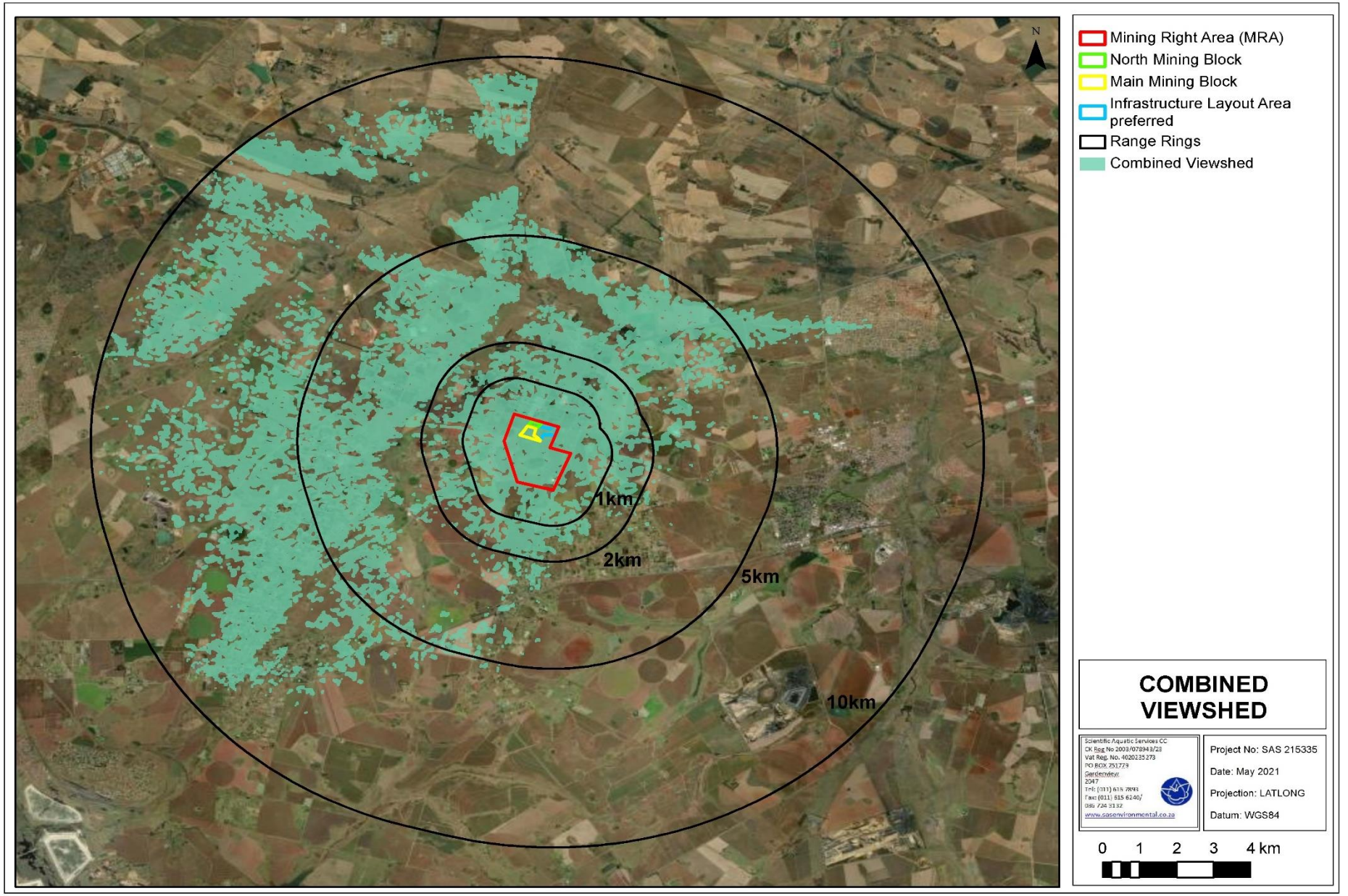


Figure 15: Combined viewshed (indicated as shaded areas) of all proposed mining infrastructure overlaid onto digital satellite imagery.

5.5.2 Line of Sight Analysis

A line of sight and elevation profile analysis was 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 were evaluated, extending from possible receptor sites towards the centre of the project area. The visibility of each point along the cross section was calculated though the use of the Google Earth Pro Elevation Profile function. The function only evaluates the topography of the area with land cover, existing manmade infrastructure and vegetation not taken into account. To ensure the line of sight is fully assessed the height of the proposed infrastructure, to scale with respect to each cross section, has been incorporated, based on the proposed project layout.

The locations of the cross sections are indicated in Figure 16 below, with the various cross sections included in Figures 17 and 18, where a clear line of site towards potential receptors are indicated in red, while an obstructed line of sight is shown is shown in green. Although receptor sites beyond 5km of the MRA area are not indicated in Figure 16, the main receptors, including residential areas and main roads, beyond 5km were also considered in the line of sight analysis. The results of the analysis, specific to the location of each cross section may be summarised as follows:

- Cross Section A: Residential development, as well as the Blesbokspruit Protected Area. Located beyond 10km to the southwest of the MRA area will be effective screened from viewing the proposed Rietkol Project through topography, while residents of the Modder East Orchards A.H., located immediately adjacent to the project will have a clear view thereof. A clear line of sight also exists between the proposed mining infrastructure areas and various prominent roadways, such as the R555, the R50 and the N12 along this cross section.
- Cross Section B: Along Cross Section B, running in a south-north direction, it is evident that, the majority of Eloff Small Holdings, located to the south of the MRA area, will not have a clear line of sight towards the proposed project, with only the northern portion of Eloff having an unobstructed view towards the proposed infrastructure. Road users on the R555 will also be effectively screened, while road users on the N12 and R50 north of the MRA area will have an unobstructed view towards the proposed project. Residents of Modder East Orchards A.H., particularly those residing to the south of the N12 will be visually impacted by the proposed project.
- Cross Section C: Along this cross section, the majority of Eloff Small Holdings, with the exception of residents within the north of this area, will be effectively screened from the proposed project, while the majority of residents of Modder East Orchards A.H.,

south of the N12 will have a clear line of sight towards the project. The project is shown to be visible from the N12 along this cross section, but not from the R555 located approximately 5km to the south.

- Cross Sections D and E: These cross sections indicate that the majority of residents of Modder East Orchards A.H., as well as road users of the N12 highway will have unobstructed lines of sight towards the proposed infrastructure, while the project will be effectively screen from view from receptors to the southeast, including those residing within the town of Delmas.
- Cross Section F: Along this cross section, a clear line of sight is shown to exist between the proposed infrastructure and the R50 to the northeast and between the proposed infrastructure and the residents of Modder East Orchards A.H. The infrastructure also has a clear line of sight from Rietkol A.H., located to the southwest of the MRA area.

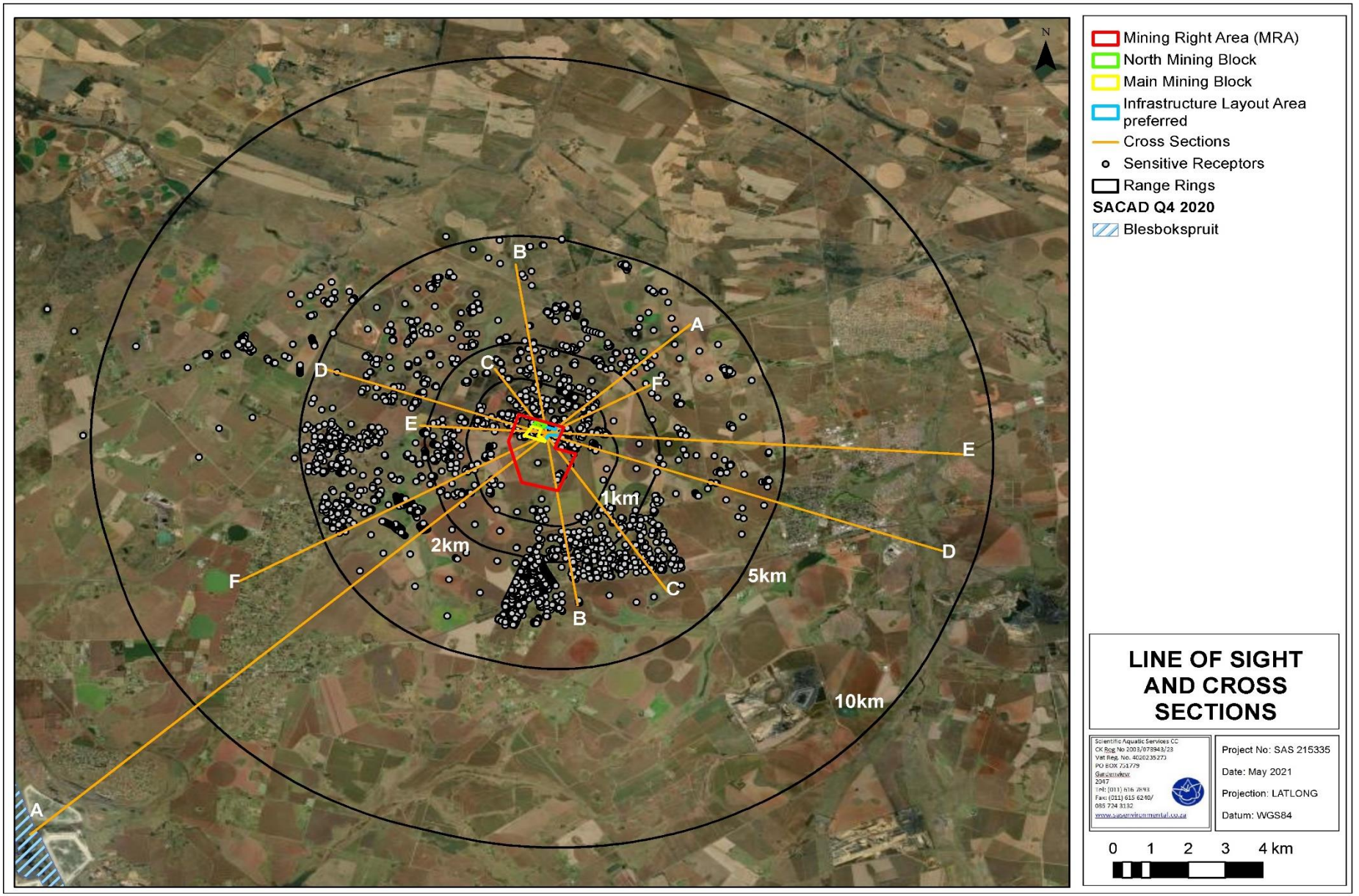


Figure 16: Location of cross sections used in the Line of Sight analyses (receptors beyond 5km of the MRA area are not indicated).

