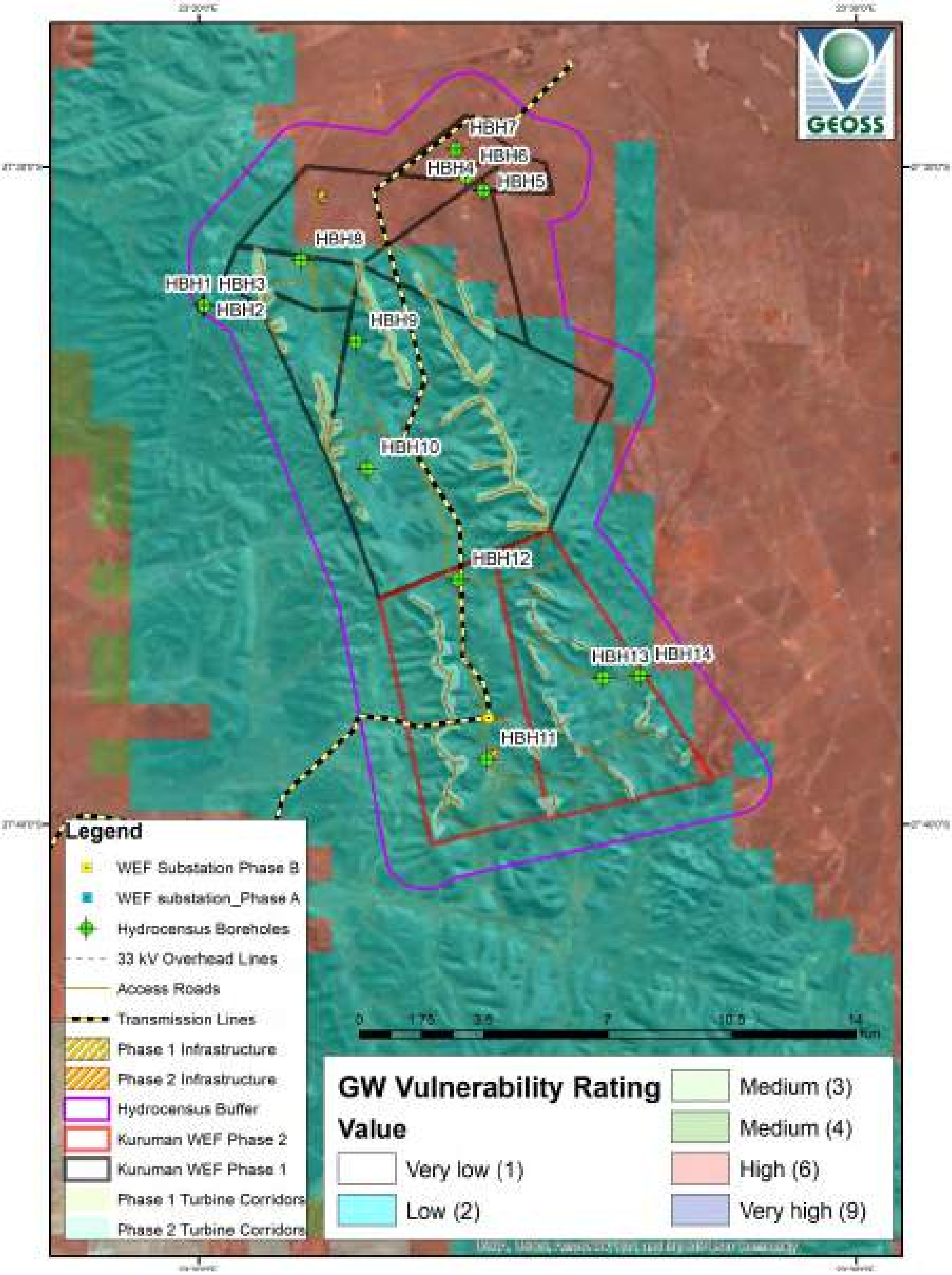


Map 6: National groundwater vulnerability (calculated according to the DRASTIC methodology) and boreholes (DWAF, 2005).

1.11.2 APPENDIX B: site photos

Table 7: Photos of hydrocensus boreholes identified during site visit

BH_ID	Photo
HBH1	
HBH2	
HBH3	
HBH4	No Photo Available
HBH5	No Photo Available

HBH6	
HBH7	
HBH8	
HBH9	

HBH10	
HBH11	
HBH12	
HBH13	

HBH14	

(last page)

VISUAL IMPACT ASSESSMENT:

for the Proposed Development of the Phase 2 Kuruman Wind Farm Facility, Kuruman, Northern Cape Province: SCOPING REPORT

Report prepared for:	*Report prepared by:*
CSIR – Environmental Management Services	SiVEST
P O Box 320	51 Wessels Road
Stellenbosch	Rivonia
7600	2128

08 May 2018

SPECIALIST EXPERTISE

Curriculum Vitae of Visual Specialist – Andrea Gibb

Name	Andrea Gibb
Profession	Environmental Practitioner / Visual Specialist
Name of Firm	SiVEST SA (Pty) Ltd
Present Appointment	Senior Manager Environmental Division
Years with Firm	7 Years
Date of Birth	29 January 1985
Place of Birth	South Africa
ID Number	8501290020089
Nationality	South African

Education

Matriculated 2003, Full Academic Colours, Northcliff High School, Johannesburg, South Africa

Professional Qualifications

BSc (Hons) Environmental Management (University of South Africa 2008-2010)
Coursework**:** Project Management, Environmental Risk Assessment and Management, Ecological and Social Impact Assessment, Fundamentals of Environmental Science, Impact Mitigation and Management, Integrated Environmental Management Systems & Auditing, Integrated Environmental Management, Research Methodology.
Research Proposal**:** Golf Courses and the Environment

BSc Landscape Architecture (with distinction) (University of Pretoria 2004-2007)
Coursework: Core modules focused on; design, construction, environmental science, applied sustainability, shifts in world paradigms and ideologies, soil and plant science, environmental history, business law and project management.
Awards: Cave Klapwijk prize for highest average in all modules in the Landscape Architecture programme, ILASA book prize for the best Landscape Architecture student in third year design, Johan Barnard planting design prize for the highest distinction average in any module of plant science.

Employment Record

Aug 2010 – to date	SiVEST SA (Pty) Ltd: Environmental Practitioner
Jan 2008 – July 2010	Cave Klapwijk and Associates: Environmental Assistant and Landscape Architectural Technologist
Feb 2006 – Dec 2006	Cave Klapwijk and Associates: Part time student

Key Experience

Specialising in the field of Environmental Management and Visual Assessment.

Andrea has 10 years' work experience and is employed by SiVEST Environmental as the Senior Manager heading up the Johannesburg office. She is primarily involved with managing large scale multifaceted Environmental Impact Assessments (EIAs) and Basic Assessments (BAs) (incl. Amendment Applications), undertaken according to International Finance Corporation (IFC) standards and Equator Principles, within the renewable energy generation and electrical distribution sectors. Andrea has extensive experience in overseeing public participation and stakeholder engagement processes and has also been involved in environmental feasibility and sensitivity analyses. She further specialises in undertaking and overseeing visual impact and landscape character assessments.

Key Visual Impact Assessment Experience

<u>Aug 2010 – to date</u>

- VIAs for the proposed construction of the Grasskoppies, Hartebeest Leegte, Ithemba and !Xha Boom Wind Farms near Loeriesfontein, Northern Cape Province.
- VIAs for the proposed Phezukomoya and San Kraal Wind Energy Facilities near Noupoort, Northern Cape Province.
- VIAs for the proposed Assagay Valley and Kassier Road North Mixed Use Developments, KwaZulu-Natal Province.
- VIA for the proposed construction of the Aletta 140MW Wind Energy Facility near Copperton, Northern Cape Province.
- VIAs (Scoping and Impact Phase) for the proposed construction of the Sendawo 1, 2 and 3 solar PV energy facilities near Vryburg, North West Province.
- VIA (Scoping and Impact Phase) for the proposed construction of the Sendawo substation and associated power line near Vryburg, North West Province.
- VIAs (Scoping and Impact Phase) for the proposed construction of the Tlisitseng 1 and 2 solar PV energy facilities near Lichtenburg, North West Province.
- VIA for the proposed construction of the Tlisitseng substation and associated 132kV power line near Lichtenburg, North West Province.
- VIA for the proposed Tinley Manor South Banks Development, KwaZulu-Natal Province.
- VIAs (Scoping and Impact Phase) for the proposed construction of the Helena 1, 2 and 3 75MW Solar PV Energy Facilities near Copperton, Northern Cape Province.
- Visual Status Quo and Due Diligence Report for the possible rapid rail extensions to the Gauteng network, Gauteng Province.
- VIA for the proposed Tweespruit to Welroux power lines and substation, Free State Province.
- VIA for the proposed construction of the Nokukhanya 75MW Solar PV Power Plant near Dennilton, Limpopo Province.
- VIA (Scoping and Impact Phase) for the proposed development of the Dwarsrug Wind Farm near Loeriesfontein, Northern Cape Province.
- VIA for the proposed construction of two 132kV power lines and associated infrastructure from the Redstone Solar Thermal Power Project site to the Olien MTS near Lime Acres, Northern Cape Province.
- VIAs for the Spoornet Coallink Powerline Projects in KZN and Mpumalanga.
- VIA for the (Scoping and Impact Phase) proposed Construction of the Renosterberg Wind Farm near De Aar, Northern Cape Province.
- VIA for the (Scoping and Impact Phase) proposed Construction of the Renosterberg Solar PV Power Plant near De Aar, Northern Cape Province.
- VIA for the proposed Mookodi Integration phase 2 132kV power lines and Ganyesa substation near Vryburg, North West Province.
- VIA for the proposed construction of a substation and 88kV power line between Heilbron (via Frankfort) and Villiers, Free State Province.
- Visual Status Quo Assessment for the Moloto Development Corridor Feasibility Study in the Gauteng Province, Limpopo Province and Mpumalanga Province.

SPECIALIST DECLARATION

I, **Andrea Gibb**, as the appointed independent specialist, in terms of the 2014 EIA Regulations, hereby declare that I:

- I act as the independent specialist in this application;
- I 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;
- regard the information contained in this report as it relates to my specialist input/study to be true and correct, and do not have and will not have any financial interest in the undertaking of the activity, other than remuneration for work performed in terms of the NEMA, the Environmental Impact Assessment Regulations, 2014 and any specific environmental management Act;
- 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 Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I have no vested interest in the proposed activity proceeding;
- 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;
- I have ensured that information containing all relevant facts in respect of the specialist input/study was distributed or made available to interested and affected parties and the public and that participation by interested and affected parties was facilitated in such a manner that all interested and affected parties were provided with a reasonable opportunity to participate and to provide comments on the specialist input/study;
- I have ensured that the comments of all interested and affected parties on the specialist input/study were considered, recorded and submitted to the competent authority in respect of the application;
- all the particulars furnished by me in this specialist input/study are true and correct; and
- I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.

Signature of the specialist:

Name of Specialist: Andrea Gibb

Date: 19 March 2018

LIST OF ABBREVIATIONS

BA	Basic Assessment
DEA	Department of Environmental Affairs
DEM	Digital Elevation Model
EIA	Environmental Impact Assessment
EMPr	Environmental Management Programme
GIS	Geographic Information System
kV	Kilo Volt
MW	Megawatt
NEMA	National Environmental Management Act No. 107 of 1998
NFEPA	National Freshwater Ecosystem Priority Areas
NGI	National Geospatial Information
OHL	Overhead Line
PPP	Public Participation Process
PV	Photovoltaic
SANBI	South African National Biodiversity Institute
VIA	Visual Impact Assessment
WEF	Wind Energy Facility

GLOSSARY

Definitions	
Anthropogenic feature	An unnatural feature as a result of human activity.
Aspect	Direction in which a hill or mountain slope faces.
Cultural landscape	A representation of the combined worlds of nature and of man illustrative of the evolution of human society and settlement over time, under the influence of the physical constraints and/or opportunities presented by their natural environment and of successive social, economic and cultural forces, both external and internal (World Heritage Committee, 1992).
Sense of Place	The unique quality or character of a place, whether natural, rural or urban. It relates to uniqueness, distinctiveness or strong identity.
Scenic Route	A linear movement route, usually in the form of a scenic drive, but which could also be a railway, hiking trail, horse-riding trail or 4x4 trail.
Sensitive visual receptors	An individual, group or community that is subject to the visual influence of the proposed development and is adversely impacted by it. They will typically include locations of human habitation and tourism activities.
Study area:	The study area / visual assessment zone is assumed to encompass a zone of 8km from the outer boundary of the proposed wind farm application site.
Vantage point	A point in the landscape from where a particular project or feature can be viewed.
Viewpoint	A point in the landscape from where a particular project or feature can be viewed.
Viewshed	The outer boundary defining a visual envelope, usually along crests and ridgelines.
Visual assessment zone	The visual assessment zone / study area is assumed to encompass a zone of 8km from the outer boundary of the proposed wind farm application site.
Visual character	The physical elements and forms and land use related characteristics that make up a landscape and elicit a specific visual quality or nature. Visual character can be defined based on the level of change or transformation from a completely natural setting.

Visual contrast	The degree to which the development would be congruent with the surrounding environment. It is based on whether or not the development would conform with the land use, settlement density, forms and patterns of elements that define the structure of the surrounding landscape.
Visual envelope	A geographic area, usually defined by topography, within which a particular project or other feature would generally be visible.
Visual exposure	The relative visibility of a project or feature in the landscape.
Visual impact	The effect of an aspect of the proposed development on a specified component of the visual, aesthetic or scenic environment within a defined time and space.
Visual receptors	An individual, group or community that is subject to the visual influence of the proposed development but is not necessarily adversely impacted by it. They will typically include commercial activities and motorists travelling along routes that are not regarded as scenic.
Visual sensitivity	The inherent sensitivity of an area to potential visual impacts associated with a proposed development. It is based on the physical characteristics of the area (visual character), spatial distribution of potential receptors, and the likely value judgements of these receptors towards the new development, which are usually based on the perceived aesthetic appeal of the area.

TABLE OF CONTENTS

TABLES AND FIGURES

APPENDICES

SCOPING PHASE

1.1. INTRODUCTION AND METHODOLOGY

1.1.1. Scope and Objectives

Mulilo Renewable Project Developments (Pty) Ltd (hereafter referred to as 'Mulilo') is proposing to construct a wind energy facility (WEF) near Kuruman in the Northern Cape Province. The proposed WEF together with associated infrastructure is referred to as Kuruman Wind Energy Facility (WEF) Phase 2.

This proposed development is currently the subject of an Environmental Authorisation (EA) application being submitted under the EIA Regulations 2014 (as amended in 2017) and a Visual Impact Assessment (VIA) is required in order to inform the Environmental Impact Report (EIR) and Application for Environmental Authorisation (EA) under NEMA.

The aim of the VIA is to identify potential visual issues associated with the development of the proposed WEF and its associated infrastructure, as well as to determine the potential extent of visual impact. This is done by characterising the visual environment of the area and identifying areas of potential visual sensitivity that may be subject to visual impacts.

1.1.2. Terms of Reference

The Terms of Reference for this VIA include the following:

- A description of the regional and local features;
- Identification of the visual character of the receiving environment;
- Desktop and field investigation to identify sensitive and potentially sensitive receptor locations;
- Mapping of the sensitive landscape features and/or receptor locations;
- Assessing (identifying and rating) the potential impacts on the environment,
- Description of the potential cumulative impacts;
- Identification of relevant legislation and legal requirements; and
- Providing recommendations on possible mitigation measures and rehabilitation procedures/ management guidelines.

1.1.3. Approach and Methodology

As mentioned above, this scoping level VIA is based on a combination of desktop-level assessment as well as field-based observation.

- <u>Physical landscape characteristics</u>

Physical landscape characteristics such as topography, vegetation and land use are important factors influencing the visual character and visual sensitivity of the study area. Baseline information about the physical characteristics of the study area was initially sourced from spatial databases provided by National Geospatial Information (NGI), the South African National Biodiversity Institute (SANBI) and the South African National Land Cover Dataset (Geoterraimage – 2014). The characteristics identified via desktop means were later verified during the site visit.

- <u>Identification of potentially sensitive receptor locations</u>

Receptor locations and routes that are potentially sensitive to the visual intrusion of the proposed development were also identified in order to ascertain if a more focussed assessment will need to be undertaken in the next phase of the EIA.

- Fieldwork and photographic review

A three (3) day site visit was undertaken between the 19th and the 21st of February 2018 (summer). The study area was visited in order to;

- verify the landscape characteristics identified via desktop means;
- capture photos of the proposed study area;
- verify the sensitivity of visual receptor locations identified via desktop means;
- eliminate receptor locations that are unlikely to be influenced by the proposed development;
- identify any additional visually sensitive receptor locations within the study area; and
- assist with the impact rating assessment from visually sensitive receptor locations.

- Impact Assessment

A rating matrix was used to objectively evaluate the significance of the visual impacts associated with the proposed development, both before and after implementing mitigation measures. Mitigation measures were identified (where possible) in an attempt to minimise the visual impact of the proposed development. The rating matrix made use of a number of different factors including geographical extent, probability, reversibility, irreplaceable loss of resources, duration and cumulative effect in order to assign a level of significance to the visual impact of the project.

