Proposed Hoogland Wind Farms and Grid Connection Project

Northern Cluster: Hoogland 1 and Hoogland 2 Wind Farms

Visual Impact Assessment

DFFE Reference:

Prepared by: Quinton Lawson and Bernard Oberholzer

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EXECUTIVE SUMMARY

The current visual assessment is for the two Hoogland North WEF layouts (HL01 and HL02), the layouts having 87 and 80 turbines for HL01 and HL02 respectively. However, the application will be for a maximum of 60 turbines for each wind farm.

There are a number of visual receptors in close proximity to the proposed WEFs, these being mainly farmsteads, and guest accommodation at Donkergat. The proposed turbines are also in proximity to the R381, the main route between Beaufort West and Loxton. The proposed wind farms are located on both sides of the R381 and are adjacent to the proposed Nuweveld North Wind Farm, which could result in these wind farms merging together visually.

The overall visual impact significance for the wind turbines on both the proposed WEFs has been rated as high, before and after mitigation. The visual impact significance for related infrastructure has been rated as medium, and therefore not considered visually intrusive in relative terms.

The cumulative visual impact significance of the two proposed Hoogland WEFs, seen in combination with the proposed Hoogland South WEFs (HL03 and HL04), and the three proposed Nuweveld WEFs, has been rated as high to very high before mitigation, and would reduce to high after mitigation taking into account that only 60 turbines would be developed for each wind farm, and that clustering of the proposed turbines could reduce the potential merging effect of the proposed wind farms.

The layouts of the two WEFs have followed a number of iterations during the Screening and Scoping Phases, based on the various specialist findings, resulting in the layouts avoiding visual 'no-go' areas. Currently, the visual assessment considers the worst-case scenario in terms of the visual impacts associated with the two proposed WEFs.

Where a situation exists that not all the turbines would be required, and all other factors are equal, priority should be given to dropping outlier turbines (that extend the zone of visual influence and detract from the visual cohesion of the proposed WEFs) or those in the 'high' visual sensitivity areas. Similarly, where fewer turbines are required, consideration could be given to omitting turbines in proximity to the R381, and to enhancing the clustering effect.

The layouts of the two proposed Hoogland North WEFs have avoided most of the scenic resources and visual receptors of the area, and provided the recommended mitigation measures are implemented, the wind farms would not present a potential fatal flaw in visual terms. The opinion of the visual specialists is that the project, may therefore be authorised from a visual perspective provided the visual mitigations are implemented.

NATIONAL ENVIRONMENTAL MANAGEMENT ACT, 1998 (ACT NO. 107 OF 1998) AND ENVIRONMENTAL IMPACT REGULATIONS, 2014 (AS AMENDED) - REQUIREMENTS FOR SPECIALIST REPORTS (APPENDIX 6)

Regulation GNR 326 of 4 December 2014, as amended 7 April 2017, Appendix 6	**Section of Report**
1. (1) A specialist report prepared in terms of these Regulations must contain- a) details of- i. the specialist who prepared the report; and ii. the expertise of that specialist to compile a specialist report including a curriculum vitae;	Page iv and v and Appendix A
b) a declaration that the specialist is independent in a form as may be specified by the competent authority;	Page iv and v
c) an indication of the scope of, and the purpose for which, the report was prepared;	Section 2
(cA) an indication of the quality and age of base data used for the specialist report;	Section 2
(cB) a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	Section 7
d) the date and season of the site investigation and the relevance of the season to the outcome of the assessment;	Section 5
e) a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used;	Sections 3, 6, 7
f) details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure, inclusive of a site plan identifying site alternatives;	Section 7
g) an identification of any areas to be avoided, including buffers;	Sections 7, 8 and 9
h) a map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	Appendix C
i) a description of any assumptions made and any uncertainties or gaps in knowledge;	Section 2
j) a description of the findings and potential implications of such findings on the impact of the proposed activity, (including identified alternatives on the environment) or activities;	Section 7
k) any mitigation measures for inclusion in the EMPr;	Section 8
l) any conditions for inclusion in the environmental authorisation;	Section 8
m) any monitoring requirements for inclusion in the EMPr or environmental authorisation;	Section 8
n) a reasoned opinion- i. (as to) whether the proposed activity, activities or portions thereof should be authorised; (iA) regarding the acceptability of the proposed activity or activities; and ii. if the opinion is that the proposed activity, activities or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan;	Section 9
o) a description of any consultation process that was undertaken during the course of preparing the specialist report;	Section 3
p) a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	N/A
q) any other information requested by the competent authority.	N/A
2) Where a government notice *gazetted* by the Minister provides for any protocol or minimum information requirement to be applied to a specialist report, the requirements as indicated in such notice will apply.	N/A

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Abbreviations and Glossary

List of Abbreviations

CAA	Civil Aviation Authority
DFFE	Department of Forestry, Fisheries and Environment
DEM	Digital Elevation Model
EAP	Environmental assessment practitioner
EIA	Environmental Impact Assessment
EMPr	Environmental Management Programme
GN	Government Notice
GPS	Global Positioning System
NEMA	National Environmental Management Act
NFEPA	National Freshwater Ecosystem Priority Areas
O&M	Operations and maintenance
REDZ	Renewable Energy Development Zone
REEA	Renewable Energy EIA Application Database
SACAA	South African Civil Aviation Authority
SACAD	South African Conservation Areas Database
SAPAD	South African Protected Areas Database
VIA	Visual Impact Assessment
WEF	Wind energy facility

Glossary

Definitions	
Receptor	Individuals, groups or communities who are subject to the visual influence of a particular project.
Viewpoint	A selected point in the landscape from which views of the project are ascertained.
Viewshed	The outer boundary defining a view catchment area, used to determine the zone of visual influence.
View shadow	An area within the view catchment visually obscured from the project, usually by topography.
Visual absorption capacity	The ability of an area to visually absorb development by means of screening topography, vegetation or buildings.

1. INTRODUCTION

Quinton Lawson and Bernard Oberholzer (see Appendix A for CVs) have been appointed by SLR South Africa Consulting (PTY) Ltd, on behalf of Red Cap Energy (Pty) Ltd and their affiliate companies (Red Cap Hoogland 1 (Pty) Ltd, Red Cap Hoogland 2 (Pty) Ltd, Red Cap Hoogland 3 (Pty) Ltd and Red Cap Hoogland 4 (Pty) Ltd), hereafter referred to as "Red Cap", to undertake a visual impact assessment for the proposed construction of four wind farms and associated grid connection (together known as the Hoogland Projects) in an area located between Loxton and Beaufort West in the Western Cape Province (see Figure 1).

Hoogland 1 Wind Farm and Hoogland 2 Wind Farm are located to the north closer to Loxton and form the Northern Cluster of wind farms which will share a grid connection, named the Hoogland Northern Grid Connection. Hoogland 3 Wind Farm and Hoogland 4 Wind Farm are located closer to Beaufort West and comprise the Southern Cluster which will similarly share a separate grid connection, named the Hoogland Southern Grid Connection. The two Grid Connections are each in the form of 132 kV overhead power lines and will connect the Hoogland Wind Farms to the Nuweveld Collector Substation on Red Cap's adjacent Nuweveld Wind Farms Project.

In terms of the EIA Regulations various aspects of the proposed development may have an impact on the environment and are considered to be listed activities. These activities require authorisation from the National Competent Authority (CA), namely the Department of Forestry, Fisheries and the Environment (DFFE), prior to the commencement thereof. Specialist studies have been commissioned to verify the sensitivity and assess the impacts of the wind farms under the Gazetted specialist protocols (GN R 320 and GN R 1150 of 2020). The scope of this report is the Hoogland 1 Wind Farm and Hoogland 2 Wind Farm (the Northern Wind Farm Cluster) Even though these are two separate applications they will be considered in the same specialist report.

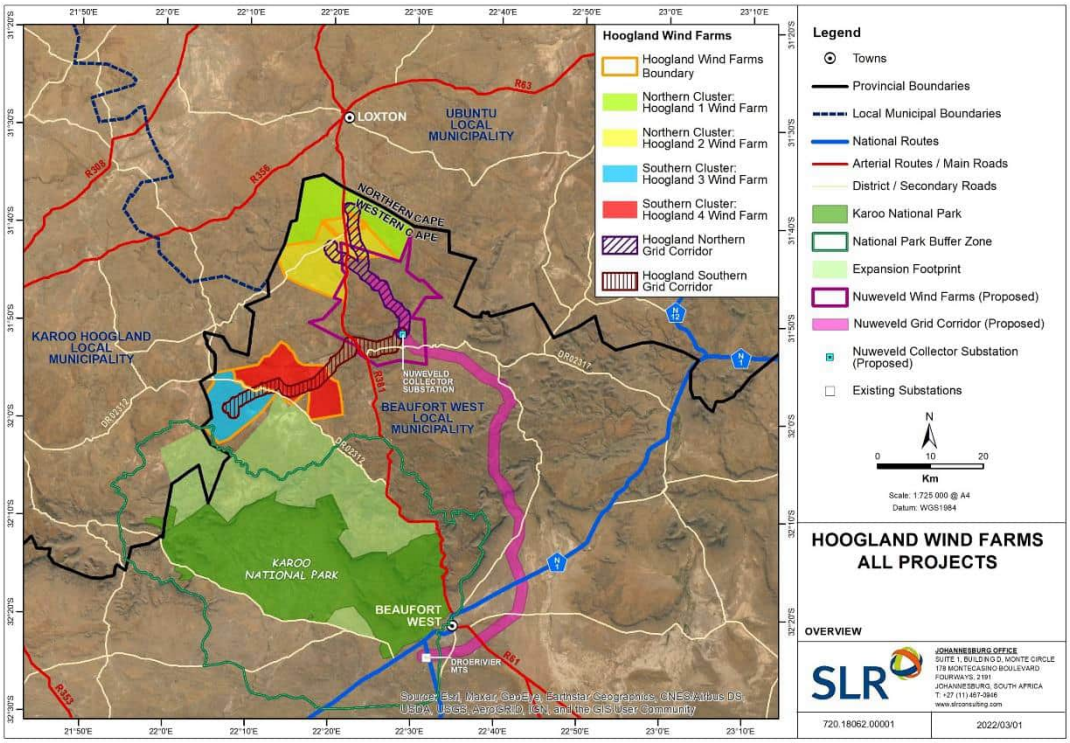


Figure 1: Regional context map

2. ASSESSMENT METHODOLOGY

2.1 Terms of Reference

A Terms of Refence has been provided by SLR (2021), which includes a template for the specialist assessment reports, a detailed project description and an impact rating methodology, included here as Appendix B.

2.2 Approach

The visual assessment methodology included the following steps:

- A 3D digital terrain model of the study area was prepared in order to determine the viewshed of the project, based on the latest layout provided by Red Cap.
- Potential sensitive receptors, such as farmsteads outside the site, were identified using the viewshed map and Google Earth.
- Landscape features and sensitive receptors were mapped together with recommended buffers on the base maps. The buffers for wind turbines, buildings, roads and powerlines were separately mapped.
- Field work was used to verify the existence and significance of the landscape features and receptors in order to refine the visual mapping layers.
- A photographic record was made with the emphasis on views from potential sensitive receptors (mainly surrounding farmsteads) of the proposed project at varying distances.
- The panoramic photographs, which included their GPS positions, were then used to create the post – mitigation photomontages.
- Potential visual impacts relating to the proposed WEFs for construction, operational and decommissioning phases of the project were assessed along with their relative significance.
- Mitigation measures to avoid or minimise potential negative visual impacts were formulated.
- Cumulative visual impacts in relation to other existing and proposed wind energy facilities in the area were assessed.
- Impact significance ratings were determined based on a methodology provided by SLR.

Site visits were carried out 17-18 May 2021 and 21 September 2021. Map 3 indicates the track used during fieldwork. The season was not a consideration for the visual survey, but clear visibility was required.

The original Scoping layout was assessed, and draft recommendations were provided to mitigate the impact of the visual intrusion of turbines. This required the removal of any turbines located within the 1:10 slopes, and to address cumulative impacts, to ensure no turbines are to be located within 750 m of the R381. Red Cap agreed to treating these areas as no-go's and thus removing any turbines from them in the future layout iterations. This is in line with Red Cap's iterative design approach to continually engage with specialists to identify no-go areas and then accordingly adjust the layout to ensure avoidance is applied as much as possible to continually improve the layout throughout the assessment process. These measures have therefore been applied and will remain no-go areas in all future iterations.

2.3 Assumptions and Limitations

The actual turbine model that may be used has not been determined at this stage, but a worst-case scenario from a visual perspective has been used in this visual assessment (in terms of height and rotor diameter) (please see Section 0).

Some assumptions were made regarding the footprint and height of the proposed substations (including associated battery facilities) and operation and management (O&M) buildings, as well as lighting and fencing relating to the proposed project as architectural details of these would only become available at a later stage.

3. LEGAL REQUIREMENT AND GUIDELINES

Legal and policy documents relating to visual and scenic resources are described below. These tend to fall under the National Heritage legislation, the natural heritage being part of the 'national estate', and therefore the VIA Report needs to be read in conjunction with the HIA.

National Heritage Resources Act (Act 25 of 1999 NHRA)	The Act includes protection of national and provincial heritage sites, as well as areas of environmental or cultural value, and proclaimed scenic routes. Natural heritage, including scenic resources, form part of the 'national estate'.
Provincial Government of the Western Cape 2005: Guideline for Involving Visual and Aesthetic Specialists in EIA Processes. B. Oberholzer.	A guideline document for specialist visual input with respect to determining potential visual impacts, along with criteria for rating the significance of impacts.
Provincial Government of the Western Cape, 2006: Strategic Initiative to Introduce Commercial and Land Based Wind Energy Development to the W. Cape.	A broad guiding framework for the location of wind energy facilities based on the sensitivity and capacity of landscape types and the scale of the project.
CSIR, 2018. Draft National Wind and Solar SEA Phase 2: Visual and Scenic Resources Chapter, B. Oberholzer and Q. Lawson.	Phase 2 Wind and Solar PV SEA provides a high-level visual assessment of focus areas, building on the previous Phase 1 Wind and Solar PV SEA, 2015.

4. PROJECT DESCRIPTION

4.1 Project Location

The proposed project is located between Loxton and Beaufort West in the Western Cape Provinces as shown on Map 1, and the local context on Map 2. Noting that some road infrastructure (watercourse crossings) within both Northern Cape and Western Cape will also require upgrade as part of the projects.

4.2 Wind farm components

Each wind farm requires several key components to facilitate the generation of electricity at a large scale, including Wind turbines, roads, underground cables and overhead high voltage power lines (up to 66 kV), a substation (including and operations and maintenance area), and a battery storage facility in the vicinity of the substation.

Table 1 below represents the various wind farm components and their specifications that have visual implications. Temporary areas necessary for construction are also included. The location of these components in relation to each wind farm site is shown on Map 5.

*Table 1: Summary of components and approximate footprint areas of the Hoogland North Wind Farms**

Components	Description	Hoogland 1	Hoogland 2
Location	Central coordinates:	31°38'18.90"S, 22°18'0.44"E	31°43'16.68"S, 22°19'50.27"E
Access	Commuter traffic and small loads: access from the south via the N1 and R381. Abnormal loads: via Loxton and R381.	Through Loxton, south along the R381	
Extent	The total area of the site being considered for developing each wind farm:	16,772 ha	17,832ha
Number of wind turbines and generation capacity	Maximum of 60 wind turbines per wind farm. Targeted nameplate generation capacity for each wind farm a maximum of 420 MW.	60	60
	Number of turbines included in the layout for approval for each wind farm	87	80
Wind turbine specifications	Rotor diameter: 100 to 195m (50 to 97.5m blade / radius) Hub height: 80 to 150m Rotor top tip height: 13 to 247.5m Rotor bottom tip height: minimum of 20m (and not lower).	-	-

Components	Description	Hoogland 1	Hoogland 2
Turbine Foundations	Diameter up to 35m, alongside 40m hardstand (1,400m^2). Permanent total footprint as indicated.	8.4 ha (permanent)	8.4 ha (permanent)
Turbine Hardstands and Laydown Areas	Permanent crane pad of 80 x 40m adjacent to each turbine foundation. Total permanent footprints indicated.	19.2 ha (permanent)	19.2 ha (permanent)
	Additional 20 x 40m of temporary hardstand area near each crane pad. Blade laydown area of 104 x 20m (plus additional embankment area) approx. 104 x 5m. Temporary crane boom assembly area of 120 x 15m. Temporary areas a max. of 5,200m^2 per turbine.	31.2 ha (temporary)	31.2 ha (temporary)
Cabling	Turbines to be connected to on-site substation via up to 66 kV cables. Cables to be laid underground in trenches mainly adjacent to proposed wind farm roads (as part of the temporary impact of 'Site roads' below) but in some instances the cables will deviate from the road. Such sections of off-road cables amount to the following length and footprint:	10.7 km 6.4 ha (temporary)	7.6 km 4.6 ha (temporary)
	Where it has been possible, cables have been routed along existing local roads. Note that cables running next to public roads will not be able to run within the road reserve, but as close as possible to the road reserve in the adjacent private owned land. These have the following length and footprint:	0.5 km 0.3 ha (temporary)	18.8 km 11.3 ha (temporary)
Internal wind farm overhead power lines	Limited overhead monopole lines where burying not possible due to technical, geological, environmental or topographical constraints. Up to 66 kV overhead power lines supported by 132 kV monopoles approx. 22m high, plus tracks for access to pylons.	0,2 km 0,1 ha (permanent)	0.5 km 0,3 ha (permanent)
	Where possible, to reduce areas of new impact, sections of overhead line have been routed next to proposed Eskom overhead lines.	3,2 km 1,9 ha (permanent)	10,2 km 6,1 ha (permanent)
Site roads	The total road network for each wind farm:	122,2 km	110.8 km
	Permanent roads 6m wide plus side drains on one or both sides. Many roads will have underground cables running next to them.	97.7 ha (permanent)	88.7 ha (permanent)
	A 15m wide road corridor may be temporarily impacted during construction and rehabilitated to allow for a 6m road surface after construction.	110 ha (temporary)	99.7 ha (temporary)
	This total road network also includes upgrades to sections of public roads, to the following extent:	4,7 km (permanent)	3,6 km (permanent)
	This total road network also includes shared road infrastructure with the other wind farm in the respective cluster:	16,9 km (permanent)	16,9 km (permanent)
	This total road network also includes shared road infrastructure with Nuweveld North and West Wind Farms as follows:	N/A	11,6 km (permanent)
Wind farm Substations	Each wind farm will have two 150 x 75m substation yards for each wind farm including Operation and Maintenance (O&M) building, Substation and High Voltage Gantry.	2,3ha (permanent)	2,3ha (permanent)
Battery energy storage system (BESS)	Two ±3.5 ha battery energy storage system (BESS) adjacent or near to the substations depending on the local constraints. Each BESS connected to substation by underground or overhead cable or own substation located within the BESS footprint, connected to Eskom switching station via short 132 kV overhead line.	7ha (permanent)	7ha (permanent)
Operations and maintenance (O&M) area	The O&M area, including offices, stores, workshops and laydown area.	Forms part of substation yard	Forms part of substation yard
Security	Security gate and hut installed at most entrances to wind farm site (estimated as 4 entrances each at 20m^2). Existing fencing around perimeter of properties to remain. Temporary and permanent yard areas enclosed with 2.4m high fence.	80m^2	80m^2
Temporary areas required for the construction / decommissioning phase	Temporary site camp/s areas of ±20,000m^2 Batching plant area of ±2,000m^2 General laydown area of ± 36,000m^2 Bunded fuel & lubricants storage facility at the site camp.	6 ha (temporary)	6 ha (temporary)

Components	Description	Hoogland 1	Hoogland 2
	Temporary laydown areas including crane boom and blade laydown areas and other potential temporary areas under "turbine hardstands".		
Shared offsite infrastructure: N1 Bypass Road	Temporary 6m bypass road to avoid Beaufort West would be shared by the Hoogland Wind Farms with the Nuweveld Wind Farm project. A 12 m wide road corridor may be temporarily impacted during construction and rehabilitated once construction is complete. The length of the temporary road will be about 5.6 km of which about 2.5 km is along an existing track.	6.8 ha (shared, (temporary)	6.8 ha (shared, (temporary)
Other offsite shared infrastructure	Stream crossings upgrades along the R381 to the north of the project area and along the DR02314 to the north-west of the project area.	4.4 ha (shared, permanent) 5ha (shared, temporary)	4.4 ha (shared, permanent) 5ha (shared, temporary)
Total disturbance footprint **I**n reality, less area will be impacted as only 60 turbines would be developed per wind farm.		165,7 ha temporary and 141 ha permanent	164.6 ha temporary and 136.3 ha permanent

*Note these areas represent more than will be impacted given the road values are based on all the turbines shown in the layout for each individual wind farm being constructed wherein reality only 60 of these turbines will be developed per wind farm.

4.3 Turbine specifications

Since the turbine technology is continually evolving it is not possible for the developer, at this early stage in the development process, to specify the exact turbine model and specification.