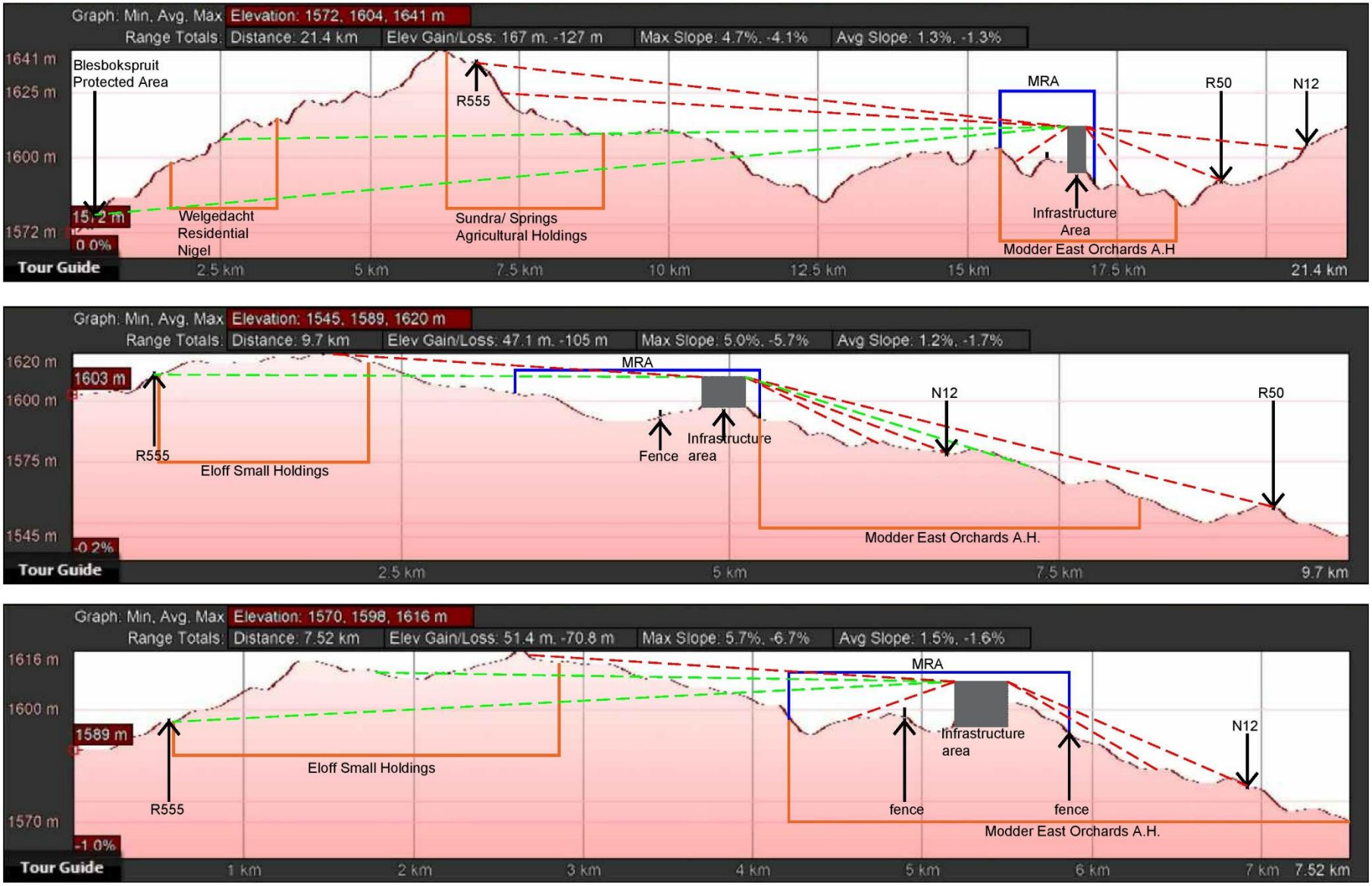


Figure 17: Results of the Line of Sight Analysis: Cross Sections A (top), B (middle) and C (bottom). Red lines indicate unobstructed lines of sight while green lines indicate that no clear line of sight exists between the receptor site and the proposed infrastructure.

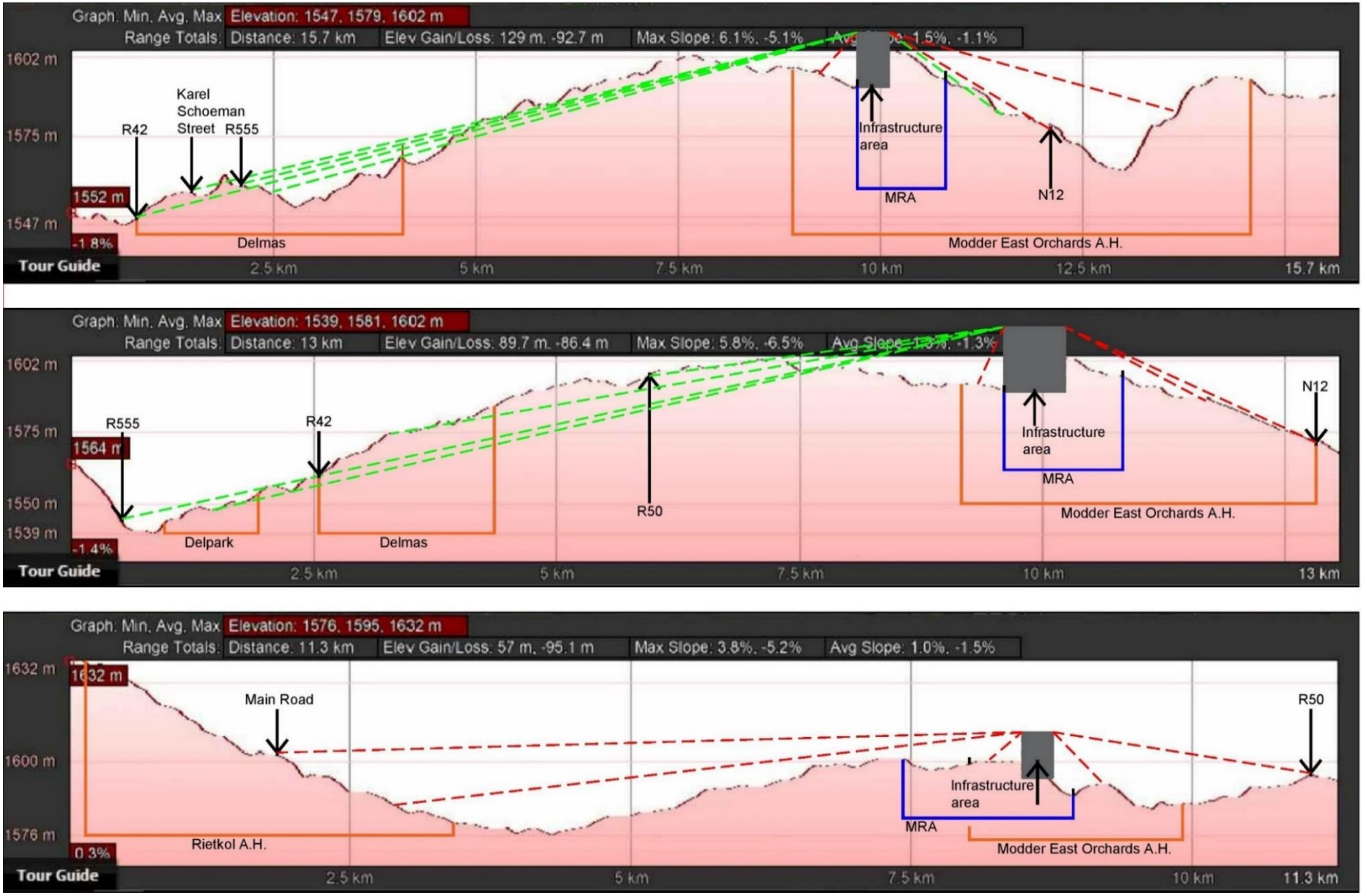


Figure 18: Results of the Line of Sight Analysis: Cross Sections D (top), E (middle) and F (bottom). Red lines indicate unobstructed lines of sight while green lines indicate that no clear line of sight exists between the receptor site and the proposed infrastructure.

5.6 Key Observation Points

Key Observation Points (KOPs) were identified based on prominent viewpoints, where mostly uninterrupted views of the proposed Rietkol Project are expected to occur and at points where positive viewshed areas intersect with potential receptors. The KOP analyses have been conducted by investigating the visual influence of the proposed infrastructure as per the available site layouts, taking into account that at a distance from the site alternatives, the visibility of the proposed infrastructure will be reduced. The majority of KOPs were therefore selected within 5km of the proposed project and no further than 10km, as visual receptors beyond this distance from the project are unlikely to be significantly affected. KOPs were also selected to be representative of a larger area, such as a section of a roadway or larger settlement, where required (IEMA, 2013).

Conceptual visual simulations were rendered from the KOPs selected for the proposed project and are included in Appendix G, with the location of KOPs indicated in Figure 18 below. All photographs were taken towards the proposed infrastructure 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 6 of this report, with specific emphasis on limiting vegetation clearing and retain large existing trees wherever possible, implementing dust and lighting control measures, and ensuring that progressive rehabilitation takes place and considering overall infrastructure appearance, the visual impact may be reduced.

A summary of the findings from the KOP analysis, with reference to Appendix G, is included in Table 6.

