VISUAL IMPACT ASSESSMENT
FOR THE KLIPKRAAL WEF 4

VISUAL ASSESSMENT SCOPING REPORT

Prepared for

KLIPKRAAL WIND ENERGY FACILITY 4 (PTY) LTD

Prepared by

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M KLAPWIJK

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1 INTRODUCTION

Klipkraal Wind Energy Facility 4 (Pty) Ltd (hereafter referred to as ‘Klipkraal 4’), has appointed SiVEST Environmental (hereafter referred to as ‘SiVEST’) to undertake the required EIA processes for the proposed construction of five (5) wind farms and associated infrastructure [including substations and Battery Energy Storage Systems (BESS)] on a number of properties, majority being adjacent, near the town of Fraserburg in the Northern Cape Province of South Africa. The proposed wind farms make up a larger wind energy facility (WEF) (with associated BESS) which will be referred to as the Klipkraal WEF. It should be noted that the proposed wind farm projects form part of separate EIA applications.

The overall objective of the proposed wind farm projects is to generate electricity by means of renewable energy technologies, capturing wind energy to feed into the national grid, which will be procured under either the Renewable Energy Independent Power Producer Procurement Programme (REIPPPP), other government run procurement programmes, any other program it intends to supply power to or for sale to private entities, if required. To further ensure efficient power delivery, the facility will also incorporate the use of storage technologies like batteries (i.e. BESS).

As required in Part A of the Government Gazette 43110, GN 320, a site sensitivity verification was undertaken to confirm the current land use and environmental sensitivity of the proposed project area. The details of the site sensitivity verification are noted below:

Date of Site Visit	11-13 May 2022
Specialist Name	Menno Klapwijk
Professional Registration Number	87006
Specialist Affiliation / Company	South African council for the Landscape Architectural Professions (SACLAP) Bapela Cave Klapwijk
Specialist Topic	Visual Impact Assessment
Proposed WEF Project Name	Klipkraal WEF 4

The proposed WEF and associated grid connection infrastructure is located approximately 30 km south east of Fraserburg in the Karoo Hoogland Local Municipality, in the Namakwa District Municipality (**Figure 1: Regional Locality Plan)**

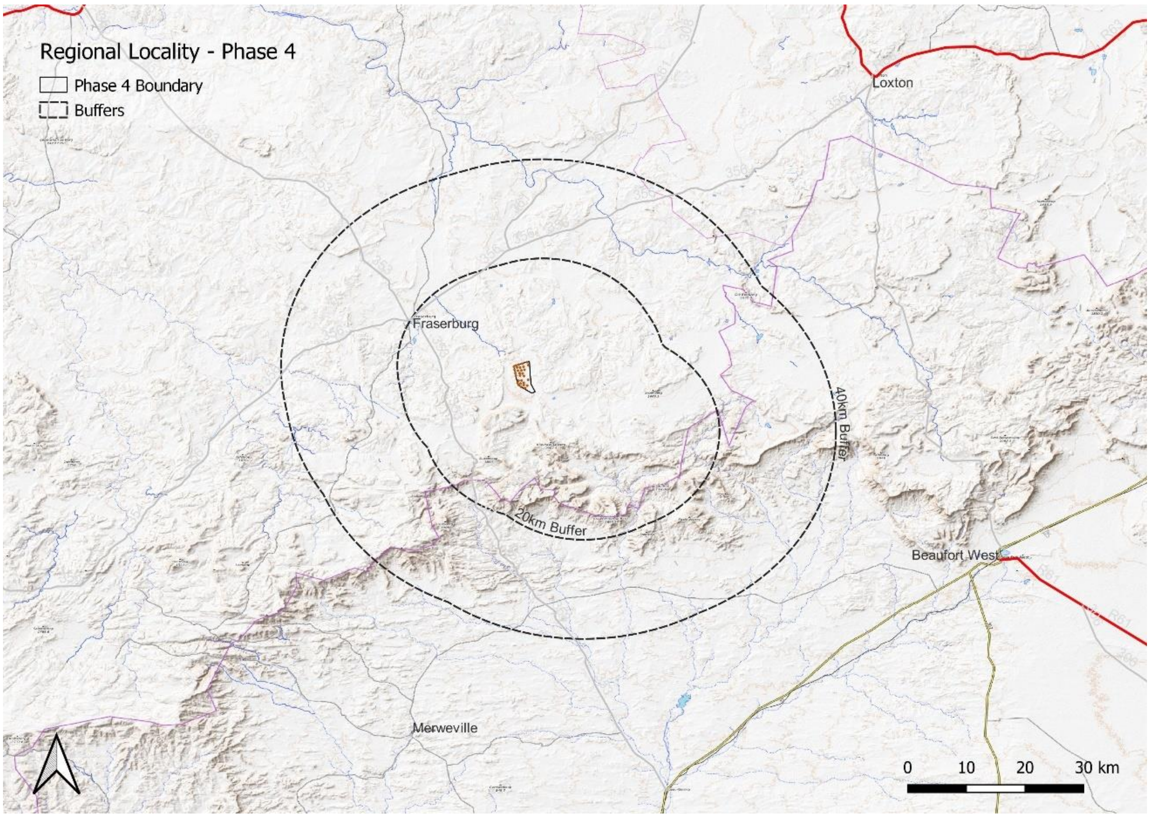

Figure 1: Regional Locality Map

2 OBJECTIVES

This visual assessment is a specialist study to determine the visual effects of the proposed development on the surrounding environment.

The primary objective of this specialist study is therefore to describe the potential impact of these structures on the visual character and sense of place of the area. This Specialist Study will have the following objectives

- Determine the visual character of the area by evaluating environmental components such as topography, current land use activities, surrounding land use activities, etc.
- Identify elements of particular visual quality that could be affected by the proposed project.
- Assessment of the preferred project layout following the site sensitivity verification and layout identification.
- Viewshed for various elements of the proposed development must be calculated, defined, and presented, and the varying sensitivities of these viewsheds must be highlighted.
- Specification of development setbacks or buffers required and provide clear motivations for these recommendations.

- Identification and assessment of the potential direct, indirect, and cumulative impacts of the proposed development on the receiving environment from a visual perspective.
- Cumulative impacts to be assessed by considering renewable energy projects and other applicable (and relevant) projects within 20 km of the proposed projects.
- Impact significance must be rated both without and with mitigation, and must cover the construction, operational and decommissioning phases of the project.
- Identification of the visual impact of the proposed project infrastructure on the different viewsheds. All impacts should be considered under varying conditions as appropriate to the assessment i.e. day, night, clear weather, cloudy weather, etc.
- Maps depicting viewsheds across the sites should be generated and included in the VIA Report. These maps must indicate current viewsheds/visual landscape/obstructions, as well as expected visual impacts during the construction, operational and decommissioning phases of the proposed project.
- An impact statement indicating the acceptability of the proposed development and EA condition recommendations.
- A description of assumptions and limitations in the report.
- A section indicating how the National Web-Based Screening Tool was interrogated and whether classification of the site is accurate or not. If not, it must be motivated why the classification is not accurate.
- Identification of any additional protocols, licensing and/or permitting requirements that are relevant to the project and the implications thereof.
- Provide recommendations with regards to potential monitoring programmes; and
- Determine mitigation and/or management measures, which could be implemented to as far as possible, reduce the effect of negative impacts and enhance the effect of positive impacts. Also, identify best practice management actions, monitoring requirements, and rehabilitation guidelines for all identified impacts.

3 THE VISIBILITY IN CONTEXT

The site is situated on the top of a plateau landform. The edge of the landform forms an escarpment that descends generally to the south. Intermittent views are contained mainly to the upper plateau levels. The landscape is flat and stony dotted with hills and mountains. The groundcover is mainly grassy dwarf shrubland containing very few trees if at all any. The low ground cover does not assist in any visual screening or blending with the landscape, especially bearing in mind the scale and magnitude of the wind turbines

4 STUDY APPROACH AND METHOD

The study area was determined as the site and a 20 and 40 km buffer zone around it. The visibility of the turbines would be insignificant beyond this point. Refer to **Figure 1 Regional Locality Map,** which identifies the study area. However, a 40 km buffer zone has also been included in the study, as it may be possible, that when viewed from an elevated position, the structures could be visible depending on light and atmospheric conditions as well as the red flashing lights on top of the turbines at night.