- Consultation with I&APs

Continuous consultation with Interested and Affected Parties (I&APs) undertaken as part of the public participation process for the EIA will be used to help establish how the proposed development will be perceived by the various receptor locations and the degree to which the impact will be regarded as negative. Although I&APs have not as yet provided any feedback in this regard, the report will be updated to include relevant information as and when it becomes available.

In addition, the landowners of the properties within which the proposed WEF development would be constructed were asked to complete a visual impact questionnaire in order to determine whether they would view the proposed development in a negative light and whether the farmsteads / homesteads located on these properties could ultimately be eliminated from the list of identified potentially sensitive visual receptors locations. These questionnaires were also used to inform the VIA and have been included in **Appendix B**.

1.1.4. Assumptions and Limitations

The following assumptions and limitations apply:

- This visual study has been undertaken based on the project description and preliminary layout information provided by Mulilo and the CSIR at the inception of the project.

- Given the nature of the receiving environment and the height of the proposed wind turbines, the study area or visual assessment zone is assumed to encompass a zone of 8km from the proposed WEF – i.e. an area of 8km from the boundary of the application site. This 8km limit on the visual assessment zone relates to the importance of distance when assessing visual impacts. Although the wind farm may still be visible beyond 8km, the degree of visual impact would diminish considerably and as such the need to assess the impact on potential receptor locations beyond this distance would not be warranted.

- The identification of visual receptor locations has been based on a combination of desktop assessment as well as field-based observation. Initially Google Earth imagery was used to identify potential visual receptor locations within the study area. Thereafter a three (3) day site visit was undertaken between the 19th and 21st of February 2018 (summer) in order to verify the sensitive visual receptor locations within the study area and assess the visual impact of the development from these receptor locations. Due to the extent of the study area, it was not possible to visit every potentially sensitive receptor location and as such a number of broad assumptions have been made in terms of the sensitivity of the receptors to the proposed development. It should be noted that not all receptor locations would necessarily perceive the proposed development in a negative way. This is usually dependent on the use of the facility and the economic dependency on the scenic quality of views from the facility. Sensitive receptor locations typically include sites that are likely to be adversely affected by the visual intrusion of the proposed development. They include; tourism facilities and scenic locations within natural settings. The presence of a receptor location in an area potentially affected by the proposed development does not therefore necessarily mean that visual impact will be experienced.

- Due to access limitations during the field investigation / site visit and the nature of the study area, the identified potentially sensitive visual receptor locations (such as farmsteads and dwellings) could not be visited and investigated from a visual perspective during the time of the field investigation / site visit. Although the use of these receptor locations could not be investigated further during the field investigation, they were still regarded as being potentially sensitive to the visual impacts associated with the proposed development and were assessed as part of the VIA.

- Impact rating assessments on the sensitive and potentially sensitive visual receptor locations have not been undertaken in this scoping phase VIA report as the scoping phase was used primarily to identify sensitive and potentially sensitive visual receptor locations, verify the landscape characteristics, verify the sensitivity of visual receptor locations, eliminate receptor locations that are unlikely to be influenced by the proposed development and identify any additional visually sensitive receptor locations within the study area. The impact rating assessments of the proposed development on the sensitive and potentially sensitive visual receptor locations will be undertaken during the EIA phase of the proposed development and will be provided in the EIA phase VIA report.

- No feedback regarding the visual environment has been received from the public participation process to date. The only feedback regarding the visual environment which has been received to date includes a visual impact questionnaire which was completed by the landowner of the property being proposed for the WEF development. This questionnaire was used in order to determine whether the landowner would view the proposed development in a negative light and whether the farmsteads / homesteads located on this property could ultimately be eliminated from the list of identified potentially sensitive visual receptor locations. Any feedback from the public during the review period of the Draft Scoping Report (DSR) will however be incorporated into further drafts of this report. Undertaking a perception survey falls outside of the scope of this VIA.

- The viewshed analysis does not take into account any existing vegetation cover or built infrastructure which may screen views of the proposed development. In addition, detailed topographic data was not available for the broader study area and as such the visibility analysis does not take into account any localised topographic variations which may constrain views. This analysis should therefore be seen as a conceptual representation or a worst case scenario.

- The visibility analysis is based purely on topographic data available for the broader study area and does not take into account any localised topographic variations or any existing infrastructure and / or vegetation which may constrain views. In addition, the analysis does not take into account differing perceptions of the viewer which largely determine the degree of visual impact being experienced. The visual sensitivity analysis should therefore be seen as a conceptual representation or a worst-case scenario which rates the visibility of the site in relation to potentially sensitive receptor locations.

- Due to the varying scales and sources of information as well as the fact that the terrain data available for the study area (NGI 25m DEM) is fairly coarse and somewhat inconsistent; maps and visual models may have minor inaccuracies. As such, only large scale topographical variations have been taken into account and minor topographical features or small undulations in the landscape may not be depicted on the DEM.

- This scoping phase visual assessment has been based on the entire application site. As such, no visualisation modelling or three dimensional simulations have been compiled at this stage as the scoping phase findings will inform the final layout. This will therefore be undertaken in the next phase of the study, should the need be proven by stakeholder / I&AP feedback.

- Operational and security lighting will be required for the proposed wind energy facility and the associated infrastructure proposed within the development footprint. At the time of undertaking the visual study no information was available regarding the type and intensity of lighting required and therefore the potential impact of lighting at night has not been assessed at a detailed level. As such, the night-time environment in the study area was not fully characterised and will need to be assessed in the next phase of this study.

- The cumulative impact assessment in this scoping phase VIA has been based on the information made available by the Environmental Assessment Practitioner (EAP), namely CSIR. At the time of writing this VIA report, very little information had however been sourced and made available for each of the proposed renewable energy facilities planned in close proximity to the proposed Kuruman Phase 2 development. As such, it was not possible to conduct a literature review to determine the identified impacts and recommended mitigation measures. This scoping level cumulative impact assessment is therefore based on broad assumptions as to the likely impacts of these developments. A full literature review will however be conducted during the impact phase and will be provided in the impact phase VIA report, provided that the necessary information is forthcoming.

- It should be noted that the fieldwork was undertaken in mid-February 2018, during late summer when most rainfall occurs in the area. As such, it is likely that the visual impact of the proposed development would be less significant at this time of year than it would be during the winter months when the surrounding vegetation is expected to provide less potential screening than in the late summer months.

- The overall weather conditions in the study area also have certain visual implications and are expected to affect the visual impact of the proposed development to some degree. As mentioned above, the fieldwork was undertaken during the late summer months which are characterised by clear weather conditions. In these conditions, the wind turbines would present a greater contrast with the surrounding environment than they would on a cloudy overcast day. The weather conditions during the time of the study were therefore taken into consideration when undertaking this scoping phase VIA. In addition, the weather conditions during the time of the study will be taken into consideration when undertaking the impact rating for each identified sensitive and potentially sensitive receptor locations in the next phase of the study.

1.1.5. Source of Information

Main sources of information for the visual impact assessment included:

- Project description for the proposed Kuruman WEF Phase 2 provided by Mulilo;
- Elevation data from 25m DEM from the NGI;
- 1:50 000 topographical maps of South Africa from the NGI;
- Land cover and land use data extracted from the 2013-2014 South African National Land-Cover Dataset provided by GEOTERRAIMAGE;
- Vegetation classification data extracted from SANBI's VEGMAP 2012 dataset;
- Google Earth Satellite imagery 2016;
- South African Renewable Energy EIA Application Database from Department of Environmental Affairs (incremental release Quarter 4 2017).

1.2. APPLICABLE LEGISLATION AND PERMIT REQUIREMENTS

Key legal requirements pertaining to the proposed WEF development are as follows:

In terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998), (NEMA) and the EIA Regulations 2014 (as ameneded), the proposed development includes listed activities which require a full Environmental Impact Assessment (EIA) to be undertaken. As part of this EIA process, the need for a VIA to be undertaken has been identified in order to assess the visual impact of the proposed WEF.

There is currently no legislation within South Africa that explicitly pertains to the assessment of visual impacts, however in addition to NEMA the following legislation has relevance to the protection of scenic resources:

- National Environmental Management: Protected Areas Act, 2003 (Act No. 57 of 2003)
- National Heritage Resources Act, 1999 (Act No. 25 of 1999)

Based on these Acts protected or conservation areas and sites or routes with cultural or symbolic value have been taken into consideration when identifying sensitive and potentially sensitive receptor locations and rating the sensitivity of the study area.

1.3. DESCRIPTION OF THE AFFECTED ENVIRONMENT

1.3.1. Site Location

The proposed WEF is located approximately 15km south-west of Kuruman in the Northern Cape Province (Refer to ***Regional Context Map*** which has been provided in **Appendix C**). The site lies within the boundaries of Ga-Segonyana Local Municipality, in the John Taolo Gaetsewe District Municipality. As shown in the ***Site Locality Map*** which has been provided in **Appendix C**, the application site comprises two (2) farms and is approximately 4 450 hectares (ha) in extent, although the actual footprint of the proposed development is only expected to occupy some 9% of this area.

1.3.2. Topography

The study area is largely dominated by the Kuruman Hills, a range of high hills and ridges running in a roughly north-south alignment, parallel to the R31 Main Road (**Figure 1**).

Figure 1: Typical view of the Kuruman Hills which can be found within the application site

The surrounding area is however largely characterised by the relatively flat plains of the Ghaap Plateau with some relief in the form of isolated koppies and hills (**Figure 2**). In addition the terrain in the study area is characterised by a network of low lying dry water courses.

Figure 2: Typical view of the topography within the study area

Much of the application site lies in the Kuruman Hills and the terrain here is characterised by a mix of incised valleys and flatter, higher lying plateaux (**Figure 3**).

Figure 3: Typical view of the topography from within the application site

The topography and slope of the study area is illustrated in the respective ***Topography Map*** and ***Slope Classification Map*** which have been provided in **Appendix C**.

<u>Visual Implications</u>

Areas of flat relief, such as the flat plains and the higher-lying grassy plateaux, are characterised by wide ranging vistas. Vistas in the hillier and higher-lying terrain can be more open or more enclosed, depending on the position of the viewer. Within some of the more incised valleys for example, the vista would limited, whereas a much wider view or vista would be available from the higher-lying ridge tops or slopes (**Figure 4**). Importantly in the context of this study the same is true of objects placed at different elevations and within different landscape settings, with objects placed on high-elevation slopes or ridge tops being highly visible, while those placed within valleys or enclosed plateaux would be far less visible.

Figure 4: Typical wide vista experienced from a high-lying area

GIS technology was used to undertake a preliminary visibility analysis for the turbine assessment corridors. A worst-case scenario was assumed when undertaking the analysis, where random points within the corridors were considered with a maximum height of 220m. Other infrastructure associated with the proposed WEF was not factored into the visibility analysis as the visual impact of the associated infrastructure is generally not regarded as a significant factor when compared to the visual impact associated with wind turbines. The resulting viewshed indicates the geographical area from where turbines located within the assessment corridors would be visible, i.e. the zone of visual influence. This analysis is based entirely on topography (relative elevation and aspect) which is an important factor that should be considered when determining the area of visual influence for a WEF development. The viewshed analysis does not take into account any existing vegetation cover or built infrastructure which may screen views of the proposed development. In addition, detailed topographic data was not available for the broader study area and as such the visibility analysis does not take into account any localised topographic variations which may constrain views. This analysis should therefore be seen as a conceptual representation or a worst case scenario.

The results of this analysis are shown in the ***Preliminary Visibility Analysis Map*** which has been provided in **Appendix C**. From this it is evident that turbines placed within the assessment corridors would be highly visible from most parts of the study area.

1.3.3. Vegetation

According to Mucina and Rutherford (2006), the areas of the visual assessment zone which are characterised by flatter plains are largely covered by the Kuruman Thornveld vegetation type, which is generally characterized by a well-developed shrub layer and an open tree layer dominated by camel thorn trees (*Acacia erioloba*) (**Figure 5**).

Figure 5: Typical vegetation cover which can be found within the parts of the study area characterised by flatter plains

The hillier areas of the Kuruman Hills are classified as Kuruman Mountain Bushveld which is typically characterised by an open shrub layer and a well-developed grass layer (**Figure 6**).

Figure 6: Typical vegetation cover which can be found within the hillier parts of the study area such as the Kuruman Hills

In certain areas, man has had an impact on the natural vegetation, especially around farmsteads, where over many years tall exotic trees and other typical garden vegetation have been established

(**Figure 7**). Much of the study area however is still characterised by natural low shrubland with transformation limited to a few isolated areas of cultivation.

Figure 7: Example of the typical tall exotic trees and other garden vegetation which have been established around farmsteads within the study area

A site locality map showing the vegetation cover which can be found within the study area is shown in the ***Vegetation Classification Map*** which has been provided in **Appendix C**.

<u>Visual Implications</u>

The predominant low shrub layer and open areas of grasslands result in wide-open vistas across most of the study area (**Figure 5** and **Figure 6**). Vegetation would only provide significant screening in areas where artificial wooded vegetation has been established around farmhouses (**Figure 7**). The relatively low density of human habitation and natural vegetation cover across large portions of the study area would give the viewer the general impression of a largely natural rural setting (**Figure 8**).


Figure 8: Typical natural rural visual character of majority of the study area

1.3.4. Land Use

According to the South African National Land Cover dataset (2013-2014) from Geoterraimage (2014), much of the visual assessment area is characterised by natural unimproved vegetation which is dominated by low shrubland, grassland and woodland/open bush (Refer to ***Land cover* Classification *Map*** which has been provided in **Appendix C**). The arid nature of the local climate has resulted in livestock rearing being the dominant activity within the area (**Figure 9**). Only very small, isolated areas have been cultivated and as such, the natural vegetation has been retained across much of the study area.

Figure 9: Evidence of livestock rearing taking place within the study area

The nature of the climate and corresponding land use has also resulted in low stocking densities and relatively large farm properties across the area. Thus the area has a very low density of rural settlement, with relatively few scattered farmsteads occurring across the area. Built form in the rural parts of the study area is limited to isolated farmsteads (**Figure 8**), gravel access roads (**Figure 10**), ancillary farm buildings, telephone lines (**Figure 11**), fences and farm workers' dwellings.

Figure 10: Typical view of the gravel access roads which can be found within the study area

Figure 11: Typical view of the telephone lines which can be found within the study area

It should also be noted that existing medium voltage power lines are also present within the area and can thus also be found within parts of the rural sections of the study area (**Figure 12**).

Figure 12: Typical view of the existing medium voltage power lines which can be found within parts of the study area

The closest built-up area is the town of Kuruman which is located some 6kms north of the study area (**Figure 13**). It should be noted that this area is characterised by significant amounts of urban transformation and/or disturbance and would therefore not be impacted significantly by the proposed development.

Figure 13: Typical urban built-up character of the town of Kuruman

Further human influence is visible in the area in the form of the R31 main road which runs south through Kuruman, to Barkly West (**Figure 14**).

Figure 14: Typical view of the R31 main road

In addition, there are some relatively small scale mining/quarrying activities scattered across the study area.

<u>Visual Implications</u>

As stated above, sparse human habitation and the predominance of natural vegetation cover across large portions of the study area would give the viewer the general impression of a largely natural rural setting (**Figure 8**).

The influence of the level of human transformation on the visual character of the area is described in more detail below.

1.3.5. Visual Character

The above physical and land use-related characteristics of the study area contribute to its overall visual character. Visual character can be defined based on the level of change or transformation from a completely natural setting, which would represent a natural baseline in which there is little evidence of human transformation of the landscape. Varying degrees of human transformation of a landscape would engender differing visual characteristics to that landscape, with a highly modified urban or industrial landscape being at the opposite end of the scale to a largely natural undisturbed landscape. Visual character is also influenced by the presence of built infrastructure such as buildings, roads and other objects such as telephone or electrical infrastructure.

As mentioned above, much of the study area is characterised by rural areas with low densities of human settlement. Agriculture in the form of livestock grazing (**Figure 9**) is the dominant land use, which has transformed the natural vegetation in some areas.

However, a large portion of the study area has retained a natural appearance due to the presence of the low shrubs and taller trees dominated by camel thorn (*Acacia erioloba*). The most prominent anthropogenic elements in these areas include the R31 main road (**Figure 14**), power lines (Figure 12) and other linear elements, such as telephone poles (**Figure 11**), communication poles and farm boundary fences. The presence of this infrastructure is an important factor in this context, as the introduction of the proposed wind energy facilities would result in less visual contrast where other anthropogenic elements are already present.

The scenic quality of the landscape is also an important factor contributing to the visual character of an area or the inherent sense of place. Visual appeal is often associated with unique natural features or distinct variations in landform. As such, the hilly / mountainous terrain which occurs on the application site and within the wider study area is considered to be an important feature that would potentially increase the scenic appeal and visual interest in the area.