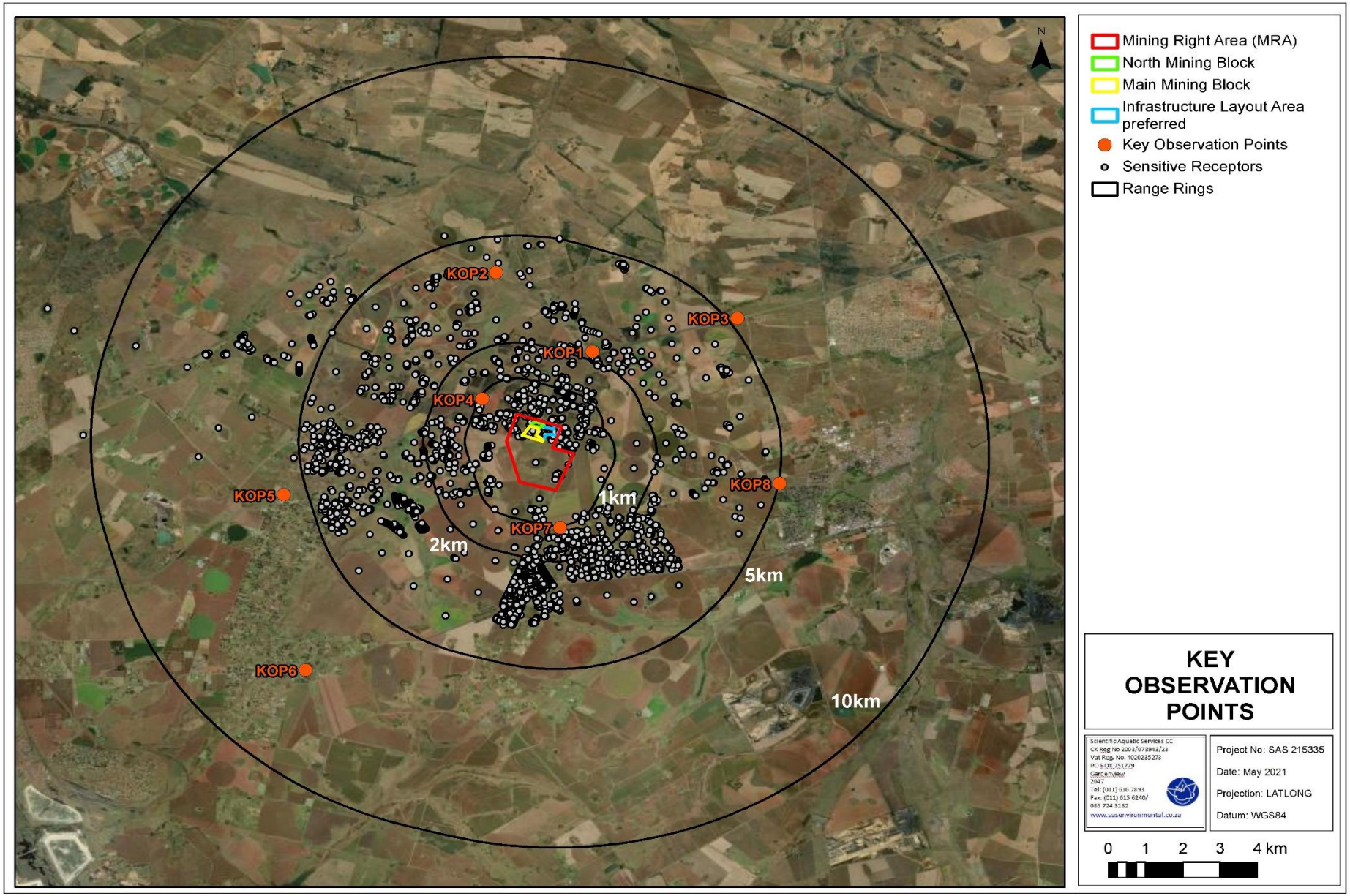


Figure 19: Location of Key Observation Points (KOPs), indicated in orange.

Table 6: Summary of results of the findings of the KOP analysis.

Key Observation Point (KOP)	Location	Distance from the MRA area	Receptor Sensitivity	Visual Exposure/ Visibility	Motivation
KOP 1	N12/ R50 intersection	2,2kkm to the northeast	Moderate - mostly road users	Moderate	Existing intervening infrastructure and vegetation will partially obscure views of the proposed project.
KOP 2	R50	4km to the north	Moderate - mostly road users	Moderate	Existing intervening infrastructure and vegetation will mostly obscure views of the proposed project. Views of the project from this area will be intermittent.
KOP 3	N12	5,6km to the northeast	Moderate - mostly road users	Low	Existing intervening infrastructure and vegetation will mostly obscure views of the proposed project. Views towards the proposed infrastructure are further obscured by distance.
KOP 4	N12 Modder East Orchards A.H.	1km to the northwest	High - permanent residents Moderate - road users	Moderate	Located within 2km of the MRA area. A high degree of screening is provided by existing infrastructure and vegetation at this location, however along other section of this road the infrastructure is expected to be highly visible.
KOP 5	N12 Riekol A.H.	5,7km to the southwest	High - permanent residents Moderate - road users	Low	Existing intervening infrastructure and vegetation will mostly obscure views of the proposed project. Views towards the proposed infrastructure are further obscured by distance.
KOP 6	R555 Sundra A.H.	7,8km to the southwest	High - permanent residents Moderate - road users	Low	Existing intervening infrastructure and vegetation will mostly obscure views of the proposed project. Views towards the proposed infrastructure are further obscured by distance.
KOP 7	Gravel road Eloff Smallholdings	1,2km to the south	High - permanent residents Moderate - road users	High	Located within 2km of the MRA area. Limited screening provided by existing infrastructure and vegetation.
KOP 8	R50 Delmas	5,5km to the east	High - permanent residents Moderate - road users	None	Complete screening is provided by local topography.

5.7 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 7). 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 7: Environmental zones.

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

Night lighting sources, mainly from existing residences are currently present within and adjacent to the MRA area, and vehicular light sources also coming from the adjacent gravel road and the N12 and R50 to the northwest and northeast of the MRA area respectively. The lighting environment of the MRA area is considered consistent with Environmental Zone E2 – Low District Brightness. Overall, although night-time lighting is currently impacting on the MRA area, this area is still considered to be relatively dark during the night.

The proposed Rietkol Project will operate during the night-time hours, and therefore additional night time lighting will be contributed, as lighting, including that of 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. It is important to note that Product will be transported from Monday through to Sunday during daylight hours only and the additional night time lighting will therefore not originate from beyond the MRA boundaries.

6. IMPACT ASSESSMENT

Potential impacts on the visual environment of the region as a result of the proposed Rietkol Project, as based on available information, are discussed in the sections below, according to the method outlined in Appendix H. 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, if they are fully implemented.

After consideration of the findings of the impact assessment, recommendations and mitigation measures have been developed that will assist in minimising the proposed project's visual impact to lower significance levels throughout the various development phases.

6.1 Impact Assessment

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

Table 8: Summary of the Risk Assessment of the proposed Rietkol Mining Project on the visual environment

ID	Sensitive Receptors	Potential Impact	Nature of Impact	Duration	Extent	Probability	Intensity	Weighting factor	Impact Significance WOM	Possible Mitigation Measures	Mitigation Efficiency	Impact Significance WM	Potential for residual risk
Pre-Construction Phase													
1	Highly sensitive receptors: Local Residents Moderately Sensitive Receptors: road users and potential tourists	• Visual intrusion of mining activities on sensitive receptors during the preconstruction phase, due to: - Positioning of visually intrusive infrastructure on higher lying areas where it will be visible for significant distances and within a clear line of sight from various visual receptor sites, during the planning phase. - Failure to plan for final closure and rehabilitation in the form of backfilling of open cast pits, final shaping, grading and revegetation, that may lead to further visual intrusion and receptor exposure impacts on the landscape character during later development phases.	Negative	Short Term	Site specific	Improbable	Low	Low to Medium	Low	• All effort should be made to ensure that the proposed extent of all surface infrastructure footprint areas and permanent structures is kept as small as possible and that the highest, most intrusive infrastructure are not located on the most visually exposed portions of the property. • As far as possible, surface infrastructure should be positioned in areas that have already been disturbed. • Areas of disturbance should be kept as small as possible and the areas cleared of natural vegetation and topsoil must be kept to a minimum. • Planning for closure and final rehabilitation must be initiated.	Medium	Low	Medium
Construction Phase													
2	Highly sensitive receptors: Local Residents Moderately Sensitive Receptors: road users and potential tourists	• Visual impact on the landscape character and Sense of Place associated with the MRA area and surrounding area during construction, due to: - Site clearing, including the removal of topsoil and vegetation within the mining	Cumulative Negative	Short term	District	Probable	Medium	Medium	Low to Medium	• Areas of disturbance should be kept as small as possible and the areas cleared of natural vegetation and topsoil must be kept to a minimum. • The duration of the construction period must be reduced as far as possible through careful project planning.	Medium	Low	Medium

		and mine infrastructure footprint areas leading to high visual contrast. - Construction of proposed mining infrastructure components including access roads. - An increase in dust and vehicular movement/ traffic due to construction activities. - Topographic alteration of the landscape within and adjacent to the MRA area.								• Dust management and suppression should take during the construction phase within all areas where excessive dust is noted. • It must be ensured that as far as possible all infrastructure is placed outside of delineated wetlands and natural topographical features, as such features can be considered visual resources.			
3	Highly sensitive receptors: Local Residents Moderately Sensitive Receptors: road users and potential tourists	• Visual intrusion of mining construction activities on visual receptors during the construction phase, due to: - General construction of mining infrastructure associated with the Rietkol Project. - Site clearing, including the removal of topsoil and vegetation - Increased amount of human activity, vehicles, and other equipment - Vegetation damage, - scarring of the terrain, and altering of landforms or contours	Cumulative Negative	Short Term	District	Probable	Medium	Medium	Low to Medium	• As proposed, existing infrastructure within the infrastructure layout should be repurposed for offices, workshops, ablution facilities, etc. to reduce the impact footprint and associated vegetation clearance requirements. • As far as possible, existing natural vegetation around the MRA area should be maintained, with particular reference to existing tall trees along the site perimeter. The eucalyptus trees on holdings 209 & 212 also provide a good visual buffer between the mine and the informal settlement on holding 152, and it is proposed that these trees be retained for the duration of the mining operations. • It is recommended that the perimeter fence be put in place prior to commencement of mining infrastructure within the MRA area for screening purposes. • Where screening of higher infrastructure components located within the direct line of site of highly sensitive visual receptors, is not possible, siting should take advantage of partial screening opportunities with specific mention of large existing or proposed new trees.	Medium	Low	Medium

										• Good housekeeping within the MRA area must be implemented throughout the duration of the construction phase and the construction site must be kept neat and orderly at all times. • It must be ensured that all buildings and other built structures fit its surroundings through the appropriate use of colour and material selection in order to lower the visibility of the proposed project. Painting or coating infrastructure components to match darker colours in the natural surroundings may reduce the distance required for effective screening. • 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. Bright white structures are to be avoided as these will contrast significantly with the natural surroundings. • The use of permanent signs and project construction signs should be minimised and visually unobtrusive.			
Operational Phase													
4	Highly sensitive receptors: Local Residents Moderately Sensitive Receptors: road users and potential tourists	• Visual impact on the landscape character and Sense of Place associated with the MRA area and surrounding area during operations, due to: - On-going mining activities and on-going operation of the processing plant. - Drilling, blasting, ground excavation and ongoing movement of vehicles leading to dust.	Cumulative Negative	Long term	District	Probable	High	Medium to High	Medium	• As proposed, the use on the North Block opencast area is to be used for in-pit tailings disposal in order to avoid the construction of additional surface tailings infrastructure. • Internal roads should be surfaced to minimise dust. • Access roads must be suitably maintained to limit and prevent erosion and dust pollution. • Ongoing dust monitoring is to be implemented. • Vehicle speed on unpaved roads must be reduced to limit dust generation.	Medium	Low	Medium

