PROPOSED RIPPONN WIND FARM,
EASTERN CAPE PROVINCE

VISUAL IMPACT ASSESSMENT

Produced for:

Ripponn (Pty) Ltd

On behalf of:

Savannah Environmental (Pty) Ltd
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1. STUDY APPROACH

1.1. Qualification and Experience of the Practitioner

Lourens du Plessis (t/a LOGIS) is a *Professional Geographical Information Sciences (GISc) Practitioner* registered with The South African Geomatics Council (SAGC), and specialises in Environmental GIS and Visual Impact Assessments (VIA).

He has been involved in the application of Geographical Information Systems (GIS) in Environmental Planning and Management since 1990. He has extensive practical knowledge in spatial analysis, environmental modeling and digital mapping, and applies this knowledge in various scientific fields and disciplines. His GIS expertise are often utilised in Environmental Impact Assessments, Environmental Management Frameworks, State of the Environment Reports, Environmental Management Plans, tourism development and environmental awareness projects.

He holds a BA degree in Geography and Anthropology from the University of Pretoria and worked at the GisLAB (Department of Landscape Architecture) from 1990 to 1997. He later became a member of the GisLAB and in 1997, when Q-Data Consulting acquired the GisLAB, worked for GIS Business Solutions for two years as project manager and senior consultant. In 1999 he joined MetroGIS (Pty) Ltd as director and equal partner until December 2015. From January 2016 he worked for SMEC South Africa (Pty) Ltd as a technical specialist until he went independent and began trading as LOGIS in April 2017.

Lourens has received various awards for his work over the past two decades, including EPPIC Awards for ENPAT, a Q-Data Consulting Performance Award and two ESRI (Environmental Systems Research Institute) awards for *Most Analytical* and *Best Cartographic Maps*, at Annual International ESRI User Conferences. He is a co-author of the ENPAT book and has had several of his maps published in various tourism, educational and environmental publications.

He is familiar with the "Guidelines for Involving Visual and Aesthetic Specialists in EIA Processes" (Provincial Government of the Western Cape: Department of Environmental Affairs and Development Planning) and utilises the principles and recommendations stated therein to successfully undertake visual impact assessments. Although the guidelines have been developed with specific reference to the Western Cape province of South Africa, the core elements are more widely applicable (i.e. within the Eastern Cape Province).

Savannah Environmental appointed Lourens du Plessis as an independent specialist consultant to undertake the visual impact assessment for the proposed Ripponn Wind Farm (a Wind Energy Facility (WEF)). He will not benefit from the outcome of the project decision-making.

1.2. Assumptions and Limitations

This assessment was undertaken during the planning stage of the project and is based on information available at that time. It is assumed that all information regarding the project details provided by the client is correct and relevant to the proposed project.

1.3. Level of Confidence

Level of confidence[1] is determined as a function of:

- The information available, and understanding of the study area by the practitioner:
  - 3: A high level of information is available of the study area and a thorough knowledge base could be established during site visits, surveys etc. The study area was readily accessible.
  - 2: A moderate level of information is available of the study area and a moderate knowledge base could be established during site visits, surveys etc. Accessibility to the study area was acceptable for the level of assessment.
  - 1: Limited information is available of the study area and a poor knowledge base could be established during site visits and/or surveys, or no site visit and/or surveys were carried out.

- The information available, understanding of the study area and experience of this type of project by the practitioner:
  - 3: A high level of information and knowledge is available of the project and the visual impact assessor is well experienced in this type of project and level of assessment.
  - 2: A moderate level of information and knowledge is available of the project and/or the visual impact assessor is moderately experienced in this type of project and level of assessment.
  - 1: Limited information and knowledge is available of the project and/or the visual impact assessor has a low experience level in this type of project and level of assessment.

These values are applied as follows:

Table 1: Level of confidence.

	Information on the project & experience of the practitioner			
Information on the study area		**3**	**2**	**1**
	3	9	6	3
	2	6	4	2
	1	3	2	1

*The level of confidence for this assessment is determined to be **9** and indicates that the author's confidence in the accuracy of the findings is high:*

- The information available, and understanding of the study area by the practitioner is rated as **3** and
- The information available, understanding and experience of this type of project by the practitioner is rated as **3**.

1.4. Methodology

The study was undertaken using Geographical Information Systems (GIS) software as a tool to generate viewshed analyses and to apply relevant spatial criteria to the proposed facility. A detailed Digital Terrain Model (DTM) for the

[1] Adapted from Oberholzer (2005).

study area was created from topographical data provided by NASA in the form of a 30m SRTM (Shuttle Radar Topography Mission) elevation model.

The Plan of Study for the Visual Impact Assessment (VIA) is stated below.

The VIA will be determined according to the nature, extent, duration, intensity or magnitude, probability and significance of the potential visual impacts, and will propose management actions and/or monitoring programs, and may include recommendations related to the wind turbine generator (WTG) layout.

The visual impact will be determined for the highest impact-operating scenario (worst-case scenario) and varying climatic conditions (i.e. different seasons, weather conditions, etc.) will not be considered.

The VIA will consider potential cumulative visual impacts, or alternatively the potential to concentrate visual exposure/impact within the region (if applicable).

The following VIA-specific tasks have been undertaken:

- **Determine potential visual exposure**

The visibility or visual exposure of any structure or activity is the point of departure for the visual impact assessment. It stands to reason that if (or where) the proposed facility and associated infrastructure were not visible, no impact would occur.

The viewshed analyses of the proposed facility and the related infrastructure are based on a 30m SRTM digital terrain model of the study area.

The first step in determining the visual impact of the proposed facility is to identify the areas from which the structures would be visible. The type of structures, the dimensions, the extent of operations and their support infrastructure are taken into account.

- **Determine visual distance/observer proximity to the facility**

In order to refine the visual exposure of the facility on surrounding areas/receptors, the principle of reduced impact over distance is applied in order to determine the core area of visual influence for this type of structure.

Proximity radii for the proposed infrastructure are created in order to indicate the scale and viewing distance of the facility and to determine the prominence of the structures in relation to their environment.

The visual distance theory and the observer's proximity to the facility are closely related, and especially relevant, when considered from areas with a high viewer incidence and a predominantly negative visual perception of the proposed facility.

- **Determine viewer incidence/viewer perception (sensitive visual receptors)**

The next layer of information is the identification of areas of high viewer incidence (i.e. main roads, residential areas, settlements, etc.) that would be exposed to the project infrastructure.

This is done in order to focus the attention on areas where the perceived visual impact of the facility will be the highest and where the perception of affected observers will be negative.

Related to this dataset, is a land use character map, that further aids in identifying sensitive areas and possible critical features (i.e. tourist facilities, national parks, etc. – if applicable), that should be addressed.

- **Determine the visual absorption capacity of the landscape**

This is the capacity of the receiving environment to absorb the potential visual impact of the proposed facility. The VAC is primarily a function of the vegetation, and will be high if the vegetation is tall, dense and continuous. Conversely, low growing sparse and patchy vegetation will have a low VAC.

The VAC would also be high where the environment can readily absorb the structure in terms of texture, colour, form and light / shade characteristics of the structure. On the other hand, the VAC for a structure contrasting markedly with one or more of the characteristics of the environment would be low.

The VAC also generally increases with distance, where discernible detail in visual characteristics of both environment and structure decreases.

- **Calculate the visual impact index**

The results of the above analyses are merged in order to determine the areas of likely visual impact and where the viewer perception would be negative. An area with short distance visual exposure to the proposed infrastructure, a high viewer incidence and a predominantly negative perception would therefore have a higher value (greater impact) on the index. This focusses the attention to the critical areas of potential impact and determines the potential **magnitude** of the visual impact.

Geographical Information Systems (GIS) software will be used to perform all the analyses and to overlay relevant geographical data sets in order to generate a visual impact index.

- **Determine impact significance**

The potential visual impacts are quantified in their respective geographical locations in order to determine the significance of the anticipated impact on identified receptors. Significance is determined as a function of extent, duration, magnitude (derived from the visual impact index) and probability. Potential cumulative and residual visual impacts are also addressed. The results of this section is displayed in impact tables and summarised in an impact statement.

- **Propose mitigation measures**

The preferred alternative (or a possible permutation of the alternatives) will be based on its potential to reduce the visual impact. Additional general mitigation measures will be proposed in terms of the planning, construction, operation and decommissioning phases of the project.

- **Reporting and map display**

All the data categories, used to calculate the visual impact index, and the results of the analyses will be displayed as maps in the accompanying report. The methodology of the analyses, the results of the visual impact assessment and the conclusion of the assessment will be addressed in this VIA report.

- **Site visit**

A site visit was undertaken (July 2020) in order to verify the results of the spatial analyses and to identify any additional site specific issues that may need to be addressed in the VIA report.

2. BACKGROUND AND PROPOSED INFRASTRUCTURE

Ripponn (Pty) Ltd is proposing the development of a commercial wind farm and associated infrastructure on a site located approximately 36km south-east of Somerset East and 28km south-west of Cookhouse (measured from the centre of the site) within the Blue Crane Route Local Municipality and the Sarah Baartman District Municipality in the Eastern Cape Province.

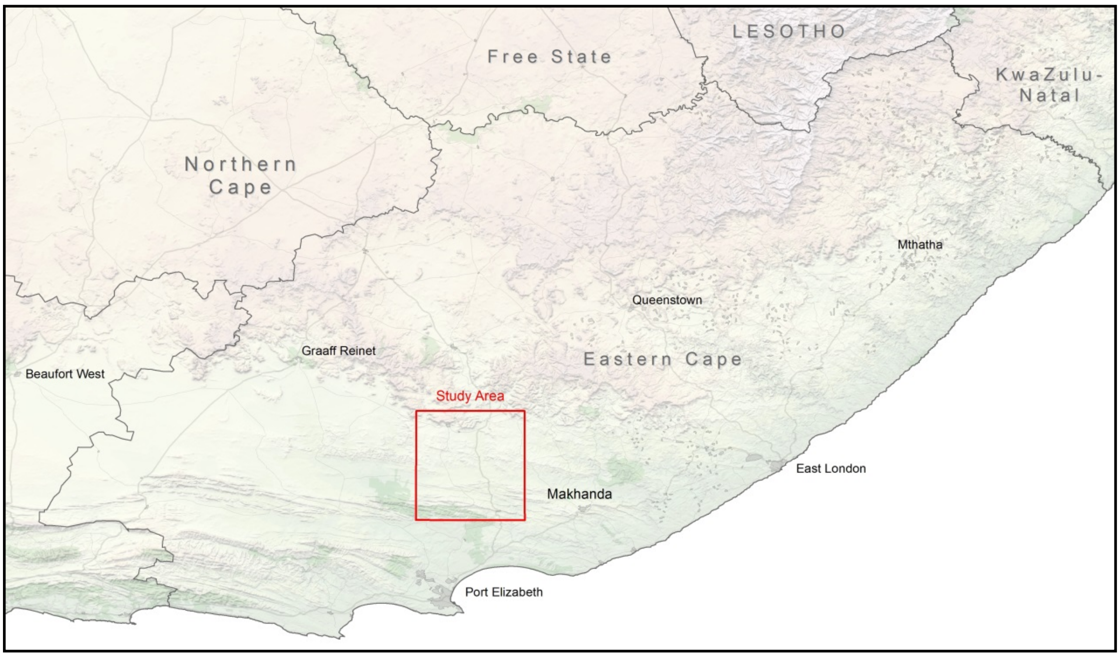

Figure 1: Regional locality of the proposed Ripponn WEF.

A preferred project site with an extent of ~12,838ha has been identified by Ripponn (Pty) Ltd as a technically suitable area for the development of the Ripponn Wind Farm with a contracted capacity of up to 324MW that can accommodate up to 36 turbines. The entire project site is located within the Cookhouse Renewable Energy Development Zone (REDZ). Due to the location of the project site within the REDZ, a Basic Assessment (BA) process will be undertaken in accordance with GN114 as formally gazetted on 16 February 2018. The project site comprises the following eight (8) farm portions:

- Remaining Extent of Farm No 381
- Remaining Extent of Farm Wilton No 409
- Portion 7 of Farm No 381
- Remaining Extent of Farm Hartebeest Kuil No 220
- Portion 1 of Farm Hartebeest Kuil No 220
- Portion 2 of Farm Haartebeestkuil No 220
- Portion 2 of Farm No 230
- Remaining Extent of Portion 4 (Pruim Plaas) of Farm Draai Hoek No 221

The Ripponn Wind Farm project site is proposed to accommodate the following infrastructure, which will enable the wind farm to supply a contracted capacity of up to 324MW:

- Up to 36 wind turbines with a maximum hub height of up to 166m. The tip height of the turbines will be up to 246m;
- A 132/33kV on-site collector substation to be connected to a proposed 400kV Main Transmission Substation (MTS) located to the south via a new 132kV overhead power line (twin turn dual circuit line). The development of the proposed 400kV Main Transmission Substation will be assessed as part of the separate BA process in order to obtain Environmental Authorisation;
- Concrete turbine foundations and turbine hardstands;
- Temporary laydown areas which will accommodate the boom erection, storage and assembly area;
- Cabling between the turbines, to be laid underground where practical;
- Access roads to the site and between project components with a width of approximately 4,5m;
- A temporary concrete batching plant;
- Temporary staff accommodation; and
- Operation and Maintenance buildings including a gate house, security building, control centre, offices, warehouses, a workshop and visitors centre.

A development envelope for the placement of the wind energy facility infrastructure (i.e. development footprint) has been identified within the project site and assessed as part of the BA process. The development envelope is ~5,400ha in extent and the much smaller development footprint of ~30.8ha will be placed and sited within the development envelope.

The construction phase of the WEF is dependent on the number of turbines ultimately erected and is estimated at one week per turbine. The construction phase is expected to be ~30 months. The lifespan of the facility is approximated at 20 to 25 years.

3. SCOPE OF WORK

This report is the undertaking of a Visual Impact Assessment (VIA) of the proposed Ripponn WEF as described above.

The determination of the potential visual impacts is undertaken in terms of nature, extent, duration, magnitude, probability and significance of the construction and operation of the proposed infrastructure.

The study area for the visual assessment encompasses a geographical area of approximately 6,003km² (the extent of the full page maps displayed in this report) and includes a minimum 20km buffer zone from the proposed wind turbine structures.

Anticipated issues related to the potential visual impact of the proposed WEF include the following:

- The visibility of the facility to, and potential visual impact on, observers travelling along the national, arterial or secondary roads within the study area.
- The visibility of the facility to, and visual impact on residents of homesteads within the study area.
- The potential visual impact of the facility on the visual character or sense of place of the region.
- The potential visual impact of the facility on tourist routes or tourist destinations (if present).
- The potential visual impact of the construction of ancillary infrastructure (i.e. substations and power line) on observers in close proximity to the facility.
- The visual absorption capacity of the natural vegetation (if applicable).
- The potential cumulative visual impact of the proposed WEF and associated infrastructure in context of the operational Cookhouse and Amakhala Emoyeni WEFs, and the proposed Hamlett, Redding and Aeolus WEFs located within the study area, or potential consolidation of visual impacts, with specific reference to the location of the proposed WEF within the Cookhouse Renewable Energy Development Zone (REDZ).
- The potential visual impact of lighting of the facility in terms of light glare, light trespass and sky glow.
- Potential visual impacts associated with the construction phase.
- The potential visual impact of shadow flicker.
- The potential to mitigate visual impacts and inform the design process.

It is envisaged that the issues listed above may constitute a visual impact at a local and/or regional scale.

4. RELEVANT LEGISLATION AND GUIDELINES

The following legislation and guidelines have been considered in the preparation of this report:

- The Environmental Impact Assessment Regulations, 2014 (as amended);
- Guideline on Generic Terms of Reference for EAPS and Project Schedules (DEADP, Provincial Government of the Western Cape, 2011).

5. THE AFFECTED ENVIRONMENT

The project is proposed within a development envelope with a surface area of approximately 5,400ha. The final surface area to be utilised for the facility will be smaller (~30.8ha), depending on the type of turbine selected, the final site layout and the placement of wind turbines and ancillary infrastructure. The development envelope, wind turbine layout and proposed grid connection infrastructure are indicated on **Figure 2**.

The entire development envelope is located in a rural area, currently zoned as agriculture, at a distance of approximately 36km south-east of Somerset East.