Assumptions have therefore been made as to the maximum possible area of impact by the potential turbine blades based on a range of turbine sizes. This area of impact is referred to as the "exaggerated rotor swept area envelope", as it 1) takes into account multiple turbine size scenarios at once, and 2) assumes each turbine has the largest blade it can from the lowest hub height and extends this all the way up to the highest hub height (see Figure 2). This reflects an exaggerated worst-case scenario.

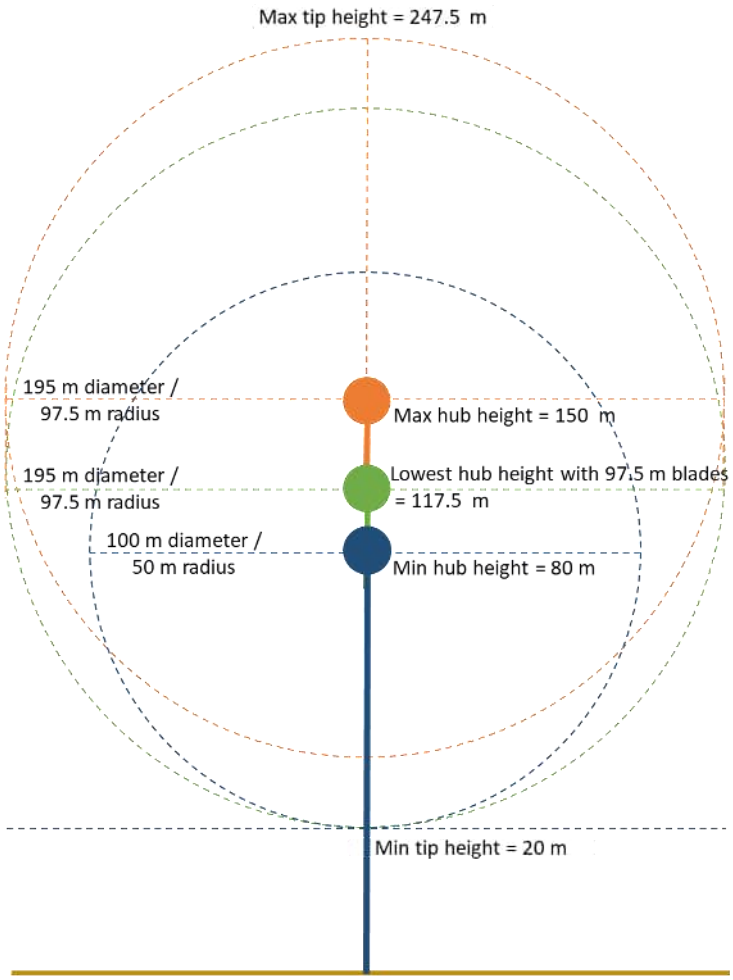


Figure 2: Exaggerated rotor swept area envelope (Source: SLR, 2021)

4.4 Power transmission

4.4.1 Cables

At each turbine, power is stepped up to a maximum of 66 kV (either in the turbine or in a transformer container next to the turbine). Each turbine will be connected to their respective Wind Farm substation via high voltage power lines (~66 kV lines). For the most part cables will be laid underground in trenches (~1 m deep), generally running alongside existing or proposed internal roads, but sometimes deviating from these. In limited instances, where burying of cables is not possible due to technical, geological, environmental or topographical constraints, then short overhead power lines will be erected to traverse these constrained areas.

Internal overhead power lines will be spanned using short 132 kV type monopoles of approximately 22m in height. The typical design for the proposed internal overhead power line monopoles is depicted Figure 3 below.

Maps 5 and 8 depict the site layout and visual features for Hoogland 1 and 2 WEFs. Maps 9 to 12 indicate the respective sensitivity levels for wind turbines, buildings (including substations and BESS), internal overhead powerlines and roads and underground cables.

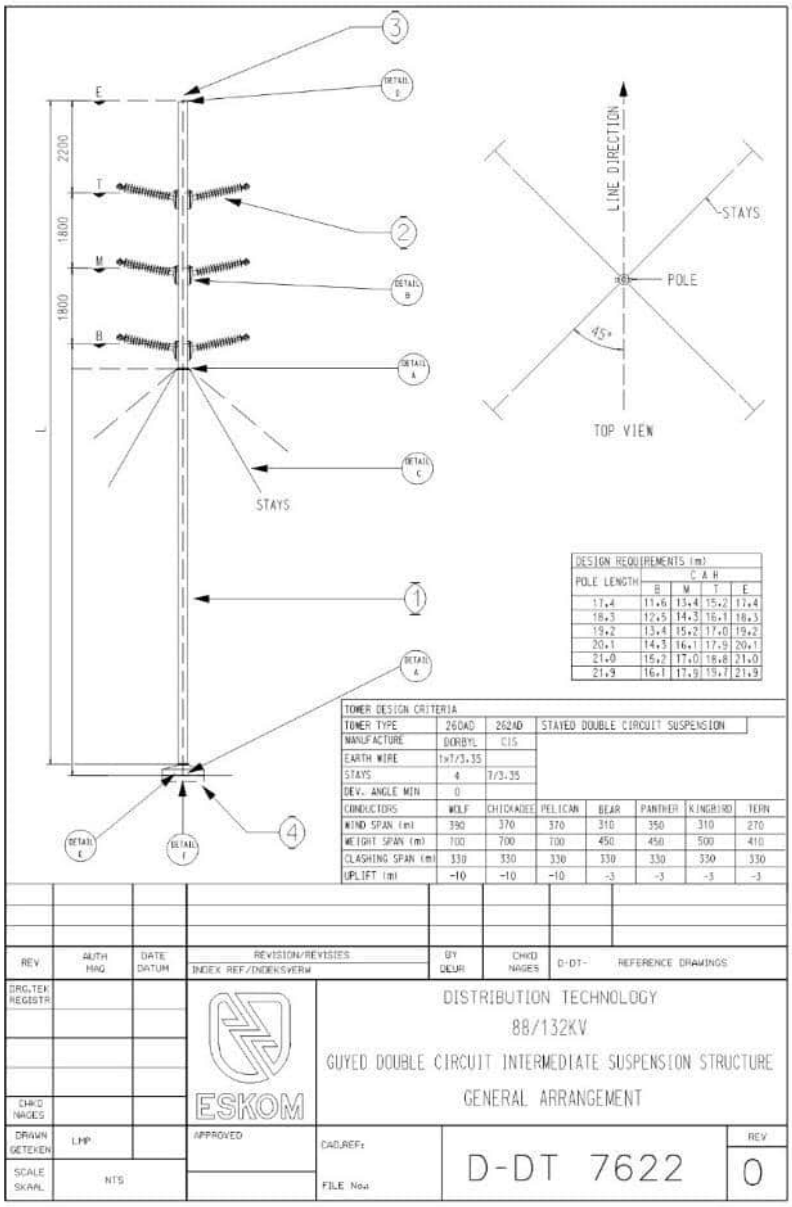


Figure 3: Typical design of proposed 66kV monopoles for internal overhead powerlines (source: SLR, 2021)

4.4.2 Substations

Two substations would be provided for each wind farm. The substation yard will house Operation and Maintenance (O&M) buildings, substation building and a High Voltage Gantry. Switching gear, step-up transformers and protection equipment are also mounted on concrete plinths as part of the substation.

4.4.3 Battery facility

Each wind farm proposal includes the possibility for the development of a battery energy storage system (BESS). The BESS would be located in close proximity to the wind farm substation, fenced off and linked to the substation via up to 66 kV cables. If the BESS requires its own substation, it would include typical substation components and be located within the BESS footprint.

A BESS will be located in close proximity to each wind farm substation and therefore there will be two BESS per wind farm. The battery facility will either be Lithium Ion or Redox Flow and both technologies will be assessed as it is unknown which technology will be selected. The physical footprint of each BESS, regardless of technology and grid connection will be approximately 3.5 ha.

Lithium-Ion

Lithium-Ion battery containers are normally a standard size of about 12 m long x 2.5 m wide x 2.7-3 m high. Multiple containers (e.g. approximately 240, with an extra 3-5 containers for electrical connections and controls), would be required (Figure 4 indicates an example).

Figure 4: Example of a 15-container Lithium-Ion BESS installation

Redox Flow

specially designed steel containers would house the batteries. Adjacent to these is another container housing the conversion and auxiliary systems (Figure 5). The height of the installation will not exceed 3m.

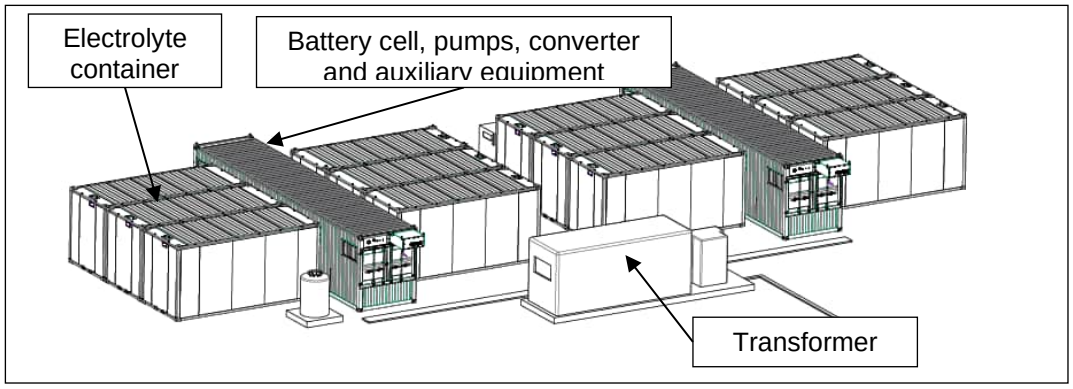


Figure 5: Indicative layout of a Flow battery of approximately 0.1 ha

Figure 6 below indicates a typical layout of the combined substation, switching station and BESS facilities.

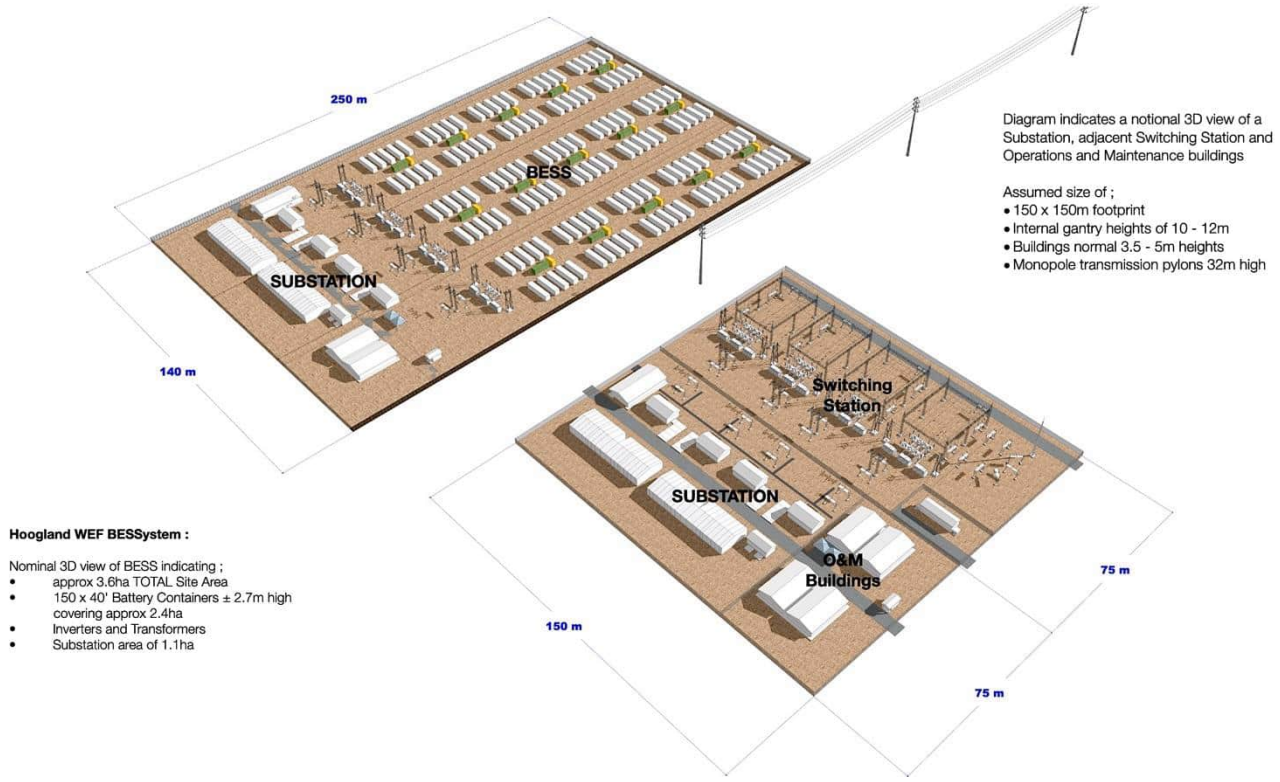


Figure 6: Indicative layout of BESS (Lithium ion, with substation), substation and switching station

4.5 Timeframes

The operational life of a wind energy facility is typically around 20 years where after it could be refurbished / upgraded, or decommissioned depending on the situation at the time, and subject to the relevant environmental processes and authorisations.

4.6 Site Layouts

The site layout for each wind farm has been through various iterations during the Screening and Initial Design Phases, and Scoping Phase, in which turbines from identified no-go areas were removed as a key aspect of the design process. The current layout makes provision for a number of potential turbine positions specific to each wind farm (as detailed in Table 1 above), with associated infrastructure as shown on Maps 9 to 12.

4.7 Alternatives

A comprehensive iterative design process has been undertaken to inform the respective Wind Farm layouts and associated Grid Connection infrastructure for the Hoogland Projects.

The integration of the screening and assessment of environmental and social constraints alongside the technical components of the project, early in a project lifecycle, allowed for the reduction in risks to the project and supports the application of the mitigation hierarchy by demonstrating the avoidance and minimisation of impacts. This integrated design approach negates the need for an alternative's assessment in the detailed Environmental Impact Assessment (EIA) process (as per NEMA).

However, the preferred layouts of the Hoogland WEFs will each be assessed against the '**no-go' alternative**. The 'no-go' alternative is the option of not constructing the Project where the status quo of the current farming activities on the site would prevail.

5. BASELINE DESCRIPTION OF THE RECEIVING ENVIRONMENT

A brief description of the landscape and scenic features of the study area are given below, and in the accompanying photographs. Visual features are indicated on Map 8.

Landscape setting

The Hoogland North proposed wind farms (HL01 and HL02) are located on the Nuweveld plateau in the Great Karoo. Both wind farms straddle the R381 Provincial Main Road between Beaufort West and Loxton, a gravel road for most of this stretch, which includes a number of passes and *poorts* along the Route.

It is an expansive semi-arid landscape, with widely scattered farmsteads nestled among tree copses, usually near sources of water or boreholes, many of the farm names ending with the term *'fontein'*. The large farms support mainly merino sheep, and occasionally dorper sheep and cattle, as well as game, such as springbok and other small antelope.

Figure 7: Quaggasfontein farmstead nestled in a tree copse, north of the site (see Map 3 for the location)

Geology and landforms

The landscape in this part of the Great Karoo has been eroded over time, the once deeply buried Beaufort Group mudstones and sandstones and the dolerite intrusions having been exposed to form the present-day Karoo landscape, see Figure 8 to Figure 10 below, and Map 4.

The Nuweveld escarpment and plateau is characterised by horizontal sills of erosion-resistant dolerite forming steep cliffs in places, boulder-strewn *mesas* or plateaus and flat-topped *koppies,* that are the main scenic features of the study area. The gentler, lower hillslopes and plains consist of more easily weathered mudstone, with occasional narrow ledges of harder sandstone.

The flattish plains are at around 1400m elevation, and the dolerite ridges and mesas are 1500-1600m elevation.

Figure 8: Dolerite koppies are a characteristic feature of the landscape on the Hoogland sites

Figure 9: Typical dolerite rock outcrop

Figure 10: Exposed Beaufort Group rocks

Vegetation cover

The vegetation of the Upper Karoo Bioregion is a response to the geology and relatively low rainfall, which occurs mainly in summer. The *Eastern Upper Karoo* vegetation type covers a vast area on the plateau above the escarpment, and consists largely of dwarf shrubland, along with grasses and succulent shrubs in places.

The *Upper Karoo Hardeveld* vegetation type covers smaller areas, occurring on the dolerite crests and steep slopes, often among large boulders. It consists of a grassy dwarf Karoo shrubland (Figure 11), (Mucina and Rutherford, 2006).

Figure 11: The vegetation responds to the local climate, geology and topography

Land use

There are seven farmsteads within the two Hoogland North sites, three on HL01 and four on HL02 (not all are permanently occupied). Farmsteads surrounding the site are on average 5 to 10km apart, linked by narrow gravel roads. A list of surrounding farmsteads, and their distances from the proposed wind farms are given in Table 3.

Farmsteads are sheltered by exotic poplars (valley cottonwood, Lombardy poplar), pines (including Allepo pine), beefwoods, cypresses, gums, weeping willows and pepper trees. Pines and poplars have been used to create avenues or shelterbelts in places.

Cultivation of crops, such as lucerne and maize, is confined to small patches of flat alluvial land, usually along drainage courses. A number of farmsteads in the general area seemed derelict.

Sense of place

The flat-topped hills are a characteristic feature of the Great Karoo in an otherwise fairly featureless, parched landscape, an area noted mainly for its empty, uncluttered landscapes, stillness, red sunsets, dark nights and starry skies, as well as for the ancient paleontological remains hidden in the rocks.

Springbok and many other smaller antelope roam free on game farms, while the occasional donkey cart still transports '*Karretjie*' people along dirt roads. Isolated farmsteads form green oases in the semi-arid landscape, sheltered from the heat by poplars and other exotic trees. For the visitor it is a vast landscape inhabited by flocks of sheep and small antelope.

A characteristic feature noted on the field trip were the dry-packed stone walls, sometimes used as small *kraals* to herd sheep, and other times as low walls stretching for a kilometre or more in places.

6. VISUAL SENSITIVITY MAPPING

DFFE Screening Tool

The DFFE Screening Tool map (Landscape Theme) for the Hoogland North cluster is included in Appendix C. The map is disputed as it is based on broad regional-scale mapping, and more detailed project-scale mapping is provided on Maps 9 to 12 for the various components of the two proposed WEFs.

Viewsheds and Viewpoints

Viewsheds of the wind turbine layouts are indicated on Maps 6 and 7 being the zone of visual influence of the WEFs for both Hoogland North WEFs[1]. Map 6 indicates the number of turbines that would be visible within 5km, based on the tip height of the turbines. Map 7 indicates the number of turbines that would be visible from 5 to 25km, based on the hub height of the turbines. The colours denote how many turbines are visible from each location, while the 'clear' areas are in a view shadow and therefore not visually affected. These maps show that in some cases only a few turbines would be visible, even from nearby receptors. Table 2 below defines visibility in terms of distance.

Table 2: Definitions of visibility

Distance	Visibility	Notes
0-2.5km	Very high visibility	Prominent feature within the observer's frame
2.5-5km	High visibility	Relatively prominent feature within the observer's frame
5-10km	Moderate visibility	Only prominent with clear visibility as part of the wider landscape
10-20km	Marginal visibility	Seen in very clear visibility as a minor element in the landscape

Viewpoints identified during the field trip are indicated on Map 3. These are based on potentially sensitive receptors, mainly surrounding farmsteads, some of which have guest accommodation. Viewpoints were selected to represent a range of distances to give an idea of their relative visibility.

Viewpoints visited on the field trip are listed in Table 3 below, together with distances to the nearest wind turbine and the potential level of visibility of the proposed wind farms. Distances to other farmsteads within the viewshed are listed in Table 4, these having varying visibility of the proposed wind farms.

[1] The Northern Cluster Wind Farms have been assessed cumulatively so as to represent a worst-case scenario for the purpose of the EIA report.

