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VISUAL IMPACT ASSESSMENT AS PART OF THE ENVIRONMENTAL ASSESSMENT AND AUTHORISATION PROCESS FOR THE PROPOSED DIAMOND PROSPECTING AND BULK SAMPLING PROJECTS IN THE RICHTERSVELD, NORTHERN CAPE PROVINCE.

SCOPING REPORT

Prepared for

NDI Geological Consulting Services (Pty) Ltd

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EXECUTIVE SUMMARY

Scientific Aquatic Services (SAS) was appointed to conduct a Visual Impact Assessment (VIA) as part of the Environmental Impact Assessment (EIA) and Authorisation process for the proposed diamond mining prospecting and bulk sampling activities within and along the Orange River within the Richtersveld, Northern Cape Province.

The proposed prospecting and bulk sampling activities include seven (7) prospecting pockets within two greater Prospecting Right Application Areas (PRAA). The south western area is referred to as PRAA 1 where prospecting pockets 1, 2 3A and 3B are located and PRAA 2, further north and east where the prospecting and bulk sampling Pockets 4, 5 and 6 are located. The PRAA 1 and PRAA 2 and the associated prospecting pockets are hereafter collectively referred to as the "focus area".

Prospecting pockets 4, 5 and 6 are located within the Richtersveld National Park, otherwise known as the Richtersveld Cultural and Botanical Landscape. Based on digital satellite imagery there are limited sensitive receptors situated within a 5 km radius of the focus area. Sensitive Receptors include settlements including Klipheuwel, Sendelingsdrif, Auchas, Sanddrift, and Skilpad. There are limited gravel roads on the South African side of the Orange River, however several roads are present on the Namibian side of the river; namely: the Daberas Pass, Auchas Pass, Niklaas Pass and the formalised C13 Road running along the Orange River.

The Richtersveld National Park is a mountainous desert which has the highest diversity of succulent plants in the world and has a significantly high ecotourism aspect including but not limited to indigenous culture, rich biodiversity, river rafting, Fish River Canyon hike, sport fishing along the Orange River, birdwatching and desert living. Since the Orange River is a well established and world renowned area for sport fishing, such as fly-fishing as well as river rafting the Orange River and the associated floodplain is considered a very highly sensitive receptor.

The area surrounding the focus area is characterised by deep canyons, jagged mountain ranges, vivid landscapes of the unusual colours of the rocks and soils. Vegetation also comprises of extremely rare succulent plants and languid stretches and white water rapids of the Orange River. As such the quality of the landscape is considered very high and the sense of place of the area provides the feeling of becoming one with nature.

The greater region surrounding the focus area is mainly natural and undisturbed thus limited anthropogenic structures are present in this region, thus the area could be described as intrinsically dark with limited to no sources of night time-lighting. The proposed prospecting and bulk sampling activities could have a negative impact on the landscape character, sense of place and visual quality of the area.

Based on the outcome of the preliminary assessment it was determined that the proposed prospecting and bulk sampling activities will most likely have a high to very high visual impact on the receiving environment, due to the sensitivity of the focus area situated within the Richtersveld National Park and not necessarily the nature and size of the operation.

From a visual aspect, there are significantly high visual impacts associated with the proposed prospecting and bulk sampling activities. The visual impacts associated with the proposed prospecting and bulk sampling activities will be assessed in detail in the EIA Phase of the project and management and mitigatory measures will be presented in line with the mitigation hierarchy, as advocated by the DMR (2013), in order to ensure informed decision making by all relevant authorities and improved sustainable development decisions and application of integrated environmental management in the area.

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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)

ACRONYMS

ARC	Agricultural Research Council
BLM	(United States) Bureau of Land Management
BPEO	Best Practicable Environmental Option
CHPP	Coal Handling and Processing Plant
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
GN	General Notice
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
NEMA	National Environmental Management Act (No. 108 of 1997)
PRAA	Prospecting Right Application Area
PNR	Private Nature Reserve
SACAD	South African Conservation Area Database
SANBI	South African National Biodiversity Institute
SAPAD	South African Protected Area Database
SAS	Scientific Aquatic 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 Aquatic Services (SAS) was appointed to conduct a Visual Impact Assessment (VIA) as part of the Environmental Impact Assessment (EIA) and Authorisation process for the proposed diamond mining prospecting and bulk sampling activities within and along the Orange River within the Richtersveld, Northern Cape Province.

The proposed prospecting and bulk sampling activities include seven (7) prospecting pockets within two greater Prospecting Right Application Areas (PRAA). The south western area is referred to as PRAA 1 where prospecting pockets 1, 2 3A and 3B are located and PRAA 2, further north and east where the prospecting and bulk sampling Pockets 4, 5 and 6 are located. The PRAA 1 and PRAA 2 and the associated prospecting pockets are hereafter collectively referred to as the "focus area".

The individual prospecting pockets, cover approximately 640 ha. These areas are located within the Richtersveld Metropolitan Municipality which is an administrative area of the Namakwa District Municipality. The focus area is situated approximately 10 km northeast of the town of Sendelingsdrif, adjacent to the Orange River and bordering Namibia. The location and extent of the focus area, comprising the PRAA 1 and PRAA 2 and their associated prospecting pockets are indicated in Figures 1 and 2.

A VIA entails a process of data collection, spatial analysis, visualisation and interpretation to describe the quality of the landscape prior to development taking place and then identifying possible visual impacts after development. Assessing visual impacts are difficult as it is very subjective due to a person's perception being affected by more than only the immediate environmental factors (Oberholzer, 2005). Visual impacts occurring as a result of the proposed prospecting and bulk sampling activities will occur during the construction, operational and decommissioning phases, with limited residual visual impacts occurring post-closure, provided that efficient and appropriate 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 prospecting activities, an increase of human and vehicular movement and potential impacts from night time lighting within an intrinsically dark area where limited lighting sources are present.

The specialist visual impact assessment to be undertaken as part of the EIA Phase of the study, 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 proposed prospecting and bulk sampling activities within the Richtersveld and adjacent to the Orange River, from a visual resource management and aesthetic point of view. The report should furthermore serve to inform the planning, design and decision-making process as to the layout and nature of the proposed prospecting and bulk sampling activities.

1.2 Project Description

Samara Mining (Pty) Ltd intends to prospect for alluvial diamonds within the floodplain of the Orange River. No prospecting will take place within 50m of the low flow active channel of the river. Prospecting for such resources will thus require the excavation of several trenches to obtain the bulk samples required. An expected ten trenches, each 100 m x 25 m x 4 m, are anticipated to be excavated per prospecting pocket. The volume of overburden/waste to be removed will be 2500 m^3 on each excavation and the Volume of resource bearing gravel to be abstracted will be 7500 m^3 for each excavation.