		- Increased proliferation of alien plant species and further transformation of natural habitat (rocky grasslands) leading to a change in landscape character. - Disturbance of soils and potential occurrence of erosion due to operational activities. - An increase in vehicular traffic on local roads as well as the maintenance of roads and infrastructure.							• Ongoing alien vegetation control and management should take place. • Transport of the mined resource should be optimised as far as possible to limit the number of additional vehicles on local and district roads.			
5	Highly sensitive receptors: Local Residents Moderately Sensitive Receptors: road users and potential tourists	• Visual intrusion of mining activities on visual receptors during operations, due to: - Ongoing opencast mining and operational activities, including conveying and processing of materials. - Presence of mining infrastructure. - Increased traffic and increased presence of mining vehicles on the local roads - Ongoing loss of vegetation, scarring of the terrain, and alteration of landforms and contours.	Cumulative Negative	Long term	District	Highly Probable	High	Medium to High	Medium to High	• As far as possible, existing roads are to be utilised, also for construction purposes, to limit cumulative impacts from roads and traffic. • Transport of the mined resource should be optimised as far as possible to limit the number of additional vehicles on local and district roads. • As far as possible, natural contours must be followed during infrastructure placement and cut and fill activities should be kept to a minimum. • Infrastructure heights should be designed to be a low as possible. • All operational facilities should be actively maintained.	Medium	Medium	Medium

6	Highly sensitive receptors: Local Residents Moderately Sensitive Receptors: road users and potential tourists	• Visual impacts from night time lighting, due to: - 24-hour operations impacting on receptors accustomed to a low district brightness during night time. - Exterior lighting around buildings, parking areas, and other work areas. - Security and other lighting around and on support structures and conveyors could also contribute to light pollution. - Lighting at night from operational vehicles within the MRA area. - Maintenance activities conducted at night, such as mirror or panel washing, might require vehicle-mounted lights which could also contribute to light pollution. -	Cumulative Negative	Long term	District	Highly Probable	High	Medium to High	Medium to High	• Transport of mined material on public roads must be limited to daylight hours only, as proposed. • A lighting engineer may be consulted to assist in the planning and placement of light fixtures for the mining facility and all ancillary infrastructures in order to reduce visual impacts associated with glare and light trespass. • Placement of lighting outside of the MRA boundary should be limited to security lighting at the main entrance. • Outdoor lighting must be strictly controlled. • The use of high light masts and high pole top security lighting should be avoided. Any high lighting masts should be covered to reduce sky glow. • Up-lighting of structures must be avoided, with lighting installed at downward angles that provide precisely directed illumination beyond the immediate surrounding of the mining infrastructure, thereby minimising the light spill and trespass. • Care should be taken when selecting luminaries to ensure that appropriate units are chosen and that their location will reduce spill light and glare to a minimum. Only “full cut-off” light fixtures that direct light only below the horizontal must be used on the building. • Censored and motion lighting may be installed at office areas, workshops and other buildings to prevent use of lights when not needed. • Minimum wattage light fixtures should be used, with the minimum intensity necessary to accomplish the light's purpose. • The use of low-pressure sodium lamps, yellow LED lighting, or an equivalent reduces skyglow and wildlife impacts.	Medium	Medium	Low

										Bluish-white lighting is more likely to cause glare and attract insects.			
Decommissioning and Closure Phase													
7	Highly sensitive receptors: Local Residents Moderately Sensitive Receptors: road users and potential tourists	• Visual intrusion of mining activities on visual receptors during the decommissioning and closure phase, due to: - General decommissioning activities including the dismantling of infrastructure. - Potential ineffective decommissioning and rehabilitation leading to permanent presence of mining infrastructure. - Potential ineffective final rehabilitation actions resulting poor vegetation cover, erosion being present, infrastructure remaining, and open cast pits not being adequately backfilled and shaped.	Negative	Temporary	Site specific	Probable	Low	Low to Medium	Low	• Once mining activities have been completed, it must be ensured that all mining infrastructure be removed from site, that all open cast pits have been completely of partially backfilled, and that all bare areas are sufficiently graded and vegetated to blend in with the surroundings. • In the case of the main open cast pit, which will only be partially backfilled due to an expected deficit in inert backfilling material available, this feature should be filled with water and rehabilitated to have a natural appearance.	Medium	Low	Medium

6.2 Impact Summary

Based on the above assessment, several possible impacts could occur, that may affect the visual character of the area and impact on potential sensitive receptors and visually sensitive landscapes.

Table 9 below summarises the findings of the impact assessment, indicating the significance of the various impacts without mitigation (WOM) takes place and the likely impact significance if effective management and mitigation takes place, i.e. with mitigation (WM).

Table 9: Summary of the results obtained from the assessment of visual impacts from Alternative 1 of the proposed project.

Pre-Construction phase		
Impact	**WOM**	**WM**
1: Visual intrusion of mining activities on visual receptors	Low	Low
Construction phase		
Impact	**WOM**	**WM**
2: Impact on landscape character and sense of place	Low to Medium	Low
3: Visual intrusion of mining activities on visual receptors	Low to Medium	Low
Operational phase		
Impact	**WOM**	**WM**
4: Impact on landscape character and sense of place	Medium to High	Medium
5: Visual intrusion of mining activities on visual receptors	Medium to High	Medium
6: Visual impacts from night time lighting	Medium to High	Medium
Decommissioning Phase		
Impact	**WOM**	**WM**
7: Visual intrusion of mining activities on visual receptors	Medium Low	Low

6.3 Impact Discussion

Several potential risks to the visual environment that may occur as a result of the proposed mining project, are further described:

- The proposed project may impact on the existing landscape and visual character of the region and Sense of Place associated with the MRA area and its immediate surroundings. The character of the landscape in the region of the MRA area is currently dominated by gently undulating topography interspersed with cultivated fields, alien tree stands and low-density development, with the vegetation comprising open grassland vegetation, typical of the region. The MRA area itself and it immediate vicinity have not previously been exposed to mining activities and the overall character of the landscape is therefore at risk to be altered by the proposed mining activities. It is however important to note that some light industrial activities are currently present in the region;

- The altered visual environment during the various development phases of the proposed mining project may lead to high levels of visual intrusion on the MRA area, some incompatibility with the surrounding land uses as well as high levels of visual contrast. This in turn will negatively impact on the existing medium to high VAC (the ability of an area to visually absorb development) of the MRA area;
- The proposed mining project may impact on visual exposure and visibility, which relates directly to the perception of sensitive visual receptors towards the project. Sensitive visual receptors have been determined to primarily comprise of residents living within 5km of the proposed project and local roads users. Direct visual exposure will take place as a result of mining infrastructure being visible to residents of the various settlements in the immediate vicinity of the MRA area, as well as indirectly through fugitive dust generated by construction and operation related activities, such as construction vehicles driving on dirt roads, as well as blasting and earthworks activities. Temporary stockpiles associated with opencast mining and the upgrading of access roads will also alter the visual environment. In addition to physical mining infrastructure, impacts from clearing of vegetation, potential erosion as a result of bare soils and alteration of local topography will also create contrast in the landscape and will be highly visible to receptors; and
- Lighting associated with the proposed project may be visible during both day and night, but is more likely to have an adverse visual impact during the night-time. Lighting from operational activities during the 24-hour operations may be visible for significant distances (beyond 5km) and indirect lighting impacts may reduce the night sky quality at locations some distance from the light sources.

6.4 *Cumulative* Impacts

Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time. Cumulative visual impacts resulting from landscape modifications as a result of the proposed project in conjunction with further planned mining activity within the region is likely to be of high significance, even more so due to the fact that no existing mining activities is currently present within the MRA area and its immediate surrounds. The cumulative impact of additional traffic on the local and regional roads will also occur and affect the sense of place of the larger region.

6.5 Residual Impacts

Certain surface infrastructure components, including opencast mining areas, may remain present once decommissioning has occurred, with the main open cast pit expected to remain

in the form of an open water body. It is also possible that the development of the proposed infrastructure may lead to permanent scarring of the landscape and possible permanent alteration or loss of natural elements and features. Some mining infrastructure may also remain present after closure. Alien and invasive vegetation is likely to proliferate as a result of disturbance due to construction activities and may also remain present after decommissioning. Revegetation of cleared and other impacted areas and rehabilitation of any impacted areas therefore have the potential to be unsuccessful, which will lead to a long term or permanent visual impact in the area.

6.6 *Alternatives*

6.6.1 No-Go Alternative

Should the proposed Rietkol Project not be developed, no additional visual impacts will occur.

6.6.2 Access Route Alternative

Two access road alternatives are considered for the Rietkol Project, namely Alternative Access Road South and Alternative Access Road North. Access Road South is a wide gravel road which will require minimum upgrading (Jacana Environmentals CC, 2021) and will have a lowered visual during the construction phase of the project. Since both roads are already present, from a visual perspective it is irrelevant which road will be utilised, as the roads are already present in the landscape. During the operational phase, whereby the access road is used by mining vehicles, both route alternatives are expected to have similar visual impacts.

6.6.3 Mine Residue Disposal

The mine schedule allows for North Block to be mined within a short period of time, where after slimes (tailings) will be pumped into the mined-out void. The alternative is to construct surface tailings facilities within the infrastructure area (Jacana Environmental CC, 2018). In-pit disposal of the mine residue as opposed to the construction of surface tailings facilities is preferred from a visual perspective, due to the lowered level of visual intrusion afforded by this alternative and a lowered risk of residual infrastructure remaining once mining activities have been concluded.

6.7 *Monitoring*

Visual monitoring, to ensure that mitigation measures regarding visual impacts are put in place and maintained, should be considered throughout all development phases. The following points aim to guide the design of the monitoring plan:

- The selected KOPs from where infrastructure is proven to be visible, should be used over the life of the project to review the success of the mitigation plan;

- The visual monitoring plan should be based on the following parameters:
  - Vegetation cover and height; and
  - Disturbance to receptors and recording of any complaints received.
- A decommissioning/ closure and final rehabilitation plan must be developed in order to ensure that the area's pre-development scenic quality and visual integrity is restored and maintained as far as possible. Important aspects addressed should include requirements on the backfilling of open cast voids, removal of all aboveground structures that the project site be re-graded and shaped, and that indigenous vegetation be re-established to be consistent with the surrounding landscape. In the case of the main open cast void, which will only be partially backfilled due to an expected deficit in available backfilling material and filled with water, the resulting water body should be shaped and vegetated to have a natural appearance;
- At decommissioning the success of rehabilitation would be based on the rate and percentage of vegetation recovery. Monitoring is to continue beyond decommissioning to ensure that the rehabilitation is successful and that the vegetation is self-sustaining and that no significant invasive floral species, resulting from disturbance from the project, are present;
- Vegetation must be monitored in line with the recommendations made by the floral specialist in terms of vegetation growth, density, height and species composition after decommissioning, to ensure that the proposed infrastructure footprint area is suitably revegetated;
- The maintenance of infrastructure must be monitored throughout the operational phase of the project; and
- Results of the monitoring activities must be taken into account during all phases of the proposed project and action must be taken to mitigate impacts as soon as unexpected negative visual effects from the proposed activities become apparent.

