VISUAL IMPACT ASSESSMENT AS PART OF THE ENVIRONMENTAL IMPACT ASSESSMENT AND AUTHORISATION PROCESS FOR THE PROPOSED MINING OF GYPSUM ON PORTION 0 OF THE FARM KANAKIES 332, NEAR LOERIESFONTEIN, NORTHERN CAPE PROVINCE

Prepared for:

Cabanga Environmental

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EXECUTIVE SUMMARY

Scientific Terrestrial Services (STS) was appointed to conduct a Visual Impact Assessment (VIA) for the proposed mining of natural Gypsum (Gy) on the remaining extent of the farm Kanakies 332, near Loeriesfontein, Northern Cape Province, henceforth referred to as the Mining Right Area (MRA). The MRA is situated within the Hantam Local Municipality and of the Calvinia magisterial district.

The MRA is situated approximately 41 km west of the town of Loeriesfontein, and 40 km north north-west of Niewhoudtville, and 53 km north north-east of Nuwerus. The Doring River traverses the southwest corner of the MRA. The extent of the MRA is approximately 7,457 ha, and approximately 689 ha will be earmarked for mining. The area where the gypsum deposit is concentrated will henceforth be referred to as the "focus area". Furthermore, the approximate area required for infrastructure is 9 ha, and will comprise the following:

- Mobile crushing and high frequency screening plant;
- Shipping container type office block and ablution facility;
- Vehicle parking area and fuel storage area;
- Product stockpile area;
- Run of Mine (ROM) stockpile area; and
- Access Road.

Although the proposed Mining Right Application will include the remaining extent of the farm Kanakies 332, the current study was confined to the focus area.

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

Description of the Receiving Environment

The receiving environment of the focus area has a remote rural character and is composed of open canopy succulent shrubland where livestock grazing is the dominant land use. The topography of the focus area is characterised by relatively flat to slightly undulating terrain, as such one can see significant distances across the landscape. The MRA is situated within a remote area where limited human activity / movement and sensitive receptors are present, as such there are few anthropogenic structures in the area, but those that do occur include housing compounds, powerlines, the Transnet Railway Line and associated service road, gravel farm roads and fences.

Potential sensitive receptors identified within the area include: farmsteads located further than 5km from the focus area, except for one farmstead situated within the MRA, and potential visitors and hikers within the Kalk Gat Private Nature Reserve situated directly adjacent to the southwestern border of the MRA. With the MRA situated in a remote area, there are few roads associated such as; the closest regional road is the R355 (approximately 15km north), with a gravel service road of the Transnet Railway Line traversing the MRA and several farm roads. Existing anthropogenic structures such as farm houses and associated sheds, powerlines, fences, the Transnet Railway Line and road / railway signs are present within the area.

The focus area is characterised by the following vegetation types: the majority of the focus area is within the Northern Knersvlakte Vygieveld, with a small southwestern portion falling within the Knersvlakte Shale Vygieveld vegetation type. Due to drought conditions at the time of assessment, the vegetative cover was low with extensive bare ground visible throughout the focus area. It should however be noted that the vegetation associated with the focus area is of low to moderate height, thus the vegetation will not provide screening ability to the receiving environment.

Due to the nature of the project, its location within an area currently unaffected by mining activities, and limited anthropogenic structures present in the area, the proposed projected will lead to a high level of

visual intrusion on the landscape and is expected to be noticeable in relation to its surroundings. However, due to the bare ground dominating the area at the time of assessment, soil disturbance (surface trench mining) will result in a low degree of contrast in colour, making it difficult to distinguish the surface trench mining from its surroundings, when viewed from a distance. Since most sensitive receptors, except for the farm stead situated within the MRA, are situated further than 5km from the focus area, the proposed mining activities are in the background with a low visual intrusion on the viewer.

The focus area is considered to have a moderate scenic quality, due to the visual variety that is presented in the form of slightly undulating plains, mountainous terrain in the larger region, open canopy succulent shrubland, limited anthropogenic structures, and although mostly dry, the Doring and Krom Rivers and associated ephemeral drainage lines which create an increased visual interest.

The sense of place associated with the focus area can be described as calm, tranquil and peaceful, wild with limited development, with a strong association to the natural environment. The sense of place is however not unique to the focus area as it extends to the larger Namaqualand region.

From the viewshed analysis, the proposed surface infrastructure will not be visible to any sensitive receptors situated south to northwest of and within 10km of the focus area. Furthermore, the proposed surface infrastructure will only be seen in limited areas northeast to south of the focus area, and as observed very limited sensitive receptors fall within the viewshed of the proposed mine. The viewshed analysis also indicates that there will not be a clear line of sight from the Kalk Gat Private Nature Reserve. Based on the field verification the proposed surface infrastructure will be moderately visible to the only sensitive receptor situated within 1km of the focus area, where the proposed infrastructure is considered to be in the foreground. The proposed surface infrastructure and surface trench mining will be moderately to barely visible to receptors situated further than 3km, and as such fall in the middle- to background of the sensitive receptors.

The night time lighting environment of the region is therefore considered intrinsically dark (Zone E1 [Natural]). The impact from the mining project is therefore expected to be significant in such a remote area during night-time hours, should 24hour mining activities take place. However, since the proposed mining activities will only take place during the daylight hours, the proposed project is not expected to substantially contribute to the effects of sky glow and artificial lighting in the region. Since the Kanakies mine is situated in a remote area, with limited light sources, the security lighting utilised at night will be visible within an approximate 5km (or further) radius.

Impact Assessment Summary

Construction phase

Impact	Unmanaged	Managed
1: Impact on landscape character and sense of place	Medium High	Medium Low
2: Visual intrusion and VAC impacts	Medium High	Medium Low
3: Visual exposure and visibility impacts	Medium High	Low
4: Impacts due to night time lighting	Medium Low	Low

Operational phase

Impact	Unmanaged	Managed
1: Impact on landscape character and sense of place	Medium High	Medium High
2: Visual intrusion and VAC impacts	Medium-High	Medium High
3: Visual exposure and visibility impacts	Medium-High	Medium Low
4: Impacts due to night time lighting	Medium-High	Medium Low

Decommissioning Phase

Impact	Unmanaged	Managed
1: Impact on landscape character and sense of place	Medium Low	Low
2: Visual intrusion and VAC impacts	Medium Low	Low
3: Visual exposure and visibility impacts	Medium Low	Low
4: Impacts due to night time lighting	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 concurrent revegetation, alien and invasive species management throughout the construction and operational project phases, as well as consideration of material selection, effective management of lighting and dust suppression and implementing good housekeeping measures.
- An effective dust management plan taking into account stockpile areas, the plant infrastructure area (stockpiles and transfer points), as well as haul/ access roads must be designed and implemented in order to mitigate the impact of dust on sensitive receptors throughout all mining phases.
- Up-lighting of structures must be avoided where possible, with lighting installed at downward angles that provide precisely directed illumination beyond the immediate surroundings of the infrastructure, thereby minimising the light spill and trespass.
- No naked / unshielded light sources are to be directly visible from a distance. Only reflected light should be visible from outside the focus area.
- From a visual perspective, the project is not considered 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 (IEM) 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

The table below provides the National Environmental Management Act, 1998 (Act 107 of 1998) (NEMA) Regulations 2017 (as amended in 2014) for Specialist Reports and also the relevant sections in the reports where these requirements are addressed.

NEMA Regulations (2017) - Appendix 6	Relevant section in report
(1) A specialist report prepared in terms of these Regulations must contain -	
(a) details of -	
(i) the specialist who prepared the report; and	Appendix M
(ii) the expertise of that specialist to compile a specialist report, including a curriculum vitae;	Appendix M
(b) a declaration that the specialist is independent in a form as may be specified by the competent authority;	Appendix M
(c) an indication of the scope of, and the purpose for which, the report was prepared;	Section 1.2
(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 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 and Appendices B to K
(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 alternatives;	Section 5
(g) an identification of any areas to be avoided, including buffers;	Not applicable – findings from ecological assessment may be used to conserve natural visual resources
(h) a map superimposing the activity, including the associated structures and infrastructure on the environmental sensitivities of the site, including areas to be avoided, including buffers;	Not applicable – findings from ecological assessment may be used to conserve natural visual resources
(i) a description of any assumptions made and any uncertainties or gaps in knowledge;	Section 1.4
(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 5 and 6
(k) any mitigation measures for inclusion in the EMPr;	Section 6.6
(l) any conditions for inclusion in the environmental authorisation;	Section 6.6
(m) any monitoring requirements for inclusion in the EMPr or environmental authorisation;	Section 6.7
(n) a reasoned opinion -	
(i) as to whether the proposed activity, activities or portions thereof should be authorised;	Section 7
(iA) 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 6.6
(o) a description of any consultation process that was undertaken during the course of preparing the specialist report	Section 5.1
(p) a summary and copies, if any, comments received during any consultation process and, where applicable all responses thereto; and	Section 5.1
(q) any other information requested by the competent authority.	No other information requested

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

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 power line 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

ARC	Agricultural Research Council
BLM	(United States) Bureau of Land Management
BPEO	Best Practicable Environmental Option
DEM	Digital Elevation Model
DTM	Digital Terrain Model
DWS	Department of Water and Sanitation
EAP	Environmental Assessment Practitioner
EIA	Environmental Impact Assessment
EIM	Integrated Environmental Management
GIS	Geographic Information System
GPS	Global Positioning Systems
IAPs	Interested and Affected Parties
IDP	Integrated Development Plan
IEM	Integrated Environmental Management
KOP	Key Observation Point
LI IEMA	Institute of Environmental Management and Assessment
m.a.m.s.l.	Meters above mean sea level
MRA	Mining Right Area
NEMA	National Environmental Management Act (No. 108 of 1997)
NGL	Natural Ground Level
SANBI	South African National Biodiversity Institute
STS	Scientific Terrestrial Services
UNESCO	United Nations Educational Scientific and Cultural Organization
VAC	Visual Absorption Capacity
VIA	Visual Impact Assessment
VRM	Visual Resource Management
WHS	World Heritage Site

1 INTRODUCTION

1.1 Background

Scientific Terrestrial Services (STS) was appointed to conduct a Visual Impact Assessment (VIA) for the proposed mining of natural Gypsum (Gy) on the remaining extent of the farm Kanakies 332, near Loeriesfontein, Northern Cape Province, henceforth referred to as the Mining Right Area (MRA) (Figure 1 & 2). The MRA is situated within the Hantam Local Municipality and of the Calvinia magisterial district.

The MRA is situated approximately 45 km west of the town of Loeriesfontein, and 40 km north north-west of Niewhoudtville, and 53 km north north-east of Nuwerus. The Doring River traverses the southwest corner of the MRA. The extent of the MRA is approximately 7,457 ha, and approximately 689 ha will be earmarked for mining. The area where the gypsum deposit is concentrated will henceforth be referred to as the "focus area". Furthermore, the approximate area required for infrastructure is 9 ha, and will comprise the following:

- Mobile crushing and high frequency screening plant;
- Shipping container type office block and ablution facility;
- Vehicle parking area and fuel storage area;
- Product stockpile area;
- Run of Mine (ROM) stockpile area; and
- Access Road.

The gypsum deposit consists of 2 layers i.e. a powder layer with an approximate thickness of 0.4 meters, approximately 0.2 to 0.7 meters under the surface, followed by a nodular crystalline layer with an approximate thickness of 0.9 to 1.3 meters. The gypsum deposit will be harvested by trench mining with the depth of trenching varying between 1.4 and 2.5m. The overburden layer will first be removed (0.2 to 0.7m), followed by the selective removal of the powder layer (0.4m) and subsequently the removal of the crystal containing clay layer (between 0.9 and 1.3m). The powder will be screened to remove foreign materials and is expected to be recovered by a margin of at least 40% by volume harvested, inclusive of waste generated during screening, which should be less than 2% combined from dust generated and foreign objects removed during screening. The clay layer will be roll-crushed and screened by means of high frequency technology alongside the trench to increase the average gypsum composition from between 40 and 50 percent to between 80 and 90%. The harvesting recovery margin is estimated at 65% by volume extracted whilst the efficiency of the high frequency screening process is expected to be no less than 37%, calculating to an overall

76% mean loss by volume of material harvested. For more information regarding the mining activities refer to the Witkop Fluorspar Mine (Pty) Ltd Mining Work Programme.

Although the proposed Mining Right Application will include the remaining extent of the farm Kanakies 332, the current study was confined to the focus area.

A VIA entails a process of data collection, spatial analysis, visualisation and interpretation to describe the quality of the landscape prior to development taking place and then identifying possible visual impacts after development. Assessing visual impacts are difficult as it is very subjective due to a person's perception being affected by more than only the immediate environmental factors (Oberholzer, 2005). Visual impacts occurring as a result of the proposed mining activities will occur during the construction, operational and decommissioning phases, with the limited residual visual impacts occurring post-closure, provided that efficient rehabilitation of the development footprint areas take place. Impacts, that may have an overall detrimental effect on the aesthetic character of the focus area and its surrounds, would specifically result from vegetation clearing, general construction activity, and an increase of human and vehicular movement and impacts from night time lighting.

This report, after consideration and description of the visual integrity of the focus area and surroundings, must guide the proponent, authorities and Environmental Assessment Practitioner (EAP), by means of recommendations, as to the suitability of the focus area for the intended land use, from a visual and aesthetic point of view. This report should furthermore serve to inform the planning, design and decision-making process as to the layout and nature of the proposed mining activities.

1.2 Project Scope

The purpose of this report is:

- To determine the Category of Development and Level of Assessment as outlined by Oberholzer (2005);
- To describe the receiving environment in terms of regional context, location and environmental and landscape characteristics;
- To describe and characterise the proposed project and the receiving environment in its envisioned future state;
- To identify the main viewsheds through undertaking a viewshed analysis, based on the proposed height of infrastructure components and the Digital Elevation Model (DEM), as a mechanism to identify the locations of potential sensitive receptors sites and the distance of these receptor sites from the focus area;

- 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.

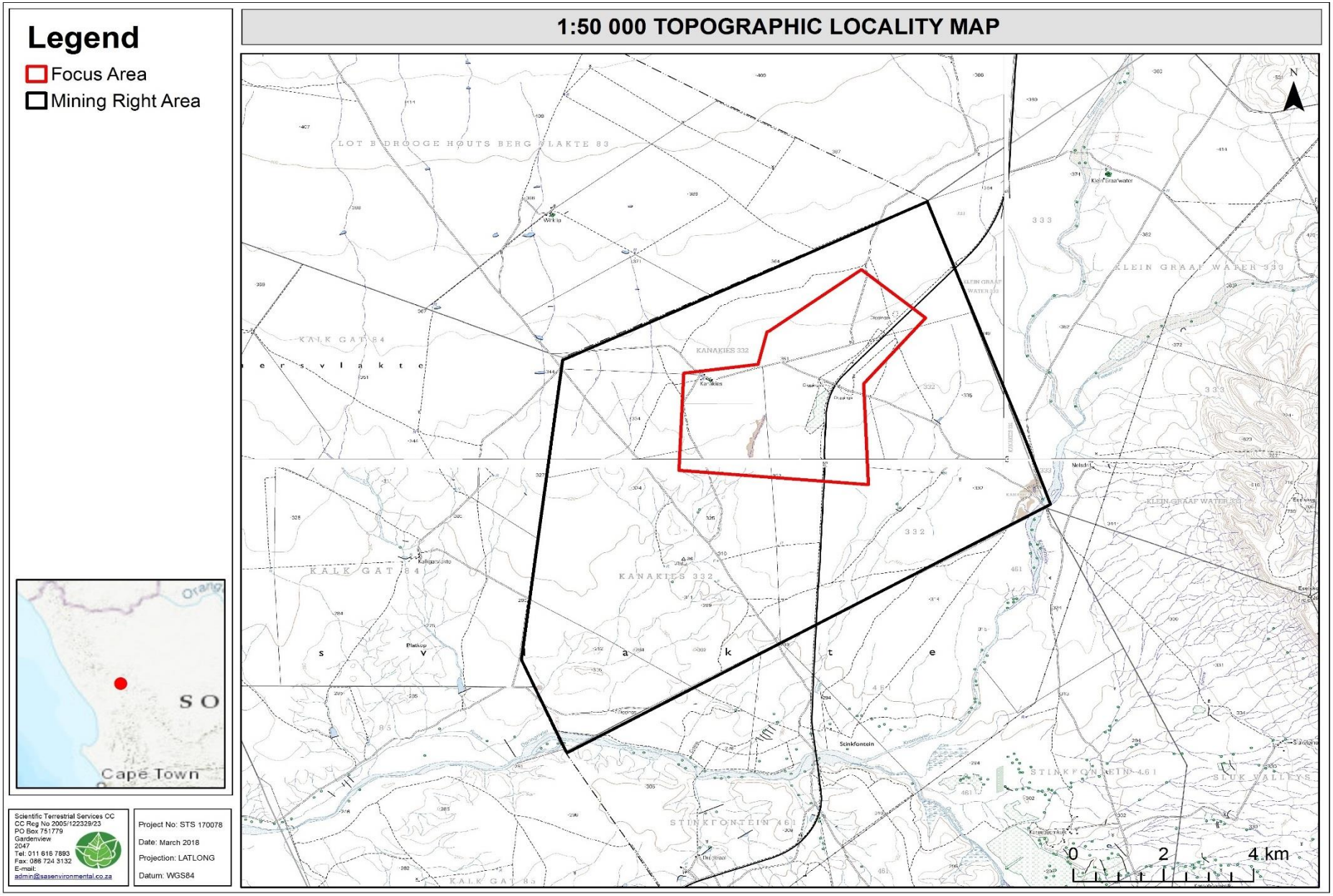


Figure 1: 1:50 000 Topographical map depicting the location of the Mining Right Area (MRA) and focus area in relation to the surrounding region.