The method used was both a desk top study using Google Earth and a site inspection. The Screening report generated by the National Web-Based Environmental Screening Tool, as provided by SIVEST, was used as a point of departure.

In order to address the objectives of the impact assessment study the following method will be used:

- In terms of the EIA process a site sensitivity verification process was initiated. This report provided recommendations based the site's sensitivity to the proposed development.

- Define the extent of the affected visual environmental, the viewing distance and the critical views.

- Determine the setting, visual character and land use of the area surrounding the area, and the Genius Loci (sense of place). This will be done in terms of:

  - Topography
  - Vegetation cover
  - Land use
  - Visibility
  - Landscape diversity
  - Landscape character
  - Landscape quality

- Discus and/or meet with the specialist consultant team to identify specific aspects of the construction and development which would affect the visual quality of a setting.

- Define the extent of the affected visual environmental, the viewing distance and the critical views.

- Evaluate the landscape characteristics against which impact criteria ratings will be applied.

- The viewshed, the area within which the proposed project can be visible, will be determined using digital 1:50 000 topographic maps with 20 m contour intervals analysed by the Geographic Information System (GIS), algorithms available in the ArcView Software Suite.

A site visit was undertaken over the period of 11 to 13 May 2022.

The purpose of the site visit was to determine the extent of the potential visibility of the turbine structures and powerline grid alternatives and to understand and document the receiving environment.

The field study entailed travelling public roads that surrounded and crossed the study area to determine the potential visibility from these areas. The route (**Figure 2: Locality Map with Photo/Viewpoints**) followed the N1 from Beaufort West south-west turning north-west along a dirt road towards Fraserburg soon after the Grid Corridor Alternative 1 crosses the N1. The route follows the Grid Corridor then follows a route forking west towards the Alternative 2 route. The route then heads north immediately after crossing the Alternative 2 route heading towards the point where Alternative 1 and 2 converge. The route then crosses Alternative route 2 heading west, follows a valley north-wards to the west of the WEF sites to where the roads forks towards Fraserburg and Loxton. The remainder of the route follows the road towards Loxton.

Google Earth was used to identify homesteads and structures that may be visually impacted. This information was used during the site inspection.

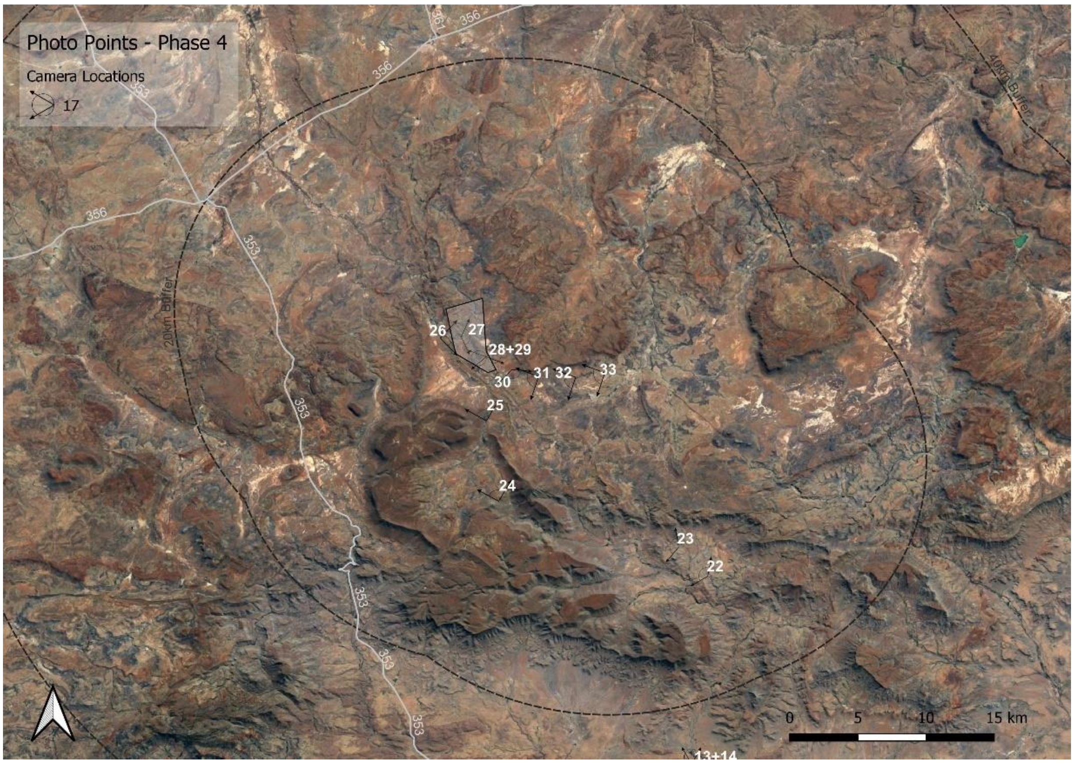

Figure 2: Locality Map with Photo/Viewpoints

The **Visual Assessment** will cover the following key aspects:

Description of the visual landscape of the area with specific focus on topographical features that offer impact mitigation opportunities and constraints.

Description of key areas from which the proposed project will be seen (the view shed) as well as the viewing distance.

An assessment of the visual absorption capacity of the landscape (i.e., the capacity of the landscape to visually absorb structures and forms placed upon it). Particular attention must be paid to conservation, tourism, eco-tourism and associated activities, and potential impacts on sense of place.

The identification of potential impacts (positive and negative, including cumulative impacts if relevant) of the proposal on the visual landscape during construction and operation.

Recommendations on position alternatives, and additional alternatives should they be identified, to avoid negative impacts.

The identification of mitigation measures for enhancing benefits and avoiding, reducing, or mitigating negative impacts and risks (to be implemented during design, construction and operation of the proposed project).

The formulation of a clear and simple system to monitor impacts, and their management, based on key indicators.

To aid in the integration of findings, this study must involve close collaboration with the Heritage, Social and Socio-Economic Impact Assessments.

5 LIMITATIONS, CONTRAINTS AND ASSUMPTIONS

The following assumptions and limitations are applicable to this study:

- The assessment is based on assumed demographic data. No detailed study will be done to determine accurate data on potential viewers of the project components. If necessary, these studies could be undertaken during the design phase of the project; Google Earth was used to identify homesteads and structures that may be visually impacted. This information was used during the site inspection. It was not possible to determine whether these structures were occupied as most of them were closed when the site visit was conducted. It could also be that these structures are occupied on a temporary basis.

- Determining a visual resource in absolute terms is not achievable. Evaluating a landscape's visual quality is both complex and problematic. Various approaches have been developed but they all have one problem in common: unlike noise or air pollution, which can be measured in a relatively simple way, for the visual landscape mainly qualitative standards apply. Therefore, subjectivity cannot be excluded in the assessment procedure (Lange 1994). Individually there is a great variation in the evaluation of the visual landscape based on different experiences, social level and cultural background. Exacerbating the situation is the inherent variability in natural features. Climate, season, atmospheric conditions, region, sub-region all affect the attributes that comprise the landscape. What is considered scenic to one person may not be to another (NLA, 1997).

- Localized visual perceptions of the economically depressed communities have not been tested as these may be influenced rather by the economic and job opportunities that would exist rather than the direct visual perception of the project.

- The viewshed map is computer generated and does not take into account local and minor visual interruptions in the landscape such as trees on the edge of roads, minor landforms, buildings, etc. As a result, the visibility on these maps could be overstated.

- The assessment does not consider the ancillary project infrastructure and components such as borrow pits, spoil dumps, construction camp sites, etc. These components will be assessed in detail during the design phase should the project be implemented.

- The 'Do Nothing' alternative was not specifically addressed as it is likely that the existing landscape will remain in its existing condition.

If the study, however, determined that the negative visual impact is of such a magnitude and significance that it will seriously influence the decision on whether to build, it will then be necessary to
test and determine the visual perceptions of neighbouring communities. Such a study is involved, costly and time consuming.

6 DESCRIPTION OF THE PROJECT

The proposed WEF and associated grid connection infrastructure is located approximately 30 km southeast of Fraserburg in the Karoo Hoogland Local Municipality, in the Namakwa District Municipality.