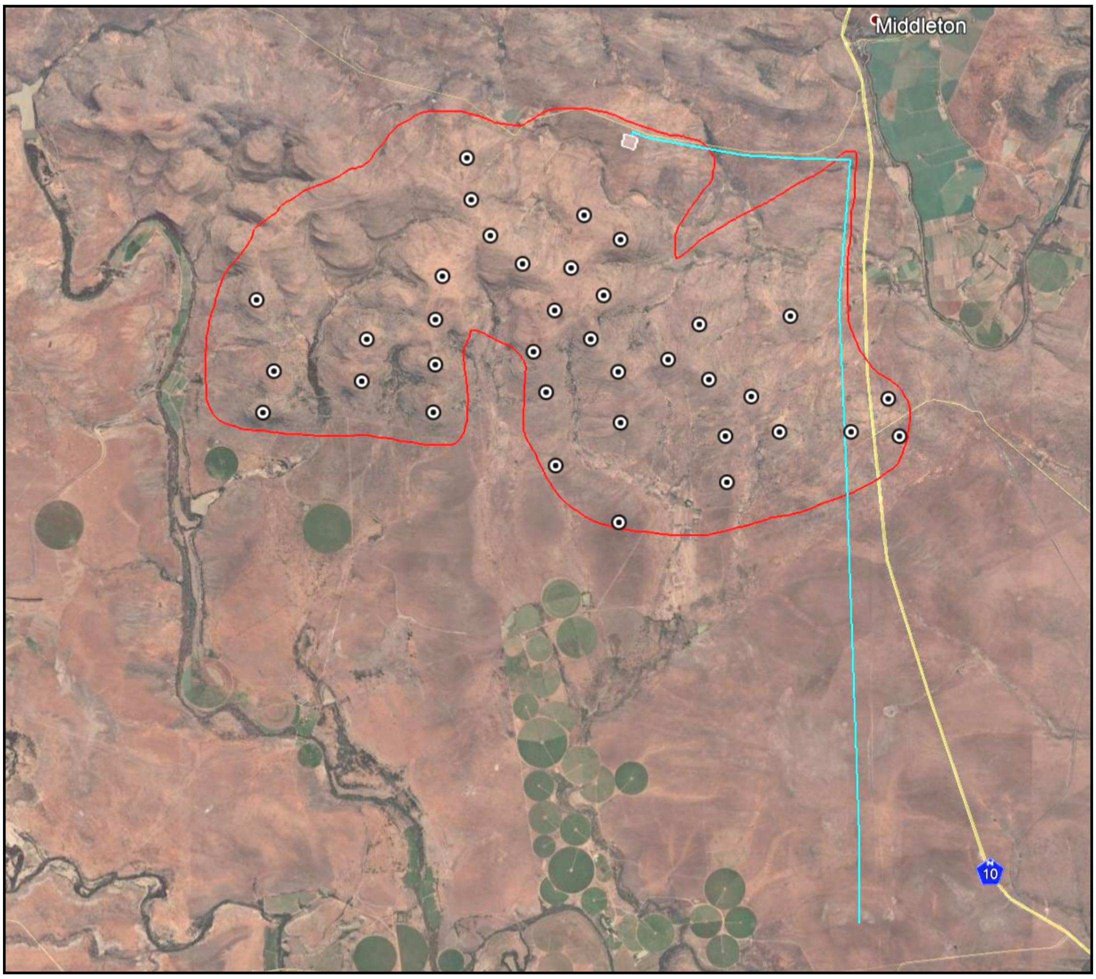

Figure 2: Aerial view of the development envelope (red outline) indicating the proposed wind turbine layout (white dots) and grid connection infrastructure (blue line).

Topography, hydrology and vegetation

The study area occurs on land that ranges in elevation from approximately 140m above sea level (south of the Addo Elephant National Park) to 1,610m (at the top of the Bosberg Mountains north of Somerset East). The proposed development envelope spans across *strongly undulating plains and hills* and *tall hills* at an average elevation of 614m above sea level. The larger study area is located in between the Bosberg Mountains (to the north) and the Suurberge to the south on terrain morphological units ranging from *plains* in the centre to *strongly undulating plains and hills* to the north and south.

The largest hydrological features include the perennial Great Fish and Little Fish Rivers that drain from the northern mountains in a southerly direction. The confluence of these rivers is on the plains, east of the N10 national road. The proposed development envelope is situated in between the two rivers upstream from the confluence, on ridges west of the N10. Besides these rivers there are a number of non-perennial drainage lines and farm dams within the study area. The region is relatively arid and is referred to as the Nama-Karoo Biome (Lower

Karoo Bioregion). The average rainfall is indicated at between 300 – 500mm per annum.

The vegetation cover in the region is primarily *grassland* and *low shrubland*, with some *forest* and *woodland* occurring along the banks of the Little Fish and Great Fish Rivers. The floodplains of these rivers are indicated as *Southern Karoo Riviere*, whilst the grassland and low shrubland is respectively referred to as *Albany Broken Veld* and *Great Fish Thicket*. In the higher lying mountainous terrain the vegetation types are *Kowie Thicket* and *Suurberg Shale Fynbos*.

Refer to **Maps 1**, **2** and **3** for the topography and land cover maps of the study area.

Land use and settlement patterns

The majority of the study area is sparsely populated (less than 10 people per km^2) and consists of a landscape of wide-open spaces and very little development. The largest concentrations of people are located at Somerset East, Cookhouse, Bedford and Alicedale, the main towns within the region.

The relatively low rainfall has as a consequence that the region has largely been untransformed by dryland agriculture, with irrigated agriculture (crop circles) and crop production primarily limited to areas along the Little Fish and Great Fish Rivers.

Besides the limited cultivation of crops, the study area is largely in a natural state, with mainly sheep and game farming as additional economic activities.

Farm residences, or homesteads, dot the landscape at an irregular interval. These homesteads are generally located at great distances from each other (i.e. more than 3km apart), except for the Golden Valley, Ondersmoordrif and Middleton agricultural areas along the Great Fish River where they are more concentrated.

The N10 national road provides motorised access to the region from the city of Port Elizabeth, the largest urban centre closest to the site (approximately 145km by road). Another 4km gravel road (the Bloemhof secondary road) provides the quickest access to the proposed development site from the N10.

There are no designated protected areas or other identified tourist attractions or destinations within close proximity to the development envelope. The Somerset East Bosberg Nature Reserve is located approximately 15km north-west of the site, north of the town of Somerset East. The Addo Elephant National Park is located south of the Suurberge at distances exceeding 35km.[2]

In spite of the rural and natural character of the study area, there are a large number of overhead power lines in close proximity to the development site. These include:

- Golden Valley/Rippon 1 220kV
- Poseidon/Grassridge 1 and 2 400kV
- Poseidon/Dedisa 1 400kV
- Rippon/SATS 1 and 2 220kV
- Rippon/Doringkom 1 220kV

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[2] Sources: DEAT (ENPAT Eastern Cape), NBI (Vegetation Map of South Africa, Lesotho and Swaziland), NLC2013-14 (ARC/CSIR), REEA_OR_2020_Q2 and SAPAD2019-20 (DEA).

The entire proposed Ripponn development envelope is located within the Cookhouse REDZ and the Gazetted Eastern Power Corridor. Refer to **Figure 3** for the regional locality of the site in relation to the Cookhouse REDZ. REDZ are described as:

"areas where large scale wind and solar PV energy facilities can be developed in terms of SIP 8 and in a manner that limits significant negative impacts on the environment, while yielding the highest possible socio-economic benefits to the country."

Source: https://redzs.csir.co.za

Figure 3 further indicates the status of Renewable Energy Environmental Applications (REEA) within the Cookhouse REDZ (dated 2020 2nd quarter). It must be noted that the database is not always updated regularly and therefore some projects shown in **Figure 3** may no longer be considered for development, no longer have a valid Environmental Authorisation or are omitted entirely, e.g. the proposed Albany WEF located partially within the Cookhouse REDZ, north-east of Makhanda.

Applications that have been approved or constructed include:

- Amakhala Emoyeni Wind Farm
- Cookhouse Wind Farm
- Golden Valley Wind Farm
- Msenge Emoyeni Wind Farm
- Izidluli Emoyeni Wind Farm
- Nxuba Wind Farm
- Nojoli Wind Farm
- Waainek Wind Farm
- Highlands Wind Energy Facility

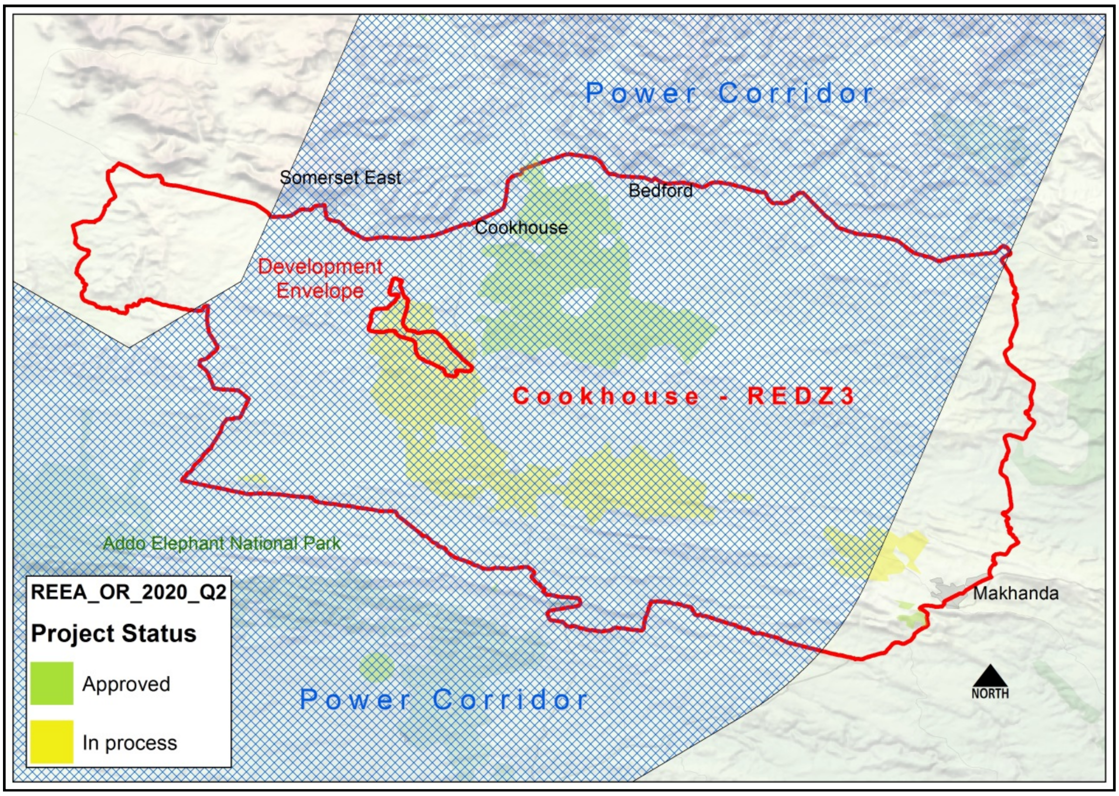


Figure 3: Regional locality of the development envelope in relation to the Cookhouse Renewable Energy Development Zone (REDZ) and Power Corridor (*Source: REEA_OR_2020_Q2*).

*Note: The data above (**Figure 3**) is provided by the Department of Environmental Affairs. The author accepts no responsibility for the accuracy thereof.*

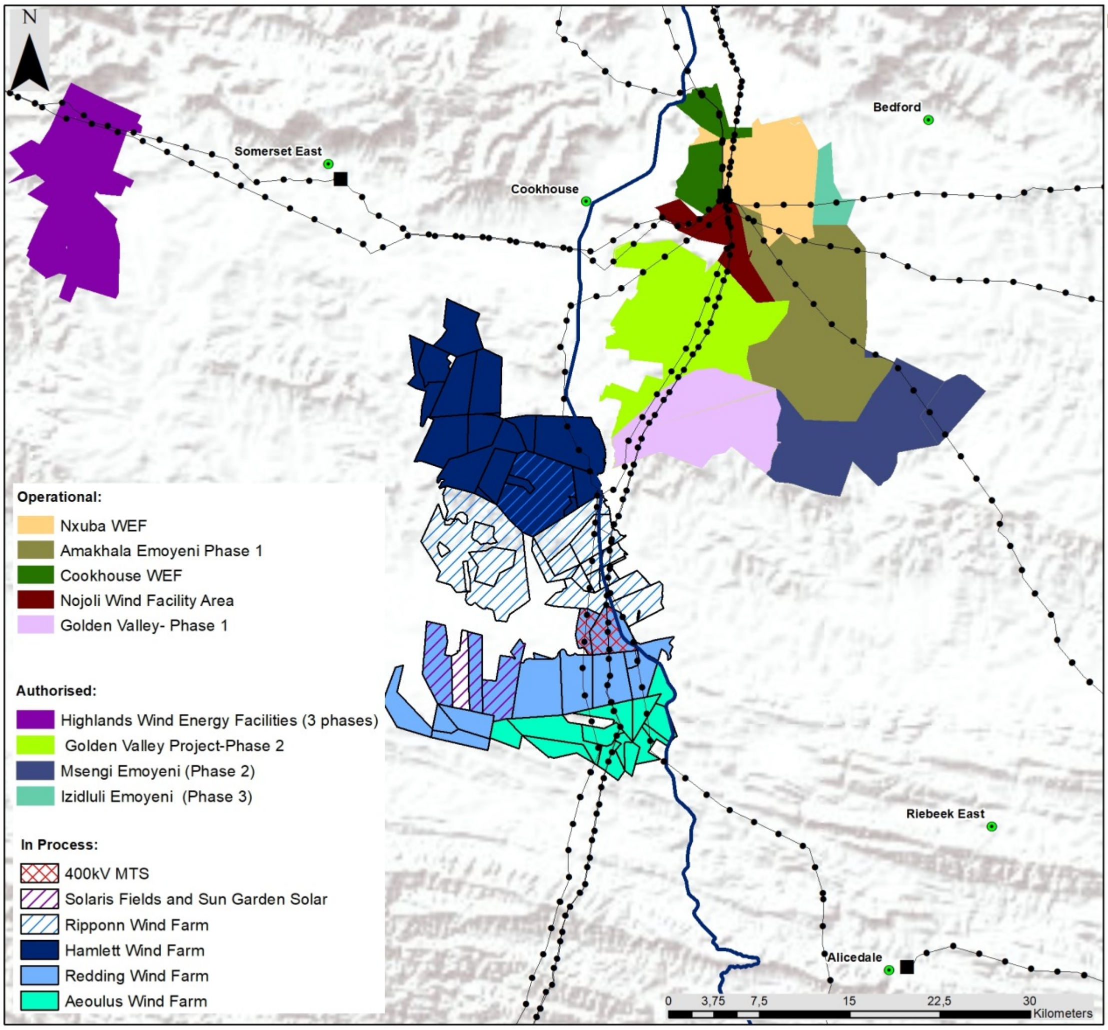


Figure 4: Cumulative map of WEF developments within the western section of the Cookhouse REDZ. (*Source: Savannah Environmental*).

The photographs below aid in describing the general environment within the study area and surrounding the proposed development envelope.