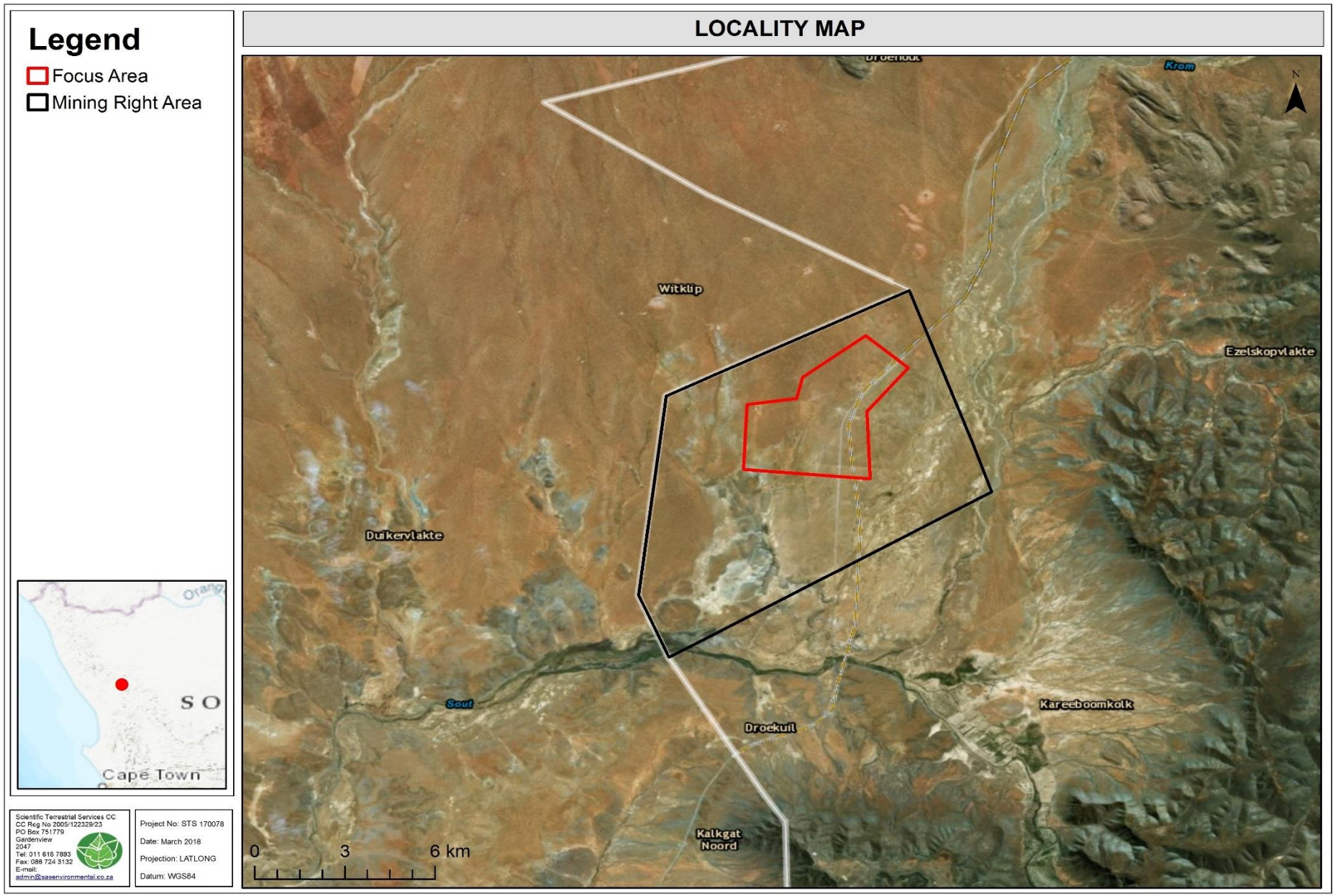


Figure 2: Digital satellite image depicting the location of the Mining Right Area (MRA) and focus area in relation to the surrounding region.

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:

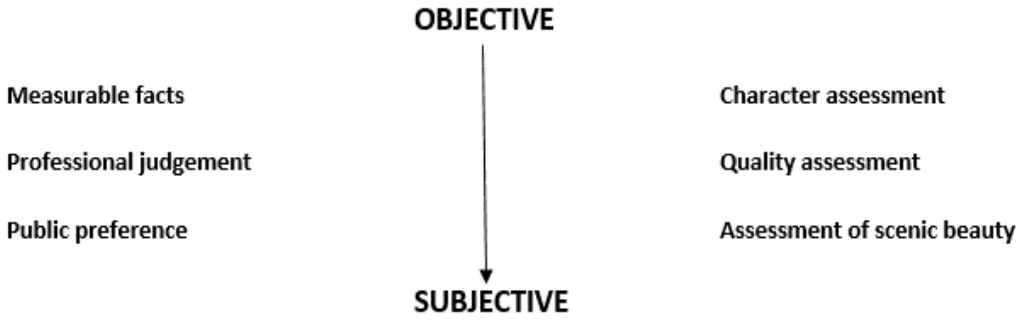
- Long term protection of important scenic resources and heritage sites;
- Minimisation of visual intrusion on scenic resources;
- Retention of wilderness or special areas intact as far as possible; and
- Responsiveness to the area's uniqueness, or sense of place.

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 Northern Cape Province, the "Guidelines for Involving Visual and Aesthetic Specialists in the EIA Process"

(Oberholzer, 2005), prepared for the Western Cape Department of Environmental Affairs & Development Planning, was used;

- All information relating to the proposed project as referred to in this report is assumed to be the latest available information. Additionally, best practice guidelines were taken into consideration and utilising the maximum expected heights of the infrastructure and the placement thereof in viewshed calculations as a precautionary approach;
- 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 Landscape Institute and Institute of Environmental Management and Assessment (LI IEMA, 2002); and



- The viewsheds resulting from the DEM and as illustrated in this report, indicate the areas from which the proposed project is likely to be visible and do not take local vegetation cover and anthropogenic structures into account. Potential sensitive receptor sites have therefore been ground-truthed during the field assessment.

2 LEGAL, POLICY AND PLANNING CONTEXT FOR VIAs

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

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

National Environmental Management: Protected Areas Act (Act 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 proposed Kanakies mine is situated within the Hantam Local Municipality for which the draft IDP 2015 – 2020 is available. According to the IDP document there are some mining activities such as salt and gypsum, within the municipality but are not labour intensive, however it does create job opportunities for 140 000 by 2020 and 200 000 by 2030.

Other

- According to the Northern Cape Provincial Spatial Development Framework (NCPSDF, 2012) the mining industry of the province is of national and international importance;
- Visual and aesthetic resources are also protected by local authorities, where policies and by-laws relating to urban edge lines, scenic drives, special areas, signage, communication masts, etc. have been formulated; and
- Other decision-making authorities such as the Department of Water and Sanitation (DWS) and the, in terms of their particular legislative frameworks, may also require VIAs to support informed decision-making.

3 DESCRIPTION OF THE PROPOSED PROJECT

Witkop Fluorspar Mine (Pty) Ltd intends to mine the gypsum deposit by means of simple trench mining, with the depth thereof varying between 1, 4 and 2,5m. The deposit will be harvested by first removing the overburden layer (0, 2 and 0,7m), followed by selective removal of the powder layer (0,4m) and subsequently by removal of the crystal containing clay layer (0, 9 to

1,3m). The powder will be screened to remove foreign materials and is expected to be recovered by a margin of at least 40% by volume harvested, inclusive of waste generated during screening, which should be less than 2% combined from dust generated and foreign objects removed during screening. The clay layer will be roll-crushed and screened by means of high frequency technology alongside the trench, to increase the average gypsum composition from between 40 and 50 to 80 and 90%. The harvesting recovery margin is estimated at 65% by volume extracted whilst the efficiency of the high frequency screening process is expected to be no less than 37%, calculating to an overall 76% mean loss by volume of material harvested. For more information regarding the mining activities refer to the Witkop Fluorspar Mine (Pty) Ltd Mining Work Programme.

The surface infrastructure associated with the proposed Kanakies Mine include the following (illustrated in Appendix A):

1. Plant and equipment consisting of a mobile crushing and high frequency screening plant, which will occupy an area of less than approximately <0,6 ha;
2. A small shipping container type office block and ablution facility which will occupy approximately 0,2 ha, otherwise known as a park-home. The height of the containers is 3m, and it will be elevated by 30cm, hence the total height that will be used for the viewshed analysis will be 3,3m for the office block and ablution facility. The water tank that will be utilised is 2m high and will be placed 3m above the ground hence the total height of the water tank is 5m that will be used for the viewshed analysis (Figure A2 and A3);
3. A vehicle parking area, fuel storage area and maintenance shed area which will occupy approximately 0, 6 ha in total. The maximum height of the fuel and oil storeroom is 3,5m. the height of the maintenance building is 7,04m, and several solar panels will be mounted on the roof to charge the batteries located in the storeroom (Figure A3- A5);
4. A stockpile area of 2.1 ha to store 8000 to 10 000 ton of finished product and another stockpile area of 0,5 ha to store a similar amount of run of mine. The stockpiles will have a maximum height of 3m each (Figure A6). The stockpiles will be designated for agricultural grade and industrial grade products; and
5. A total of approximately 5 ha of dirt road will be established to access the infrastructure area.

Furthermore, the deposit consists of two layers of gypsum – a powder layer of an approximate thickness of 0,4m, which lies approximately 0,2 to 0,7 m below the surface, followed by a nodular crystalline layer of gypsum of an approximate thickness of 0,9 to 1,3m (Figure A7).

The mining right area is serviced by a series of gravel farm roads, which provides access to the concentrated gypsum area as well as the Transnet rail siding situated along the eastern border of the farm. The rail siding is earmarked to serve as a loading base for gypsum on a permanent basis. The roads will be sprayed with a 20 ton bowser to suppress dust in the vicinity. A maximum of a 10km haul road with a width of 5m will be required over the life of the mine and will be created and rehabilitated concurrently as needed.

The life of mine is estimated to be 75 years, with the agricultural market comfortably absorbing 20 000 tons per annum, calculating to a life of mine of approximately 10 years and the industrial market in the Western Cape estimated at 20 000 ton per annum, calculating to approximately 64 years life of mine.

4 METHOD OF ASSESSMENT

4.1 Desktop Assessment

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

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

During the desktop assessment, which took place prior to and in preparation of the field assessment, the 1:50 000 topographical map, as well as high definition aerial photographs were used to identify dominant landforms and landscape patterns. These resources, together with digital elevation data projected in GIS were utilised to generate a visual context map indicating the Kanakies Mine area and the cumulative viewsheds of the proposed project, based on the maximum heights of the infrastructure being considered, as described in Section 3, used as input data. In order to generate the combined viewshed, individual viewsheds were

generated for the office block and ablution facility (containers), the water tank, the fuel and oil storeroom, the maintenance shed and the stockpiles, which were then overlaid.

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 B – K.

4.2 Field Assessment

A field assessment was undertaken during the summer season on 26 January 2018, which is considered to be a suitable time period during which to conduct the VIA, as it is during the dry season (winter rainfall region) and natural vegetation is less dense allowing the observer to see further across the landscape. It is important to note that due to the drought conditions experienced within the Western Cape, the vegetation was scarce, allowing the observer to see further across the landscape.

The field assessment included a drive-around and on-foot survey of the proposed Kanakies Mine and a drive-around of the surrounds, in order to determine the visual context within which the proposed project is to be developed. Focus was placed on assessing areas identified as being potentially important observation points, including residential areas, farm steads, Nature Reserves, and farm and prominent roads within the area. Points from where the proposed Kanakies Mine was determined to be visible were recorded (making use of Global Positioning Systems (GPS) in order to confirm these aesthetically sensitive viewpoints and potential sensitive visual receptors in relation to the proposed project.

High-resolution photographs were taken from areas from where the proposed project will have the highest visual impact and these photographs served as the basis from which representative visual simulations will be developed, which will serve to indicate the visibility of the proposed project in relation to identified Key Observation Points (KOPs). The visual model and photographs will then be 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

The Scoping Phase Public Meeting was held on the 9th of February 2018, and the Scoping Report was made available for public review between the 27th of March – 29th of April 2018, whereby Interested and Affected Parties (I&APs) were allowed to comment on the proposed project. A second Public Meeting is scheduled for the 29th of August 2018 to summarise the findings from the specialist studies for I&APs, which will be held concurrently with the public review of the EIA EMP report. Any comments received during the second round of public review will be addressed accordingly.

5.2 Brief Summary of Concerns and Issues Raised By I&APs

The following table summarises the issues raised by I&AP's during the Scoping phase public consultation on the relevant specialist report.

Comment received by I&AP's during Scoping Phase	Response
The impacts on the cultural landscapes and viewscapes must be assessed.	Refer to Section 6 of this report.

5.2 Development Category and Level of Impact Assessment

Through application of the VIA methods of assessment as presented in Appendix B, it was determined that the proposed project can be defined as a Category 5 development, which includes mining activities. According to Oberholzer (2005), a high visual impact is therefore expected, with potential intrusion on farm steads and may potentially lead to a significant change in the scenic resources and visual character of the area. In line with the above, a Level 4 Assessment is therefore required.

However, based on the outcome of the field assessment the proposed Kanakies Mine is situated in a remote area where only two sensitive receptors are situated within 1,5km of the focus area, with other sensitive receptors situated further than 5km from the focus area. It is therefore anticipated that the proposed Kanakies Mine will have a moderate visual impact on the receiving environment, due to the limited sensitive receptors in the area.

5.3 Description of the Receiving Environment

To holistically describe the receiving environment, this section of the report aims to determine the intrinsic value of the receiving landscape including aspects of the natural, cultural and

scenic landscape, taking both tangible and intangible factors into consideration. The table below aims to describe the particular character, uniqueness, intactness, rarity, vulnerability and representability of the Kanakies Mine within its existing context. General views of the landscape associated with the Kanakies Mine and surrounds with respect to the slightly undulating topography, open canopy and the overall character are indicated in the table below.

Table 1: Summary of the visual assessment of the proposed Kanakies Mine and surrounds.

<table>
<tr><td colspan="4">General view of the proposed surface trench mining and infrastructure areas, indicating the Transnet railway line, limited vegetative cover, bare ground, relatively flat topography of the area, with mountains in the greater region
   </td></tr>
<tr><td rowspan="2">Climate (Appendix D)</td><td rowspan="2">As a result of climate variations throughout the year, the appearance and perception of the landscape within and surrounding the Mining Right Area (MRA) changes with the seasons. The focus area and its surrounds appear muted during the summer months, with some seasonal autumn colours present, while it appears vibrant with various colours during the winter and spring months (flowering season). However, the Northern Cape has experienced extreme drought conditions for several years, thus there is limited seasonal variation, with a low vegetative cover. It should be noted that even though there is seasonal variation in the vegetation, the Northern Knersvlakte Vygieveld does not consist of tall floral species, thus seasonal variation in terms of vegetation, is unlikely to have an effect on the area from where project components would potentially be visible. Atmospheric dust concentration is higher during the dry summer months due to drier soil conditions and lower rainfall, resulting in atmospheric haziness, which will somewhat limit visibility of surrounding landscape. Due to the drought conditions present at the time of assessment, the haziness caused by atmospheric dust concentration was relatively high, obscuring the view of the focus area from more distant vantage points.</td><td>Landscape Character (Appendix F)</td><td>The landscape character associated with the focus area and immediate surroundings can be described as rural, relatively flat to slightly undulating, open canopy succulent shrubland where livestock grazing is taking place. The landscape is considered open with limited vegetative cover and due to the relatively flat topography one can see a significant distance across the landscape. The MRA is situated within a remote area where limited human activity / movement and sensitive receptors are present, as such there are few anthropogenic structures in the area, such as housing compounds, powerlines, the Transnet Railway Line and associated service road, gravel farm roads and fences. Key aesthetic aspects of the landscape associated with the focus area and the surrounding region are described in Appendix F. Since limited anthropogenic transformations are evident in the area, the proposed mining activities is expected to have a high impact on the landscape character, however due to the area being remote there are very few sensitive receptors in the area, that will experience the negative visual impact.</td></tr>
<tr><td>Visual Absorption Capacity (VAC) (Appendix G)</td><td>Medium (Score 9)
Due to the nature of the project, its location within an area currently unaffected by mining activities, and limited anthropogenic structures present in the area, the proposed projected will lead to a high level of visual intrusion on the landscape and is expected to be noticeable in relation to its surroundings. However, due to the bare ground dominating the area at the time of assessment, soil disturbance (surface trench mining) will result in a low degree of contrast in colour, making it difficult to distinguish the surface trench mining from its surroundings, when viewed from a distance. Furthermore, the</td></tr>
</table>

			undulating terrain, the distance from sensitive receptors, the overall limited height of the proposed surface infrastructure and the existing housing compound approximately 1,4km northeast of the infrastructure area, will serve to lower the visual intrusion from certain sensitive receptors. Since the majority of sensitive receptors, with the exception of the farm stead situated within the MRA, are situated further than 5km from the focus area, the proposed mining activities are in the background with a low visual intrusion on the viewer.
Land Use and visual receptors (Appendix E)	The focus area is situated in a relatively flat area surrounded by mountainous terrain in the greater region (approximately 25km from the focus area), located in open veld where livestock farming is currently taking place, which is considered the dominant land use of the area. Other land uses of the area include: the Transnet Railway line which traverses the MRA (currently in use), the housing compound of the workers for Transnet, farm steads and the Kalk Gat Private Nature Reserve that situated on the southwestern border of the MRA. Of the above, permanent residents are considered to be highly sensitive receptors, while people at their place of work are moderately sensitive receptors, as they are likely to focus on the activities at hand and not the surrounding environment. Since the MRA is situated within a remote area, the closest regional road is the R355 situated approximately 15km north of the MRA and a gravel service road for the Transnet Railway Line traversing the MRA. Furthermore, several farm roads are present in the area. The abovementioned roads are predominantly utilised by farmers, farm workers and Transnet maintenance workers, and due to their momentary views and experience of the receiving environment, are classified as low sensitivity receptors. Existing anthropogenic structures such as farm houses and associated sheds, powerlines, fences, the Transnet Railway Line and road / railway signs are present within the area.	**Landscape Quality (Appendix H)**	**Medium (Score 12)** The landscape associated with the MRA and surroundings provide topographical variety in the form of slightly undulating plains, mountainous terrain in the larger region, open canopy succulent shrubland, limited anthropogenic structures, and although mostly dry, the Doring and Krom Rivers and associated ephemeral drainage lines which leads to an increased visual interest. Even though the vegetation component at the time of assessment was homogenous, due to extreme drought conditions, the greater Namaqualand area has a high floral diversity after sufficient winter rainfall, thus attracting many tourists, increasing the landscape quality of the area. Furthermore, anthropogenic structures are present in the surrounds, the proposed Kanakies Mine will add to discordant elements in the area, lowering the landscape quality of the area.
		Landscape Value (Appendix I)	With reference to Appendix I, the focus area is likely to be most valued by farmers, farm workers, tourists coming to the Namaqualand region to indulge in the beauty of the wildflowers, people camping and hiking within the Kalk Gat Private Nature Reserve and the Transnet workers inhabiting the housing compounds situated within the MRA and adjacent to the railway line. The region is also likely to be valued by motorists traveling along the R355 and gravel roads in the vicinity. It should be noted that the MRA is situated approximately 15km southwest of the R355, and thus the proposed Kanakies Mine will not have any visual impact on tourists traveling along the R355, and the gravel roads in the vicinity of the MRA are utilised by farmers and farm workers. Furthermore, the Namaqualand region is of provincial, national and international importance due to the flowering season attracting vast numbers of tourists from across the globe. Although the MRA is not situated on a route earmarked for tourists to view the wildflowers, local residents of the Loeriesfontein area and their families are likely to view the MRA and surrounds during the flowering season. The proposed project may therefore substantially lower the landscape value of the area through the direct loss of vegetation and potential loss of undiscovered tangible and intangible historical and cultural artefacts. The Transnet Railway Line, associated service road and workers' housing compounds have already lowered the landscape value of the area.