This report is focussed only on Phase 1 (Facility 1)

At this stage it is anticipated that the proposed Klipkraal 1 WEF will comprise up to sixty (60) wind turbines with a maximum total energy generation capacity of up to approximately 300 MW. In summary, the proposed Klipkraal 1 WEF development will include the following components:

Wind Turbines:

- Approximately 60 turbines, between 5MW and 8MW, with a maximum export capacity of up to approximately 300MW. This will be subject to allowable limits in terms of the Renewable Energy Independent Power Producer Procurement Programme (REIPPPP) or any other program.
- The final number of turbines and layout of the wind farm will, however, be dependent on the outcome of the Specialist Studies in the EIA phase of the project;
- Each wind turbine will have a maximum hub height of up to approximately 200m;
- Each wind turbine will have a maximum rotor diameter of up to approximately 200m;
- Permanent compacted hardstanding areas / platforms (also known as crane pads) of approximately 100m x 100m (total footprint of approx. 10 000m^2) per wind turbine during construction and for on-going maintenance purposes for the lifetime of the proposed wind farm projects. This will however depend on the physical size of the wind turbine;
- Each wind turbine will consist of a foundation (i.e. foundation rings) which may vary in depth, from approximately 3m and up to 10m or greater, depending on the physical size of each wind turbine. It should be noted that the foundation can be up to as much as approximately 700m^3;

Electrical Transformers:

- Electrical transformers will be constructed near the foot of each respective wind turbine in order to step up the voltage to 66kV.
- The typical footprint of the electrical transformers is up to approximately 10m x 10m, but can be up to 20m x 20m at certain locations;

Step-up / Collector Substations:

- One 11-66/132-400kV step-up / collector substation, each occupying an area of up to approximately 2ha,
- The proposed substation will include an Eskom portion and an Independent Power Producer (IPP) portion, hence the substation has been included in this EIA and in the grid connection infrastructure BA (separate application - substations, switching stations and power lines) to allow for handover to Eskom.
- Following construction, the substation will be owned and managed by Eskom. The current applicant will retain control of the medium voltage components (i.e. 33kV components) of the substation, while the high

voltage components (i.e. 400kV components) of the substation will likely be ceded to Eskom shortly after the completion of construction;

Main Transmission Substations (MTS):

- One (1) new 132/400kV Main Transmission Substation (MTS) is being proposed, occupying an area of up to approximately 120ha.
- The proposed MTS will include an Eskom portion and an IPP portion.
- Following construction, the substation will be owned and managed by Eskom. The current applicant will retain control of the 132-400kV and lower voltage components of each MTS, while the 132/400kV voltage components of the MTS will likely be ceded to Eskom shortly after the completion of construction;

Electrical Infrastructure:

- The wind turbines will be connected to the proposed substation via medium voltage (i.e. 33kV) cables.
- These cables will be buried along access roads wherever technically feasible, however, the cables can also be overhead (if required);
- Each WEF will then connect to the MTS via an up to 400kV powerline.

Battery Energy Storage Systems (BESS):

- One (1) Battery Energy Storage System (BESS) will be constructed for the wind farm and will be located next to the 33-66/132-400kV step-up / collector substations which form part of the respective wind farms, or in between the wind turbines.
- It is anticipated that the type of technology will be either Lithium Ion or Sodium-Sulphur (or as determined prior to construction).
- These batteries are not considered hazardous goods as they will be storing ‘energy’.
- The size, storage capacity and type of technology will be determined / confirmed prior to construction. This information will be provided to I&AP’s prior to the commencement of construction.

Roads:

- Internal roads with a temporary width of up to approximately 15m will provide access to the location each wind turbine. These roads will be rehabilitated back to 8m once construction has been completed.
- Existing site roads will be used wherever possible, although new site roads will be constructed where necessary.
- Existing site roads may also be upgraded using temporary concrete stones in order to accommodate for the heavy loads.
- Turns will have a radius of up to 50m for abnormal loads (especially turbine blades) to access the various wind turbine positions.

Site Access:

- The proposed wind farm application site will be accessed via existing gravel roads from the R353 Regional Route;

<u>Temporary Staging Areas:</u>

- A temporary staging area will be required for the wind farm and will be located both at the foot of each wind turbine and at the storage facility (i.e. turbine development area) to allow for working requirements.
- One (1) temporary staging area per wind turbine / range of wind turbines will be required.
- Temporary staging areas will cover an area of up to approximately 100m x 100m (10 000m2 / 1ha) each;

<u>Temporary Construction Camps:</u>

- One (1) temporary construction camp will be required during the construction phase for the wind farm.
- This area will be used as a permanent maintenance area during the operational phase.
- The combined Temporary Construction Camp / Permanent Maintenance Area will cover an area of up to approximately 2.25ha.
- A cement batching plant as well as a chemical storage area will fall within the Temporary Construction Camp and Permanent Maintenance Area.
- The Temporary Construction Camp and Permanent Maintenance Area will be strategically placed within the proposed wind farm site and will avoid all high sensitivity and/or ‘no-go’ areas;

<u>Offices, Accommodation, a Visitors’ Centre and Operation & Maintenance (O&M) Buildings:</u>

- An office (including ablution facilities), accommodation (including ablution facilities), a Visitors’ Centre and an Operation & Maintenance (O&M) building will be required and will occupy areas of up to approximately 100m x 100m (i.e. 1ha).
- Each wind farm (i.e. each phase) will have its own O&M building and Office, however, the Accommodation and Visitors’ Centre will be centralised locations which will be shared between certain wind farm projects (i.e. shared between certain phases which will be confirmed at a later stage);

<u>Septic Tank and Soak-Away Systems:</u>

- The proposed wind farm will consist of a septic tank and soak-away system.
- This will be required for construction as well as long term use.
- The septic tank and soak-away system will be placed 100m or more from water resource (which includes boreholes);

<u>Fencing:</u>

- Fencing will be required and will surround the wind farm.
- The maximum height of the fencing as well as the area which the fencing will cover will be confirmed during the detailed design phase, prior to construction commencing.

- Fences will however be constructed according to specifications recommended by the Ecologist and Avifauna specialist (as per the EMPr);

<u>Temporary Infrastructure to Obtain Water from Available Local Sources</u>:
- Temporary infrastructure to obtain water from available local sources will be required. Water may also be obtained from onsite boreholes and from the town of Fraserburg.
- New or existing boreholes, including a potential temporary above ground pipeline (approximately 50cm in diameter) for each wind farm, to feed water to the sites are being proposed.
- Water will potentially be stored in temporary water storage tanks.
- The necessary approvals from the Department of Water and Sanitation (DWS) will be applied for separately (should this be required); and

<u>Temporary Containers:</u>
- Temporary containers of up to approximately 80m^3 will be required for the storage of fuel on-site during the construction phase of the wind farm.
- The chemical storage area will fall within the Temporary Construction Camp and permanent Maintenance Area.

Phases 1 to 3 of the WEF application site incorporates the following farm portions:
- Remainder of the Farm Matjesfontein No. 409 (RE/409) - C02600000000040900000.
- Remainder of the Farm Klipfontein No. 447 (RE/44) - C02600000000044700000; and
- Portion 1 of the Farm Klipfontein No. 447 (1/447) - C02600000000044700001.

Phases 4 to 5 of the WEF application site incorporates the following farm portions:
- Portion 3 of the Farm Ratelfontein No. 394 (3/394) - C02600000000039400003; and
- Remainder of the Farm Matjiesfontein No. 411 (RE/411) - C02600000000041100000.

Phase	Applicant	Capacity	No. of turbines
Phase 1	Klipkraal Wind Facility 1 (Pty) Ltd	300MW	60
Phase 2	Klipkraal Wind Facility 2 (Pty) Ltd	300MW	60

Phase 3	Klipkraal Wind Facility 3 (Pty) Ltd	300MW	60
Phase 4	Klipkraal Wind Facility 4 (Pty) Ltd	300MW	60
Phase 5	Klipkraal Wind Facility 5 (Pty) Ltd	300MW	60

7 POTENTIAL VISUAL IMPACT

The extent of the visual impact of the project will depend on the following characteristics of the receiving environment:

Topography

Topography describes the landform that gives rise the physical setting.

