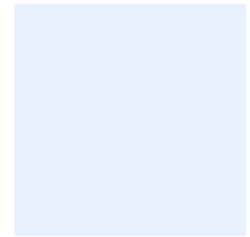


# KARREEBOSCH WIND ENERGY FACILITY: VISUAL SPECIALIST COMMENT FOR THE PART 2 AMENDMENT, FINAL LAYOUT & EMPR APPROVAL PROCESS

Prepared for: WSP Group Africa (Pty) Ltd

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## GLOSSARY OF TERMS

### Definitions

**Anthropogenic feature:** An unnatural feature resulting from human activity.

**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.

**Slope Aspect:** Direction in which a hill or mountain slope faces.

**Study area / Visual assessment zone;** The study area or visual assessment zone is assumed to encompass a zone of 5km from the outer boundary of the proposed Solar PV Facility application site.

**Viewpoint:** A point in the landscape from where a particular project or feature can be viewed.

**Viewshed / Visual Envelope:** The geographical area which is visible from a particular location.

**Visual character:** The pattern of physical elements, landforms and land use characteristics that occur consistently in the landscape to form a distinctive visual quality or character.

**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 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, residents 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.

## ACRONYMS AND ABBREVIATIONS

Acronym / Abbreviation	Definition
BA	Basic Assessment
DBAR	Draft Basic Assessment Report
DEM	Digital Elevation Model
DFFE	Department of Forestry, Fisheries and the Environment
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
EMP	Environmental Management Plan
FBAR	Final Basic Assessment Report
GIS	Geographic Information System
MW	Megawatt
NEMA	National Environmental Management Act
OHP	Overhead powerline
REIPPPP	Renewable Energy Independent Power Producer Procurement Programme
VIA	Visual Impact Assessment
VR	Visual Receptor
WEF	Wind Energy Facility

## Proposed Karreebosch Wind Energy Facility: Visual Specialist Comment

### 1. INTRODUCTION

Karreebosch Wind Farm (RF) (Pty) Ltd, (hereafter referred to as "Karreebosch") was issued with an Environmental Authorisation (EA) for the proposed 140MW Karreebosch Wind Energy Facility (WEF) and its associated infrastructure, near Matjiesfontein in the Western Cape Province on 29 January 2016 (DFFE Reference 14/12/16/3/3/2/807). This authorisation made provision for the construction of a total number of 65 wind turbines, each with a hub height of 100m and a rotor diameter of 140m, and maximum generating capacity of 140MW.

Subsequent to this, the EA has undergone three amendments, the most relevant from a visual perspective being DFFE Reference 14/12/16/3/3/2/807/AM2 dated 15 November 2018 which allowed for:

- Changes to turbine specifications, increasing the hub height to 125m and the rotor diameter to 160m;
- An increase to the height of the wind measuring mast from 120m to 125m; and
- Increasing the individual energy generation capacity of the turbines from a range of between 2MW and 3.3MW to a range of between 2 and 5.5MW;

Electrical infrastructure to serve the Karreebosch WEF is presently being assessed under a separate Basic Assessment (BA) process under review from the Department of Forestry, Fisheries and Environment .

Karreebosch is now proposing amendments to the existing EA as outlined in the table below and SLR Consulting (South Africa) (Pty) Ltd (SLR) has been requested to provide visual specialist comment in respect of the proposed amendments and also to provide visual specialist inputs, where necessary, for the updated EMPr.

**Table 1: Proposed amendments to the Karreebosch EA (DFFE Ref: 14/12/16/3/3/2/807/AM3)**

Aspect to be amended	Authorised	Proposed Amendment
Number of Turbines	Up to 65 with a foundation of 25m in diameter and 4m in depth	Up to 40 turbines with a foundation of 30m in diameter and 5m in depth
Turbine generating capacity	Up to 5.5 MW	up to 7.5 MW in capacity each
Turbine Hub Height	A range up to and including 125m	All turbines up to 140m
Rotor Diameter	A range up to and including 160m	All turbines up to 170m
Blade length	~80m	~85m