Table 3: Viewpoints: Farmsteads Outside the Hoogland Northern Cluster

View-point	Name	Latitude	Longitude	Distance	Visibility
Hoogland Northern Cluster					
vp1	R381 Jakhalsdans	-31,533388	22,340610	6,40	Moderate visibility, screened by trees. Guest accommodation.
vp2	R381 Loxton	-31,486335	22,349657	11,59	Marginal visibility. Town partly screened by trees and buildings.
vp3	Altona	-31,542395	22,511810	13,73	Marginal visibility. Low-lying, screened by trees. Faces north, away from WEF.
vp4	Spes Bona	-31,571718	22,573074	13,89	Marginal visibility. On a ridge, partly screened by trees. Faces west.
vp5	Quaggasfontein	-31,622090	22,522900	6,56	Moderate visibility. Low-lying, screened by trees. Faces NW away from WEF.
vp6	Erasmuskraal	-31,543915	22,443776	10,58	Marginal visibility. Low-lying, partly screened by trees. Faces north away from WEF.
vp7	Tereva	-31,520179	22,311007	7,31	Moderate visibility. Only a barn and silos.
vp8	Nuwelande	-31,544565	22,272136	6,02	Moderate visibility. Low-lying, screened by trees. Faces N and W away from WEF.
vp9	Donkergat	-31,765827	22,229447	2,05	V. high visibility. Low-lying, partly screened by trees. Game farm with guest accommodation.
vp10	Springfontein	-31,734408	22,195151	3,81	High visibility. Mostly screened by eastern ridge and trees. Faces SW away from WEF.
vp11	Roodepoort	-31,786874	22,188669	6,50	Moderate visibility. Low-lying, partly screened by trees. Lies between both WEF sites.
vp12	Sakrivierpoort	-31,820161	22,136953	12,57	Moderate visibility. Partly screened by trees. Lies between both WEF sites.
vp13	Minverwagspoort	-31,837755	22,125564	14,55	Moderate visibility. Lies between both WEF sites.
vp14	Snydersfontein	-31,838660	22,346069	8,71	Moderate visibility. Lies between both WEF sites.
vp15	Sterkfontein	-31,800820	22,298162	2,79	High visibility. Low-lying. Ridge on N side limits view of closest turbines. Lies between both WEF sites.
vp16	Lapfontein	-31,878606	22,327152	11,87	Marginal visibility. Screened by ridge on NW side. Lies between both WEF sites.
vp17	Driefontein	-31,885379	22,264198	12,35	North WEF not visible, in view shadow.
vp18	Kalkfontein	-31,896655	21,998607	28,17	Beyond 25km. North WEF not visible, in view shadow. Low-lying.
vp19	Uitspansfontein	-32,047021	22,277338	30,05	Beyond 25km. Marginal visibility, screened by trees.
vp20	Rockdale	-32,056561	22,356335	31,70	Beyond 25km. Marginal visibility. Appears uninhabited.
vp21	Groot Waterval	-31,952400	21,963179	34,47	Beyond 25km. North WEF not visible, in view shadow
vp22	Vosfontein/Inverurie	-31,813488	22,235712	5,95	Moderate visibility. Closest turbines screened by ridge. Lies between both WEF sites.
vp23	Juriesfontein	-31,650807	22,131558	12,75	North WEF not visible, in view shadow.
vp24	De Wilg	-31,661327	22,117902	12,78	Marginal visibility.
vp25	Brandfontein	-31,688135	22,049286	17,72	Marginal visibility.

Table 4: Other Farmsteads within the Viewshed of the Northern Cluster

Name	Latitude	Longitude	distance within	Visibility
Klipbanksfontein	-31.86187	22.21481	5	Very high visibility. Between both WEF sites.
Ramfontein	-31.62700	22.43777	5	High visibility. Currently unoccupied / derelict.
Rocklands	-31.72574	22.39957	5	Very high visibility. Within the Nuweveld WEF.
Lakenvlei	-31.60180	22.44798	5	Very high visibility.
Kiewietsfontein	-31.57173	22.22072	10	Moderate visibility. Derelict farmstead.

Silvery Home	-31.48915	22.22967	15	Marginal visibility
Swaelkrans	-31.47989	22.22805	15	Marginal visibility
Biesiespoort	-31.47078	22.37636	15	Marginal visibility.
De Hoop	-31.52903	22.13857	20	Marginal visibility
Rooikop	-31.48327	22.14823	20	Marginal visibility
Rooivlakte	-31.46070	22.39456	20	Marginal visibility
Middelsyfer	-31.40224	22.32716	25	Very low visibility. Derelict farmstead.
Omkeerkolk	-31.57063	22.02644	25	Very low visibility.
Werda	-31.56467	22.02833	25	Very low visibility.
Ystervarkpoort	-31.40474	22.45234	25	Very low visibility.

Visual Sensitivity Mapping Criteria

Landscape features of visual or scenic value, along with potential sensitive receptors in the surroundings, are described in Table 5 below. These provide a visual baseline for the study area. (See Map 8).

Table 5: SEA Visual Sensitivity Mapping Criteria

Scenic Resource	**Landscape features within or adjacent to the development site.**
Topographic features	Characteristic landforms include the *mesas* and *koppies* formed from horizontal dolerite sills. Vertical dolerite dykes form long knobbly ridges and rock outcrops. Landscape features in the area contribute to scenic and natural heritage value, providing visual interest or contrast in the open Karoo landscape.
Water Features	In the dry landscape, drainage features and the larger dams provide scenic and amenity value.
Cultural landscapes	Green patches of cultivated land and tree copses in alluvial valleys form part of the cultural landscape. The Heritage Assessment includes archaeological and historical features, which have visual implications.
Scenic Resource	**Receptors adjacent to the site or in the local surroundings.**
Protected Areas	The Karoo National Park, about 40km from the site, has wilderness and scenic value in addition to its biological conservation role, serving as an important visitor / tourist destination, (Map 1). Visual significance is increased by its protection status.
Game farms	Private game farms and guest accommodation in the area are important for the local tourism economy, and tend to be sensitive to loss or degradation of scenic quality.
Human settlements, farmsteads	Loxton is about 13km north of the site and would potentially be within the zone of visual influence of the proposed Hoogland Northern Cluster. Surrounding farmsteads, particularly those within 10km of the project, could be sensitive to the visual intrusion of wind turbines in the landscape. It is assumed that farms that form part of the development are less visually sensitive.
Scenic routes and arterial roads	The R381 Route between Beaufort West and Loxton, which includes a number of small passes and poorts, has scenic value in places. This route, and primary district roads, used by residents and visitors to the area, are therefore visually sensitive.

Recommended Buffers for Wind farms

Guidelines prepared in the past for buffers around wind energy farms are indicated in Table 6 below. These are, however, intended for regional scale mapping purposes and have been adapted at the local project scale for individual wind farms in Table 7. For example, buffers would vary depending on viewshed mapping, actual site conditions and the design height of wind turbines.

Table 6: Visual Guidelines for Wind Turbines

Landscape features	**PGWC Guidelines [1]**	**SEA Visual Guidelines [2]**	**Comment**
Project area boundary	-	-	Usually 1.5 times height of the proposed turbines.
Prominent topographic features	500m	500m	Includes prominent ridgelines, peaks and scarps.
Steep slopes	>1:4	>1:4 and >1:10	Generally avoid slopes >1:10.
Perennial rivers, large dams, wetland features	500m	250 - 500m	Subject to specialist freshwater assessment.
Provincial / arterial roads	500m	500m to 1 km	Depends on local context, e.g. rural or urban areas.
Scenic routes and passes	2.5 km	1 to 2,5 km	Could be less if in a view shadow.
National parks/ protected areas	2 km	3 to 5 km	Could be less if in a view shadow.
Private nature reserves/ game farms/ guest farms	500m	1,5 to 3 km	Could be less if in a view shadow.
Farmsteads	400m (noise)	500m	General literature recommends 500m to 2 km.
Settlements	800m	2 to 4 km	Could be less if in a view shadow.
Cultural landscapes/ heritage sites	500m	500m	Subject to heritage assessments.

[1] Provincial Government of the Western Cape, 2006. Recommended Criteria Thresholds for Regional and Site Level Assessment.
[2] CSIR, 2018. SEA for Wind and Solar Photovoltaic Energy in SA, Phase 2. Visual and Scenic Resources Chapter prepared by B. Oberholzer and Q. Lawson.

Scenic resources and sensitive receptors within the study area have been categorised into no-go, high sensitivity, medium and low visual sensitivity zones, as indicated in Table 7 to Table 10 below. The visual

sensitivity mapping categories for wind turbines, buildings (including substations and BESS), internal roads and internal overhead powerlines are indicated on Maps 9 to 12. The visual features and visual sensitivity for the Beaufort Bypass Road are indicated on Maps 13 and 14(see Table 10).

Table 7: Visual Sensitivity Mapping Categories for Wind Turbines (Map 9)

Scenic Resources	**No-go areas**	**High visual sensitivity**	**Medium visual sensitivity**	**Low visual sensitivity**
Topographic feature: prominent scarps, peaks and ridges	Feature	within 250m	within 500m	-
Topographic feature: minor ridges, scarps and outcrops	Feature	within 150m	-	-
Steep slopes	Slopes > 1:10	Slopes 1:10 - 1:20	-	-
Scenic water features	within 250m	within 500m	-	-
Cultural landscapes[1]	Refer to HIA		-	-
Protected Landscapes / Sensitive Receptors				
National Parks (Karoo NP)	within 5km	within 10km	within 15km	-
Nature Reserves	n/a	-	-	-
Private reserves / game farms outside the WEF sites	Within 1,5km	within 3 km	within 5 km	-
Settlements/ towns (Loxton)	n/a	n/a	n/a	-
Farmsteads outside site	within 1km	within 2km	within 3km	-
Farmsteads inside site	within 500m	within 750m	within 1km	-
Arterial route R381[2]	within 750m	within 1 km	within 1,5 km	-
Scenic Passes/ Poorts (R381)	within 1km	within 1,5km	within 2km	-
Main district road	within 250m	within 500m	within 750m	-

[1]Cultural Landscapes are the areas defined by the heritage specialists around important cultural feature/s as presented in the heritage report. Visual implications and sense of place need to be considered.

[2]The no-go buffer was originally 500 m when designing the wind farm, but subsequently recommended to increase to 750 m in response to cumulative impacts.

Table 8: Visual Sensitivity Mapping for Buildings, Substation and Battery Facility (Map 10)

Scenic Resources	**No-go areas**	**High visual sensitivity**	**Medium visual sensitivity**	**Low visual sensitivity**
Topographic feature: prominent scarps, peaks and ridges	Feature	within 100m	-	-
Minor ridges, scarps and outcrops	Feature	within 100m	-	-
Steep slopes	Slopes > 1:4	Slopes > 1:10	-	-
Scenic water features	within 50m	within 100m	-	-
Cultural landscapes[1]	Refer to HIA		-	-
Protected Landscapes / Sensitive Receptors				
National Park (Karoo NP)	n/a	n/a	n/a	-
Nature Reserves	n/a	n/a	n/a	-
Private reserves / game farms	within 250m	within 500m	within 1 km	-
Farmsteads outside	within 250m	within 500m	Within 750m	-
Farmsteads inside	within 150m	within 250m	within 500m	-
Scenic routes / Poorts	within 500m	within 750m	within 1km	-
Arterial route R381	within 250m	within 500m	within 750m	-
Main district road	within 150m	within 250m	within 500m	-
Scenic district road	within 250m	within 500m	within 750m	-

Table 9: Visual sensitivity mapping categories for internal overhead powerlines (Map 11)

Scenic Resources	No-go areas	High visual sensitivity	Medium visual sensitivity	Low visual sensitivity
Topographic feature: prominent scarps, peaks and ridges	-	Feature	-	-
Minor ridges, scarps and outcrops	-	Feature	-	-
Steep slopes	-	Slopes > 1:4	Slopes > 1:10	-
Scenic water features	within 50m	within 100m	-	-
Cultural landscapes[1]	Refer to HIA			
Protected Landscapes / Sensitive Receptors				
National Parks	n/a	-	-	-
Nature Reserves	n/a	-	-	-
Private reserves / game farms	n/a	-	-	-
Farmsteads outside	n/a	-	-	-
farmsteads inside	within 50m	within 100m		-
Scenic routes / Poorts	within 100m	within 150m	-	-
Arterial route R381	within 50m	within 100m	-	-
Main district road	-	within 50m	-	-

[1]Cultural Landscapes are the areas defined by the heritage specialists around important cultural feature/s as presented in the heritage report.
Exceptions would apply where internal overhead power lines ascend/descend scarps at right angles. The lines should follow valleys and avoid peaks/ridges where possible. The final route of internal lines needs to be reviewed by the specialist/s.
Note that the predominant pylon style is a 132 kV style monopole of approx. 22 m high even though the voltage will be a maximum of 66 kV.

Table 10: Visual sensitivity mapping categories for internal access roads (Map 12)

Scenic Resources	No-go areas	High visual sensitivity	Medium visual sensitivity	Low visual sensitivity
Topographic feature: prominent scarps, peaks and ridges	Feature	within 50m	-	-
Minor ridges, scarps and outcrops	-	Feature	-	-
Steep slopes	Slopes > 1:4	Slopes > 1:10	-	-
Scenic water features	within 50m	within 100m	-	-
Cultural landscapes[1]	Refer to HIA			
Protected Landscapes / Sensitive Receptors				
National Parks (Karoo NP)	n/a	n/a	n/a	-
Nature Reserves	n/a	n/a	n/a	-
Private reserves / game farms	n/a	n/a	n/a	-
Farmsteads outside	n/a	n/a	n/a	-
farmsteads inside	within 50m	within 100m	within 150m	-
Scenic routes / Poorts	-	within 100m	within 150m	-
Arterial route R381	-	-	-	-
Main district road	-	-	-	-

[1]Cultural Landscapes are the areas defined by the heritage specialists around important cultural feature/s as presented in the heritage report.

Table 11: Visual sensitivity mapping categories for N1 Bypass Route (Map 11)

Scenic Resources	No-go areas	High visual sensitivity	Medium visual sensitivity	Low visual sensitivity
Topographic features, ridges, peaks, scarps	Feature	-	-	-
Geology features / outcrops	Feature	-	-	-
Steep slopes	Slopes > 1:4	Slopes > 1:10	-	-
Scenic water features	Feature	Within 50m	-	-
Cultural landscapes[1] (Rock Art only)	Area as defined by the heritage specialist	Within 50m	-	-
Cultural landscapes[1] (all other, excluding Rock Art)	-[2]	Within 50m		
Protected Landscapes / Sensitive Receptors				
National Parks (Karoo NP)	Within 50m	Within 100m	Within 150m	-
Nature Reserves	n/a	n/a	n/a	-
Private reserves / game farms	n/a	n/a	n/a	-
Towns, Settlements	Feature	Within 100m	Within 150m	
Farmsteads	Feature	Within 50m	Within 100m	-

[1]Cultural Landscapes are the areas defined by the heritage specialists around important cultural feature/s as presented in the heritage report

[2] No Go areas that are more relevant to visual impacts have been defined in these cultural landscapes and thus preclude development within them where it will be visually unacceptable. These are captured and mapped under the scenic resources above such as "topographic features, ridges, peaks, scarps", "scenic water features", "farmsteads", "scenic routes" etc.

7. VISUAL IMPACT ASSESSMENT

7.1 Impact assessment

The visual assessments of the proposed WEFs are based on a number of quantitative and qualitative criteria to determine potential visual impacts, as well as their relative significance, including the considerations described below.

Visual Exposure

Viewsheds of the proposed WEFs are indicated on Maps 6 and 7, being the potential zone of visual influence of the Northern Cluster development based on the current layout of wind turbines (representing a theoretical 'worst case scenario'). Map 6 indicates the number of turbines that would be visible within 5km, based on the tip height of the turbines. Map 7 indicates the number of turbines that would be visible from 5 to 25km, based on the hub height of the turbines. These maps show that in some cases only a few turbines would be visible, even from nearby receptors.

Visibility

A number of significant viewpoints have been identified, together with their relative distances and anticipated visibility of the proposed WEFs in Table 3 and Table 4 above. The viewpoints were selected based on proximity to the WEFs and the potential sensitivity of identified receptors, including users of arterial routes along with guest farms and farmsteads.

Degrees of visibility would depend on the number of turbines in the view field and their position in the landscape (e.g. on ridgelines), as well as on foreground screening provided by topography or trees. See Figure 1 below for a comparison of visibility of turbines at various distances.

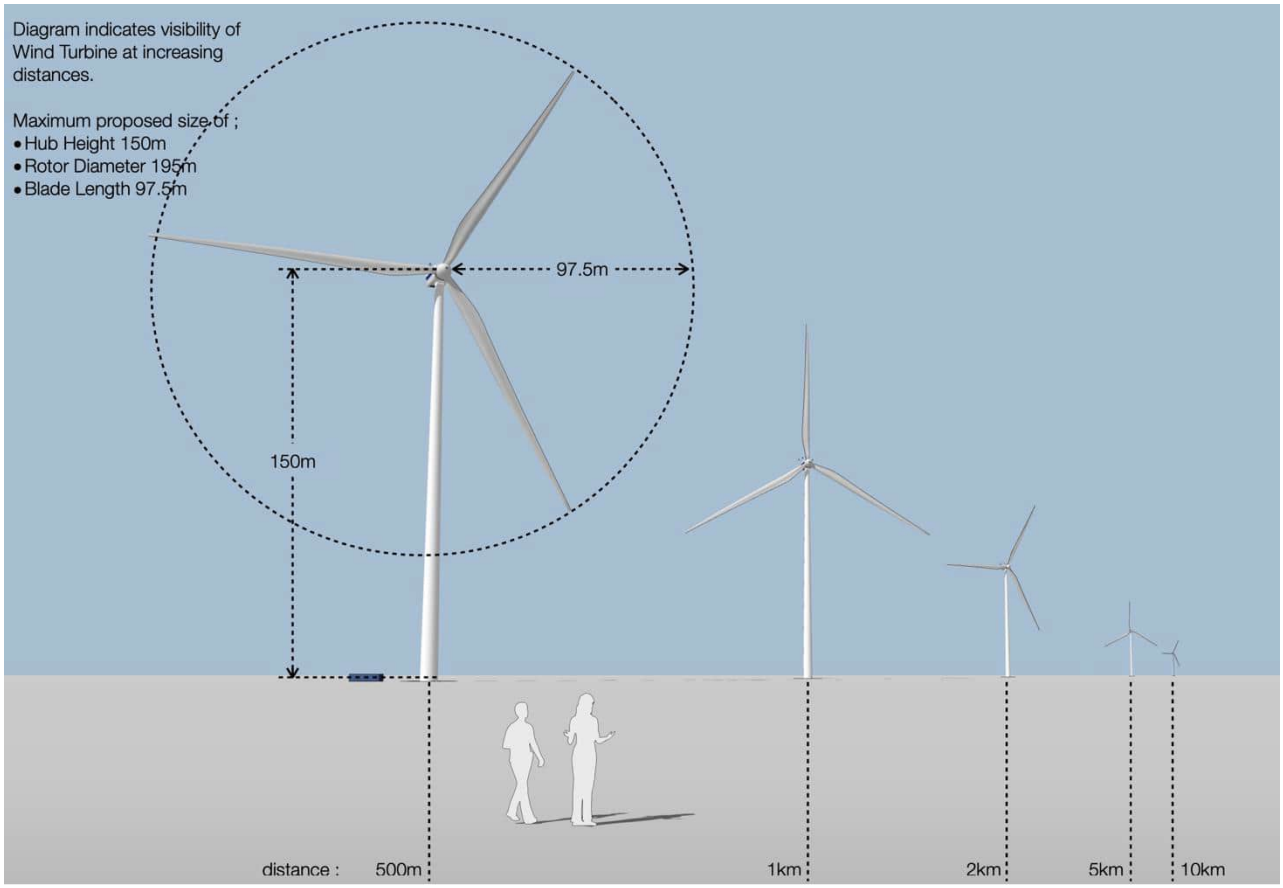


Figure 12: Comparison of visibility of wind turbines at various distances

Visual Absorption Capacity (VAC)

This relates to the potential of the landscape to screen the proposed WEFs from view. Wind turbines tend to be more obscured from view in broken mountainous topography and more exposed in the open plains. Turbines located on ridgelines or *koppies* tend to be more visible in the landscape, particularly when seen in silhouette. The sparse Karoo vegetation provides little screening effect. However dense clumps of trees around farmsteads tend to reduce visibility by receptors.

Landscape Integrity

Landscape integrity tends to be enhanced by scenic or rural quality and intactness of the landscape, as well as absence of other visual intrusions. Natural or pristine landscapes tend to have higher visual quality and therefore higher value. Cultural landscapes, such as rural or farming scenes also have visual or scenic value. On the other hand, industrial activity and visual 'clutter', including substations and power lines, detract from these scenes.

Most of the site for the proposed WEFs has an uncluttered, expansive landscape with pastoral scenes, for which the Karoo is renowned.

Visually Sensitive Resources

Natural and cultural landscapes, or scenic resources, form part of the 'National Estate' and may have local, regional or even national significance, usually, but not only, of tourism importance. Within the study area, the dolerite dykes, koppies and other outcrops tend to be the main features of scenic and geological interest.

Visual Impact Intensity

The overall potential visual impact intensity is determined in Table 12 below by combining all the factors above, namely visual exposure, visibility, visual absorption capacity, landscape integrity and visually sensitive resources. Visual impact intensity is in turn used to assess visual impact consequence of the two proposed WEFs and related infrastructure, such as the substation (including associated battery facilities), buildings, internal overhead powerlines and access roads.

Table 12: Visual Impact Intensity

Visual Criteria	Comments	Wind turbines	Related infrastructure
Visual exposure	Extensive viewshed relating to large scale and number of wind turbines.	High	Low
Visibility	Visible from parts of the R381 Route, main district roads, and a number of farmsteads and guest farms.	High	Low
Visual absorption capacity (VAC)	Visually exposed plain and ridges (in places), and therefore low VAC.	High	Medium
Landscape integrity / intactness	Effect on rural farming character and Karoo landscape.	High	Medium
Landscape / scenic sensitivity	Effect on scenic resources / dolerite outcrops.	High	Low
Impact intensity	Summary	**High**	**Medium**

The quantification of overall visual impact significance for the proposed Hoogland North 1 and 2 WEFs is based on the methodology provided by SLR (2021), as used in the tables below. The assessment criteria are included in Appendix B of this report.