The greater area surrounding the proposed development site is an important component when assessing visual character. The area can be considered to be typical of a Karoo or “platteland” landscape that would characteristically be encountered across the high-lying dry western and central interior of South Africa. Much of South Africa’s dry Karoo interior consists of wide open, uninhabited spaces sparsely punctuated by widely scattered farmsteads and small towns. Traditionally the Karoo has been seen by many as a dull, lifeless part of the country that was to be crossed as quickly as possible on route between the major inland centres and the Cape coast, or between the Cape and Namibia. However, in the last couple of decades this perception has been changing, with the launching of tourism routes within the Karoo. In a context of increasing urbanisation in South Africa’s major centres, the Karoo is being marketed as an undisturbed getaway, especially as a stop on a longer journey from the northern parts of South Africa to the Western and Eastern Cape coasts. Examples of this may be found in the relatively recently published “Getaway Guide to Karoo, Namaqualand and Kalahari” (Moseley and Naude-Moseley, 2008).

The typical Karoo landscape can also be considered a valuable ‘cultural landscape’ in the South African context. Although the cultural landscape concept is relatively new, it is becoming an increasingly important concept in terms of the preservation and management of rural and urban settings across the world (Breedlove, 2002).

Cultural Landscapes can fall into three categories (according to the Committee's Operational Guidelines):

i) "a landscape designed and created intentionally by man";
ii) an "organically evolved landscape" which may be a "relict (or fossil) landscape" or a "continuing landscape";
iii) an "associative cultural landscape" which may be valued because of the "religious, artistic or cultural associations of the natural element"

The typical Karoo landscape consisting of wide open plains, and isolated relief, interspersed with isolated farmsteads, windmills and stock holding pens, is an important part of the cultural matrix of the South African environment. The Karoo farmstead is also a representation of how the harsh arid nature of the environment in this part of the country has shaped the predominant land use and economic activity practiced in the area, as well as the patterns of human habitation and interaction. The presence of small towns, such as Kuruman, engulfed by an otherwise rural environment, form an integral part of the wider Karoo landscape. As such, the Karoo landscape as it exists today has value as a cultural landscape in the South African context. In the context of the types of cultural landscape listed above, the Karoo cultural landscape would fall into the second category, that of an organically evolved, “continuing” landscape.

Much of the study area, as visible to the viewer, represents a typical Karoo cultural landscape. This is important in the context of potential visual impacts associated with the development of a WEF as introducing this type of development could be considered to be a degrading factor in the context of the natural Karoo character of the study area, as discussed further below.

1.3.6. Sensitive Visual Receptor Locations

A sensitive receptor location is defined as a location from where receptors would potentially be adversely impacted by a proposed development. This takes into account a subjective factor on behalf of the viewer – i.e. whether the viewer would consider the impact as a negative impact. As described above, the adverse impact is often associated with the alteration of the visual character of the area in terms of the intrusion of the WEF into a ‘view’, which may affect the ‘sense of place’. The identification of sensitive receptor locations is typically undertaken based on a number of factors which include:

- the visual character of the area, especially taking into account visually scenic areas and areas of visual sensitivity;
- the presence of leisure-based (especially nature-based) tourism in an area;
- the presence of sites / routes that are valued for their scenic quality and sense of place;
- the presence of homesteads / farmsteads in a largely natural setting where the development may influence the typical character of their views; and
- feedback from interested and affected parties, as raised during the public participation process conducted as part of the EIA study.

A distinction must be made between a potentially sensitive receptor location and a sensitive receptor location. A potentially sensitive receptor location is a site from where the proposed wind farm may be visible, but the receptor may not necessarily be adversely affected by any visual intrusion associated with the development. Potentially sensitive receptor locations include locations such as residential dwellings, farmsteads / homesteads, as well as locations of commercial activities and certain movement corridors, such as roads that are not tourism routes.

Sensitive receptor locations typically include sites that are likely to be adversely affected by the visual intrusion of the proposed development. They include; tourism facilities, scenic sites and certain residential dwellings and/or farmsteads / homesteads in natural settings.

Distance bands from were used to delineate zones of visual impact from the application site, as the visibility of the development would diminish exponentially over distance. As such, the proposed development would be more visible to receptor locations located within a short distance, and these receptor locations would therefore experience a higher adverse visual impact than those located further away. Distance from the application site was therefore used to determine zones of visual impact. Based on the height and scale of the project, the radii chosen to assign these zones of visual impact are as follows:

- 0 < 2km (high impact zone);
- 2 < 5km (moderate impact zone); and
- 5km < 8km (low impact zone).

Preliminary desktop assessment of the study area identified several potentially sensitive visual receptor locations, including existing residential areas, farm houses, accommodation and sport/recreation facilities. However, no sensitive visual receptor locations were identified within the rural parts of the study area. This is mainly due to low levels of leisure-based or nature based tourism activities in the assessment area.

In many cases, roads, along which people travel, are regarded as sensitive receptor locations. The primary thoroughfare in the study area is the R31 main road (**Figure 14**), a regional route in the Northern Cape Province linking Kuruman with Kimberley in the south east and carrying much of the local access traffic to and from these towns. It is considered unlikely that this road would be widely used by tourists and as such it is not regarded as being visually sensitive.

Other thoroughfares in the study area are primarily used by local farmers travelling to and from Kuruman. They are therefore not regarded as visually sensitive as they do not form part of any scenic tourist routes, and are not specifically valued or utilised for their scenic or tourism potential.

Visual receptor locations are examined in more detail in **Section 1.3.8** below.

1.3.7. Existing and Proposed Renewable Energy Developments

Several developments with similar impacts exist and are being proposed within a 50 km radius of the proposed project. These are relevant as they influence the cumulative visual impact of the proposed development and have been taken into consideration when identifying the cumulative impacts. The existing and proposed developments within a 50 km radius of the proposed project are listed in **Table 1** below and are indicated in the ***Renewable Energy Developments within 50kms of the Application Site Map*** which has been provided in **Appendix C**.

Table 1: Existing and proposed renewable energy developments within 50kms of Kuruman WEF Phase 2

DEA_REF	PROJ_TITLE	APPLICANT	EAP	TECHNOLOGY	MEGAWATT
14/12/16/3/3/2/819	The 75 MW AEP Legoko Photovoltaic Solar Facility on Portion 2 of the Farm Legoko 460, Kuruman Rd within the Gamagara Local Municipality in the Northern Cape Province	AEP Lekogo Solar (Pty) Ltd	Cape Environmental Assessment Practitioners	Solar PV	75
14/12/16/3/3/2/820	The 75 MW AEP Mogobe Photovoltaic Solar Facility on portion 1 of the farm Legoko 460 and farm Sekgame 461, Kuruman Rd within the Gamagara Local Municipality in the Northern Cape Province	AEP Mogobe Solar (Pty) Ltd	Cape Environmental Assessment Practitioners	Solar PV	75
12/12/20/1858/1	Kathu Solar Energy Facility	Renewable Energy Investments South Africa Pty Ltd	Savannah Environmental Consultants (Pty) Ltd	Solar PV	75
12/12/20/1858/2	Kathu Solar Energy Facility 25MW 2	Lokian Trading and Investments	Savannah Environmental Consultants (Pty) Ltd	Solar PV	25
12/12/20/1860	Proposed establishment of the Sishen Solar Farm on Portion 6 of Wincanton 472, NC	VentuSA Energy Pty Ltd	Savannah Environmental Consultants (Pty) Ltd	Solar PV	74
12/12/20/1906	Proposed construction of solar farm for Bestwood, Kgalagadi District Municipality, NC	Katu Property Developers Pty Ltd	Rock Environmental Consulting (Pty) Ltd	Solar PV	0
12/12/20/1994 12/12/20/1994/1 12/12/20/1994/2 12/12/20/1994/3	The Proposed Construction Of Kalahari Solar Power Project On The Farm Kathu 465, Northern Cape Province	Group Five Pty Ltd	WSP Environmental (Pty) Ltd	Solar PV	480
12/12/20/2566	A 19MW Photovoltaic Solar Power Generation Plant On The Farm Adams 328 Near Hotazel, Northern Cape Province	To review	To review	Solar PV	19
12/12/20/2567	The Proposed 150mw Adams Photo-Voltaic Solar Energy Facility On The Farm Adams 328 Near Hotazel Northern Cape Province	To review	To review	Solar PV	75
14/12/16/3/3/1/474	Construction of the Roma Energy Mount Roper Solar Plant on the Farm Moutn Roper 321, Kuruman, Ga-Segonyana Local Municipality	To review	EnviroAfrica Environmental Consultants (Pty) Ltd	Solar PV	10
14/12/16/3/3/1/475	The Proposed Construction Of Keren Energy Whitebank Solar Plant On Farm Whitebank 379, Kuruman, Northern Cape Province	To review	EnviroAfrica Environmental Consultants (Pty) Ltd	Solar PV	10

14/12/16/3/3/2/273	The Proposed San Solar Energy Facility And Associated Infrastructure On A Site Near Kathu, Gamagara Local Municipality, Northern Cape Province	To review	Savannah Environmental Consultants (Pty) Ltd	Solar PV	75
14/12/16/3/3/2/616	Proposed renewable energy geneartion project on Portion 1 of the Farm Shirley No. 367, Kuruman RD, Gamagara Local Municipality, Shirley Solar Park	Danax Energy (Pty) Ltd	AGES Limpopo (Pty) Ltd	Solar PV	75
14/12/16/3/3/2/761	Proposed 75 MW Perth-Kuruman Solar Farm on the remainder of the farm Perth 276 within the Joe Morolong Local Municipality, Northern Cape Province	Agulhas-Hotazel Solar Power (Pty) Ltd	Strategic Environmental Focus (Pty) Ltd	Solar PV	75
14/12/16/3/3/2/762	The 75MW Perth-Hotazel Solar Farm and its associated infrastructure on the Remainder of the Farm Perth 276 within the Joe Morolong Local Municipality in Northern Cape Province	Agulhus-Hotazel Solar Power (Pty) Ltd	Strategic Environmental Focus	Solar PV	75
14/12/16/3/3/2/911	Proposed 75MW AEP Kathu Solar PV Energy Facility on the Remainder of the Farm 460 Legoko near Kathu within the Gamagara local Municipality in the Northern Cape Province	AEP Kathu Solar (Pty) Ltd	Cape Eprac	Solar PV	75
14/12/16/3/3/2/934	Kagiso Solar Power Plant near Hotazel, Northern Cape Province	Kagiso Solar Power Plant (RF) (Pty) Ltd	Environamics cc	Solar PV	115
14/12/16/3/3/2/935	Proposed 115 Megawatt (MW) Boitshoko Solar Power Plant on the Remaining Extent of Portion 1 of The Farm Lime Bank no. 471 Near Kathu in the Gamagara Local Municipality	Boitshoko Solar Power Plant (RF) (Pty) Ltd	Environamics cc	Solar PV	115
14/12/16/3/3/2/936	Tshepo Solar Power Plant near Hotazel, Northern Cape	Tshepo Solar Power Plant (RF) (Pty) Ltd	Environamics cc	Solar PV	115
To be Announced	Kuruman Wind Energy Facility (WEF) Phase 1 near Kuruman, Northern Cape Province	Mulilo Renewable Project Developments (Pty) Ltd	Council of Scientific and Industrial Research (CSIR)	Wind	4.5

1.3.8. Results of the Field Study

As previously stated, the field investigation and photographic review was conducted between the 19th and 21st of February 2018. A summary of the findings of this investigation is provided below.

Visibility

The field investigation confirmed that the Kuruman Hills are a significant feature of the local landscape and as such, wind turbines placed on the ridges and higher lying plateaus of these hills would be highly visible to several identified potentially sensitive receptor locations and receptor roads as described below.

Potentially Sensitive Visual Receptors

The field investigation revealed a total number of nineteen (19) potentially sensitive receptor locations in the visual assessment zone as indicated in the ***Potentially Sensitive Visual Receptor Locations Map*** which has been provided in **Appendix C**. As mentioned, no sensitive receptor locations were identified in the study area. These potentially sensitive receptor locations were identified as scattered farmsteads / homesteads which house the local farmers as well as their farm workers. These dwellings are regarded as potentially sensitive visual receptor locations as they are located within a mostly rural setting and the proposed development will likely alter natural vistas experienced from these dwellings.

Details of the potentially sensitive receptor locations are provided in **Table 2** below.

Table 2: Potentially sensitive visual receptor locations in the study area

Name	Details	Approximate distance from the application site	Visual Impact Zone
VR28	Farmstead / Homestead	6.65	Low
VR29	Farmstead / Homestead	6.23	Low
VR30	Farmstead / Homestead	6.20	Low
VR31	Farmstead / Homestead	3.91	Moderate
VR32	Farmstead / Homestead	5.93	Low
VR47	Farmstead / Homestead	6.38	Low
VR48	Farmstead / Homestead	6.43	Low
VR49	Farmstead / Homestead	4.08	Moderate
VR50	Farmstead / Homestead	3.43	Moderate
VR51	Farmstead / Homestead	2.20	Moderate
VR52	Farmstead / Homestead	3.23	Moderate
VR53	Farmstead / Homestead	4.15	Moderate
VR54	Farmstead / Homestead	7.24	Low
VR55	Farmstead / Homestead	5.86	Low
VR57	Farmstead / Homestead	0.47	High
VR58	Farmstead / Homestead	2.82	Moderate
VR59	Farmstead / Homestead	5.27	Low
VR60	Farmstead / Homestead	7.00	Low
VR61	Farmstead / Homestead	5.56	Low

The degree of visual impact experienced will vary from one receptor location to another, as it is largely based on the viewer's perception. Factors influencing the degree of visual impact experienced by the viewer include the following:

- Value placed by the viewer on the natural scenic characteristics of the area;
- The viewer's sentiments toward the proposed structures. These may be positive (a symbol of progression toward a less polluted future) or negative (foreign objects degrading the natural landscape); and
- Degree to which the viewer will accept a change in the typical Karoo character of the surrounding area.

1.3.9. Environmental Sensitivity Map

Visual Sensitivity can be defined as the inherent sensitivity of an area to potential visual impacts associated with a proposed development. It is based on the physical characteristics of the area (i.e. topography, landform and land cover), the spatial distribution of potential receptor locations, and the likely value judgements of these receptor locations towards a new development (Oberholzer: 2005). A viewer's perception is usually based on the perceived aesthetic appeal of an area and on the presence of economic activities (such as recreational tourism) which may be based on this aesthetic appeal.

In order to assess the visual sensitivity of the area, SiVEST has developed a matrix based on the characteristics of the receiving environment which, according to the Guidelines for Involving Visual and Aesthetic Specialists in the EIA Processes, indicate that visibility and aesthetics are likely to be 'key issues' (Oberholzer: 2005).

Based on the criteria in the matrix (**Table 3**), the visual sensitivity of the area is broken up into a number of categories, as described below:

- **High** - The introduction of a new development such as a wind farm would be likely to be perceived negatively by receptor locations in this area; it would be considered to be a visual intrusion and may elicit opposition from these receptor locations
- **Moderate** - Presence of receptor locations, but due to the nature of the existing visual character of the area and likely value judgements of receptor locations, there would be limited negative perception towards the new development as a source of visual impact.
- **Low** - The introduction of a new development would not be perceived to be negative, there would be little opposition or negative perception towards it.

The table below outlines the factors used to rate the visual sensitivity of the study area. The ratings are specific to the visual context of the receiving environment within the study area.

Table 3: *Environmental factors used to define visual sensitivity of the study area*

FACTORS	RATING									
	1	2	3	4	5	6	7	8	9	10
Pristine / natural character of the environment										
Presence of sensitive visual receptor locations										
Aesthetic sense of place / scenic visual character										
Value to individuals / society										
Irreplaceability / uniqueness / scarcity value										
Cultural or symbolic meaning										
Scenic resources present in the study area										
Protected / conservation areas in the study area										

Sites of special interest present in the study area										
Economic dependency on scenic quality										
Local jobs created by scenic quality of the area										
International status of the environment										
Provincial / regional status of the environment										
Local status of the environment										
**Scenic quality under threat / at risk of change										

**Any rating above '5' will trigger the need to undertake an assessment of cumulative visual impacts.

Low							**Moderate**							**High**
10	**20**	**30**	**40**	**50**	**60**	**70**	**80**	**90**	**100**	**110**	**120**	**130**	**140**	**150**

Based on the above factors, the study area is rated as having a moderately-low visual sensitivity. This is mainly owing to the rural character of the area. An important factor contributing to the visual sensitivity of an area is the presence, or absence of visual receptor locations that may value the aesthetic quality of the landscape and depend on it to produce revenue and create jobs. As described above, relatively few potentially sensitive receptor locations are present in the study area. In addition, no formally protected areas and leisure / nature-based tourism activities were identified within the study area. Despite this however, the area would still be valued as a typical Karoo cultural landscape.

Although the area is associated with a moderately low visual sensitivity, it should be stressed that the concept of visual sensitivity has been utilised indicatively to provide a broad-scale indication of whether the area is likely to be sensitive to visual impacts, and is based on the physical characteristics of the study area, economic activities and land use that predominates. This does not mean that high visual impacts could not potentially be experienced in areas of low visual sensitivity. The potential presence and perception of sensitive receptor locations as discussed above must also be taken into account.