The processing of excavated samples will entail the use of 8 x 18 feet rotary pans with a minimum and maximum tonnage of 45 and 56 respectively, subject to the Gravel Specific Gravity. From the rotary pans, concentrate will be pumped to a vacuum and filter system for further processing which will remove the dirt, filter the water to a drinkable standard and either release it back into the Orange River or supply surrounding communities with water by pumping it into the municipal reservoirs. As such, further development of associated infrastructure to support the prospecting includes:

- Ablution facilities;
- Access roads;
- Diesel storage facilities;
- Fences;
- Office sites;
- Plant sites; and
- Vehicle parking areas.

The active channel of the Orange River is 30-40 m wide, however the riverbed is approximately 300-400 m wide. It is proposed that eighty per cent (80%) of the riverbed will be worked dry; Samara will make small temporary diversions in the river to prospect (working in a phased manner with concurrent rehabilitation). No blasting will be required as part of prospecting activities, and there will be no processing in the riverbed only on the Orange River active channel embankment or within 50 m thereof. Only machinery and associated pumps will be located on the banks of the low flow channel and near the riverbed.

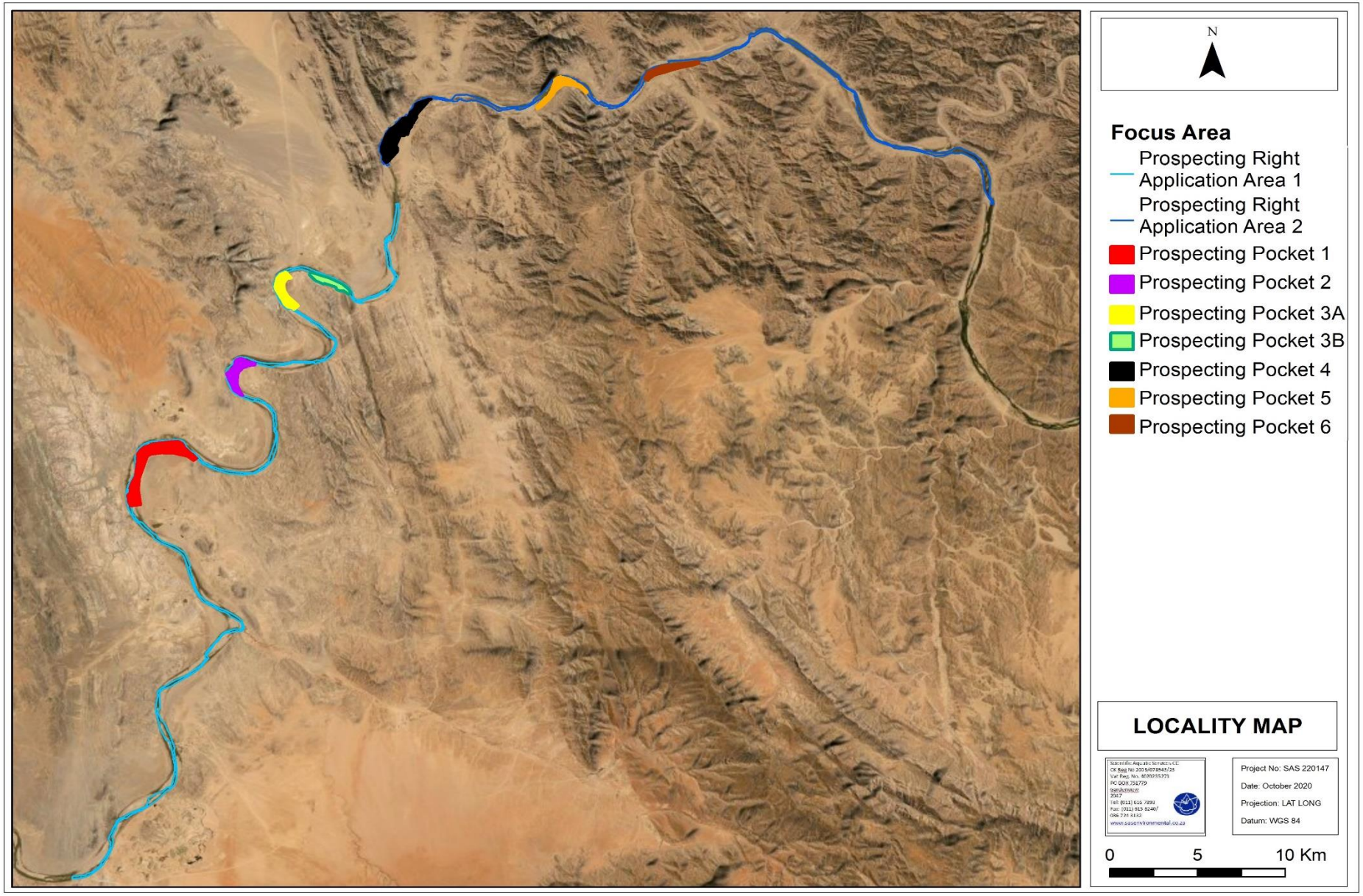

Figure 1: Digital Satellite image depicting the location of the PRAA and its associated prospecting pockets in relation to surrounding areas.