From the desktop and fieldwork studies, it was determined that the visual impacts would be similar for both of the Hoogland North WEFs (HL01 and HL02), and therefore the visual impact assessment tables for these have not be separated and are applicable to both wind farms equally. Visual mitigation measures have been provided in Table 20.

Table 13: Visual Impact Assessment – Construction Phase (HL01 and HL02)

Issue: Visual intrusion of construction activities on the Karoo landscape.		
Description of Impact		
Visual intrusion of cranes, heavy vehicles and construction activities required for the erection of wind turbines, and related infrastructure. Temporary construction areas eg camps and batching plants Visual scarring from earthworks for assembly platforms. Soil/ rubble stockpiles from earthworks. Litter generated from construction site. Noise and dust from construction activity affecting the Karoo's sense of place.		
Type of Impact	Direct	
Nature of Impact	Negative	
Phases	Construction	
Criteria	Without Mitigation	With Mitigation
Intensity	High	Medium
Duration	Short-term	Short-term
Extent	Local	Local
Consequence	Medium	Medium
Probability	Definite/ Continuous	Probable
Significance	Medium -	Medium -
Degree to which impact can be reversed	The impact is reversible by means of site rehabilitation after construction and removal of construction equipment.	

Degree to which impact may cause irreplaceable loss of resources	Scenic resources are not damaged irreparably.
Degree to which impact can be mitigated	There is some scope for mitigation as per the recommended mitigation measures below.

Table 14: Visual Impact Assessment – Operation Phase (Wind Turbines HL01 and HL02)

Issue: Visual intrusion of wind turbines on the Karoo landscape.		
Description of Impact		
Potential visual intrusion of the tall wind turbines on the rural landscape, scenic resources and sensitive receptors. Change in the pastoral Karoo character and sense of place of the local area.		
Type of Impact	Direct	
Nature of Impact	Negative	
Phases	Operational	
Criteria	Without Mitigation	With Mitigation
Intensity	High (see Table 12)	High
Duration	Long-term	Long-term
Extent	Local	Local
Consequence	High	High
Probability	Definite/ Continuous	Definite/ Continuous
Significance	High -	High -
Degree to which impact can be reversed	The impact could be reversible at the decommissioning phase by means of dismantling the turbines and site rehabilitation.	
Degree to which impact may cause irreplaceable loss of resources	Scenic resources are not damaged irreparably.	
Degree to which impact can be mitigated	Mitigation only achievable by means of avoidance in the siting of turbines. No potential for screening of the tall turbines.	

Table 15: Visual Impact Assessment – Operation Phase (Infrastructure HL01 and HL02)

Issue: Visual intrusion of infrastructure on the Karoo landscape.		
Description of Impact		
Visual effect of industrial-type substations and BESS on the rural Karoo landscape. Visual intrusion of internal overhead powerlines, including silhouette effect on skylines of ridges/ koppies. Visual intrusion of internal access roads and hardstands in the local area.		
Type of Impact	Direct	
Nature of Impact	Negative	
Phases	Operational	
Criteria	Without Mitigation	With Mitigation
Intensity	Medium (see Table 12)	Low
Duration	Long-term	Long-term
Extent	Local	Local
Consequence	Medium	Medium
Probability	Definite/ Continuous	Definite/ Continuous
Significance	Medium -	Medium -
Degree to which impact can be reversed	The impact could be reversible at the decommissioning phase by means of dismantling the infrastructure and implementing site rehabilitation.	
Degree to which impact may cause irreplaceable loss of resources	Scenic resources are not damaged irreparably.	
Degree to which impact can be mitigated	Some mitigation is achievable through careful siting and screening of infrastructure.	

Table 16: Visual Impact Assessment – Operation Phase (Lighting HL01 and HL02)

Issue: Visual intrusion of lighting at night.		
Description of Impact		
Visual effect on the dark skies of the Karoo created by lights on turbines for aircraft navigation. Visual intrusion of area and security lighting around the substations and O&M buildings.		
Type of Impact	Direct	
Nature of Impact	Negative	
Phases	Operational	
Criteria	Without Mitigation	With Mitigation
Intensity	Medium	Low
Duration	Long-term	Long-term
Extent	Local	Local
Consequence	Medium	Medium
Probability	Definite/ Continuous	Definite/ Continuous
Significance	Medium -	Medium -
Degree to which impact can be reversed	The impact could be reversible at the decommissioning phase by means of dismantling the turbines and other infrastructure and site rehabilitation.	
Degree to which impact may cause irreplaceable loss of resources	Scenic resources are not damaged irreparably.	
Degree to which impact can be mitigated	Some mitigation achievable for navigation lights by means of technological advances. Security and other outdoor lighting can be fitted with reflectors.	

Table 17: Visual Impact Assessment – N1 Bypass Road

Issue: Visual impact of the N1 Bypass road on the Karoo National Park, Beaufort West town and the golf course		
Description of Impact		
Visual and noise intrusion of the roadway and related truck traffic on adjacent sensitive visual receptors.		
Type of Impact	Direct	
Nature of Impact	Negative	
Phases	Operational	
Criteria	Without Mitigation	With Mitigation
Intensity	High	High
Duration	Short-term	Short-term
Extent	Local	Local
Consequence	High	Medium
Probability	Definite/ Continuous	Definite/ Continuous
Significance	High -	Medium -
Degree to which impact can be reversed	The impact could be reversible at the decommissioning phase by means of site rehabilitation.	
Degree to which impact may cause irreplaceable loss of resources	The resource is damaged irreparably but is represented elsewhere	
Degree to which impact can be mitigated	Earth berms and planting to be used to visually screen the roadway in places of close proximity to residential areas. Traffic and other signage to be limited to only that which is essential. Where lighting is required, these are to have reflectors to avoid light spillage on adjacent areas.	

Table 18: Visual Impact Assessment – Decommissioning Phase (HL01 and HL02)

Issue: Visual intrusion of activities to remove infrastructure.		
Description of Impact		
Visual effect of construction activities to remove infrastructure at the end of the life of the project, including wind turbines, substation, buildings, internal overhead powerlines and access roads.		
Type of Impact	Direct	
Nature of Impact	Negative	
Phases	Decommissioning	
Criteria	Without Mitigation	With Mitigation
Intensity	High	Medium
Duration	Very short-term	Very short-term
Extent	Local	Local
Consequence	Medium	Medium
Probability	Definite/ Continuous	Probable
Significance	Medium -	Medium -
Degree to which impact can be reversed	The impact is reversible by means of site rehabilitation after construction and removal of construction equipment.	
Degree to which impact may cause irreplaceable loss of resources	Scenic resources are not damaged irreparably.	
Degree to which impact can be mitigated	There is some scope for mitigation as per the recommended mitigation measures below.	

Table 19: Visual Impact Assessment – Cumulative Visual Impact (Wind Turbines HL01 and HL02)

Issue: Cumulative visual intrusion of wind turbines on the Karoo landscape.		
Description of Impact		
Potential visual intrusion of the tall wind turbines on the rural landscape, scenic resources and sensitive receptors. Change in the pastoral Karoo character and sense of place of the local area. Refer to Section 7.3.		
Type of Impact	Direct	
Nature of Impact	Negative	
Phases	Operational	
Criteria	Without Mitigation	With Mitigation
Intensity	Very high	Very high
Duration	Long-term	Long-term
Extent	Regional	Regional
Consequence	High	High
Probability	Definite/ Continuous	Definite/ Continuous
Significance	High -	High -
Degree to which impact can be reversed	The impact could be reversible at the decommissioning phase by means of dismantling the turbines and implementing site rehabilitation.	
Degree to which impact may cause irreplaceable loss of resources	Scenic resources are not damaged irreparably.	
Degree to which impact can be mitigated	Mitigation only achievable by means of avoidance in the siting of turbines. No potential for screening of the tall turbines.	

7.2 Alternatives

An iterative design process has been undertaken to inform the respective Wind Farm layouts and associated infrastructure for the two Hoogland North WEFs. Therefore, no site or layout alternatives are being assessed, as initial layout alternatives were screened out of the project in the early Screening Phase.

However, the preferred layouts of the Hoogland Wind Farms, and respective Grid Corridors, will each be assessed against the '**no-go' alternative**. The 'no-go' alternative is the option of not constructing the Project where the status quo of the current farming activities on the site would prevail.

The no-go alternative would mean that there would be no additional visual intrusion on the rural landscape and on farmsteads in the area by wind turbines and related infrastructure. Scenic features and the overall sense of place would therefore remain intact. The downside is that no renewable energy would be produced.

It is envisaged that the potential visual impact significance of the no-go alternative would be neutral as the status quo would likely continue and there would be no further visual impacts.

7.3 Cumulative Impacts

Other than the proposed Nuweveld Wind Farms immediately to the south-east, there are currently no other proposed or approved renewable energy EA applications within a 30km (or even 50km) radius of the project site, (see Map 1). The nearest operational wind farm to the site is the Noblesfontein Wind Farm located approximately 65km to the south-east. The cumulative impact that is being assessed will therefore be the collective impact of the four proposed Hoogland Wind Farms and Grid Connection applications with the three proposed Nuweveld Wind Farm and Gridline applications, since this is the information that is in the public domain and available for use in a cumulative impact assessment.

There will be cumulative visual impacts arising from the combination of the Hoogland North and Hoogland South WEFs, as well as the proposed three Nuweveld wind farms once all wind farms are developed. The proximity of the Hoogland North and the Nuweveld North WEFs to each other could particularly increase cumulative visual impacts, especially when seen from the R381 Provincial Route (Table 19) and there would be a change to the largely rural character and sense of place of the area.

However, the nature of the topography would result in some screening between the above-mentioned wind farms, and these would therefore seldom be seen fully in combination. The Hoogland Northern and Southern Clusters are also spaced more than 10 km apart from each other which ensures a visual separation of the two clusters. Similarly, the Hoogland Wind Farms have a number of smaller natural gaps, derived from the various specialist sensitivity mapping, which helps to provide a clustering effect.

The intention is that Red Cap would develop a maximum of 60 turbines for each wind farm, and thus what is assessed here would in reality be more conservative as it is based on about on a third more turbines than the number for the final layout. The final 60 turbine locations would only be determined after the environmental process is complete as the final layout would take account of technical, commercial, planning, legislation and other relevant factors.

For context, the Hoogland North Wind Farms fall outside the Wind and Solar Renewable Energy Development Zone (REDZ 11), Beaufort West, as indicated on Map 1. However, the Hoogland South Cluster wind farms are located within this REDZ, and the Nuweveld Wind Farms partly within this REDZ. According to the Developer, there is interest from other renewable energy developments in the area.

Opinions vary on whether wind farms should be clustered together to concentrate the visual impacts, or whether they should be dispersed more than 30 km apart. The concept of REDZs tends to suggest that wind farms should be grouped in zones that have been identified as being suitable for wind farm development.

Therefore, since this area has the potential to become a new renewable energy node, it may be reasonable to assume that the Hoogland North Cluster would potentially be contiguous with other projects in this REDZ.

Based on the cumulative visual impact matrix, the overall significance could potentially be high for the two proposed Hoogland North WEFs when seen in combination with the proposed adjacent wind farms mentioned above, given the potential effect on the rural landscape and the Karoo sense of place.

In terms of mitigation, it is proposed that where a choice exists between turbines to be dropped and all other factors being equal, priority should be given to removing or relocating those within 1 km of the R381, as well as widening any other gaps to improve the visual clustering effect. Removing turbines in the "high" visual sensitivity category could also be considered.

8. MITIGATION AND EMPR REQUIREMENTS

Mitigation measures are recommended for the siting of wind turbines and related infrastructure in order to minimise visual impacts on scenic resources and sensitive receptors. Some mitigation, through avoidance, has already been achieved during the screening stage. The potential visual impacts and recommended visual mitigations are outlined below for both the Hoogland North 1 and 2 proposed WEFs.

Table 20: Recommended Mitigations

Potential Visual Impacts	**Recommended Mitigations**
Design and Construction Phase:	
Visual intrusion of cranes, heavy vehicles and construction activities resulting from the erection of wind turbines. Soil/ rubble stockpiles from earthworks. Dust and litter from construction activities. Visual scarring from earthworks for assembly platforms. Noise and dust from construction activity affecting the Karoo's sense of place.	Visually sensitive skylines, such as dolerite ridges, koppies, rock outcrops and slopes steeper than 1:4 or 1:10 gradient, avoided in the layout design. The Scoping layout largely meets these requirements. Disturbed areas rehabilitated / revegetated as soon as possible during the construction phase. Temporary laydown and areas and batching plants to be located away from arterial or district roads unless approved by the visual specialists (Map 12). This current layout is acceptable in this regard, where a visual buffer of 50m would be provided. Stockpiles to be demarcated and located within approved construction footprints. Recycling and refuse bins to be provided to eliminate litter from the site.
Operation Phase:	
Potential visual intrusion of the tall wind turbines on the rural landscape, scenic resources and sensitive receptors. Change in the pastoral Karoo character and sense of place of the local area.	Some mitigation already achieved in the siting of turbines during the Screening and Scoping Phases (Map 9). Further potential design recommendations in relation to cumulative impacts are shown in the last row of this table.
Industrial-type effect of substations on the rural Karoo landscape. Visual intrusion of internal overhead powerlines on the landscape, including silhouette effect on skylines of ridges and koppies. Visual intrusion of internal access roads and hardstands in the local area.	Substations and O&M Buildings to be located in unobtrusive low-lying areas away from provincial and district roads where possible. The current location shown in Map 10 meet these requirements. On-site signage to be discrete, and billboards prohibited. Signage to be fixed as low as possible, preferably against a backdrop to avoid intrusion on the skyline. Security and other outdoor lighting to be fitted with reflectors to conceal the light source.

Potential Visual Impacts	Recommended Mitigations
Design and Construction Phase:	
Visual effect on the dark skies of the Karoo created by navigation lights on turbines for aircraft. Visual intrusion of area and security lighting around the substations and O&M buildings.	Use of available technology to minimise the visual effect of navigation lights, conforming with CAA requirements. Use of reflectors on area and security lighting to conceal light sources.
Decommissioning Phase:	
Visual intrusion and noise of construction activities during decommissioning. Visual intrusion of remaining disused structures, including wind turbines, substation, buildings, internal overhead powerlines and access roads on the Karoo landscape if not rehabilitated.	Disturbed areas rehabilitated / revegetated as soon as possible after the decommissioning phase. Wind turbines and building structures removed at the end of the life of the project. Hardstands and access roads no longer required to be ripped and regraded. Exposed or disturbed areas revegetated and returned to grazing pasture or natural veld to blend with the surroundings.
Cumulative Visual Impacts	
High numbers of wind turbines in close proximity to adjacent WEFs potentially result in a visual merging effect, transforming the visual and scenic experience of the area.	Clusters of wind turbines should ideally be separated by means of adequate visual buffers, as largely achieved in the layout. Where a choice exists between turbines to be dropped (when the final 60 turbine positions, or less, are selected), and all other factors are equal, priority should be given to dropping outlier turbines or those in the 'high' visual sensitivity areas including those within 1 km of the R381, and consideration given to removing turbines where widening of gaps improve the clustering effect.

Environmental Management Programme

Visual input into the Environmental Management Programme (EMPr) is discussed below. This should be included in the Environmental Authorisation for the project.

Construction Phase Monitoring:

Ensure that visual management measures are included as part of the EMPr, monitored by an Environmental Control Officer (ECO), including siting of any construction camps, stockpiles, temporary laydown areas and batching plants outside of identified no-go areas unless otherwise approved by the visual specialists (see mitigation measures above), as well as the implementation of dust suppression and litter control measures. Rehabilitation efforts to commence immediately after construction activities are completed.

Responsibility: ECO / Contractor.

Timeframe: Preparation of EMPr during the planning phase. Monitoring during the construction phase.

Operation Phase Monitoring:

Ensure that visual mitigation measures are monitored by management on an on-going basis, including the maintenance of rehabilitated areas, as well as control of any signage, lighting and wastes at the proposed wind farm, with interim inspections by the environmental officer based on site.

Responsibility: Wind Farm operator and ECO.

Timeframe: During the operational life of the project.

Decommissioning Phase Monitoring:

Ensure that procedures for the removal of wind turbines and building structures during decommissioning are implemented, including recycling of materials and rehabilitation of the site to a visually acceptable standard, and signed off by the delegated authority.

It is assumed that some access roads and concrete pads would remain. Those that are not required should be ripped and the vegetation or grazing cover reinstated.

The revegetation measures are not described here as they would fall under the auspices of the vegetation/ biodiversity specialist.

Responsibility: ECO / Contractor / qualified rehabilitation ecologist or horticulturist.

Timeframe: During the decommissioning contract phase, as well as a prescribed maintenance period thereafter (usually one year).

9. SUMMARY AND CONCLUSION

9.1 Summary of Findings

The current visual assessment is based on the Pre-Application Stage of the two Hoogland North WEF layouts (HL01 and HL02). A number of layout design related mitigation measures have been recommended that will be adopted by the developer in the next iteration of the design. Visual photomontages have been prepared to depict the post-mitigation layout and the conclusions therefore assume that the developer will apply all of the design recommendations as discussed below.

The preliminary visual assessment findings are the following:

- There are a relatively high number of potential wind turbine locations currently indicated in the layouts provided to the specialists, being 87 and 80 turbines for HL01 and HL02 respectively. It is not intended that this number of turbines will be developed as the application is for a maximum of 60 turbines for each wind farm.
- The viewshed is fairly extensive to the north of the site, particularly with turbines located at the higher elevations. The viewshed to the south-east is less extensive because of intervening topography.
- There are a large number of visual receptors in close proximity to the proposed WEFs (see Table 3), these being mainly farmsteads, as well as guest accommodation at Donkergat.
- There are several wind turbines in fairly close proximity to the R381, which is the main arterial route between Beaufort West and Loxton, and which is therefore the main visual and scenic corridor in this part of the Karoo. A no-go buffer of 750 m along the R381 has been adopted.
- The wind turbines of both HL01 and HL02 are spread across both sides of the R381, which tends to increase the visibility and visual experience of the wind farm.
- Several of the wind turbines in HL01 are located on prominent landforms (mainly slopes), which would increase their visibility and affect the scenic quality of the local area. Both 1:4 and 1:10 slopes have been avoided for the location of turbines.
- Several of the wind turbines in both HL01 and HL02 are in close proximity (less than 5km) to the proposed Nuweveld WEFs, which means that the wind farms could merge together in visual terms. Currently, a 3km gap between the turbines closest to Nuweveld, and those further north, has been used to create a clustering effect. Similarly, other gaps in the layout have been created from receptors other than those on the R381.
- The overall visual impact significance for the wind turbines has been rated as high, both before and after mitigation.
- The visual impact significance for related infrastructure has been rated as medium, and therefore not considered visually intrusive in relative terms.
- The cumulative visual impact significance of the two proposed Hoogland WEFs, seen in combination with the proposed Hoogland South WEFs (HL03 and HL04), and the three proposed Nuweveld WEFs, has been rated as high, using the rating criteria provided by SLR. In reality a maximum of 60 turbines would be developed for each wind farm, which would reduce the overall visual effect. As described above, the natural clustering effect also reduces the potential merging together of the proposed wind farms. In addition, the location in proximity to a REDZ could mean the wider area becomes a renewable energy node in the future, where grouping is expected.

- The only effective mitigation for the two proposed WEFS is 'avoidance'. This would include a reduction in the number of wind turbines, namely reducing to 60 turbines per wind farm, and the relocation of certain turbines in visually sensitive locations, namely slopes.

- In summary, the following additional avoidance measures are recommended:

    - There are a large number of wind turbines in 'high' visual sensitivity areas, (see Map 9. Where a choice exists between turbines to be dropped, and all other factors are equal, priority should be given to removing outlier turbines or those in the 'high' visual category in the layout.
    - Similarly, where a choice exists between turbines to be dropped, and all other factors are equal, priority should be given to removing or relocating those within 1 km of the R381, and consideration should be given to removing turbines where widening of gaps would improve the clustering effect.

9.2 Conclusion and Impact Statement

The layouts of the Hoogland North WEFs (HL01 and HL02) have followed an iterative planning process during the Screening Phase, based on the various specialist findings, including the mapping of scenic resources and sensitive receptors. The proposed layout for construction and operational infrastructure largely succeeds in avoiding most visual 'no-go' areas indicated on the visual sensitivity maps and is acceptable. Further refinement of the layout has been recommended where a choice exists between turbines to be dropped to reduce the layout to a maximum of 60 turbines, and all other factors are equal.

The cumulative visual impact of the proposed WEFs and related infrastructure, such as the substations and associated battery facilities, could affect the rural quality, or sense of place of the general area, particularly when combined with the proposed Hoogland South WEFs (HL03 and HL04), and with the adjacent three proposed Nuweveld WEFs by the same Developer.