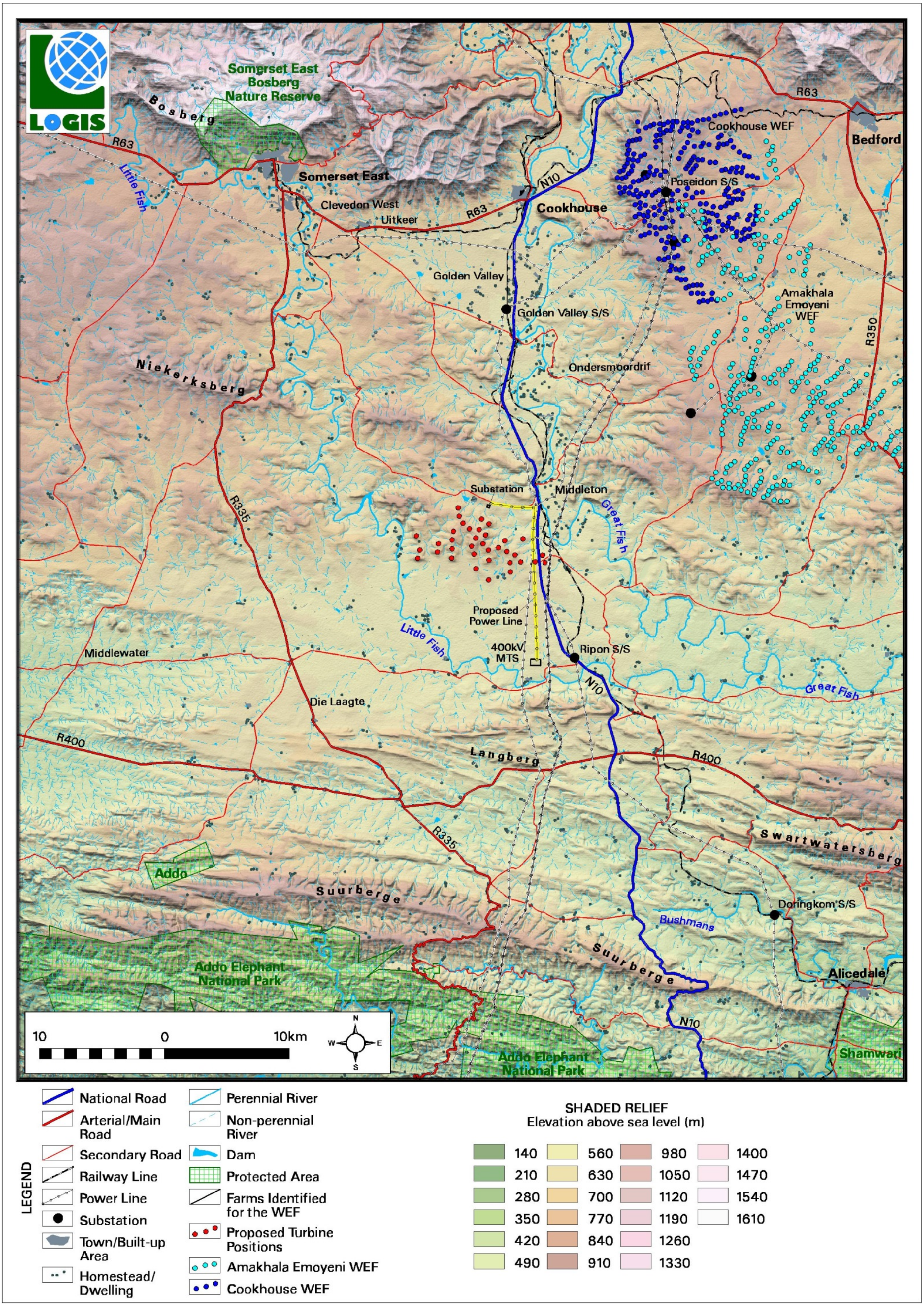
Figure 5: Access road from the N10 to the proposed Ripponn project site.

Figure 6: Agricultural activities along the Great Fish River.

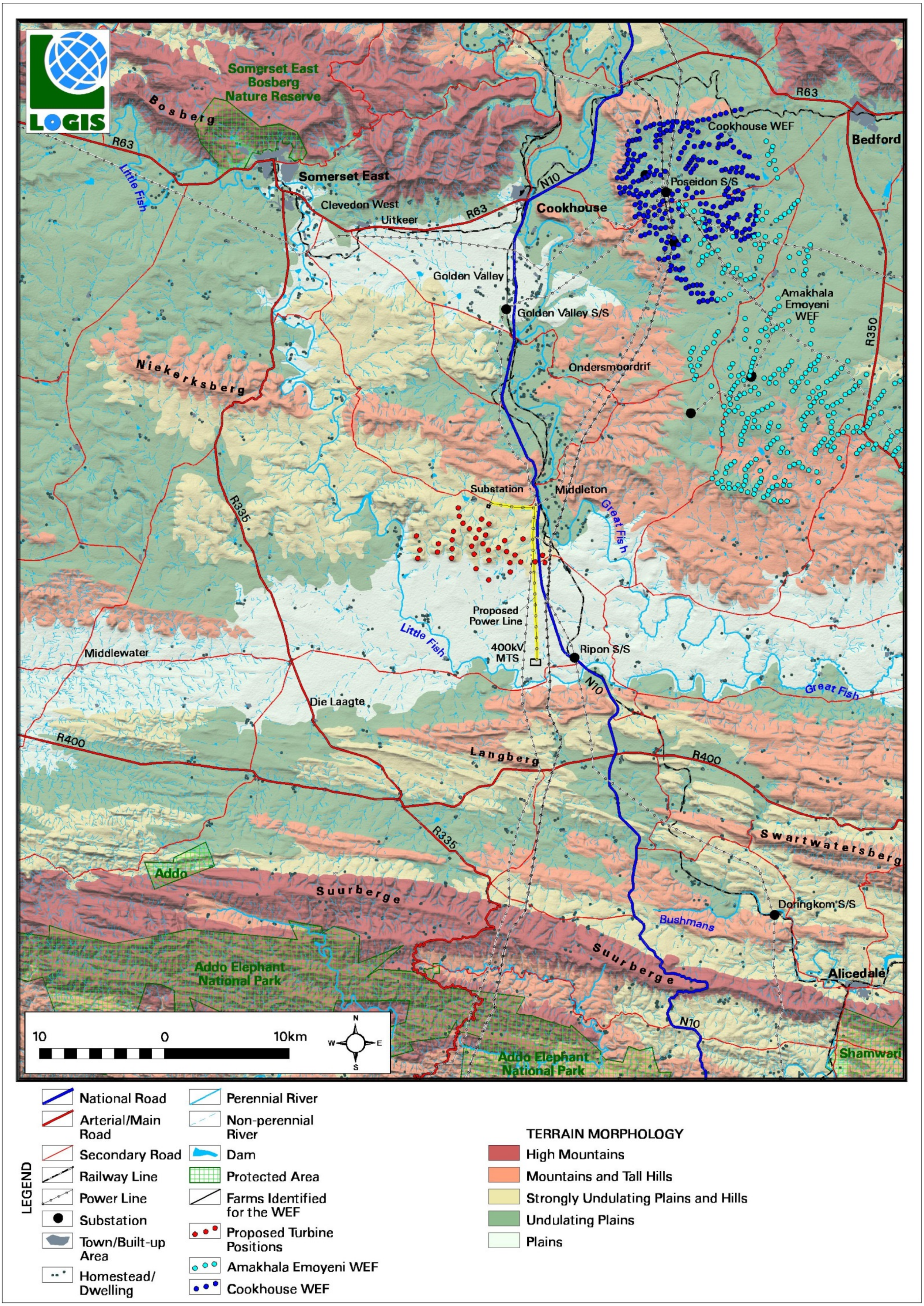
Figure 7: View of the development site from the N10 national road.

Figure 8: The general environment surrounding the site.

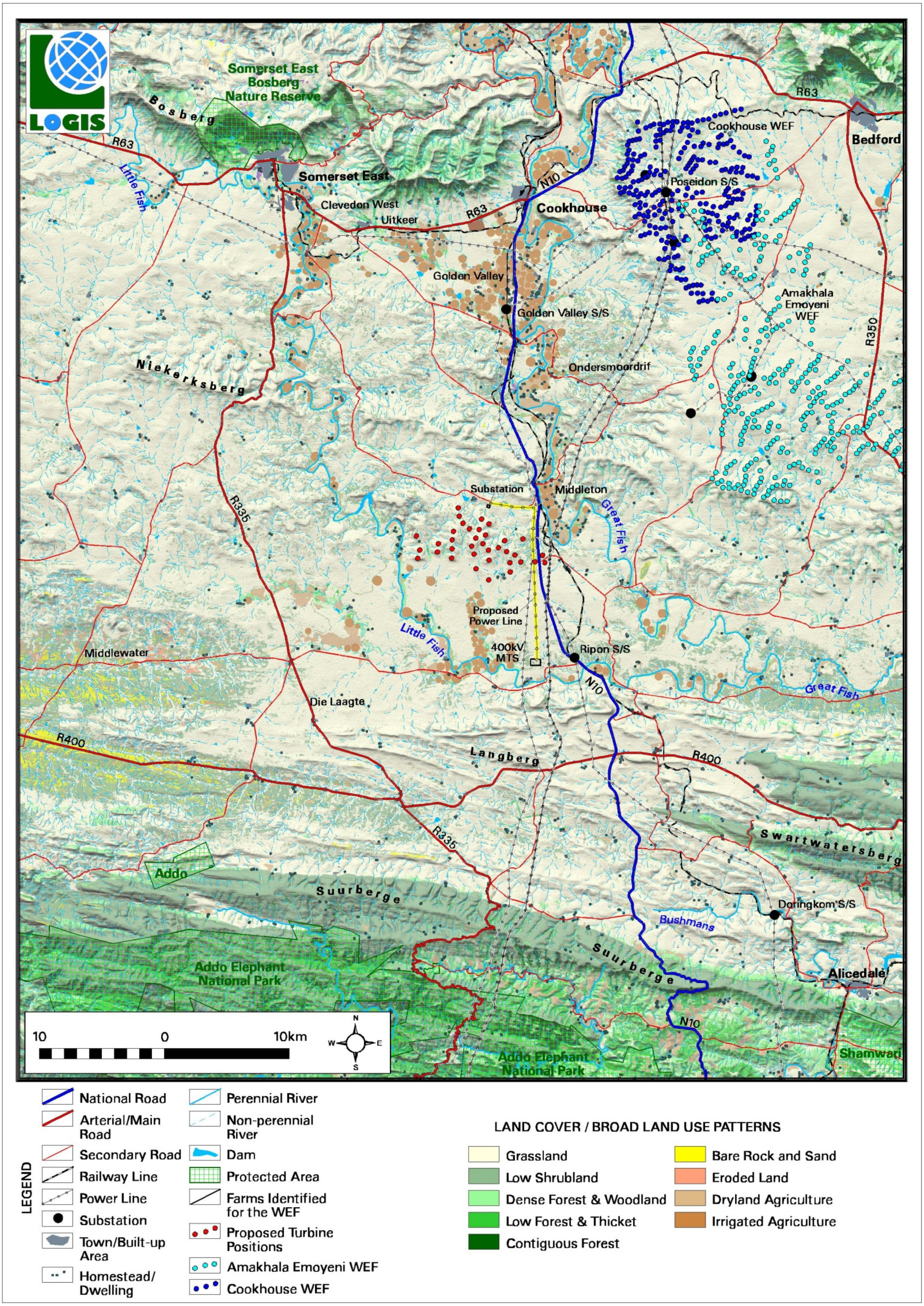
Figure 9: Grassland north-east of the proposed development site.



Map 1: Shaded relief map of the study area.



Map 2: Terrain morphology.



Map 3: Land cover and broad land use patterns.

6. RESULTS

6.1. Potential visual exposure - WEF

A visibility analysis was undertaken from each of the wind turbine positions (36 in total) at an offset of 246m (approximate blade-tip height) above ground level. The result of the visibility analysis is displayed on **Map 4**.

The viewshed analysis does not include the effect of vegetation cover or existing structures on the exposure of the proposed WEF, therefore signifying a worst-case scenario.

The result of the viewshed analysis displays the potential areas of visual exposure, as well as the potential frequency of exposure. The frequency of exposure indicates the number of turbines that may be exposed i.e. more turbines may be visible in the darker orange areas than in the yellow areas. Land that is more elevated is typically more exposed to the proposed WEF, whilst lower lying areas such as valleys are shielded, or not as exposed.

The wind turbine structures will be visible from a relatively large area due to their elevated location on hills and ridges within the development envelope. It is expected that the wind turbine structures will be highly visible from homesteads within a 5km radius, as well as from the N10 national road and secondary roads traversing within this zone.

Further afield, between a radius of 5 – 10km, the wind turbines are expected to be visible from homesteads and agricultural holdings, as well as from the secondary roads, and the N10 national road.

At distances in between 10 - 20km the visual exposure becomes more scattered due to the undulating nature of the topography. The turbines are however still expected to be visible from the receptor sites mentioned above, especially to the north.

Visibility beyond 20km from the turbine structures will primarily be to the north. The towns of Somerset East and Cookhouse also fall within this zone, but visual exposure within these towns is highly unlikely due to the built structures present in the towns.

Theoretical visibility from the Somerset East Bosberg Nature Reserve is also possible within this zone, but is similarly unlikely due to the location of the reserve north-west of the town.

The turbine structures are shielded from the Addo Elephant National Park by the Suurberge to the south and the park will not be visually affected by the WEF.

The homesteads and roads expected to be visually influenced are listed below. It should be noted that this section of the report focusses only on the potential visual exposure at varying distances and it does not yet refer to visual impact significance or any correlation thereto.

Less than 5km from the wind turbines:

- Wellington Grove
- Wilton
- Prospect

- De Hoop 1 & 2
- Middleton
- Dagbreek
- Serenade
- Eendor
- Voorspoed 1, 2 & 3
- Spes Bona
- Draaihoek
- Alfalfa
- Hesitation
- Pruimplaas
- Bethel
- Die Vlakte
- Doringkloof
- Herbou
- Glentana
- Jordaanskraal

Located within a 5 - 10km radius:

- Lindhurst
- Thornvale
- Delportshoop
- Somersdal
- Soutvlei
- Rietfontein
- Driefontein
- Vlaklaagte
- Glentana
- Reddingshoop
- Draai van Visrivier
- Karee Krans
- Britskraal 1 & 2
- Sarahdale
- Rooiplaas
- Rockcliffe
- Dennehof
- De Kroon
- Matjesfontein
- Van Aards Kraal
- De Hoop

Located within a 10 - 20km radius:

- Esperant
- Kriegerskraal
- Wilgerfontein
- Junction Drift
- Peninsula
- Brandplaas
- Brakfontein
- Rietfontein
- Companiesdrift
- Tweefontein
- Alwingate
- Brakfontein
- Watsonia

- Beenleegte
- Stillerus
- Bassonskraal
- Artista
- Modderfontein
- Greylingskraal
- Radyn
- Deelkraal
- Leeufontein
- Perdefontein
- Hangar
- Eureka
- Ashleigh
- Houghamdale
- Rondavel
- Watercroft
- Stenhouse
- Morning Star
- La Fleaurette
- Rivermead
- Colne
- Felli Place
- Fara
- Minstead
- De Rus
- Dalfreich
- Altona
- Volmoed
- Thorn Park
- Jagersdrift
- Sasveld
- Lusthof
- Ordinansie
- Gedagtenis
- Massina
- Klaver
- Onder-Smoordrift
- Renie
- Middelbergplaas
- Smitskraal
- Spes Bona
- Uitershoek
- Kroonkop
- Good Hope
- Welgelegen
- Uitkyk
- Nuweland
- Olyvenfontein

Located beyond 20km:

- Steenbokhoek
- Modderlaagte
- Boschfontein
- Waterkloof
- Glen Cimming
- Bloemhof

- Burnham
- Bassonskloof
- Shadwell
- Ann's Villa
- Viewlands
- Theldon
- Lynton
- Protest
- Witwater
- Goedgenoeg
- Deelkraal
- Zwartfontein
- Zwartfontein East
- Waterloo
- Hopefield
- Karkotskraal
- Somerset East Outlying
- Fairview
- Dirko
- Lower Dirko
- Olivewoods
- Wentworth
- Rooiwal
- Burgerhof
- Merindol
- Elimsrus
- Waranga House
- Silverbeck
- Baviaanskrans

It is envisaged that the structures, where visible from short to moderate distances (e.g. less than 20km), may constitute a high visual prominence, potentially resulting in moderate to very high visual impacts.

6.2. Cumulative visual assessment

Cumulative visual impacts can be defined as the additional changes caused by a proposed development in conjunction with other similar developments or as the combined effect of a set of developments. In practice the terms 'effects' and 'impacts' are used interchangeably.

Cumulative visual impacts may be:

- Combined, where the wind turbines of several WEFs are within the observer's arc of vision at the same time;
- Successive, where the observer has to turn his or her head to see the various WEF's wind turbines; and
- Sequential, when the observer has to move to another viewpoint to see different developments, or different views of the same development (such as when travelling along a route).

The visual impact assessor is required (by the competent authority) to identify and quantify the cumulative visual impacts and to propose potential mitigating measures. This is often problematic as most regulatory bodies do not have specific rules, regulations or standards for completing a cumulative visual assessment, nor do they offer meaningful guidance regarding appropriate assessment methods. There are also not any authoritative thresholds or restrictions related to the capacity of certain landscapes to absorb the cumulative visual impacts of wind turbines.

To complicate matters even further, cumulative visual impact is not just the sum of the impacts of two developments. The combined effect of both may be much greater than the sum of the two individual effects, or even less.

The cumulative impact of the WEF development on the landscape and visual amenity is a product of:

- The distance between individual WEFs (or turbines);
- The distance over which the wind turbines are visible;
- The overall character of the landscape and its sensitivity to the structures;
- The siting and design of the WEFs themselves; and
- The way in which the landscape is experienced.

The specialist is required to conclude if the proposed development will result in any unacceptable loss of visual resource considering all the projects existing and proposed in the area.