During the scoping phase, all project specialists were also requested to indicate the environmentally-sensitive areas within the development site. This exercise was undertaken to inform the design of the development layout within the application site.

The aim of the assessment was to identify those parts of the application site where locating turbines and other associated infrastructure would result in the greatest probability of visual impacts on potentially sensitive visual receptor locations, and should be precluded from the proposed development i.e. areas within the application site that should be avoided.

As previously mentioned, the visual prominence of a tall structure such as a wind turbine would be exacerbated if located on a ridge top or high lying plateau. Preliminary layout plans for the proposed development have largely utilised the higher lying plateaus within the application site for turbine placement and as such the development is likely to be highly visible from much of the surrounding area. This does not necessarily mean that these plateaus should be precluded from any development and as such a desktop analysis was conducted to determine likely visual sensitivity in relation to the potentially sensitive receptor locations in the study area.

Using GIS-based visibility analysis, it was possible to determine which sectors of the site would be visible to the highest numbers of receptor locations in the study area. This analysis took into account all the potentially sensitive receptor locations indicated in the ***Potentially Sensitive Visual Receptor Locations Map*** which has been provided in **Appendix C**, as well as points along the N14 receptor road at 500m intervals. Based on this analysis, the areas visible to the highest number of receptor locations were initially rated as areas of 'High Sensitivity'. Given the importance of viewing distance in assessing visual impacts, the initial sensitivity ratings were weighted according to distance from the receptor locations. The resultant sensitivity map is shown in the ***Visual Sensitivity Map*** which has been provided in **Appendix C**. Areas of high sensitivity should preferably be precluded from turbine development.

It should be noted that this sensitivity rating applies to turbine development only. The visual impacts resulting from the associated infrastructure are considered to have far less significance when viewed in the context of multiple wind turbines and as such the infrastructure has been excluded from the sensitivity analysis.

It should be further noted that the visibility analysis is based purely on topographic data available for the broader study area and does not take into account any localised topographic variations or any existing infrastructure and / or vegetation which may constrain views. In addition, the analysis does not take into account differing perceptions of the viewer which largely determine the degree of visual impact being experienced. The visual sensitivity analysis should therefore be seen as a conceptual representation or a worst-case scenario which rates the visibility of the site in relation to potentially sensitive receptor locations.

1.4. DESCRIPTION OF PROJECT ASPECTS RELEVANT TO THE VISUAL IMPACT ASSESSMENT

In this section, the typical visual issues and impacts related to the establishment of a WEF are discussed. It is important to note that over the next few years several WEFs are likely to be constructed in South Africa. The development and associated environmental assessment of WEFs in South Africa is however relatively new, and thus it is valuable to draw on international experience. This section of the report therefore draws on international literature and web material (of which there is significant material available) to describe the generic impacts associated with WEFs.

At this stage it is proposed that the WEF, comprising wind turbines and associated infrastructure, will be constructed on several farms comprising the application site with a total area of approximately 4454ha. The total number of turbines proposed is 52, each with a generation capacity of 4.5MW. The generated electricity will be fed into the national grid via a 132kV power line at either the Ferrum Substation or the Segame Substation. It should however be noted that this 132kV power line will require a separate Environmental Authorisation (EA) in order to allow for handover to Eskom and is being assessed as a part of a separate Basic Assessment (BA) process.

Detailed below is a preliminary list of the key components of the project that have visual implications. Although the associated infrastructure has been included here, the visual impact of associated infrastructure is generally far less significant than the visual impact associated with wind turbines. The infrastructure would however, magnify the visual prominence of the development if located on ridge tops or flat sites in natural settings where there is limited tall wooded vegetation present to conceal the impact.

1.4.1. Turbines

Wind turbines proposed for the Kuruman WEF (Phase 1) will have a hub height of 140m, a rotor diameter of 160m and a blade length of 80m (**Figure 15**). Each wind turbine will have a foundation as well as a hardstand area / platform which will be required for turbine crane usage. It is proposed that 52 turbines will be constructed within identified turbine corridors, each with a generation capacity of 4.5MW. At this stage, turbine positions have not been finalised and as such this assessment focusses on the corridors as a whole. The height of the turbines and their location on higher lying ridges and plateaus would result in the development typically being visible over a large area.

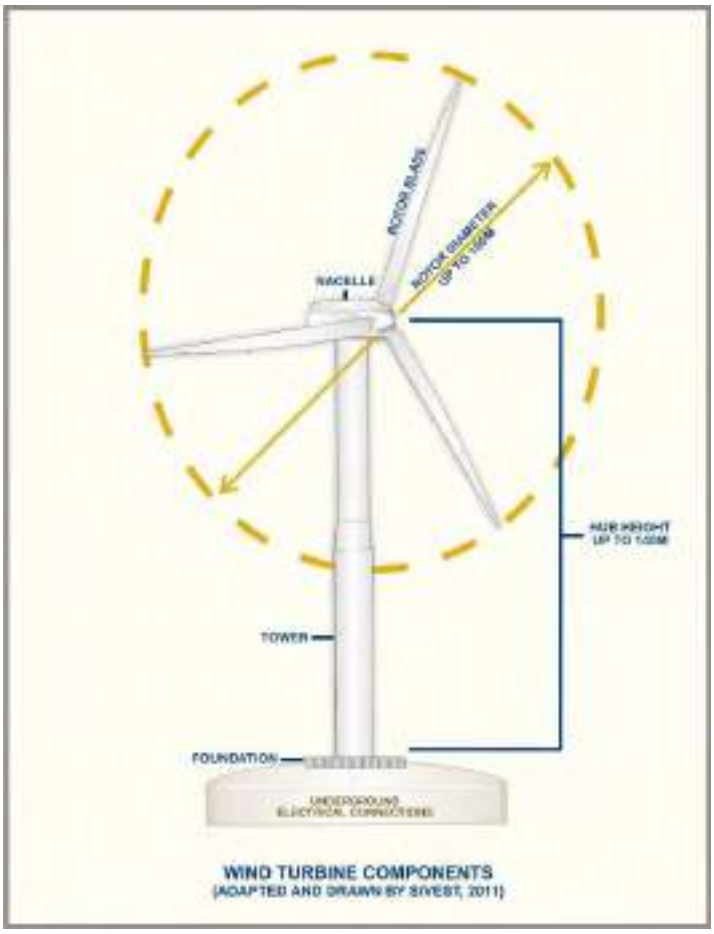
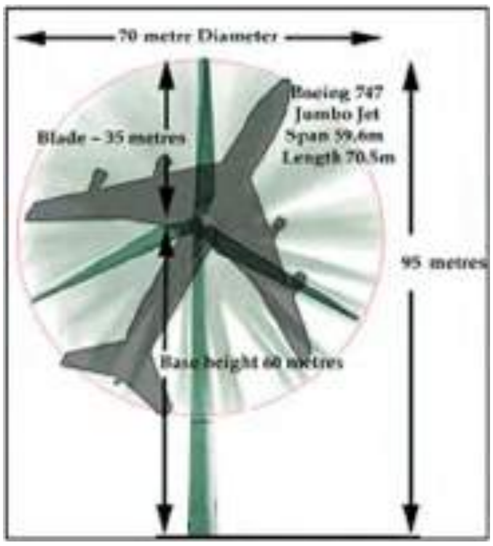


Figure 15: Typical components of a wind farm

Internationally, studies have demonstrated that there is a direct correlation between the number of turbines and the degree of objection to a WEF, with less opposition being encountered when fewer turbines are proposed (Devine-Wright, 2005). Certain objectors to wind energy developments also mention the “sky space” occupied by the rotors of a turbine. As well as height, "sky space" is an important issue. “Sky space” refers to the area in which the rotors would rotate. The diagram below indicates that the “sky space” occupied by rotors would be similar to that occupied by a jumbo jet (http://www.stopbickertonwindturbines.co.uk/ - page on visual impact).



The visual prominence of the development would be exacerbated within natural settings, in areas of flat terrain or if located on a ridge top. Even dense stands of wooded vegetation are likely to offer only partial visual screening, as the wind turbines are of such a height that they will rise above even mature large trees.

- **Shadow Flicker**

Shadow flicker is an effect which is caused when shadows repeatedly pass over the same point. It can be caused by wind turbines when the sun passes behind the hub of a wind turbine and casts a shadow that continually passes over the same point as the rotor blades of the wind turbine rotate (http://www.ecotricity.co.uk).

The effect of shadow flicker is only likely to be experienced by people situated directly within the shadow cast by the rotor blades of the wind turbine. As such, shadow flicker is only expected to have an impact on people residing in houses located within close proximity of a wind turbine (less than 500m) and at a specific orientation, particularly in areas where there is little screening present. Shadow flicker may also be experienced by and impact on motorists if a wind turbine is located in close proximity to an existing road. The impact of shadow flicker can be effectively mitigated by choosing the correct site and layout for the wind turbines, taking the orientation of the turbines relative to the nearby houses and the latitude of the site into consideration. Tall structures and trees will also obstruct shadows and prevent the effect of shadow flicker from impacting on surrounding residents (http://www.ecotricity.co.uk).

- **Motion-Based Visual Intrusion**

An important component of the visual impacts associated with wind turbines is the *movement* of the rotor blades. Labelled as motion-based visual intrusion, this refers to the inclination of the viewer to focus on discordant, moving features when scanning the landscape. Evidence from surveys of public attitudes towards WEFs suggest that the viewing of moving rotor blades is not necessarily perceived negatively (Bishop and Miller, 2006). The authors of the study suggest two possible reasons for this; firstly when the turbines are moving they are seen as being 'at work', 'doing good' and producing energy. Conversely, when they are stationary they are regarded as a visual intrusion that has no evident purpose. More interestingly, the second theory that explains this perception is related to the intrinsic value of wind in certain areas and how turbines may be an expression or extension of an otherwise 'invisible' presence.

Famous winds across the world include the Mistral of the Camargue in France, the Föhn in the Alps, or the Bise in the Lavaux region of Switzerland. The wind, in these cases, is an intrinsic component of the landscape being expressed in the shape of trees or drifts of sands, but being otherwise invisible. The authors of the study argue that wind turbines in these environments give expression, when moving, to this quintessential landscape element. In a South African context, this phenomenon may well be experienced if wind farms are developed in areas where typical winds, like berg winds, or the south-easter in the Cape are an intrinsic part of the environment. In this way, it may even be possible that wind farms will, through time form part of the cultural landscape of an area, and become a representation of the opportunities presented by the natural environment.

1.4.2. WEF Electrical Infrastructure

The proposed wind turbines will be connected to an on-site collector substation by way of internal reticulation power lines which will be buried underground. A 2ha assessment site has been identified for the collector substation, although the exact size of the development footprint is not known at this stage. It is however known that the substation structures will have a maximum height of 30m. **Figure 16** below shows the process typically associated with the generation of electricity from WEFs.

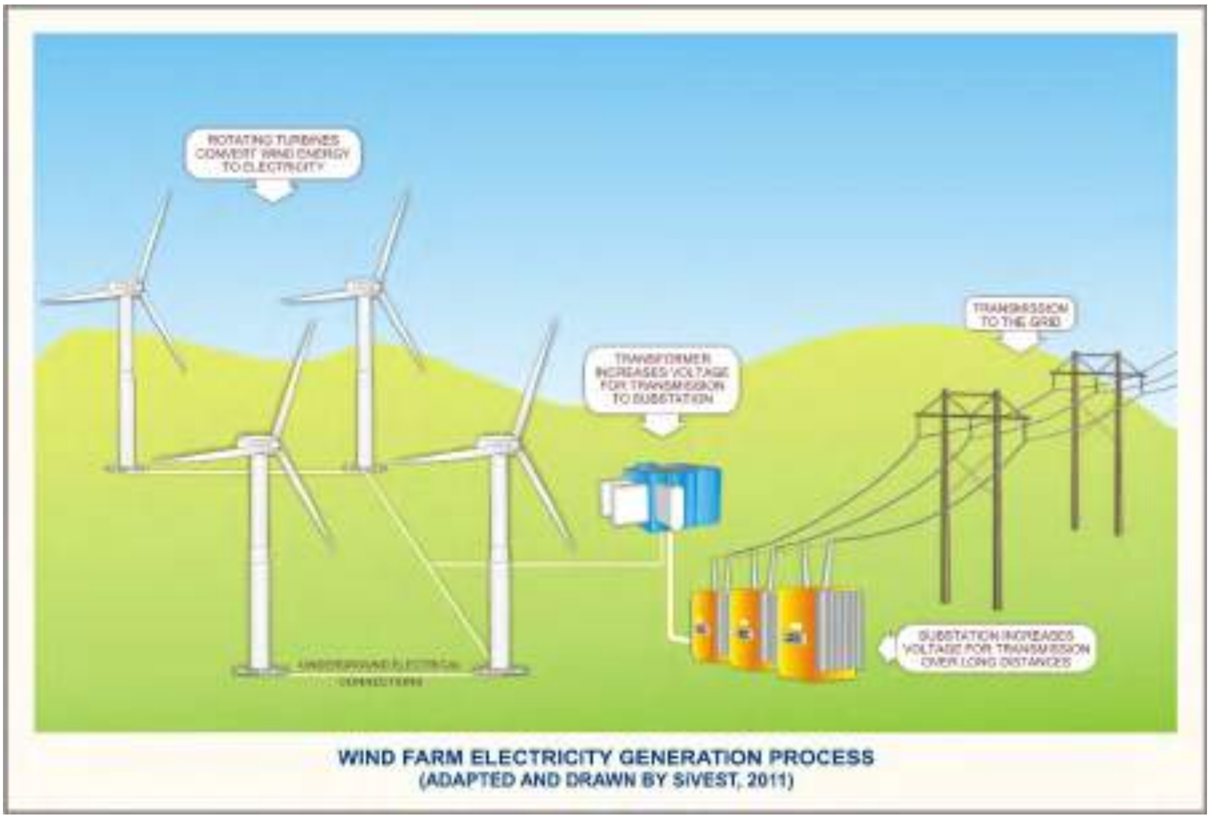


Figure 16: Conceptual wind farm electricity generation process showing electrical connections

As mentioned above, however, internal reticulation power lines will be utilised which will be buried underground. However, the new collector substation by nature is a large object and will typically be visible for great distances. Thus in the context of a largely natural landscape, the new collector substation will be perceived to be highly incongruous. Conversely, the presence of other anthropogenic objects associated with the built environment, especially other power lines or substations, may result in the visual environment being considered to be ‘degraded’ and thus the introduction of a new substation into this setting may be less of a visual impact than if there was no existing built infrastructure visible.

Other possible electrical infrastructure on-site may also be associated with visual impacts. Wind turbines are usually inter-connected with a series of cables, which are likely to be buried, but which also may take the form of above-ground power lines if deemed necessary. These cables may become a visual intrusion if placed in areas of the site that are visible to the surrounding areas, especially those areas that are located on ridges and associated sloping ground. Trenches excavated for the cables (both during construction and post-construction once the trench has been back-filled) may become prominent if they create a linear feature that contrasts with the surrounding vegetation.

1.4.3. Roads

The WEF internal road network will provide access within the site and will connect all the turbines. This road network will comprise new roads and some existing roads, all constructed or widened to a width of 5m. These access roads could be considered a visual intrusion if they are constructed in visible areas of the site. Roads are likely to be wider than cable trenches and thus could be even more greatly visible than the cable servitude. In addition, the cutting of 'terraces' into a steep sided slope would increase the visibility and contrast of the road against the surrounding vegetation.

1.4.4. Laydown Areas

In addition to the construction lay down areas next to each turbine, three construction yards will be established on the application site each with an area of 2ha. These construction yards will accommodate various welfare and storage facilities. From a visual perspective, construction yards could result in visual impacts if they are placed in prominent positions such as on ridge tops. In these locations, buildings may break the natural skyline, drawing the attention of the viewer.

1.5. IDENTIFICATION OF IMPACTS

1.5.1. Identification of Potential Impacts

Potential visual issues / impacts resulting from the proposed Kuruman WEF (Phase 2) and associated infrastructure are outlined below.

1.5.2. Construction Phase

- Potential visual intrusion resulting from construction vehicles and equipment;
- Potential impacts of increased dust emissions from construction activities and related traffic; and
- Potential visual scarring of the landscape as a result of site clearance and earthworks.

1.5.3. Operational Phase

- Potential alteration of the visual character of the area;
- Potential visual intrusion resulting from wind turbines located on ridge lines and higher plateaus; and
- Potential alteration of the night time visual environment as a result operational and security lighting as well as navigational lighting on top of the wind turbines.

1.5.4. Decommissioning Phase

- Potential visual intrusion resulting from vehicles and equipment involved in the decommissioning process;
- Potential impacts of increased dust emissions from decommissioning activity activities and related traffic; and
- Potential visual intrusion of any remaining infrastructure on the site.

1.5.5. Cumulative impacts

- Combined visual impacts from several renewable energy facilities in the broader area could potentially alter the sense of place and visual character of the area.

1.6. ASSESSMENT OF IMPACTS AND IDENTIFICATION OF MANAGEMENT ACTIONS

1.6.1. Potential Impact 1 (Construction Phase)

Nature of the impact

- Potential visual intrusion resulting from construction vehicles and equipment.
- Potential impacts of increased dust emissions from construction activities and related traffic.
- Potential visual scarring of the landscape as a result of site clearance and earthworks.