Using the assessment criteria provided by the EAP (SLR, 2021), potential visual impacts were determined in the tables. The visual impact significance of the two proposed wind farms and related infrastructure are summarised below.

Wind Turbines

Some mitigation in the form of avoidance has already taken place through the iterations in the siting of the wind turbines. Further mitigation is possible by means of omitting or micro-siting some of the wind turbines. The potential visual impact significance during the operational phase was calculated in the spreadsheet to be **high (negative)** before mitigation and would remain **high (negative)** after mitigation (see Table 14).

Although avoidance mitigations have been implemented as part of the design process, the overall visual effect of the proposed two wind farms and the associated grid line could still potentially result in a change in character to the rural Karoo landscape.

Substation, Associated Battery Facility and Buildings

Potential visual impact of the substations, associated battery facilities and O&M buildings has been minimized through siting of these in low visual sensitivity areas, away from scenic resources and sensitive receptors (see Map 10), as currently planned. The potential visual impact significance was calculated to be **medium (negative)**, before mitigation and **medium (negative)** after mitigation (see Table 15).

Internal Overhead Powerlines and Access Roads

Most internal powerlines would be constructed underground, while others, such as those crossing drainage lines and steep areas, would need to be overhead. Internal access roads would make use of existing roads and tracks where possible, although a large number of new access roads would be required. The potential

visual impact significance was calculated to be **medium (negative)**, before mitigation and **medium (negative)** after mitigation, (Table 15). Likewise, the visual impact significance of lighting at night was also determined as being **medium (negative)**, both before and after mitigation, (Table 16).

N1 Bypass Road

The proposed temporary bypass road around Beaufort West town for the transport of wind farm components would result in some visual and noise impacts on adjacent residential development, the golf course and the Karoo National Park during the construction period, resulting in a **medium (negative)** visual impact significance before mitigation, and **minor (negative)** significance after mitigation, including rehabilitation (See Table **17**).

Conclusion

Given the relatively large number and large scale of the wind turbines, the potential visual impact of the wind farm was calculated to be **high** (-) before mitigation. However, some scope for mitigation is possible through the reduction in numbers of turbines or their relocation and the developer has committed to implementing these in the final layout. The VIA considered the visual impact of 87 and 80 turbines for each of the WEFs, while acknowledging that a maximum of 60 turbines for each could be developed (as per the application), potentially reducing the visual impact. This assessment, however, considers the worst-case scenario in terms of the visual impacts associated with the two proposed Hoogland North WEFs.

Where a choice exists between turbines to be dropped (when the final 60 turbine positions, or less, are selected), and all other factors are equal, priority should be given to dropping outlier turbines (that extend the zone of visual influence and detract from the visual cohesion of the proposed WEFs) or those in the 'high' visual sensitivity areas.

Similarly, where fewer turbines are required, consideration should be given to removing or relocating those within 1 km of the R381, and by removing turbines where widening of gaps could improve the clustering effect.

Potential cumulative visual impacts of the proposed Hoogland North WEFs and associated grid line, seen in combination with the proposed Hoogland South WEFs and proposed adjacent Nuweveld WEFs, would be **high** (-). This could be mitigated to some extent through the above measures and therefore has the potential to reduce but can only be quantified once the layout of the 60 turbines is finalised. There are no other existing or proposed wind farms known within 30km although the area is immediately north of the Beaufort West REDZ and could become a future renewable energy node.

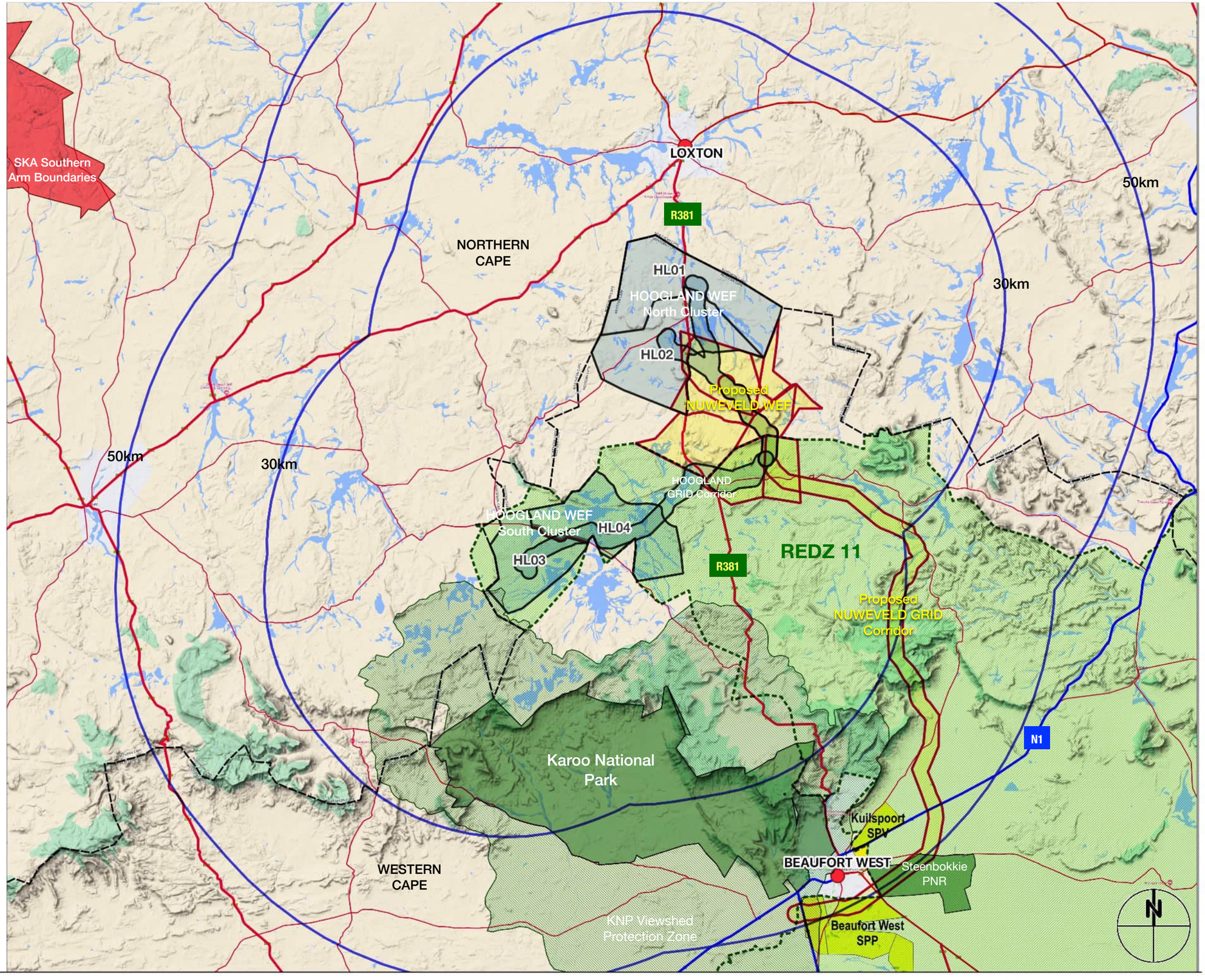
It is the opinion of the Visual Specialists that while the Hoogland 1 Wind Farm and Hoogland 2 Wind Farm layouts would each respectively have a significant visual impact, the layouts have avoided most of the scenic resources and visual receptors of the area and provided the recommended mitigation measures are implemented (specifically the removal of turbines in identified high sensitivity areas as discussed above), would not present a potential fatal flaw in visual terms. The project, with mitigations, may therefore be authorised from a visual perspective. Should the layout of the WEF and related infrastructure be materially changed, the visual implications would need to be re-assessed.

10. REFERENCES

SLR, 2021. Proposed Hoogland Wind Farms and Grid Connection: Terms of Reference for Specialist Studies.

Mucina, L. and Rutherford, M.C. (eds) 2006. The Vegetation of South Africa, Lesotho and Swaziland. *Strelizia 19*. South African National Biodiversity Institute, Pretoria.

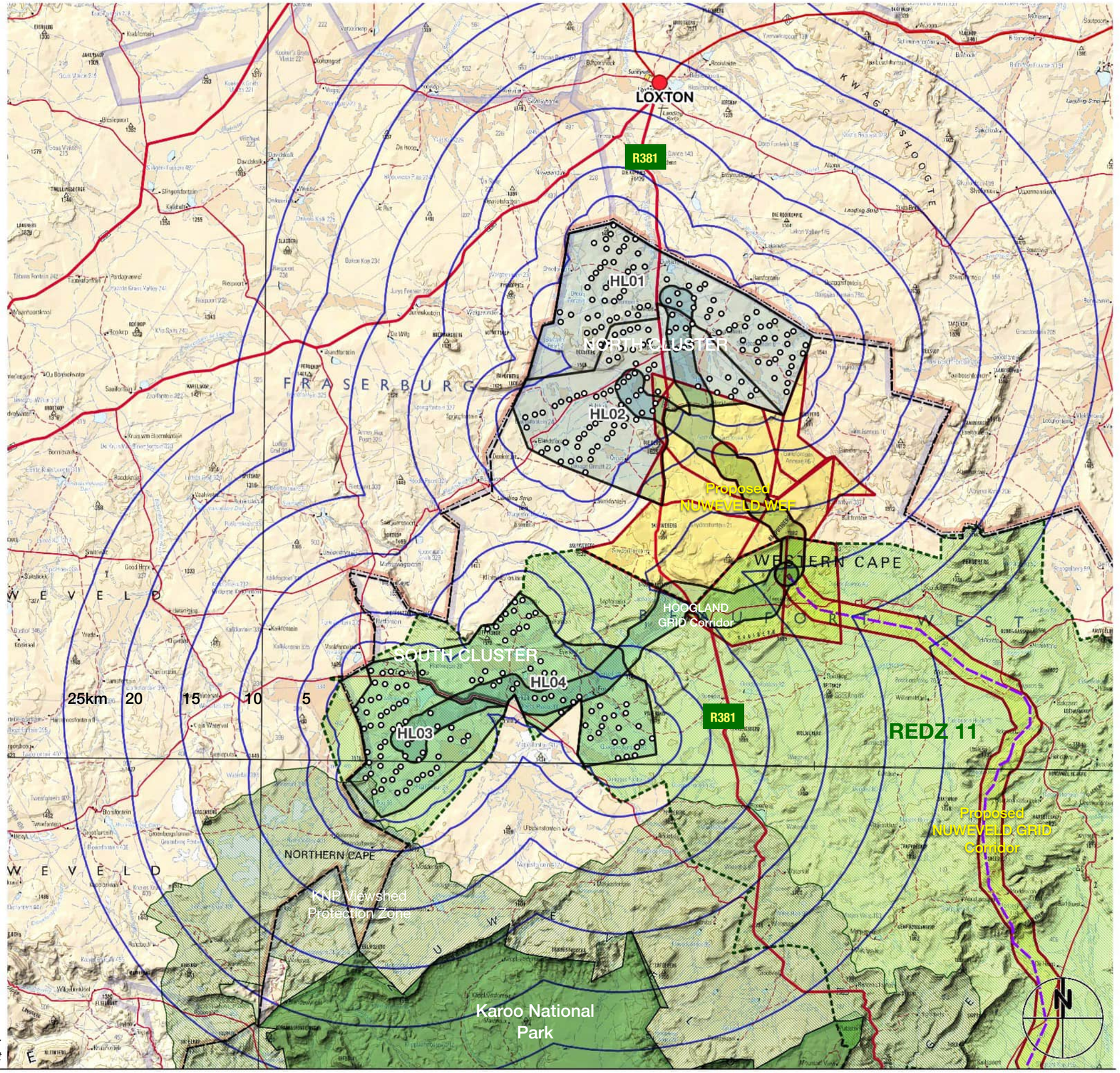
Oberholzer, B. 2005. Guideline for Involving Visual and Aesthetic Specialists in EIA Processes. Edition 1. Provincial Government of the Western Cape.



base map : Google Maps : Terrain 2021

map 1 : Regional Locality and Cumulative Impact

1:500 000 @ A3



base map : NGI 1:250K Topo-Cadastral Series :
3120 Williston, 3122 Victoria West, 3220 Sutherland, 3222 Beaufort West

map 2 : Local Context

Legend :

Field Track Route
17-18/05/2021

Field Track Route
21/09/2021

Viewpoints

base map : NGI 1:250K Topo-Cadastral Series :
3120 Williston, 3122 Victoria West, 3220 Sutherland, 3222 Beaufort West

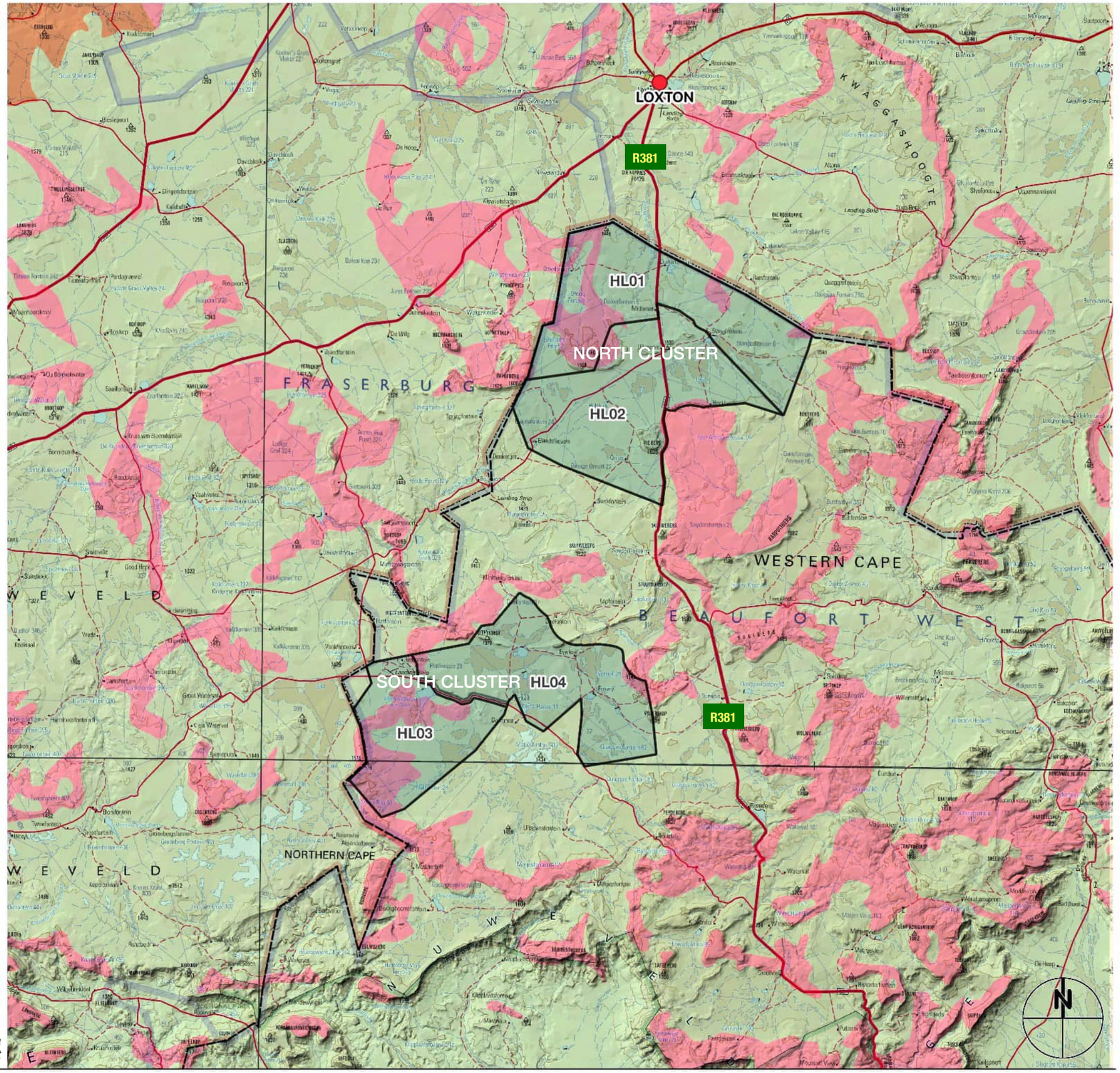
map 3 : Fieldwork - North Cluster

0 5 10 15 20 25 km

1:300 000 @ A3

Geology Legend :

- Beaufort Group Mudstones and Sandstones
- Dolerite
- Ecca Group (shale, sandstone)



base maps : Council for Geoscience : 1:1 000 000 Geological Map of South Africa : Spatial Data
NGI 1:250K Topo-Cadastral Series : 3120 Williston, 3122 Victoria West, 3220 Sutherland, 3222 Beaufort West

map 4 : Geology

0 5 10 15 20 25 km

1:350 000 @ A3

HL01 Temporary Construction Laydown and Batching Plant

HL01 WTG and Hardstand

HL01 Substation and BESS

Upgraded Roads

Internal Overhead Powerlines

HL02 Temporary Construction Laydown and Batching Plant

HL02 Substation and BESS (options)

HL02 WTG and Hardstand

Internal Access Roads

base map : NGI 1:50K Topographic Series : 3122CA Juriesfontein, 3122CB Slangfontein, 3122CC Vonkfontein, 3122CD Dunedin, 3122DA Slypfontein, 3122DC Hillcrest

map 5 : Hoogland WEF North Cluster : Project Layout

0 5 10 km

1:100 000 @ A3

LEGEND :

NORTH CLUSTER

HL01-02 Viewshed

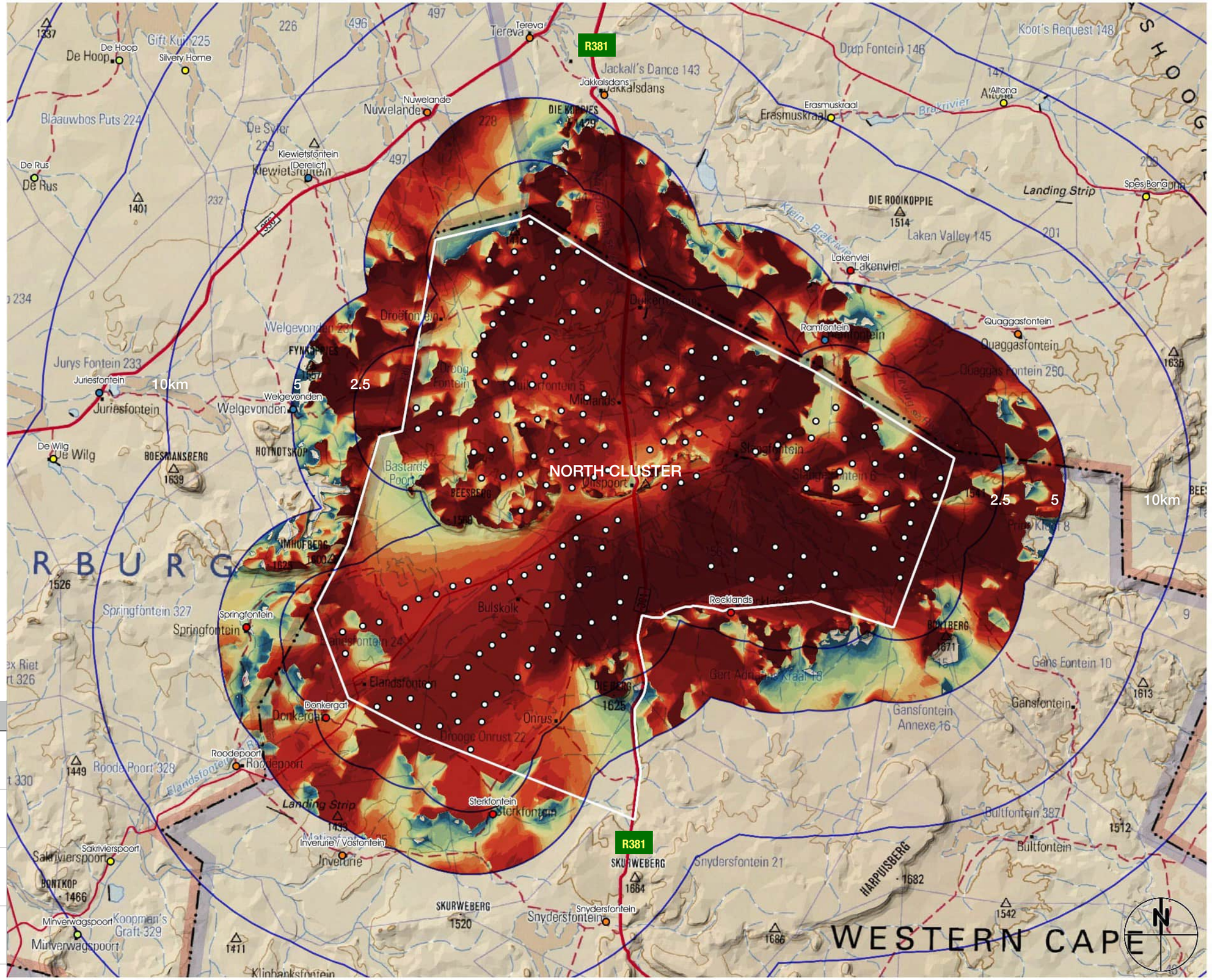
250m Rotor Blade Tip Height - up to 5km

Wind Turbines Visible

- <= 0
- 0 - 5
- 5 - 10
- 10 - 15
- 15 - 20
- 20 - 30
- 30 - 40
- 40 - 50
- 50 - 60
- 60 - 70
- 70 - 80
- 80 - 90
- 90 - 100
- 100 - 110
- 110 - 120
- 120 - 130
- 130 - 140
- 140 - 150
- 150 - 160
- > 160