Topography	The topography associated with the focus area and surrounding area is characteristic of the larger region and is not confined to the focus area. The local topography of the focus area consists of flat to slightly undulating plains, and is surrounded by mountainous terrain. Limited distinguishing topographical features in the form of prominent hills or outcrops are present within or around the focus area. Please refer to Figures 4 and 5 for the elevation and slope models of the area.	**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 sense of place associated with the focus area is related to the landscape character type, defined as rural, flat to slightly undulating terrain, with isolated farmsteads in the distance. The focus area and surrounds can further be described as calm, tranquil and peaceful, wild with limited development, with a strong association to the natural environment. The sense of place is however not unique to the focus area as it extends to the larger Namaqualand region.
Vegetation Cover (Appendix D)	The focus area is situated within the Succulent Karoo Biome, and the Knersvlakte Bioregion, according to Mucina & Rutherford (2012). The majority of the focus area is characterised by the Northern Knersvlakte Vygieveld, with a small southwestern portion falling within the Knersvlakte Shale Vygieveld (Appendix D). Based on the field assessment the focus area comprises an open canopy succulent shrubland dominated by *Atriplex lindleyi, Deverra denudate, Mesembryanthemum spp., Psilicaulon spp., Lithops spp., Drosanthemum spp.,* and the protected species *Hoodia gordonii* - under NCNCA 9 of 2009. Due to drought conditions at the time of assessment, the vegetative cover was low with extensive bare ground visible throughout the focus area. It should however be noted that the vegetation associated with the focus area is of low to moderate height, thus the vegetation will not provide screening ability to the receiving environment.	**Night Time Lighting (Appendix I)**	The focus area in its current state contains no infrastructure and thus no lighting, and since the area is remote with the workers housing compound in the MRA and farm steads present in the far distance, there are limited sources of night-time lighting in the area. The lighting environment of the region is therefore considered intrinsically dark (Zone E1 [Natural]). The impact from the mining project is therefore expected to be significant in such a remote area during night-time hours, should 24-hour mining activities take place. However, since the proposed mining activities will only take place during the daylight hours, the proposed project is not expected to substantially contribute to the effects of sky glow and artificial lighting in the region. Since the Kanakies mine is situated in a remote area, with limited light sources, the security lighting utilised at night will be visible within an approximate 5km or further radius.
		No-Go Alternative	Should the mining activities not take place within this area, no visual impacts will occur.
Visual Exposure and Visibility and Key Observation Points (KOPs) (Appendix K)			
The proposed surface infrastructure and surface trench mining is expected to be highly to moderately visible to any receptors present within a 2km radius of the focus area, taking screening abilities from the landscape into account. This is due to these areas falling within the high to moderate visibility zone of the project and the proposed infrastructure forming part of the foreground–middle ground of the potential receptors' viewing experience. The proposed project is unlikely to be significantly visible to receptors situated further than 2 kilometres of the focus area due to the relatively low height of the infrastructure, the surrounding mountainous terrain and the contrast in colour from the bare ground present, which would make it difficult to the viewer to distinguish between the bare ground and the surface trench mining area. From the viewshed analysis, it is evident that the proposed surface infrastructure will not be visible to any sensitive receptors situated south to northwest of and within 10km of the focus area. Furthermore, the proposed surface infrastructure will only be seen in limited areas northeast to south of the focus area, and as observed very limited sensitive receptors fall within the viewshed analysis. The viewshed analysis also indicates that there will not be a clear line of sight from the Kalk Gat Private Nature Reserve. Based on the field verification the proposed surface infrastructure will be moderately visible to the only sensitive receptor situated within 1km of the focus area, where the proposed infrastructure is said to be in the foreground. Since the majority of sensitive receptors are situated further than 3km from the focus area, the proposed surface infrastructure and surface trench mining will be moderately to barely visible to these receptors, and as such fall in the middle-to background of the sensitive receptors. Figures 6 to 12 below indicate the location of the selected line of sight cross sections, the findings of the line of sight analysis and the viewshed analysis as well as the conceptual visual simulations rendered from the KOPs. The table that follows describe the line of sight analyses and KOPs associated with the focus area.		

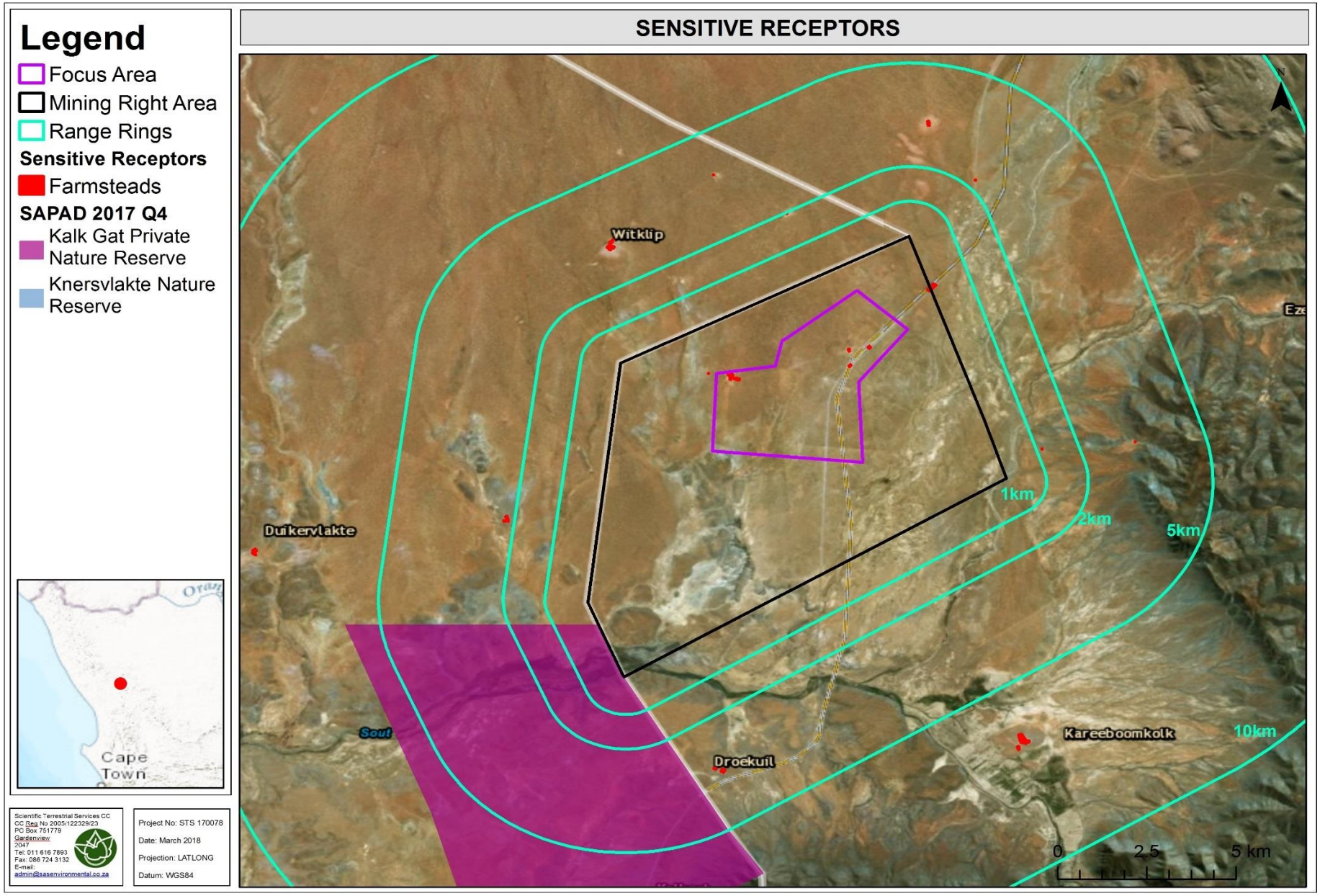


Figure 3: Map indicating the location of potential visual receptors within 5km of the Mining Right Area.

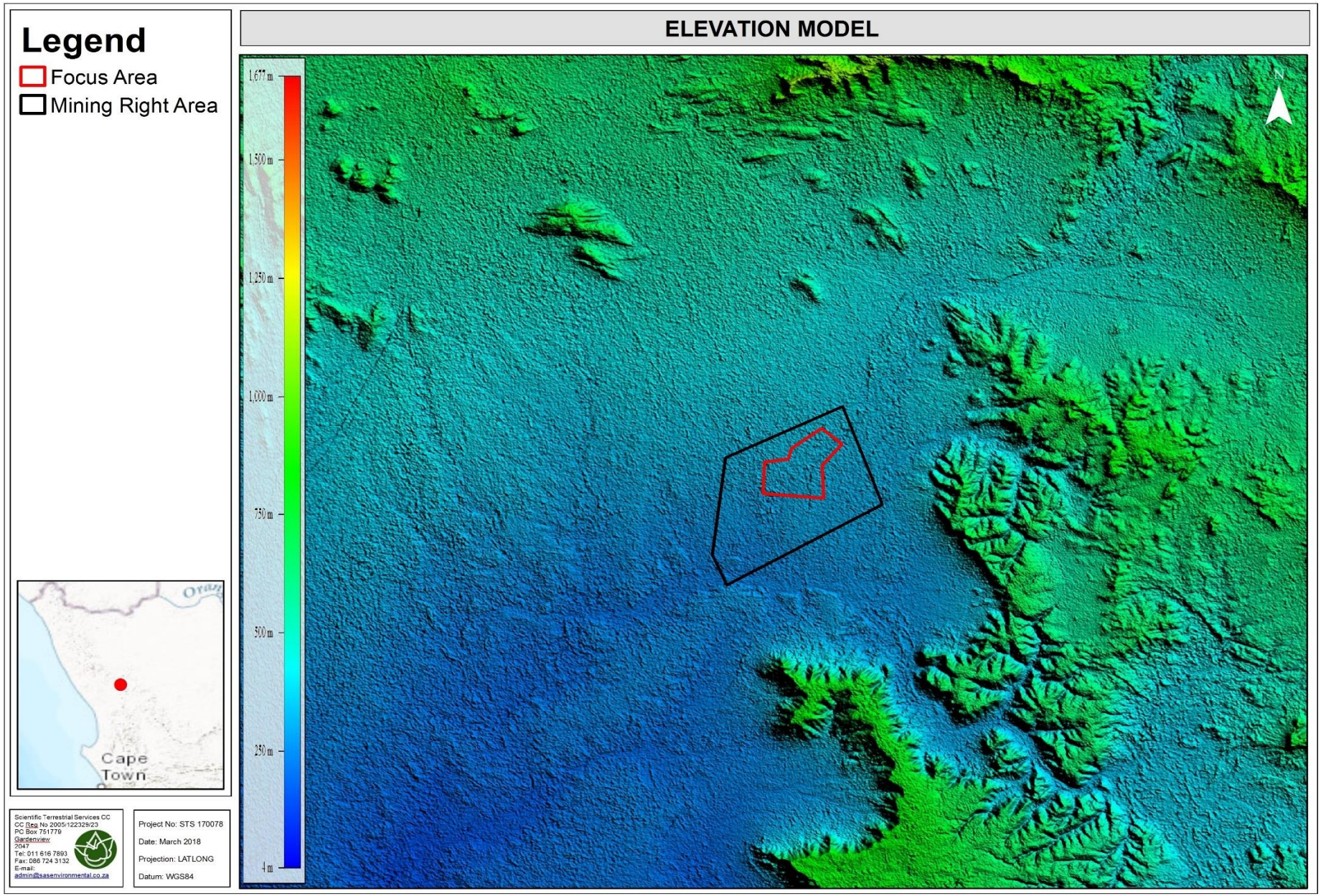


Figure 4: Elevation rendering depicting the topographical character of the Mining Right Area.

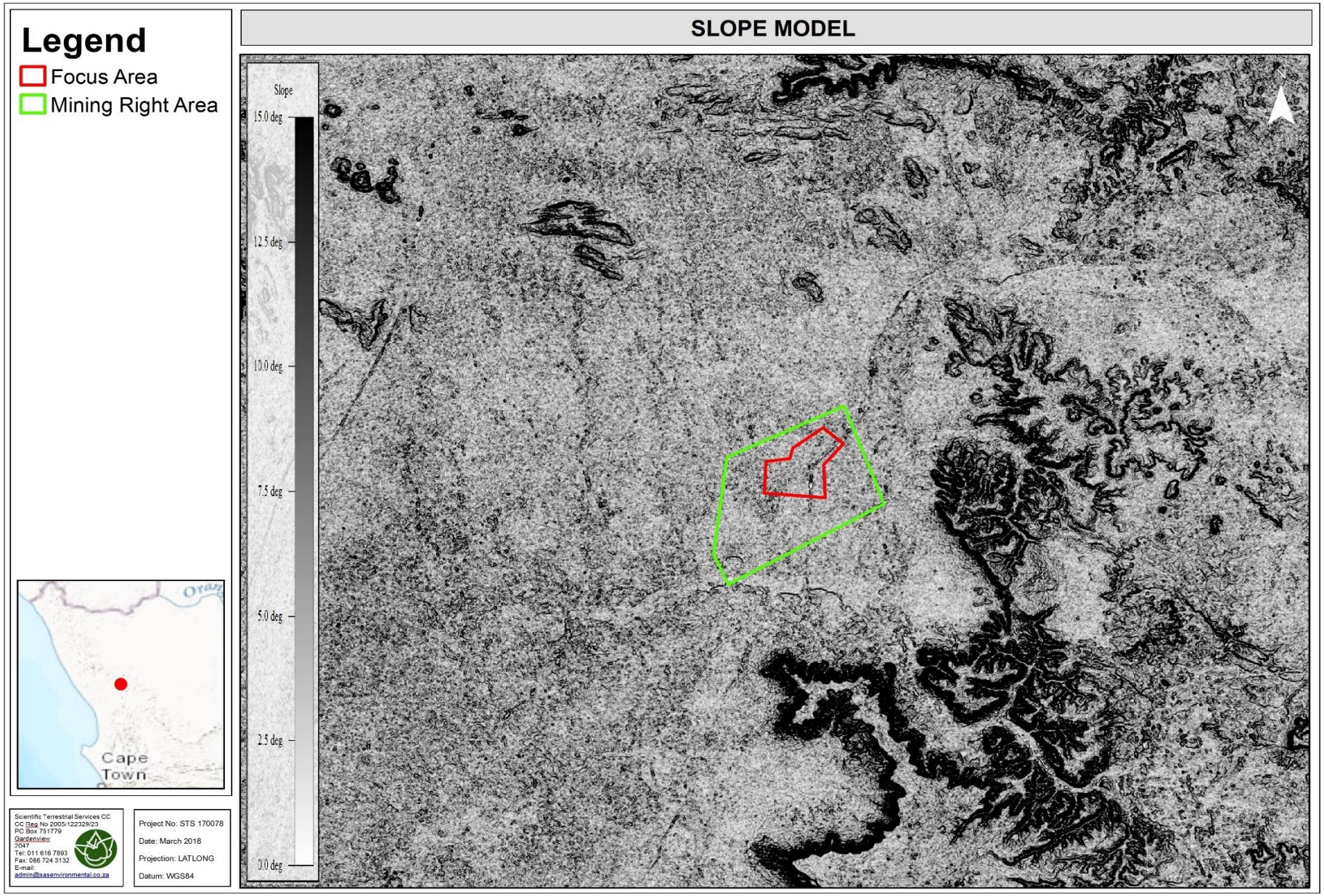


Figure 5: Map indicating the general relief associated with the Mining Right Area.

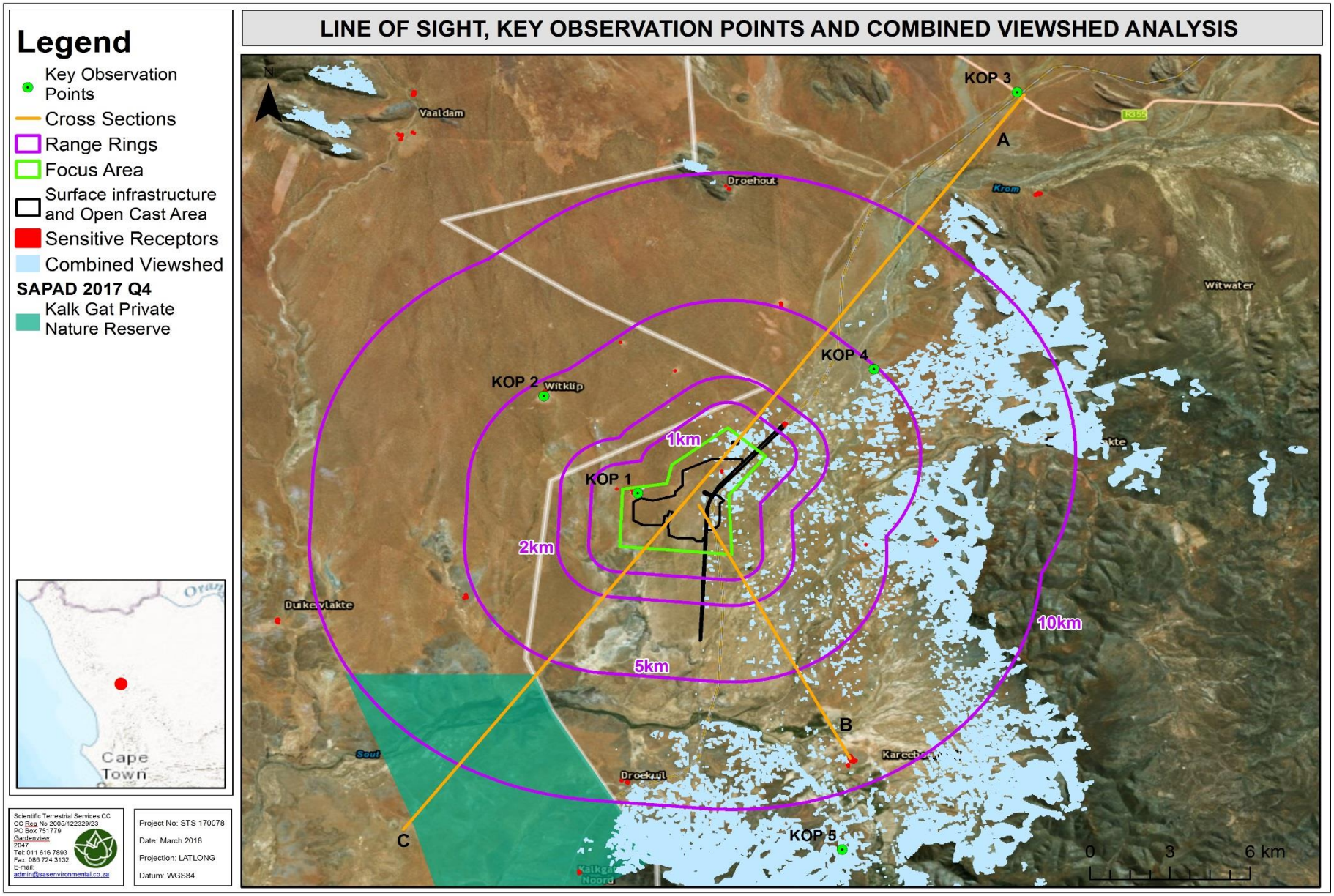


Figure 6: Map indicating the cross sections, Key Observations Points (KOPs), and viewshed for the proposed surface infrastructure.