Vegetation Cover

Vegetation refers to the vegetation cover in terms of visual diversity and not in terms of botanical characteristics.

Land Use*

Land use is described in terms of the visual mix of land uses that is a function of land diversity and character.

Visibility

Visibility is described in terms of the areas that theoretically have direct line of sight in relation to distance the viewer is away from the object. Critical affected views are also described.

Landscape Diversity

Landscape diversity is a function of topography, vegetation and land use. The greater the diversity, the greater is the potential for the proposed development to blend with the surrounding landscape.

Landscape Character

The spirit, or sense of place, is that quality imparted by the aspects of scale, colour, texture, landform, enclosure, and in particular, the land use. According to K. Lynch (1992) ‘it is the extent to which a person can recognise or recall a place as being distinct from other places as having a vivid, or unique, or at least a particular character of its own’.

The quality of *Genius Loci* is a function of attributes such as the scenic beauty or uniqueness and distinctive character of the built and cultural landscape.

Visual Quality

The visual quality is the visual significance given to a landscape determined by cultural values and the landscape’s intrinsic physical properties (Smardon, *et al*, 1986). While many factors contribute to a landscape’s visual quality, they can ultimately be grouped under three headings: vividness, intactness and unity.

The visual quality can be categorised under relative headings such as high, medium and low visual quality for the study area. High refers to those areas that have a high aesthetic appeal such as mountains, river valleys, unspoilt coastal zones, and wilderness areas. The medium areas are those that have high visual diversity, but which have already been modified by human activity comprising the aesthetic appeal such as roads, minor infrastructure and settlements. The low visual quality areas are those that are relatively highly populated, and which have been heavily impacted on by human activity such as industrial and mining areas or which have a low aesthetic appeal due to a lack of landscape diversity or interest.

The study area focuses on a 50 km radius around each of the project components.

7.1 Visibility

The visibility is dependent on the topography. The existing topography is very flat which does not assist in limiting the views. Visibility of the structures, due to the tall and imposing scale of the turbines, will be continuous and uninterrupted to beyond 40-50 km. It is considered that beyond 50 km views of the development, though still visible are considered insignificant in the landscape due to the exponential diminishing effect of distance.

In a study sponsored by the United States Department of the Interior Bureau of Land Management, 377 observations of five wind facilities in Wyoming and Colorado were made under various lighting and weather conditions. The facilities were found to be visible to the unaided eye at >58 km under optimal viewing conditions, with turbine blade movement often visible at 39 km. Under favourable viewing conditions, the wind facilities were judged to be major foci of visual attention at up to 19 km (12 mi) and likely to be noticed by casual observers at >37 km. A conservative interpretation suggests that for such facilities, an appropriate radius for visual impact analyses would be 48 km that the facilities would be unlikely to be missed by casual observers at up to 32 km, and that the facilities could be major sources of visual contrast at up to 16 km (Sullivan, *et. al*, 2011).

The critical views are from those visual receptors that are most impacted by the visual intrusion of the proposed development. These would include users of public roads, towns, villages, game farms and lodges, settlements as well as farmsteads in the nearby vicinity.

Although not all homesteads are occupied fulltime, (see dots on **Figure 3: Visual Receptors**) many of these will be in direct line of sight and within the 0-5 km zone where the magnitude of impact could be high. Other sensitive receptors include Fraserburg, the Karoo National Park, travellers on the main roads such as the R353, R356 and the R61, activities and institutions that rely on the aesthetic environment such as game farms, national parks, lodges, guesthouses as well as hunting and or photographic safari operations.

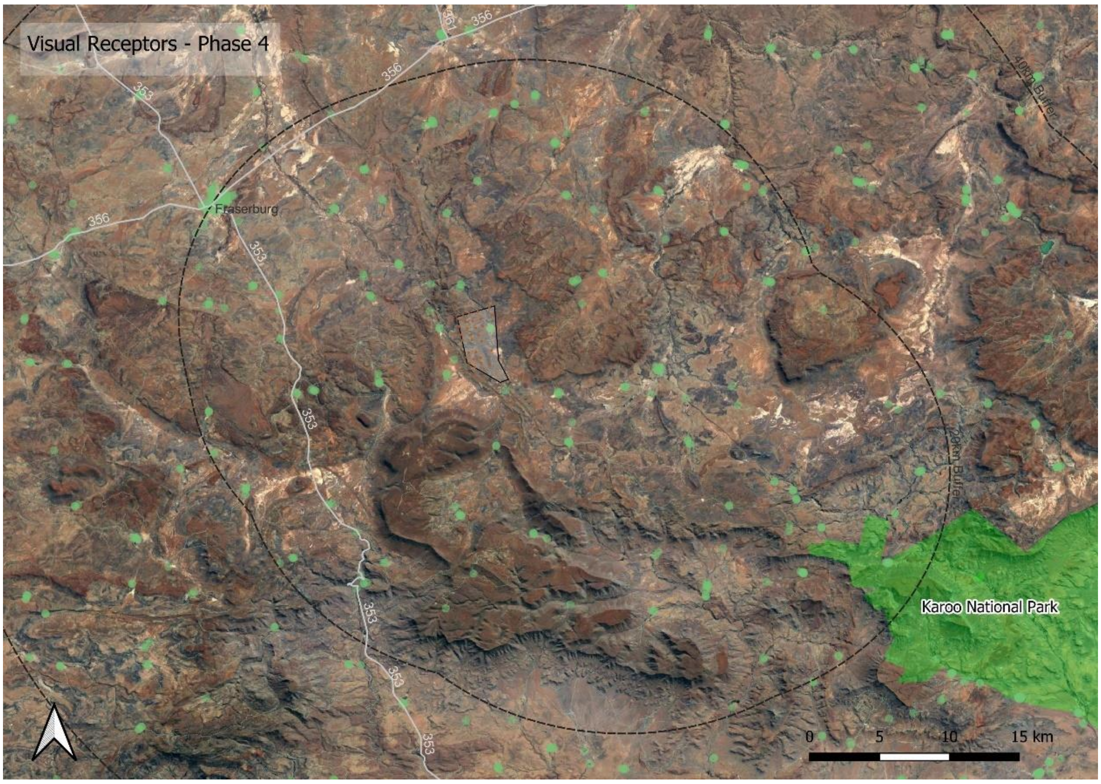

Figure 3: Visual Receptors

Farmsteads and other housing in close proximity to the wind turbines could experience the effect of flicker. A wind turbine’s moving blades can cast a moving shadow on locations within a certain distance of a turbine. These moving shadows are called shadow flicker and can be a temporary phenomenon experienced by people at nearby residences or public gathering places. The impact area depends on the time of year and day (which determines the sun's azimuth and altitude angles) and the wind turbine's physical characteristics (height, rotor diameter, blade width, and orientation of the rotor blades). Shadow flicker generally occurs during low angle sunlight conditions, typically during sunrise and sunset times of the day. However, when the sun angle gets very low (less than 3 degrees), the light has to pass through more atmosphere and becomes too diffused to form a coherent shadow. Shadow flicker will not occur when the sun is obscured by clouds or fog, at night, or when the source turbine(s) are not operating. (Green Rhino Energy). Not only can shadow flicker be a nuisance to nearby residents but, it has been suggested, could aggravate medical problems such as migraine and epilepsy.

Shadow flicker intensity is defined as the difference in brightness at a given location in the presence and absence of a shadow. Shadow flicker intensity diminishes with greater receptor-to-turbine separation distance. Shadow flicker intensity for receptor-to-turbine distances beyond 1,500 meters is very low and generally considered imperceptible. Shadow flicker intensity for receptor-to-turbine distances between 1,000 and 1,500 meters is also low and considered barely noticeable. At this distance shadow flicker intensity would only tend to be noticed under conditions that would enhance the intensity difference, such as observing from a dark room with a single window directly facing the turbine casting the shadow during sunny conditions. At distances less than 1,000 meters, shadow flicker may be more noticeable. In general, the largest number of shadow flicker hours, along with greatest shadow flicker intensity, occurs nearest the wind turbines (Green Rhino Energy).