Viewshed based on Wind Turbine Generator (WTG) with a Hub Height of 150m and Rotor Diameter of 195m. Rotor Blade Tip Height of 247.5m

distance	visibility	notes
0 - 2.5km	**Very High** visibility	Prominent feature within the observer's view frame.
2.5 - 5km	**High** visibility	Relatively prominent within the observer's view frame.
5 - 10km	**Moderate** visibility	Only prominent with clear visibility as part of the wider landscape
10 - 20km	**Marginal** visibility	Seen in very clear visibility as a minor element in the landscape



base map : NGI 1:250K Topo-Cadastral Series : 3120 Williston, 3122 Victoria West, 3220 Sutherland, 3222 Beaufort West

map 6 : Hoogland WEFs Cumulative Viewshed • North Cluster • Up to 5km

0 2.5 5 7.5 10 km

1:150 000 @ A3

LEGEND :

NORTH CLUSTER

HL01-02 Viewshed

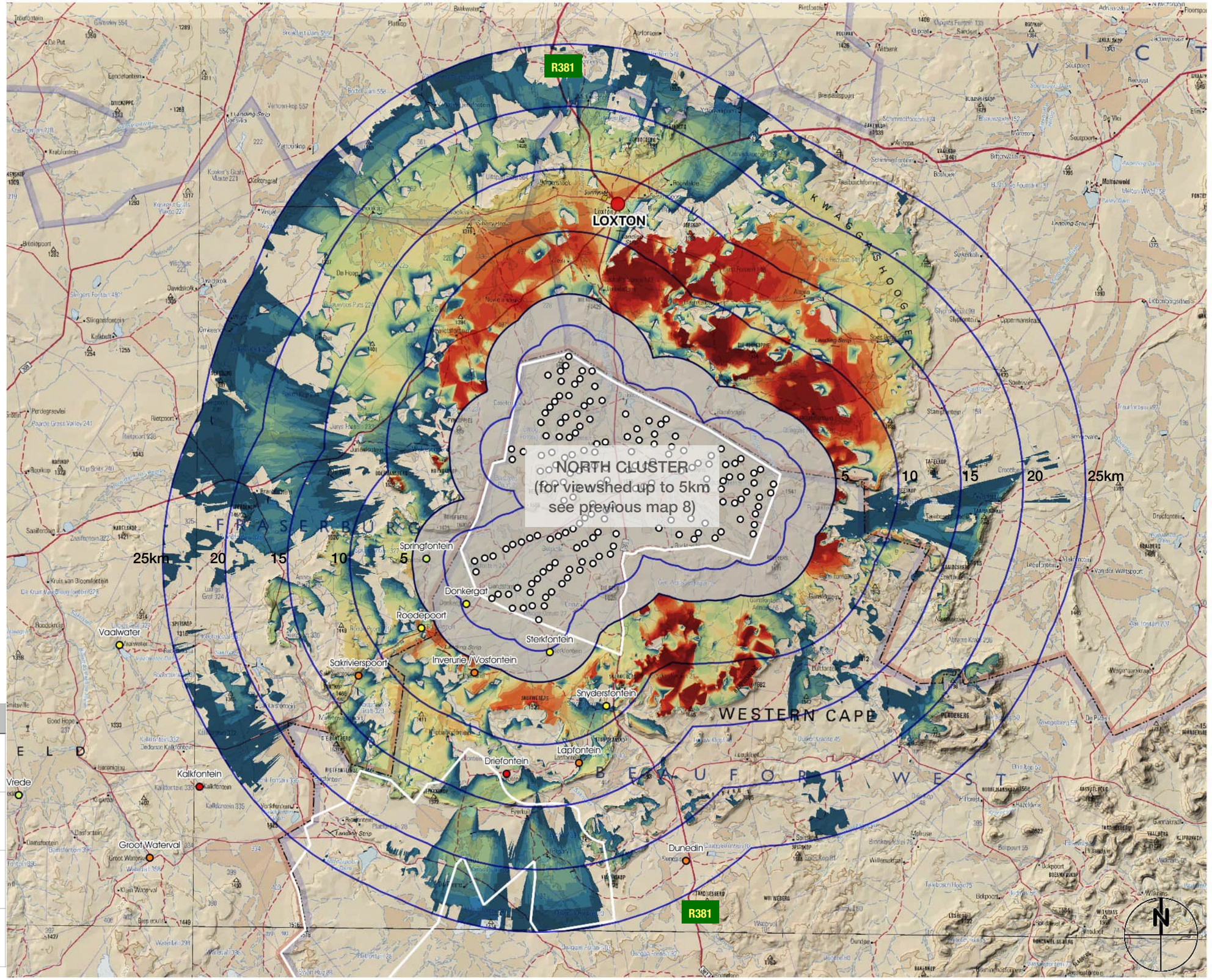
150m Hub Height for 5-25km

Wind Turbines Visible :

- <= 0
- 0 - 5
- 5 - 10
- 10 - 15
- 15 - 20
- 20 - 30
- 30 - 40
- 40 - 50
- 50 - 60
- 60 - 70
- 70 - 80
- 80 - 90
- 90 - 100
- 100 - 110
- 110 - 120
- 120 - 130
- 130 - 140
- 140 - 150
- 150 - 160
- > 160

Viewshed based on Wind Turbine Generator (WTG) with a Hub Height of 150m

distance	visibility	notes
0 - 2.5km	**Very High** visibility	Prominent feature within the observer's view frame.
2.5 - 5km	**High** visibility	Relatively prominent within the observer's view frame.
5 - 10km	**Moderate** visibility	Only prominent with clear visibility as part of the wider landscape
10 - 20km	**Marginal** visibility	Seen in very clear visibility as a minor element in the landscape



base map : NGI 1:250K Topo-Cadastral Series : 3120 Williston, 3122 Victoria West, 3220 Sutherland, 3222 Beaufort West

map 7 : Hoogland WEFs Cumulative Viewshed · North Cluster · From 5 - 25km

0 5 10 15 20 25 km

1:300 000 @ A3

Feature Legend :

- Topographic Features, Ridgelines, Scarps
- Prominent Peaks
- Steep Slopes
  > 1:10 (orange) > 1:4 (red)
- Geological Features
  Dolerite Outcrops
- Water Features, Wetlands, Major Dams
- Farmsteads
- Scenic Routes, Poorts
- Arterial Route R381
- Main District Roads
- 5m Contours
- Hoogland 01 WTGs
- Hoogland 02 WTGs

Dolerite Dykes

base map : NGI 1:50K Topographic Series : 3122CA Juriesfontein, 3122CB Slangfontein, 3122CC Vonkfontein, 3122CD Dunedin, 3122DA Slypfontein, 3122DC Hillcrest

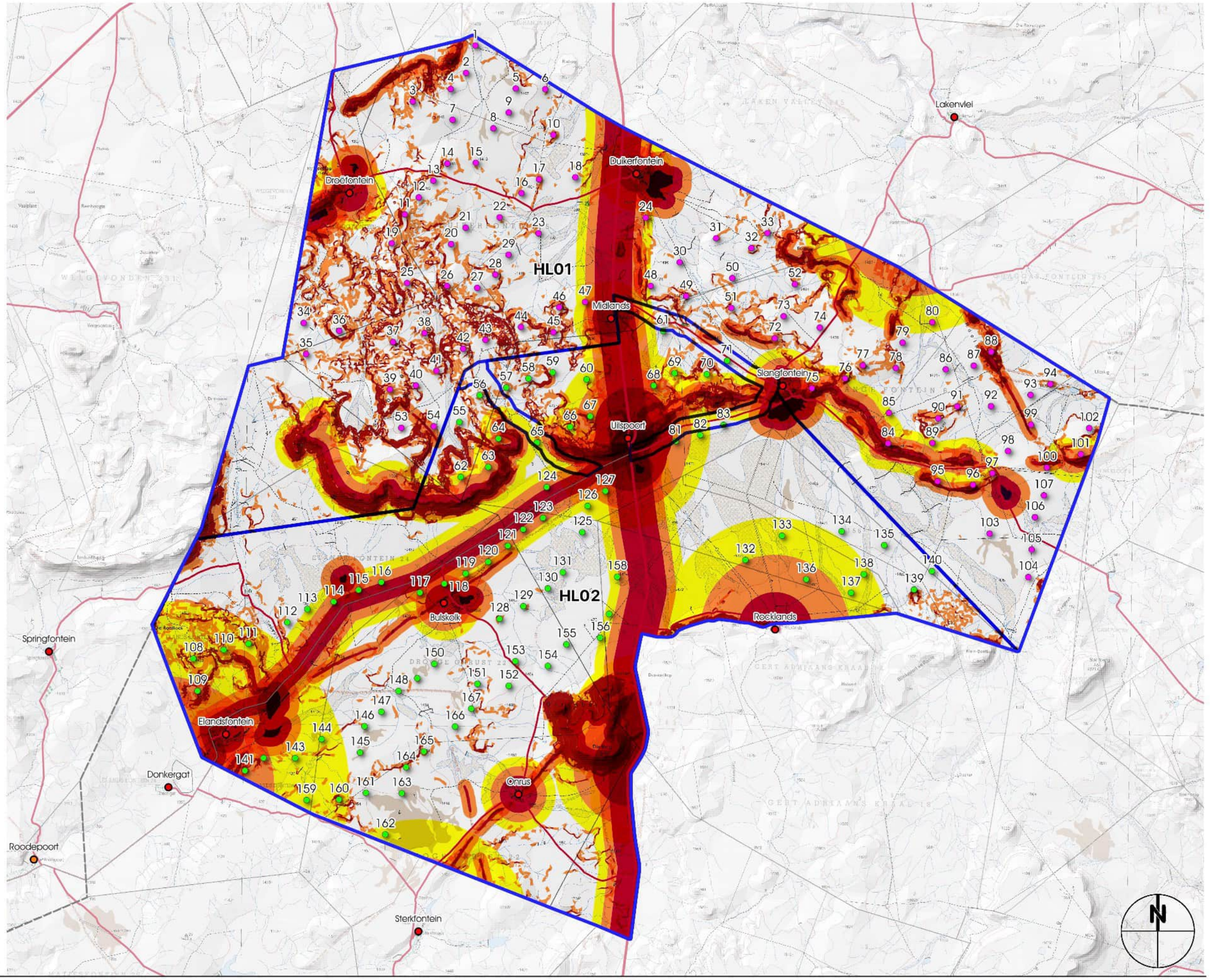
map 8 : Hoogland WEF North Cluster : Visual Features

0 5 10 km

1:100 000 @ A3

Visual Sensitivity Legend :

- No Go
- High
- Medium
- Low



base map : NGI 1:50K Topographic Series : 3122CA Juriesfontein, 3122CB Slangfontein, 3122CC Vonkfontein, 3122CD Dunedin, 3122DA Slypfontein, 3122DC Hillcrest

map 9 : Hoogland WEF North Cluster : Visual Sensitivity : Wind Turbines

0 5 10 km

1:100 000 @ A3

Visual Sensitivity Legend :

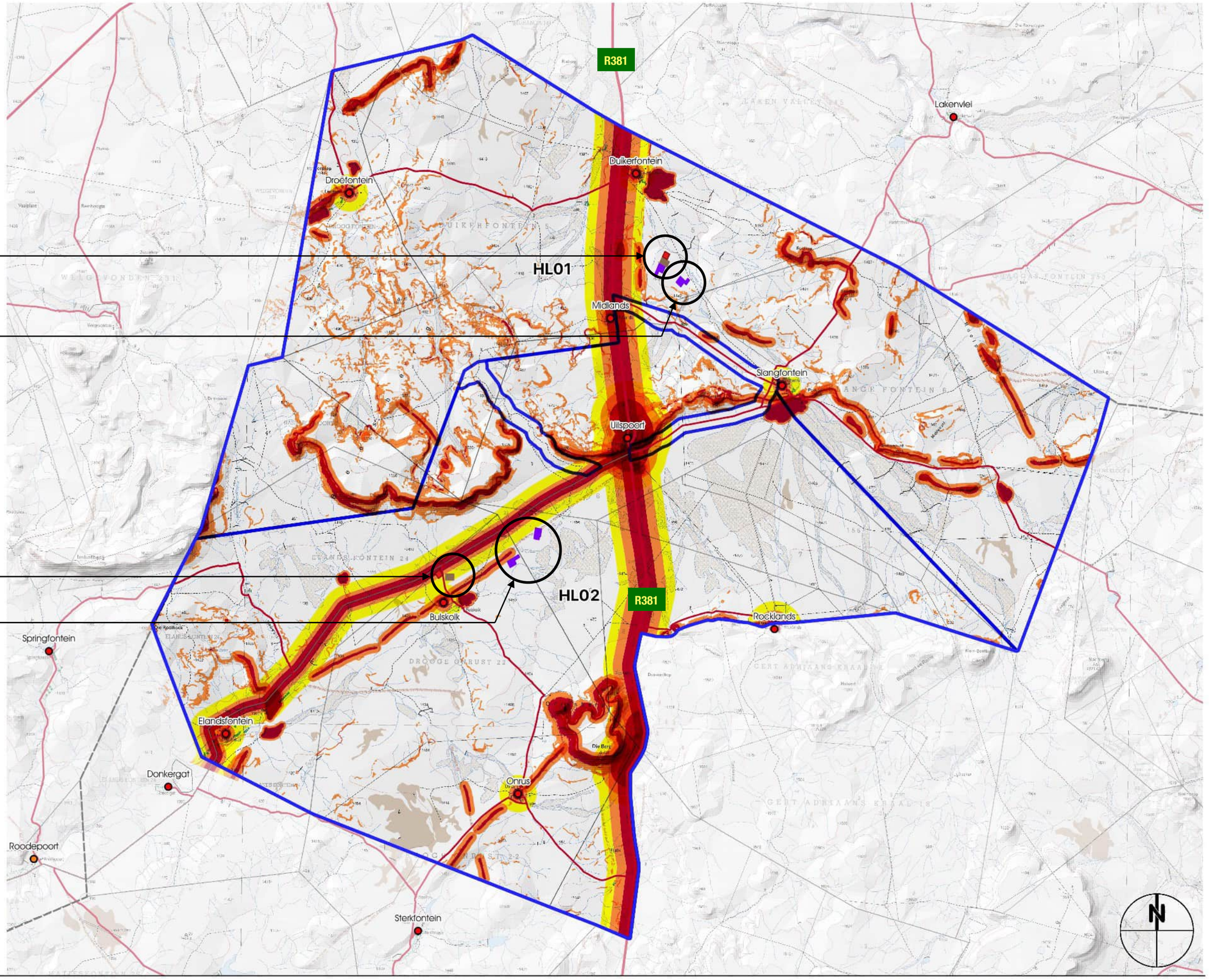
- No Go
- High
- Medium
- Low

HL01 Temporary Construction Laydown and Batching Plant

HL01 Buildings, Substation and BESS

HL02 Temporary Construction Laydown and Batching Plant

HL02 Buildings, Substation and BESS (Options)



base map : NGI 1:50K Topographic Series : 3122CA Juriesfontein, 3122CB Slangfontein, 3122CC Vonkfontein, 3122CD Dunedin, 3122DA Slypfontein, 3122DC Hillcrest

map 10 : Hoogland WEF North Cluster : Visual Sensitivity : Buildings, Substations, BESS

0 5 10 km

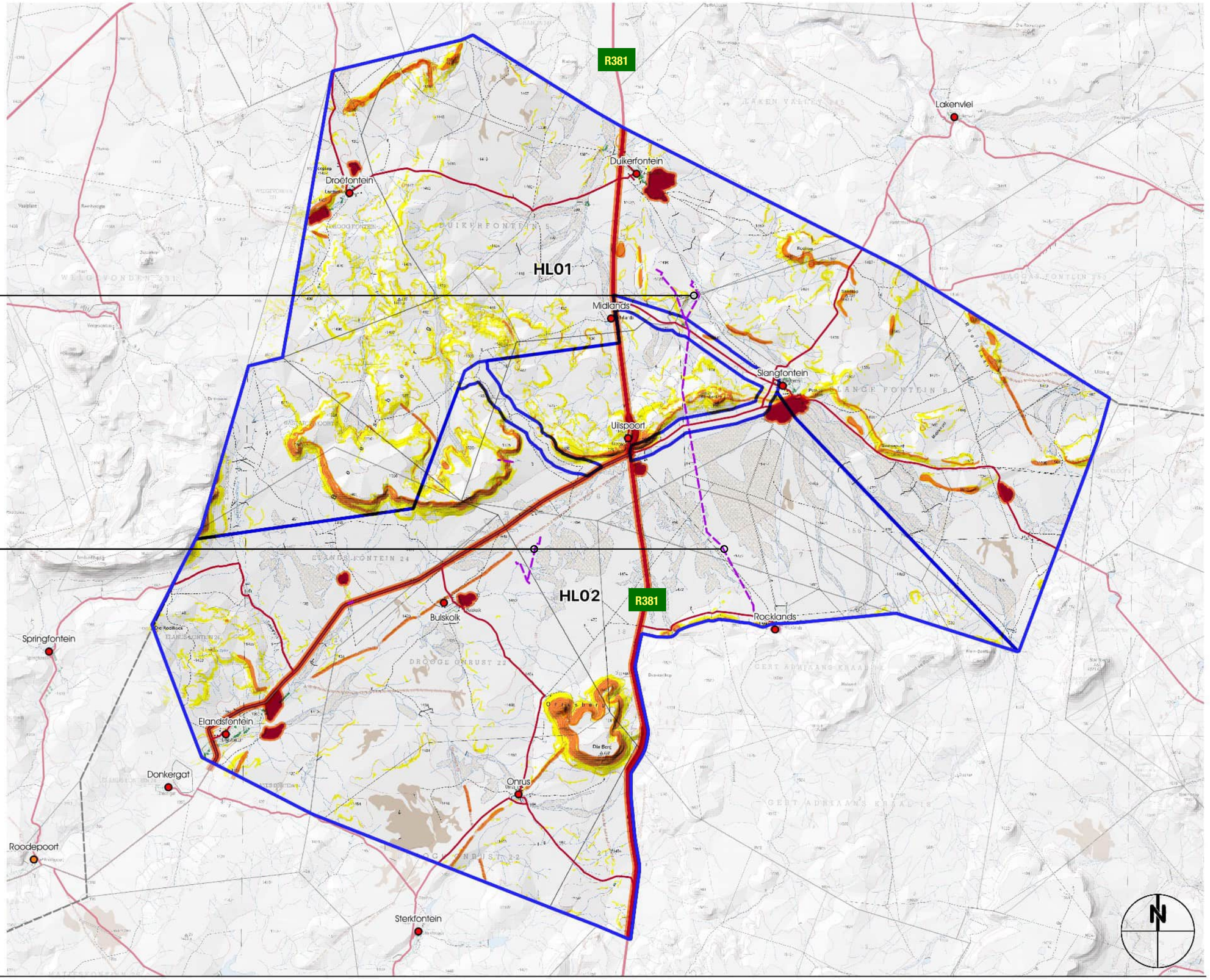
1:100 000 @ A3

Visual Sensitivity Legend :

- No Go
- High
- Medium
- Low

HL01 Internal Overhead Powerlines

HL02 Internal Overhead Powerlines



base map : NGI 1:50K Topographic Series : 3122CA Juriesfontein, 3122CB Slangfontein, 3122CC Vonkfontein, 3122CD Dunedin, 3122DA Slypfontein, 3122DC Hillcrest

map 11 : Hoogland WEF North Cluster : Visual Sensitivity : Internal OH Powerlines