Table 2: Line of sight analysis and key observation points applicable to the Kanakies Mine.

Line of Sight Analysis			Key Observation Points (KOPs)				
Cross Section:	A	Although there is a clear line of sight from the R355 roadway, the distance (approximately 16,5km geodesic), the height of the infrastructure and stockpiles, and existing anthropogenic structures such as powerlines in the landscape, will render the visibility low. Furthermore, the mountainous terrain in the greater surrounding region will attract the attention of the observer more. Additionally, motorists have momentary views of an area and tend to focus more on the road than surroundings.		**Location**	**Visibility**	**Receptor Sensitivity**	**Motivation**
			KOP1	Farmstead situated within the MRA, facing toward the surface trench mining area.	High – surface trench mining area, Marginal – stockpiles and infrastructure area	High – Permanent residents (farm worker)	The farm stead is situated approximately 200m northwest of the surface trench mining, hence the surface trench mining will be highly visible from the farmstead. The proposed infrastructure and stockpiles are situated approximately 3,6km northeast of the farmstead, therefore the visibility thereof will be marginal and in the background.
	B	According to the line of sight analysis, the surface trench mining will be visible from the farmstead, however it is unlikely to be seen due to the distance (±11km) from the farmstead as well as the limited contrast in colour that will occur from soil disturbance, thus placing the surface trench mining and associated infrastructure in the background. This was confirmed during the field assessment.	KOP2	Farmstead situated approximately 5,5km northwest of the infrastructure area.	Low	High – permanent residents (farmer)	The proposed infrastructure and surface trench mining will barely be visible form this farmstead since it is situated 5,5km from the focus area. Furthermore, the focus area will blend in with the foothill of the mountain range, making it difficult to distinguish from the surrounding landscape.
	C	Although theoretically the line of sight analysis indicates a clear line of sight from the Kalk Gat Private Nature Reserve, the distance from the surface trench mining area (±14km) and the stockpiles and infrastructure (±18km) as well as the height of the stockpiles and infrastructure, will render visibility low.	KOP3	R355 roadway approximately 16,3km northeast of the focus area.	None	Moderate – road users with a limited viewing time	The proposed Kanakies Mine will not be visible from the R55 roadway, due to the distance between the two points.
			KOP4	Farmstead situated approximately 5km northeast of the focus area.	Limited	High – permanent residents	Due to the distance and height of the proposed infrastructure and stockpiles, the focus area will barely be visible to the farmer, thus limited visual intrusion will occur.
			KOP5	On farm road situated approximately 13km southeast of the focus area	Limited to none	Moderate – road users with a limited viewing time	The proposed Kanakies Mine is situated in the background view of the farm road, thus the mine will not be visually intrusive. On a clear day the surface trench mining may be slightly visible in the distance, however due to the exposed bare ground present the, surface trench mining will be difficult to distinguish from such a distance. Furthermore, based on the field assessment it is evident that the road is used infrequently.

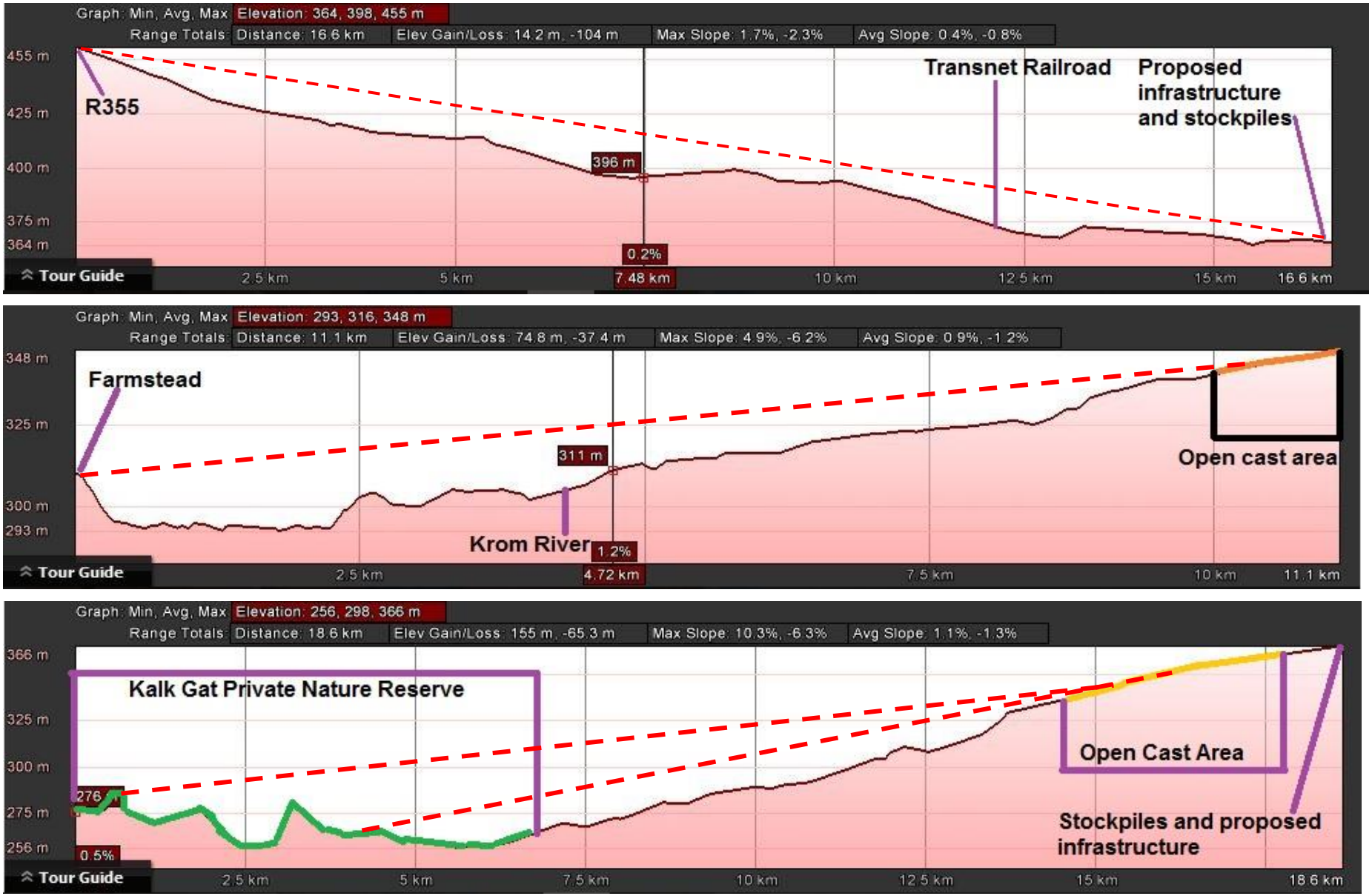


Figure 7: Results of the line of sight analysis from Cross Section A (top) to Cross Section C (bottom) of the Kanakies Focus Area.

Figure 8: Conceptual rendering of the view from KOP1 where the surface trench mining will be highly visible and the stockpiles and infrastructure will barely be visible, as indicated by the red block.

Figure 9: Conceptual rendering of the view from KOP 2 where the surface trench mining and proposed infrastructure will barely be visible, thus in the background, situated further than 5,5km from the farmstead, and blending in with the foothill of the mountain range.

Figure 10: Conceptual rendering of the view from KOP 3 where the Kanakies Mine will not be visible, due to the distance from the R355 to the Kanakies Mine (approximately 16,3km).

Figure 11: Conceptual rendering of the view from KOP 4 where the focus area will barely be visible in the far distance (background), as indicated by the dashed red arrow.

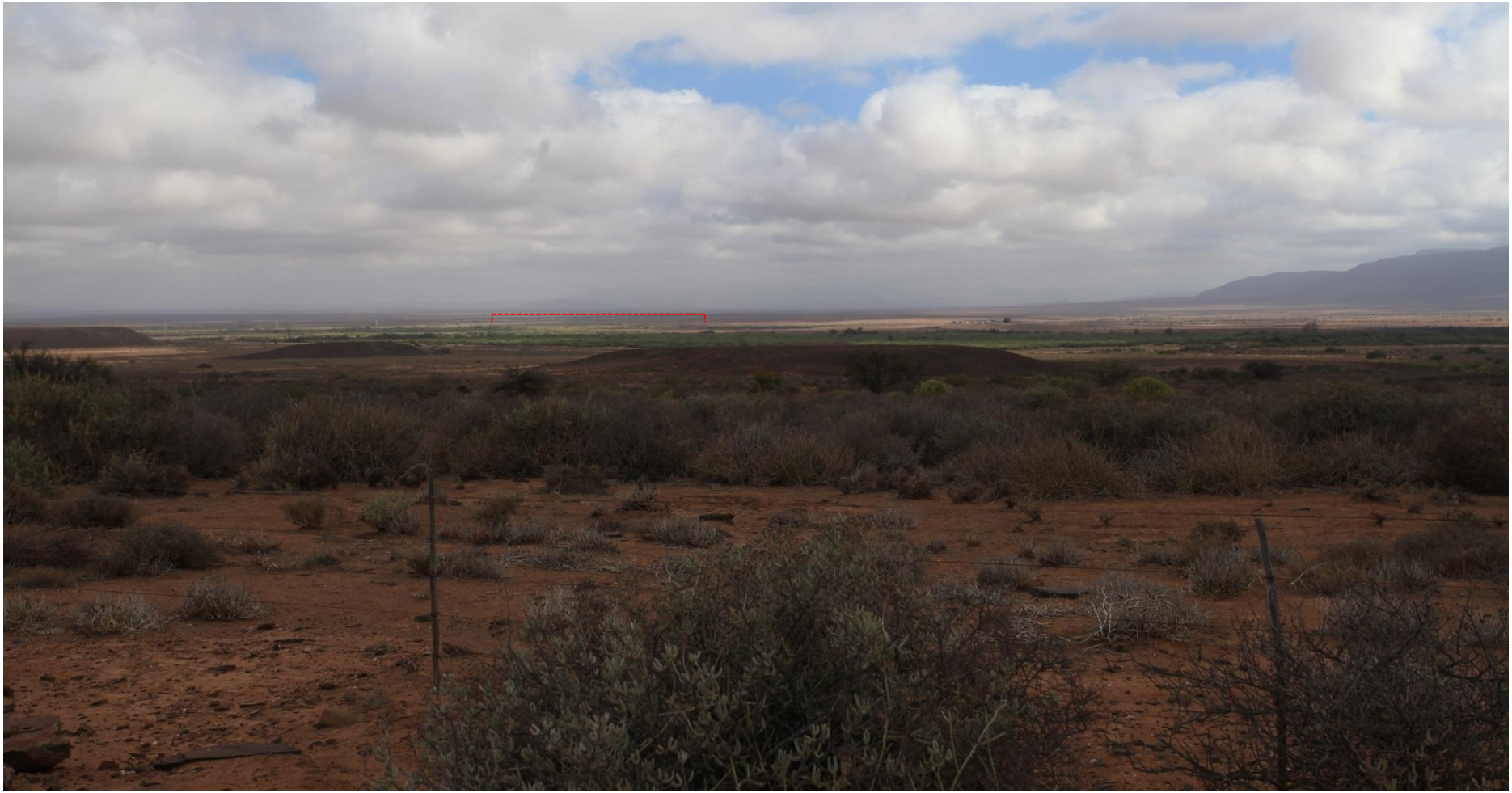


Figure 12: Conceptual rendering of the view from KOP 5 where the Kanakies Mine is in the background, thus will barely be noticeable in the far distance, as indicated by the dashed red block.

6 IMPACT ASSESSMENT

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

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

6.1 Impact Discussion

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

6.1.1 Impact 1: Impact on Landscape Character and Sense of Place

The character of the landscape and sense of place in the region of the proposed project is currently dominated by livestock farming and can be described as rural, relatively flat to slightly undulating, open canopy succulent shrubland. The MRA is situated within a remote area where limited human activity and sensitive receptors are present, as such there are few anthropogenic structures in the area, including housing compounds, powerlines, the Transnet Railway Line and the associated service road, gravel farm roads and fences. Since limited anthropogenic transformations have occurred in the area, the proposed mining activities will alter the landscape character and sense of place of the area. However, there are limited sensitive receptors in the area that will experience the negative visual impact.

Activities and aspect register

The table below identifies potential activities that might take place during the various phases of the proposed development, which could possibly impact on the landscape character and sense of place of the area. It should be noted that these activities listed in the table below

were utilised during the impact assessment as pre-mitigated impacts to ascertain the significance of the perceived impacts prior to mitigation measures.

Pre-Construction	Construction	Operational	Decommissioning
Planning and placement of mining infrastructure where it will be visible for significant distances	Site clearing, including the removal of topsoil and vegetation	On-going mining activities, including removal of gypsum, and potentially increasing the height of the stockpiles.	Demolition and removal of infrastructure leading to further dust generation, erosion and changes in the visual character of the project area
Failure to initiate a biodiversity action plan, concurrent rehabilitation plan and alien floral control plant during the pre-construction phase may lead to further impacts on the landscape character during later development phases	Construction of general surface infrastructure including additional access roads, and transportation of materials and stockpiling	Potential increased introduction and proliferation of alien plant species leading to further change in landscape character	Ineffective rehabilitation leading to poor vegetation cover with bare areas remaining present, the surface trench mining areas not being backfilled and surface infrastructure remaining
	Altering the topography of the area through the creation of stockpiles higher than 3m	Continued earthworks and vehicular movement leading to increase dust suppression	Ongoing proliferation of alien vegetation
	Potential erosion and loss of topsoil leading to higher visual contrast	Disturbance of soils and ongoing erosion due to operational activities	Ineffective rehabilitation leading to extensive area of bare soil scarring the landscape
	An increase in construction vehicular and human activity in the area, leading to an increase in dust suppression.		
	Earthworks resulting in increased dust suppression		

The significance of the impact is assessed in the table below (refer to Appendix C):

Unmanaged	Probability of Impact	Sensitivity of receiving environment	Severity	Spatial scale	Duration of impact	Likelihood	Consequence	Significance
Construction phase	5	3	4	4	4	8	12	96 (Medium High)
Operational phase	5	3	4	4	4	8	12	96 (Medium High)
Decommissioning	3	3	3	3	4	6	10	60 (Medium-Low)
Managed	**Probability of Impact**	**Sensitivity of receiving environment**	**Severity**	**Spatial scale**	**Duration of impact**	**Likelihood**	**Consequence**	**Significance**
Construction phase	5	3	3	2	3	8	8	64 (Medium Low)
Operational phase	5	3	3	3	4	8	10	80 (Medium High)
Decommissioning	3	3	2	2	2	6	6	36 (Low)

The landscape character and sense of place of the focus area is considered to be of moderate to high visual sensitivity and importance. From the above table it is clear that prior to mitigation, the expected impact on the overall visual character and sense of place of the area as a result of the proposed project is considered to be Medium High during the construction and operational phases or Medium Low during decommissioning phase. The change in landscape character and sense of place will definitely occur as the proposed mining activities will alter the land use within the area. Post mitigation - should management measures be effectively implemented; the overall impact significance may be reduced. Should suitable mitigation and effective rehabilitation not be implemented during the decommissioning and closure phase of the project, the duration of the impact will be long-term with the visual character of the region permanently altered.

6.1.2 Impact 2: Visual Intrusion and VAC impacts

The altered visual environment during the various development phases of the proposed project may lead to increased levels of visual intrusion, with moderately high levels of incompatibility with the surrounding land uses as well as visual contrast and discord between the focus area and its surroundings. It is expected that although the VAC of the project area will be negatively impacted on by the proposed project, this impact, as well as visual intrusion may be mitigated through the implementation of suitable mitigation measures.

Activities register

Pre-Construction	Construction	Operational	Decommissioning
Siting of mining infrastructure in an area where limited disturbance has occurred	Site clearing, including the removal of topsoil and vegetation	Ongoing mining activities including removal of gypsum, and potentially increasing the height of the stockpiles	Ineffective rehabilitation resulting in poor vegetation cover and erosion being present and surface trench mining area not being backfilled and revegetated
	Construction of mining infrastructure including offices and plant areas	Increased amount of human activity and presence of mining vehicles on local roads	Ineffective decommissioning and rehabilitation leading to permanent presence of mining infrastructure
	Creation of stockpiles	Ongoing vegetation clearing, scarring of the terrain and altering of landforms or contours	Ineffective rehabilitation leading to extensive bare soils, scarring the landscape
	Vegetation damage, scarring of the terrain, and altering of landforms or contours		
	Increased amount of human activity, construction vehicles, and other equipment		

The significance of the impact is assessed in the table below (refer to Appendix C):

Unmanaged	Probability of Impact	Sensitivity of receiving environment	Severity	Spatial scale	Duration of impact	Likelihood	Consequence	Significance
Construction phase	5	3	4	4	3	8	11	88 (Medium High)
Operational phase	5	3	4	4	4	8	12	96 (Medium High)
Decommissioning	4	3	3	3	4	7	10	70 (Medium Low)
Managed	**Probability of Impact**	**Sensitivity of receiving environment**	**Severity**	**Spatial scale**	**Duration of impact**	**Likelihood**	**Consequence**	**Significance**
Construction phase	5	3	3	3	3	8	9	72 (Medium Low)
Operational phase	5	3	3	3	4	8	10	80 (Medium High)
Decommissioning	3	3	2	2	2	6	6	36 (Low)

The expected level of visual intrusion through the development of a mine within the focus area is considered high due to the proposed project situated within an area currently not affected by mining activities and limited anthropogenic structures are present. The area however has a medium VAC due to its ability to absorb or conceal some visual impacts, such as the surface trench mining which will result in a low degree of contrast in colour due to bare ground dominating the area, making it difficult to distinguish the surface trench mining from its surroundings when viewed from a distance. The VAC of the Kanakies Mine will however be lowered during the mining process, due to vegetation clearing and alteration of landforms. Since the majority of sensitive receptors, with the exception of the farmstead situated within the MRA, are situated further than 5km from the focus area, the proposed mining activities are in the background with a low visual intrusion on the viewer.