A shadow flicker analysis calculates for each point of interest, in this case for each turbine:

- Number of hours per year that the flickering occurs,
- Maximum length (in minutes) that flickering occurs on the worst day in the year, and
- Number of days in the year that shadow flickering appears at all.

All the above are calculated for both the worst case.

Following German regulation, shadow flickering cannot be perceived by the human eye if the angle of the sun over the horizon is less than 3°. Plus, the blades of the turbines must cover at least 20% of the sun.

While guidelines differ, the ones in Germany are most widely adopted. Accordingly, the maximum impact allowed by shadow flickering is:

- 30 hours per annum of flickering in the worst case
- 30 minutes maximum on the worst day in the year

The shadow flicker exercise will need to be done for each of the turbine towers. The area of flicker influence is determined by the areas receiving 30 or more hours of flickering

Landscape receptors are physical areas that are regarded as visually interesting and which provide sense of place, such as the typical Karoo ambience, to that area. These receptors include rivers and drainage ways, mountains, ridges, vegetation, and any other interesting features (**See Figure 4: Landscape Receptors**).

The turbine towers, due to the open and flat topography and lack of screening vegetation, are likely to be visible beyond the 50 km zone in the northwest, north, east and south-east. This is a result of the topography being relatively flat in these directions. Minor hills and mountains could assist in screening the visibility. Views to the south and southwest would be truncated at the edge of the escarpment

The Karoo is renowned and highly valued for its dark night skies. It is a requirement by Civil Aviation that a red hazard flashing navigation light be installed on top of each turbine. These lights can be seen over extended distances of at least 40 km and when viewed against a dark sky they become very visible.

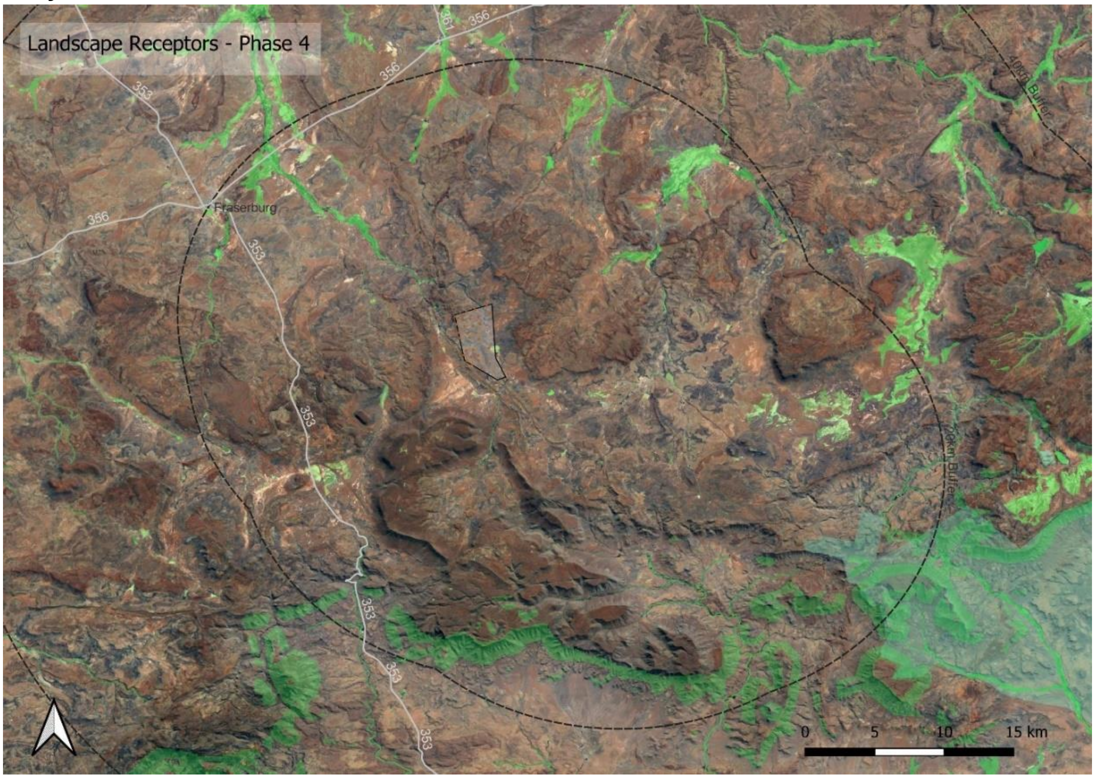

Figure 4: Landscape Receptors

7.2 Landscape Diversity

Landscape diversity within the study area is primarily based on the topographical features as well the vegetation, namely the Karoo veld and the existing land uses. The greater the diversity, the greater is the potential for the proposed development to blend with the surrounding landscape.

The study area's landscape varies from relatively flat to rolling with low ridges. The area is located on top of a rather featureless plateau which drops down over the edge to the south. The landscape is covered with low growing and sparse vegetation (see Photos 1 and 2). The current land-use is primarily small stock grazing. The peripheral visual boundaries to the north and east are truncated by low ridges. The peripheral visual boundary to the south and west is relatively undistinguished. The area appears to be sparsely populated, which was borne out during the site visit. The study area is not regarded as having a high visual quality when compared to other areas in the region such as the Swartberg Mountains, Meiringspoort and the mountains around Beaufort West and the Karoo National Park but it does display the typical and iconic Karoo landscape.

Photo 1: Typical sparse and open Karoo landscape

Photo 2 Typical sparse and open Karoo landscape

However, the very nature of the vegetation in this area (Western Upper Karoo, Eastern Upper Karoo and Roggeveld Shale Renosterveld **(Figure 5: Vegetation**) is low growing and visually uniform which does not provide much visual screening. Although the vegetation is not overly sensitive to the development it does not assist in reducing the visual expose of the turbines. The vegetation is typical of the Karoo ambience, and it is this together with the topography which provides the Karoo sense of place.

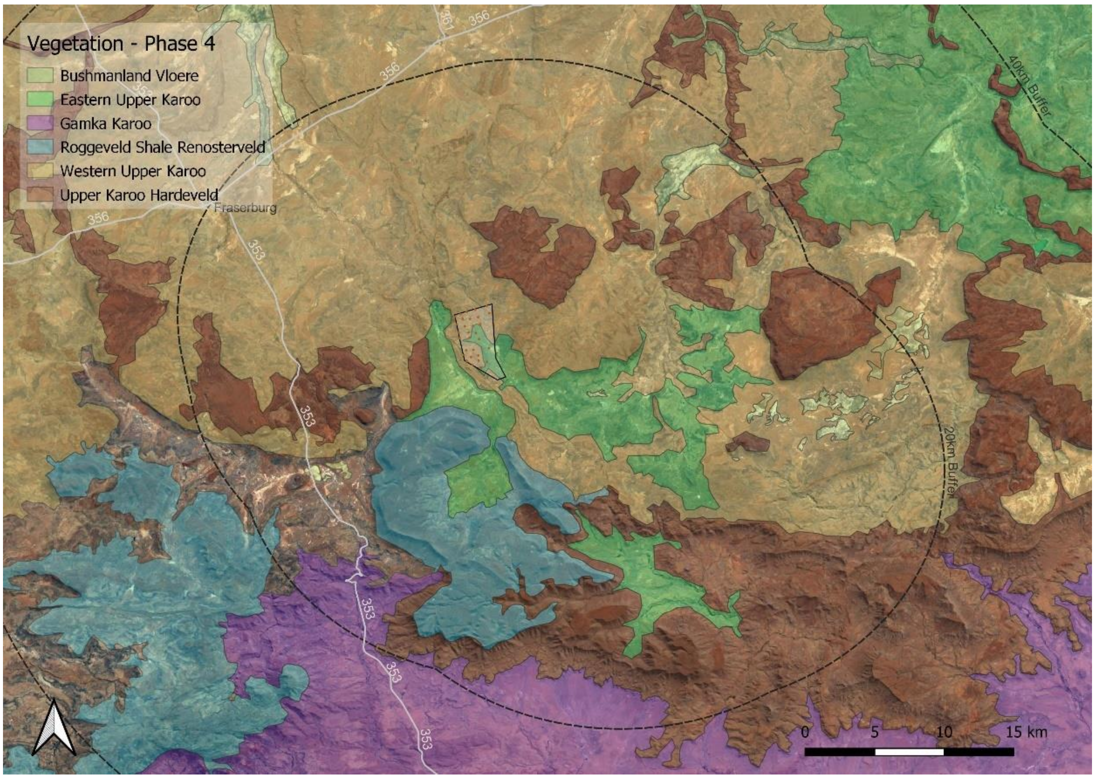

Figure 5: Vegetation

The existing land-use does not add to the diversity of the area being mainly low-density small stock farming. Low hills and shallow drainage ways occur. The tallest structures in the area are power lines and wind pumps. The area exhibits a low visual diversity.