Significance of impact without mitigation measures

During the construction phase, large construction vehicles and equipment will alter the natural character of the study area and expose visual receptor locations to visual impacts associated with construction. The construction activities may be perceived as an unwelcome visual intrusion, particularly in more natural undisturbed settings. Vehicles and trucks travelling to and from the proposed site on gravel access roads are also expected to increase dust emissions. The increased traffic on gravel roads and the resultant dust plumes could create a visual impact and may evoke negative sentiments from surrounding viewers. Surface disturbance during construction would also expose bare soil which could visually contrast with the surrounding environment. Additionally, temporarily stockpiling soil during construction may alter the landscape. Wind blowing over these disturbed areas could therefore result in dust which would have a visual impact.

The significance of visual impacts without mitigation measures during construction are rated as moderate.

Proposed mitigation measures

- Carefully plan to minimize the construction period and avoid construction delays.
- Minimise vegetation clearing and rehabilitate cleared areas as soon as possible.
- Make use of existing gravel access roads where possible.
- Unless there are water shortages, ensure that dust suppression techniques are implemented on all access roads, especially those leading up steep slopes.
- Maintain a neat construction site by removing rubble and waste materials regularly.

Significance of impact with mitigation measures

Mitigation measures will result in a reduction of visual impacts during construction from moderate to low.

1.6.2. Potential Impact 2 (Operational Phase)

Nature of the impact

- Potential alteration of the visual character of the area.
- Potential visual intrusion resulting from wind turbines located on ridge lines and higher plateaus.
- Potential alteration of the night time visual environment as a result operational and security lighting as well as navigational lighting on top of the wind turbines.

Significance of impact without mitigation measures

During the operation phase, the proposed Kuruman WEF (Phase 2) could exert a visual impact by altering the visual character of the surrounding area and exposing potentially sensitive visual receptor locations to visual impacts. The development may be perceived as an unwelcome visual intrusion, particularly in more natural undisturbed settings. Maintenance vehicles may need to access the WEF via gravel access roads and are expected to increase dust emissions in doing so. The increased traffic on the gravel roads and the dust plumes could create a visual impact and may evoke negative sentiments from surrounding viewers. Security and operational lighting at the proposed WEF could result in light pollution and glare, which could be an annoyance to surrounding viewers.

The significance of visual impacts without mitigation measures during operation are rated as moderate.

Proposed mitigation measures

Design Phase:

- Areas of 'High Sensitivity' should preferably be precluded from turbine development.
- No turbines should be placed within 500m of the N14 national road and R31 main road.
- Where possible, fewer but larger turbines with a greater output should be utilised rather than a larger number of smaller turbines with a lower capacity.
- Turbines should be painted plain white, as this is a less industrial colour (Vissering, 2011), unless another specialist recommends that one (1) or more of the turbine blades be painted an alternative colour in order to reduce an identified impact (for example as part of the Avifauna specialist's recommendations / mitigation measures). It is highly recommended that bright colours should not be permitted and that large, clear or obvious logos preferably not be used or be kept to an absolute minimum.

Operational Phase:

- Turbines should be repaired promptly, as they are considered more visually appealing when the blades are rotating (Vissering, 2011).
- If required, turbines should be replaced with the same model, or one of equal height and scale. Repeating elements of the same height, scale and form can result in unity and lessen the visual impact that would typically be experienced in a chaotic landscapes made up of diverse colours, textures and patterns (Vissering, 2011).
- Light fittings for security at night should reflect the light toward the ground and prevent light spill.
- Where practically possible, the operation and maintenance buildings should not be illuminated at night.
- Cables should be buried underground where possible.
- The operation and maintenance buildings should be painted with natural tones that fit with the surrounding environment. Non-reflective surfaces should be utilised where possible.

- Unless there are water shortages, ensure that dust suppression techniques are implemented on all access roads.
- Select the alternatives that will have the least impact on visual receptor locations.

Significance of impact with mitigation measures

Mitigation measures will result in a minor reduction of visual impacts during operation but the impact rating will remain moderate.

The significance of visual impacts without mitigation measures during construction are rated as moderate.

1.6.3. Cumulative Impacts

Nature of the impact

- Combined visual impacts from several renewable energy facilities in the broader area during the construction and operations phases could potentially alter the sense of place and visual character of the area.

Significance of impact without mitigation measures

The cumulative impacts anticipated as a result of the construction and operation of the proposed WEF include visual impacts on users of arterial and secondary roads, visual impacts on residents of farmsteads / homesteads and settlements, visual impacts of shadow flicker on potentially sensitive visual receptor locations, visual impacts of lighting at night on potentially sensitive visual receptor locations, visual impacts of construction and operation on potentially sensitive visual receptor locations and the visual impacts on the visual quality of the landscape and sense of place.

Large construction vehicles and equipment during the construction phase of the surrounding renewable energy facilities will contribute further to the alteration of the natural character of the study area and will also expose a greater number of visual receptor locations to visual impacts associated with the construction phase, especially in if some of the construction phases coincide. This is also true for the operational phase as the surrounding renewable energy facilities and their associated infrastructure would alter the visual character of the surrounding area further and expose a greater number of potentially sensitive visual receptor locations to visual impacts. The construction and operational activities may be perceived as unwelcome visual intrusions, particularly in more natural undisturbed settings. Vehicles and trucks travelling to and from the proposed development sites during the construction phases on gravel access roads are also expected to result in an increase in dust emissions in the greater area. In addition, maintenance vehicles may need to access the surrounding renewable energy facilities and their associated infrastructure via gravel access roads and are also expected to increase dust emissions in the surrounding area in doing so. The increased traffic on these roads and the dust plumes could create a greater visual impact within the greater area and may evoke more negative sentiments from surrounding viewers. It should however be noted that majority of the existing roads which can be found around the project site are also gravel. As such, the gravel access roads are not expected to contribute significantly to the overall cumulative visual impact. Surface disturbance during construction of the surrounding renewable energy facilities would also result in a greater amount of bare soil being exposed which could result in a greater visual contrast with the surrounding environment. In addition, temporary stockpiling of soil during construction may alter the landscape further. Wind blowing over these disturbed areas could result in a greater amount of dust which would have a visual impact. Security and operational lighting will be required for the operation of the surrounding renewable energy facilities and their associated infrastructure. This could therefore result in a greater amount of light pollution and glare within the surrounding area, which could be a significant annoyance to surrounding viewers.

The significance of the cumulative visual impacts without mitigation measures during construction and operation are rated as moderate.

Proposed mitigation measures

- Carefully plan to reduce the construction period.
- Minimise vegetation clearing and rehabilitate cleared areas as soon as possible.
- Vegetation clearing should take place in a phased manner.
- Maintain a neat construction site by removing rubble and waste materials regularly.
- Make use of existing gravel access roads, where possible.
- Limit the number of vehicles and trucks travelling to and from the proposed development site, where possible.
- Unless there are water shortages, ensure that dust suppression techniques are implemented on all access roads.
- Unless there are water shortages, ensure that dust suppression is implemented in all areas where vegetation clearing has taken place.
- Unless there are water shortages, ensure that dust suppression techniques are implemented on all soil stockpiles.
- Temporarily fence-off the construction sites (for the duration of the construction period).
- All reinstated cable trenches should be re-vegetated with the same vegetation that existed prior to the cable being laid, where possible.
- It is not realistic to attempt to screen wind farms visually. Providing a means whereby they can be absorbed into the landscape is more feasible. This can be approached by making use of certain materials and finishes, such as monochromatic dull colours.
- Buildings and similar structures must be in keeping with regional planning policy documents, especially the principles of critical regionalism (namely sense of place, sense of history, sense of nature, sense of craft and sense of limits).
- Where possible, fewer but larger turbines with a greater output should be utilised rather than a larger number of smaller turbines with a lower capacity.
- High visual impact zones should be viewed as zones where the number of turbines should be limited, or precluded where possible.
- Light fittings for security at night should reflect the light toward the ground (except for aviation lighting) and prevent light spill.
- The operations and maintenance buildings should not be illuminated at night, if possible.
- Turbines should be painted plain white, as this is a less industrial colour (Vissering, 2011), unless another specialist recommends that one (1) or more of the turbine blades be painted an alternative colour in order to reduce an identified impact (for example as part of the Avifauna specialist's recommendations / mitigation measures). It is highly recommended that bright colours should not be permitted and that large, clear or obvious logos preferably not be used or be kept to an absolute minimum.
- Turbines should be repaired promptly, as they are considered more visually appealing when the blades are rotating (or at work) (Vissering, 2011).
- If possible, the operation and maintenance buildings should be painted with natural tones that fit with the surrounding environment[1]. In addition, non-reflective surfaces should be utilised where possible.
- If required, turbines should be replaced with the same model, or one of equal height and scale. Repeating elements of the same height, scale and form can result in unity and lessen the visual impact that would typically be experienced in a chaotic landscapes made up of diverse colours, textures and patterns (Vissering, 2011).
- As far as possible, limit the number of maintenance vehicles, which are allowed to access the sites.
- Bury cables under the ground where possible.
- Select the alternatives that will have the least impact on visual receptor locations.

[1] Depending on the building design, the developer may find it preferable to paint the building white in order to reflect heat and keep the interior of the building cool.

Significance of impact with mitigation measures

Mitigation measures will not result in a reduction of cumulative visual impacts during construction and operation. Moderate cumulative visual impacts are still expected during the construction and operational phases.

1.7. IMPACT ASSESSMENT SUMMARY

The EIA process requires that an overall rating for visual impact be provided to allow the visual impact to be assessed alongside other environmental parameters. The CSIR has developed an impact rating matrix for this purpose. The assessment of impacts and recommendation of mitigation measures as discussed above are collated in **Table 4** - **Table 7** below.

Please refer to **Appendix A** for an explanation of the impact rating methodology

Table 4: Impact assessment summary table for the Construction Phase

Construction Phase													
Direct Impacts													
Aspect/ Impact Pathway	Nature of Potential Impact/ Risk	Status	Spatial Extent	Duration	Consequence	Probability	Reversibility of Impact	Irreplaceability	Potential Mitigation Measures	Significance of Impact and Risk		Ranking of Residual Impact/ Risk	Confidence Level
										Without Mitigation/ Management	With Mitigation/ Management (Residual Impact/ Risk)		
Construction Activities	Visual intrusion and dust emissions	Negative	Local	Short-Term	Substantial	Very likely	High	Low	- Carefully plan to minimize the construction period and avoid construction delays. - Minimise vegetation clearing and rehabilitate cleared areas as soon as possible. - Make use of existing gravel access roads where possible. - Unless there are water shortages, ensure that dust suppression techniques are implemented on all access roads. - Maintain a neat construction site.	Moderate	Low	4	Medium

Table 5: Impact assessment summary table for the Operational Phase

Operational Phase													
Direct Impacts													
Aspect/ Impact Pathway	Nature of Potential Impact/ Risk	Status	Spatial Extent	Duration	Consequence	Probability	Reversibility of Impact	Irreplaceability	Potential Mitigation Measures	Significance of Impact and Risk		Ranking of Residual Impact/ Risk	Confidence Level
										Without Mitigation/ Management	With Mitigation/ Management (Residual Impact/ Risk)		

Operational Activities	Visual intrusion, dust emissions and light pollution and glare	Negative	Local	Long Term	Substantial	Very likely	High	Low	*Design Phase:* - High visual impact zones should be viewed as zones where the number of turbines should be limited, where possible. - No turbines should be placed within 500m of the N14 national road and R31 main road. - Where possible, fewer but larger turbines with a greater output should be utilised rather than a larger number of smaller turbines with a lower capacity. - Turbines should be painted plain white, as this is a less industrial colour (Vissering, 2011), unless another specialist recommends that one (1) or more of the turbine blades be painted an alternative colour in order to reduce an identified impact (for example as part of the Avifauna specialist's recommendations / mitigation measures). It is highly recommended that bright colours should not be permitted and that large, clear or obvious logos preferably not be used or be kept to an absolute minimum. *Operational Phase:* - Turbines should be repaired promptly, as they are considered more visually appealing when the blades are rotating (or at work) (Vissering, 2011). - If required, turbines should be replaced with the same model, or one of equal height and scale. Repeating elements of the same	Moderate	Moderate	3	Medium

									height, scale and form can result in unity and lessen the visual impact that would typically be experienced in a chaotic landscapes made up of diverse colours, textures and patterns (Vissering, 2011). - Light fittings for security at night should reflect the light toward the ground and prevent light spill. - Unless there are water shortages, ensure that dust suppression techniques are implemented on all access roads. - Where practically possible, the operations and maintenance buildings should not be illuminated at night. - Cables should be buried underground where possible. - If possible, the operation and maintenance buildings should be painted with natural tones that fit with the surrounding environment[2]. In addition, non-reflective surfaces should be utilised where possible. - Select the alternatives that will have the least impact on visual receptor locations.				

[2] Depending on the building design, the developer may find it preferable to paint the building white in order to reflect heat and keep the interior of the building cool.

Table 6: Impact assessment summary table for the Decommissioning Phase

Decommissioning Phase													
Direct Impacts													
Aspect/ Impact Pathway	**Nature of Potential Impact/ Risk**	**Status**	**Spatial Extent**	**Duration**	**Consequence**	**Probability**	**Reversibility of Impact**	**Irreplaceability**	**Potential Mitigation Measures**	**Significance of Impact and Risk**		**Ranking of Residual Impact/ Risk**	**Confidence Level**
										Without Mitigation/ Management	**With Mitigation/ Management (Residual Impact/ Risk)**		
Decommissioning Activities	Visual intrusion and dust emissions	Negative	Local	Short-Term	Substantial	Very likely	High	Low	- Carefully plan to minimize the construction period and avoid construction delays. - Minimise vegetation clearing and rehabilitate cleared areas as soon as possible. - Make use of existing gravel access roads where possible. - Unless there are water shortages, ensure that dust suppression techniques are implemented on all access roads. - Maintain a neat construction site.	Moderate	Low	4	Medium

Table 7: Cumulative impact assessment summary table

Cumulative Impacts													
Aspect/ Impact Pathway	**Nature of Potential Impact/ Risk**	**Status**	**Spatial Extent**	**Duration**	**Consequence**	**Probability**	**Reversibility of Impact**	**Irreplaceability**	**Potential Mitigation Measures**	**Significance of Impact and Risk**		**Ranking of Residual Impact/ Risk**	**Confidence Level**
										Without Mitigation/ Management	**With Mitigation/ Management (Residual Impact/ Risk)**		

Construction Activities	Visual intrusion and dust emissions	Negative	Regional	Short Term	Substantial	Very likely	Moderate	Moderate	- Carefully plan to reduce the construction period. - Minimise vegetation clearing and rehabilitate cleared areas as soon as possible. - Vegetation clearing should take place in a phased manner. - Maintain a neat construction site by removing rubble and waste materials regularly. - Make use of existing gravel access roads, where possible. - Limit the number of vehicles and trucks travelling to and from the proposed development site, where possible. - Unless there are water shortages, ensure that dust suppression techniques are implemented on all access roads. - Unless there are water shortages, ensure that dust suppression is implemented in all areas where vegetation clearing has taken place. - Unless there are water shortages, ensure that dust suppression techniques are implemented on all soil stockpiles. - Temporarily fence-off the construction sites (for the	Moderate	Moderate	3	Medium

									duration of the construction period). - All reinstated cable trenches should be re-vegetated with the same vegetation that existed prior to the cable being laid, where possible. - It is not realistic to attempt to screen wind farms visually. Providing a means whereby they can be absorbed into the landscape is more feasible. This can be approached by making use of certain materials and finishes, such as monochromatic dull colours. - Buildings and similar structures must be in keeping with regional planning policy documents, especially the principles of critical regionalism (namely sense of place, sense of history, sense of nature, sense of craft and sense of limits).				

Operational Activities	Visual intrusion, dust emission and light pollution and glare	Negative	Regional	Long Term	Substantial	Very likely	Moderate	Moderate	- Where possible, fewer but larger turbines with a greater output should be utilised rather than a larger number of smaller turbines with a lower capacity. - High visual impact zones should be viewed as zones where the number of turbines should be limited, where possible. - Light fittings for security at night should reflect the light toward the ground (except for aviation lighting) and prevent light spill. - The operations and maintenance buildings should not be illuminated at night, if possible. - Turbines should be painted plain white, as this is a less industrial colour (Vissering, 2011), unless another specialist recommends that one (1) or more of the turbine blades be painted an alternative colour in order to reduce an identified impact (for example as part of the Avifauna specialist's recommendations / mitigation measures). It is highly recommended that bright colours should not be permitted and that large, clear or obvious logos preferably not be	Moderate	Moderate	3	Medium

									used or be kept to an absolute minimum. - Turbines should be repaired promptly, as they are considered more visually appealing when the blades are rotating (or at work) (Vissering, 2011). - If possible, the operation and maintenance buildings should be painted with natural tones that fit with the surrounding environment[3]. In addition, non-reflective surfaces should be utilised where possible. - If required, turbines should be replaced with the same model, or one of equal height and scale. Repeating elements of the same height, scale and form can result in unity and lessen the visual impact that would typically be experienced in a chaotic landscapes made up of diverse colours, textures and patterns (Vissering, 2011). - As far as possible, limit the number of maintenance vehicles, which are allowed to access the sites. - Bury cables under the ground where possible. - Unless there are water shortages, ensure that dust suppression techniques are				

									implemented on all access roads. - Select the alternatives that will have the least impact on visual receptor locations.				