Prior to mitigation measures being implemented, this impact is expected to be Medium-High during both the construction and operational phases and Medium-Low during the decommissioning phase, as a result of visual intrusion and loss of VAC. These significance ratings may be lowered through the implementation of mitigation measures and provided that progressive revegetation of impacted areas take place. The duration of the impact, should mitigation measures not be implemented, may be long term, but should mitigation be effective and the recovery of the landscape be actively sought after closure and through concurrent rehabilitation, may be lowered.

6.1.3 Impact 3: Visual Exposure and Visibility Impacts

This impact relates directly to the perception of sensitive visual receptors towards the proposed project. Highly sensitive visual receptors have been determined to primarily comprise residents (farmers) situated further than 5km from the focus area, with the exception of one farmstead situated within the MRA, and potential visitors to the Kalk Gat Private Nature Reserve situated adjacent to the MRA. Moderately sensitive receptors are road users of the farm roads in and around the MRA, with the closest regional road situated 15km north of the MRA, and people at their place of work, Transnet workers and farmworkers. Visual exposure will take place directly as a result of mining infrastructure and associated lighting being visible and indirectly through fugitive dust generated by construction and operation related activities, such as earthwork activities and construction vehicles driving on dirt roads which will alter the visual environment. In addition to mining infrastructure, impacts from clearing of vegetation, potential erosion as a result of bare soils, and alteration of landscape morphology will also create a noticeable contrast in the landscape. However, with limited sensitive receptors present within 5km of the focus area, limited viewers will observe the negative visual impact of the proposed Kanakies Mine.

Activities register

Pre-Construction	Construction	Operational	Decommissioning
Preparing and planning of the project site	Construction of infrastructure such as additional access roads	Ongoing mining activities including removal of gypsum, and potentially increasing the height of the stockpiles	Ineffective rehabilitation including poor vegetation cover which will contribute to dust generation and surface trench mining areas not being backfilled and revegetated
Placement and design of infrastructure leading to the mining infrastructure and activities being visible over significant distances and by visually sensitive receptors situated further than 5km	Dust generation due to movement of vehicles and removal of vegetation exposing bare ground	Presence and movement of vehicles and an increased level of human activity	Ineffective decommissioning and rehabilitation leading to permanent presence of mining infrastructure
	Creation of stockpiles		
	Loss of vegetation cover, leading to erosion and loss of topsoil leading to increased visual contrast		

The significance of the impact is assessed in the table below (refer to Appendix C):

Unmanaged	Probability of Impact	Sensitivity of receiving environment	Severity	Spatial scale	Duration of impact	Likelihood	Consequence	Significance
Construction phase	5	3	4	4	3	8	11	88 (Medium High)
Operational phase	5	3	4	4	4	8	12	96 (Medium High)
Decommissioning	3	3	3	3	3	6	9	54 (Medium Low)
Managed	**Probability of Impact**	**Sensitivity of receiving environment**	**Severity**	**Spatial scale**	**Duration of impact**	**Likelihood**	**Consequence**	**Significance**
Construction phase	4	3	2	2	3	7	7	49 (Low)
Operational phase	4	3	2	3	4	7	9	63 (Medium-Low)
Decommissioning	3	3	2	2	2	6	6	36 (Low)

The proposed mining activities are expected to visually impact on a number of sensitive receptors, particularly residents, workers, road users further than 5km and potential visitors to the Kalk Gat Private Nature Reserve, in particular uncontrolled dust generation from earthworks and vehicular movement on gravel roads, prior to the implementation of mitigation measures. Due to the limited sensitive receptors present in the area, the proposed Kanakies mine will have limited visual exposure and visibility impacts prior to mitigation measures. Should mitigation measures be implemented, the proposed impact, especially dust generation, will be reduced to the limited sensitive receptors present within 5km of the surface trench mining and surface infrastructure area, which will be directly affected by the proposed mining activities.

6.1.4 Impact 4: Impacts due to Night Time Lighting

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

The focus area in its current state contains no infrastructure and thus no lighting, and since the area is remote with the workers housing compound in the MRA and farm steads present in the far distance, there are limited sources of night-time lighting in the area. The mining operations will only take place during daylight hours, thus the only source of night time lighting

associated with the Kanakies Mine will be security lighting, thus contribution to skyglow is limited. However, should 24-hour mining operations take place, the night time lighting will contribute significantly to the effects of sky glow and artificial lighting in the region and reduce the appearance of starry skies. The pre-mitigated impacts below are scored on the assumption that 24-hour mining activities are taking place, and with mitigation and management measures implemented the impacts are scored on the assumption that the mining activities will only take place during the day.

Activities register

Pre-Construction	Construction	Operational	Decommissioning
Preparing and planning of site and siting of infrastructure	Use of security lighting during the construction phase	Exterior lighting around the offices, parking areas and other infrastructure areas	Stationary and vehicle mounted lighting during the decommissioning and rehabilitation phase
Planning of light placement and overall lighting strategy		Lighting at night from operational vehicles	
		Security and other lighting around and on support structures could also contribute to light pollution	
		Maintenance activities conducted at night	

The significance of the impact is assessed in the table below (refer to Appendix C):

Unmanaged	Probability of Impact	Sensitivity of receiving environment	Severity	Spatial scale	Duration of impact	Likelihood	Consequence	Significance
Construction phase	4	3	3	4	3	7	10	77 (Medium Low)
Operational phase	5	3	4	4	4	8	12	96 (Medium High)
Decommissioning	4	3	3	4	3	7	10	70 (Medium Low)
Managed	**Probability of Impact**	**Sensitivity of receiving environment**	**Severity**	**Spatial scale**	**Duration of impact**	**Likelihood**	**Consequence**	**Significance**
Construction phase	3	3	2	2	3	6	7	42 (Low)
Operational phase	3	3	3	3	4	6	10	60 (Medium Low)
Decommissioning	3	3	2	2	3	6	7	42 (Low)

From the table above, it is clear that before mitigation, the impact on visual resources through light pollution, particularly at night, is highly likely to occur during all development phases, should 24-hour mining activity take place. Due to the area being considered intrinsically dark the landscape is considered visually sensitive to lighting, and thus the proposed mining

activities will substantially contribute to the effects of sky glow and light trespass which will in turn reduce the visual quality of the environment.

Before mitigation, the impact on visual resources through light pollution, particularly at night, is Medium-Low during the construction and decommissioning phases, and Medium-High during the Operational Phase. Ensuring that mining activities are restricted to daylight hours only, and with effective implementation of mitigation measures pertaining to lighting, with particular reference to lighting design and placement, it may result in the lighting impact being reduced to Medium-Low and Low significance levels.

6.2 Impact Summary

Based on the above assessment it was found that there are four possible impacts that may affect the visual character of the areas and impact on potential sensitive receptors and visually sensitive landscapes.

Table 3 below summarises the findings of the impact assessments, indicating the significance of the various impacts before mitigation takes place and the likely impact significance if effective management and mitigation takes place.

Table 3: Summary of the results obtained from the assessment of visual impacts from the proposed project.

Construction phase		
Impact	**Unmanaged**	**Managed**
1: Impact on landscape character and sense of place	Medium High	Medium Low
2: Visual intrusion and VAC impacts	Medium High	Medium Low
3: Visual exposure and visibility impacts	Medium High	Low
4: Impacts due to night time lighting	Medium Low	Low
Operational phase		
Impact	**Unmanaged**	**Managed**
1: Impact on landscape character and sense of place	Medium High	Medium High
2: Visual intrusion and VAC impacts	Medium-High	Medium High
3: Visual exposure and visibility impacts	Medium-High	Medium Low
4: Impacts due to night time lighting	Medium-High	Medium Low
Decommissioning Phase		
Impact	**Unmanaged**	**Managed**
1: Impact on landscape character and sense of place	Medium Low	Low
2: Visual intrusion and VAC impacts	Medium Low	Low
3: Visual exposure and visibility impacts	Medium Low	Low
4: Impacts due to night time lighting	Medium Low	Low

6.3 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 mining activities is likely to be of high significance, even more so due to the fact that no existing mining activities are currently present in the region. The cumulative impact of additional traffic on the local and regional roads as well as combined impacts from night time lighting will also affect the sense of place of the larger region.

6.4 Residual Impacts

It is possible that after all surface infrastructure have been removed scarring of the terrain may remain present post-closure. Even though the surface trench mining area will be backfilled and revegetated once mining activities have ceased, indigenous vegetation of the area will be permanently lost or altered. The possibility also exists that rehabilitation efforts, including revegetation of impacted areas, including the surface trench mining area, be unsuccessful, which will lead to a long term or permanent visual impact in the area.

6.5 Mitigation Measures

The sections below indicate the required mitigatory, management and monitoring measures required to minimise potential visual impacts.

General housekeeping

- All construction and operational areas must be kept in a neat and orderly condition at all times. No rubble should be dumped at random within the site, but within relevant removable bins. An efficient removal system of waste and rubble must be ensured during all development phases;
- Fires within the MRA are to be prohibited;
- All operational facilities, including vehicles, should be maintained in good working order; and
- Any areas for material storage, waste sorting and other potentially intrusive activities must be designated and screened from view as far as considered feasible.

Development footprint

- The development footprints and disturbed areas should be kept as small as possible and the areas cleared of natural vegetation and topsoil must be kept to a minimum;
- The extent of all infrastructure footprint areas and permanent/ temporary structures must be limited to what is essential; and

- As far as possible, existing roads are to be utilised, to limit cumulative impacts from roads and increased vehicular movement.

Infrastructure placement

- As far as possible, infrastructure should not be placed on ridgelines, near freshwater resources or other locations where they would be silhouetted against the sky. In this regard it is important to, as far as possible, keep the stockpiles at a maximum height of 3m, as stipulated in the project description, so as to ensure that it does not form part of the skyline (extend over the mountain crest in the distance);
- The stockpiles should be shaped in such a way to fit in with the surrounding undulating landscape and revegetated, if feasible, to blend with the surroundings to minimise visual contrast; and
- Should new or additional roads be required, they are to follow the contours of the landforms in order to make it less visually prominent and to reduce the need for cut and fill activities, where possible.

Infrastructure appearance

- It must be ensured that all buildings or office containers fit its surroundings through the appropriate use of colour and material selection, in order to lower visibility of the proposed project;
- Natural colours should be used in all instances and the use of highly reflective material should be avoided. Any metal surfaces should be painted to fit in with the natural environment in a colour that blends in effectively with the background. White structures are to be avoided as these will contrast significantly with the natural surroundings; and
- The identification of appropriate colours (olive greens, tans and light grey) and textures for facility materials should take into account both summer and winter appearance;
- The use of permanent signs and project construction signs should be in accordance with the requirements of the project and mining regulations, be minimised and visually unobtrusive.

Screening

- It must be ensured that existing vegetation, on the periphery of the MRA is retained during the construction phase, to ensure that limited contrast in colour occur outside the MRA;
- It must be ensured, wherever possible, that existing natural vegetation is to be retained during the construction and operational phases of the project and incorporated into the concurrent site rehabilitation;
- An ecological approach to any proposed landscaping is recommended. Should plants be introduced for this purpose, choice should be guided by ecological rather than horticultural principles;

- Painting or coating infrastructure components to match darker colours in the natural surroundings may reduce the distance required for effective screening;
- The surface infrastructure area should be screened through the use of a clearVU fence or, equally approved, which will result in a more unified and tidy appearance.

Erosion

- Erosion, which may lead to increased levels of visual contrast and further detract from the visual environment, must be prevented throughout the lifetime of the project by means of putting soil stabilisation measures in place, where required, and through concurrent rehabilitation.

Dust

- Access roads are to be maintained and minimise dust from traffic on gravel roads, through the use of approved dust suppression techniques, such as regular wetting of gravel roads.
- An effective dust management plan taking into account stockpile areas, the plant infrastructure area (stockpiles and transfer points), as well as haul/ access roads must be designed and implemented in order to mitigate the impact of dust on sensitive receptors throughout all mining phases; and
- Vehicle speed on gravel roads must be reduced to limit dust creation.

Lighting

- 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;
- Construction activities should be restricted to daylight hours as far as possible, in order to limit the need to bright floodlighting and the potential for skyglow;
- It is recommended that maintenance works should not take place at night or on weekends, unless absolutely essential;
- Outdoor lighting must be strictly controlled;
- Low-level lighting or limiting mounting heights of lighting fixtures or utilising foot-light or bollard level lights is recommended. The use of high light masts and high pole top security lighting should be avoided along the periphery of the focus area. Any high lighting masts should be covered to reduce glow and light spillage;
- Use minimum lumen or wattage in light fixtures, where possible and practical;
- Up-lighting of structures must be avoided where possible, with lighting installed at downward angles that provide precisely directed illumination beyond the immediate surroundings of the infrastructure, thereby minimising the light spill and trespass;

- No naked / unshielded light sources are to be directly visible from a distance. Only reflected light should be visible from outside the focus area;
- 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. It is recommended that “full cut-off” light fixtures that direct light only below the horizontal is to be used on buildings (Figure 13);

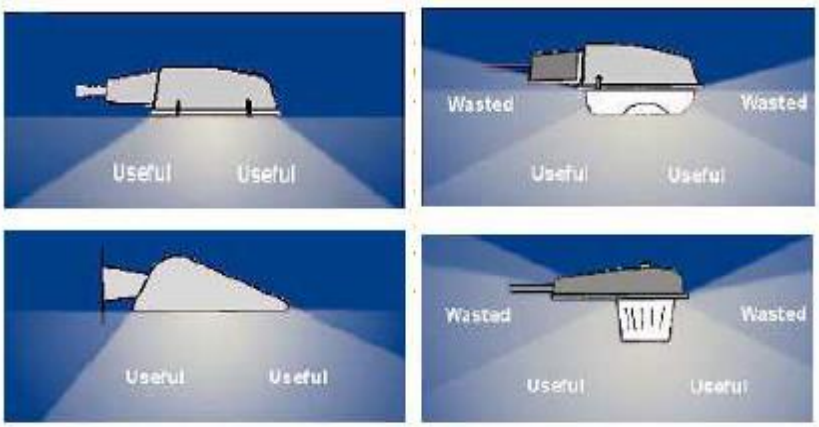


Figure 13: Illustration of full cut off light fixtures (left) and semi-cut-off fixtures (right) (ASSA, 2012)

- The use of low-pressure sodium lamps, yellow LED lighting, or an equivalent reduces sky glow and wildlife impacts where possible and practical. Bluish-white lighting is more likely to cause glare and attract insects, and is associated with other human physiological issues (BLM, 2013);
- Making use of motion detectors on security lighting, at office areas and the maintenance area, ensures that the site will remain in relative darkness, until lighting is required for security and maintenance purposes; and
- Vehicle-mounted lights or portable light towers are preferred over permanently mounted lighting for night time maintenance activities. If possible, such lighting should be equipped with hoods or louvers and be aimed toward the ground to avoid causing glare and sky glow (BLM, 2013).

Rehabilitation

- Concurrent/ progressive rehabilitation must be implemented and disturbed areas must be revegetated with indigenous vegetation as per the applicable vegetation rehabilitation and management plan, as soon as areas become available;
- Upon decommissioning when the surface trench mining area is backfilled, it is vital that vegetation be reinstated to blend with the natural environment. It is recommended that a site nursery be operated throughout the lifetime of the mine for this purpose and to ensure that indigenous vegetation is available.

6.6 *Monitoring*

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

- Development and implementation of a decommissioning and site revegetation plan in order to ensure that the area's pre-development scenic quality and integrity is restored and that the project area is visually integrated into the surrounding landscape setting. Important aspects addressed should include requirements that most aboveground and near-ground structures be removed, that the project site be re-graded, and that indigenous vegetation be re-established to be consistent with the surrounding landscape;
- The plan should include provisions for monitoring the effectivity of the proposed mitigation measures and determining compliance with the project's visual impact mitigation requirements;
- The method of monitoring must be designed to be objective and repeatable in order to ensure consistent results;
- The selected KOPs should be used over the life of the project to review the success of the mitigation plan;
- Predevelopment visual conditions and the inventoried visual quality rating and scenic integrity should be reviewed after construction;
- The visual monitoring programme should be based on the following parameters:
  - Airborne dust (in line with air quality assessment)
  - Visibility of lights at night from surrounding receptors;
  - Number of lights visible;
  - Vegetation cover and height; and
  - Disturbance to receptors.
- At closure the success of rehabilitation would be based on the extent and percentage of vegetation recovery as well no mining infrastructure or traces thereof being present. Monitoring is to continue beyond mine closure to ensure that the rehabilitation is successful and that the vegetation is self-sustaining;
- Maintenance of mining infrastructures and operations must be monitored throughout the operational phase of the project, to ensure that deterioration of the infrastructure does not occur, in turn affecting the aesthetics of the area;

- Results of the monitoring activities must be taken into account during all phases of the proposed mining development and action must be taken to mitigate impacts as soon as negative effects from mining related activities become apparent.

7 CONCLUSION

Scientific Terrestrial Services (STS) was appointed to conduct a Visual Impact Assessment (VIA) for the proposed mining of natural Gypsum (Gy) on the remaining extent of the farm Kanakies 332, near Loeriesfontein, Northern Cape Province, henceforth referred to as the Mining Right Area (MRA). The MRA is situated within the Hantam Local Municipality and within the Calvinia magisterial district. The MRA is situated approximately 41 km west of the town of Loeriesfontein, and 40 km north north-west of Niewhoudtville, and 53 km north north-east of Nuwerus. The Doring River traverses the southwest corner of the MRA. The extent of the MRA is approximately 7,457 ha, and approximately 689 ha will be earmarked for mining. The area where the gypsum deposit is concentrated will henceforth be referred to as the “focus area”. Furthermore, the approximate area required for infrastructure is 9 ha.

Based on the findings from both the desktop and the field assessments it is evident that the proposed mining project is located within a remote area considered to be relatively flat to slightly undulating, open canopy succulent shrubland with few distinguishing topographical features in the form of prominent hills or large outcrops present, although the greater region comprises mountainous terrain. The majority of sensitive receptors, with the exception of one farm stead situated within the MRA, are situated further than 5km from the focus area, the proposed mining activities is expected to have a low visual intrusion on the viewer.