Aspect to be amended	Authorised	Proposed Amendment
Area occupied by transformer stations/ substation	<ul style="list-style-type: none"> <li>Two 33/132kV Substation 100m x 200m</li> <li>Extension of the existing 400kV substation at Komsberg</li> <li>Transformer art each turbine: total area &lt;1500m<sup>2</sup> (2 m<sup>2</sup> per turbine up to 10m<sup>2</sup> at some locations)</li> </ul>	<ul style="list-style-type: none"> <li>one 33/132kV substation 150m x 200m (3ha)</li> <li>Extension of the existing 400kV substation at Komsberg</li> <li>Transformer at each turbine: 6m x 3m= 720m<sup>2</sup> total area &lt;0.4ha (up to 10mX10m at some locations)</li> </ul>
Capacity of on-site substation	132kV	33/132kV
Areas occupied by construction camp	300 x 300m = 90 000m <sup>2</sup>	Areas occupied by construction camp and laydown areas up to 14ha
Area occupied by laydown areas	Operation: (70 x 50) x 71 =248 500m <sup>2</sup>	
Areas occupied by buildings	~10 000m <sup>2</sup>	~10 000m <sup>2</sup> and will be located within the construction camp for use during the operational phase
Length of (new) internal access roads	~40 km	~77 km of new internal access roads and up to ~14 km of 4x4 access tracks . ~30km of existing access roads which are 4m wide will be widened by up to 9m.
Width of internal roads	Up to 12m	Internal Access roads up to 12m wide (turns will have a radius of up to 55m) with additional yet associated servitudes/ reserve for above/underground cabling installation and maintenance where needed. 200m wide road corridor along the internal access roads for micro-siting during construction. Internal 4x4 tracks associated with the 33kV and 132kV OHPLs will be up to 4m wide and substation access roads of up to 9m.
Height of fencing	Up to 3m	Up to 4m

## 2. METHODOLOGY

An assessment of the proposed layout changes for the Karreebosch WEF from a visual perspective will involve the tasks as outlined below.

- A review of the original VIA undertaken for the project as well as Visual Specialist inputs in respect of any subsequent amendments;
- An assessment of the proposed new turbine specifications and layout changes in relation to the findings of the original VIA, including:
  - A re-assessment of potential turbine visibility (viewshed) from previously identified receptor locations;
  - An assessment of potential visual sensitivity in relation to the outputs from the National Web Based Environmental Screening Tool, specifically outputs from the Landscape and Flicker Themes.
- Compilation of a Visual Specialist Assessment Report outlining the findings of the assessment and:
  - identifying whether the proposed amendments will result in any additional visual impacts or exacerbate the impacts previously identified in the VIA for this development; and
  - providing additional recommendations or mitigation measures (if necessary) for inclusion in the respective EMPs for these projects.
- Site Sensitivity Verification in accordance with the Assessment Protocols for specialist studies<sup>1</sup>.

## 3. ASSUMPTIONS AND LIMITATIONS

Given the fact that the proposed WEF is within the project area originally assessed for the Karreebosch WEF VIA, it has been assumed that the baseline conditions and receptor locations in the area remain largely unchanged. As such, additional fieldwork was not considered necessary and baseline information for this report is drawn from the previous WEF VIA. Additional information has however been drawn from a recent field investigation undertaken in support of the VIA for the proposed 132kV Karreebosch power line, as well as from a desktop assessment using Google Earth.

## 4. SUMMARY OF PREVIOUS VIA FINDINGS

MetroGIS (Pty) Ltd (hereafter referred to as MetroGIS) undertook a VIA for the proposed 140 megawatt (MW) Karreebosch WEF in July 2015. A second report was compiled by MetroGIS in July 2018, providing visual specialist comment in respect of the proposed amendments to the EA to allow for changes in the turbine dimensions.

In summary, the original VIA described the landscape in the vicinity of the Karreebosch WEF project area as having a harsh, rugged character with vast expanses of natural and undeveloped landscape. Sheep farming is the dominant land use activity and population densities are very low. Built form in much of the area is limited to isolated farmsteads and associated rural infrastructure, although high voltage power lines and the R354 main road form prominent man-made features in the landscape.