[3] Depending on the building design, the developer may find it preferable to paint the building white in order to reflect heat and keep the interior of the building cool.

1.8. CONCLUSIONS AND RECOMMENDATIONS

A scoping-level study has been conducted in order to identify the potential visual impact and issues related to the development of the proposed Phase 2 Kuruman WEF near Kuruman in the Northern Cape Province. Although the majority of the study area has a largely natural, untransformed visual character, it is characterised by the presence of typical rural / pastoral infrastructure and is not typically valued or utilised for its tourism significance. The study area / visual assessment zone has seen limited transformation / disturbance and is considered to be largely natural / scenic. The study area will therefore be impacted significantly from a visual perspective as a result of the development of the proposed WEF. It should also be noted that there are several renewable energy developments (solar and wind) being proposed and/or constructed within 50kms of the proposed WEF. These facilities and their associated infrastructure, will significantly alter the visual character and baseline in the study area once constructed and make it appear to have a more industrial-type visual character. Due to the low levels of leisure-based or nature based tourism activities in the assessment area, no sensitive visual receptors were identified within the study area. It was however ascertained that the proposed WEF development is likely to visually impact nineteen (19) potentially sensitive receptors. In many cases, roads along which people travel, are regarded as sensitive receptors. The primary thoroughfare in the study area is the R31 main road. It is however considered unlikely that this road would be widely used by tourists and as such it is not regarded as being visually sensitive. No potentially sensitive receptor roads were therefore identified within the study area.

An overall impact rating was also conducted in order to allow the visual impact to be assessed alongside other environmental parameters. The impact rating revealed that overall the proposed WEF (including associated infrastructure) is expected to have a moderate negative visual impact rating during both construction and operation, with relatively few mitigation measures available. The significance of the cumulative impacts associated with the proposed WEF in addition to the other renewable energy developments proposed nearby were also rated according to the significance rating methodology. The impact assessment revealed that the cumulative visual impacts of the proposed WEF in addition to the other renewable energy developments (including associated infrastructure) proposed nearby would have a moderate negative visual impact rating during both construction and operation, with relatively few mitigation measures available. These impacts would however remain moderate after the implementation of the relevant mitigation measures, due to the nature of the impacts.

Accordingly, further assessment will be required in the EIA phase to investigate the sensitivity of the identified receptor locations to visual impacts associated with the proposed development and to quantify the resulting visual impacts.

1.8.1. Methodology for Further Assessment

The focus of the EIA-phase visual study will be to undertake a more detailed, GIS-based assessment of both the magnitude and significance of the visual impacts associated with the proposed WEF development.

Essentially, the EIA phase assessment will focus on updating and refining the findings of the scoping phase visual study based on the updated layout and will focus on areas where potential sensitive receptor locations are located.

A separate rating matrix will be used to assess the visual impact of the proposed development on the identified potentially sensitive visual receptor locations. This matrix is based on the distance of a receptor location from the proposed development, the presence of screening factors and the visual contrast of the proposed development with the typical elements and forms in the landscape.

Should the technical specifications and design details be available, the proposed wind turbines will be visually simulated / modelled to provide an indication of the possible impacts from different distances and key vantage points within the study area. This will also assist with the assessment and rating of the identified visual impacts.

The Cumulative Impact Assessment which was undertaken and included in this scoping phase visual study will be updated to include a detailed literature review of other visual impact assessments / studies conducted for the other renewable energy developments being proposed within the area, should this information be made available by CSIR.

Should any site layout or location alternatives be considered and need to be assessed in the EIA phase, these will be comparatively assessed in order to ascertain the preferred alternative from a visual perspective.

The EIA phase visual study will conclude with an impact statement which will provide the visual specialist's professional opinion with regards to the visual impacts identified. This statement will also indicate whether these identified visual impacts are significant enough to prevent the project from proceeding and whether an EA should be granted.

It is envisaged that the main deliverable of the study would be the generation of a spatial databases / maps indicating the zones of visual impact and visualisation imagery, as well as a detailed report indicating the findings of the study.

1.9. REFERENCES

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Appendix A

IMPACT RATING METHODOLOGY PROVIDED BY CSIR

Specialist Impact Assessment Criteria

The identification of potential impacts and risks should include impacts that may occur during the construction, operational and decommissioning phases of the activity. The assessment of impacts is to include direct, indirect, as well as cumulative impacts.

In order to identify potential impacts (both positive and negative) it is important that the nature of the proposed activity is well understood so that the impacts associated with the activity can be understood. The process of identification and assessment of impacts will include:

- Determine the current environmental conditions in sufficient detail so that there is a baseline against which impacts can be identified and measured;
- Determine future changes to the environment that will occur if the activity does not proceed;
- An understanding of the activity in sufficient detail to understand its consequences; and
- The identification of significant impacts which are likely to occur if the activity is undertaken.

As per DEA *Guideline 5: Assessment of Alternatives and Impacts* the following methodology is to be applied to the prediction and assessment of impacts. Potential impacts should be rated in terms of the direct, indirect and cumulative:

- **Direct impacts** are impacts that are caused directly by the activity and generally occur at the same time and at the place of the activity. These impacts are usually associated with the construction, operation or maintenance of an activity and are generally obvious and quantifiable.

- **Indirect impacts** of an activity are indirect or induced changes that may occur as a result of the activity. These types of impacts include all the potential impacts that do not manifest immediately when the activity is undertaken or which occur at a different place as a result of the activity.

- **Cumulative impacts** are impacts that result from the incremental impact of the proposed activity on a common resource when added to the impacts of other past, present or reasonably foreseeable future activities. Cumulative impacts can occur from the collective impacts of individual minor actions over a period of time and can include both direct and indirect impacts.

- **Nature of impact** - this reviews the type of effect that a proposed activity will have on the environment and should include "what will be affected and how?"

- **Status** - Whether the impact on the overall environment (social, biophysical and economic) will be:
  - Positive - environment overall will benefit from the impact;
  - Negative - environment overall will be adversely affected by the impact; or
  - Neutral - environment overall will not be affected.

- **Spatial extent** – The size of the area that will be affected by the risk/impact:
  - Site;
  - Local (<10 km from site);
  - Regional (<100 km of site);
  - National; or
  - International (e.g. Greenhouse Gas emissions or migrant birds).

- **Duration** – The timeframe during which the risk/impact will be experienced:

- Very short term (instantaneous);
- Short term (less than 1 year);
- Medium term (1 to 10 years);
- Long term (the impact will occur for the project duration); or
- Permanent (mitigation will not occur in such a way or in such a time span that the impact can be considered transient (i.e. the impact will occur beyond the project decommissioning)).

- **Reversibility of impacts -**
  - High reversibility of impacts (impact is highly reversible at end of project life, i.e. this is the most favourable assessment for the environment. For example, the nuisance factor caused by noise impacts associated with the operational phase of an exporting terminal can be considered to be highly reversible at the end of the project life);
  - Moderate reversibility of impacts;
  - Low reversibility of impacts; or
  - Impacts are non-reversible (impact is permanent, i.e. this is the least favourable assessment for the environment. The impact is permanent. For example, the loss of a palaeontological resource on the site caused by building foundations could be non-reversible).

- **Irreplaceability of resource loss caused by impacts –**
  - High irreplaceability of resources (project will destroy unique resources that cannot be replaced, i.e. this is the least favourable assessment for the environment. For example, if the project will destroy unique wetland systems, these may be irreplaceable);
  - Moderate irreplaceability of resources;
  - Low irreplaceability of resources; or
  - Resources are replaceable (the affected resource is easy to replace/rehabilitate, i.e. this is the most favourable assessment for the environment).

Using the criteria above, the impacts will further be assessed in terms of the following:

- **Probability** – The probability of the impact occurring:
  - Extremely unlikely (little to no chance of occurring);
  - Very unlikely (<30% chance of occurring);
  - Unlikely (30-50% chance of occurring)
  - Likely (51 – 90% chance of occurring); or
  - Very Likely (>90% chance of occurring regardless of prevention measures).

- **Consequence**–The anticipated severity of the impact:
  - Extreme (extreme alteration of natural systems, patterns or processes, i.e. where environmental functions and processes are altered such that they permanently cease);
  - Severe (severe alteration of natural systems, patterns or processes, i.e. where environmental functions and processes are altered such that they temporarily or permanently cease);
  - Substantial (substantial alteration of natural systems, patterns or processes, i.e. where environmental functions and processes are altered such that they temporarily or permanently cease);
  - Moderate (notable alteration of natural systems, patterns or processes, i.e. where the environment continues to function but in a modified manner); or
  - Slight (negligible alteration of natural systems, patterns or processes, i.e. where no natural systems/environmental functions, patterns, or processes are affected).

o

- **Significance** – To determine the significance of an identified impact/risk, the consequence is multiplied by probability (qualitatively as shown in Figure 1 below). The approach incorporates internationally recognised methods from the Intergovernmental Panel on Climate Change (IPCC) (2014) assessment of the effects of climate change and is based on an interpretation of existing information in relation to the proposed activity, to generate an integrated picture of the risks related to a specified activity in a given location, with and without mitigation. Risk is assessed for each significant stressor (e.g. physical disturbance), on each different type of receiving entity (e.g. the municipal capacity, a sensitive wetland), qualitatively (very low, low, moderate, high, very high) against a predefined set of criteria (as shown in Figure 1 below).

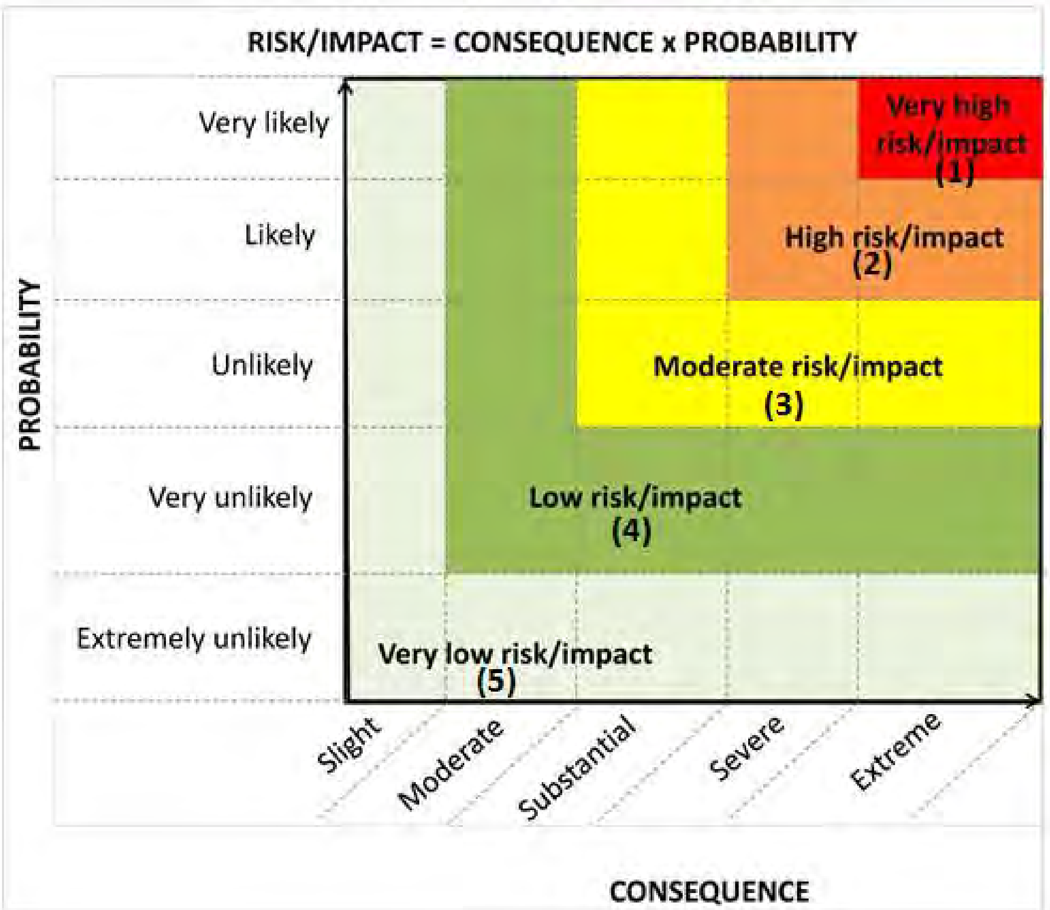


Figure 1: Guide to assessing risk/impact significance as a result of consequence and probability.

- **Significance** – Will the impact cause a notable alteration of the environment?
  - o Very low (the risk/impact may result in very minor alterations of the environment and can be easily avoided by implementing appropriate mitigation measures, and will not have an influence on decision-making);
  - o Low (the risk/impact may result in minor alterations of the environment and can be easily avoided by implementing appropriate mitigation measures, and will not have an influence on decision-making);

- Moderate (the risk/impact will result in moderate alteration of the environment and can be reduced or avoided by implementing the appropriate mitigation measures, and will only have an influence on the decision-making if not mitigated); or
- High (the risk/impacts will result in a considerable alteration to the environment even with the implementation on the appropriate mitigation measures and will have an influence on decision-making).
- Very high (the risk/impacts will result in major alteration to the environment even with the implementation on the appropriate mitigation measures and will have an influence on decision-making (i.e. the project cannot be authorised unless major changes to the engineering design are carried out to reduce the significance rating)).

The above assessment must be described in the text (with clear explanation provided on the rationale for the allocation of significance ratings) and summarised in an impact assessment Table in a similar manner as shown in the example below (Table 1).

- **Ranking -** With the implementation of mitigation measures, the residual impacts/risks must be ranked as follow in terms of significance:
  - Very low = 5;
  - Low = 4;
  - Moderate = 3;
  - High = 2; and
  - Very high = 1.

- **Confidence** – The degree of confidence in predictions based on available information and specialist knowledge:
  - Low;
  - Medium; or
  - High.

Impacts will then be collated into an EMPr and these will include the following:

- Management actions and monitoring of the impacts;
- Identifying negative impacts and prescribing mitigation measures to avoid or reduce negative impacts; and
- Positive impacts will be identified and enhanced where possible.

Other aspects to be taken into consideration in the assessment of impact significance are:

- Impacts will be evaluated for the construction, operational and decommissioning phases of the development. The assessment of impacts for the decommissioning phase will be brief, as there is limited understanding at this stage of what this might entail. The relevant rehabilitation guidelines and legal requirements applicable at the time will need to be applied;
- The impact evaluation will, where possible, take into consideration the cumulative effects associated with this and other facilities/projects which are either developed or in the process of being developed in the local area; and
- The impact assessment will attempt to quantify the magnitude of potential impacts (direct and cumulative effects) and outline the rationale used. Where appropriate, national standards are to be used as a measure of the level of impact.

- Impacts should be assessed for all layouts and project components.
- **<u>IMPORTANT NOTE FROM THE CSIR</u>: IMPACTS SHOULD BE DESCRIBED BOTH BEFORE AND AFTER THE PROPOSED MITIGATION AND MANAGEMENT MEASURES HAVE BEEN IMPLEMENTED. THE ASSESSMENT OF THE POTENTIAL IMPACT "BEFORE MITIGATION" SHOULD TAKE INTO CONSIDERATION ALL MANAGEMENT ACTIONS THAT ARE ALREADY PART OF THE PROJECT DESIGN (WHICH ARE A GIVEN). THE ASSESSMENT OF THE POTENTIAL IMPACT "AFTER MITIGATION" SHOULD TAKE INTO CONSIDERATION ANY ADDITIONAL MANAGEMENT ACTIONS PROPOSED BY THE SPECIALIST, TO MINIMISE NEGATIVE OR ENHANCE POSITIVE IMPACTS.**

Appendix B

VISUAL IMPACT QUESTIONNAIRE

SiVEST

ENVIRONMENTAL IMPACT ASSESSMENTS FOR THE PROPOSED DEVELOPMENT OF THE KURUMAN PHASE 1 AND PHASE 2 WIND ENERGY FACILITIES NEAR KURUMAN, NORTHERN CAPE PROVINCE

VISUAL IMPACT QUESTIONNAIRE

1. Have you ever seen a wind turbine in real life / in a photograph?

   YES

2. Do you consider your surrounding environment to be scenic or something of natural beauty to be valued?

   YES

   If yes-

   a. Do you think the proposed development will detract from the beauty of the landscape?

   NO

3. Would you consider the establishment of the proposed structures (i.e. wind turbines) to be elegant structures that symbolize progression toward a less polluted future, or foreign objects that will degrade and alter the natural landscape?