For the purpose of this study, viewshed analyses were undertaken from all existing and proposed WEFs within a 30km radius of the proposed Ripponn WEF. These include the Ripponn WEF itself, the proposed Hamlett, Redding and Aeolus WEFs, and the existing or authorised Amakhala Emoyeni and Cookhouse WEFs. It should be noted that these WEFs include different phases or projects, e.g. the Amakhala Emoyeni WEF also includes the Msengi Emoyeni and Izidluli Emoyeni WEFs. The Cookhouse WEF similarly includes the Nxuba and Nojoli WEFs. Additional WEFs not included are the Golden Valley Phases 1 and 2 WEFs, and the Highlands WEFs (three phases), as no wind turbine layouts were available at the time of the completion of the VIA report.

The proposed Ripponn WEF wind turbine layout is located approximately 15km (at the closest) from the operational Amakhala Emoyeni WEF and 24km from the Cookhouse WEF. It is located immediately south of the proposed Hamlett WEF and respectively 8km and 12km from the Redding and Aeolus WEFs.

Additional proposed WEFs within the Cookhouse REDZ (near Makhanda) include:

- Wind Garden WEF
- Fronteer WEF
- Albany WEF

These three proposed WEFs are located within the eastern section of the Cookhouse REDZ at distances exceeding 46km from the proposed Ripponn WEF.

Visibility analyses of the Ripponn, Hamlett, Redding and Aeolus WEFs, and the existing Amakhala Emoyeni and Cookhouse WEFs were undertaken individually from each of the WEF's wind turbine positions, respectively 36, 37, 64, 33, 350 and 256 turbines at an offset off 200m above ground level (the approximate blade-tip height). The results of these viewshed analyses were overlain in order to determine areas where all six WEFs may be visible, areas where five, four, three, two may be visible, or areas where only turbines from a single WEF may be visible.

The cumulative viewshed analysis is displayed on **Map 5**. The areas of visual exposure is displayed as an index ranging from one (green), two (light green), three (yellow), four (orange), five (red) and six (magenta). This implies that areas that are magenta, red or orange have a higher cumulative visual exposure than yellow or green areas.

Results

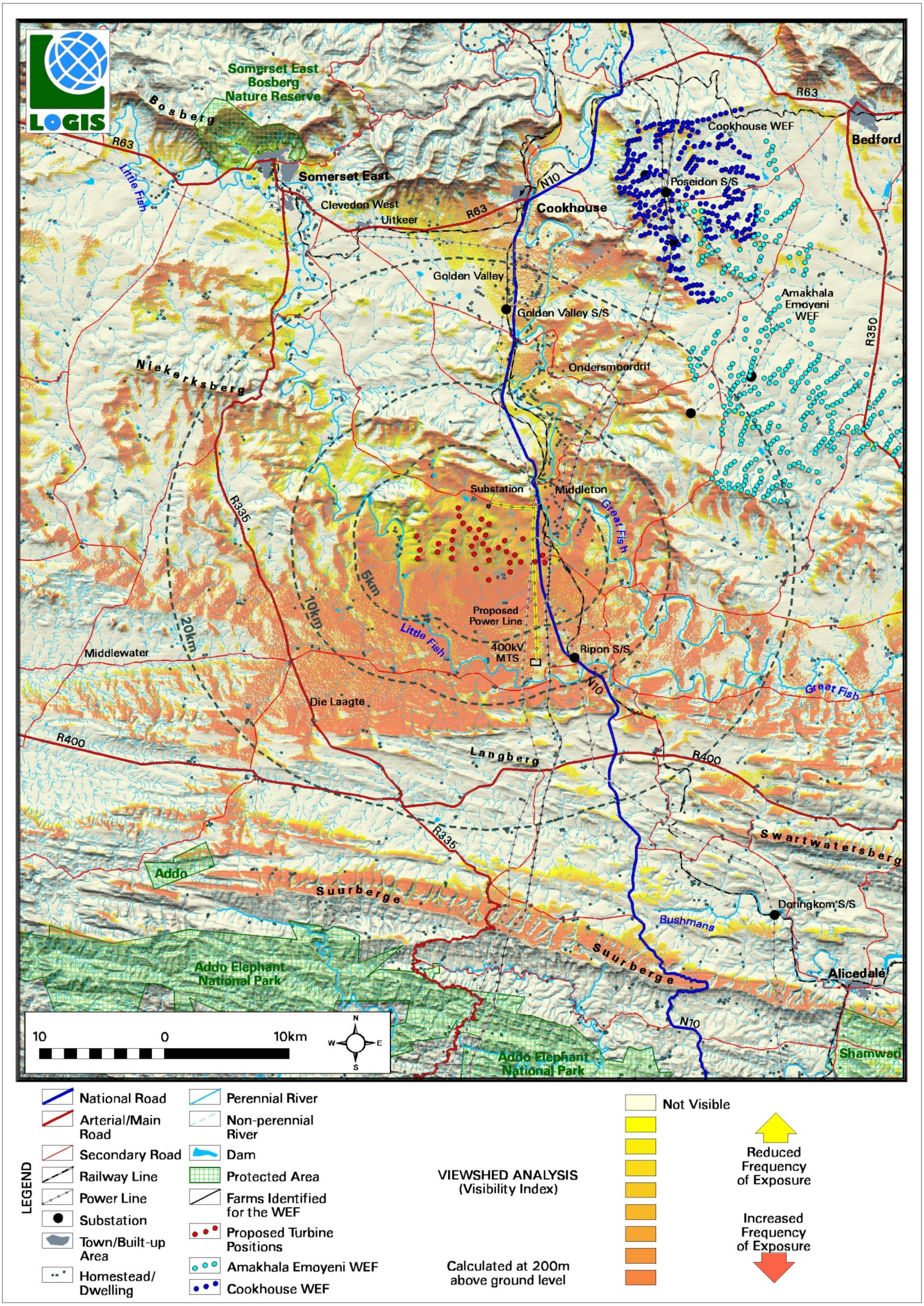
It is expected that higher-lying terrain (i.e. more elevated vantage points) would overall be most exposed to wind turbine infrastructure within the study area. It should be noted though that the elevated terrain may sometimes be very distant from the WEF structures located the furthest away. For instance, the north-facing slopes of the Suurberge are located 50km from the closest wind turbines at the Cookhouse WEF. The Bosberg south-facing slopes are a similar distance from the closest wind turbines at the proposed Aeolus WEF. It is expected that the turbines located in the foreground would be much more prominent, and would likely contribute more to the potential cumulative visual impact, than the most distant wind turbines.

In this case, and due to the relative long distance between the WEFs in the study area, the potential cumulative visual impact will more likely be sequential[3] rather than combined.[4] This statement relates specifically to observers travelling along the N10 national road, where observations of wind turbines (from the south to the north) will begin at the Aeolus WEF, followed by the Redding WEF, then the Ripponn WEF, then the Hamlett and Amakhala Emoyeni wind turbines, and finally the Cookhouse WEF. Combined cumulative visual exposure is also expected, but more likely at a more localised scale, e.g. where the observer is located in between the Ripponn and Redding WEFs, or in between the Cookhouse and Amakhala Emoyeni WEFs.

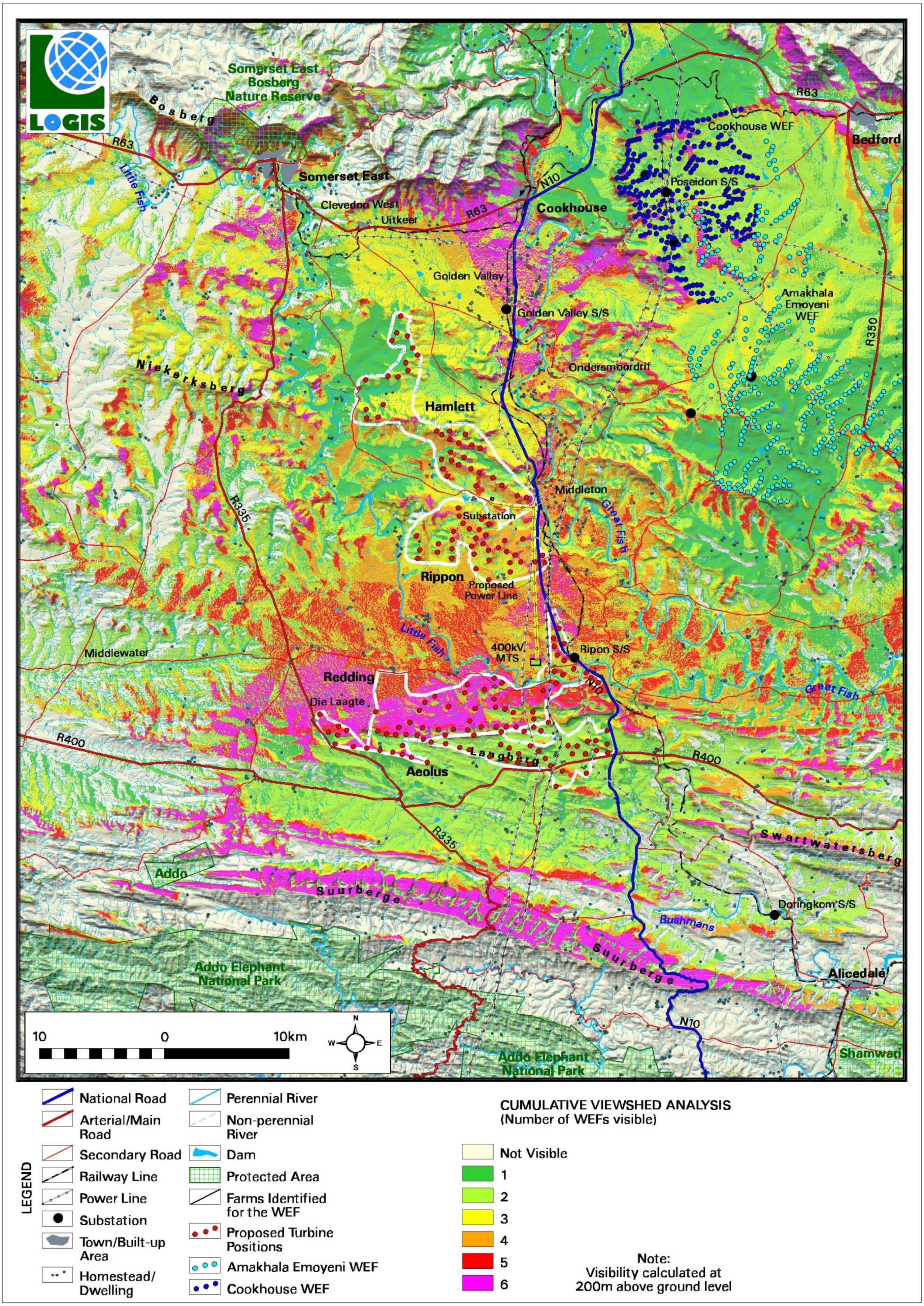
Overall, the areas of higher cumulative visual exposure contain sensitive visual receptors in the form of residents of homesteads and observers travelling along the national, arterial or regional roads traversing the study area. The combined number of wind turbines within a 30km radius from the Hamlett WEF (should all be constructed) may theoretically be up to 776, potentially resulting in cumulative visual impacts ranging from moderate to high significance.

[3] The observer has to move to another viewpoint to see different developments, or different views of the same development.

[4] The wind turbines of several WEFs are within the observer's arc of vision at the same time.



Map 4: Viewshed analysis of the proposed Ripponn WEF.



Map 5: Cumulative viewshed analysis of the proposed Rippon, Hamlett, Redding, Aeolus, Amakhala Emoyeni and Cookhouse WEF turbines.

6.3. Potential visual exposure – 132kV power line

The visibility of the proposed power line alignment between the Ripponn WEF Collector Substation and the Main Transmission Substation (MTS) is shown on **Map 6** below. The visibility analysis was undertaken along the alignment at an offset of 25m above average ground level (i.e. the maximum height of the power line structures), for a distance of 3km from the centre line. The viewshed analysis was restricted to a 3km radius due to the fact that visibility beyond this distance is expected to be negligible/highly unlikely for the relatively constrained vertical dimensions of this type of power line (i.e. a 132kV power line).

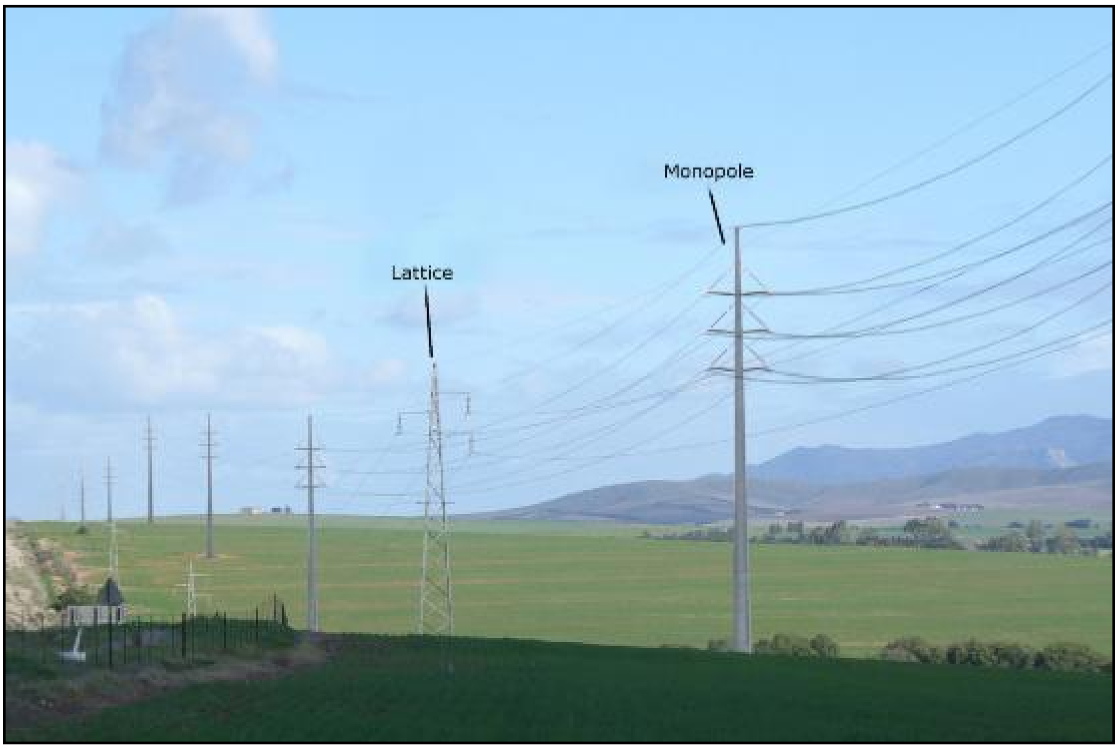


Figure 10: Examples of 132kV overhead power lines.