The higher the visual diversity, the greater is the opportunity to visually blend the project with the environment as these will more readily accept visual change or any structure placed within them. The higher the diversity, the higher the Visual Absorption Capacity (VAC) or the ability of the environment to accept visual change.

The low visual diversity of area will result in a low VAC and will in turn result in any large scale or tall structure to be highly visible due to the lack of screening and the high visual contrast. The surrounding hills and mountains on the visual periphery contain the views and terminate the views

7.3 Landscape Quality and Character

The spirit, or sense of place, is that quality imparted by the aspects of scale, colour, texture, landform, enclosure, and in particular, the land use. According to K. Lynch (1992) ‘it is the extent to which a person can recognise or recall a place as being distinct from other places as having a vivid, or unique, or at least a particular character of its own’.

The quality of *Genius Loci* is a function of attributes such as the scenic beauty or uniqueness and distinctive character of the built and cultural landscape.

The *Genius Loci* or sense of place of the study area is typical Nama Karoo with its low arid bushes, wide open landscape and the sheep and goat farming. The only tall structures in the area are the odd wind pump and transmission lines. The sense of place of the rural and natural ambience and character of the setting will be changed by the high visual prominence of the turbines.

The visual quality can be categorised as low visual quality for the study area. The low visual quality is based on the lack of visual diversity as a result of the uniformity of the vegetation which lack specific interest, and the surrounding flat and open landscape.

7.4 Confirmation or Dispute of the Current use of the Land and the Environmental Sensitivity

The Screening Tool report provided a **Flicker Theme Sensitivity** map that showed areas of low sensitivity and very high sensitivity, which specifically relate to areas with “potential temporarily or permanently inhabited residence”. This coincided with the information obtained from Google Earth in terms of homesteads and structures. However, several of the homesteads appeared to be unoccupied or even abandoned. If this is the case the issue regarding flicker would not be applicable to all these dwellings. The Screening tool indicates the Flicker effect to be of low sensitivity for potential temporary or permanently inhabited residences.

The Screening Tool also contains a map of **Relative Landscape Theme Sensitivity** as it relates to wind developments. The map shows that the proposed site intersects with the areas having very high sensitivity.

These relative landscape themes do not relate specifically to the visual impact except for the more aesthetically pleasing mountain tops and high ridges as well as rivers and wetlands. The flatter slopes and the low vegetation increase the visual sensitivity of the area. The mountains are experienced below the plateau on the visual periphery and are generally not visible form the study area.

The Screening Tool indicated that the **Plant Theme Sensitivity** was low sensitivity. However, the very nature of the vegetation in this area (Western Upper Karoo, Eastern Upper Karoo and Roggeveld Shale Renosterveld is low growing and visually uniform which does not provide much visual screening. Although the vegetation is not overly sensitive to the development it does not assist in reducing the visual expose of the turbines. The vegetation is typical of the Karoo ambience, and it is this together with the topography which provides the Karoo sense of place.

8 IDENTIFICATION OF POTENTIAL RISK SOURCES

Various risk sources for the visual impact have been identified for the construction and operation phases and can be classified as both negative and positive. The following general risks are associates with the visual intrusion in the landscape.

8.1 Risk Sources

8.1.1 Construction Phase

It is anticipated that the major risk source during construction would be:

Negative Risk Sources

- Excessive clearing and stripping of topsoil for preparing the area for the development,
- Edge shaping and embankment landscape stabilisation of the platforms not done or unsuccessful.
- The relatively random and disorganised lay down of building materials, vehicles and offices.
- The extent and intensity of the security and construction lighting at night.
- Dust from construction activities.
- Open and un-rehabilitated landscape scarring; and
- High seed bank of alien species in the topsoil can lead to the uncontrolled spread of exotic invader plant species. This could create a vegetated area that is visually contrary to the surrounding landscape.

Positive Risk Sources

- Image of construction activity could lead to a perceived view of progress and benefit to the community.

8.1.2 Operational Phase

It is anticipated that the major risk source during operation would be:

Negative Risk Sources

- Areas and /or specific sites of aesthetic value may be disfigured by the introduction of a wind farm within the viewshed resulting in a permanent change to the existing visual quality of visually sensitive areas.
- Constant disruption of rural night ambience by red warning flashing lights.

- The compromising of views from or the alteration of the ambience of natural areas.
- Edges may not blend in with the landscape or cut slopes may be too steep to be adequately re-vegetated.
- Need to keep certain areas such as road reserves, platform edges etc. clear of vegetation which will result in visual scarring.

Positive Risk Sources

- The development could be the visual affirmation of progress and prosperity for the region. Localised visual perceptions of the economically depressed communities of the population have not been tested as these may be influenced rather by the economic and job opportunities that could exist rather than the direct visual perception of the project.

9 POTENTIAL VISUAL IMPACT

9.1 Review input on the preferred infrastructure locations

As with most WEF's the opportunity to alter turbine positions is limited as positions these are based on topography, wind conditions and other technical considerations. Those turbines that are closest to homesteads and other sensitive visual receptors and which are within the accepted restriction zone[1] of 0-5 km would potentially have to be omitted or the layout design revised to accommodate these homesteads due to the potential high significant impact. Homesteads within a 2 km zone could be subjected to the effects of visual flicker

9.2 Description of the potential direct, indirect and cumulative impacts that will require further assessment in the EIA Phase.

Direct impacts that need to be considered are the impacts on sensitive receptors such as towns, homesteads, tourists and those establishments that rely on the natural aesthetics of the environment such as conservation area, national parks, guest houses and B&B's as well as hunting and or photographic safari operations.

The Karoo is renowned and highly valued for its dark night skies. It is a requirement by Civil Aviation that a red hazard flashing navigation light be installed on top of each turbine. These lights can be seen over extended distances of at least 40km and when viewed against a dark sky they become very visible. To minimise this visual intrusion, the use of AVWS (Audio Visual Warning System) technology should be investigated. AVWS is a radar-based obstacle avoidance system that activates obstruction lighting and audio signals only when an aircraft is in close proximity to an obstruction on which an AVWS unit is mounted, such as a wind turbine. The obstruction lights and audio warnings are inactive when aircraft are not in proximity to the obstruction. BML 2013[2]

Cumulative visual impacts may arise where more than one wind turbine development is visible from the same point. There are several renewable energy generation facilities approved and in the planning stages in the area as indicated in **Figure 6** below. However, these are at least 70km or more and beyond a distance where they are visible.

[1] Cave S, 2013. Wind Turbines Planning and Separation Planning Distances, Northern Ireland Assembly: Research and Information Service Research paper
Shadow flicker could have an impact on nearby homesteads. Turbines should be sited in such a way as to eliminate the effect by using flicker determination software for calculations. If the turbines cannot re-position, then they should not operate during the short timeframe when the effect is a concern.