   ELEGANT STRUCTURES

4. Would it be problematic for you if wind turbines were visible from your farmhouse / dwelling?

   NO

5. In general do you regard the proposed establishment of a wind farm in your direct surroundings as a positive or negative change and what is your overall opinion / perception toward the proposed development?

   Positive, I am in favor of the development.

6. What are the main roads in the area primarily used for (e.g. farm access, day visitors etc.)?

FARM ACCESS, FOR INHABITANTS ONLY

7. Are there any tourism activities / facilities in the area that you know of?

NO

If yes-

a Please elaborate / provide general information related to tourism in the area

8 Are there any future tourism activities / facilities planned in the area that you know of?

NO

If yes-

a. Please elaborate / provide general information related to future tourism in the area

9. Do any places in the area have any cultural or symbolic meaning?

NO

If yes-

a. Please elaborate / provide information

10. Are there any scenic resources present in the area (e.g. mountains, scenic rivers, water falls etc.)?

Mountains

If yes-

a. Please elaborate / provide information

....

....

....

11. Are there any sites of special interest present in the area?

....

NO

If yes-

a. Please elaborate / provide information

....

....

....

12. Are there any future residential developments planned in the area?

....

NO

If yes-

a. Please elaborate / provide information

....

....

....

FOR INQUIRIES PLEASE CONTACT:

Stephan Jacobs

PO Box 2921, RIVONIA, 2128
Email stephanj@sivest.co.za

Tel (011) 798 0600
Fax: (011) 803 7272

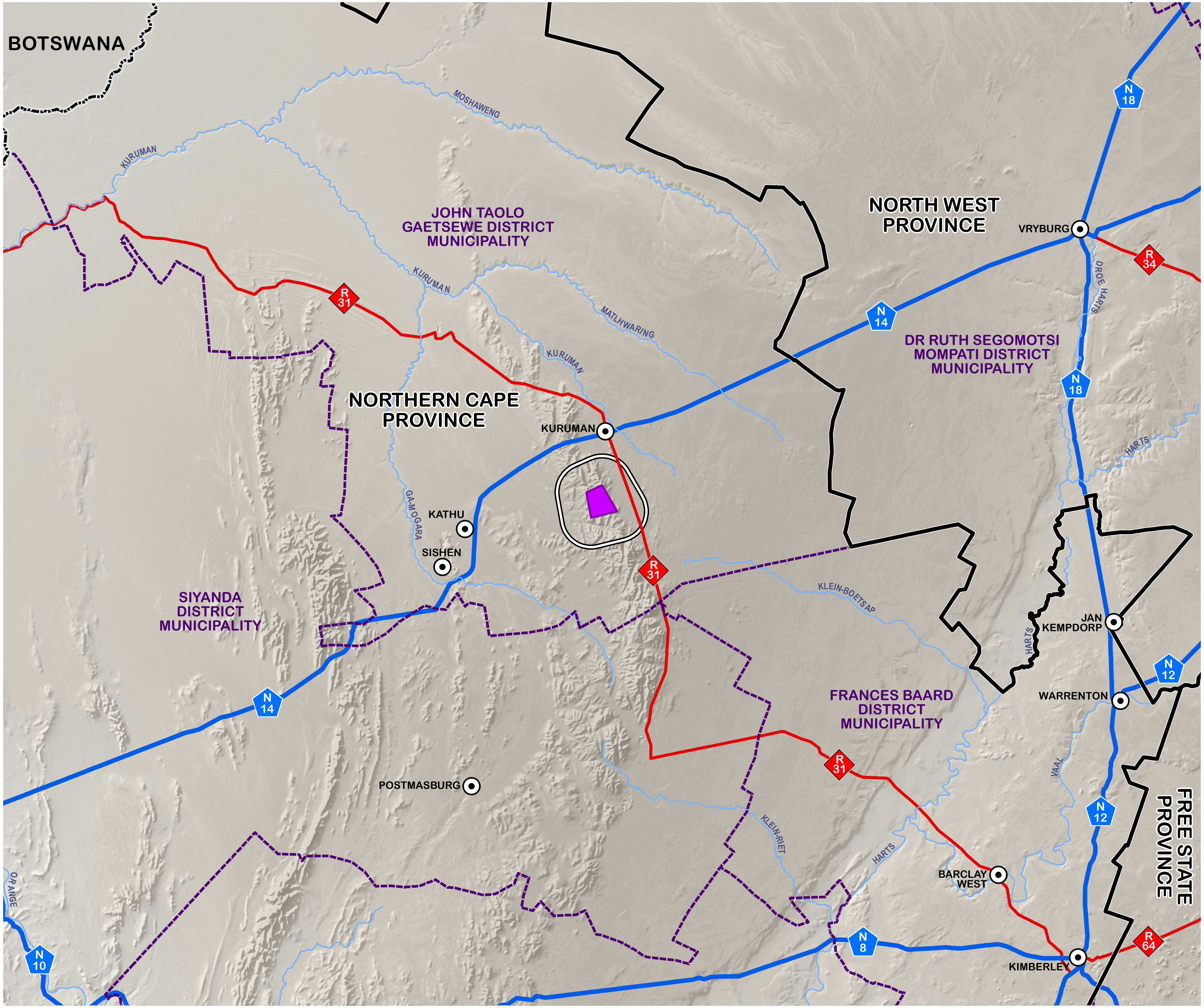
Appendix V

PROJECT MAPS

PROPOSED CONSTRUCTION OF THE KURUMAN WIND ENERGY FACILITY (PHASE 2)

NEAR KURUMAN, NORTHERN CAPE PROVINCE

VISUAL ASSESSMENT: REGIONAL CONTEXT



Legend

- Main Towns
- National Boundary
- Provincial Boundaries
- District Municipal Boundaries
- National Routes
- Main Arterial Routes
- Main Rivers
- Kuruman WEF Phase 2 Application Site
- 8km Visual Assessment Zone

SOURCE:
MUNICIPAL DEMARCATION BOARD, 2011
NGI, 2014

N

0 10 20

Kilometers

ENVIRONMENTAL DIVISION
51 WESSELS ROAD
RIVONIA, 2128
JOHANNESBURG
SOUTH AFRICA

Phone: +27 11 798 0600
Fax: +27 11 803 7272
e-mail: info@sivest.co.za

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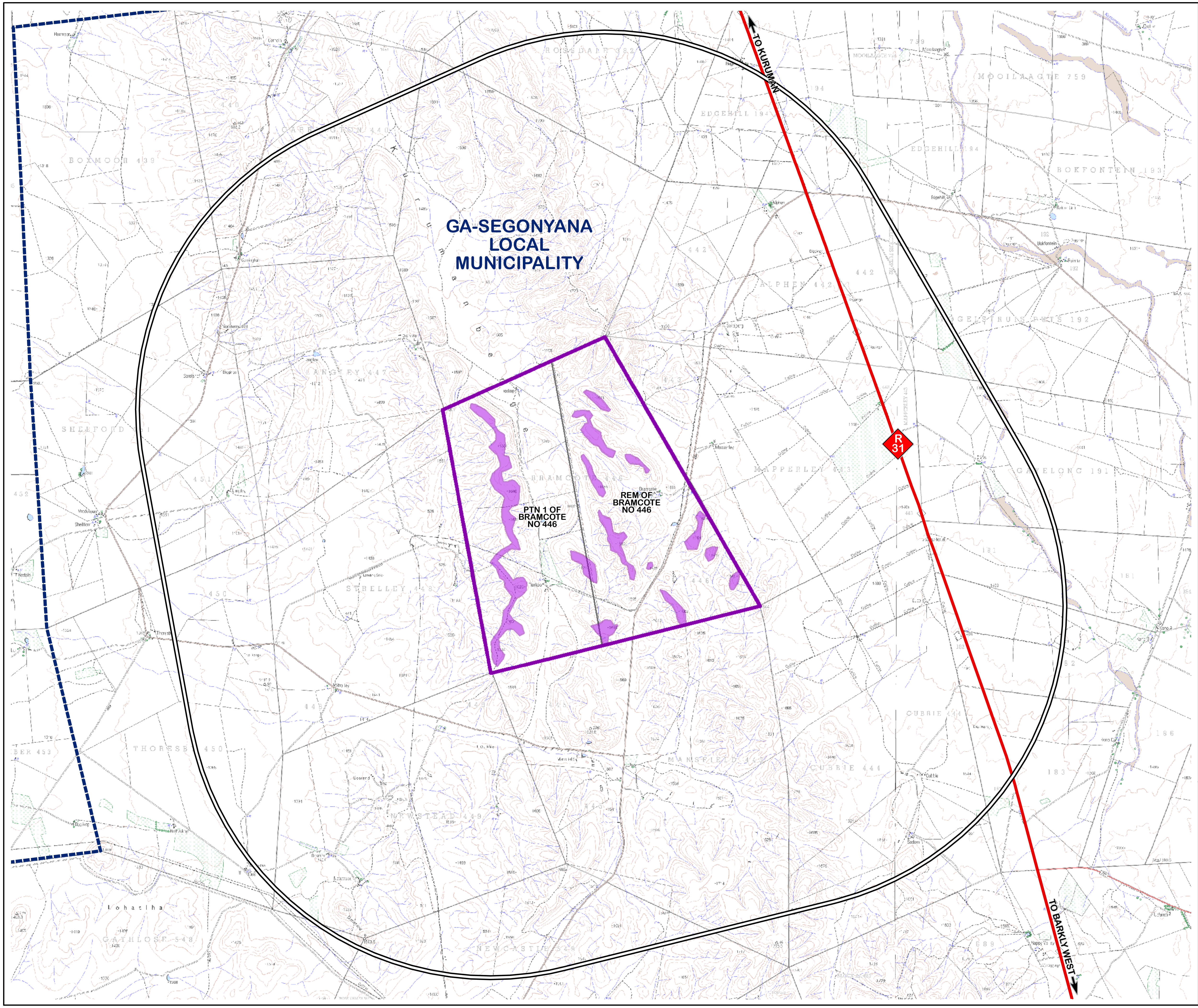

PROPOSED CONSTRUCTION OF THE KURUMAN WIND ENERGY FACILITY (PHASE 2)

NEAR KURUMAN, NORTHERN CAPE PROVINCE

VISUAL ASSESSMENT: SITE LOCALITY

Legend

- Local Municipal Boundaries
- Main Arterial Routes
- Rivers/Watercourses
- Kuruman WEF Phase 2 Application Site
- Component Farm Portions
- Turbine Asessment Corridors
- 8km Visual Assessment Zone

SOURCE:
MUNICIPAL DEMARCATION BOARD, 2011
NGI, 2014

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Kilometers

SiVEST
ENVIRONMENTAL DIVISION
51 WESSELS ROAD
RIVONIA, 2128
JOHANNESBURG
SOUTH AFRICA

Phone: +27 11 798 0600
Fax: +27 11 803 7272
e-mail: info@sivest.co.za

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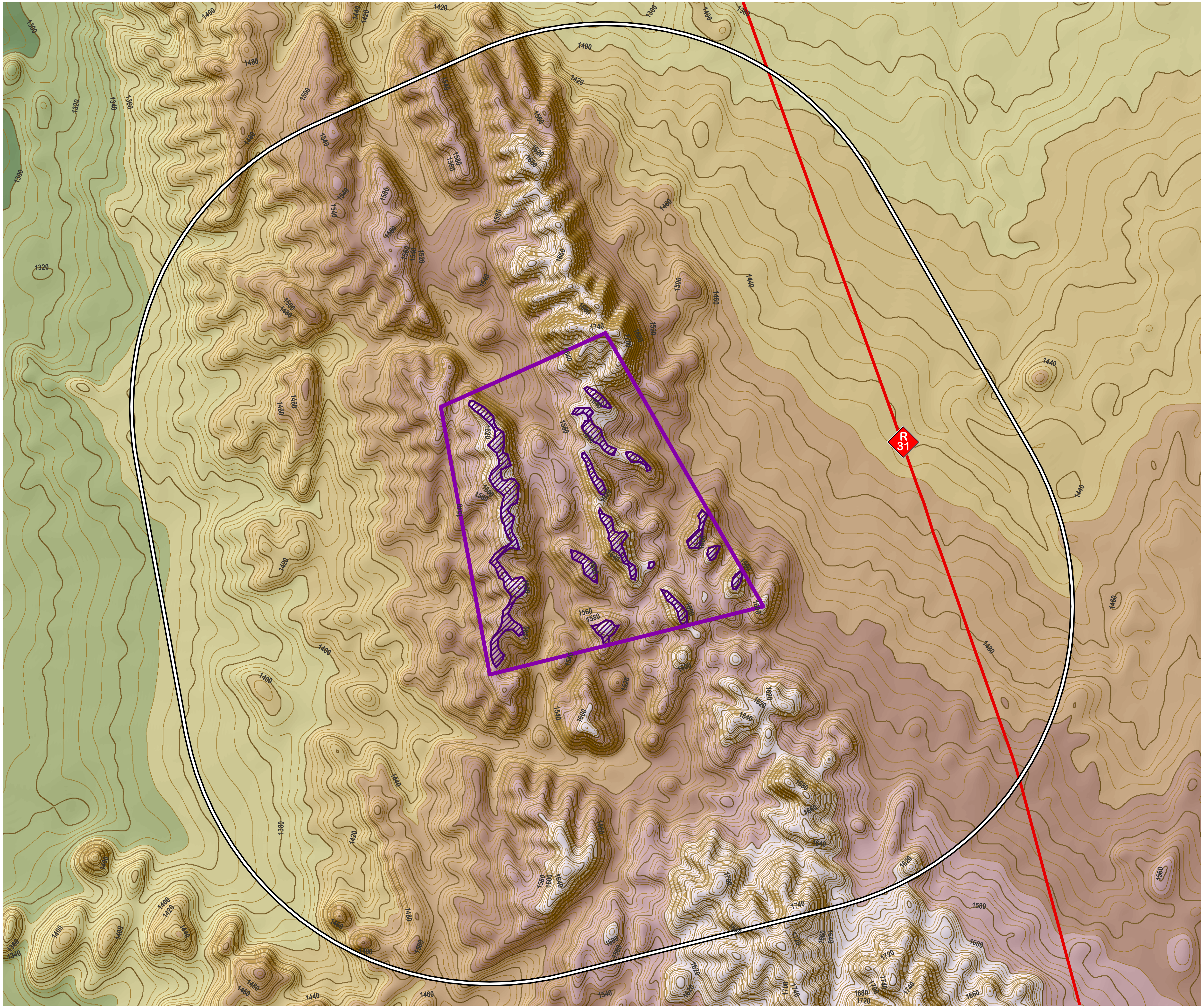

PROPOSED CONSTRUCTION OF THE KURUMAN WIND ENERGY FACILITY (PHASE 2)

NEAR KURUMAN, NORTHERN CAPE PROVINCE

VISUAL ASSESSMENT: TOPOGRAPHY

Legend

- Main Arterial Routes
- Contours (20m Interval)
- Contours (5m Interval)
- Kuruman WEF Phase 2 Application Site
- Turbine Asessment Corridors
- 8km Visual Assessment Zone

Elevation (msl)

High: >1,600m

Low: <=1,300m

SOURCE:
NFEPA, 2011
NGI, 2014

N

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Kilometers

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ENVIRONMENTAL DIVISION
51 WESSELS ROAD
RIVONIA, 2128
JOHANNESBURG
SOUTH AFRICA
Phone: +27 11 798 0600
Fax: +27 11 803 7272
e-mail: info@sivest.co.za