0 5 10 km

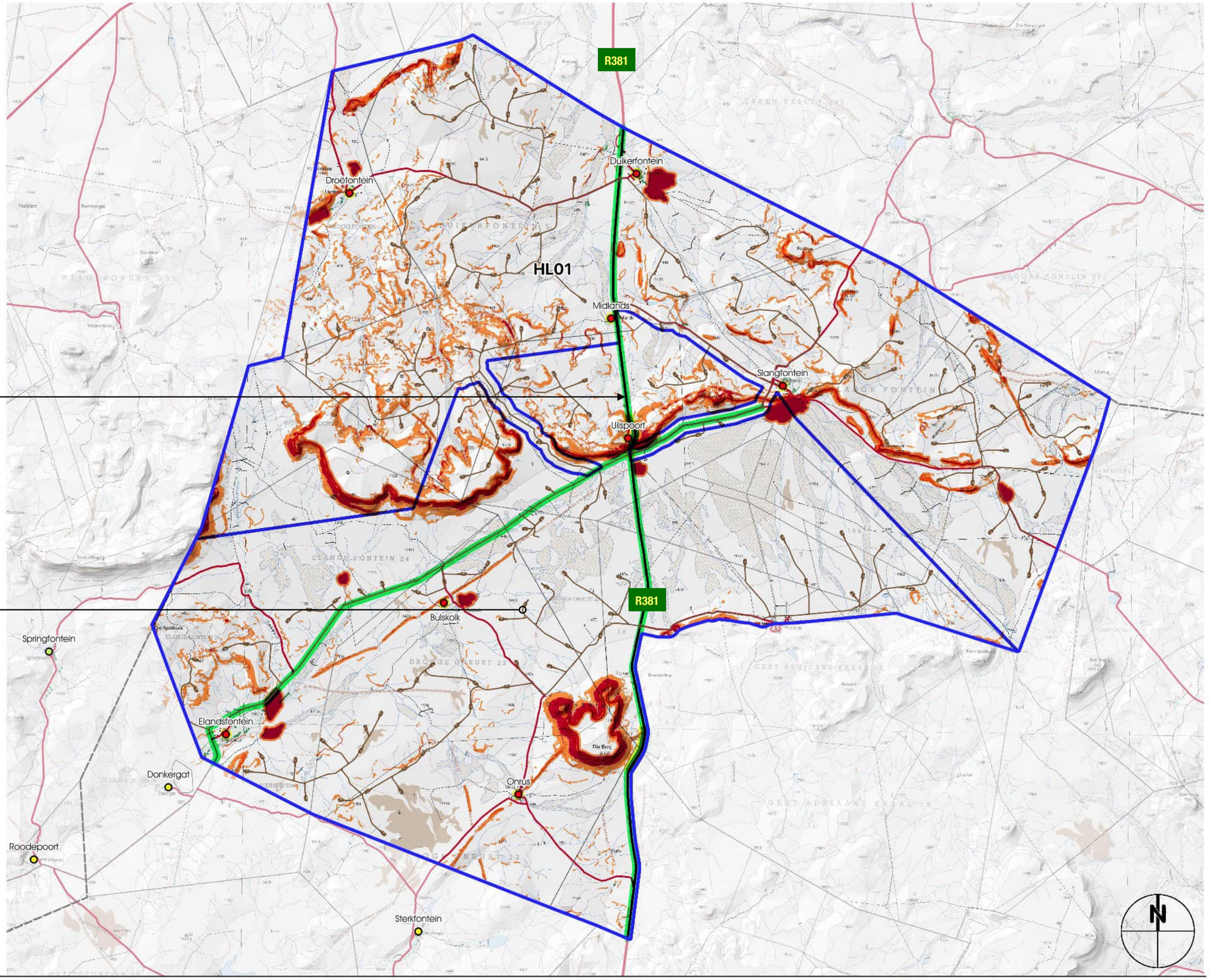
1:100 000 @ A3

Visual Sensitivity Legend :

- No Go
- High
- Medium
- Low

Upgraded Roads

Internal Roads and Hardstands



base map : NGI 1:50K Topographic Series : 3122CA Juriesfontein, 3122CB Slangfontein, 3122CC Vonkfontein, 3122CD Dunedin, 3122DA Slypfontein, 3122DC Hillcrest

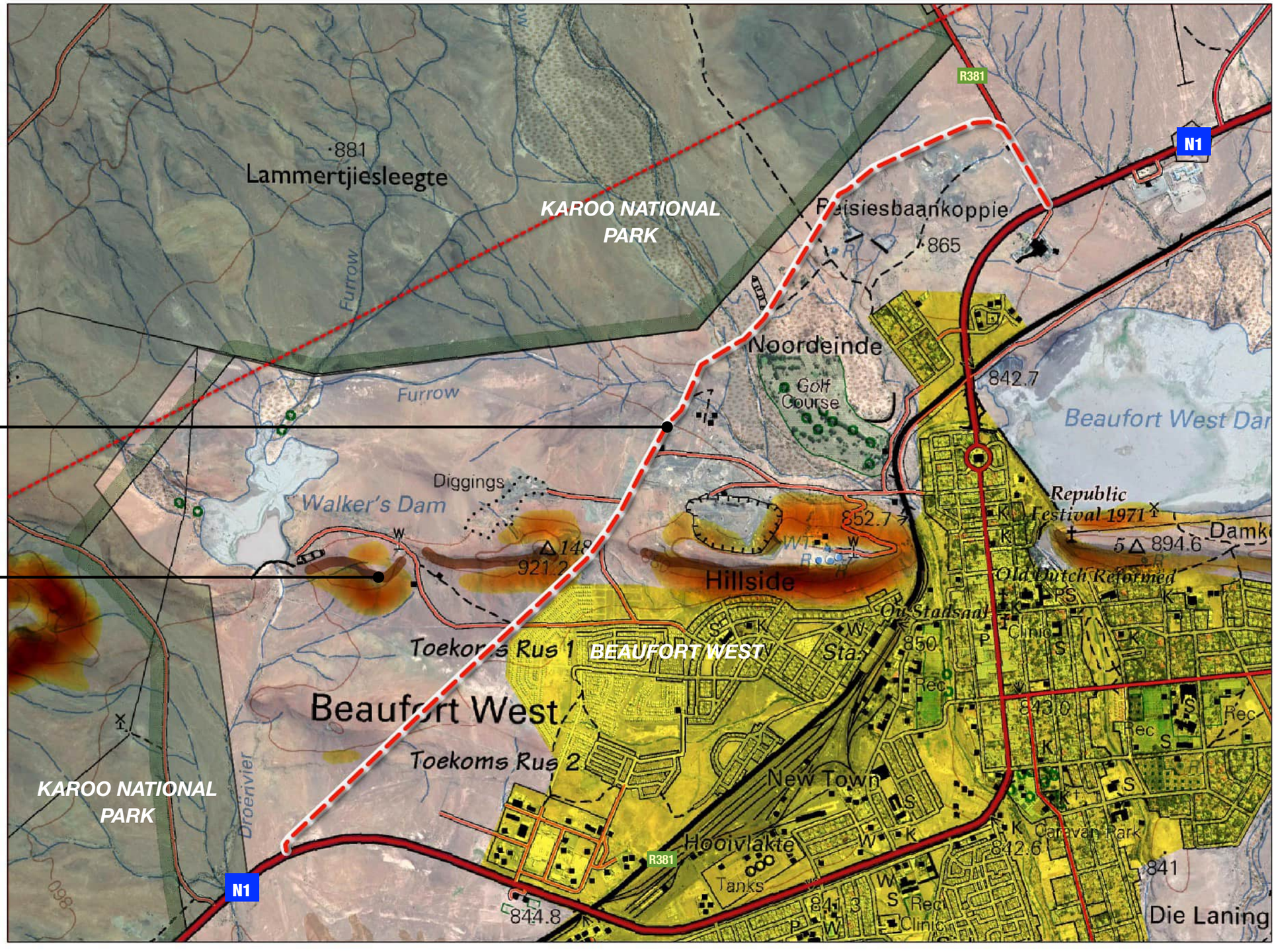
map 12 : Hoogland WEF North Cluster : Visual Sensitivity : Internal Roads

0 5 10 km

1:100 000 @ A3

Beaufort West ByPass Road in 50m wide corridor

Local ridge lines and steep slopes



base map : NGI 1:50K Topographic Series 3222BC Beaufort West

map 13 : HOOGLAND North WEF : Beaufort West ByPass Visual Features

0 0.5 1 1.5 2 2.5 km

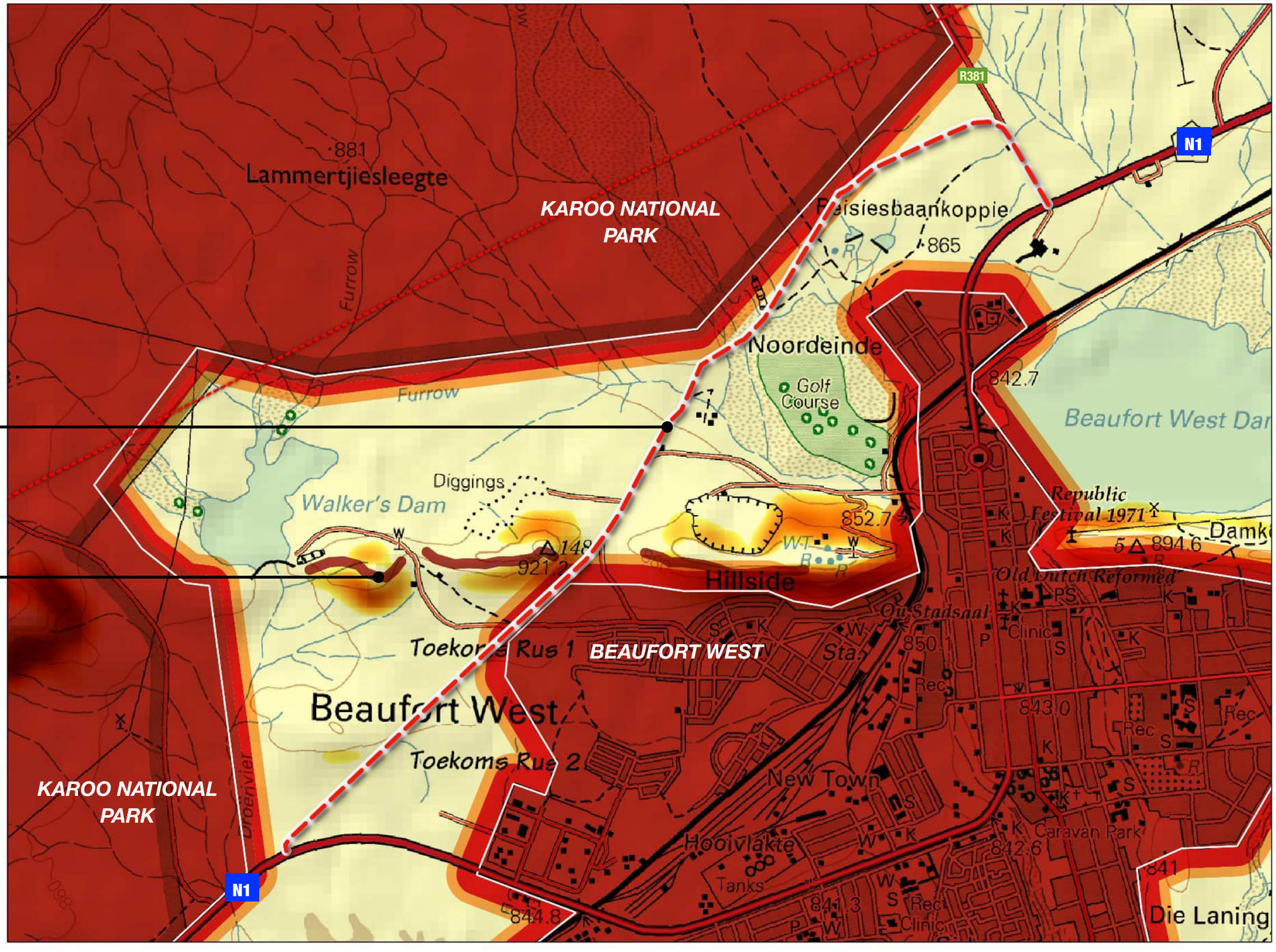
1:20 000

Visual Sensitivity Legend :

- No Go
- High
- Medium
- Low

Beaufort West ByPass Road in 50m wide corridor

Local ridge lines and steep slopes



base map : NGI 1:50K Topographic Series 3222BC Beaufort West

map 14 : HOOGLAND North WEF : Beaufort West ByPass Visual Sensitivity

0 0.5 1 1.5 2 2.5 km

1:20 000

Viewpoint 9 **:** Looking North-East from **Donkergat Game Farm**

Coordinates : 31.765827S, 22.229447E Distance : 2.05km

Viewpoint 15 **:** Looking North-East from **Sterkfontein Farm**

Coordinates : 31.800328S, 22.298547E Distance : 2.79km

NOTE : Rotors only visible in the distance beyond Die Berg. Closest Turbines are hidden behind the ridge to the North (left) of the farmstead.

Viewpoint Photomontages

Viewpoint 10 **:** Looking East from **Springfontein Farm**

Coordinates : 31.734549S, 22.195270E Distance : 3.81km

Viewpoint 22 **:** Looking North-East from **Vosfontein Farm**

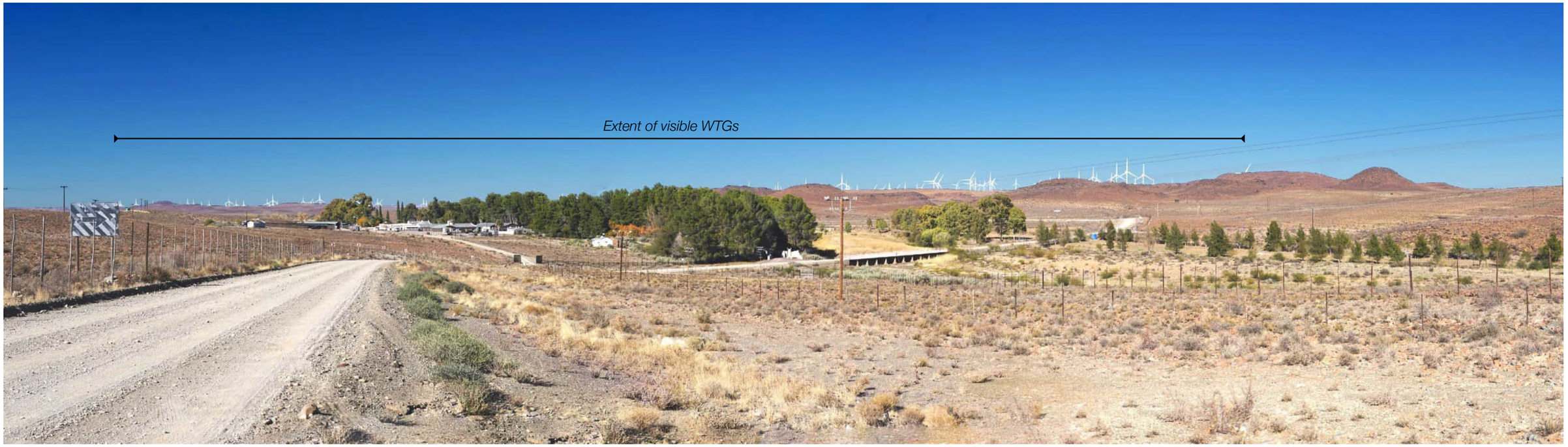
Coordinates : 31.813488S, 22.235712E Distance : 5.95km

NOTE : Closest Turbines are hidden behind the ridge to the North-West (left) of the farmstead.

Viewpoint Photomontages

Viewpoint 8 **:** Looking South-East from **Nuwelande Farm**

Coordinates : 31.544565S, 22.272136E Distance : 6.02km



Viewpoint 1 **:** Looking South from **R381 at Jakkalsdans Farm**

Coordinates : 31.533388S, 22.340610E Distance : 6.40km

Viewpoint Photomontages

Appendix A: Visual Specialists

Bernard Oberholzer, Landscape Architect
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Quinton Lawson, Architect
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Expertise

Bernard Oberholzer has a Bachelor of Architecture (UCT) and Master of Landscape Architecture (U. of Pennsylvania), and has more than 20 years' experience in undertaking visual impact assessments. He has presented papers on *Visual and Aesthetic Assessment Techniques*, and is the author of *Guideline for Involving Visual and Aesthetic Specialists in EIA Processes,* prepared for the Dept. of Environmental Affairs and Development Planning, Provincial Government of the Western Cape, 2005.

Quinton Lawson has a Bachelor of Architecture Degree (Natal) and has more than 10 years' experience in visual assessments, specializing in 3D modelling and visual simulations. He has previously lectured on visual simulation techniques in the Master of Landscape Architecture Programme at UCT.
The authors have been involved in visual assessments for a wide range of residential, industrial and renewable energy projects. They prepared the 'Landscape/Visual Assessment' chapter in the report for the *National Wind and Solar PV Strategic Environmental Assessment (SEA)*, as well as the *National Electricity Grid Infrastructure SEA* in association with the CSIR, for the Department of Environmental Affairs in 2014-2015

Appendix B: Visual Assessment Methodology

Table 1: Impact Assessment Methodology

PART A: DEFINITIONS AND CRITERIA		
Determination of CONSEQUENCE	**Consequence is a function of intensity, spatial extent and duration**	
Determination of SIGNIFICANCE	**Significance is a function of consequence and probability**	
Criteria for ranking of the INTENSITY of environmental impacts	**Very High**	Severe change, disturbance or degradation caused to receptors. Associated with severe consequences. May result in severe illness, injury or death. Targets, limits and thresholds of concern continually exceeded. Substantial intervention will be required.
	High	Prominent change, or large degree of modification, disturbance or degradation caused to receptors or which may affect a large proportion of receptors, possibly entire species or community.
	Medium	Moderate change, disturbance or discomfort caused to receptors and/or which may affect a moderate proportion of receptors.
	Low	Minor (slight) change, disturbance or nuisance caused to receptors which is easily tolerated without intervention, or which may affect a small proportion of receptors.
	Very Low	Negligible change, disturbance or nuisance caused to receptors which is barely noticeable or may have minimal effect on receptors or affect a limited proportion of the receptors.
Criteria for ranking the DURATION of impacts	**Very Short-term**	The duration of the impact will be < 1 year or may be intermittent.
	Short-term	The duration of the impact will be between 1 - 5 years.
	Medium-term	The duration of the impact will be Medium-term between, 5 to 10 years.
	Long-term	The duration of the impact will be Long-term, between 10 and 20 years. (Likely to cease at the end of the operational life of the activity).
	Permanent	The duration of the impact will be permanent
Criteria for ranking the EXTENT of impacts	**Site**	Impact is limited to the immediate footprint of the activity and immediate surrounds within a confined area.
	Local	Impact is confined to within the project site / area and its nearby surroundings.
	Regional	Impact is confined to the region, e.g., coast, basin, catchment, municipal region, district, etc.
	National	Impact may extend beyond district or regional boundaries with national implications.
	International	Impact extends beyond the national scale or may be transboundary.

PART B: DETERMINING CONSEQUENCE						
		EXTENT				
		Site	Local	Regional	National	International
Intensity- Very Low						
DURATION	Permanent	**Low**	**Low**	**Medium**	**Medium**	**High**
	Long-term	**Low**	**Low**	**Low**	**Medium**	**Medium**
	Medium-term	**Very Low**	**Low**	**Low**	**Low**	**Medium**
	Short-term	**Very low**	**Very Low**	**Low**	**Low**	**Low**
	Very Short-term	**Very low**	**Very Low**	**Very Low**	**Low**	**Low**
Intensity -Low						
DURATION	Permanent	**Medium**	**Medium**	**Medium**	**High**	**High**
	Long-term	**Low**	**Medium**	**Medium**	**Medium**	**High**

	Medium-term	**Low**	**Low**	**Medium**	**Medium**	**Medium**
	Short-term	**Low**	**Low**	**Low**	**Medium**	**Medium**
	Very Short-term	**Very low**	**Low**	**Low**	**Low**	**Medium**
Intensity- Medium						
DURATION	Permanent	**Medium**	**High**	**High**	**High**	**Very High**
	Long-term	**Medium**	**Medium**	**Medium**	**High**	**High**
	Medium-term	**Medium**	**Medium**	**Medium**	**High**	**High**
	Short-term	**Low**	**Medium**	**Medium**	**Medium**	**High**
	Very Short-term	**Low**	**Low**	**Low**	**Medium**	**Medium**
Intensity -High						
DURATION	Permanent	**High**	**High**	**High**	**Very High**	**Very High**
	Long-term	**Medium**	**High**	**High**	**High**	**Very High**
	Medium-term	**Medium**	**Medium**	**High**	**High**	**High**
	Short-term	**Medium**	**Medium**	**Medium**	**High**	**High**
	Very Short-term	**Low**	**Medium**	**Medium**	**Medium**	**High**
Intensity - Very High						
DURATION	Permanent	**High**	**High**	**Very High**	**Very High**	**Very High**
	Long-term	**High**	**High**	**High**	**Very High**	**Very High**
	Medium-term	**Medium**	**High**	**High**	**High**	**Very High**
	Short-term	**Medium**	**Medium**	**High**	**High**	**High**
	Very Short-term	**Low**	**Medium**	**Medium**	**High**	**High**
		Site	Local	Regional	National	International
		EXTENT				
PART C: DETERMINING SIGNIFICANCE						
PROBABILITY (of exposure to impacts)	Definite/ Continuous	**Very Low**	**Low**	**Medium**	**High**	**Very High**
	Probable	**Very Low**	**Low**	**Medium**	**High**	**Very High**
	Possible/ frequent	**Very Low**	**Very Low**	**Low**	**Medium**	**High**
	Conceivable	**Insignificant**	**Very Low**	**Low**	**Medium**	**High**
	Unlikely/ improbable	**Insignificant**	**Insignificant**	**Very Low**	**Low**	**Medium**
		Very Low	Low	Medium	High	Very High
		CONSEQUENCE				
PART D: INTERPRETATION OF SIGNIFICANCE						
Very High -	Very High +	Represents a key factor in decision-making. In the case of adverse effects, the impact would be considered a fatal flaw unless mitigated to lower significance.				