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<sup>1</sup> Formally gazetted on 20 March 2020 (GN No. 320)

Overall, the environment is largely untransformed from the natural state and views are mostly wide open and expansive, unimpeded by development.

Considering the height of the turbines, the location of the turbines on elevated land and ridges and the lack of screening vegetation, turbines are expected to be highly visible from significant portions of the surrounding landscape. This factor is confirmed by the viewshed analyses presented in the VIA and reconfirmed in 2022, and the revised viewshed analyses generated in support of the Visual Specialist Amendment report undertaken in July 2018.

#### 4.1 SENSITIVE RECEPTORS

Potentially sensitive receptors identified in the original VIA included local residences / farmsteads and the R354 main road which is a recognised scenic route. No major conservation or protected areas were identified within the study area.

Due to the low density of settlement and the untransformed nature of the environment, the area was found to have a high visual quality that is likely to result in the visual receptors being highly sensitive to any visual disturbance. However, it was noted that the receptors that will experience the highest degree of visual impact are in fact farmsteads located within the Karreebosch WEF project area. This would suggest that the occupants of these farmsteads are involved in the development and as such are less likely to perceive the WEF in a negative light.

It was also noted that turbines would be highly visible from sections of the R354 main, and as this is a recognised scenic route, travellers on this road may perceive the proposed development in negative light.

#### 4.2 IDENTIFIED IMPACTS

In the previous VIA, the assessment and mitigation of impacts involved the following:

- An assessment of the impacts based on a synthesis of criteria for each site, including nature of impact, extent, duration, intensity, probability, reversibility and significance; and
- The formulation of mitigation measures/recommendations with regards to minimizing visual impacts.

#### 4.3 IMPACT RATING

The previous VIA provided impact ratings for the proposed development as outlined below.

##### 4.3.1 Construction Phase

During construction, visual impacts will result from increased numbers of heavy vehicles accessing the site, thus causing a visual nuisance to other road users and land owners in the area. Dust generated by construction work could also result in visual impacts.

The overall significance of these impacts was however rated as Moderate Negative but may be reduced to Minor Negative with mitigation.

### 4.3.2 Operations

The original VIA identifies several potential causes of visual impact during operation as outlined below.

Potential visual impact on users of the R354 and secondary roads in close proximity of the proposed WEF is expected to be of High Negative significance, with few mitigation measures available to reduce the impacts due the terrain and limited visual barriers.

Potential visual impact on the settlements and homesteads within 10km of the proposed WEF is expected to be of High to Moderate Negative significance, with few mitigation measures available to reduce the impacts. However, relatively few settlements and homesteads were identified within 10km of the WEF, and many of these are located within the Karreebosch WEF project area. This would suggest that the occupants of these farmsteads are involved in the development and as such are less likely to perceive the WEF in a negative light.

Potential visual impact on road users and on the settlements and homesteads in the broader region (beyond 10km from the proposed WEF) is expected to be of Moderate Negative significance, with few mitigation measures available to reduce the impacts.

On-site ancillary infrastructure associated with the WEF, including inverters, 33kV overhead power lines, internal access roads and operations buildings will be located within the WEF footprint and may be visible from visual receptors located in close proximity to the project area. Visual impacts could result from visual scarring of the landscape caused by the road network, and other on-site infrastructure could create visual clutter in the landscape. The overall significance of these impacts was rated as Moderate Negative, both before and after mitigation.

Shadow flicker, resulting from the shade cast by a wind turbine and its rotating blades, may impact on any residences in close proximity to the wind turbines. As there are no buildings or sections of road within 480m of a wind turbine, impacts resulting from shadow flicker are anticipated to be negligible.

Operational and security lighting at the WEF may impact on the nightscape, introducing light pollution into an otherwise undisturbed night-time environment. The overall significance of these impacts was however rated as Moderate Negative but may be reduced to Minor Negative with mitigation.

The VIA also highlighted the potential impact of the proposed WEF on the visual character of the Karoo landscape and the sense of place associated with the broader region. When viewed as a single entity, the proposed Karreebosch WEF is only expected to result in Minor Negative impacts. Impacts would be reduced even further due to the remoteness of the WEF and the relatively scarcity of receptors in the area.