7. CONCLUSION

Based on the findings from both the desktop and the field assessments it is evident that the proposed mining project is located within a region considered to be relatively level, with gentle undulations and few distinguishing topographical features in the form of prominent hills or large outcrops present, although a large wetland pan is located within the southern portion of the MRA area. The VAC of the MRA area has been determined as being medium, with vegetation being largely intact and providing good cover. The overall landscape is considered to have medium scenic quality and exhibiting a mostly positive character, although some

detracting features are present. The sense of place associated with the MRA area, is not highly significant when compared to its surroundings, but local diversity in landscape features, including alien tree stands and rocky outcrops within the centre of the MRA area, do provide some visual interest.

With reference to the MRA area, the main visual receptors include local residents, farmers and workers on farms within areas from where the proposed project will be visible. The immediate region associated with the MRA area is not specifically known to be a tourist area, however birders may frequent the area. Other potential sensitive receptors are people travelling on the N12 highway, located to the north of the MRA area, the R50 to the northeast and the R555 to the south. The viewshed analysis indicates that the proposed project will be highly visible from portions of the N12 and R50 roadways but will mostly be obscured from view from the R555. The proposed project is likely to only be intermittently visible from these main roads due to screening from existing infrastructure and trees and due to the limited duration of visual exposure experienced by motorists.

Several potential risks to the receiving aesthetic and visual environment as a result of the proposed mining operation have been identified, relating to impacts on visual character and sense of place, visual intrusion and visibility of mining infrastructure. Based on the impact assessment, it was found that the various potential visual impacts identified will be most significant during the operational phase of the project.

Should it be deemed appropriate to mine the resource, mitigation measures will have to be implemented in order to minimise the visual impacts, with specific reference to the consideration of material selection, making use of screening opportunities, effective management of night-time lighting and dust and implementing good housekeeping measures during the operational phase of the project, ongoing invasive species management throughout the construction and operational project phases, as well as limiting residual aboveground infrastructure post-closure.

It is the opinion of the specialists that this study provides the relevant information required in order to ensure that the best long term use of the resources on the property will be made in support of the principle of sustainable development. From a visual perspective, the project is not considered to be fatally flawed and all potential impacts have the potential to be reduced though mitigation.

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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, powerlines, 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:

Very high visual impact expected:
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.

High visual impact expected:
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.

Moderate visual impact expected:
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.

Minimal visual impact expected:
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.

Little or no visual impact expected:
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.

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 was required for the proposed project (Oberholzer, 2005).

Level 1 input:
Identification of issues, and site visit;
Brief comment on visual influence of the project and an indication of the expected impacts / benefits.

Level 2 input:
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.

Level 3 assessment:
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).

Level 4 assessment:
As per Level 3 assessment, plus complete 3D modelling and simulations, with and without mitigation.
Review by independent, experienced visual specialist (if required).

APPENDIX B - 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 B1: Aesthetic and perceptual aspects of landscape character.

Aspect	Characteristics				Motivation
Scale	Intimate	Small	Large	Vast	The scale of the landscape is considered to be **large** due to significant vistas visible as one approaches the MRA area from the southwest and northeast, particularly when viewed from higher-lying areas.
Enclosure	Tight	Enclosed	Open	Exposed	The MRA area is **enclosed**, with buildings, cultivated lands and tall woody trees.
Diversity	Uniform	Simple	Diverse	Complex	The landscape is considered to be **simple**, with vegetation pattern, structures and type, as well as topography being large homogeneous.
Texture	Smooth	Textured	Rough	Very rough	The texture associated with the landscape is **textured** due to the dominance of cultivated fields and open grassland.
Form	Vertical	Sloping	Rolling	Horizontal	The dominant form of the landscape is **rolling**, due to gently undulating topography.
Line	Straight	Angular	Curved	Sinuous	When considering the larger area, the line landscape element is mostly **curved** with limited linear man-made elements present.
Colour	Monochrome	Muted	Colourful	Garish	The colours associated with the landscape are **muted**, with vegetation forming the dominant colour palette of shades of green. Limited seasonal colour is expected.
Balance	Harmonious	Balanced	Discordant	Chaotic	The landscape is considered to be **balanced** in terms of the relationship between the vertical and horizontal landscape elements.

Aspect	Characteristics				Motivation
Pattern	Random	Organised	Regular	Formal	The landscape pattern is **regular**, with elements being evenly spaced and well-balanced.
Movement	Dead	Still	Calm	Busy	The level of movement within the vicinity of the MRA area is **calm**, with moderately low levels of pedestrian and vehicular movement in the area of the MRA area (excluding main roads and towns).

APPENDIX C - 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 D1). Five factors have been considered, namely vegetation, soil contrast, visual variety, topographical diversity and recovery time.

Table C1: VAC Factors and Rating table.

Factors	Rating Criteria and Score		
Vegetation	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. **Score: 1**	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. **Score: 2**	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. **Score: 3**
Soil contrast	Surface disturbance would expose a high degree of contrast in colour with surrounding soil, rock and vegetation. **Score: 1**	Surface disturbance would expose a medium degree of contrast in colour with surrounding soil, rock and vegetation. **Score: 2**	Surface disturbance would expose only a low degree of contrast in colour with surrounding soil, rock and vegetation. **Score: 3**
Visual variety	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. **Score: 1**	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. **Score: 2**	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. **Score: 3**
Topographical diversity	Landform has low amount of topographic diversity and variety. **Score: 1**	Landform has moderate amount of topographic diversity and variety. **Score: 2**	Landform has high amount of topographic diversity and variety. **Score: 3**
Recovery time	Long-term recovery time (greater than 5 years) **Score: 1**	Medium recovery time (3 to 5 years) **Score: 2**	High (rapid) recovery time (1 to 2 years) **Score: 3**

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 C2: 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.

APPENDIX D - 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 D1: Landscape Quality - Explanation of Rating Criteria.

Factor	Definition
Landform	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.
Vegetation	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.
Water	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.
Colour	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.
Adjacent Scenery	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.
Scarcity	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.
Cultural Modifications	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 D2: Scenic Quality - Rating Criteria and scoring system.

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

APPENDIX E - 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 F - 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 trails, 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.

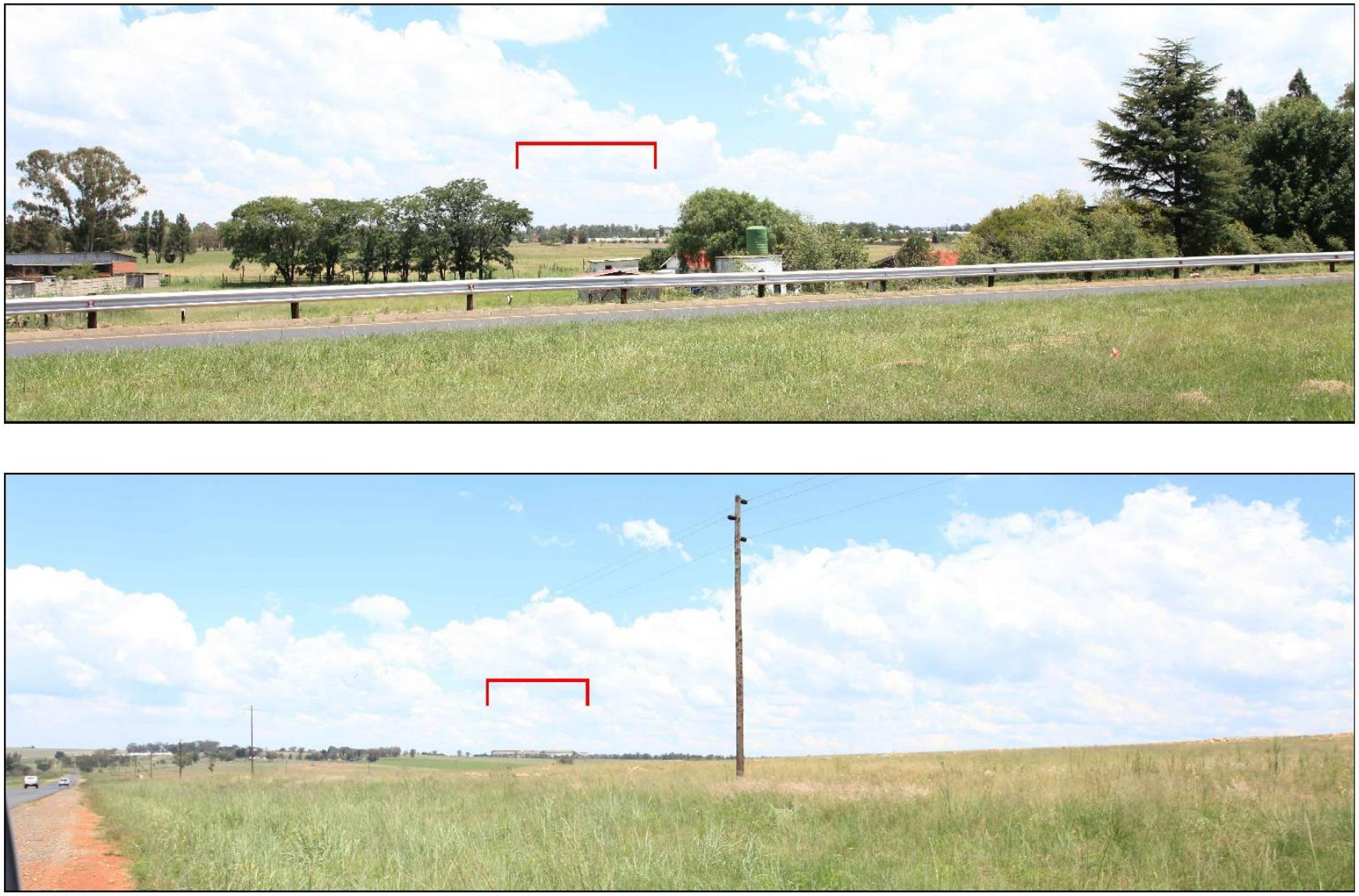
The most sensitive receptors may include:

- 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:

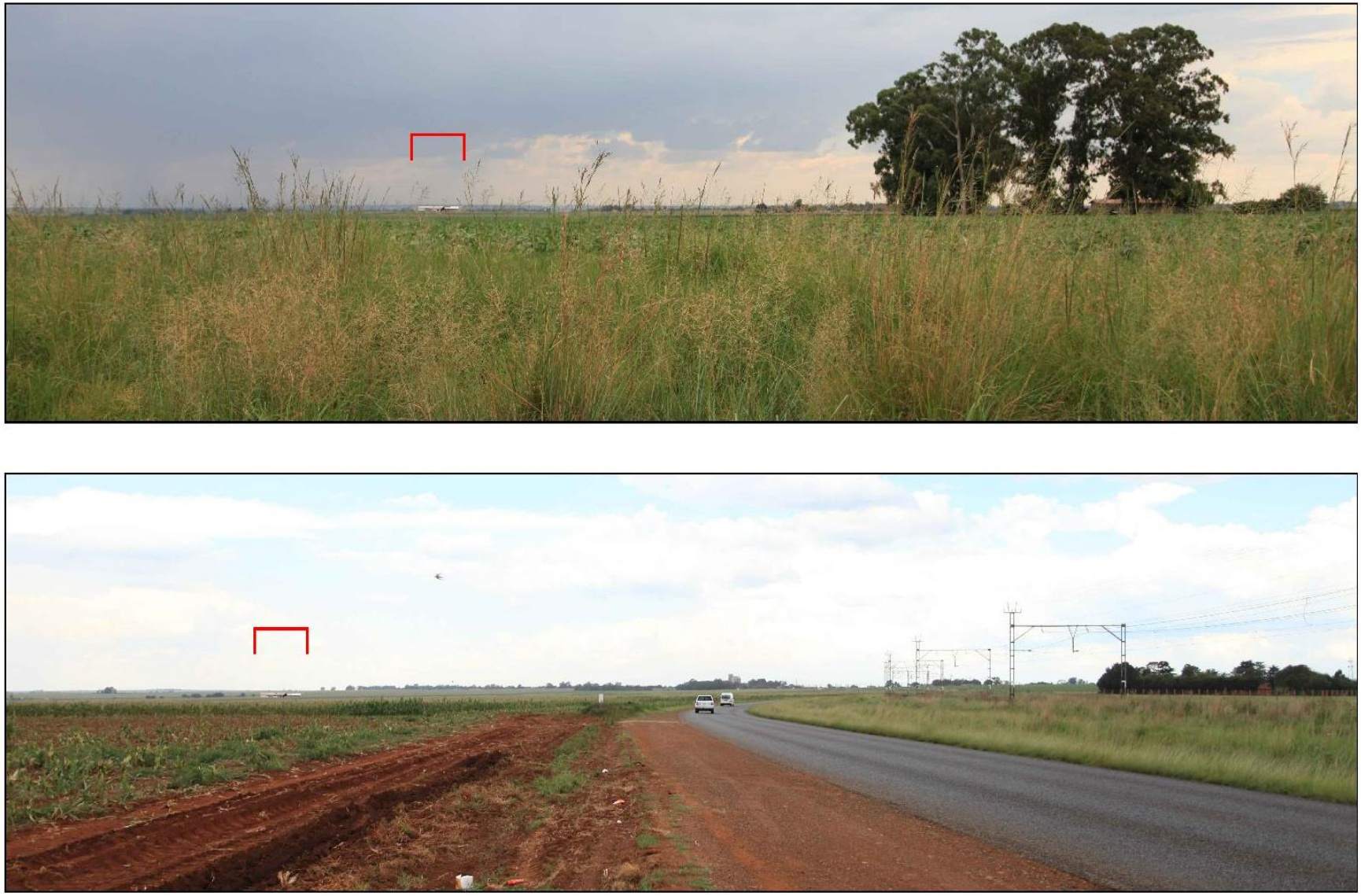
- People engaged in outdoor sport or recreation (other than appreciation of the landscape, as in landscape of acknowledges importance or value);
- People travelling through or past the affected landscape in cars on trains or other transport routes;
- People at their place of work.

APPENDIX G - CONCEPTUAL ILLUSTRATIONS OF THE PROPOSED RIETKOL PROJECT FROM SELECTED KOPs



Conceptual representation of views towards the proposed Rietkol Project from KOP1 (top) and KOP2 (bottom).

Conceptual representation of views towards the proposed Rietkol Project from KOP3 (top) and KOP4 (bottom).



Conceptual representation of views towards the proposed Rietkol Project from KOP5 (top) and KOP6 (bottom).

Conceptual representation of views towards the proposed Rietkol Project from KOP7 (top) and KOP8 (bottom).

APPENDIX H - IMPACT ASSESSMENT METHODOLOGY

Impact Significance

- **Nature and Status**

The 'nature' of the impact describes what is being affected and how. The 'status' is based on whether the impact is positive, negative or neutral.

- **Spatial Extent**

'Spatial Extent' defines the spatial or geographical scale of the impact.

Category	Rate	Descriptor
Site	1	Site of the proposed development
Local	2	Limited to site and/or immediate surrounds
District	3	Victor Khanye Local Municipal Area
Region	4	Nkangala District Municipal Area
Provincial	5	Mpumalanga Province
National	6	South Africa
International	7	Beyond South African borders

- **Duration**

'Duration' gives the temporal scale of the impact.

Category	Rate	Descriptor
Temporary	1	0 – 1 years
Short term	2	1 – 5 years
Medium term	3	5 – 15 years
Long term	4	Where the impact will cease after the operational life of the activity either because of natural process or by human intervention
Permanent	5	Where mitigation either by natural processes or by human intervention will not occur in such a way or in such a time span that the impact can be considered as transient

- **Probability**

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

Category	Rate	Descriptor
Rare	1	Where the impact may occur in exceptional circumstances only
Improbable	2	Where the possibility of the impact materialising is very low either because of design or historic experience
Probable	3	Where there is a distinct possibility that the impact will occur
Highly probable	4	Where it is most likely that the impact will occur
Definite	5	Where the impact will occur regardless of any prevention measures

- **Intensity**

'Intensity' defines whether the impact is destructive or benign, in other words the level of impact on the environment.

Category	Rate	Descriptor
Insignificant	1	Where the impact affects the environment is such a way that natural, cultural and social functions and processes are not affected. Localised impact and a small percentage of the population is affected
Low	2	Where the impact affects the environment is such a way that natural, cultural and social functions and processes are affected to a limited extent
Medium	3	Where the affected environment is altered in terms of natural, cultural and social functions and processes continue albeit in a modified way
High	4	Where natural, cultural or social functions or processes are altered to the extent that they will temporarily or permanently cease
Very High	5	Where natural, cultural or social functions or processes are altered to the extent that they will permanently cease and it is not possible to mitigate or remedy the impact

- **Ranking, Weighting and Scaling**

The weight of significance defines the level or limit at which point an impact changes from low to medium significance, or medium to high significance. The purpose of assigning such weights serves to highlight those aspects that are considered the most critical to the various stakeholders and ensure that the element of bias is taken into account. These weights are often determined by current societal values or alternatively by scientific evidence (norms, etc.) that define what would be acceptable or unacceptable to society and may be expressed in the form of legislated standards, guidelines or objectives. The weighting factor provides a means whereby the impact assessor can successfully deal with the complexities that exist between the different impacts and associated aspect criteria.

Spatial Extent	Duration	Intensity / Severity	Probability	Weighting factor	Significance Rating (SR - WOM) Pre-mitigation	Mitigation Efficiency (ME)	Significance Rating (SR-WM) Post Mitigation
Site (1)	Short term (1)	Insignificant (1)	Rare (1)	Low (1)	Low (0 – 19)	High (0.2)	Low (0 – 19)
Local (2) / District (3)	Short to Medium term (2)	Minor (2)	Unlikely (2)	Low to Medium (2)	Low to Medium (20 – 39)	Medium to High (0.4)	Low to Medium (20 – 39)
Regional (4)	Medium term (3)	Medium (3)	Possible (3)	Medium (3)	Medium (40 – 59)	Medium (0.6)	Medium (40 – 59)
Provincial (5) / National (6)	Long term (4)	High (4)	Likely (4)	Medium to High (4)	Medium to High (60 – 79)	Low to Medium (0.8)	Medium to High (60 – 79)
International (7)	Permanent (5)	Very high (5)	Almost certain (5)	High (5)	High (80 – 110)	Low (1.0)	High (80 – 110)

- **Impact significance without mitigation (WOM)**

Following the assignment of the necessary weights to the respective aspects, criteria are summed and multiplied by their assigned weightings, resulting in a value for each impact (prior to the implementation of mitigation measures).

Equation 1:

Significance Rating (WOM) = (Extent + Intensity + Duration + Probability) x Weighting Factor

- **Effect of Significance on Decision-makings**

Significance is determined through a synthesis of impact characteristics as described in the above paragraphs. It provides an indication of the importance of the impact in terms of both tangible and intangible characteristics. The significance of the impact "without mitigation" is the prime determinant of the nature and degree of mitigation required.

Rating	Rate	Descriptor
Negligible	0	The impact is non-existent or insignificant, is of no or little importance to decision making.
Low	1-19	The impact is limited in extent, even if the intensity is major; the probability of occurrence is low and the impact will not have a significant influence on decision-making and is unlikely to require management intervention bearing significant costs.
Low to Medium	20 – 39	The impact is of importance, however, through the implementation of the correct mitigation measures such potential impacts can be reduced to acceptable levels. The impact and proposed mitigation measures can be considered in the decision-making process
Medium	40 – 59	The impact is significant to one or more affected stakeholder, and its intensity will be medium or high; but can be avoided or mitigated and therefore reduced to acceptable levels. The impact and mitigation proposed should have an influence on the decision.
Medium to High	60 -79	The impact is of major importance but through the implementation of the correct mitigation measures, the negative impacts will be reduced to acceptable levels.
High	80 – 110	The impact could render development options controversial or the entire project unacceptable if it cannot be reduced to acceptable levels; and/or the cost of management intervention will be a significant factor and must influence decision-making.

Mitigation

"Mitigation" is a broad term that covers all components of the 'mitigation hierarchy' defined hereunder. It involves selecting and implementing measures, amongst others, to conserve biodiversity and to protect, the users of biodiversity and other affected stakeholders from potentially adverse impacts because of mining or any other land use. The aim is to prevent adverse impacts from occurring or, where this is unavoidable, to limit their significance to an acceptable level. Offsetting of impacts is considered the last option in the mitigation hierarchy for any project.

The mitigation hierarchy in general consists of the following in order of which impacts should be mitigated:

- Avoid/ prevent impact: can be done through utilising alternative sites, technology and scale of projects to prevent impacts. In some cases, if impacts are expected to be too high, the "no project" option should also be considered, especially where it is expected that the lower levels of mitigation will not be adequate to limit environmental damage and eco-service provision to suitable levels.
- Minimise (reduce) impact: can be done through utilisation of alternatives that will ensure that impacts on biodiversity and eco-services provision are reduced. Impact minimisation is considered an essential part of any development project.
- Rehabilitate (restore) impact is applicable to areas where impact avoidance and minimisation are unavoidable where an attempt to re-instate impacted areas and return them to conditions which are ecologically similar to the pre-project condition or an agreed post project land use, for example arable land. Rehabilitation can however not be considered as the primary mitigation

toll as even with significant resources and effort rehabilitation that usually does not lead to adequate replication of the diversity and complexity of the natural system. Rehabilitation often only restores ecological function to some degree to avoid ongoing negative impacts and to minimise aesthetic damage to the setting of a project. Practical rehabilitation should consist of the following phases in best practice:

- Structural rehabilitation which includes physical rehabilitation of areas by means of earthworks, potential stabilisation of areas as well as any other activities required to develop a long terms sustainable ecological structure;
- Functional rehabilitation, which focuses on ensuring that the ecological functionality of the ecological resources on the subject property supports the intended post-closure land use. In this regard, special mention is made of the need to ensure the continued functioning and integrity of wetland and riverine areas throughout and after the rehabilitation phase;
- Biodiversity reinstatement that focuses on ensuring that a reasonable level of biodiversity is re-instated to a level that supports the local post-closure land uses. In this regard, special mention is made of re-instating vegetation to levels which will allow the natural climax vegetation community of community suitable for supporting the intended post-closure land use; and
- Species reinstatement that focuses on the re-introduction of any ecologically important species, which may be important for socio-cultural reasons, ecosystem functioning reasons and for conservation reasons. Species re-instatement need only occur if deemed necessary.