It is expected that the power line may be visible within the 3km corridor and potentially highly visible within a 500m radius of the power line structures, due to the generally flat terrain it traverses. The power line may be exposed to observers travelling along the N10 national road and the Bloemhof secondary road, as well as observers residing in the Middleton area, east of the power line. Homesteads within this area include:

- De Hoop 1 & 2
- Voorspoed 1, 2 & 3
- Serenade
- Dagbreek
- Eendor

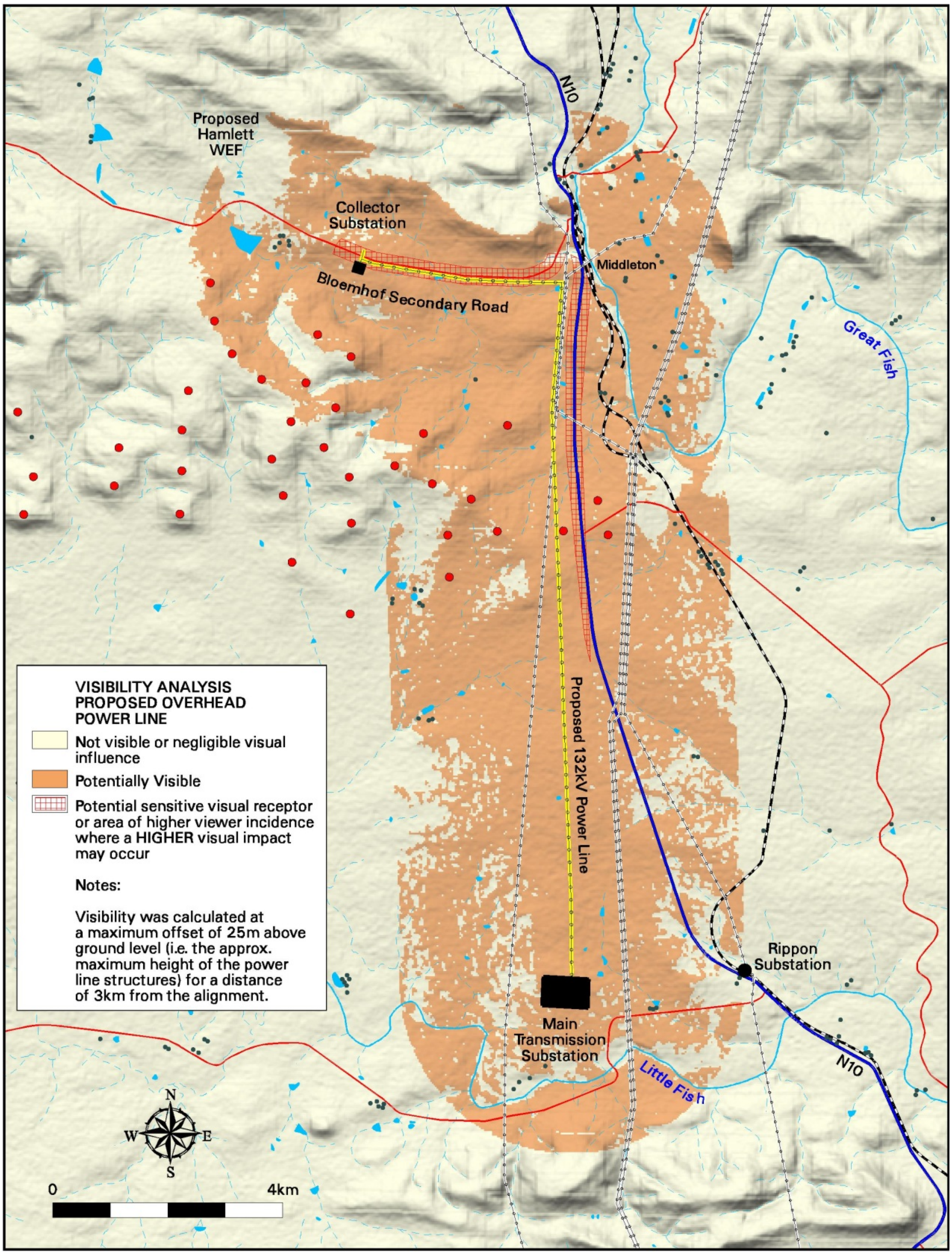
Additional potentially exposed homesteads to the west of the proposed power line include:

- Wilton
- Pruimplaas
- Herbou
- Doringkloof
- Die Vlakte
- Vlaklaagte

- Grasfontein

The above homesteads are all located on farms earmarked for the Hamlett, Ripponn or Redding WEFs.

It should be noted that the power line will traverse adjacent to the Poseidon/Grassridge 1 400kV power line, and in between this line and the Golden Valley/Rippon 1 220kV, Poseidon/Dedisa 1 400kV and the Poseidon/Grassridge 2 400kV power lines. These power line structures are larger in size and effectively form a power line corridor within the region. Additional to these lines, there is a railway line traversing in between the proposed 132kV power line and the Middleton agricultural area. It is expected that the existing power line and railway line structures will largely offset the visual exposure, and potential visual impact, of the proposed Ripponn WEF to MTS Substation power line.



Map 6: Visibility analysis of the proposed overhead power line.

6.4. Visual distance / observer proximity to the WEF

The proximity radii are based on the anticipated visual experience of the observer over varying distances. The distances are adjusted upwards for larger WEFs (e.g. more than 50 wind turbines) and downwards for smaller WEFs (e.g. less than 50 turbines). This methodology was developed in the absence of any known and/or accepted standards for South African WEFs.

The principle of reduced impact over distance is applied in order to determine the core area of visual influence for these types of structures. It is envisaged that the nature of the structures and the rural character of the study area would create a significant contrast that would make the facility visible and recognisable from greater distances.

The proximity radii for the wind turbines were created in order to indicate the scale and viewing distance of the facility and to determine the prominence of the structures in relation to their environment. It should be noted that even though the proximity radii are indicated as (near) concentric circles from the wind turbines, the visual prominence of the structures will only apply where they are visible, as determined in the previous section (**Section 6.1**) of this report.

The proximity radii, based on the dimensions of the proposed development footprint are indicated on **Map 7**, and include the following:

- 0 - 5km. Short distance view where the WEF would dominate the frame of vision and constitute a very high visual prominence.
- 5 – 10km. Short to medium distance view where the structures would be easily and comfortably visible and constitute a high visual prominence.
- 10 - 20km. Medium to long distance view where the facility would become part of the visual environment, but would still be visible and recognisable. This zone constitutes a moderate visual prominence.
- > 20km. Long distance view of the facility where the structures are not expected to be immediately visible and not easily recognisable. This zone constitutes a lower visual prominence for the facility.

Figure 11: Schematic representation of a wind turbine from 1, 2, 5 and 10km under perfect viewing conditions.

The visual distance theory and the observer's proximity to the facility are closely related, and especially relevant, when considered from areas with a high viewer incidence and a potentially negative visual perception of the proposed facility.

6.5. Viewer incidence / viewer perception

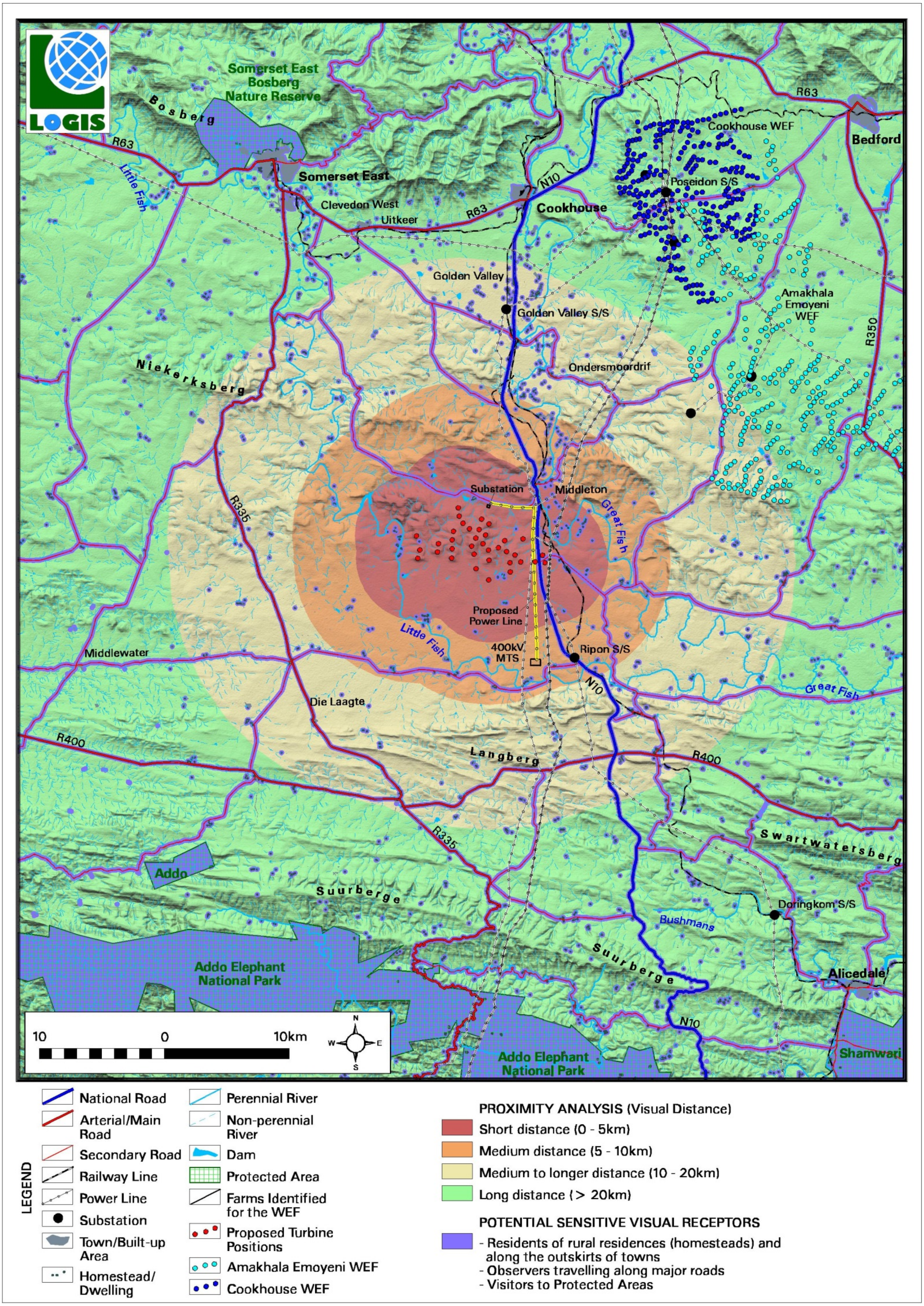
The number of observers and their perception of a structure determine the concept of visual impact. If there are no observers or if the visual perception of the structure is favourable to all the observers, there would be no visual impact.

It is necessary to identify areas of high viewer incidence and to classify certain areas according to the observer's visual sensitivity towards the proposed WEF and its related infrastructure. It would be impossible not to generalise the viewer incidence and sensitivity to some degree, as there are many variables when trying to determine the perception of the observer; regularity of sighting, cultural background, state of mind, purpose of sighting, etc. which would create a myriad of options.

Viewer incidence is expected to be the highest along the national, arterial and secondary roads within the study area. Commuters and tourists using these roads may be negatively impacted upon by visual exposure to the WEF. Additional potentially sensitive visual receptors are residents and visitors to the homesteads and rural residences within the study area. It is expected that the viewer's perception, unless the observer is associated with (or supportive of) the WEF, would generally be negative.

The author is not aware of any specific objections raised against the construction of the Ripponn WEF.

Refer to **Map 7** for the location of the potential sensitive visual receptors discussed above.



Map 7: Proximity analysis and potential sensitive visual receptors.

6.6. Visual absorption capacity

The broader study area is located within the Nama-Karoo Biome characterised by large open, *low shrubland*, grassland and bare soil in places (**Figure 11**).

Overall, the Visual Absorption Capacity (VAC) of the receiving environment is deemed low by virtue of the nature of the vegetation and the low occurrence of urban development. In addition, the scale and form of the proposed structures mean that it is unlikely that the environment will visually absorb them in terms of texture, colour, form and light/shade characteristics.

Where homesteads and settlements occur, some more significant vegetation and trees may have been planted, which would contribute to the visual absorption capacity (i.e. shielding the observers from the facility). As this is not a consistent occurrence, however, VAC will not be taken into account for any of the homesteads or settlements, thus assuming a worst case scenario in the impact assessment.

Figure 12: *Low shrubland*, grassland and bare soil within the study area – low VAC.

6.7. Visual impact index

The combined results of the visual exposure, viewer incidence/perception and visual distance of the proposed Hamlett WEF are displayed on **Map 8**. Here the weighted impact and the likely areas of impact have been indicated as a visual impact index. Values have been assigned for each potential visual impact per data category and merged in order to calculate the visual impact index.

The criteria (previously discussed in this report) which inform the visual impact index are:

- Visibility or visual exposure of the structures
- Observer proximity or visual distance from the structures
- The presence of sensitive visual receptors
- The perceived negative perception or objections (if applicable) to the structures
- The visual absorption capacity of the vegetation cover or built structures (if applicable)

An area with short distance visual exposure to the proposed infrastructure, a high viewer incidence and a potentially negative perception (i.e. a sensitive visual receptor) would therefore have a **higher** value (greater impact) on the index. This helps in focussing the attention to the critical areas of potential impact and determining the potential **magnitude** of the visual impact.

General

The index indicates that **potentially sensitive visual receptors** within a 5km radius of the WEF may experience a **very high** visual impact. The magnitude of visual impact on sensitive visual receptors subsequently subsides with distance to; **high** within a 5 – 10km radius (where/if sensitive receptors are present) and **moderate** within a 10 – 20km radius (where/if sensitive receptors are present). Receptors beyond 20km are expected to have a **low** potential visual impact.

Magnitude of the potential visual impact

The WEF may have a visual impact of **very high** magnitude on the following observers (within a 5km radius):

Residents of/visitors to:

- Wellington Grove
- Wilton
- Prospect
- Pruimplaas
- Die Vlakte
- Doringkloof
- Glentana
- Jordaanskraal
- Herbou

Note:

The location of these properties on the farms earmarked for the Ripponn or Hamlett WEFs reduces the probability of this impact occurring i.e. it is assumed that they are supportive of the WEF developments on the affected properties.

Residents of/visitors to:

- De Hoop 1 & 2
- Middleton
- Dagbreek
- Serenade
- Eendor
- Voorspoed 1, 2 & 3
- Spes Bona
- Draaihoek
- Alfalfa
- Hesitation
- Bethel

Observers travelling along the:

- The N10 national and secondary roads traversing within a 5km radius of the WEF

The WEF may have a visual impact of **high** magnitude on the following observers (5 – 10km radius):

Residents of/visitors to:

- Driefontein
- Vlaklaagte
- Reddingshoop
- Draai van Visrivier
- Britskraal 1

Note:

The location of these properties on the farms earmarked for the Redding WEF reduces the probability of this impact occurring i.e. it is assumed that they are supportive of the WEF developments within the region.

- Lindhurst
- Thornvale
- Delportshoop
- Somersdal
- Soutvlei
- Rietfontein
- Glentana
- Karee Krans
- Britskraal 2
- Sarahdale
- Rooiplaas
- Rockcliffe
- Dennehof
- De Kroon
- Matjesfontein
- Van Aards Kraal
- De Hoop

The WEF may have a visual impact of **moderate** magnitude on the following observers located between a 10 – 20km radius of the wind turbine structures:

Residents of/visitors to:

- Esperant
- Kriegerskraal
- Wilgerfontein
- Junction Drift
- Peninsula
- Brandplaas
- Brakfontein
- Rietfontein
- Companiesdrift
- Tweefontein
- Alwingate
- Brakfontein
- Watsonia
- Beenleegte
- Stillerus
- Bassonskraal
- Artista

- Modderfontein
- Greylingskraal
- Radyn
- Deelkraal
- Leeufontein
- Perdefontein
- Hangar
- Eureka
- Ashleigh
- Houghamdale
- Rondavel
- Watercroft
- Stenhouse
- Morning Star
- La Fleaurette
- Rivermead
- Colne
- Felli Place
- Fara
- Minstead
- De Rus
- Dalfreich
- Altona
- Volmoed
- Thorn Park
- Jagersdrift
- Sasveld
- Lusthof
- Ordinansie
- Gedagtenis
- Massina
- Klaver
- Onder-Smoordrift
- Renie
- Middelbergplaas
- Smitskraal
- Spes Bona
- Uitershoek
- Kroonkop
- Good Hope
- Welgelegen
- Uitkyk
- Nuweland
- Olyvenfontein

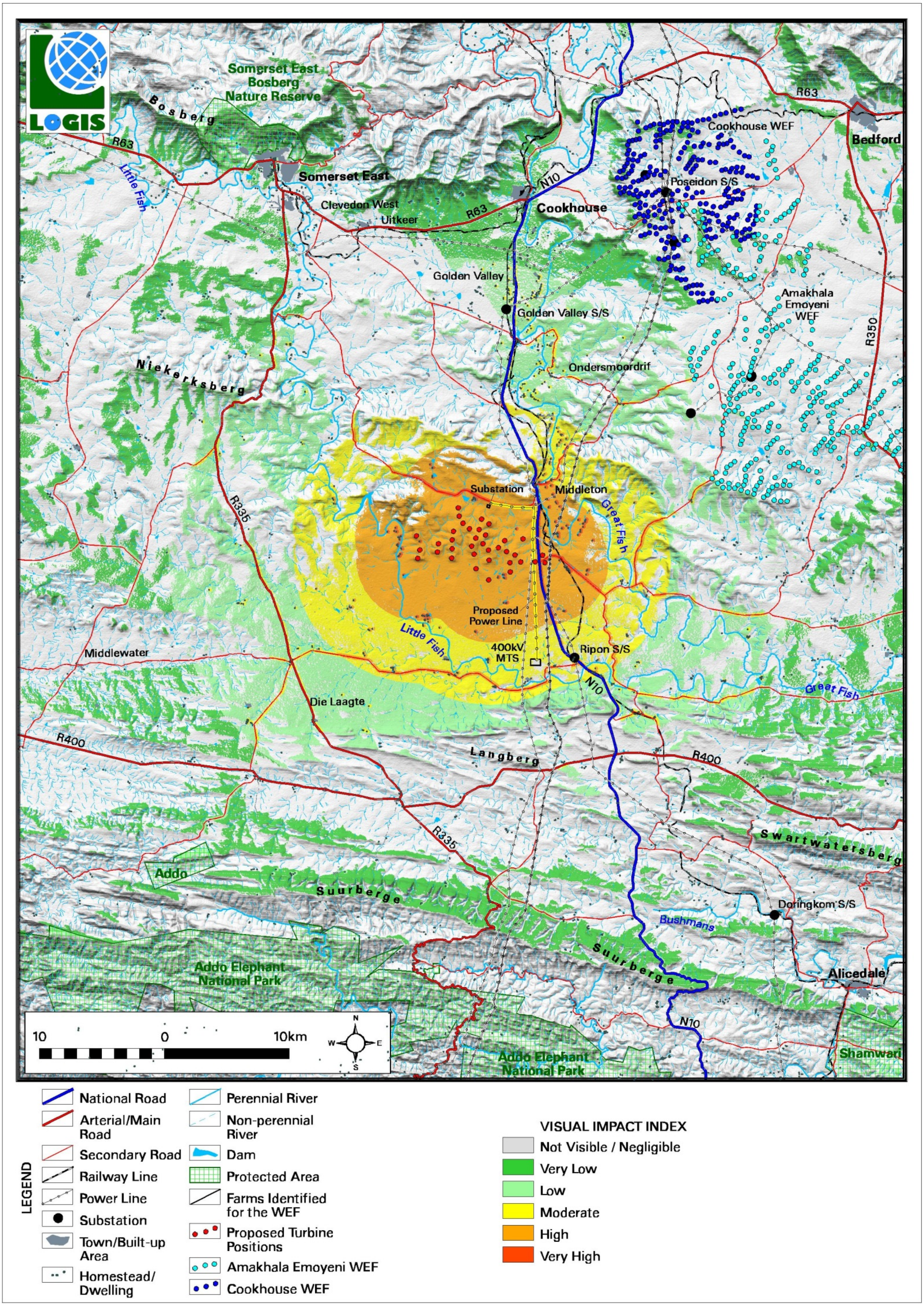
The WEF may have a visual impact of **low** magnitude on the following observers located beyond a 20km radius of the wind turbine structures:

Residents of/visitors to:

- Steenbokhoek
- Modderlaagte
- Boschfontein
- Waterkloof
- Glen Cimming
- Bloemhof
- Burnham
- Bassonskloof

- Shadwell
- Ann's Villa
- Viewlands
- Theldon
- Lynton
- Protest
- Witwater
- Goedgenoeg
- Deelkraal
- Zwartfontein
- Zwartfontein East
- Waterloo
- Hopefield
- Karkotskraal
- Somerset East Outlying
- Fairview
- Dirko
- Lower Dirko
- Olivewoods
- Wentworth
- Rooiwal
- Burgerhof
- Merindol
- Elimsrus
- Waranga House
- Silverbeck
- Baviaanskrans

Note:
Where homesteads are derelict or deserted, the visual impact will be non-existent, until such time as it is inhabited again.



Map 8: Visual impact index.

7. VISUAL IMPACT ASSESSMENT

7.1. Impact rating methodology

The previous section of the report identified specific areas where likely visual impacts would occur. This section will attempt to quantify these potential visual impacts in their respective geographical locations and in terms of the identified issues (see Chapter 3: SCOPE OF WORK) related to the visual impact.

The methodology for the assessment of potential visual impacts states the **nature** of the potential visual impact (e.g. the visual impact on users of major roads in the vicinity of the proposed alignment) and includes a table quantifying the potential visual impact according to the following criteria:

- **Extent** - site only (very low = 1), local (low = 2), regional (medium = 3), national (high = 4) or international (very high = 5)[5].
- **Duration** - very short (0-1 yrs. = 1), short (2-5 yrs. = 2), medium (5-15 yrs. = 3), long (>15 yrs. = 4), and permanent (= 5).
- **Magnitude** - None (= 0), minor (= 2), low (= 4), medium/moderate (= 6), high (= 8) and very high (= 10)[6].
- **Probability** – very improbable (= 1), improbable (= 2), probable (= 3), highly probable (= 4) and definite (= 5).
- **Status** (positive, negative or neutral).
- **Reversibility** - reversible (= 1), recoverable (= 3) and irreversible (= 5).
- **Significance** - low, medium or high.

The **significance** of the potential visual impact is equal to the **consequence** multiplied by the **probability** of the impact occurring, where the consequence is determined by the sum of the individual scores for magnitude, duration and extent (i.e. **significance = consequence (magnitude + duration + extent) x probability**).

The significance weighting for each potential visual impact (as calculated above) is as follows:

- <30 points: Low (where the impact would not have a direct influence on the decision to develop in the area)
- 30-60 points: Medium/moderate (where the impact could influence the decision to develop in the area)
- >60: High (where the impact must have an influence on the decision to develop in the area)

---

[5] Local = within 5km of the development site. Regional = between 5-10km (and potentially up to 20km) from the development site.

[6] This value is read from the visual impact index. Where more than one value is applicable, the higher of these will be used as a worst case scenario.

7.2. Visual impact assessment

The primary visual impacts of the proposed WEF are assessed as follows:

7.2.1. Construction impacts

Potential visual impact of construction activities on sensitive visual receptors in close proximity to the proposed WEF.

During construction, there may be a noticeable increase in heavy vehicles utilising the roads to the development site that may cause, at the very least, a visual nuisance to other road users and landowners in the area.

Construction activities may potentially result in a **moderate** (significance rating = 48) temporary visual impact, both before and after mitigation (significance rating = 30).

Table 2: Visual impact of construction on sensitive visual receptors in close proximity to the proposed WEF.

Nature of Impact: Visual impact of construction activities on sensitive visual receptors in close proximity to the proposed WEF.		
	Without mitigation	***With mitigation***
Extent	Local **(2)**	Local **(2)**
Duration	Short term **(2)**	Short term **(2)**
Magnitude	High **(8)**	Moderate **(6)**
Probability	Highly Probable **(4)**	Probable **(3)**
Significance	Moderate **(48)**	Moderate **(30)**
Status (positive or negative)	Negative	Negative
Reversibility	Reversible (1)	Reversible (1)
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	

Mitigation:

<u>Planning:</u>

- Retain and maintain natural vegetation in all areas outside of the development footprint.

<u>Construction:</u>

- Ensure that vegetation is not unnecessarily removed during the construction period.
- Plan the placement of lay-down areas and temporary construction equipment camps in order to minimise vegetation clearing (i.e. in already disturbed areas) where possible.
- Restrict the activities and movement of construction workers and vehicles to the immediate construction site and existing access roads.
- Ensure that rubble, litter, and disused construction materials are appropriately stored (if not removed daily) and then disposed of regularly at licensed waste facilities.
- Reduce and control construction dust using approved dust suppression techniques as and when required (i.e. whenever dust becomes apparent).
- Restrict construction activities to daylight hours whenever possible in order to reduce lighting impacts.
- Rehabilitate all disturbed areas immediately after the completion of construction works.

Cumulative impacts: None.
Residual impacts: None, provided that rehabilitation works are carried out as required.

7.2.2. Potential visual impact on sensitive visual receptors (residents and visitors) located within a 5km radius of the wind turbine structures

The operation of theRipponn WEF is expected to have a **high** visual impact (significance rating = 64) on observers/visitors residing at homesteads within a 5km radius of the wind turbine structures. This includes:

- De Hoop 1 & 2
- Middleton
- Dagbreek
- Serenade
- Eendor
- Voorspoed 1, 2 & 3
- Spes Bona
- Draaihoek
- Alfalfa
- Hesitation
- Bethel

The following WEF properties are provisionally included, due to their assumed support for the WEF.

- Wellington Grove
- Wilton
- Prospect
- Pruimplaas
- Die Vlakte
- Doringkloof
- Glentana
- Jordaanskraal
- Herbou

No mitigation of this impact is possible (i.e. the structures will be visible regardless), but general mitigation and management measures are recommended as best practice. The table below illustrates this impact assessment.

Table 3: Visual impact on observers (residents and visitors) in close proximity to the proposed wind turbine structures.

Nature of Impact: Visual impact on observers (residents at homesteads and visitors/tourists) in close proximity (i.e. within 5km) to the wind turbine structures		
	Without mitigation	***With mitigation***
Extent	Local **(2)**	Local **(2)**
Duration	Long term **(4)**	Long term **(4)**
Magnitude	Very high **(10)**	Very high **(10)**
Probability	Highly probable **(4)**	Highly probable **(4)**
Significance	High **(64)**	High **(64)**
Status (positive, neutral or negative)	Negative	Negative
Reversibility	Reversible (1)	Reversible (1)
Irreplaceable loss of resources?	No	No

Can impacts be mitigated?	No, only best practice management measures can be implemented.

Generic best practise mitigation/management measures: Planning: ➢ Retain/re-establish and maintain natural vegetation in all areas outside of the development footprint/servitude. Operations: ➢ Maintain the general appearance of the facility as a whole. Decommissioning: ➢ Remove infrastructure not required for the post-decommissioning use. ➢ Rehabilitate all areas. Consult an ecologist regarding rehabilitation specifications.
Residual impacts: The visual impact will be removed after decommissioning, provided the WEF infrastructure is removed and the area rehabilitated. Failing this, the visual impact will remain.

7.2.3. Potential visual impact on sensitive visual receptors (observers travelling along roads) located within a 5km radius of the wind turbine structures

The operation of the Hamlett WEF is expected to have a **high** visual impact (significance rating = 64) on observers traveling along the roads within a 5km radius of the wind turbine structures. This includes observers travelling along the:

- The N10 national road and secondary roads

No mitigation of this impact is possible (i.e. the structures will be visible regardless), but general mitigation and management measures are recommended as best practice. The table below illustrates this impact assessment.

Table 4: Visual impact on observers travelling along roads in close proximity to the proposed wind turbine structures.

Nature of Impact: Visual impact on observers travelling along the roads in close proximity (i.e. within 5km) to the wind turbine structures		
	Without mitigation	***With mitigation***
Extent	Local **(2)**	Local **(2)**
Duration	Long term **(4)**	Long term **(4)**
Magnitude	Very high **(10)**	Very high **(10)**
Probability	Highly probable **(4)**	Highly probable **(4)**
Significance	High **(64)**	High **(64)**
Status (positive, neutral or negative)	Negative	Negative
Reversibility	Reversible (1)	Reversible (1)
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	No, only best practice management measures can be implemented.	

Generic best practise mitigation/management measures: Planning: ➢ Retain/re-establish and maintain natural vegetation in all areas outside of the development footprint/servitude. Operations: ➢ Maintain the general appearance of the facility as a whole. Decommissioning: ➢ Remove infrastructure not required for the post-decommissioning use. ➢ Rehabilitate all areas. Consult an ecologist regarding rehabilitation specifications.
Residual impacts: The visual impact will be removed after decommissioning, provided the WEF infrastructure is removed and the area rehabilitated. Failing this, the visual impact will remain.

7.2.4. Potential visual impact on sensitive visual receptors within the region (5 – 10km radius)

The Hamlett WEF could have a **high** visual impact (significance rating = 60) on residents of (or visitors to) homesteads within a 5 - 10km radius of the wind turbine structures.

Residents of/visitors to:

- Lindhurst
- Thornvale
- Delportshoop
- Somersdal
- Soutvlei
- Rietfontein
- Glentana
- Karee Krans
- Britskraal 2
- Sarahdale
- Rooiplaas
- Rockcliffe
- Dennehof
- De Kroon
- Matjesfontein
- Van Aards Kraal
- De Hoop

The following WEF properties are provisionally included, due to their assumed support for WEFs within the region.

- Driefontein
- Vlaklaagte
- Reddingshoop
- Draai van Visrivier
- Britskraal 1

No mitigation of this impact is possible (i.e. the structures will be visible regardless), but general mitigation and management measures are recommended as best practice. The table below illustrates this impact assessment.

Table 5: Visual impact of the proposed wind turbine structures within the region (5 – 10km).

Nature of Impact: Visual impact on observers travelling along the roads and residents at homesteads within a 5 – 10km radius of the wind turbine structures		
	Without mitigation	**_With mitigation_**
Extent	Regional **(3)**	Regional **(3)**
Duration	Long term **(4)**	Long term **(4)**
Magnitude	High **(8)**	High **(8)**
Probability	Highly probable **(4)**	Highly probable **(4)**
Significance	High **(60)**	High **(60)**
Status (positive, neutral or negative)	Negative	Negative
Reversibility	Reversible (1)	Reversible (1)
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	No, only best practise measures can be implemented	
Generic best practise mitigation/management measures: Planning: ➢ Retain/re-establish and maintain natural vegetation in all areas outside of the development footprint/servitude. Operations: ➢ Maintain the general appearance of the facility as a whole. Decommissioning: ➢ Remove infrastructure not required for the post-decommissioning use. ➢ Rehabilitate all areas. Consult an ecologist regarding rehabilitation specifications.		
Residual impacts: The visual impact will be removed after decommissioning, provided the WEF infrastructure is removed and the area rehabilitated. Failing this, the visual impact will remain.		

7.2.5. Potential visual impact on sensitive visual receptors within the region (10 – 20km radius)

The Hamlett WEF could have a **moderate** visual impact (significance rating = 52) on residents of (or visitors to) homesteads within a 10 - 20km radius of the wind turbine structures.

Residents of/visitors to:

- Esperant
- Kriegerskraal
- Wilgerfontein
- Junction Drift
- Peninsula
- Brandplaas
- Brakfontein
- Rietfontein
- Companiesdrift
- Tweefontein
- Alwingate
- Brakfontein
- Watsonia
- Beenleegte
- Stillerus
- Bassonskraal
- Artista

- Modderfontein
- Greylingskraal
- Radyn
- Deelkraal
- Leeufontein
- Perdefontein
- Hangar
- Eureka
- Ashleigh
- Houghamdale
- Rondavel
- Watercroft
- Stenhouse
- Morning Star
- La Fleaurette
- Rivermead
- Colne
- Felli Place
- Fara
- Minstead
- De Rus
- Dalfreich
- Altona
- Volmoed
- Thorn Park
- Jagersdrift
- Sasveld
- Lusthof
- Ordinansie
- Gedagtenis
- Massina
- Klaver
- Onder-Smoordrift
- Renie
- Middelbergplaas
- Smitskraal
- Spes Bona
- Uitershoek
- Kroonkop
- Good Hope
- Welgelegen
- Uitkyk
- Nuweland
- Olyvenfontein

No mitigation of this impact is possible (i.e. the structures will be visible regardless), but general mitigation and management measures are recommended as best practice. The table below illustrates this impact assessment.

Table 6: Visual impact of the proposed wind turbine structures within the region (10 – 20km).

Nature of Impact: Visual impact on observers travelling along the roads and residents at homesteads within a 10 – 20km radius of the wind turbine structures		
	Without mitigation	***With mitigation***
Extent	Regional **(3)**	Regional **(3)**
Duration	Long term **(4)**	Long term **(4)**

Magnitude	Moderate **(6)**	Moderate **(6)**
Probability	Probable **(4)**	Probable **(4)**
Significance	Moderate **(52)**	Moderate **(52)**
Status (positive, neutral or negative)	Negative	Negative
Reversibility	Reversible (1)	Reversible (1)
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	No, only best practise measures can be implemented	
Generic best practise mitigation/management measures: Planning: ➢ Retain/re-establish and maintain natural vegetation in all areas outside of the development footprint/servitude. Operations: ➢ Maintain the general appearance of the facility as a whole. Decommissioning: ➢ Remove infrastructure not required for the post-decommissioning use. ➢ Rehabilitate all areas. Consult an ecologist regarding rehabilitation specifications.		
Residual impacts: The visual impact will be removed after decommissioning, provided the WEF infrastructure is removed and the area rehabilitated. Failing this, the visual impact will remain.		

7.2.6. Shadow flicker

Shadow flicker only occurs when the sky is clear, and when the turbine rotor blades are between the sun and the receptor (i.e. when the sun is low). De Gryse in Scenic Landscape Architecture (2006) found that "*most shadow impact is associated with 3-4 times the height of the object*". Based on this research, an 800m buffer along the edge of the outer most turbines is identified as the zone within which there is a risk of shadow flicker occurring.

There are no places of residence within the 800m buffer. The significance of shadow flicker is therefore anticipated to be **low** to **negligible**.

Table 7: Visual impact of shadow flicker on sensitive visual receptors in close proximity to the proposed WEF.

Nature of Impact: Visual impact of shadow flicker on sensitive visual receptors in close proximity to the proposed WEF.		
	Without mitigation	***With mitigation***
Extent	Local **(2)**	Local **(2)**
Duration	Long term **(4)**	Long term **(4)**
Magnitude	Low **(4)**	Low **(4)**
Probability	Improbable **(2)**	Improbable **(2)**
Significance	Low **(20)**	Low **(20)**
Status (positive, neutral or negative)	Negative	Negative
Reversibility	Reversible (1)	Reversible (1)
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	N.A. due to the low probability of occurrence	
Generic best practise mitigation/management measures: N.A.		