When viewed in conjunction with future planned WEF development in the surrounding area however, impacts affecting the sense of place associated with the landscape would increase the level of significance to moderate.

### 4.3.3 Cumulative Impacts

The VIA recognised that there are a number of other existing and proposed renewable energy and electrical infrastructure developments in close proximity to the Karreebosch WEF. During construction and operation, these facilities would inevitably change the visual character of the area and alter the inherent sense of place, thus giving rise to significant cumulative impacts. The overall significance of these impacts was however not assigned a separate significance rating in the VIA.

## 4.4 IMPACT STATEMENT

The VIA concluded that, although anticipated visual impacts on nearby sensitive receptors are high, they are not considered to be fatal flaws for the proposed WEF. Potential visual impacts are largely contained within the Tankwa River sub-catchment and limited sensitive receptors or tourist routes are expected to be affected by the proposed WEF. In addition, anticipated impacts of major significance are generally limited in extent.

It was therefore recommended that the development of the facility with the amendments as proposed be supported, subject to the implementation of the recommended mitigation measures and management programme identified in the VIA.

## 5. SPECIALIST COMMENT

### 5.1 AMENDMENTS TO TURBINE SPECIFICATIONS

The proposed new turbine specifications would allow for a hub height of 140m and a rotor diameter of 170m, resulting in a maximum height at the blade tip of 225m, some 20m higher than the height currently authorised. While an increase in the height of the turbines would increase the visibility of the WEF, a GIS-based visibility analysis has shown that, in this instance the increase in visibility would be marginal and the viewshed would not include any additional receptors. Visual impacts resulting from the larger turbines would be greatest within a 1km to 2km radius, from where the increased height of the structure would be most noticeable. However, all the potentially sensitive receptors identified within 2km of a wind turbine placement are in fact farmsteads located within the Karreebosch WEF project area. As the occupants of these farmsteads are assumed to be involved in the development, they are less likely to perceive the WEF in a negative light. Hence the larger turbines as proposed are not expected to increase the impacts experienced by any of the identified receptors.

In addition, the change in the turbine specifications being proposed for the Karreebosch WEF has allowed for a reduction in the number of turbines required for the facility. Hence, a total of twenty-five (25) turbines have now been removed from the authorised layout depicted in **Figure 1**. This has in turn resulted in a slight reduction in the area from which the turbines will be visible (viewshed). In addition, with fewer turbines in evidence, there will be less visual clutter in the landscape and the cumulative impacts would be slightly reduced.

In light of this, and the limited human habitation and relatively remote location of the proposed Karreebosch WEF, the proposed changes in the turbine specifications are not expected to result in any increased visual impacts on the identified receptors or affect any additional receptors in the surrounding area.

### 5.2 PROPOSED WEF LAYOUT

As part of this amendment application, Specialists are being asked to assess updated aspects of the layout as described in **Table 1** and as shown in **Figure 2**. From a visual perspective, the most significant changes in the layout are as follows:

- A reduction in the number of turbines, resulting in the removal of 25 turbines from the layout; and
- Minor adjustments to the positioning of the remaining 40 turbines;

The proposed updates in the WEF layout as outlined above do not deviate significantly the previous layouts that were fully assessed in the VIA undertaken in July 2015, with further visual comment being provided in July 2018. In addition, it has been established, via desktop assessment using Google Earth imagery, that, although the landscape to the south of Karreebosch WEF is undergoing significant change as a result of the development of the Roggeveld WEF (which has been operational since 2021), there has been little change since 2018 in the baseline characteristics and the number of sensitive receptors across the remainder of the study area. As such, it is not anticipated that the final layout will result in any changes in the significance of the impacts identified in the VIA, nor will it result in any additional visual impacts.