2 United States Department of the Interior. 2013. Best Management Practices for Reducing Visual Impacts of Renewable Energy Facilities on BLM-Administered Lands. Bureau of Land Management. Cheyenne, Wyoming. 342 pp, First Edition 2013

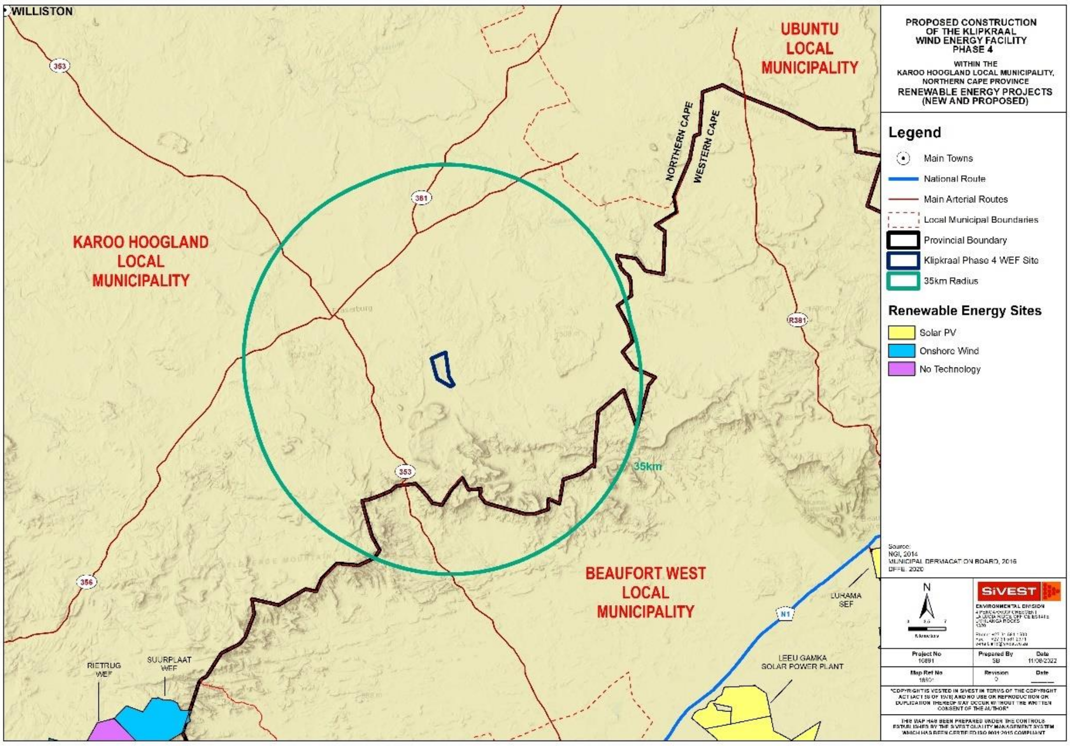

Figure 6: Regional EA Applications for Renewable Energy Projects Located Within a 35 km Radius from the Proposed WEFs Study Area

Table 4: Klipkraal2 WEF High Level Impact Table - Visual

Impact	***Impact Criteria***		***Significance and Ranking (Pre-mitigation)***	***Potential mitigation measures***	***Significance and Ranking (Post-mitigation)***	***Confidence Level***
VISUAL						
DIRECT – CONSTRUCTION PHASE						
Visual intrusion and potential flicker effect by wind turbines and associated structures and infrastructure on visual receptors	***Status***	***Negative***	Very low (5)	• Site turbines at least 2 km from any occupied homestead or hospitality/tourism facility, where possible	*Very low (5)*	*High*
	Spatial Extent	***Local***				
	Duration	***Short Term***				
	Consequence	***Moderate***				
	Probability	***Extremely Unlikely***				
	Reversibility	***High***				
	Irreplaceability	***Replaceable***				
Visual intrusion by wind turbines and associated structures and infrastructure on visual and landscape receptors	***Status***	***Negative***	Low (4)	• Limit area of disturbance for turbine footprint, access roads and construction camp or sites • Suppress dust during construction • Site turbines at least 2 km from any occupied homestead hospitality/tourism facility, where possible • Mitigation will already have been implemented by the placement of turbines	*Low (4)*	*High*
	Spatial Extent	***Regional***				
	Duration	***Short Term***				
	Consequence	***Moderate***				
	Probability	***Likely***				
	Reversibility	***High***				
	Irreplaceability	***Replaceable***				

				according to distance from visual receptors • Limit area of disturbance for access roads, substations and construction camp sites • Locate construction camps and all related facilities such as stockpiles, lay-down areas, batching plants in areas already impacted such as existing farmyards or in unobtrusive locations away from the main visual receptors. • Limit access tracks for construction and maintenance vehicles to existing roads where possible. Once established do not allow random access through the veld • Suppress dust during construction. • Blend edges of road and platforms with surrounding landscape • Rehabilitate exposed disturbed areas • Avoid vegetation stripping in straight lines but rather non-geometric shapes that blend with the landscape • Limit need for security lighting • Use non-reflective materials • Paint all other project infrastructure elements		

				such as operational buildings, support poles etc. a dark colour • Avoid bright colour/patterns and logos		
Visual intrusion by Access Road, Substations and Associated structures and infrastructure on visual and landscape receptors	***Status***	***Negative***	Low (4)	• Limit area of disturbance for access roads, substations and construction camp sites • Locate construction camps and all related facilities such as stockpiles, lay-down areas, batching plants in areas already impacted such as existing farmyards or in unobtrusive locations away from the main visual receptors. • Limit access tracks for construction and maintenance vehicles to existing roads where possible. Once established do not allow random access through the veld • Suppress dust during construction. • Blend edges of road and platforms with surrounding landscape • Rehabilitate exposed disturbed areas • Avoid vegetation stripping in straight lines but rather non-geometric shapes that blend with the landscape • Limit need for security lighting	*Low (4)*	*Hig h*
	Spatial Extent	***Local***				
	Duration	***Short Term***				
	Consequence	***Moderate***				
	Probability	***Likely***				
	Reversibility	***High***				
	Irreplaceability	***Replaceable***				

				• Use non-reflective materials • Paint all other project infrastructure elements such as operational buildings, support poles etc. a dark colour • Avoid bright colour/patterns and logos		
DIRECT – OPERATIONAL PHASE						
Visual intrusion and potential flicker effect by wind turbines and associated structures and infrastructure on visual receptors	***Status*** ***Spatial Extent*** ***Duration*** ***Consequence*** ***Probability*** ***Reversibility*** ***Irreplaceability***	***Negative*** ***Local*** ***Long term*** ***Substantial*** ***Likely*** ***High*** ***Replaceable***	Moderate (3)	• Mitigation will already have been implemented by the placement of turbines according to distance from visual receptors • Manage need for top of turbine red hazard lighting to only when a plane enters the affected airspace rather than be permanently lit • Limit need for security lighting	*Low (4)*	*High*
Visual intrusion by wind turbines and associated structures and infrastructure on landscape receptors	***Status*** ***Spatial Extent*** ***Duration*** ***Consequence*** ***Probability*** ***Reversibility*** ***Irreplaceability***	***Negative*** ***Regional*** ***Long term*** ***Substantial*** ***Likely*** ***High*** ***Replaceable***	Moderate (3)	• Mitigation will already have been implemented by the placement of turbines according to distance from visual receptors • Limit need for security lighting • Use non-reflective materials • Paint all other project infrastructure elements such as operational buildings, support poles etc. a dark colour • Avoid bright colour/patterns and logos	*Moderate (3)*	*High*

Visual intrusion by Access Road, Substations and Associated structures and infrastructure on visual and landscape receptors	***Status***	***Negative***	Moderate (3	• Maintain rehabilitated disturbed areas	*Moderate (3)*	*High*
	Spatial Extent	***Local***				
	Duration	***Long term***				
	Consequence	***Moderate***				
	Probability	***Likely***				
	Reversibility	***High***				
	Irreplaceability	***Replaceable***				
DIRECT – DECOMMISSIONING PHASE						
Visual intrusion and potential flicker effect by wind turbines and associated structures and infrastructure on visual receptors Visual intrusion by wind turbines and associated structures and infrastructure on visual and landscape receptors	***Status***	***Neutral***	Low (4)	• Remove all project components from site • Rip all compacted hard surfaces such as platforms, words areas, access and service roads etc. and reshape to blend with the surrounding landscape • Rehabilitate/revegetate all disturbed areas to visually the original state by shaping and planting	*Very low (5)*	*High*
	Spatial Extent	***Local***				
	Duration	***Medium term***				
	Consequence	***Moderate***				
	Probability	***Likely***				
	Reversibility	***High***				
	Irreplaceability	***Replaceable***				

Visual intrusion by Access Road, Substations and Associated structures and infrastructure on visual and landscape receptors						

10 APPLICABLE LEGISLATION

There are no specific legal requirements nor is there any direct reference to the visual environment in the legislation. General legislation pertaining to the environment is contained in the National Environmental Management Act (NEMA) (Act No. 107 of 1998) as well as the National Heritage Resources Act No. 25, 1999 and the associated provincial regulations provide legislative protection for listed or proclaimed site, such as urban conservation areas, nature reserves and proclaimed scenic routes.