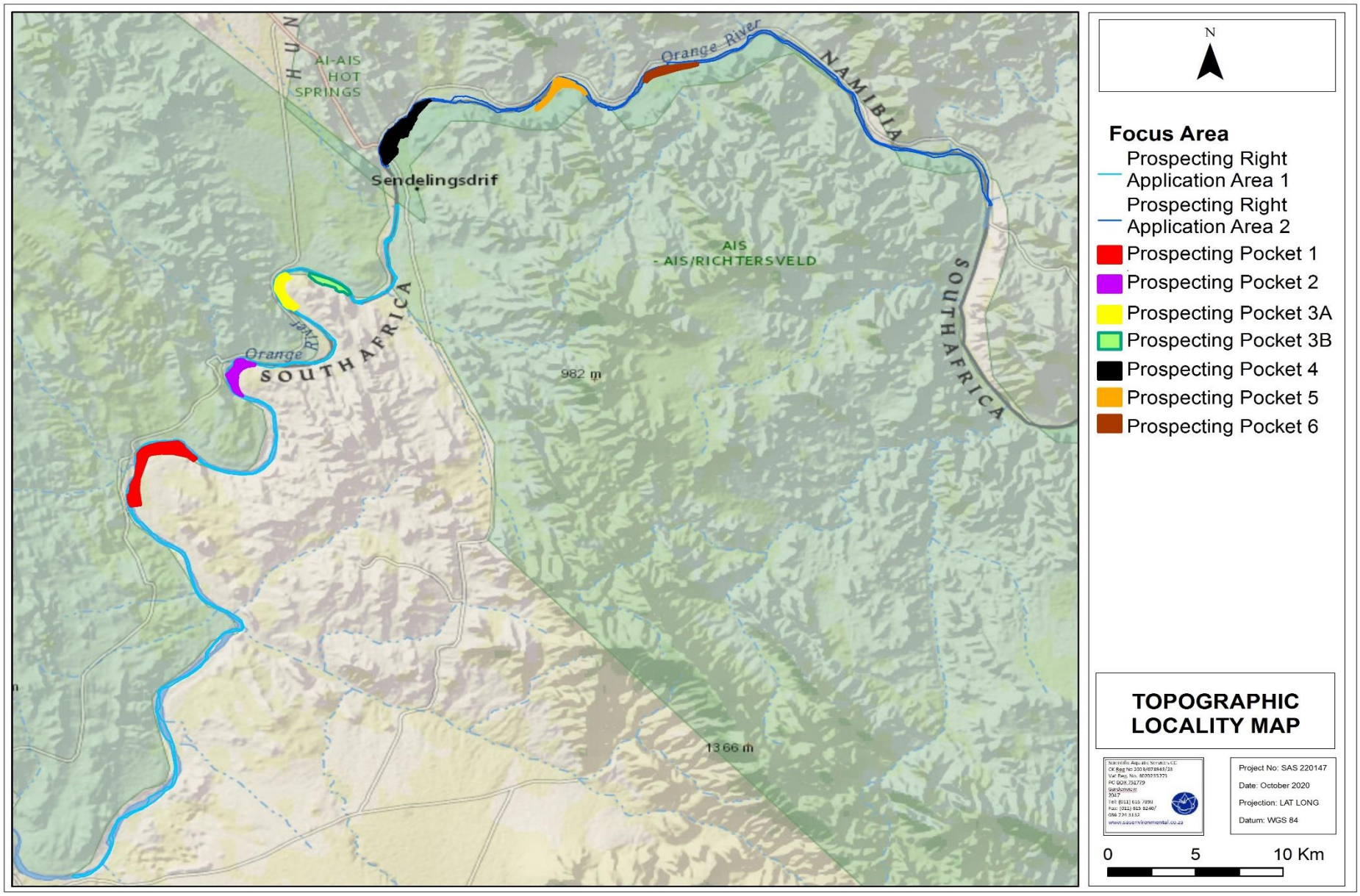

Figure 2: The PRAA and prospecting pockets depicted on a topographical map in relation to its surrounding area.

1.3 Project Scope

The purpose of the Scoping Report are as follows:

- To compile a desktop study of the state of the environment of the focus area including climate, topography, land uses and land cover with the data obtained from the websites of the South African National Biodiversity Institute (SANBI), the Agricultural Research Council (ARC) and the South African Protected (and Conservation) Areas Databases (SAPAD & SACAD, 2019). All databases used were published within the last 5 years and contain up to date and relevant information.
- All sensitive receptors were identified and mapped within 5km of the focus area, with the use of digital satellite imagery as well as the 1: 50 000 topographical map of the focus area;
- Digital Elevation Data obtained from the Global Mapper software and associated database was utilised to generate a visual context map indicating the focus area and conceptual viewsheds of the proposed prospecting and bulk sampling activities based on the precautionary principle; and
- Perceived impacts that the proposed project might have on the receiving environment.

1.4 Principles and Concepts of VIAs

Visual resources have value in terms of the regional economy and inhabitants of the region. Furthermore, these resources are often difficult to place a value on as they normally also have cultural or symbolic values. 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.

1.5 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);
- 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 definition as a precautionary approach; and
- At the time of the desktop assessment the exact heights of the proposed infrastructure was not known, therefore an approximate height of 10 m at each prospecting pocket was utilized during the viewshed analysis. The viewsheds resulting from the Digital Elevation Model (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 been identified and will therefore be ground-truthed during the field assessment during the EIA Phase.

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, 1998 (No. Act 107 of 1998). This includes the 2014 NEMA EIA regulations as amended (published in General Notice (GN) No. 324, GN No. 325 and GN No. 327.

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

The National Environmental Management: Protected Areas Act, 2003 (Act No. 57 of 2003)

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

- Restricted activities involving national and protected parks:
- 48(1) Despite other legislation, no person may conduct commercial prospecting, mining, exploration, production, or related activities–

  (a) in a special nature reserve, national park, or nature reserve

  (b) in a protected environment without the written permission of the Minister and the Cabinet member responsible for minerals and energy affairs; or

  (c) in a protected area referred to in section 9(b), (c) or (d).

The National Heritage Resources Act, 1999 (Act No. 25 of 1999)

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

The Advertising on Roads and Ribbons Act, 1940 (Act No. 21 of 1940)

Visual pollution is controlled, to a limited extent, by the Advertising on Roads and Ribbons Act, 1940 (Act No. 21 of 1940), which deals mainly with signage on public roads.

The Municipal Systems Act, 2000 (Act No. 32 of 2000)

In terms of the Municipal Systems Act, 2000 (Act No. 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 focus area is situated within the Richtersveld Metropolitan Municipality which is an administrative area of the Namakwa District Municipality.

Other

- Visual and aesthetic resources are also protected by local authorities, where policies and by-laws relating to urban edge lines, scenic drives, special areas, signage, communication masts, etc. have been formulated; and
- Other decision-making authorities such as the Department of Water and Sanitation (DWS) and relevant authorities of the local and district municipality, in terms of their

particular legislative frameworks, may also require VIAs to support informed decision-making.

3 PRELIMINARY AND DESK BASED RESULTS

The VIA was conducted to determine the potential impacts that the proposed prospecting and bulk sampling activities will have on the sense of place, landscape quality, and character of the receiving environment. The desktop assessment focused on identifying areas that may potentially be sensitive receptors, of which includes but is not limited to farmsteads, villages / settlements, recreational areas, nature reserves and national parks and prominent roads within the area.

Based on the desktop assessment the following was evident:

- According to Mucina & Rutherford (2012) all of the prospecting pockets are situated within the Azonal Vegetation Biome, the Alluvial Vegetation Bioregion and the Lower Gariep Alluvial Vegetation Type. See Appendix B for further detail regarding the climate, altitude, topography and floral species associated with the Vegetation Type;
- Based on digital satellite imagery, topographical maps and DEM the prospecting pockets are situated in flat alluvial terraces and on the Orange River bed, surrounded by mountainous terrain in the greater region;
- According to NPAES (2009) and SAPAD (2019) the prospecting pockets 4, 5 and 6 are located within the Richtersveld National Park, otherwise known as the Richtersveld Cultural and Botanical Landscape. Based on digital satellite imagery there are limited sensitive receptors situated within a 5 km radius of the focus area namely settlements including Klipheuwel, Sendelingsdrif, Auchas, Sanddrift, and Skilpad (Figure 3). There are limited gravel roads on the South African side of the Orange River, however several roads are present on the Namibian side of the river; namely: the Daberas Pass, Auchas Pass, Niklaas Pass and the formalised C13 Road running along the Orange River. Furthermore, it is evident that historic and current sand and diamond mining have taken and are taking place along the Orange River, as such portions of the Orange River area have been disturbed and exposed to mining activities;
- The Richtersveld National Park is a mountainous desert which has the highest diversity of succulent plants in the world (4 849 species, of which 1 940 are endemic). The coastal mists provide moisture to the moisture deficient landscape. Alluvial diamonds and truly indigenous cultures are also key characteristics of the area that need to be considered. The Richtersveld National Park has a significantly high ecotourism aspect including but not limited to indigenous culture, rich biodiversity, river rafting, the Fish