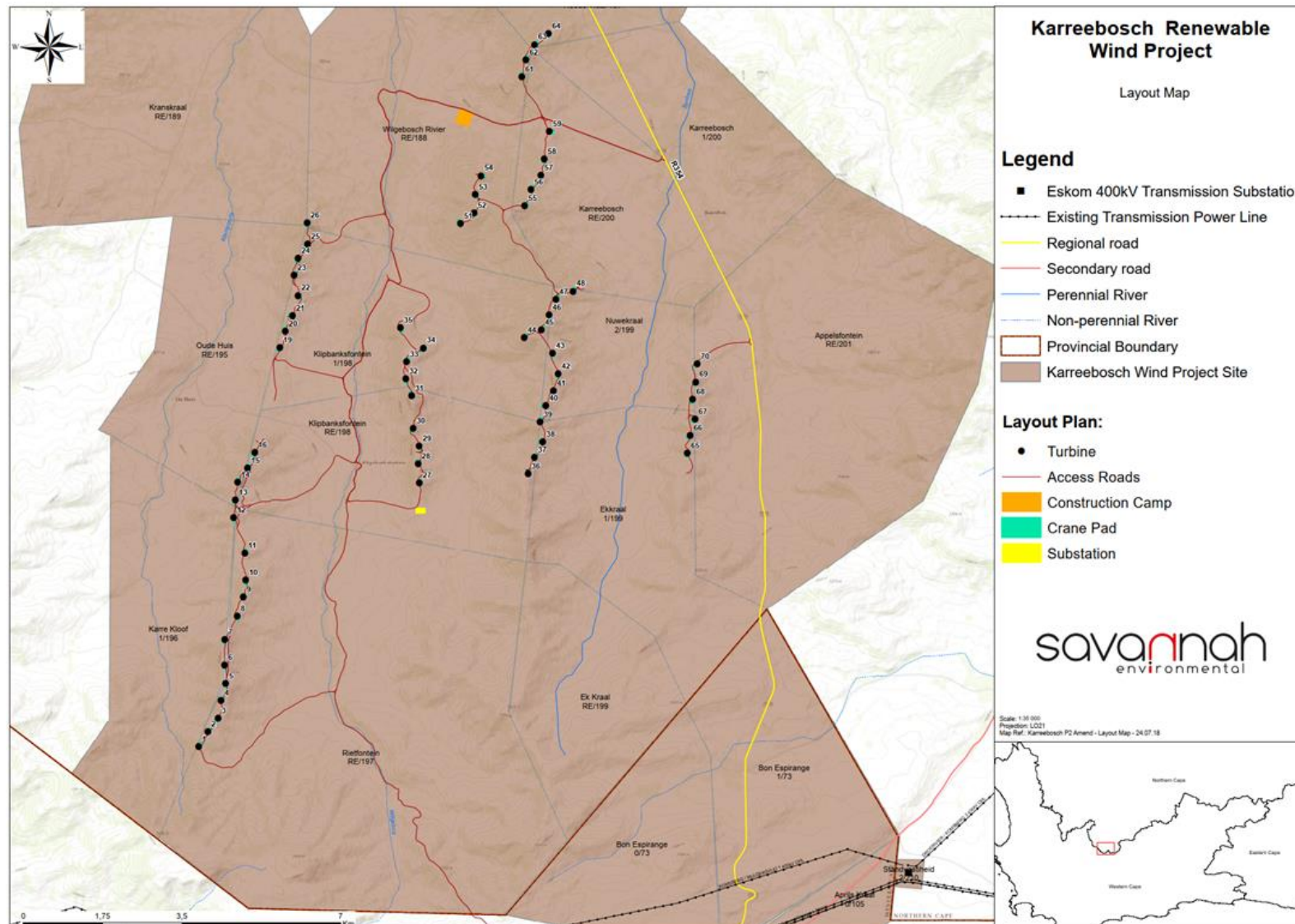


Figure 1: : Karreebosch WEF and associated infrastructure authorised as per the November 2018 Part 2 EA Amendment (Ref: 14/12/16/3/3/2/807/AM2) (source: Savannah Environmental, 2018).