High -	High +	These beneficial or adverse effects are considered to be very important considerations and are likely to be material for the decision-making process. In the case of negative impacts, substantial mitigation will be required.
Medium -	Medium +	These beneficial or adverse effects may be important but are not likely to be key decision-making factors. The cumulative effects of such issues may become a decision-making issue if leading to an increase in the overall adverse effect on a particular resource or receptor. In the case of negative impacts, mitigation will be required.
Low -	Low +	These beneficial or adverse effects may be raised as localised issues. They are unlikely to be critical in the decision-making process but could be important in the subsequent design of the project. In the case of negative impacts, some mitigation is likely to be required.
Very Low -	Very Low +	These beneficial or adverse effects will not have an influence on the decision, neither will they need to be taken into account in the design of the project. In the case of negative impacts, mitigation is not necessarily required.
Insignificant		Any effects are beneath the levels of perception and inconsequential, therefore not requiring any consideration.

Appendix C: Site Sensitivity Verification

1 Introduction

Red Cap Energy (Pty) Ltd ('Red Cap') is proposing to develop four wind farms and associated grid connections (together known as the Hoogland Projects) located between Loxton and Beaufort West in the Western Cape Province. Refer to Figure 1 and Figure 2.

Hoogland 1 Wind Farm and Hoogland 2 Wind Farm form the Northern Cluster of wind farms which will share a grid connection, named the Hoogland Northern Grid Connection. Hoogland 1 Wind Farm and Hoogland 2 Wind Farm comprise the Northern Cluster which will similarly share a separate grid connection, named the Hoogland Northern Grid Connection. The two Grid Connections are each in the form of 132 kV overhead power lines and will connect the Hoogland Wind Farms to the Nuweveld Collector Substation on Red Cap's adjacent Nuweveld Wind Farms Project.

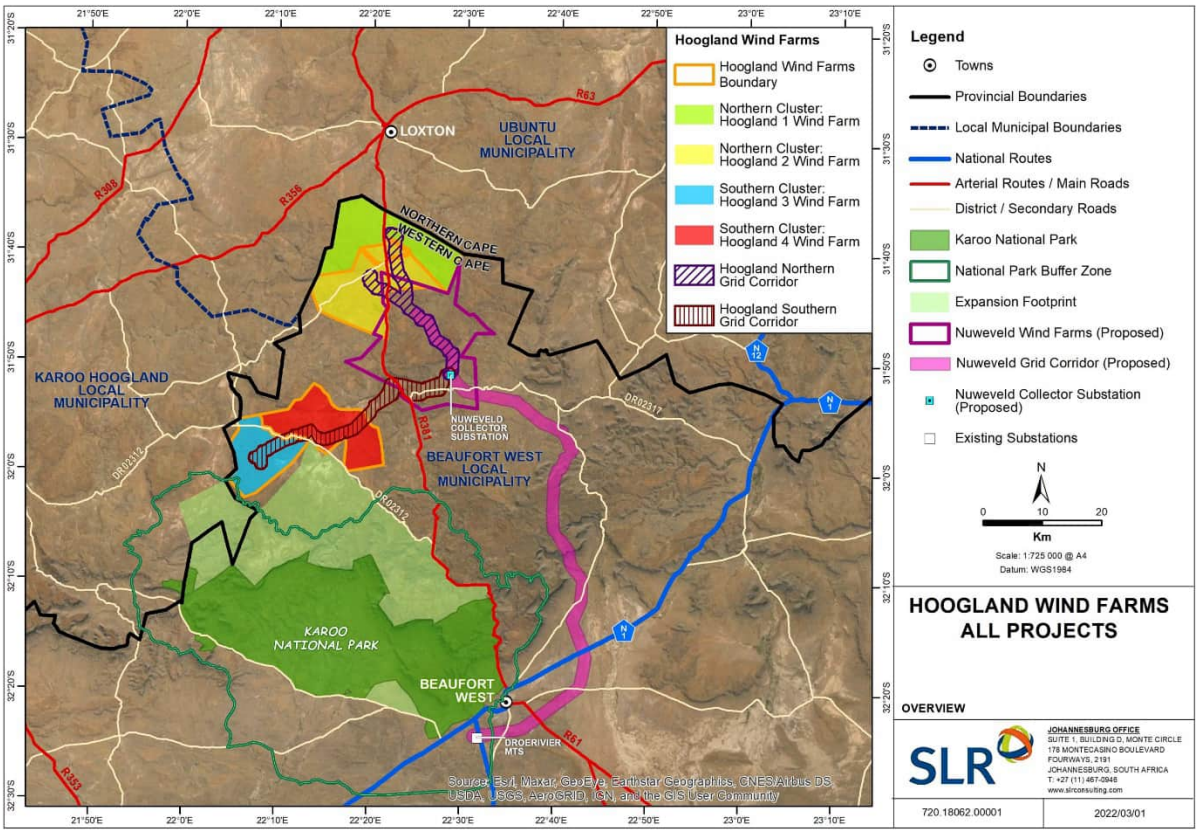


Figure 1: Locality Map of the Proposed Hoogland Wind Farms and associated Grid Corridor

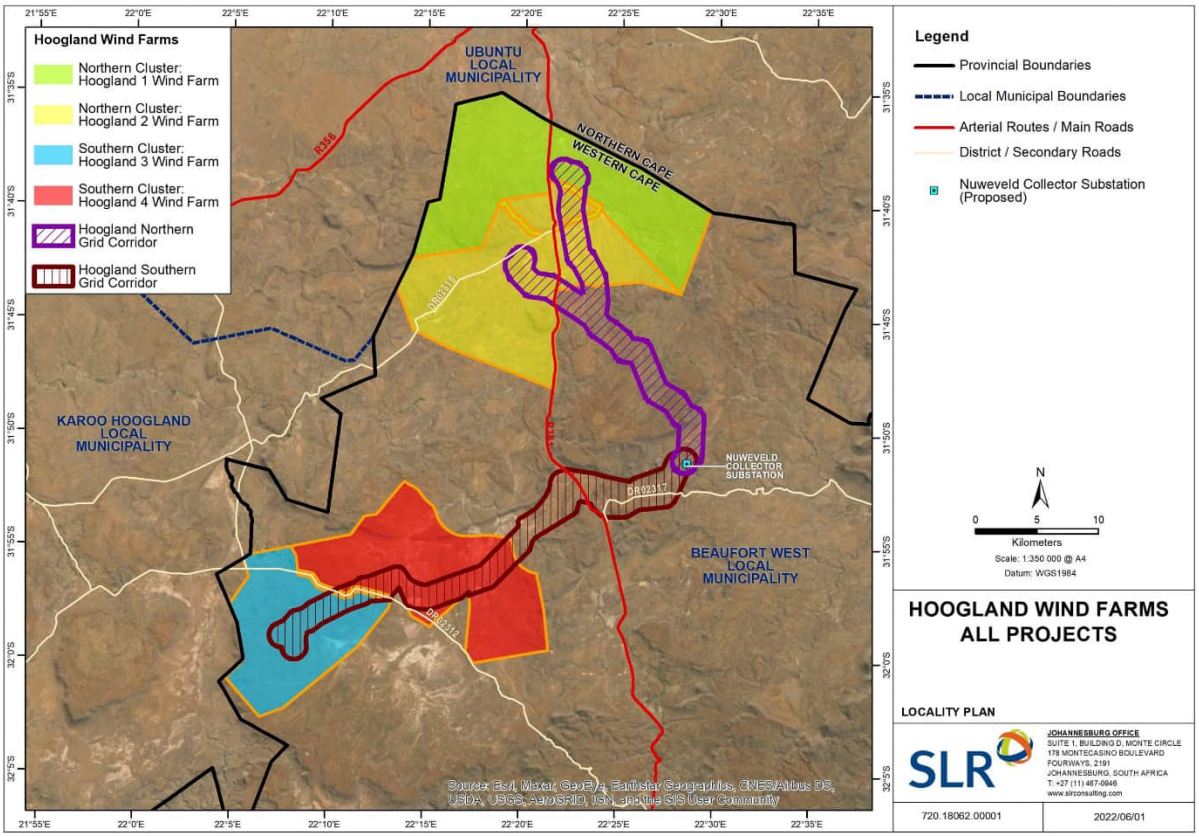


Figure 2: Situational Map of the Proposed Hoogland Wind Farms and associated Grid Connection Corridors

In accordance with GN 320 and GN 1150 (20 March 2020) [3] of the NEMA EIA Regulations of 2014, a site sensitivity verification has been undertaken by the visual specialists to confirm the current land use and environmental sensitivity of the proposed project area as identified by the National Web-Based Environmental Screening Tool for the Hoogland Wind Farm and Grid Connection project sites under these specialist protocols.

The scope of this report is the Hoogland 1 Wind Farm and Hoogland 2 Wind Farm (the Northern Wind Farm Cluster.

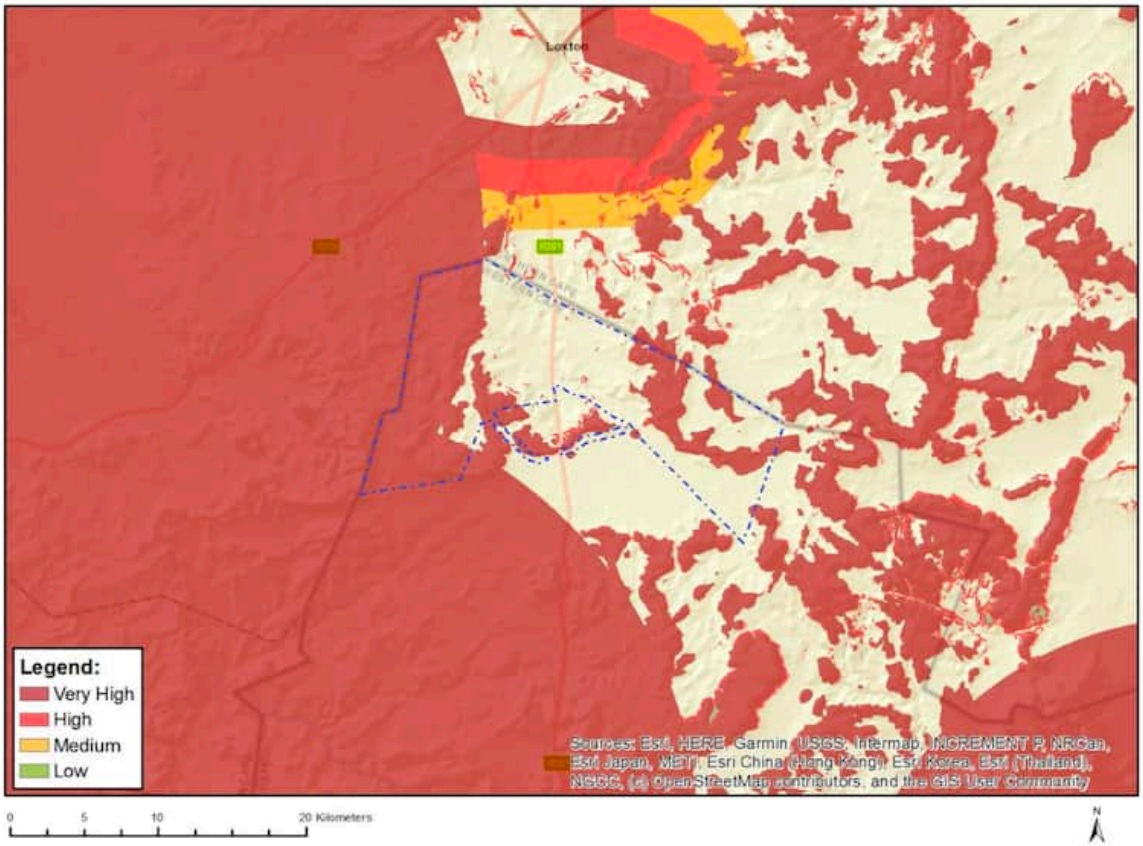
2 Site Sensitivity Methodology

The environmental sensitivity of the proposed development area for the 'Landscape Theme' was established through the following methodology.

- desk top analysis, using satellite imagery and topographic maps;
- site visit fieldwork, photographic survey and viewshed analysis;
- various data bases, including SAPAD.

[3] [3] GN 320 (20 March 2020): Procedures for The Assessment and Minimum Criteria for Reporting on Identified Environmental Themes in terms of Sections 24(5)(A) and (H) and 44 of the National Environmental Management Act, 1998, when applying for Environmental Authorisation

MAP OF RELATIVE LANDSCAPE (WIND) THEME SENSITIVITY



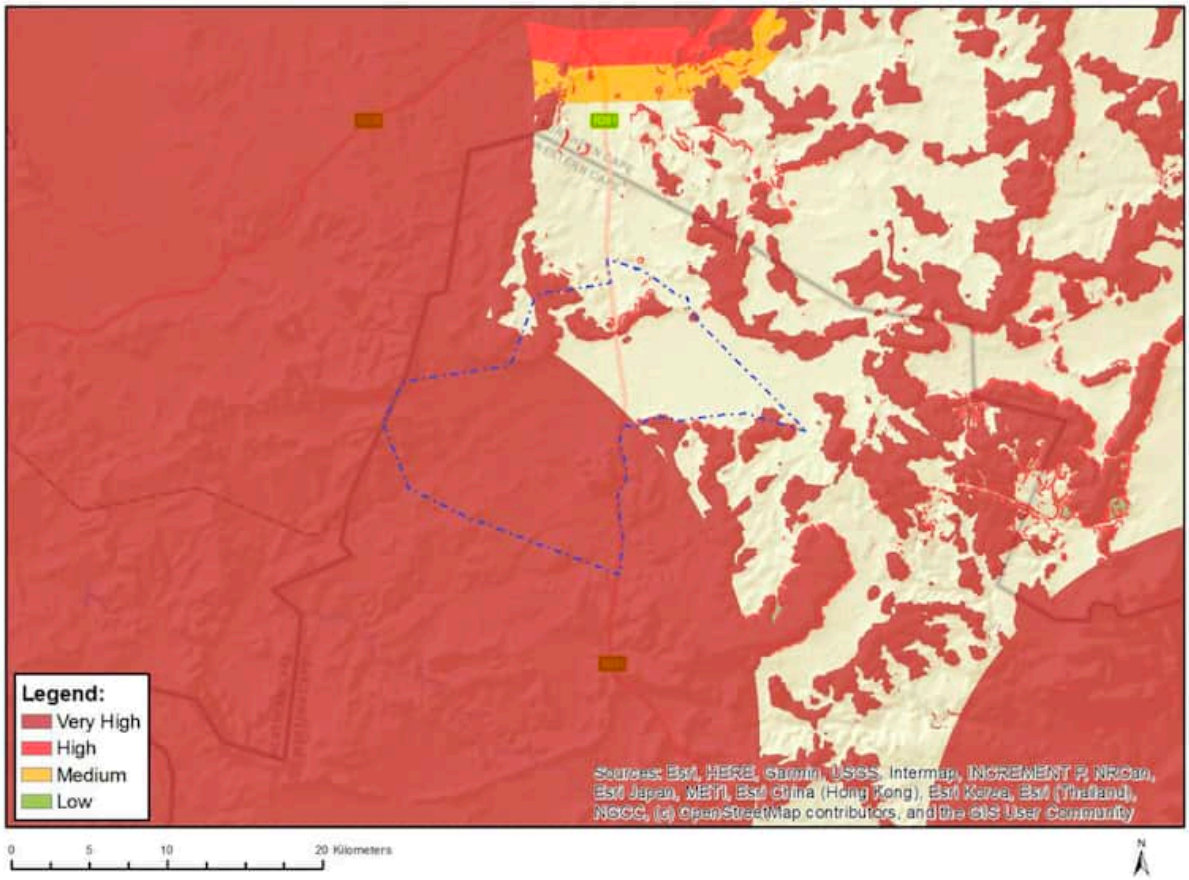
Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
X			

Sensitivity Features:

Sensitivity	Feature(s)
High	Slope between 1:4 and 1:10
Low	Slope less than 1:10
Very High	South African Large Telescope
Very High	Mountain tops and high ridges
Very High	Slope more than 1:4

Figure 3: Screening Tool Map for Hoogland 1 Wind Farm

MAP OF RELATIVE LANDSCAPE (WIND) THEME SENSITIVITY



Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
X			

Sensitivity Features:

Sensitivity	Feature(s)
High	Slope between 1:4 and 1:10
Low	Slope less than 1:10
Very High	South African Large Telescope
Very High	Mountain tops and high ridges
Very High	Slope more than 1:4

Figure 4: Screening Tool Map for Hoogland 2 Wind Farm

3 Outcome of the Site Sensitivity Verification

The Screening Tool Landscape Theme, which is based on regional scale mapping, is disputed based on more detailed mapping at the project site scale by the visual specialists, including mapping of local landscape features, protected areas and sensitive receptors, together with recommended buffers. The results are indicated in Figure 5 below.

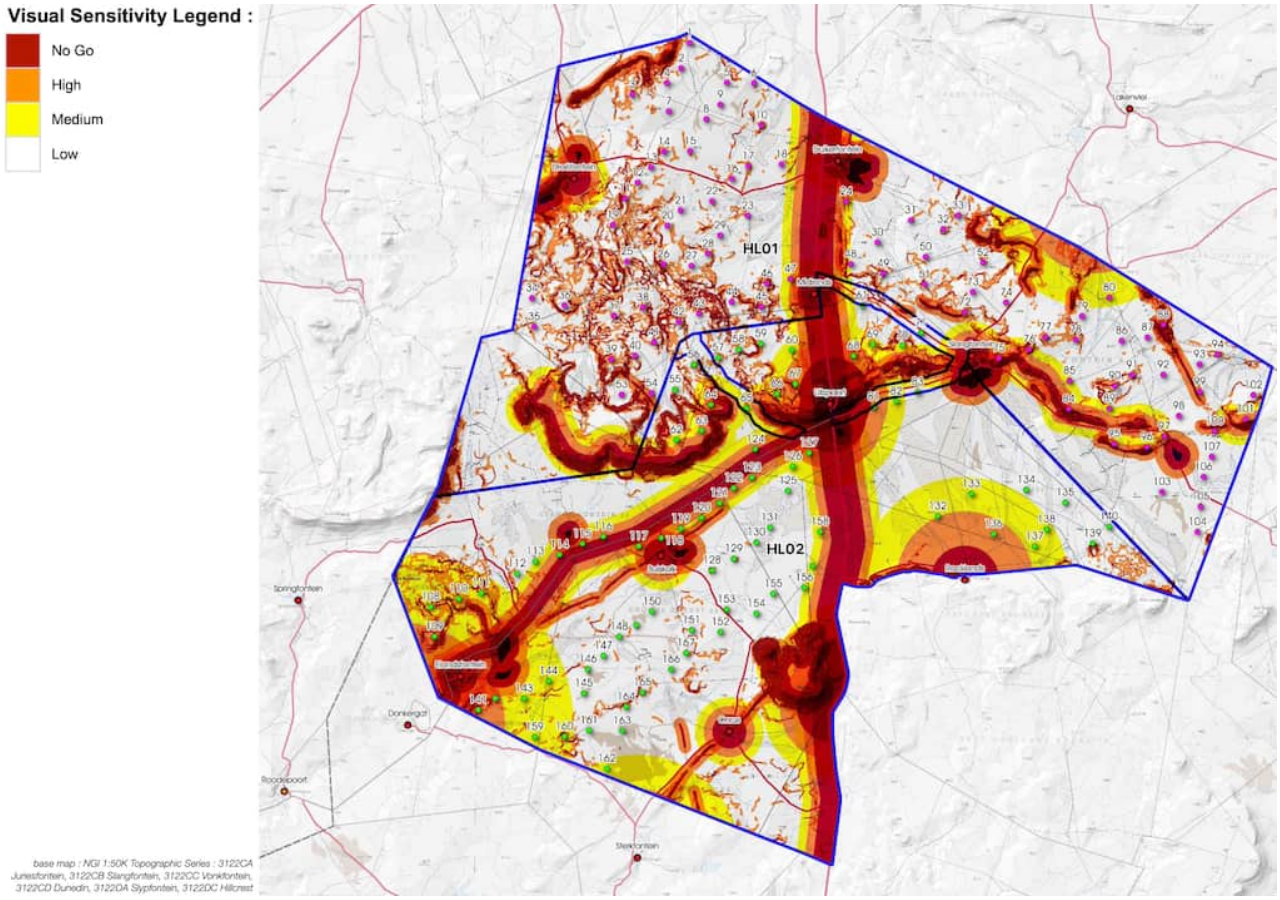


Figure 5: Visual Sensitivity Map for Hoogland Northern Cluster Wind Farms

4 Conclusion

The detailed project-scale mapping in Figure 5 confirms that site sensitivities identified in the visual specialist study have been verified.