➢ Offset impact: refers to compensating for latent or unavoidable negative impacts on biodiversity. Offsetting should take place to address any impacts deemed unacceptable which cannot be mitigated through the other mechanisms in the mitigation hierarchy. The objective of biodiversity offsets should be to ensure no net loss of biodiversity. Biodiversity offsets can be considered a last resort to compensate for residual negative impacts on biodiversity.

According to the DMR (2013) “Closure” refers to the process for ensuring that mining operations are closed in an environmentally responsible manner, usually with the dual objectives of ensuring sustainable post-mining land uses and remedying negative impacts on biodiversity and ecosystem services. The significance of residual impacts should be identified on a regional as well as national scale when considering biodiversity conservation initiatives. If the residual impacts lead to irreversible loss or irreplaceable biodiversity, the residual impacts should be considered to be of very high significance and when residual impacts are considered to be of very high significance, offset initiatives are not considered an appropriate way to deal with the magnitude and/or significance of the biodiversity loss. In the case of residual impacts determined to have medium to high significance, an offset initiative may be investigated. If the residual biodiversity impacts are considered of low significance, no biodiversity offset is required.

➢ **Impact significance with mitigation measures (WM)**

In order to gain a comprehensive understanding of the overall significance of the impact, after implementation of the mitigation measures, it is necessary to re-evaluate the impact.

➢ **Mitigation Efficiency (ME)**

The most effective means of deriving a quantitative value of mitigated impacts is to assign each significance rating value (WOM) a mitigation effectiveness (ME) rating. The allocation of such a rating is a measure of the efficiency and effectiveness, as identified through professional experience and empirical evidence of how effectively the proposed mitigation measures will manage the impact. Thus, the lower the assigned value the greater the effectiveness of the proposed mitigation measures and subsequently, the lower the impacts with mitigation.
Equation 2: Significance Rating (WM) = Significance Rating (WOM) x Mitigation Efficiency (ME)
Mitigation Efficiency is rated out of 1 as follows:

Category	Rate	Descriptor
Not Efficient (Low)	1	Mitigation cannot make a difference to the impact
Low to Medium	0.8	Mitigation will minimize impact slightly
Medium	0.6	Mitigation will minimize impact to such an extent that it becomes within acceptable standards
Medium to High	0.4	Mitigation will minimize impact to such an extent that it is below acceptable standards
High	0.2	Mitigation will minimize impact to such an extent that it becomes insignificant

- **Significance Following Mitigation (SFM)**

The significance of the impact after the mitigation measures are taken into consideration. The efficiency of the mitigation measure determines the significance of the impact. The level of impact is therefore seen in its entirety with all considerations taken into account.

APPENDIX I - 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 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.

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This report must not be altered or added to without the prior written consent of the author. This also refers to electronic copies of this report which are supplied for the purposes of inclusion as part of other reports, including main reports. Similarly, any recommendations, statements or conclusions drawn from or based on this report must make reference to this report. If these form part of a main report relating to this investigation or report, this report must be included in its entirety as an appendix or separate section to the main report.

APPENDIX J - SPECIALISTS CVs AND DECLARATION

Details of the specialist who prepared the report

Stephen van Staden	MSc Environmental Management (University of Johannesburg)
Michelle Pretorius	BSc (Landscape Architecture); BSc (Hons) Plant Science (University of Pretoria)
Sanja Swanepoel	BSc Zoology (University of Pretoria)

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

Company of Specialist:	Scientific Aquatic Services		
Name / Contact person:	Stephen van Staden		
Postal address:	29 Arterial Road West Oriel Bedfordview		
Postal code:	1401	Cell:	083 415 2356
Telephone:	011 616 7893	Fax:	011 615 6240/ 086 724 3132
E-mail:	stephen@sasenvgroup.co.za		
Qualifications	MSc (Environmental Management) (University of Johannesburg) BSc (Hons) Zoology (Aquatic Ecology) (University of Johannesburg) BSc (Zoology, Geography and Environmental Management) (University of Johannesburg)		
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		

SCIENTIFIC AQUATIC SERVICES (SAS) – SPECIALIST CONSULTANT INFORMATION

CURRICULUM VITAE OF STEPHEN VAN STADEN

PERSONAL DETAILS

Position in Company	Managing member, Ecologist, Aquatic Ecologist
Date of Birth	13 July 1979
Nationality	South African
Languages	English, Afrikaans
Joined SAS	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

EDUCATION

Qualifications

MSc (Environmental Management) (University of Johannesburg)	2002
BSc (Hons) Zoology (Aquatic Ecology) (University of Johannesburg)	2000
BSc (Zoology, Geography and Environmental Management) (University of Johannesburg)	1999

COUNTRIES OF WORK EXPERIENCE

South Africa – All Provinces

Southern Africa – Lesotho, Botswana, Mozambique, Zimbabwe

Eastern Africa – Tanzania

West Africa – Ghana, Liberia, Angola, Guinea Bissau

Central Africa – Democratic Republic of the Congo

SELECTED PROJECT EXAMPLES

Development compliance studies

- Project co-leader for the development of the EMP for the use of the Wanderers stadium for the Ubuntu village for the World Summit on Sustainable Development (WSSD).
- Environmental Control Officer for Eskom for the construction of an 86Km 400KV power line in the Rustenburg Region.
- Numerous Environmental Impact Assessment (EIA) and EIA exemption applications for township developments and as part of the Development Facilitation Act requirements.
- EIA for the extension of mining rights for a Platinum mine in the Rustenburg area by Lonmin Platinum.
- EIA Exemption application for a proposed biodiesel refinery in Chamdor.
- Compilation of an EIA as part of the Bankable Feasibility Study process for proposed mining of a gold deposit in the Lofa province, Liberia.
- EIA for the development of a Chrome Recovery Plant at the Two Rivers Platinum Mine in the Limpopo province, South Africa.

- Compilation of an EIA as part of the Bankable Feasibility Study process for the Mooihoek Chrome Mine in the Limpopo province, South Africa.
- Mine Closure Plan for the Vlakfontein Nickel Mine in the North West Province.

Specialist studies and project management

- Development of a zero discharge strategy and associated risk, gap and cost benefit analyses for the Lonmin Platinum group.
- Development of a computerised water balance monitoring and management tool for the management of Lonmin Platinum process and purchased water.
- The compilation of the annual water monitoring and management program for the Lonmin Platinum group of mines.
- Analyses of ground water for potable use on a small diamond mine in the North West Province.
- Project management and overview of various soil and land capability studies for residential, industrial and mining developments.
- The design of a stream diversion of a tributary of the Olifants River for a proposed opencast coal mine.
- Waste rock dump design for a gold mine in the North West province.
- Numerous wetland delineation and function studies in the North West, Gauteng and Mpumalanga Kwa-Zulu Natal provinces, South Africa.
- Hartebeespoort Dam Littoral and Shoreline PES and rehabilitation plan.
- Development of rehabilitation principles and guidelines for the Crocodile West Marico Catchment, DWAF North West.

Aquatic and water quality monitoring and compliance reporting

- Development of the Resource quality Objective framework for Water Use licensing in the Crocodile West Marico Water management Area.
- Development of the Resource Quality Objectives for the Local Authorities in the Upper Crocodile West Marico Water management Area.
- Development of the 2010 State of the Rivers Report for the City of Johannesburg.
- Development of an annual report detailing the results of the Lonmin Platinum groups water monitoring program.
- Development of an annual report detailing the results of the Everest Platinum Mine water monitoring program.
- Initiation and management of a physical, chemical and biological monitoring program, President Steyn Gold Mine Welkom.
- Aquatic biomonitoring programs for several Xstrata Alloys Mines and Smelters.
- Aquatic biomonitoring programs for several Anglo Platinum Mines.
- Aquatic biomonitoring programs for African Rainbow Minerals Mines.
- Aquatic biomonitoring programs for several Assmang Chrome Operations.
- Aquatic biomonitoring programs for Petra Diamonds.
- Aquatic biomonitoring programs for several coal mining operations.
- Aquatic biomonitoring programs for several Gold mining operations.
- Aquatic biomonitoring programs for several mining operations for various minerals including iron ore, and small platinum and chrome mining operations.
- Aquatic biomonitoring program for the Valpre bottled water plant (Coca Cola South Africa).
- Aquatic biomonitoring program for industrial clients in the paper production and energy generation industries.
- Aquatic biomonitoring programs for the City of Tshwane for all their Waste Water Treatment Works.
- Baseline aquatic ecological assessments for numerous mining developments.
- Baseline aquatic ecological assessments for numerous residential commercial and industrial developments.
- Baseline aquatic ecological assessments in southern, central and west Africa.

Wetland delineation and wetland function assessment

- Wetland biodiversity studies for three copper mines on the copper belt in the Democratic Republic of the Congo.
- Wetland biodiversity studies for proposed mining projects in Guinea Bissau, Liberia and Angola in West Africa.
- Terrestrial and wetland biodiversity studies for developments in the mining industry.
- Terrestrial and wetland biodiversity studies for developments in the residential commercial and industrial sectors.

- Development of wetland riparian resource protection measures for the Hartbeespoort Dam as part of the Harties Metsi A Me integrated biological remediation program.
- Priority wetland mammal species studies for numerous residential, commercial, industrial and mining developments throughout South Africa.

Terrestrial ecological studies and biodiversity studies

- Development of a biodiversity offset plan for Xstrata Alloys Rustenburg Operations.
- Biodiversity Action plans for numerous mining operations of Anglo Platinum throughout South Africa in line with the NEMBA requirements.
- Biodiversity Action plans for numerous mining operations of Assmang Chrome throughout South Africa in line with the NEMBA requirements.
- Biodiversity Action plans for numerous mining operations of Xstrata Alloys and Mining throughout South Africa in line with the NEMBA requirements.
- Biodiversity Action plan for the Nkomati Nickel and Chrome Mine Joint Venture.
- Terrestrial and wetland biodiversity studies for three copper mines on the copperbelt in the Democratic Republic of the Congo.
- Terrestrial and wetland biodiversity studies for proposed mining projects in Guinea Bissau, Liberia and Angola in West Africa.
- Numerous terrestrial ecological assessments for proposed platinum and coal mining projects.
- Numerous terrestrial ecological assessments for proposed residential and commercial property developments throughout most of South Africa.
- Specialist Giant bullfrog (*Pyxicephalus adspersus*) studies for several proposed residential and commercial development projects in Gauteng, South Africa.
- Specialist Marsh sylph (*Metisella meninx*) studies for several proposed residential and commercial development projects in Gauteng, South Africa.
- Project management of several Red Data Listed (RDL) bird studies with special mention of African grass owl (*Tyto capensis*).
- Project management of several studies for RDL Scorpions, spiders and beetles for proposed residential and commercial development projects in Gauteng, South Africa.
- Specialist assessments of terrestrial ecosystems for the potential occurrence of RDL spiders and owls.
- Project management and site-specific assessment on numerous terrestrial ecological surveys including numerous studies in the Johannesburg-Pretoria area, Witbank area, and the Vredefort dome complex.
- Biodiversity assessments of estuarine areas in the Kwa-Zulu Natal and Eastern Cape provinces.
- Impact assessment of a spill event on a commercial maize farm including soil impact assessments.