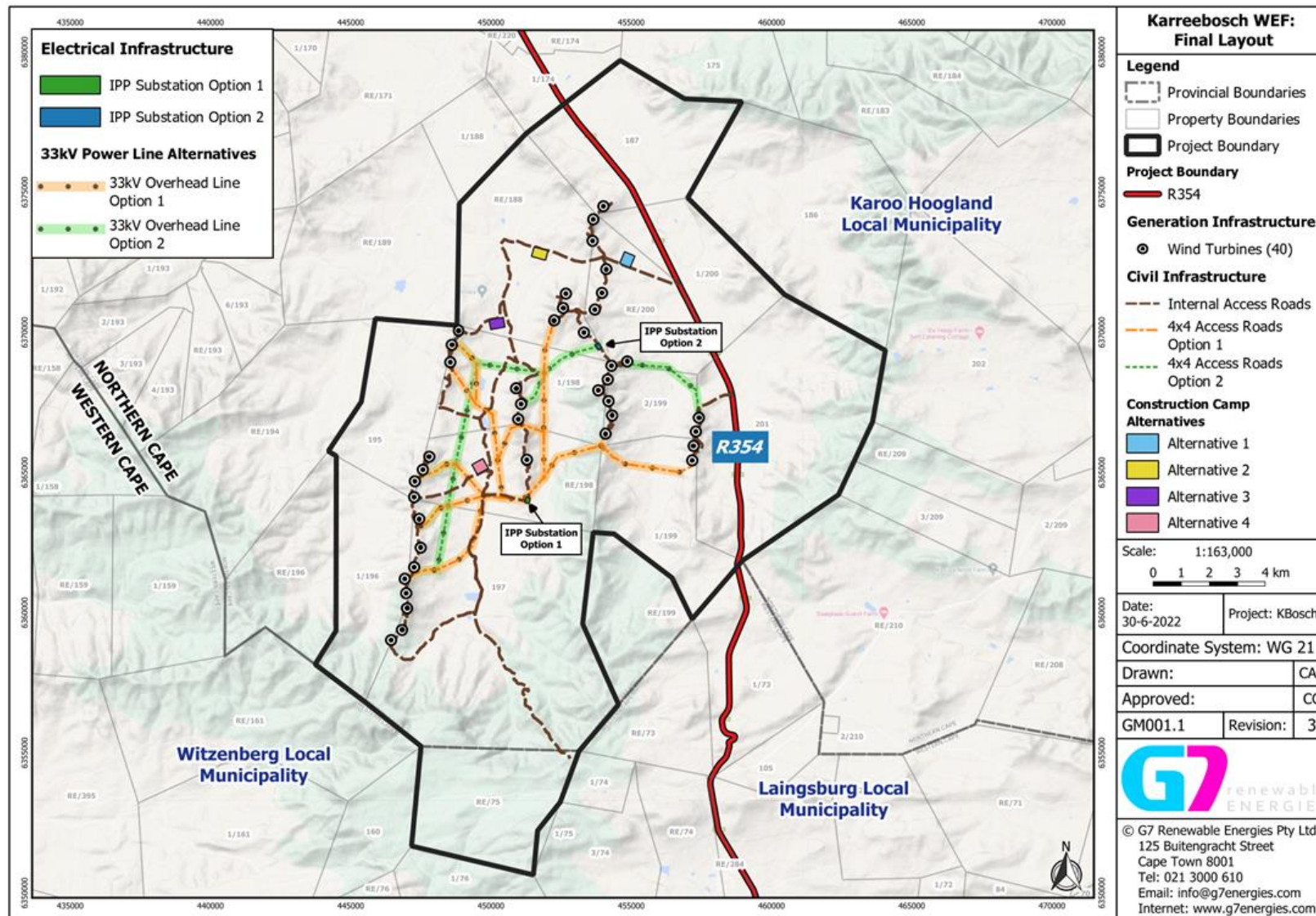


Figure 2: Proposed Final layout of the Karreebosch WEF and associated infrastructure (source: G7, 2022).



### 5.3 SENSITIVITIES IDENTIFIED BY THE NATIONAL WEB-BASED ENVIRONMENTAL SCREENING TOOL

In support of this visual specialist comment, and in accordance with Appendix 6 of the National Environmental Management Act (Act 107 of 1998, as amended) (NEMA) Environmental Impact Assessment (EIA) Regulations of 2014, a site sensitivity verification has been undertaken in order to confirm the current land use and environmental sensitivity of the proposed project area and to assess the sensitivities against the outputs of the National Web-Based Environmental Screening Tool (Screening Tool).