The VAC is considered medium due to the bare ground dominating the focus area at the time of assessment, soil disturbance (surface trench mining) will result in a low degree of contrast in colour, making it difficult to distinguish the surface trench mining from its surroundings, when viewed from a distance. Furthermore, the undulating terrain, the distance from sensitive receptors, the overall limited height of the proposed surface infrastructure and the existing housing compound situated approximately 1,4km northeast of the infrastructure area, will serve to lower the visual intrusion from certain sensitive receptors. The overall landscape quality is considered to have medium scenic quality, exhibiting mostly a positive character, with some detracting features present. The sense of place is not unique to the focus area as it extends to the larger Namaqualand region, however the landscape associated with the MRA provides topographical variety in the form of slightly undulating plains, mountainous terrain in

the larger region, and the Doring and Krom Rivers and associated ephemeral drainage lines leading to increased visual interest. The lighting environment of the focus area is considered intrinsically dark, thus the impact from the mining project is expected to be significant in such a remote area during night-time hours. Since the proposed mining activities will only take place during the daylight hours, it is not expected to contribute significantly to the effects of sky glow and artificial lighting in the region. The Kanakies Mine is situated in a remote area, with limited light sources, therefore the security lighting utilised at night will be visible within an approximate 5km (or further) radius.

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 Gypsum resource, mitigation measures will have to be implemented in order to minimise the visual impacts, with specific reference to concurrent rehabilitation throughout the construction and operational phases, as well as consideration of material selection, effective management of lighting and dust generation and implementing good housekeeping measures.

It is the opinion of the specialist 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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Witkop Fluorspar Mine (Pty) Ltd Mining Work Programme submitted in support of a Mining Right Application.

APPENDIX A – PROPOSED LAYOUT OF THE INFRASTRUCTURE AREAS FOR THE KANAKIES MINE

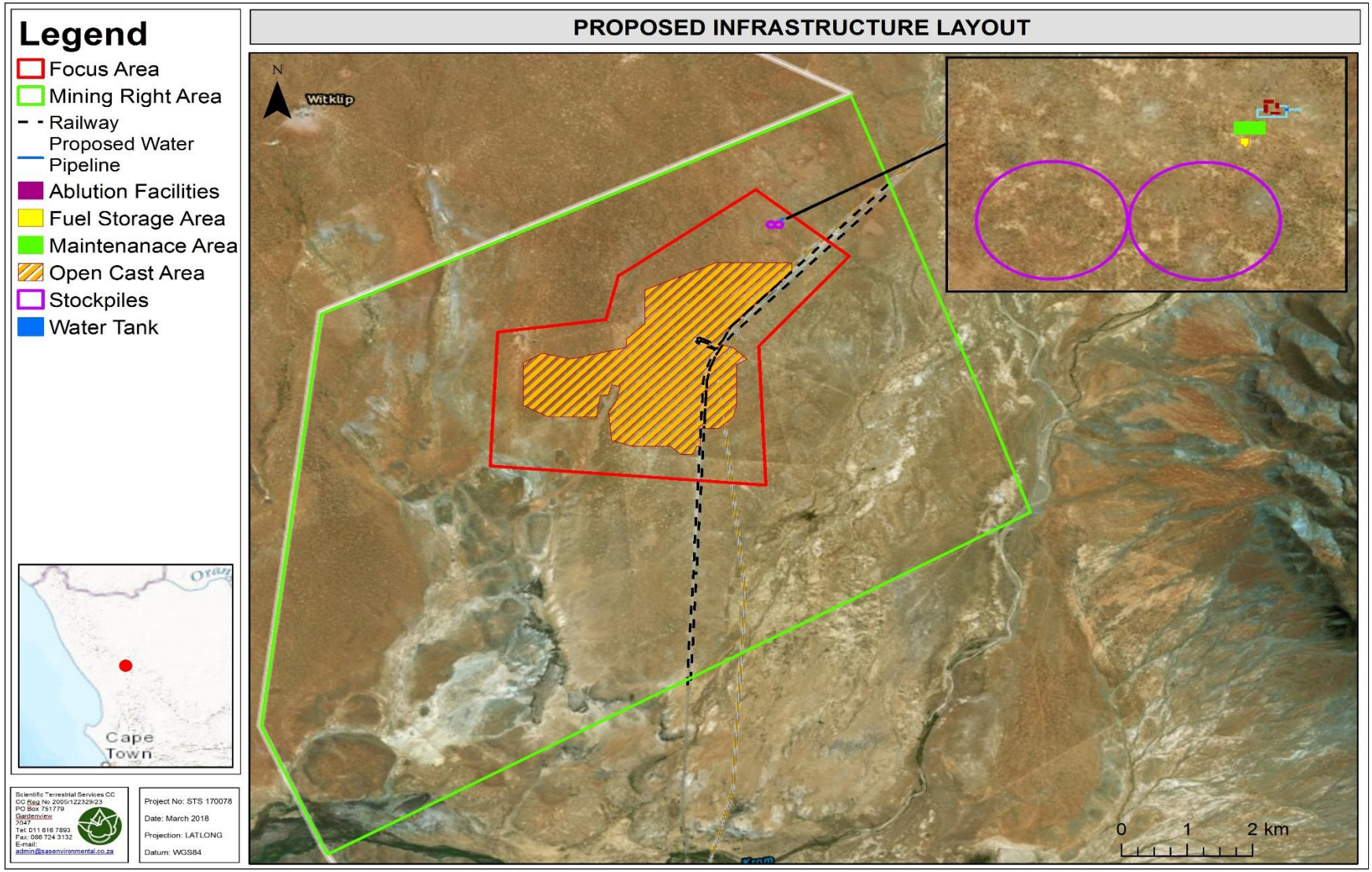

Figure A1: Location of the proposed surface infrastructure and stockpiles in relation to the Mining Right Area of the Kanakies Mine.

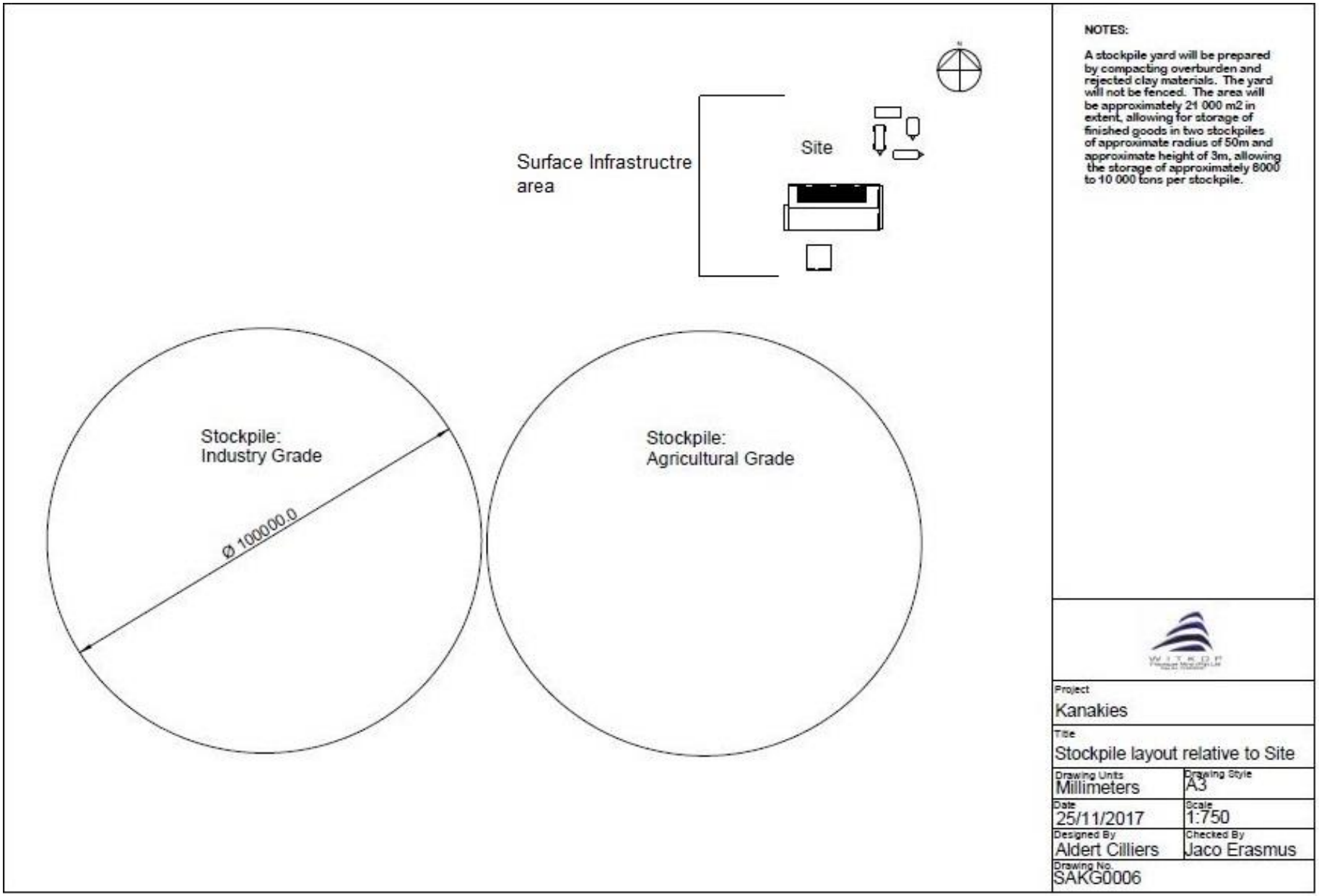

Figure A2: Demonstration of the proposed surface infrastructure and stockpiles associated with the Kanakies Mine.

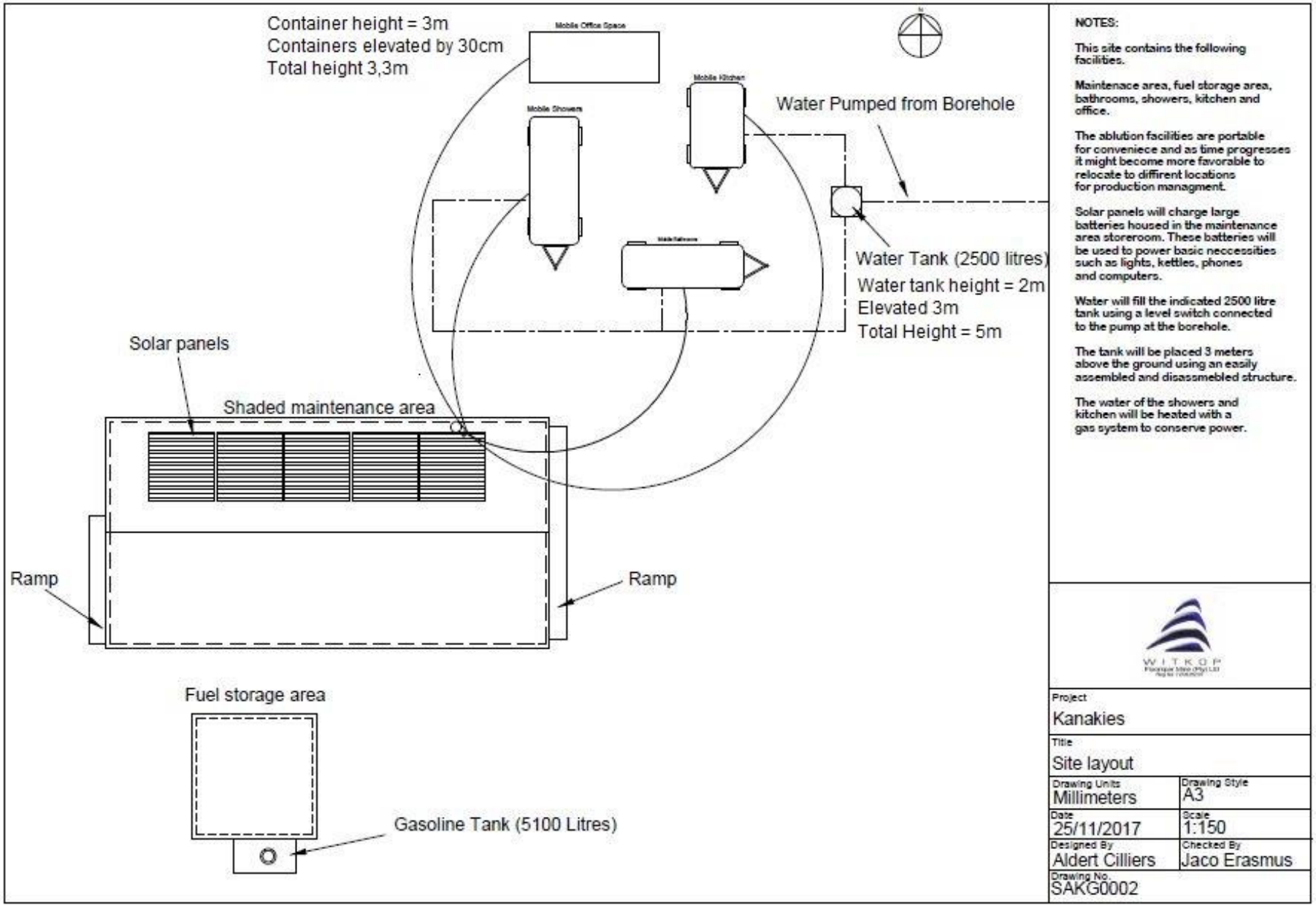

Figure A3: Demonstration of the proposed surface infrastructure associated with the Kanakies Mine.

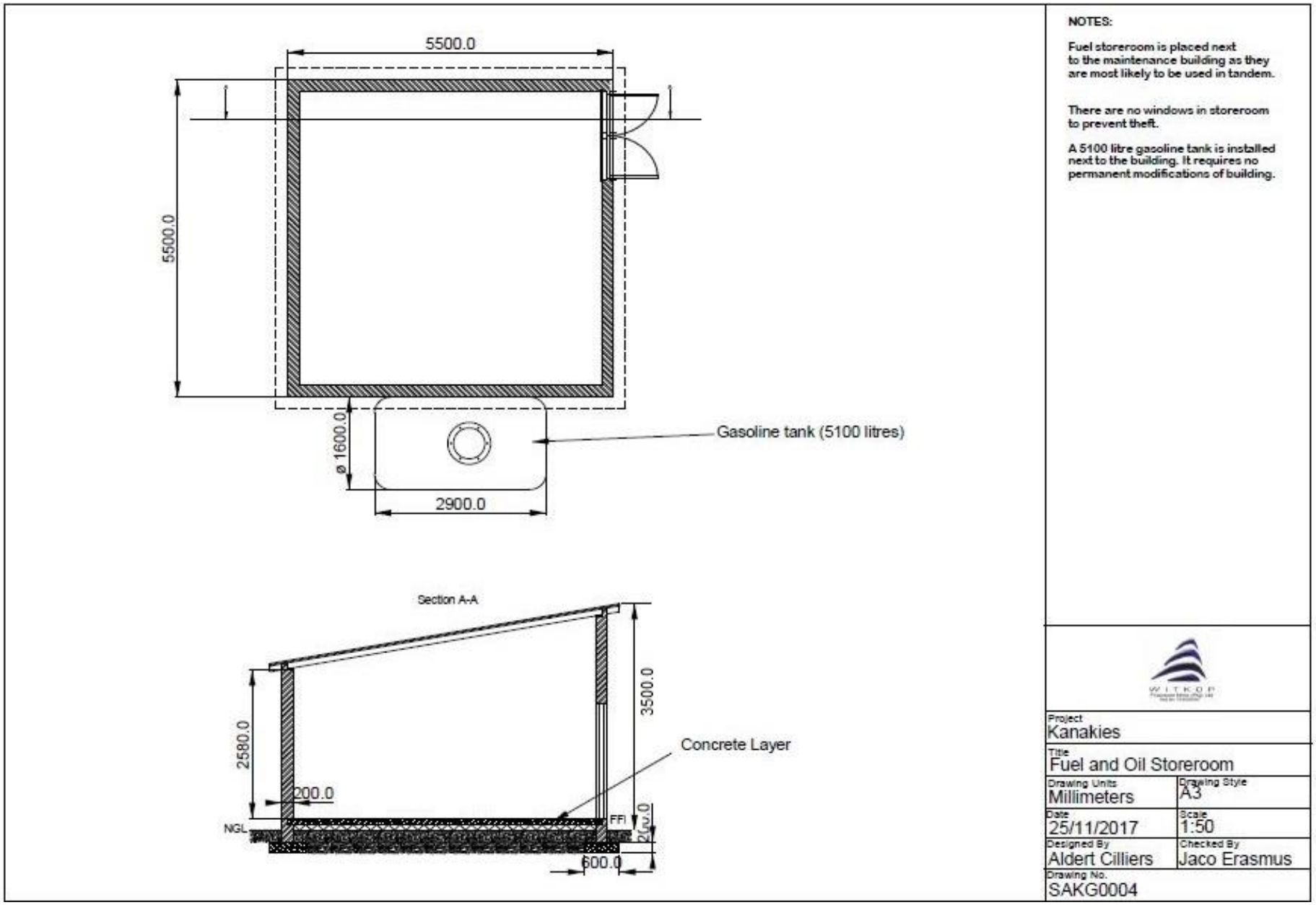

Figure A4: Further detail of the proposed fuel and oil storeroom surface infrastructure associated with the Kanakies Mine.

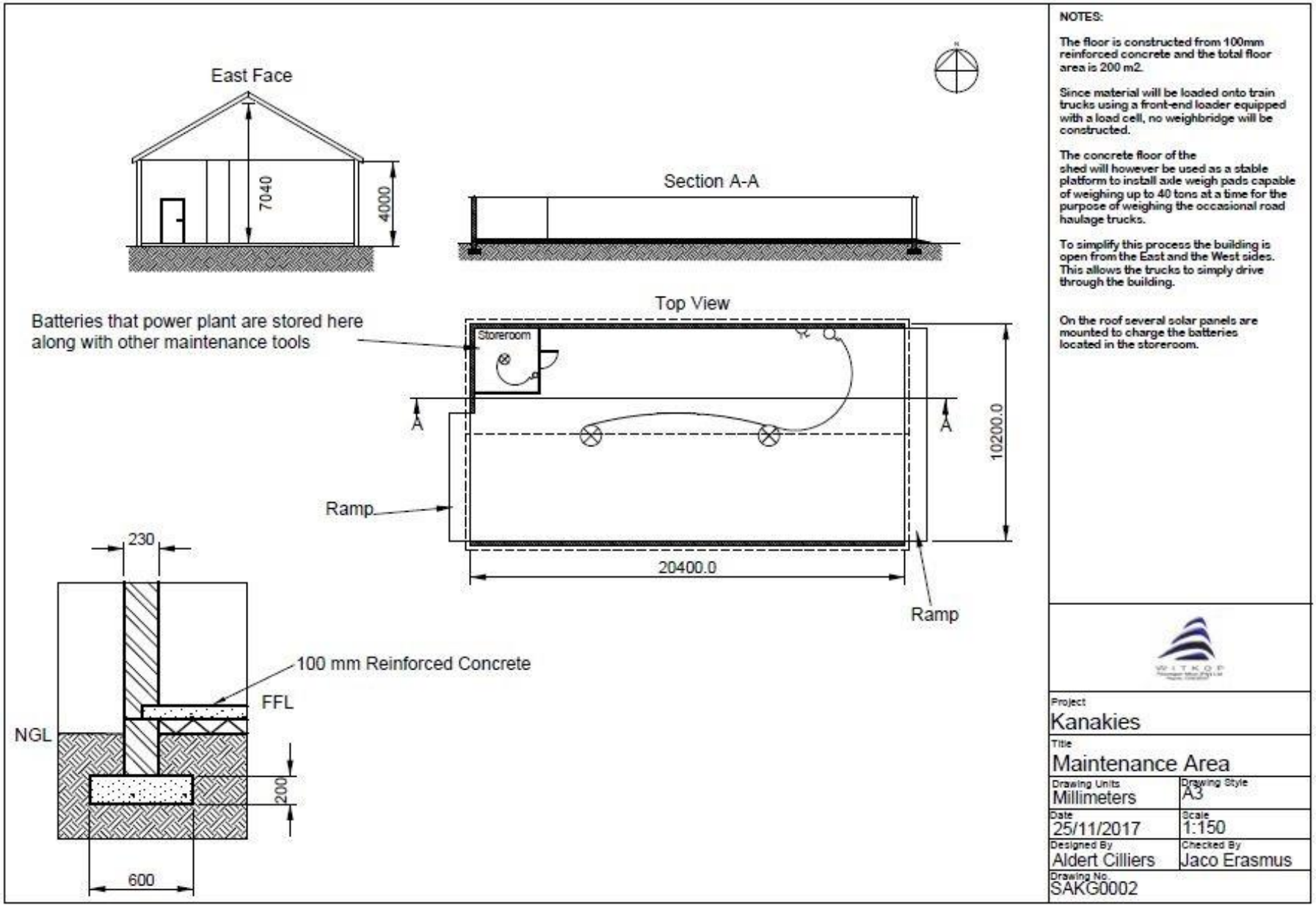

Figure A5: Further detail of the proposed maintenance shed surface infrastructure associated with the Kanakies Mine.