Fisheries management studies

- Tamryn Manor (Pty.) Ltd. still water fishery initiation, enhancement and management.
- Verlorenkloof Estate fishery management strategising, fishery enhancement, financial planning and stocking strategy.
- Mooifontein fishery management strategising, fishery enhancement and stocking programs.
- Wickams retreat management strategising.
- Gregg Brackenridge management strategising and stream recalibration design and stocking strategy.
- Eljira Farm baseline fishery study compared against DWAF 1996 aquaculture and aquatic ecosystem guidelines.

SCIENTIFIC AQUATIC SERVICES (SAS) – SPECIALIST CONSULTANT INFORMATION

CURRICULUM VITAE OF MICHELLE PRETORIUS

PERSONAL DETAILS

Position in Company	Visual specialist, Ecologist, Botanist,
Date of Birth	5 October 1982
Nationality	South African
Languages	English, Afrikaans
Joined SAS	2011

MEMBERSHIP IN PROFESSIONAL SOCIETIES

Professional member of the South African Council for Natural Scientific Professions (SACNASP)
Professional member of the South African Council for the Landscape Architectural Profession (SACLAP)
Member of the Botanical Society of South Africa

EDUCATION

Qualifications

BSc (Hons) Plant Science (University of Pretoria)	2009
BSc (Landscape Architecture) (University of Pretoria)	2006
BSc (Botany) (University of Pretoria)	2003

Short Courses

Global Mapper Training – Blue Marble Training	2014
Rehabilitation of Mine-impacted Land – Africa Land Use Training	2011
Mine Closure and Rehabilitation Conference – ITC	2011
Rehabilitation of Degraded Land – Africa Land Use Training	2009

COUNTRIES OF WORK EXPERIENCE

South Africa – Gauteng, Mpumalanga, North West, Limpopo, KwaZulu-Natal, Western Cape, Northern Cape
Tanzania
Democratic Republic of the Congo

SELECTED PROJECT EXAMPLES

Visual Impact Assessments

- Visual Impact Assessment as part of the environmental assessment and authorisation process for the proposed Argent Colliery, Mpumalanga.
- Visual Impact Assessment as part of the EIA process for the proposed upgrade of the Zonderwater Prison Waste Water Treatment Works in the vicinity of Cullinan, Gauteng.
- Visual Impact Assessment as part of the EIA process for the proposed Springboklaagte Colliery, Mpumalanga.
- Visual Impact Assessment as part of the Environmental Impact Assessment (EIA) and authorisation process for the proposed Harriet's Wish Mining Project, Limpopo Province;
- Visual Impact Assessment Scoping Report as part of the EIA Process for the Proposed Pan Palladium PGE Project, Limpopo Province
- Visual Impact Assessment as part of the environmental assessment process for the proposed Tjate Platinum Mine, Limpopo Province;
- Visual Impact Assessment as part of the environmental assessment and authorisation process for the proposed Argent Colliery, Mpumalanga;
- Visual Impact Assessment as part of the Environmental Impact Assessment process for the proposed Springboklaagte Colliery, Mpumalanga;

- Visual Impact Assessment as part of the environmental assessment process for the proposed Bankfontein Colliery, Middleburg, Mpumalanga;
- Visual Impact Assessment as part of the environmental assessment process for the proposed Khutala Block 5 Colliery expansion project, Ogies, Mpumalanga;
- Visual Impact Assessment as part of the EIA process for the proposed Moabsvelden Colliery, Mpumalanga;
- Visual Impact Assessment as part of the Environmental Assessment and Authorisation Process for the Proposed Leandra Mining Project, Gauteng and Mpumalanga Provinces;
- Visual Impact Assessment as part of the Environmental Assessment and Authorisation Process for the Proposed The Duel Coal Project, Limpopo Province.

Floral Assessments

- Floral assessment as part of the environmental assessment and authorisation process for the proposed Vandyksdrift project at the Wolvekrans Colliery, Mpumalanga.
- Floral assessment as part of the environmental authorisation process for the proposed Tharisa North eastern waste rock dump, North West Province.
- Terrestrial ecological scan as part of the environmental authorisation process for the proposed Olievenhoutbosch linkage road, Gauteng.
- Floral assessment as part of the proposed Lekutung hotel, residential and golf estate development, North West Province.
- Phytosociological description, PES and function assessment of the floral resources in the vicinity of the Musonoi project in Kolwezi, Democratic Republic of Congo.
- Vegetation management plan for input into the closure planning process of the Tulawaka Gold Mine, Tanzania.
- Habitat evaluation in terms of floral integrity and PES in order to determine whether the grassland on the proposed Gillimead Agricultural Holdings development site has high conservation value, Gillimead, Gauteng.

Wetland Assessments

- Consideration of potential wetland features on the proposed Lanseria Extension 57 development site, Sunrella A.H, Gauteng.
- Riparian Vegetation Index determination and wetland delineation for the proposed Libertas Road upgrades, Gauteng.
- Wetland assessment along the proposed alignment of the bus rapid transit line 2a and 2b in the City of Tshwane, Gauteng.
- Wetland delineation in the vicinity of a proposed open pit development site, Modikwa Platinum Mine, Limpopo Province.

Rehabilitation Projects

- Wetland and watercourse rehabilitation plan for the river crossing in the vicinity of the Olifants River on Kleinfontein Mine, Mpumalanga
- Thaba Mall terrestrial rehabilitation plan – guideline document for landscape rehabilitation, Thabazimbi, Limpopo Province.
- Rehabilitation plan for a portion of a borrow pit in the vicinity of Soshanguve, Gauteng
- Rehabilitation and management plan for the Mamelodi Hatherley 132 kv Power Line, City of Tshwane, Gauteng.

Environmental and Ecological Management Plans

- Environmental Management Plan for the Montana Tuine Erf 1611 & 1673 development, City of Tshwane, Gauteng.
- Ecological Management plan for the South Hills Mixed-use development, situated on Erf 1202 South Hills, Holding 88 of the Farm Klipriviersberg Estate Small Holding A.H. and Portion 65 (a portion of Portion 7) of the Farm Klipriviersberg 106-IR, South Hills (Moffat Park), Johannesburg, Gauteng.
- Environmental management plan for Erf 275, Meerhof township, Hartbeespoort dam, North West Province.

Environmental Control Officer

- Monthly specialist Environmental Control Officer (ECO) function to oversee the implementation of the wetland and watercourse rehabilitation plan for the river crossing in the vicinity of the Olifants River on Kleinfontein Mine, Mpumalanga.
- Monthly specialist Environmental Control Officer (ECO) for the monitoring of wetland and ecological impacts on Portion 16 of the Farm Zondagsvlei 9-IS, Ogies, Mpumalanga.

- Monthly specialist Environmental Control Officer (ECO) function to oversee the implementation of the rehabilitation and management plan for the Klipkruisfontein development site, Shoshanguwe, Gauteng.

Plant Rescue and Relocation

- Report on the rescue and relocation of Hypoxis hemerocallidea adjacent to Lanseria Airport, Johannesburg, Gauteng.
- Report on the rescue of Hypoxis hemerocallidea, Boophane disticha and various other floral species at the mall of the south development site, Alberton, Gauteng.
- Report on the rescue and relocation of Hypoxis hemerocallidea at Forest Hill City – Phase 1, Monavoni x58, Gauteng.

Terrestrial Monitoring

- Terrestrial monitoring programme for Glencore Xstrata Eland Platinum Mine, North West Province.
- Terrestrial monitoring programme for Xstrata Boshoek, North West Province.

SCIENTIFIC AQUATIC SERVICES (SAS) – SPECIALIST CONSULTANT INFORMATION

CURRICULUM VITAE OF SANJA ERWEE

PERSONAL DETAILS

Position in Company	GIS Technician
Date of Birth	8 April 1991
Nationality	South African
Languages	English, Afrikaans
Joined SAS	2014

EDUCATION

Qualifications

BSc Zoology 2013

COUNTRIES OF WORK EXPERIENCE

South Africa – Gauteng, Mpumalanga, North West, KwaZulu-Natal

SELECTED PROJECT EXAMPLES

GIS Assessments

- Completed GIS mapping and GIS analysis for a significant number of ecological projects
- Desktop assessment of 45 wetland and river crossings identified along the proposed Fibreco Fibre Optic Cable Route changes between Cape Town to George, George to Port Elizabeth and from Port Elizabeth to Durban
- High level desktop ecological study and site sensitivity report as part of the site selection process for the possible Rapid Rail Extension to the Gauteng Rapid Rail Network
- Ecological scan and site sensitivity report as part of the environmental authorisation process prior to prospecting activities for two prospecting areas in Newcastle, Kwazulu-Natal

Wetland Assessments

- Illiso Consulting. Wetland and aquatic ecological assessment for the proposed N3 De Beers Pass Route.
- Wetland assessment as part of the environmental authorisation process for the proposed Sappi Enstra Mill Wastewater Pipeline in Springs
- Wetland Verification and Rehabilitation Criteria for Aspen Hills Estate
- Wetland Ecological Assessment for development in Shoshanguve, adjacent to Tshwane University of Technology
- Wetland assessment as part of the environmental authorisation process for the proposed Braakfontein Coal Mine near Newcastle, Kwazulu-Natal Province

Faunal Assessments

- Faunal assessment as part of the environmental authorisation process for the proposed New Belfast Mine Railway Siding, Mpumalanga
- Terrestrial ecological scan as part of the environmental authorisation process for the proposed construction of a sewer system in the Ekangala Township, Gauteng Province
- Faunal assessment as part of the environmental authorisation process for the Ledig Water Project near Pilanesberg National Park, North West Province
- Faunal assessment as part of the ecological assessment for the Op Goedenhoop Section 102 Coal Project, Mpumalanga Province

Rehabilitation Plan

- Wetland rehabilitation plan for Dorothy Road, Midrand, Gauteng Province

Risk Assessment

- Motivation for General Authorisation for the development of a pipeline at Sappi in Springs, Gauteng Province