Under the Landscape Theme, as shown in **Figure 3** below, the tool identifies areas of Very High and High sensitivity in respect of WEF development within the Karreebosch WEF project area. According to the Screening Tool, the high sensitivity rating applied to the project area is associated with the presence of natural features such as mountain tops, high ridges and steep slopes. Based on these criteria, a significant portion of the site would be ruled out for WEF development.

The Screening Tool is however a very high level, desktop study and as such the results of the study must be viewed against factors affecting visual impact, such as:

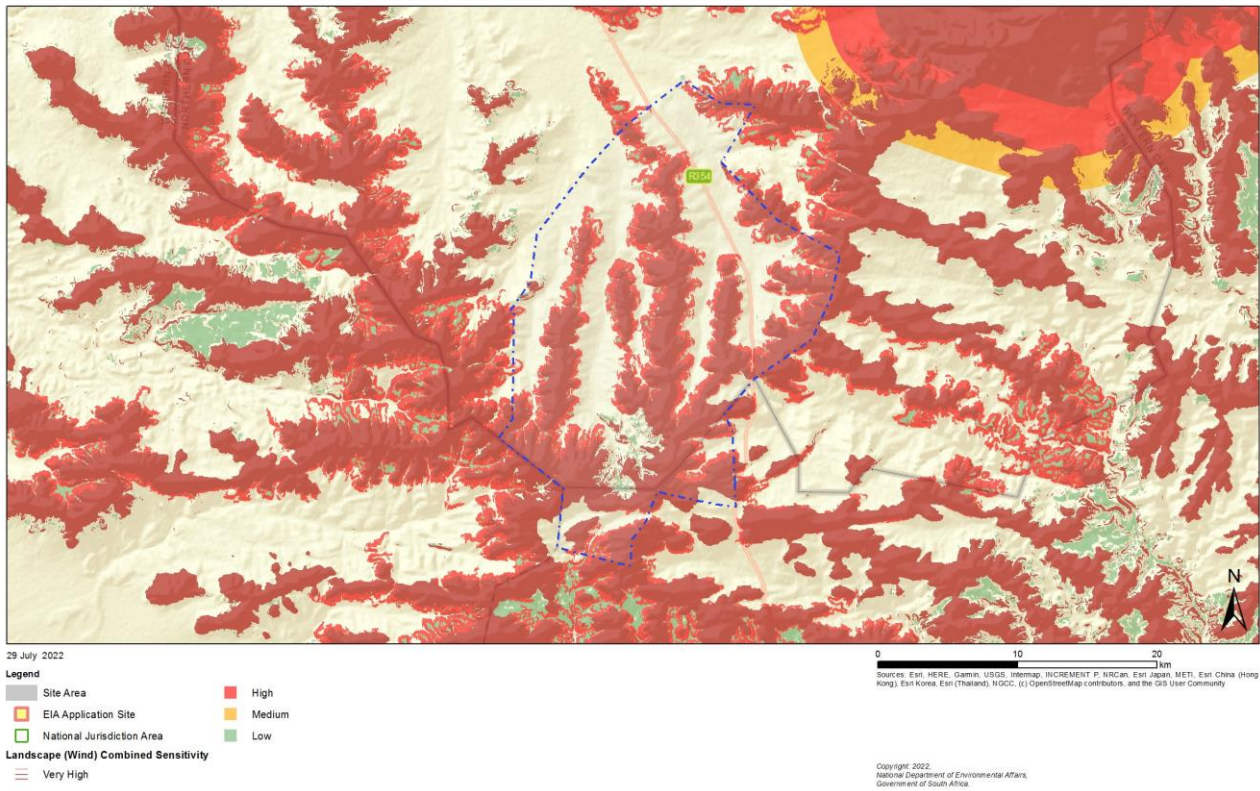
- the presence of visual receptors;
- the distance of those receptors from the proposed development; and
- the likely visibility of the development from the receptor locations.