The National Environmental Management Principles as contained in NEMA require that sustainable developments require the following considerations (amongst others):

2(4)(ii) that pollution and degradation of the environment are avoided, or, that where they cannot be altogether avoided, are minimised and remedied; and

2(4)(iii) that the disturbance of landscapes and sites that constitute the nation's cultural heritage is avoided, or where it cannot be altogether avoided, is minimised and remedied.

The National Heritage Resources Act refers, under Part 1 General Principles, to the National Estate:

3.(2)(d) Landscapes and natural features of cultural significance

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

The Protected Areas Act (NEMA) (Act 57 of 2003, Section 17) is also intended to protect natural landscapes

The Western Cape DEA&DP have produced 'A Guideline for Involving Visual and Aesthetic Specialists in EIA Processes'

11 CONCLUSIONS

The impact assessment was undertaken for only the main components of the project i.e., wind turbines and substations. The study excluded ancillary components such as borrow pits, quarries, lay-down areas and construction camps. This study evaluated the visual impact of the project with a view to assessing its severity based on the author's experience, expert opinion and accepted techniques.

The description of the visual impacts of the phases of construction and decommissioning are not considered as significant visual impacts since the period of activity is of relatively short duration and of a primary impact (localized, of short duration and easily mitigated at the end of the phase). The fact that disturbed areas, e.g. camps / lay-down areas will be rehabilitated also reduces the impacts of these phases.

It is the operational phase that presents the most significant long term visual impact. This is due primarily to the scale and form of the proposed development. Visibility reduces exponentially the further the viewer is from the proposed development.

The project will exert a **negative** influence on the visual environment. This is largely due to the:

- high visibility of the wind turbines which can be at least 200 m high, within the study area.
- the high visibility of construction and operation activity within the low growing, uniform open Karoo veld of uniform visual pattern.
- the low VAC of the area due to the low and uniform visual pattern of vegetation which does not allow for the project to be visually accommodated within the landscape as a result of the high visual contrast and absent screening.
- the scale of the project in a rural setting.
- the introduction of an extensive project within a rural setting that will be brightly lit by security lighting including red flashing aviation warning/hazard lights on the top of the turbines throughout the night.

However, due to the low relative visual quality of the area the overall significance of the visual impact is regarded as **Moderate.**

Based on the field observations and the studies herein and with the implementation of the mitigation measures, it is the Visual Specialist’s opinion the visual impact of the wind farm layout does not present a potential fatal flaw provided that the recommended mitigation measures are implemented

12 APPENDICES

11.1 Appendix A- Specialist Expertise

MENNO KLAPWIJK

LANDSCAPE ARCHITECT AND ENVIRONMENTAL PLANNER

PRESENT POSITION IN FIRM:	Principal – Bapela Cave Klapwijk
TELEPHONE NO	0832558127
WEBSITE	www.bck.co.za
ADDRESS	891 Jan Shoba Street Brooklyn Pretoria 0181
DATE OF BIRTH:	9 June 1954
NATIONALITY:	South African born in Johannesburg
LANGUAGE:	Mother Tongue: English Others: Afrikaans
ACADEMIC QUALIFICATIONS:	1983 : B.Sc. (Landscape Architecture) Texas A&M University, USA. 1986 : Environmental Impact Assessment, Graduate School of Business, University of Cape Town.
PROFESSIONAL QUALIFICATION:	Registered Landscape Architect
KEY FIELDS OF EXPERIENCE:	Particular aspects of experience include: • Visual impact assessment.

- Planning and design for conservation areas, natural resource areas, nature reserves and game farms
- Landscape design for parks, corporate headquarters, office and industrial parks, housing developments, hotels, plazas and pedestrian malls.
- Recreation planning.
- Environmental Monitoring and Auditing.
- Site / master planning and development.
- Integrated environmental assessment and planning for existing and future land uses.
- Mining and quarry reclamation and development planning and design.

PROFESSIONAL REGISTRATION AND MEMBERSHIP:	Registered: South African Council for Landscape Architecture (SACLAP) Reg No. 87006 Member: Institute of Landscape Architects of South Africa (ILASA). Member: American Society of Landscape Architects (ASLA). Member: International Association of Impact Assessors (SA) (IAIA-SA).
YEARS OF EXPERIENCE AND CAREER SUMMARY:	Thirty seven years as landscape architect and environmental planner in the United States of America ,Namibia, Botswana, Lesotho, Swaziland, Mozambique, Angola and South Africa 1989 - present: Bapela Cave Klapwijk, Pretoria - Principal 1988 - 1989: Plan Associates, Pretoria – Associate, Senior Landscape Architect. 1983 - 1988: Chris Mulder Associates Inc., Pretoria - Senior Landscape Architect..1982 - 1983: Austin and Landphair (SHWC), Landscape Architects, College Station, Texas.
ADVISORY P**OSITIONS:**	Executive Central Council Member (Institute of Landscape Architects of South Africa) (1986-1991).

Elected member of the Board of Control for Landscape Architects of South Africa (BOCLASA now SACLAP)

City Council of Pretoria, ILASA representative on CCP Town Planning and Aesthetics Committee (1987 - 2001).

External Examiner, Department of Landscape Architecture, University of Pretoria (1985 - 2016).

CSIR panel of experts to assist in the development of visual impact guidelines for the Western Cape

Council for the Built Environment Council member (June 2010 – June 2014)

Member of Alien and Invasive Species Review Panel 2020-2021

PEER REVIEWER

- VIA Shell Ultra City, Johannesburg for CSIR
- VIA Alpha Cement Factory, Saldanha for Mark Wood Consultants
- VIA Coega IDZ and Harbour, Port Elizabeth for African Environmental Solutions

EDITORIAL BOARDS

- Environmental Planning and Management (EMP) Journal
- Landscape SA Journal

PROFESSIONAL AWARDS AND COMPETITIONS:

2015 • Institute of Landscape Architects of South Africa (ILASA) National Award of Excellence: Category Design: Taung Skull World Heritage Site – Picnic Site

2007 • Institute of Landscape Architects of South Africa (ILASA) National Award of Excellence: Category Environmental Planning: Taung Skull World Heritage Site

2001 • Institute of Landscape Architects of South Africa (ILASA) National Award of Excellence: Category Environmental Planning: Driekoppies Dam

1997 • SAACE Construction World: Olifants-Sand Water Transfer Scheme.

1996 • Premier and National Awards from the Concrete Manufacturer's Association for paving design: Hatfield Plaza.

1995 • EPPIC National Premium Award: Venetia Balance.

• South African Landscape Contractors Institute (SALI). Silver Award: Bentel Abramson Head Office (with Eksklusiewe Tuine).

• South African Landscape Contractors Institute (SALI). Silver Award: AFCOL Head Office (with Eksklusiewe Tuine).

1994 • South African Landscape Contractors Institute (SALI). Gold Award: Hampton Park (with Eksklusiewe Tuine).

• South African Landscape Contractors Institute (SALI). Silver Award: Gilooly's View (with Eksklusiewe Tuine).

1992 • Institute of Landscape Architects of South Africa (ILASA). Commendation: Tourism RSA.

1991 • Institute of Landscape Architects of South Africa. National Award of Merit: Category Environmental Planning: Limpopo (Greefswald) Government Water Scheme for DWAF.

• First place in design competition for the Chris Barnard Health Centre (with H Taljaard Carter and Partners).

1987 • American Society of Landscape Architects. Honour Award: Category Planning and Research: Songimvelo Natural Resource Areas (with CMAI).

1986 • Commendation: Design competition for Bloemfontein Urban River Front.

1983 • Sigma Lambda Alpha Landscape Architecture Academic Honour Society (USA).

• Merit Award for academic excellence, Texas Chapter ASLA.

1982 • Faculty Award, Texas A&M University.

1981 • Faculty Award, University of Pretoria.

1980 • ILASA Student Award, University of Pretoria.

1979 • ILASA Student Award, University of Pretoria.

Appendix B- Specialist Declaration