Residual impacts:
N.A.

7.2.7. Lighting impacts

Potential visual impact of operational, safety and security lighting of the facility at night.

The area immediately surrounding the proposed facility has a relatively low incidence of receptors and light sources, so light trespass and glare from the security and after-hours operational lighting for the facility will have some significance for visual receptors in close proximity.

Another source of glare light, albeit not as intense as flood lighting, is the aircraft warning lights mounted on top of the hub of the wind turbines. These lights are less aggravating due to the toned-down red colour, but have the potential to be visible from a great distance. This is especially true due to the strobing effect of the lights, a function specifically designed to attract the observer's attention. The Civil Aviation Authority (CAA) prescribes these warning lights and the potential to mitigate their visual impacts have traditionally been very low other than to restrict the number of lights to turbines that delineate the outer perimeter of the facility.

Figure 13: Aircraft warning lights fitted to the wind turbine hubs (Source: http://www.pinchercreekecho.com/2015/04/29/md-of-pincher-creek-takes-on-wind-turbine-lights.)

Some ground-breaking new technology in the development of strobing lights that only activate when an aircraft is detected nearby may aid in restricting light pollution at night and should be investigated and implemented by the project proponent, if available and permissible by the CAA. This new technology is referred to as *needs-based night lights,* which basically deactivates the wind turbine's night lights when there is no flying object within the airspace of the WEF. The system relies on the active detection of aircraft by radar sensors, which relays a switch-on signal to the central wind farm control to activate the obstacle lights. See diagram in **Figure 28** below.[7]

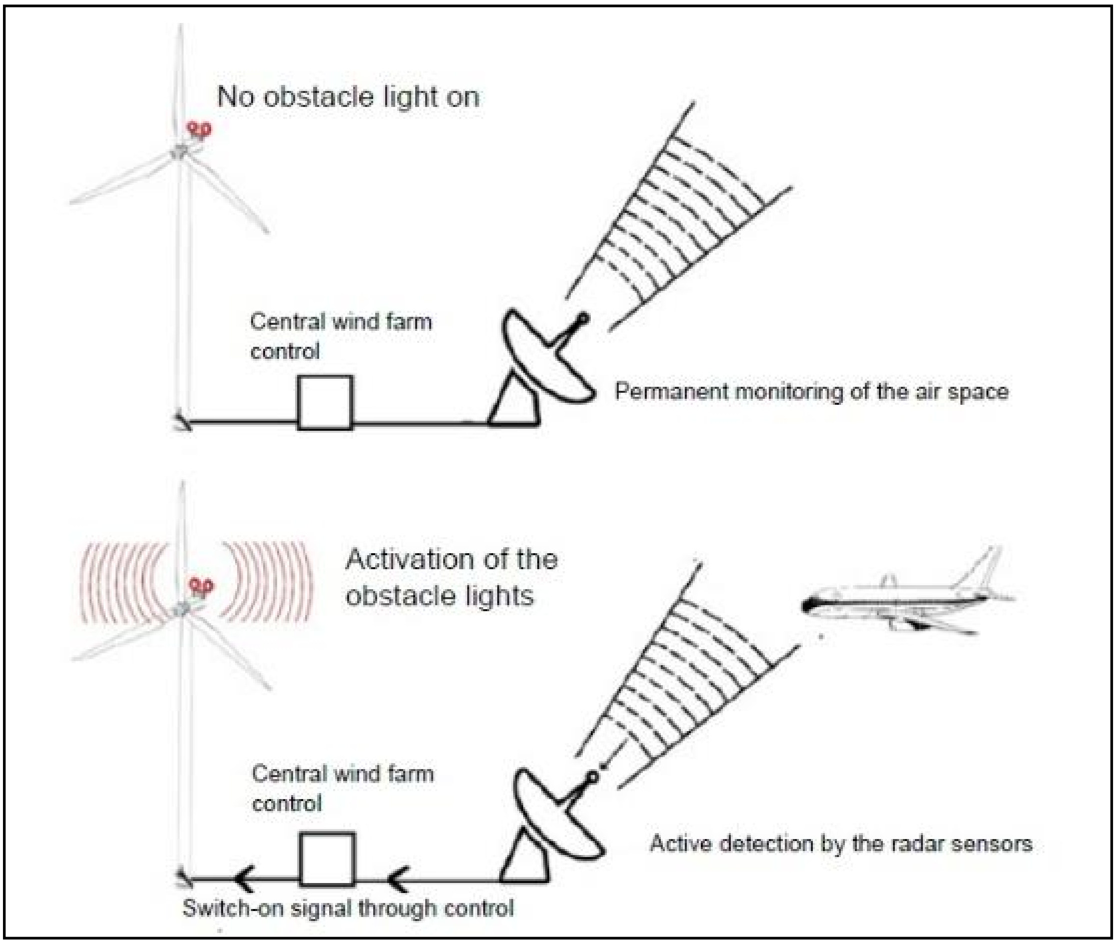


Figure 14: Diagram of the functional principle of the needs-based night lights.

Last is the potential lighting impact known as sky glow. Sky glow is the condition where the night sky is illuminated when light reflects off particles in the atmosphere such as moisture, dust or smog. The sky glow intensifies with the increase in the amount of light sources. Each new light source, especially upwardly directed lighting, contribute to the increase in sky glow.

This anticipated lighting impact is likely to be of **high** significance (rating = 60), and may be mitigated to **moderate** (rating = 45) especially within a 5 to 10km radius of the wind turbine structures.

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[7] Source: Nordex Energy GmbH, 2019

Table 8: Impact table summarising the significance of visual impact of lighting at night on visual receptors in close to medium proximity (5-10km) to the proposed WEF.

Nature of Impact: Visual impact of lighting at night on sensitive visual receptors.		
	No mitigation	***Mitigation considered***
Extent	Local/Regional **(3)**	Local/Regional **(3)**
Duration	Long term **(4)**	Long term **(4)**
Magnitude	High **(8)**	High **(8)**
Probability	Highly probable **(4)**	Probable **(3)**
Significance	High **(60)**	Moderate **(45)**
Status (positive or negative)	Negative	Negative
Reversibility	Reversible (1)	Reversible (1)
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation: Planning & operation: ➢ Implement needs-based night lighting if considered acceptable by the CAA. ➢ Limit aircraft warning lights to the turbines on the perimeter according to CAA requirements, thereby reducing the overall impact. ➢ Shield the sources of light by physical barriers (walls, vegetation, or the structure itself). ➢ Limit mounting heights of lighting fixtures, or alternatively use foot-lights or bollard level lights. ➢ Make use of minimum lumen or wattage in fixtures. ➢ Make use of down-lighters, or shielded fixtures. ➢ Make use of Low Pressure Sodium lighting or other types of low impact lighting. ➢ Make use of motion detectors on security lighting. This will allow the site to remain in relative darkness, until lighting is required for security or maintenance purposes.		
Cumulative impacts: The construction of additional WEFs (i.e. Hamlett and Wind Garden WEFs) may potentially increase the visual impacts associated with light pollution within an otherwise rural setting.		
Residual impacts: The visual impact will be removed after decommissioning, provided the facility and ancillary infrastructure is removed and the area rehabilitated. Failing this, the visual impact will remain.		

7.2.8. Ancillary infrastructure

On-site ancillary infrastructure associated with the WEF includes a 33/132kV substation and collector substation, underground 33kV cabling between the wind turbines, internal access roads, workshop and office and staff accommodation. No dedicated viewshed analyses have been generated for the ancillary infrastructure, as the range of visual exposure will fall within that of the turbines. The anticipated visual impact resulting from this infrastructure is likely to be of **low** significance both before and after mitigation.

Table 9: Visual impact of the ancillary infrastructure.

Nature of Impact: Visual impact of the ancillary infrastructure on observers in close proximity to the structures.		
	Without mitigation	***With mitigation***
Extent	Local **(2)**	Local **(2)**
Duration	Long term **(4)**	Long term **(4)**
Magnitude	Low **(4)**	Low **(4)**
Probability	Improbable **(2)**	Improbable **(2)**
Significance	Low **(20)**	Low **(20)**

Status (positive, neutral or negative)	Negative	Negative
Reversibility	Reversible (1)	Reversible (1)
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	No, only best practise measures can be implemented	
Generic best practise mitigation/management measures: Planning: ➢ Retain/re-establish and maintain natural vegetation in all areas outside of the development footprint/servitude. Operations: ➢ Maintain the general appearance of the infrastructure. Decommissioning: ➢ Remove infrastructure not required for the post-decommissioning use. ➢ Rehabilitate all areas. Consult an ecologist regarding rehabilitation specifications.		
Cumulative impacts: The construction of additional ancillary infrastructure associated with WEFs in the area (i.e. Hamlett and Wind Garden WEFs) may potentially increase the potential cumulative visual impact.		
Residual impacts: The visual impact will be removed after decommissioning, provided the ancillary infrastructure is removed and the area rehabilitated. Failing this, the visual impact will remain.		

7.2.9. Potential visual impact on sensitive visual receptors located within a 500m radius of the power line structures

The construction of the power line could have a **low** visual impact (significance rating = 24) on observers traveling along the N10 national road and local roads within a 500m radius of the power line structures. It should be borne in mind that the power line will be a more constrained 132kV line traversing adjacent to 220kV and 400kV power lines, potentially reducing the probability of the impact occurring.

No mitigation of this impact is possible (i.e. the power line structures will be visible regardless), but mitigation measures are recommended as best practice. The table below illustrates this impact assessment.

Table 10: Visual impact on observers in close proximity to the proposed power line structures.

Nature of Impact: Visual impact on observers travelling along the roads and residents at homesteads in close proximity to the power line structures		
	Without mitigation	***With mitigation***
Extent	Local **(2)**	Local **(2)**
Duration	Long term **(4)**	Long term **(4)**
Magnitude	Moderate **(6)**	Moderate **(6)**
Probability	Improbable **(2)**	Improbable **(2)**
Significance	Low **(24)**	Low **(24)**
Status (positive, neutral or negative)	Negative	Negative
Reversibility	Reversible **(1)**	Reversible **(1)**
Irreplaceable loss of resources?	No	No
Can impacts be	No	

mitigated?	

Mitigation / Management: Planning: ➢ Retain/re-establish and maintain natural vegetation immediately adjacent to the power line servitude. Operations: ➢ Maintain the general appearance of the infrastructure. Decommissioning: ➢ Remove infrastructure not required for the post-decommissioning use. ➢ Rehabilitate all affected areas. Consult an ecologist regarding rehabilitation specifications.
Residual impacts: The visual impact will be removed after decommissioning, provided the power line infrastructure is removed. Failing this, the visual impact will remain.

7.3. Visual impact assessment: secondary impacts

7.3.1. The potential impact on the sense of place of the region.

Sense of place refers to a unique experience of an environment by a user, based on his or her cognitive experience of the place. Visual criteria, specifically the visual character of an area (informed by a combination of aspects such as topography, level of development, vegetation, noteworthy features, cultural / historical features, etc.), play a significant role.

An impact on the sense of place is one that alters the visual landscape to such an extent that the user experiences the environment differently, and more specifically, in a less appealing or less positive light.

The greater environment has a rural, undeveloped character and a natural appearance. These generally undeveloped landscapes are considered to have a high visual quality.

The significance of the visual impacts on the sense of place within the **region** (i.e. beyond a 20km radius of the development and within the greater region) is expected to be of **low** significance.

No mitigation of this impact is possible (i.e. the structures will be visible regardless), but general mitigation and management measures are recommended as best practice. The table below illustrates this impact assessment.

Table 11: The potential impact on the sense of place of the region.

Nature of Impact: The potential impact on the sense of place of the region.		
	Without mitigation	***With mitigation***
Extent	Regional **(3)**	Regional **(3)**
Duration	Long term **(4)**	Long term **(4)**
Magnitude	Low **(4)**	Low **(4)**
Probability	Improbable **(2)**	Improbable **(2)**
Significance	Low **(22)**	Low **(22)**
Status (positive, neutral or negative)	Negative	Negative
Reversibility	Reversible (1)	Reversible (1)
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	No, only best practise measures can be implemented	

Generic best practise mitigation/management measures: <u>Planning:</u> ➢ Retain/re-establish and maintain natural vegetation in all areas outside of the development footprint/servitude. <u>Operations:</u> ➢ Maintain the general appearance of the facility as a whole. <u>Decommissioning:</u> ➢ Remove infrastructure not required for the post-decommissioning use. ➢ Rehabilitate all areas. Consult an ecologist regarding rehabilitation specifications.
Residual impacts: The visual impact will be removed after decommissioning, provided the WEF infrastructure is removed and the area rehabilitated. Failing this, the visual impact will remain.

7.3.2. The potential cumulative visual impact of the wind farms on the visual quality of the landscape.

The cumulative visual impact of the proposed Hamlett, Ripponn, Redding and Aeolus WEFs, as well as the existing Amakhala Emoyeni (including Msengi and Izidluli Emoyeni WEFs) and Cookhouse WEFs (including Nxuba and Nojoli WEFs) is expected to be **high**, especially the potential sequential cumulative visual impact on observers driving along the N2 national road. This impact is relevant in spite of the fact that the wind farms are located in the Cookhouse REDZ.

Table 12: The potential cumulative visual impact of wind farms on the visual quality of the landscape.

Nature of Impact: The potential cumulative visual impact of wind farms on the visual quality of the landscape.		
	Overall impact of the proposed project considered in isolation	***Cumulative impact of the project and other projects in the area***
Extent	Local **(2)**	Local **(2)**
Duration	Long term **(4)**	Long term **(4)**
Magnitude	Very high **(10)**	Very high **(10)**
Probability	Highly probable **(4)**	Highly probable **(4)**
Significance	High **(64)**	High **(64)**
Status (positive, neutral or negative)	Negative	Negative
Reversibility	Reversible (1)	Reversible (1)
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	No	
Mitigation measures: N.A.		
Residual impacts: The visual impact will be removed after decommissioning, provided the WEF infrastructure is removed and the area rehabilitated. Failing this, the visual impact will remain.		

7.4. The potential to mitigate visual impacts

The primary visual impact, namely the appearance of the WEF (the wind turbines) is not possible to mitigate. The functional design of the turbines cannot be changed in order to reduce visual impacts.

Alternative colour schemes (i.e. painting the turbines sky-blue, grey or darker shades of white) are not permissible as the CAA's *Marking of Obstacles* expressly states, "*Wind turbines shall be painted bright white to provide the maximum daytime conspicuousness*".

Failure to adhere to the prescribed colour specifications will result in the fitting of supplementary daytime lighting to the wind turbines, once again aggravating the visual impact.

Additional to this; any recommendations (refer to the *Avifauna Impact Assessment Report for the Ripponn Wind Farm*) regarding the painting of one of the three wind turbine blades black to increase the turbine visibility during rotation (as a mitigation measure against bird collisions), will also aggravate the visual impact. In spite of the fact that this recommendation is only relevant for the wind turbines located within *cautionary nest buffer zones,* this recommendation is not supported from a visual impact mitigation perspective.

The overall potential for mitigation is therefore generally low or non-existent. The following mitigation is, however possible:

- It is recommended that vegetation cover (i.e. either natural or cultivated) be maintained in all areas outside of the actual development footprint, both during construction and operation of the proposed WEF. This will minimise visual impact as a result of cleared areas, power line servitudes and areas denuded of vegetation.

- Existing roads should be utilised wherever possible. New roads should be planned taking due cognisance of the topography to limit cut and fill requirements. Construction/upgrade of roads should be undertaken properly, with adequate drainage structures in place to forego potential erosion problems.

- In terms of onsite ancillary buildings and structures, it is recommended that it be planned so that the clearing of vegetation is minimised. This implies consolidating this infrastructure as much as possible and making use of already disturbed areas rather than undisturbed sites wherever possible.

- Install aircraft warning lights that only activate when the presence of an aircraft is detected, if permitted by CAA, and where deemed feasible.

- The Civil Aviation Authority (CAA) prescribes that aircraft warning lights be mounted on the turbines. However, it is possible to mount these lights on the turbines representing the outer perimeter of the facility. In this manner, fewer warning lights can be utilised to delineate the facility as one large obstruction, thereby lessening the potential visual impact.

- Mitigation of other lighting impacts includes the pro-active design, planning and specification lighting for the facility. The correct specification and placement of lighting and light fixtures for the proposed WEF and ancillary infrastructure will go far to contain rather than spread the light. Mitigation measures include the following:

    - Shielding the sources of light by physical barriers (walls, vegetation, or the structure itself);
    - Limiting mounting heights of lighting fixtures, or alternatively using foot-lights or bollard level lights;
    - Making use of minimum lumen or wattage in fixtures;

  - Making use of down-lighters, or shielded fixtures;
  - Making use of Low Pressure Sodium lighting or other types of low impact lighting.
  - Making use of motion detectors on security lighting. This will allow the site to remain in relative darkness, until lighting is required for security or maintenance purposes.