River Canyon hike, sport fishing along the Orange River, birdwatching and desert living. Since the Orange River is a well established and world renowned area for sport fishing, such as fly-fishing, the Orange River and its associated floodplain is considered a very high sensitive receptor. As such the proposed prospecting and bulk sampling activities will have a significant impact on the ecotourism of the area, in particular the sport fishing, river rafting and desert living activities. Furthermore, the Richtersveld National Park was declared a UNESCO World Heritage Site in 2007. The Richtersveld National Parks is one of the most important of the country's conservation areas, not only for the dramatically unique landscapes, but also for its status as South Africa's first contractual park, an arrangement that brings SANParks and the local community together in a pioneering system of co-management. Figure 4 below indicates the possible camping and picnic sites situated within the Richetersveld National Park;

- The area surrounding the focus area is characterised by deep canyons, jagged mountain ranges, vivid landscapes of the unusual colours of the rocks and soils, of extremely rare succulent plants and languid stretches and white water rapids of the Orange River (Figure 5 and 6). As such the quality of the landscape is considered very high and the sense of place of the area provides the feeling of becoming one with nature;
- According to the viewshed analysis, it is evident that the proposed prospecting and bulk sampling activities will most likely be observed from sensitive receptors within 1 km of the prospecting pockets (Figure 7). Furthermore, it is evident that the activities at the prospecting pockets 1,2, 3A and 3B will more likely be observed within Namibia than South Africa, due to the mountainous terrain on the South African side of the Orange River. According to the viewshed analysis limited portions of the Richtersveld National Park will observe the proposed prospecting and bulk sampling activities. However, this area includes the camping sites, as such the proposed prospecting activities and bulk sampling points may potentially have a very significant negative visual impact on these camping sites. There are limited potential sensitive receptors within these viewsheds. As noted in Section 1.5 the viewshed analysis does not take into account the vegetation and existing anthropogenic structures, therefore the field assessment will display a more accurate outcome of the visual intrusion and visibility of the proposed project on the receiving environment;
- The greater region surrounding the focus area is mainly natural and undisturbed thus limited anthropogenic structures are present in this region, thus the area could be described as intrinsically dark with limited to no sources of night time-lighting. The proposed prospecting and bulk sampling activities could have a negative impact on the landscape character, sense of place and visual quality of the area. The historic and

current mining activities along the Orange River does however already modified the landscape character, aesthetics and sense of place of the area, thus the proposed prospecting and bulk sampling activities will increase the negative visual impact on the surroundings; and

- Even though the proposed project is situated within a remote area, visitors, including international tourists, make the effort to visit the Richtersveld National Park for its tranquil, quiet and undisturbed panoramic views, as such the proposed project is highly likely to have a high to very high visual impact on the overall landscape character of the area.

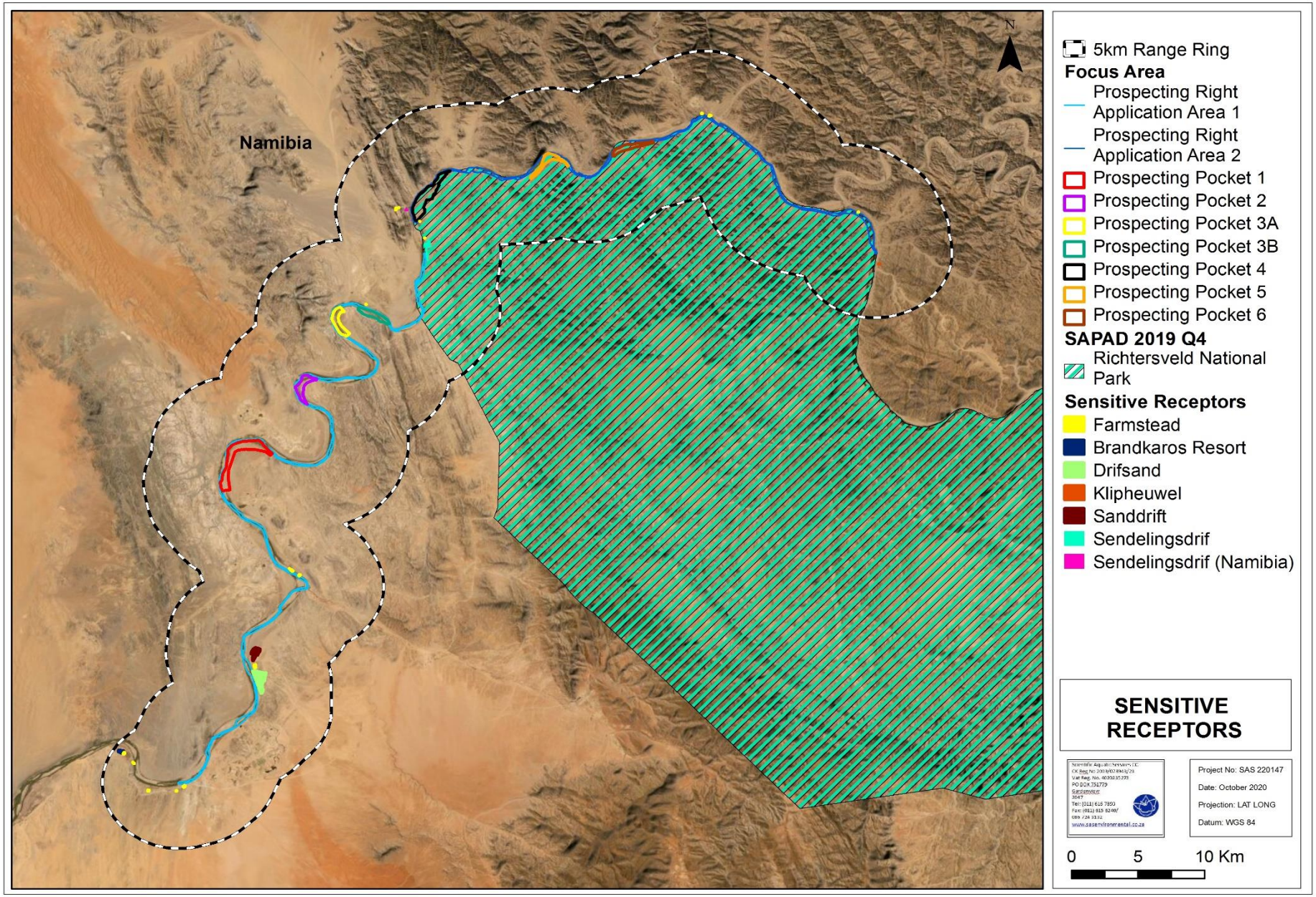

Figure 3: Map indicating the potential visual receptors within 5km of the focus area.