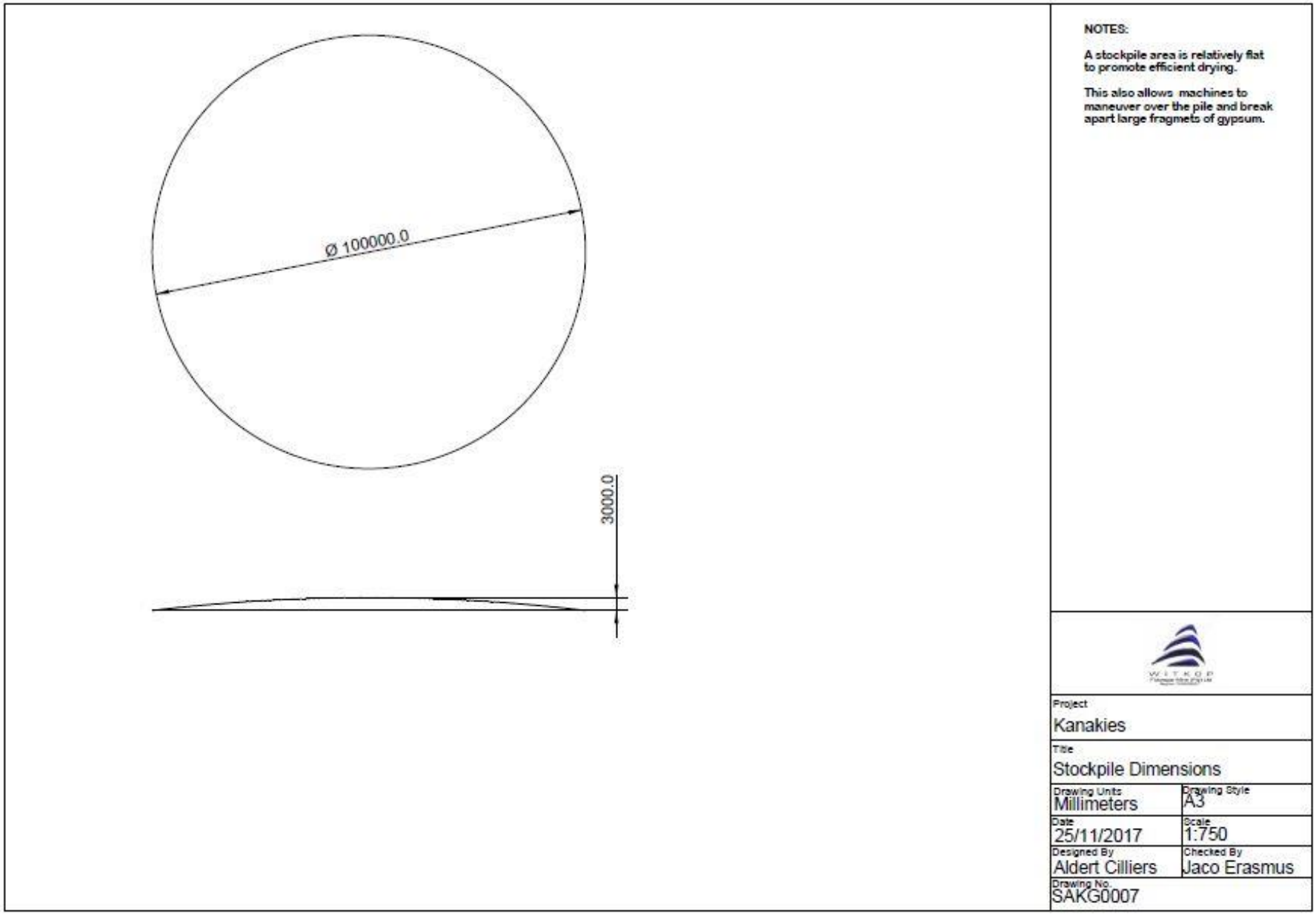

Figure A6: Dimensions of the proposed stockpiles associated with the Kanakies Mine.

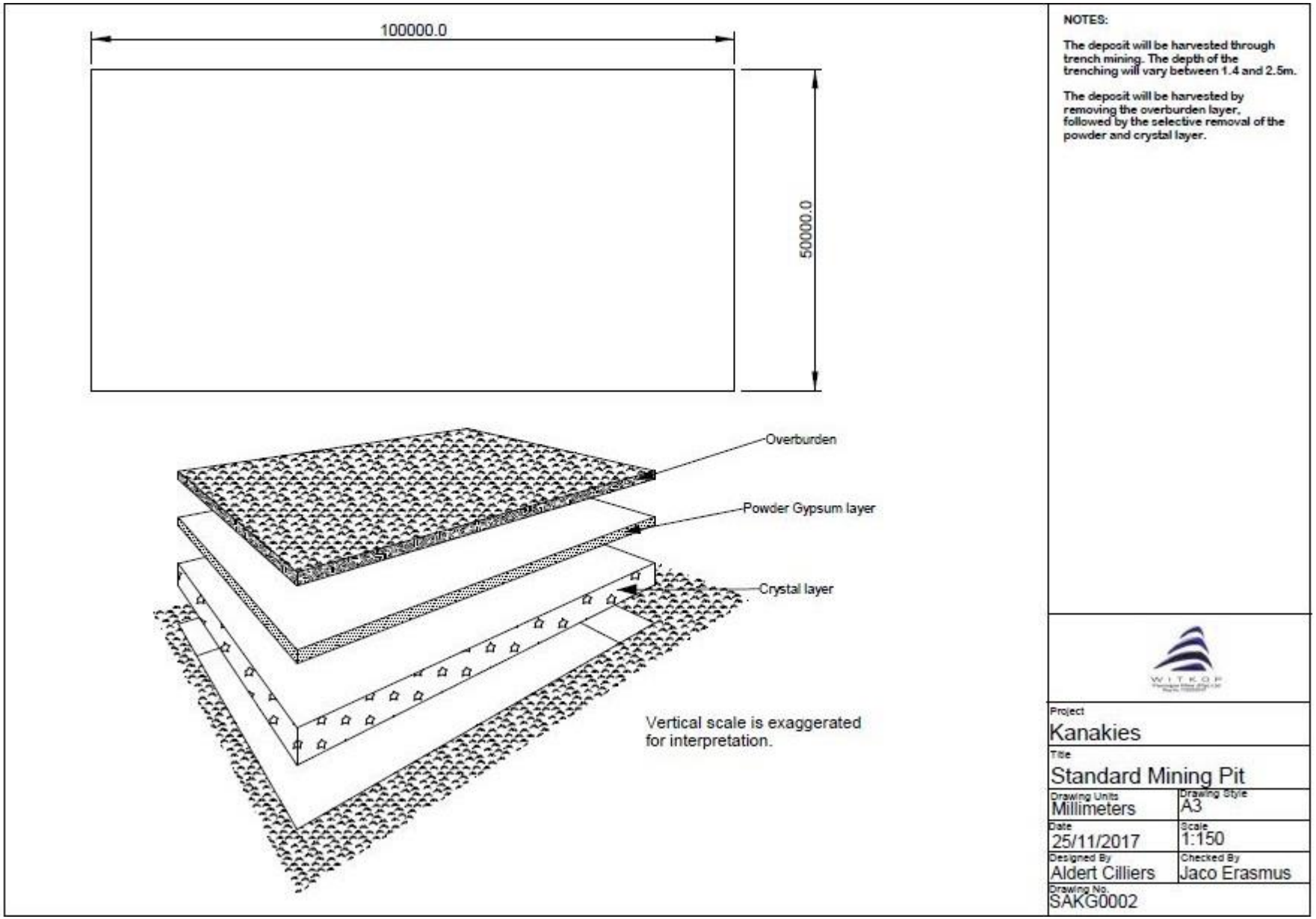

Figure A7: Standard mining pit and layers that need to be removed to obtain the gypsum mineral at the Kanakies Mine.

APPENDIX B – 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 B1: Categories of development and impact severity.

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

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

Category 1 development:
e.g. nature reserves, nature-related recreation, camping, picnicking, trails and minimal visitor facilities.

Category 2 development:
e.g. low-key recreation / resort / residential type development, small-scale agriculture / nurseries, narrow roads and small-scale infrastructure.

Category 3 development:
e.g., low-density resort / residential type development, golf or polo estates, low to medium-scale infrastructure.

Category 4 development:
e.g. medium density residential development, sports facilities, small-scale commercial facilities / office parks, one-stop petrol stations, light industry, medium-scale infrastructure.

Category 5 development:
e.g. high density township / residential development, retail and office complexes, industrial facilities, refineries, treatment plants, power stations, wind energy farms, power lines, freeways, toll roads, large scale infrastructure generally. Large-scale development of agricultural land and commercial tree plantations. Quarrying and mining activities with related processing plants.

The following box explains the nature of the impacts:

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 B2: Impact assessment level of input determination.

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

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

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 C – IMPACT ASSESSMENT METHODOLOGY

In order for the EAP to allow for sufficient consideration of all environmental impacts, impacts were assessed using a common, defensible method of assessing significance that will enable comparisons to be made between risks/impacts and will enable authorities, stakeholders and the client to understand the process and rationale upon which risks/impacts have been assessed. The method to be used for assessing risks/impacts is outlined in the sections below.

The first stage of risk/impact assessment is the identification of environmental activities, aspects and impacts. This is supported by the identification of receptors and resources, which allows for an understanding of the impact pathway and an assessment of the sensitivity to change. The definitions used in the impact assessment are presented below.

- An **activity** is a distinct process or task undertaken by an organisation for which a responsibility can be assigned. Activities also include facilities or infrastructures that are possessed by an organisation.
- An **environmental aspect** is an 'element of an organisation's activities, products and services which can interact with the environment'[1]. The interaction of an aspect with the environment may result in an impact.
- **Environmental risks/ impacts** are the consequences of these aspects on environmental resources or receptors of particular value or sensitivity, for example, disturbance due to noise and health effects due to poorer air quality. In the case where the impact is on human health or wellbeing, this should be stated. Similarly, where the receptor is not anthropogenic, then it should, where possible, be stipulated what the receptor is.
- **Receptors** can comprise, but are not limited to, people or huanthropogenic systems, such as local residents, communities and social infrastructure, as well as components of the biophysical environment such as wetlands, flora and riverine systems.
- **Resources** include components of the biophysical environment.
- **Frequency of activity** refers to how often the proposed activity will take place.
- **Frequency of impact** refers to the frequency with which a stressor (aspect) will impact on the receptor.
- **Severity** refers to the degree of change to the receptor status in terms of the reversibility of the impact; sensitivity of receptor to stressor; duration of impact (increasing or decreasing with time); controversy potential and precedent setting; threat to environmental and health standards.
- **Spatial extent** refers to the geographical scale of the impact.
- **Duration** refers to the length of time over which the stressor will cause a change in the resource or receptor.

The significance of the impact is then assessed by rating each variable numerically according to the defined criteria (refer to the tables below). The purpose of the rating is to develop a clear understanding of influences and processes associated with each impact. The severity, spatial scope and duration of the impact together comprise the consequence of the impact and when summed can obtain a maximum value of 15. The frequency of the activity and the frequency of the impact together comprise the likelihood of the impact occurring and can obtain a maximum value of 10. The values for likelihood and consequence of the impact are then read off a significance rating matrix and are used to determine whether mitigation is necessary[2].

Severity + Spatial Scale + Duration of Impact = Consequence

[1] The definition has been aligned with that used in the ISO 14001 Standard.

[2] Some risks/impacts that have low significance will however still require mitigation

Probability of Impact + Sensitivity of receiving environment = Likelihood

Likelihood x Consequence = Significance

The assessment of significance is undertaken twice. Initial, significance is based on only natural and existing mitigation measures (including built-in engineering designs). The subsequent assessment takes into account the recommended management measures required to mitigate the impacts. Measures such as demolishing infrastructure, and reinstatement and rehabilitation of land, are considered post-mitigation.

The model outcome of the impacts was then assessed in terms of impact certainty and consideration of available information. The Precautionary Principle is applied in line with South Africa's NEMA (Act 108 of 1997) in instances of uncertainty or lack of information, by increasing assigned ratings or adjusting final model outcomes. In certain instances where a variable or outcome requires rational adjustment due to model limitations, the model outcomes have been adjusted.

Table C1: Criteria for assessing significance of impacts

LIKELIHOOD DESCRIPTORS

Probability of impact	**RATING**
Highly unlikely: the event will occur only in exceptional circumstances	1
Possible: the event could occur but is not expected to occur	2
Likely: the event could occur	3
Highly likely: the event will probably occur in most circumstances	4
Definite: the event is expected to occur in most circumstances	5
Sensitivity of receiving environment	**RATING**
Visually not sensitive or important	1
Visually with limited sensitivity and/or importance	2
Visually moderately sensitive and/or important	3
Visually highly sensitive and/or important	4
Visually critically sensitive and/or important	5

CONSEQUENCE DESCRIPTORS

Severity of impact	**RATING**
Insignificant: changes to visual landscape do not adversely affect surrounding landscapes; insignificant effect on surrounding important landscapes	1
Small: changes to visual landscape affect a low number of visual receptors (residents, tourists, etc.); noticeable change to important surrounding landscapes	2
Significant: changes to visual landscape affect a moderate number of visual receptors; moderate change to significant and/or important surrounding landscapes	3
Great: changes to visual landscape affect a large number of visual receptors; large changes to significant and/or important surrounding landscapes	4
Disastrous: significant changes to visual landscape affect visual receptors across the entire region; severe changes to significant and/or important surrounding landscapes	5
Spatial scale of impact	**RATING**
Activity specific: visible within the immediate vicinity of activity only	1
Development specific: visible from within the project boundary or up to 1km from the project boundary only	2
Local area: visible from within 5 km of the project boundary	3
Subregional: visible from within 10 km of the project boundary	4
Regional: visible from significant distances beyond 10km of the project boundary	5
Duration of impact	**RATING**
One day to one month	1
One month to one year	2
One year to five years	3
Life of operation or less than 20 years	4
Permanent	5

Table C2: Significance rating matrix

LIKELIHOOD (Frequency of activity + Frequency of impact)	CONSEQUENCE (Severity + Spatial Scope + Duration)														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30
	3	6	9	12	15	18	21	24	27	30	33	36	39	42	45
	4	8	12	16	20	24	28	32	36	40	44	48	52	56	60
	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75
	6	12	18	24	30	36	42	48	54	60	66	72	78	84	90
	7	14	21	28	35	42	49	56	63	70	77	84	91	98	105
	8	16	24	32	40	48	56	64	72	80	88	96	104	112	120
	9	18	27	36	45	54	63	72	81	90	99	108	117	126	135
	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150

Table C3: **Positive/ Negative Mitigation Ratings**

Significance Rating	Value	Negative Impact Management Recommendation	Positive Impact Management Recommendation
Very High	126-150	Very strict measures to be implemented to mitigate impacts.	Actively promote the project.
High	101-125	Ensure designs take visual sensitivities into account and ensure management and housekeeping is maintained and attention to impact minimisation is paid.	Promote the project and monitor performance.
Medium High	76-100	Ensure management and housekeeping is maintained and attention to impact minimisation is paid.	Implement measures to enhance the positive aspects of the project while managing any negative impacts.
Medium Low	51-75	Ensure management and housekeeping is maintained and attention to impact minimisation is paid.	Implement measures to enhance the positive aspects of the project while actively managing any negative impacts.
Low	26-50	Promote the project and ensure management and housekeeping is maintained.	Monitor project performance and pay attention to minimising potential negative environmental impacts.
Very Low	1-25	Promote the project.	Actively seek measures to implement impact minimisation and identify positive ecological aspects to be promoted.

The following points were considered when undertaking the assessment:

- Risks and impacts were analysed in the context of the project's area of influence encompassing:
  - Primary project site and related facilities that the client and its contractors develops or controls;
  - Areas potentially impacted by cumulative impacts for further planned development of the project, any existing project or condition and other project-related developments; and
  - Areas potentially affected by impacts from unplanned but predictable developments caused by the project that may occur later or at a different location.
- Risks/ Impacts were assessed for all stages of the project cycle including:
  - Pre-construction;
  - Construction;
  - Operational; and

- Closure and Rehabilitation

- Residual and post-closure impacts were also considered;
- If applicable, transboundary or global effects were assessed;
- Individuals or groups who may be differentially or disproportionately affected by the project because of their disadvantaged or vulnerable status were assessed; and
- Particular attention was paid to describing any residual impacts that will occur after rehabilitation.

Mitigation Measure Development

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

- Mitigation and performance improvement measures and actions that address the risks and impacts[3] are identified and described in as much detail as possible;
- Measures and actions to address negative impacts will favour avoidance and prevention over minimisation, mitigation or compensation; and
- Desired outcomes are defined, and have been developed in such a way as to be measurable events with performance indicators, targets and acceptable criteria that can be tracked over defined periods, with estimates of the resources (including human resource and training requirements) and responsibilities for implementation.