- Mitigation of visual impacts associated with the construction phase, albeit temporary, would entail proper planning, management and rehabilitation of the construction site. Recommended mitigation measures include the following:

  - Ensure that vegetation is not unnecessarily cleared or removed during the construction period.
  - Reduce the construction period through careful logistical planning and productive implementation of resources.
  - Plan the placement of laydown areas and any potential temporary construction camps in order to minimise vegetation clearing (i.e. in already disturbed areas) wherever possible.
  - Restrict the activities and movement of construction workers and vehicles to the immediate construction site and existing access roads.
  - Ensure that rubble, litter, and disused construction materials are appropriately stored (if not removed daily) and then disposed regularly at licensed waste facilities.
  - Reduce and control construction dust through the use of approved dust suppression techniques as and when required (i.e. whenever dust becomes apparent).
  - Restrict construction activities to daylight hours in order to negate or reduce the visual impacts associated with lighting.
  - Rehabilitate all disturbed areas, construction areas, roads, slopes etc. immediately after the completion of construction works. If necessary, an ecologist should be consulted to assist or give input into rehabilitation specifications.

- During operation, the maintenance of the turbines and ancillary structures and infrastructure must be undertaken to ensure that the facility does not degrade, therefore aggravating the visual impact.

- Roads must be maintained to forego erosion and to suppress dust, and rehabilitated areas must be monitored for rehabilitation failure. Remedial actions must be implemented as a when required.

- Once the facility has exhausted its life span, the main facility and all associated infrastructure not required for the post rehabilitation use of the site must be removed and all disturbed areas appropriately rehabilitated. An ecologist must be consulted to give input into rehabilitation specifications.

- All rehabilitated areas should be monitored for at least a year following decommissioning, and remedial actions implemented as and when required.

- Secondary impacts anticipated as a result of the proposed WEF (i.e. visual character and sense of place) are not possible to mitigate. There is also no mitigation to ameliorate the negative visual impacts on roads frequented by tourists and which provides access to tourist destinations within the region.

Where sensitive visual receptors (as identified in **Section 6.8.2.**) are likely to be affected and where valid objections (as determined by the visual specialist) are raised by these receptors during the application process, it is recommended that the developer investigate the receptor's willingness (and the viability) of screening of visual impacts at the receptor site prior to construction commencing. This may entail the planting of natural vegetation, natural trees or the construction of screens in the pre-dominant direction of impact likely to be experienced by the principal receptor at the site. Ultimately, visual screening is most effective when placed at the receptor itself and should be considered in this context only.

Good practice requires that the mitigation of both primary and secondary visual impacts, as listed above, be implemented and maintained on an ongoing basis.

8. CONCLUSION AND RECOMMENDATIONS

The visual impact assessment (VIA) practitioner takes great care to ensure that all the spatial analyses and mapping is as accurate as possible. The intention is to quantify, using visibility analyses, proximity analyses, photo simulations and the identification of sensitive receptors, the potential visual impacts associated with the proposed Ripponn WEF. These processes are deemed to be transparent and scientifically defensible when interrogated.

However, visual impact is ultimately a subjective concept. The *subjects* in this case are the residents of, and visitors to the region. The author has attempted to accurately capture the location of these *subjects* (i.e. sensitive visual receptors and areas of likely visual impact) to the best of his ability, drawing on years of experience as a VIA practitioner. The VIA further adopts a risk averse approach in so far as to assume that the perception of most (if not all) of the sensitive visual receptors (bar the landowners of properties earmarked for WEF developments within the region), would be predominantly negative towards the development of a WEF in the region.

There are likely to be supporters of the Ripponn WEF (as renewable energy generation is a global priority) amongst the population of the larger region, but they are largely expected to be indifferent to the construction of the WEF and not as vocal in their support for the wind farm as potential detractors thereof.

The construction and operation of the proposed Ripponn WEF and its associated infrastructure will have a high visual impact on the study area, especially within (but not restricted to) a 5-10km radius of the proposed facility. The visual impact will differ amongst places, depending on the distance from the facility, but will generally occur at settlements and homesteads within this zone, and along the N10 national road (and potentially along the secondary roads) traversing near the WEF.

The combined visual impact or cumulative impact of up to 13 wind energy facilities (i.e. the existing Amakhala Emoyeni, Msengi Emoyeni, Izidluli Moyeni, Cookhouse, Nxuba, Nojoli, Golden Valley WEFs and Highland WEFs, and the proposed Hamlett, Ripponn, Redding and Aeolus WEFs) is expected to increase the area of potential visual impact within the Cookhouse REDZ. The intensity of visual impact (number of turbines visible) to exposed receptors, especially those located within a 5-10km radius of the proposed Ripponn WEF, is expected to increase when considered in conjunction with the other existing or proposed WEFs. The fact that these WEFs are located within a REDZ is not likely to mitigate the potential visual impact on affected sensitive visual receptors, but it is expected to at least concentrate WEF developments within the greater region.

Overall, the significance of the visual impacts associated with the proposed Ripponn WEF is expected to be high as a result of the generally undeveloped character of the landscape in closer proximity to the WEF. The facility would be visible within an area that contains certain sensitive visual receptors who would consider visual exposure to this type of infrastructure to be intrusive. Such visual receptors include people travelling along roads, residents of rural homesteads and settlements and tourists passing through or holidaying in the region.

Conventional mitigation (e.g. such as screening of the structures) of the potential visual impacts is highly unlikely to succeed due to the nature of the development and the receiving environment. A number of mitigation measures have been proposed (**Section 7.4**). The proposed mitigation measures will primarily be effective in terms of mitigating lighting and construction phase visual impacts.

Note: Regardless of whether or not mitigation measures will reduce the significance of the anticipated visual impacts, they are considered to be good practice and should all be implemented and maintained throughout the construction, operation and decommissioning phases of the proposed facility, should it be authorised.

9. IMPACT STATEMENT

The findings of the Visual Impact Assessment undertaken for the proposed Ripponn WEF is that the visual environment surrounding the site, especially within a 5-10km radius (and potentially up to 20km), will be visually impacted upon for the anticipated operational lifespan of the facility (i.e. 20 - 25 years).

The following is a summary of impacts remaining:

- Construction phase activities may potentially result in a **moderate** temporary visual impact, both before and after mitigation

- The operation of the Ripponn WEF is expected to have a **high** visual impact on observers/visitors residing at homesteads within a 5km radius of the wind turbine structures. No mitigation of this impact is possible.

- The operation of the Ripponn WEF is expected to have a **high** visual impact on observers traveling along the roads within a 5km radius of the wind turbine structures. No mitigation of this impact is possible.

- The operation of the Ripponn WEF could have a **high** visual impact on sensitive visual receptors within the region (5-10km radius of the wind turbine structures). No mitigation of this impact is possible.

- The Ripponn WEF could have a **moderate** visual impact on residents of (or visitors to) homesteads within a 10 - 20km radius of the wind turbine structures.

- There are no places of residence within an 800m buffer from the wind turbine structures. The significance of shadow flicker is therefore anticipated to be **low** to **negligible**.

- The anticipated night-time lighting impact is likely to be of **high** significance and may be mitigated to **moderate**, provided that *needs-based aircraft warning lights* (if permitted by the CAA and deemed feasible), is installed.

- The anticipated visual impact resulting from ancillary infrastructure is likely to be of **low** significance both before and after mitigation.

- The construction of the power line could have a **low** visual impact on observers traveling along the N10 national road and local roads within a 500m radius of the power line structures.

- The significance of the visual impacts on the sense of place within the region (i.e. beyond a 20km radius of the development and within the greater region) is expected to be of **low** significance.

- The cumulative visual impact of the proposed Ripponn, Hamlett, Redding and Aeolus WEFs, as well as the existing Amakhala Emoyeni and Cookhouse WEFs (including all phases and sub-projects) is expected to be **high**, especially the potential sequential cumulative visual impact on observers driving along the N2 national road.

The anticipated visual impacts listed above (i.e. post mitigation impacts) range from **high** to **low** significance. Anticipated visual impacts on sensitive visual receptors in close proximity to the proposed facility remain high and are not possible to mitigate. Even though it is possible that the potential visual impacts may be high within the context of the receiving environment, the proposed WEF development is not considered to be fatally flawed.

A fatal flaw occurs when:

- There is non-compliance with Acts, Ordinances, By-laws and adopted policies relating to visual pollution, scenic routes, special areas or proclaimed heritage sites.

- Non-compliance with conditions of existing Records of Decision.

- Impacts that may be evaluated to be of high significance and that are considered by the **majority** of stakeholders and decision-makers to be unacceptable.[8]

In terms of the proposed wind turbine layout, the project proponent needs to adhere to all relevant National, Provincial and Local Government regulations and ordinances, including all prescribed health and safety guidelines. If these are not adhered to, the layout may be deemed non-compliant, and may need to be revised in order to ensure compliance. The author is not aware of any non-compliance and the layout is deemed acceptable within this (legal) context.

10. MANAGEMENT PROGRAMME

The following management plan tables aim to summarise the key findings of the visual impact report and to suggest possible management actions in order to mitigate the potential visual impacts.

Refer to the tables overleaf.

[8] Source: Oberholzer, B. 2005

Table 13: Management programme – Planning.

OBJECTIVE: The mitigation and possible negation of visual impacts associated with the planning of the Proposed Ripponn WEF.		
Project Component/s	The WEF and ancillary infrastructure (i.e. turbines, access roads, substation, workshop and power line).	
Potential Impact	Primary visual impact of the facility due to the presence of the turbines and associated infrastructure as well as the visual impact of lighting at night.	
Activity/Risk Source	The viewing of the above mentioned by observers on or near the site (i.e. within 5-10km of the site) as well as within the region.	
Mitigation: Target/Objective	Optimal planning of infrastructure to minimise visual impact.	
Mitigation: Action/control	**Responsibility**	**Timeframe**
Retain and maintain natural and / or cultivated vegetation in all areas outside of the development footprint.	Project proponent/ design consultant/ Engineering, Procurement and Construction (EPC) contractor	Early in the planning phase.
Make use of existing roads wherever possible and plan the layout and construction of roads and infrastructure with due cognisance of the topography to limit cut and fill requirements.	Project proponent/ design consultant/ EPC contractor	Early in the planning phase.
Plan all roads, ancillary buildings and ancillary infrastructure in such a way that clearing of vegetation is minimised. Consolidate infrastructure and make use of already disturbed sites rather than undisturbed areas.	Project proponent/ design consultant/ EPC contractor	Early in the planning phase.
Consult a lighting engineer in the design and planning of lighting to ensure the correct specification and placement of lighting and light fixtures for the WEF and the ancillary infrastructure. The following is recommended: ○ Install aircraft warning lights that only activate when an aircraft is detected (CAA regulations/conditions permitting, and where deemed feasible). ○ Limit aircraft warning lights for the proposed WEF to the turbines on the perimeter, thereby reducing the overall requirement (CAA regulations/conditions permitting). ○ Shield the sources of light by physical barriers (walls, vegetation, or the structure itself); ○ Limit mounting heights of fixtures, or use foot-lights or bollard lights; ○ Make use of minimum lumen or wattage in fixtures; ○ Making use of down-lighters or shielded fixtures; ○ Make use of Low Pressure Sodium lighting or other low impact lighting. ○ Make use of motion detectors on security lighting, so allowing the site to remain in	Project proponent/ design consultant/ EPC contractor	Early in the planning phase.

darkness until lighting is required for security or maintenance purposes.		

Performance Indicator	Minimal exposure (limited or no complaints from I&APs) of ancillary infrastructure and lighting at night to observers on or near the site (i.e. within 5-10km) and within the region.
Monitoring	Not applicable.

Table 14: Management programme – Construction.

OBJECTIVE: The mitigation and possible negation of visual impacts associated with the construction of the Proposed Ripponn WEF.		
Project Component/s	Construction site and activities	
Potential Impact	Visual impact of general construction activities, and the potential scarring of the landscape due to vegetation clearing and resulting erosion.	
Activity/Risk Source	The viewing of the above mentioned by observers on or near the site.	
Mitigation: Target/Objective	Minimal visual intrusion by construction activities and intact vegetation cover outside of immediate construction work areas.	
Mitigation: Action/control	**Responsibility**	**Timeframe**
Ensure that vegetation is not unnecessarily cleared or removed during the construction period.	Project proponent/ EPC contractor	Early in the construction phase.
Reduce the construction period through careful logistical planning and productive implementation of resources.	Project proponent/ EPC contractor	Early in the construction phase.
Plan the placement of laydown areas and temporary construction equipment camps in order to minimise vegetation clearing (i.e. in already disturbed areas) wherever possible.	Project proponent/ EPC contractor	Early in and throughout the construction phase.
Restrict the activities and movement of construction workers and vehicles to the immediate construction site and existing access roads.	Project proponent/ EPC contractor	Throughout the construction phase.
Ensure that rubble, litter, and disused construction materials are appropriately stored (if not removed daily) and then disposed regularly at licensed waste facilities.	Project proponent/ EPC contractor	Throughout the construction phase.
Reduce and control construction dust through the use of approved dust suppression techniques as and when required (i.e. whenever dust becomes apparent).	Project proponent/ EPC contractor	Throughout the construction phase.
Restrict construction activities to daylight hours in order to negate or reduce the visual impacts associated with lighting.	Project proponent/ EPC contractor	Throughout the construction phase.
Rehabilitate all disturbed areas, construction areas, servitudes etc. immediately after the completion of construction works. If necessary, an ecologist should be consulted to assist or give input into rehabilitation specifications.	Project proponent/ EPC contractor	Throughout and at the end of the construction phase.
Performance Indicator	Vegetation cover on and in the vicinity of the site is intact (i.e. full cover as per natural vegetation within the environment) with no evidence of degradation or erosion.	
Monitoring	Monitoring of vegetation clearing during construction (by contractor as part of the construction contract).	

	Monitoring of rehabilitated areas quarterly for at least a year following the end of construction (by contractor as part of construction contract).

Table 15: Management programme – Operation.

OBJECTIVE: The mitigation and possible negation of visual impacts associated with the operation of the Proposed Ripponn WEF.		
Project Component/s	The WEF and ancillary infrastructure (i.e. turbines, access roads, substations, workshop and power lines).	
Potential Impact	Visual impact of facility degradation (including operational wind turbines) and vegetation rehabilitation failure.	
Activity/Risk Source	The viewing of the above mentioned by observers on or near the site.	
Mitigation: Target/Objective	Well maintained and neat facility.	
Mitigation: Action/control	**Responsibility**	**Timeframe**
Maintain the general appearance of the facility as a whole, including the turbines, servitudes and the ancillary buildings.	Project proponent/ operator	Throughout the operation phase.
Maintain roads and servitudes to forego erosion and to suppress dust.	Project proponent/ operator	Throughout the operation phase.
Monitor rehabilitated areas, and implement remedial action as and when required.	Project proponent/ operator	Throughout the operation phase.
Performance Indicator	Well maintained and neat facility with intact vegetation on and in the vicinity of the facility.	
Monitoring	Monitoring of the entire site on an ongoing basis (by operator).	

Table 16: Management programme – Decommissioning.

OBJECTIVE: The mitigation and possible negation of visual impacts associated with the decommissioning of the Proposed Ripponn WEF.		
Project Component/s	The WEF and ancillary infrastructure (i.e. turbines, access roads, substations, workshop and power lines).	
Potential Impact	Visual impact of residual visual scarring and vegetation rehabilitation failure.	
Activity/Risk Source	The viewing of the above mentioned by observers on or near the site.	
Mitigation: Target/Objective	Only the infrastructure required for post decommissioning use of the site retained and rehabilitated vegetation in all disturbed areas.	
Mitigation: Action/control	**Responsibility**	**Timeframe**
Remove infrastructure not required for the post-decommissioning use of the site. This may include the turbines, substations, power lines, ancillary buildings, masts etc.	Project proponent/ operator	During the decommissioning phase.
Rehabilitate access roads and servitudes not required for the post-decommissioning use of the site. If necessary, an ecologist should be consulted to give input into rehabilitation specifications.	Project proponent/ operator	During the decommissioning phase.
Monitor rehabilitated areas quarterly for at least a year following decommissioning, and implement remedial action as and when required.	Project proponent/ operator	Post decommissioning.
Performance Indicator	Vegetation cover on and in the vicinity of the site is intact (i.e. full cover as per natural vegetation within the environment) with no evidence of degradation or erosion.	
Monitoring	Monitoring of rehabilitated areas quarterly for at least a year following	

	decommissioning.

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