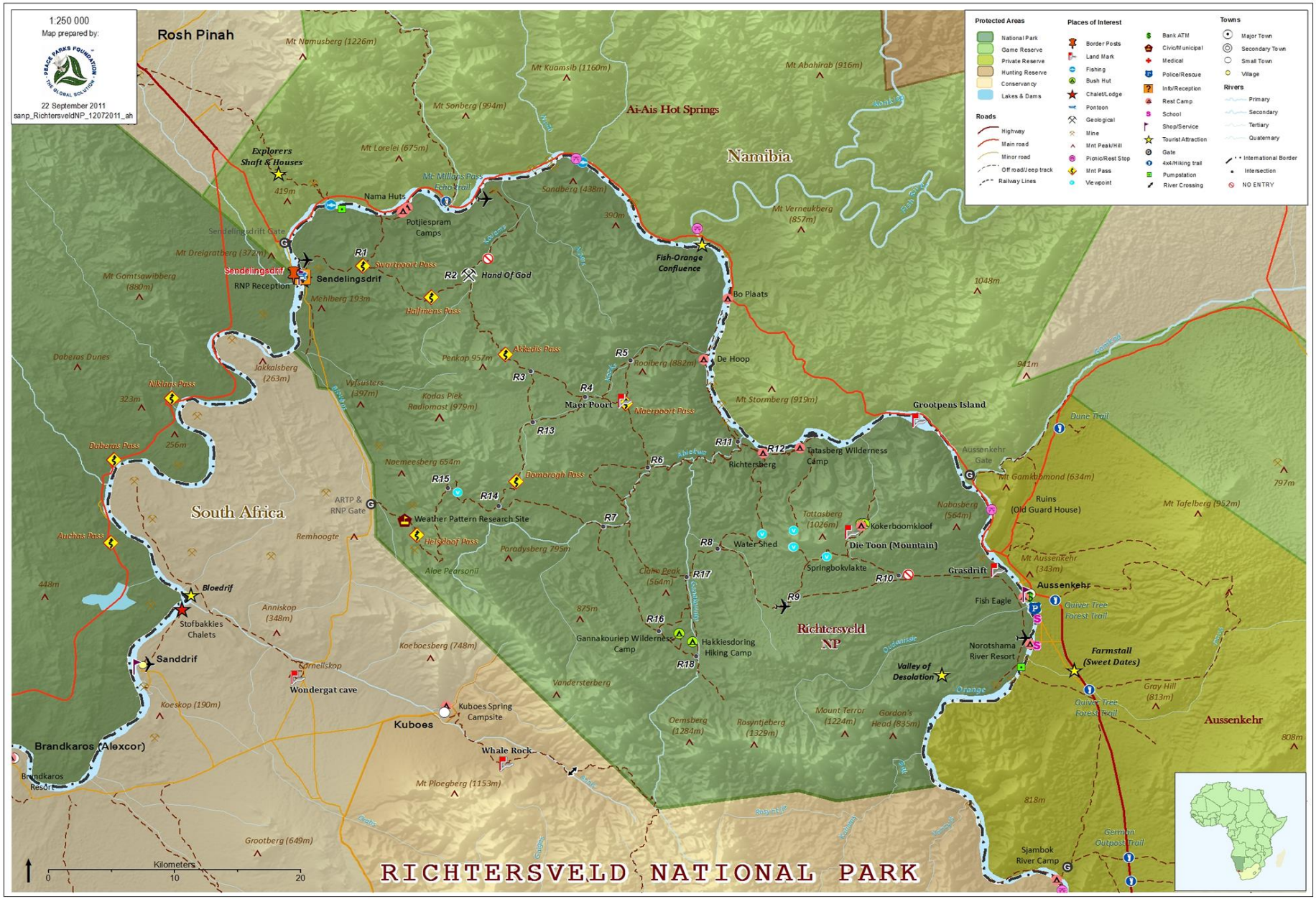

Figure 4: Map indicating the location of the camp sites and picnic spots within the Richtersveld National Park, extracted from the SANParks website.