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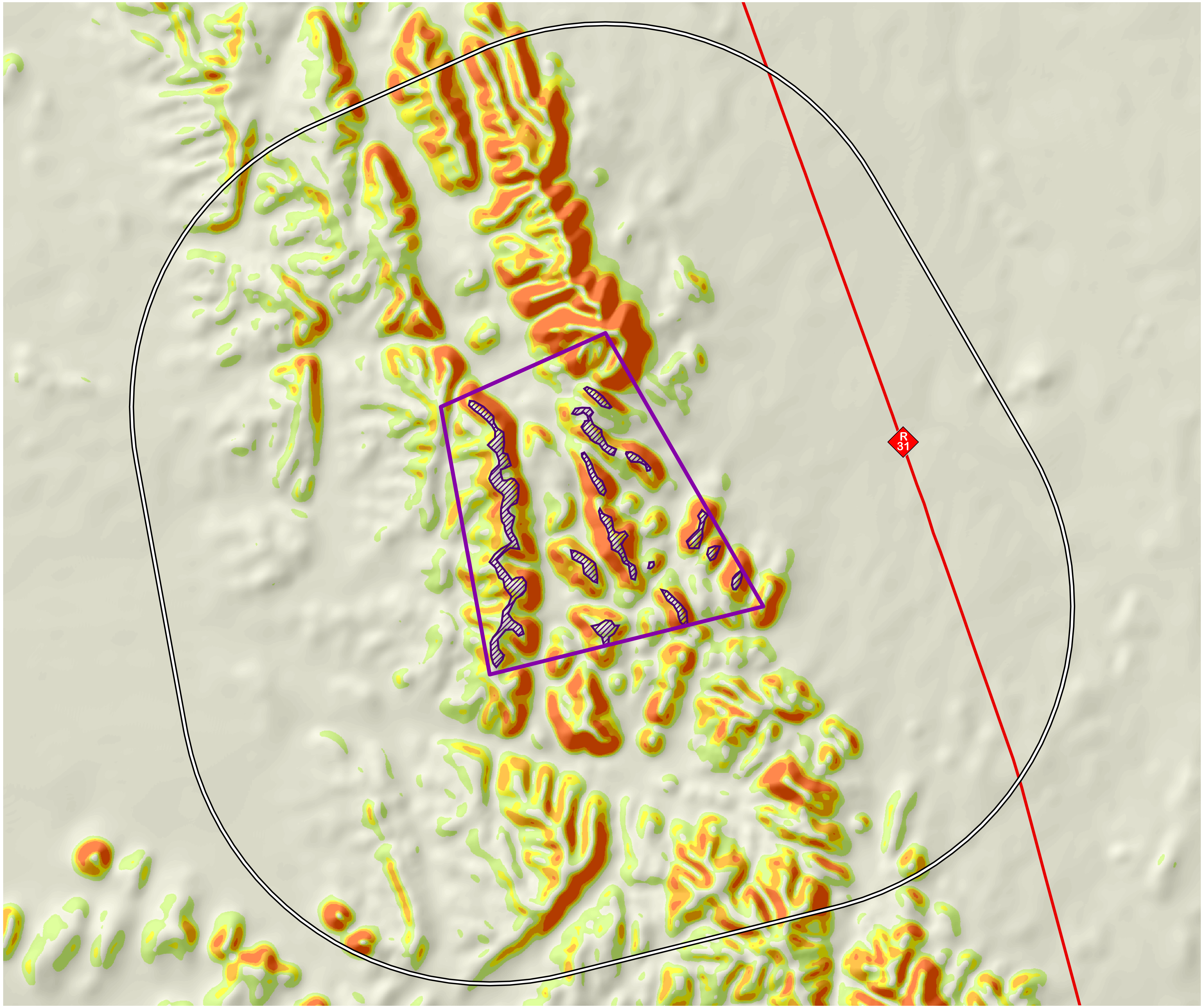
PROPOSED CONSTRUCTION OF THE KURUMAN WIND ENERGY FACILITY (PHASE 2)

NEAR KURUMAN, NORTHERN CAPE PROVINCE

VISUAL ASSESSMENT: SLOPE CLASSIFICATION



Legend

- Main Arterial Routes
- Kuruman WEF Phase 2 Application Site
- Turbine Assessment Corridors
- 8km Visual Assessment Zone

Slope Classification (Percent Rise)

- <=8%
- 8.01 - 12%
- 12.01 - 14%
- 14.01 - 18%
- >18%

SOURCE:
NFEPA, 2011
NGI, 2014

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Kilometers

ENVIRONMENTAL DIVISION
51 WESSELS ROAD
RIVONIA, 2128
JOHANNESBURG
SOUTH AFRICA

Phone: +27 11 798 0600
Fax: +27 11 803 7272
e-mail: info@sivest.co.za

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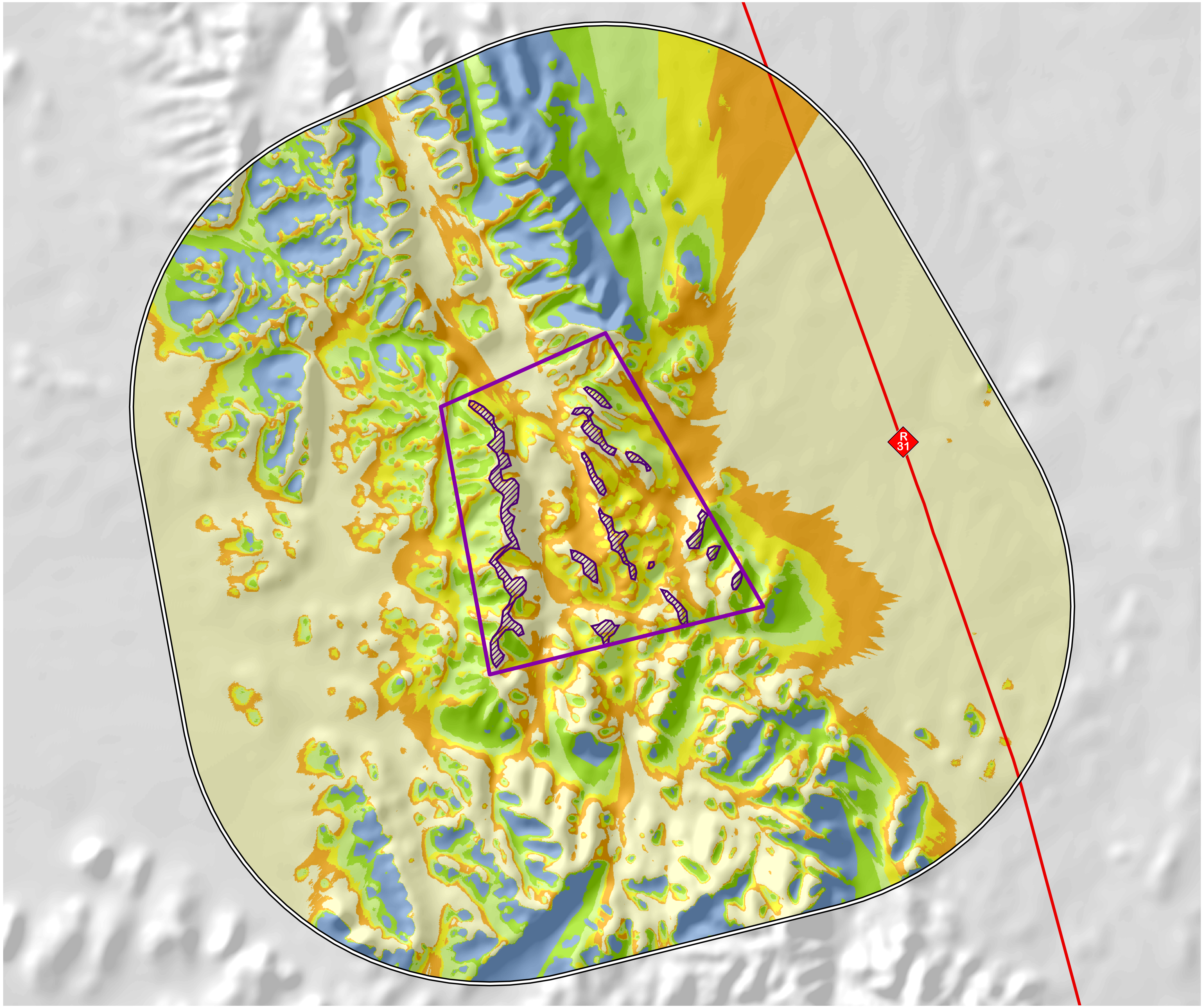

PROPOSED CONSTRUCTION OF THE KURUMAN WIND ENERGY FACILITY (PHASE 2)

NEAR KURUMAN, NORTHERN CAPE PROVINCE

VISUAL ASSESSMENT: PRELIMINARY VISIBILITY ANALYSIS

Legend

- Main Arterial Routes
- Kuruman WEF Phase 2 Application Site
- Turbine Asessment Corridors
- 8km Visual Assessment Zone

Potential Visibility of Proposed Wind Turbines

- Most Visible
- Least Visible
- Not Visible

SOURCE:
NFEPA, 2011
NGI, 2014

N

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Kilometers

SiVEST
ENVIRONMENTAL DIVISION
51 WESSELS ROAD
RIVONIA, 2128
JOHANNESBURG
SOUTH AFRICA

Phone: +27 11 798 0600
Fax: +27 11 803 7272
e-mail: info@sivest.co.za

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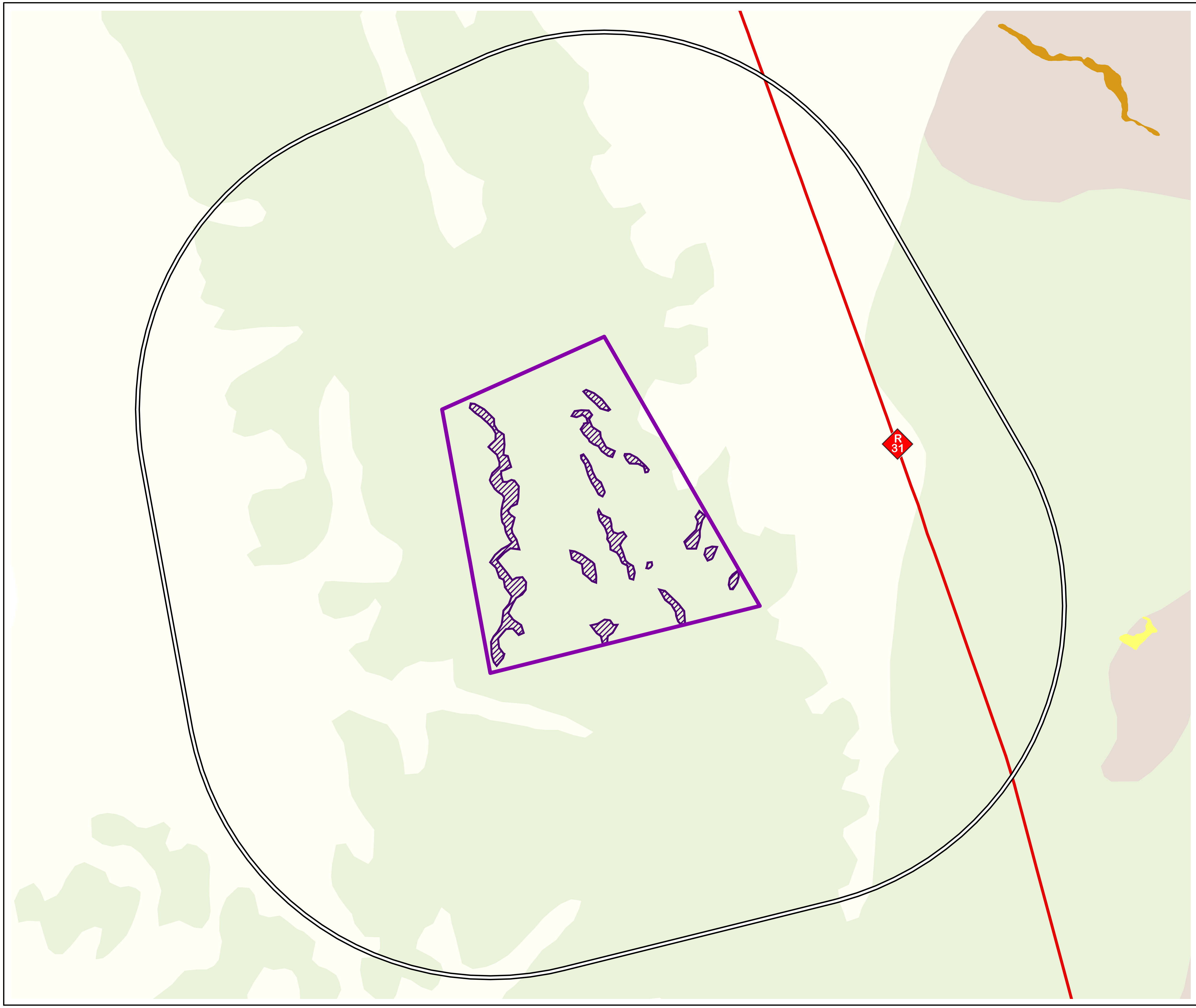

PROPOSED CONSTRUCTION OF THE KURUMAN WIND ENERGY FACILITY (PHASE 2)

NEAR KURUMAN, NORTHERN CAPE PROVINCE

VISUAL ASSESSMENT: VEGETATION CLASSIFICATION

Legend

- Main Arterial Routes
- Kuruman WEF Phase 2 Application Site
- Turbine Assessment Corridors
- 8km Visual Assessment Zone

Vegetation Classification

- Kuruman Mountain Bushveld
- Kuruman Thornveld
- Kuruman Vaalbosveld
- Southern Kalahari Mekgacha
- Southern Kalahari Salt Pans

SOURCE:
NFEPA, 2011
SANBI, 2012

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Kilometers

ENVIRONMENTAL DIVISION
51 WESSELS ROAD
RIVONIA, 2128
JOHANNESBURG
SOUTH AFRICA

Phone: +27 11 798 0600
Fax: +27 11 803 7272
e-mail: info@sivest.co.za

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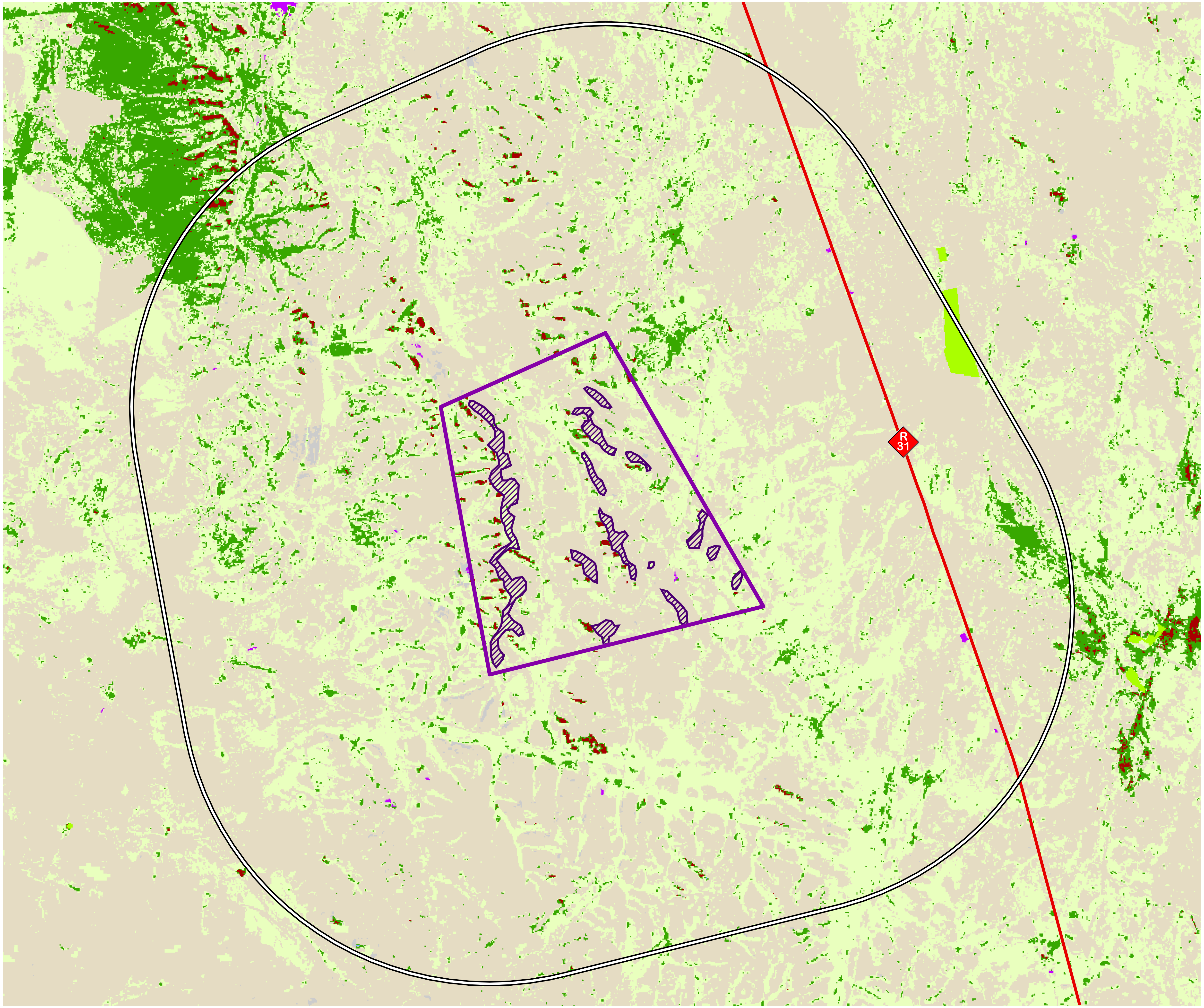

PROPOSED CONSTRUCTION OF THE KURUMAN WIND ENERGY FACILITY (PHASE 2)

NEAR KURUMAN, NORTHERN CAPE PROVINCE

VISUAL ASSESSMENT: BROAD LAND COVER CLASSIFICATION

Legend

- Main Arterial Routes
- Kuruman WEF Phase 2 Application Site
- Turbine Asessment Corridors
- 8km Visual Assessment Zone

Land Cover Classification

- Bare (None Vegetated)
- Cultivation
- Grassland
- Low Shrubland
- Mining
- Thicket/Dense Bush
- Urban Smallholding
- Waterbodies
- Woodland/Open Bush

SOURCE:
2013-2014 SA NATIONAL LAND COVER
(© GEOTERRAIMAGE - 2014)

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SiVEST
ENVIRONMENTAL DIVISION
51 WESSELS ROAD
RIVONIA, 2128
JOHANNESBURG
SOUTH AFRICA

Phone: +27 11 798 0600
Fax: +27 11 803 7272
e-mail: info@sivest.co.za

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