As most of the turbines are located on these ridges, they will theoretically be visible from a number of visual receptors. In general however, the development is positioned in such a way that, in many cases portions of the turbines will be screened from view by topographic features. In addition, viewing distance must be considered when assessing visual impacts, as beyond a certain distance, even large developments tend to be much less visible, and difficult to differentiate from the surrounding landscape. The visibility of the proposed development from the identified receptors was examined in detail in the original VIA for the Karreebosch WEF. Highest levels of visual impacts will be experienced by receptors within 5km of the nearest wind turbine, although in this instance impacts would be reduced by the fact that these receptors are in fact homesteads located within the project area for Karreebosch WEF. Turbines are also expected to be at least partially visible from sections of the R354 which is a recognised tourism route, although the level of impact would depend on the level of screening provided by the topography, and the distance of the viewer from the nearest turbine. It has been noted that the proposed WEF layout recognises a 1km buffer along the R354 which will, to some degree, reduce the level of impact on travellers using this route.

In addition, the proposed development is located within a designated renewable energy development zone (REDZ), and thus the relevant authorities support the concentration of renewable energy developments and associated transformation in this area.



### Karreebosch WEF: Landscape Sensitivity



**Figure 3: Relative Landscape Sensitivity (July 2022)**

The flicker theme demarcates areas (1 km buffers) of sensitivity around identified receptors in the area (**Figure 4**). Under this theme, several “receptors” have been identified within the Karreebosch WEF project area, and the buffers demarcated around these receptors have been assigned a “very high” sensitivity rating. Based on the findings of the original VIA as well recent field investigations conducted for another VIA in this area, it has been determined that many of the receptors identified by the Screening Tool are not in fact receptors. In addition, potential impacts resulting from shadow flicker were assessed in the previous VIA for the Karreebosch WEF and it was concluded that there are no residences or road sections on the site that are close enough to a wind turbine placement to be affected by flicker impacts.



### Karreebosch WEF: Flicker Sensitivity



Figure 4: Flicker Sensitivity (July 2022)

## 5.4 CUMULATIVE IMPACTS

Although the previous VIA considered a number of other existing and proposed renewable energy and electrical infrastructure developments in close proximity to the Karreebosch WEF, it should be noted that there have been some changes in the status of some of these projects in the interim. Construction has been completed in respect of three of the identified projects, namely Roggeveld, Karusa and Soetwater WEFs, all of which are now operational. Hence the landscape has already undergone noticeable change.

In addition, Rietkloof and Brandvalley WEFs have both been awarded preferred bidder status and one new project in the broader area has been granted EA and awarded preferred bidder status. This project, namely Oya Energy Facility is a combined Wind, Solar PV and Fuel-based Generator Facility (FBGF), located some 25kms south-west of the proposed Karreebosch WEF. Although the different technologies are expected to have different impacts, all renewable energy developments and associated grid connection infrastructure are relevant as they contribute to the alteration of the visual character of the broader area. In this instance however, given the distance from the Karreebosch WEF and the hilly topography in the broader area which limits the visibility of the facility, it is not anticipated that this development will result in any significant increase in the cumulative impacts affecting the landscape or the visual receptors within the assessment area for the Karreebosch project.

Having considered the new information relating to renewable energy developments in the broader area, the overall significance of cumulative impacts remains as High Negative, with few mitigation measures

available to reduce the impacts. As stated however, the proposed development is located within a designated renewable energy development zone (REDZ), and thus the relevant authorities support the concentration of renewable energy developments and associated transformation in this area.

## 6. CONCLUSION

SLR has assessed the previous VIA undertaken in respect of the proposed Karreebosch WEF in conjunction with the proposed changes to the turbine specifications and the updated layout (**Figure 2**). Based on this assessment, it is SLR's opinion that the layout as proposed does not give rise to any additional impacts or exacerbate the impacts previously identified in the VIA for this development. No additional mitigation measures, other than those originally proposed, or specialist input into the EMP are deemed necessary. Given the low level of human habitation and the relative absence of sensitive receptors in the area, the site layout is deemed acceptable from a visual perspective and the amendment to the Environmental Authorisation (EA) should be granted. SLR is of the opinion that the impacts associated with the construction, operation and decommissioning phases can be mitigated to acceptable levels provided the recommended mitigation measures, as outlined in the original VIA, are implemented.

## 7. R

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