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

[3] Mitigation measures should address both positive and negative impacts

APPENDIX D – VEGETATION TYPES

Table D1: Description of the vegetation types associated with the Kanakies Mining Right Area (Mucina & Rutherford, 2012)

Vegetation Type	Northern Knersvlakte Vygieveld	Knersvlakte Shale Vygieveld	Namaqualand Riviere
Climate	Winter-rainfall climate with dry, hot summers and mild, rainy winters	Winter-rainfall climate with dry, hot summers and mild, rainy winters	Arid, seasonal climate
Altitude (m)	200–800	160–540	0–800
MAP* (mm)	127	126	147
MAT* (°C)	17.9	18.6	18.1
MFD* (Days)	5	3	6
MAPE* (mm)	2641	2668	2647
MASMS* (%)	81	81	NA
Distribution	Western and Northern Cape Provinces	Western Cape Province	Northern and Western Cape Provinces
Geology & Soils	Mostly Cenozoic alluvium and calcrete that overlies the mudstone, siltstone and sandstone of the Knersvlakte Subgroup (Vanrhynsdorp Group, Namibian Erathem) as well as gneiss of the Stalhoek Complex (Mokolian). Low stone content, soils acid to neutral, shallow to deep, where shallow bedrock or duripan crusts underly. Heuweltjies occur in places	Shale bands of the Knersvlakte Subgroup (Vanrhynsdorp Group, Namibian Erathem), on level plains or hilltops and moderate to steep slopes covered by shallow soils, moderately acid to slightly alkaline, high stone content.	Alluvial sandy soils on Quaternary fluviatile sediments that overlie Namibian-age sediments and Mokolian gneisses. Seasonally wet (late winter). The riverbed sometimes carries torrential flood waters. In summer, patches of crystallised salt film may cover the soil surface in slight, clayey depressions
Conservation	Least threatened. Target 28%. None conserved in statutory conservation areas	Target 28%. None of the unit is conserved in statutory conservation areas	Least threatened. Target 24%. Only very small portion statutorily protected in nature reserves
Vegetation & landscape features (Dominant Floral Taxa in Appendix F)	Slightly undulating landscape covered with open-canopy (10–30%) succulent shrubland. Heuweltjies occur in places and these are dominated by *Stoeberia frutescens* or *Lampranthus uniflorus*. Annuals and geophytes can determine the appearance of the vegetation in spring after good winter rains	Low (10–20% of canopy cover) shrubland formed by mat-forming and cushion-forming shrubs, mainly with succulent leaves and high incidence of *spinescence*. *Ruschia* and *Salsola* are the major dominants	Complex of alluvial shrubland (*Suaeda fruticosa, Zygophyllum morgsana, Ballota africana* and *Didelta spinosa*) and patches of tussock graminoids occupying riverbeds and banks of intermittent rivers. In places low thickets of *Vachellia karroo* and *Tamarix usneoides* can be encountered

Table D2: Dominant & typical floristic species of the vegetation types associated with the Kanakies Mining Right Area (Mucina & Rutherford, 2012)

Vegetation Type	Northern Knersvlakte Vygieveld		Knersvlakte Shale Vugieveld	
Low Shrub	*Asparagus capensis* var. *capensis*, *Galenia fruticosa*, *G. secunda*, *Lessertia depressa*,	*Melolobium adenodes*, *Pteronia glabrata*, *P. intermedia*, *P. villosa*	*Asparagus capensis var. capensis, Atriplex vestita var. appendiculata, Eriocephalus ericoides, Galenia fruticosa,*	*Hirpicium alienatum, Pteronia ciliata, Tripteris sinuata*
Woody Climber	*Asparagus kraussianus*		*Asparagus kraussianus*	
Succulent Shrubs	*Cephalophyllum framesii, C. parvibracteatum (d), Drosanthemum curtophyllum (d), D. pulverulentum (d), Leipoldtia calandra (d), Ruschia subsphaerica (d), Salsola zeyheri (d), Antimima watermeyeri, Augea capensis, Didelta carnosa var. carnosa, Galenia sarcophylla, Lampranthus uniflorus, Phyllobolus trichotomus*	*Ruschia lisabeliae, R. robusta, Salsola namibica, S. tuberculata, Tetragonia fruticosa, T. robusta var. psiloptera, Zygophyllum cordifolium, Drosanthemum schoenlandianumK, Hallianthus planus NQ, Malephora purpureo-crocea NQ, Stoeberia frutescens NQ*	*Arenifera stylosa (d), Caulopsilon rapaceum (d), Ruschia spinosa (d), Salsola zeyheri (d), Augea capensis, Cheiridopsis namaquensis, Lampranthus uniflorus, Salsola aphylla,*	*S. namibica, Tetragonia fruticosa, Tylecodon wallichii subsp. wallichii, Zygophyllum foetidum, Malephora purpureo-croceaNQ, Tylecodon suffultus*
Graminoids	*Loudetia simplex (d), Panicum natalense (d), Schizachyrium sanguineum (d), Trachypogon spicatus (d), Alloteropsis semialata subsp. eckloniana,*	*Bewsia biflora, Digitaria tricholaenoides, Diheteropogon amplectens, Sporobolus pectinatus, Tristachya biseriata, T. leucothrix*	*Ehrharta delicatula, E. longiflora, Karroochloa tenella*	
Herb	*Gazania lichtensteinii (d), Adenogramma glomerata, Amellus microglossus, Cotula microglossa, Diascia pachyceras, Felicia bergeriana, Heliophila variabilis, Lotononis parviflora, Lyperia tristis,*	*Manulea cheiranthus, M. gariepina, Oncosiphon suffruticosum, Pelargonium minimum, Pharnaceum croceum, Rhynchopsidium pumilum, Tripteris breviradiata, Ursinia nana, Zaluzianskya benthamiana, Z. villosa*	*Dimorphotheca sinuata (d), Gorteria diffusa subsp. diffusa (d), Oncosiphon suffruticosum (d), Osteospermum pinnatum (d), Amellus microglossus, Emex australis,*	*Jamesbrittenia glutinosa, Lasiopogon glomerulatus, Lepidium africanum, Sisymbrium capense, Lasiopogon debilisK*

Vegetation Type	Northern Knersvlakte Vygieveld		Knersvlakte Shale Vugieveld	
Geophytic Herbs	*Cyanella hyacinthoides,* *Drimia intricata,* *Eriospermum paradoxum,* *Freesia viridis,* *Moraea ciliata,* *M. pallida,*	*Ornithoglossum viride,* *Oxalis annae,* *O. obtusa,* *O. purpurea,* *Trachyandra jacquiniana,* *Lachenalia framesii (e)*	*Drimia intricata,* *Gethyllis lata subsp. lata,* *G. linearis,* *Oxalis pes-caprae*	
Succulent Herbs	*Brownanthus vaginatus,* *Notechidnopsis tessellata,* *Phyllobolus nitidus,* *P. spinuliferus,*	*Psilocaulon junceum,* *Quaqua acutiloba,* *Tromotriche revolutaK*	*Brownanthus vaginatus (d),* *Phyllobolus nitidus,* *Psilocaulon dinteri,*	*P. junceum,* *Tetragonia microptera,* *Tromotriche revolutaK*

***(d) – Dominant species for the vegetation type; (e) – Endemic Taxa, [NQ]Namaqualand endemic, [K]Knersvlakte endemic**

Table E1: Dominant & typical floristic species of Namaqualand Riviere (Mucina & Rutherford, 2012)

Group	Species
Riparian Thicket	
Small Tree	*Vachellia karroo* (d)
Tall Shrub	*Melianthus pectinatus*, *Rhus burchellii*, *Tamarix usneoides*.
Low shrub	*Ballota africana* (d). Semiparasitic Epiphytic Shrub: *Viscum capense*
Dry River Bottom	
Tall Shrub	*Lebeckia sericea*
Low Shrubs	*Galenia africana* (d), *Gomphocarpus fruticosus* (d), *Hermannia disermifolia*, *Jamesbrittenia fruticosa*, *Salvia dentata*
Succulent Shrubs	*Suaeda fruticosa* (d), *Zygophyllum morgsana* (d), *Atriplex cinerea* subsp. *bolusii*, *Didelta carnosa* var. *carnosa*, *Lycium horridum*, *Salsola tuberculata*, *Tetragonia fruticosa*, *T. pillansii*, *Zygophyllum retrofractum, Sarcocornia terminalis* (d)(e)
Herbaceous Climber	*Didymodoxa capensis*
Graminoids	*Cynodon dactylon* (d), *Odyssea paucinervis* (d), *Cyperus marginatus*, *Diplachne fusca*, *Ehrharta longiflora*, *Isolepis antarctica*, *Scirpus nodosus*
Herb	*Limonium dregeanum* (d), *Arctotheca calendula*, *Cotula coronopifolia*, *Galium tomentosum*
Geophytic herbs	*Crinum variabile*
Succulent Herbs	*Conicosia elongata*, *Mesembryanthemum guerichianum*.

***(d) – Dominant species for the vegetation type; (e) – Endemic Taxa,**

APPENDIX E – VISUAL RECEPTORS

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

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

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

The sensitivity of visual receptors and views will depend on:

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

The most sensitive receptors may include:

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

Other receptors include:

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

APPENDIX F – 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 F1: Aesthetic and perceptual aspects of landscape character.

Aspect	Characteristics				Motivation
Scale	Intimate	Small	Large	Vast	The scale of the landscape is considered to be **vast** since no topographical features of significant height are present, and the significant distance one can see across the terrain. The mountainous terrain of the greater area does however obscure views.
Enclosure	Tight	Enclosed	Open	Exposed	The landscape is considered **open,** with limited vegetative cover and slightly undulating topography of the area.
Diversity	Uniform	Simple	Diverse	Complex	Due to the drought that the Northern Cape is currently experiencing the vegetative cover is limited with low diversity, and no topographical features are present in the proposed surface trench mining and infrastructure areas. The landscape is therefore considered **simple.**
Texture	Smooth	Textured	Rough	Very rough	The texture associated with the landscape is **rough** due to the scattered succulent shrubs n, bare ground and isolated trees.
Form	Vertical	Sloping	Rolling	Horizontal	The dominant form of the landscape is **rolling**, due to the mountainous terrain of the surrounding region. Taking only the MRA into consideration, the landscape is relatively flat (**horizontal**).
Line	Straight	Angular	Curved	Sinuous	The line landscape element is **straight** to slightly **curved** with limited linear anthropogenic elements present. The undulating topography prevents the landscape from appearing completely straight.

Aspect	Characteristics				Motivation
Colour	Monochrome	Muted	Colourful	Garish	The colours associated with the landscape are **muted**, with limited vegetation and bare ground forming the dominant colour palette of shades of green and brown. Significant seasonal colour is expected, especially after winter rains when flowering season starts. However, due to the severe drought conditions experienced in the area, the vibrant colours usually evident during the flowering season have not been present over the last few years.
Balance	Harmonious	Balanced	Discordant	Chaotic	The landscape is considered to be **balanced** in terms of the relationship between the vertical and horizontal landscape elements.
Pattern	Random	Organised	Regular	Formal	The landscape is considered **regular,** with elements being even spaced and well-balanced.
Movement	Dead	Still	Calm	Busy	The level of movement within the Mining Right Area (MRA) is **still**, with the exception of farm workers and occasional Transnet railway line maintenance workers, there is little movement in the MRA.

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

APPENDIX G– 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 G1: 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**

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

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

Table G2: Visual intrusion ratings.

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

Through applying the scoring categories as outlined above, the following scores have been calculated for the Mining Right Area:

Table G3: VAC Scores achieved.

Factor	Score obtained	Motivation
Vegetation	**1**	The MRA at the time of assessment comprised a sparse vegetative cover, with vegetation (succulent shrubs) less than 1m in height, and dominated by bare ground. Isolated tree clumps are present within the MRA. Thus, the vegetative component of the MRA will not provide screening ability to the receiving environment.
Soil contrast	**2**	At the time of assessment, the Northern Cape experienced extreme drought conditions, therefore the vegetation cover is low, with exposed bare ground dominating the area, which is not expected under normal climatic conditions (good rainfall). Therefore, should extreme drought conditions persist, soil disturbance would result in a low degree of contrast in colour with the surrounding area. However, should the vegetation cover recuperate, soil disturbance would result in a medium degree of contrast with the surrounds.
Visual variety	**2**	The vegetative cover within the MRA is limited and has a low diversity, however when viewed from a distance, visual variety is present due to the mountainous terrain of the greater area and anthropogenic features such as powerlines, fences, railway line and farm steads, which serve to create visual variety in terms of lines, colour and texture.
Topographical diversity	**2**	The topography of the surface trench mining and infrastructure areas are relatively flat, however the presence of anthropogenic structures, Doring and Krom Rivers, ephemeral drainage lines, rocky outcrops and the mountainous terrain of the greater area provides topographical variety within the region.
Recovery time	**2**	Should drought conditions persist in the area, the recovery time for the vegetation would be long-term, however should the area recover and gain sufficient rainfalls the recovery time for the vegetation would be high.
Total	**9**	**Medium**

APPENDIX H – 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 H1: 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 H2: 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**

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

Through applying the scoring categories as outlined above, the following scores have been calculated for the Mining Right Area:

Table H3: Scenic Quality – Results and motivation.

Factor	Score obtained	Motivation
Landform	**3**	The landscape associated with the MRA and surroundings provide topographical variety in the form of slightly undulating plains, mountainous terrain, Krom and Doring Rings and associated ephemeral drainage lines, erosion, and anthropogenic structures leading to increased visual interest.
Vegetation	**3**	The vegetation composition within the MRA at the time assessment is homogenous, however during the flowering season after good winter rainfall, there is a high floral diversity, attracting many tourists to the Namaqualand area.
Water	**1**	Water resources such as the Krom and Doring Rivers and ephemeral drainage lines are present within the landscape, but due to the drought conditions these resources are dried up or have very little stagnant ponds, thus these features do not visually dominant the area.
Colour	**3**	Some intensity or variety in colours and contrast of the soil and vegetation is present, but this does not form a dominant scenic element.
Adjacent Scenery	**3**	Adjacent scenery, which is similar to the MRA contributes to the greater landscape viewing experience, enhancing the overall visual quality of the area.
Scarcity	**3**	Since the landscape character type of the MRA is representative of the larger region, it is not considered to be particularly scarce within the region. However, the Namaqualand region is known for its flowering season, attracting many tourists to view the wildflowers.
Cultural Modifications	**-4**	Detracting modifications in the region, with particular reference to the Transnet railway line and associated service road, the housing compound of the Transnet workers, powerlines and other anthropogenic structures are present, and somewhat influences the quality of the landscape within the MRA. The proposed Kanakies Mine will add to visual variety introducing discordant elements to the 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.

APPENDIX I – 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 J – 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 J1). 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 J1: Environmental zones for night-time lighting.

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

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

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

APPENDIX K – VISUAL EXPOSURE AND VISIBILITY

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

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

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

Table K1: Visibility classes (IEMA, 2002).

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

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

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

Line of Sight Analysis

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

Viewshed Analysis

The viewshed analysis calculates the geographical locations from where the proposed project might be visible. This potential visual exposure of the project has been modelled by creating a Digital Terrain Model (DTM) from 1m contour data, and applying a viewshed analysis using GIS software, 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.

Key Observation Points

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

APPENDIX L – 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 STS 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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APPENDIX M – SPECIALIST INFORMATION

Details of the specialist who prepared the report

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

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

Company of Specialist:	Scientific Terrestrial Services		
Name / Contact person:	Stephen van Staden		
Postal address:	29 Arterial Road West, Oriel, Bedfordview		
Postal code:	2007	Cell:	083 465 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		

Specialist Declaration

I, Stephen van Staden, declare that -

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

Signature of the Specialist

SCIENTIFIC TERRESTRIAL SERVICES (STS) – 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.
- Lalini Dam assessment with focus on aquatic fish community analysis.
- Musami Dam assessment with focus on the FRAI and MIRAI aquatic community assessment indices.

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 TERRESTRIAL SERVICES (STS) – SPECIALIST CONSULTANT INFORMATION

CURRICULUM VITAE OF SANJA ERWEE

PERSONAL DETAILS

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

EDUCATION

Qualifications	
BSc Zoology	2013
Short Courses	
Global Mapper	2015
SANBI BGIS Course	2017
Global Mapper Lidar Course	2017

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
- High level desktop study and site sensitivity report as part of the environmental authorisation process prior to prospecting activities on Portion 4 of the Farm Kapstewel no 436, Administrative District of Hay, Northern Cape
- Cumulative Sensitivity Analyses using GIS Techniques for the Fuleni Anthracite Project, KwaZulu Natal**.**
- High level desktop study and site sensitivity report for mining activities on the farm Wessel 227 and Dibiaghomo, North of Black Rock, Northern Cape Province
- High level desktop study and site sensitivity report prior to prospecting activities for the Minerano Gold Fields Project, near Viljoenskroon, Free State Province

Wetland Assessments

- 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
- Wetland assessment as part of the water use license application for the proposed extension of a flood protection wall within the Sorex Estate, Centurion, Gauteng

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
- Terrestrial faunal, floral and wetland ecological assessment update for the proposed water supply pipeline upgrade at the Duvha Power Station, Mpumalanga

Rehabilitation Plan

- Wetland rehabilitation plan for Dorothy Road, Midrand, Gauteng Province
- Rehabilitation and Management Plan for the Freshwater Resources within the Proposed Rivierplaas Farm No 1486 Residential Development, Western Cape Province
- Wetland Rehabilitation and Management Plan for proposed mixed land use development (Kosmosdal extension 92) on the remainder of portion 2 of the farm Olievenhoutbosch 389 jr, Gauteng
- Wetland rehabilitation and management plan, including input into the stormwater management, landscaping and Red Data Listed species conservation for the Olifantsvlei Cemetery, Gauteng

Risk Assessment

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

Water Use Licence Application

- Assisting in the public participation for an Integrated Water Use Licence for the proposed sewer pipeline and upgrade of the Refengkgotso Waste Water Treatment Works (WWTW);
- Writing an emergency response plan for the proposed sewer pipeline and Refengkgotso WWTW

Visual Impact Assessment

- Assistance with the proposed Haga Wind Energy Facility and Grid Connection between Komga and Soto, Eastern Cape Province
- Visual Impact Assessment as part of the Environmental Assessment and Authorisation Process for the Proposed Transvaal Gold Mining Estates (TGME) Development Project: Gold Mining Project (GMP) – Pre-Mined Residue (PMR) And Hard Rock Mining (HRM) Near Sabie (Project 10161), Mpumalanga Province
- Visual Impact Assessment as part of the Environmental Assessment and Authorisation Process for the Proposed Transvaal Gold Mining Estates (TGME) Development Project: Gold Mining Project (GMP) – Pre-Mined Residue (PMR) And Hard Rock Mining (HRM) Near Pilgrims Rest (Project 10167), Mpumalanga Province