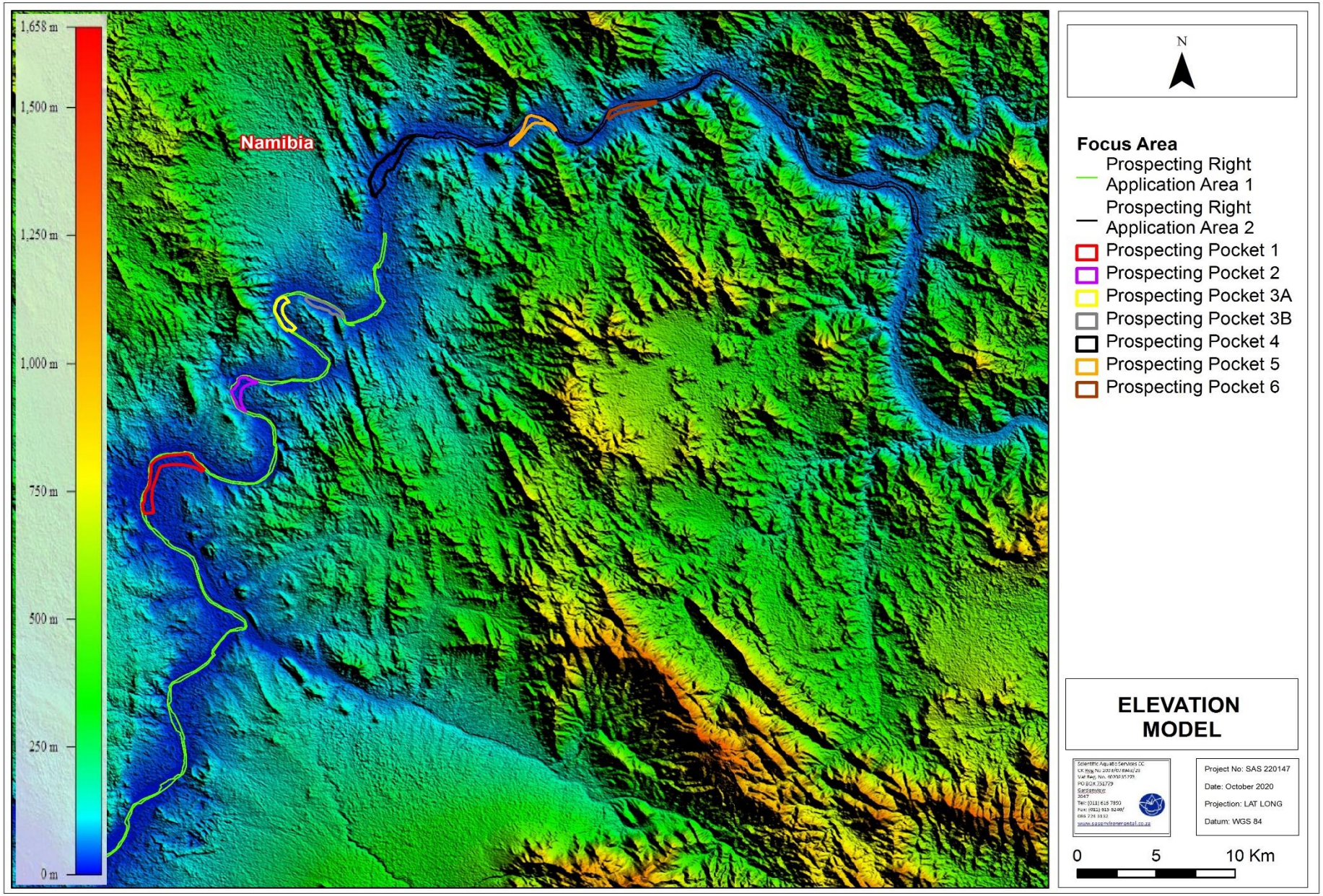

Figure 5: False colour elevation rendering depicting the topographical character of the surface infrastructure area.

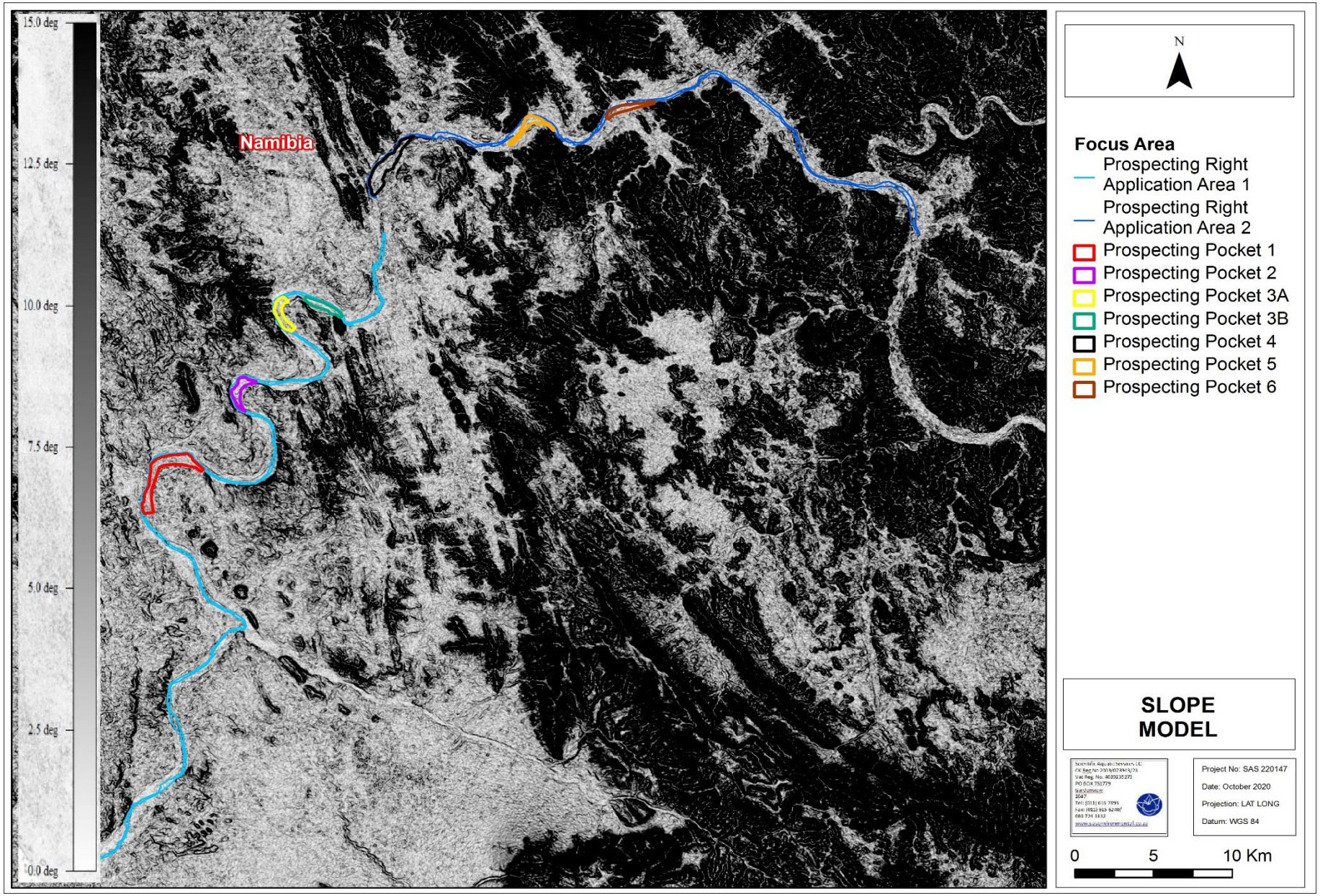

Figure 6: Monochromatic map indicating the general relief associated with the surface infrastructure area.

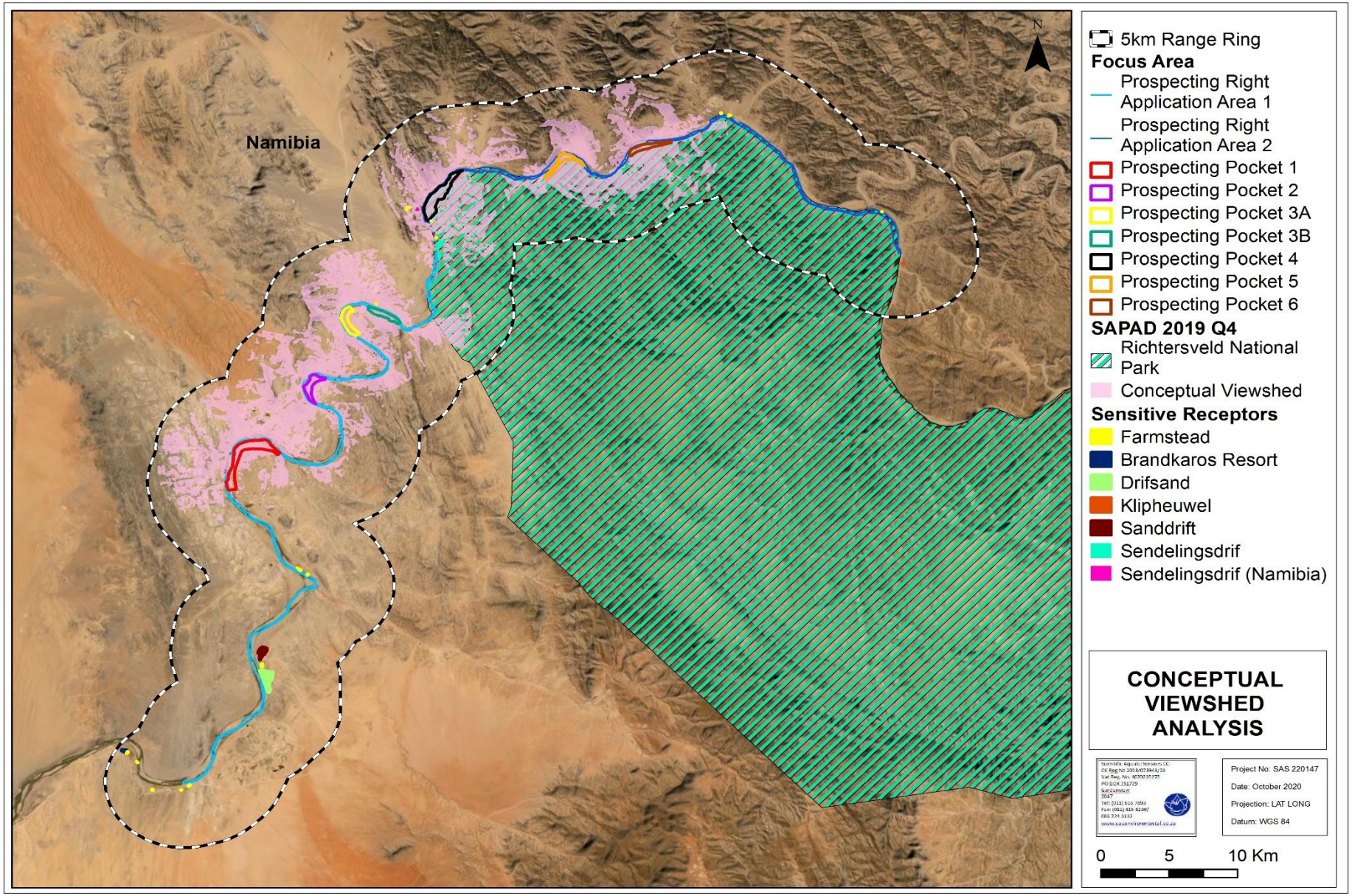

Figure 7: Conceptual viewshed (indicated as shaded areas) of the proposed prospecting and bulk sampling activities overlaid onto digital satellite imagery.

4 PERCEIVED IMPACTS

Several potential risks to the receiving environment that may occur as a result of the proposed prospecting and bulk sampling activities, have been identified and are presented below:

- The proposed prospecting and bulk sampling activities may impact on the landscape and visual character of the region and sense of place associated with the surroundings;
- The proposed prospecting and bulk sampling activities may impact on visual exposure and visibility, which relates directly to the perception of sensitive visual receptors towards the project. Direct visual exposure will take place as a result of prospecting infrastructure being visible to residents in the immediate vicinity as well as tourists visiting the Richtersveld National Park, as well as indirectly through fugitive dust generated by prospecting and bulk sampling activities, such as vehicles driving on dirt roads, as well as earthwork activities. In addition to the physical infrastructure, impacts of clearing of vegetation, potential erosion as a result of bare soils and alteration of local topography will also add to the contrast in the landscape and will likely be visible to receptors;
- The sense of place of the Orange River will most likely by affected significantly due to the proposed prospecting activities and bulk sampling points, with specific mention of the following:
    - Impacts on views of the unimpacted floodplain areas with changes top the geomorphological structure and appearance of the area;
    - Impacts on riparian vegetation structure, composition and appearance;
    - Impacts on water quality and in particular water clarity; and
    - Impacts on instream habitat.
- Lighting associated with the proposed prospecting and bulk sampling activities may be visible during both day and night but is more likely to have an adverse visual impact during the night time. Since the focus area is situated within an intrinsically dark area, there are very limited to no light sources contributing to sky glow, thus the proposed prospecting and bulk sampling activities is likely to contribute significantly to sky glow and further reduce night sky quality.

5 CONCLUSION

Scientific Aquatic Services (SAS) was appointed to conduct a Visual Impact Assessment (VIA) as part of the Environmental Impact Assessment (EIA) and Authorisation process for the

proposed diamond mining prospecting and bulk sampling activities within and along the Orange River within the Richtersveld, Northern Cape Province.

The proposed prospecting and bulk sampling activities include seven (7) prospecting pockets within two greater Prospecting Right Application Areas (PRAA). The south western area is referred to as PRAA 1 where prospecting pockets 1, 2 3A and 3B are located and PRAA 2, further north and east where the prospecting and bulk sampling Pockets 4, 5 and 6 are located. The PRAA 1 and PRAA 2 and the associated prospecting pockets are hereafter collectively referred to as the “focus area”.

The prospecting pockets 4, 5 and 6 are located within the Richtersveld National Park, otherwise known as the Richtersveld Cultural and Botanical Landscape. Based on digital satellite imagery there are limited sensitive receptors situated within a 5 km radius of the focus area namely settlements including Klipheuwel, Sendelingsdrif, Auchas, Sanddrift, and Skilpad. There are limited gravel roads on the South African side, however several roads are present on the Namibian side; namely: the Daberas Pass, Auchas Pass, Niklaas Pass and the formalised C13 Road running along the Orange River.

The Richtersveld National Park is a mountainous desert which has the highest diversity of succulent plants in the world and has a significantly high ecotourism aspect including but not limited to indigenous culture, rich biodiversity, river rafting, the Fish River Canyon hike, sport fishing along the Orange River, birdwatching and desert living. Since the Orange River is a well established and world renowned area for sport fishing, such as fly-fishing and the fact that it is a renowned river rafting site, the Orange River is considered a very highly sensitive receptor.

The area surrounding the focus area is characterised by deep canyons, jagged mountain ranges, vivid landscapes of the unusual colours of the rocks and soils, of extremely rare succulent plants and languid stretches and white water rapids of the Orange River. As such the quality of the landscape is considered very high and the sense of place of the area provides the feeling of becoming one with nature.

The greater region surrounding the focus area mainly comp[rises of natural and undisturbed land and thus limited anthropogenic structures are present in this region. The area could be described as intrinsically dark with limited to no sources of night time-lighting. The proposed prospecting and bulk sampling activities could have a negative impact on the landscape character, sense of place and visual quality of the area.

Based on the outcome of the preliminary assessment it was determined that the proposed prospecting and bulk sampling activities will most likely have a high to very high visual impact

on the receiving environment, due to the focus area situated within the Richtersveld National Park.

From a visual aspect, there are significantly high visual impacts associated with the proposed prospecting and bulk sampling activities. The visual impacts associated with the proposed prospecting and bulk sampling activities will be assessed in detail in the EIA Phase of the project and management and mitigatory measures will be presented in line with the mitigation hierarchy, as advocated by the DMR (2013), in order to ensure informed decision making by all relevant authorities and improved sustainable development decisions and application of integrated environmental management in the area.

6 EIA PHASE – PLAN OF STUDY

Specific outcomes in terms of the EIA phase report are presented in the points below (Appendices C – K):

- To undertake a site assessment to determine the visual impacts of the proposed prospecting and bulk sampling activities on the receiving environment;
- 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 identify the main viewsheds through undertaking a viewshed analysis, based on the proposed height of infrastructure components and the DEM, as a mechanism to identify the locations of potential sensitive receptors sites and the distance of these receptor sites from the project;
- To describe potential sensitive visual receptors residing at or utilising receptor sites;
- To establish receptor sites and identify KOPs from which the proposed project will have a 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;
- Inclusion of potential lighting impacts at night;
- Description of alternatives, mitigation measures and monitoring programmes; and
- 3D modelling and simulations, with mitigation.

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APPENDIX A – Indemnity and Terms of Use of this Report

The findings and observations 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. SAS CC and its staff reserve the right, at their sole discretion, 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 B – Vegetation Type

Table D1: Description of the Lower Gariep Alluvial vegetation type associated with the Prospecting Pockets (Mucina & Rutherford, 2012)

Climate	Region with very arid (desert) to subarid (semidesert) climate and erratic, unimodal (winter-rainfall) regime in the extreme west (near the Orange River mouth)
Altitude (m)	0 – 1 000
MAP* (mm)	131
MAT* (°C)	19.2
MFD* (Days)	14
MAPE* (mm)	2888
MASMS* (%)	NA
Distribution	Northern Cape Province
Geology & Soils	Recent alluvial deposits of the Orange River supporting soil forms such as Dundee and Oakleaf. The river cuts through a great variety of Precambrian metamorphic rocks. Ia land type. Subject to floods, especially in summer, caused by high precipitation on the highveld.
Conservation	Endangered. Target 31%. About 6% statutorily conserved in the Richtersveld and Augrabies Falls National Parks. Some 50% transformed for agricultural purposes (vegetables and grapes) or alluvial diamond mining. *Prosopis* species, *Nicotiana glauca* and *Argemone ochroleuca* can invade the alluvia in places.
Vegetation & landscape features	Flat alluvial terraces and riverine islands supporting a complex of riparian thickets (dominated by *Ziziphus mucronata*, *Euclea pseudebenus* and *Tamarix usneoides*), reed beds with *Phragmites australis* as well as flooded grasslands and herblands populating sand banks and terraces within and along the river.

Dominant floral taxa		
Grass Species	**Forb Species**	**Tree/ Shrub Species**
Reed bed: **Mega graminoid:** *Phragmites australis* (d). **Graminoid:** *Cynodon dactylon* (d), *Setaria verticillata* (d), *Cenchrus ciliaris*, *Cyperus laevigatus*, *Eragrostis echinochloidea*, *Leucophrys mesocoma*, *Polypogon monspeliensis*, *Stipagrostis namaquensis*	**Herb:** *Chenopodium olukondae* *Amaranthus praetermissus*, *Coronopus integrifolius*, *Frankenia pulverulenta*, *Gnaphalium confine* *Pseudognaphalium luteo-album*.	**Small Trees (riparian thicket):** *Acacia karroo* (d), *Euclea pseudebenus* (d), *Salix mucronata* subsp. *mucronata* (d), *Schotia afra* var. *angustifolia* (d), *Ziziphus mucronata* (d), *Vachellia erioloba*, *Combretum erythrophyllum*, *Ficus cordata*, *Maerua gilgii*, *Prosopis glandulosa* var. *glandulosa*, *Rhus lancea*. **Tall Shrubs (riparian thicket):** *Gymnosporia linearis* (d), *Tamarix usneoides* (d), *Ehretia rigida*, *Euclea undulata*, *Sisyndite spartea*. **Low Shrub:** *Asparagus laricinus*. **Low Shrubs (flooded grasslands and herblands):** *Tetragonia schenckii* (d), *Litogyne gariepina* **Woody Climber:** *Asparagus retrofractus* **Succulent Shrub:** *Lycium bosciifolium*

(d) = dominant species
(The genus for all *Senegalia* and *Vachellia* spp. were formerly *Acacia*)

APPENDIX C – 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 D – 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

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

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

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

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

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

	CONSEQUENCE (Severity + Spatial Scope + Duration)														
LIKELIHOOD (Frequency of activity + Frequency of impact)	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 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	
Enclosure	Tight	Enclosed	Open	Exposed	
Diversity	Uniform	Simple	Diverse	Complex	
Texture	Smooth	Textured	Rough	Very rough	
Form	Vertical	Sloping	Rolling	Horizontal	
Line	Straight	Angular	Curved	Sinuous	
Colour	Monochrome	Muted	Colourful	Garish	
Balance	Harmonious	Balanced	Discordant	Chaotic	
Pattern	Random	Organised	Regular	Formal	
Movement	Dead	Still	Calm	Busy	

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

APPENDIX 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.

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.

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 Cygnus Project 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 Cygnus 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 Cygnus Mine, the visibility of the proposed infrastructure will be reduced.

APPENDIX L – 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 Aquatic 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

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

PERSONAL DETAILS

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

MEMBERSHIP IN PROFESSIONAL SOCIETIES

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

EDUCATION

Qualifications

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

Short Courses

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

AREAS OF WORK EXPERIENCE

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

SELECTED PROJECT EXAMPLES OUT OF OVER 2000 PROJECTS WORKED ON

1 Mining: Coal, Chrome, PGM's, Mineral Sands, Gold, Phosphate, river sand, clay, fluorspar
2 Linear developments
3 Energy Transmission, telecommunication, pipelines, roads
4 Minerals beneficiation
5 Renewable energy (wind and solar)
6 Commercial development
7 Residential development
8 Agriculture
9 Industrial/chemical

KEY SPECIALIST DISCIPLINES

Biodiversity Assessments

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

Freshwater Assessments

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

Aquatic Ecological Assessment and Water Quality Studies

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

Soil and Land Capability Assessment

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

Visual Impact Assessment

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

Legislative Requirements, Processes and Assessments

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

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

PERSONAL DETAILS

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

EDUCATION

Qualifications

BSC Zoology (University of Pretoria)	2013

Short Courses

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

AREAS OF WORK EXPERIENCE

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

KEY SPECIALIST DISCIPLINES

Freshwater Assessments
- Desktop Freshwater Delineation
- Plant species and Landscape Plan

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

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