

**PROPOSED EXXARO WEST COAST WIND ENERGY FACILITY
VISUAL ASSESSMENT**

Produced for:



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MetroGIS (Pty) Ltd, specialising in visual assessment and Geographic Information Systems, undertook this visual assessment in collaboration with V&L Landscape Architects CC.

Lourens du Plessis, the lead practitioner undertaking the assessment, has been involved in the application of Geographical Information Systems (GIS) in Environmental Planning and Management since 1990.

The team undertaking the visual assessment has extensive practical knowledge in spatial analysis, environmental modelling and digital mapping, and applies this knowledge in various scientific fields and disciplines. The expertise of these practitioners is often utilised in Environmental Impact Assessments, State of the Environment Reports and Environmental Management Plans.

The visual assessment team 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.

Savannah Environmental (Pty) Ltd appointed MetroGIS (Pty) Ltd as an independent specialist consultant to undertake the visual impact assessment for the proposed Exxaro West Coast Wind Energy Facility. Neither the author, MetroGIS or V&L Landscape Architects will benefit from the outcome of the project decision-making.

1. INTRODUCTION

Exxaro Resources has proposed the establishment of a Wind Energy Facility (WEF) on the farm an extension of the Farm Rietfontein 151 (owned by Exxaro).

This piece of land is situated immediately north of the Namakwa Sands Mine. The site is located in the Western Cape Province near Brand-se-Baai (on the Atlantic sea board) and is situated approximately 75km north-west of Vredendal.

A WEF generates electricity by means of wind turbines that harness the wind of the area as a renewable source of energy. Wind energy generation, or wind farming as it is commonly referred to, is generally considered to be an environmentally friendly electricity generation option.

Exxaro Resources intends to construct up to 27 wind turbines within an identified area of 19km². The proposed facility will have a generating capacity of approximately 66MW.

The preliminary layout of the WEF (wind turbine positions) as proposed by Exxaro Resources is shown on **Map 1**. Additional infrastructure will include the following:

- Underground cables between the turbines (these will follow the road alignments);
- An onsite substation;
- A lay down area (temporary, to be used only during construction);
- A 132 kV overhead power line feeding into the Eskom grid;
- An access road to the site from the main road/s within the area and
- Internal access roads to each wind turbine.

It is expected, from a visual impact perspective, that the wind turbines (up to 27 turbines are to be constructed) would constitute the highest potential visual impact of the WEF.

Each turbine will consist of a concrete foundation, a steel tower, a hub (placed at approximately 80m above ground level) and three 44m long blades attached to the hub.

Figure 1 below is a scaled model of the proposed turbines. Slight variations of the above dimensions may occur, depending on the preferred supplier or commercial availability of wind turbines at the time of construction.

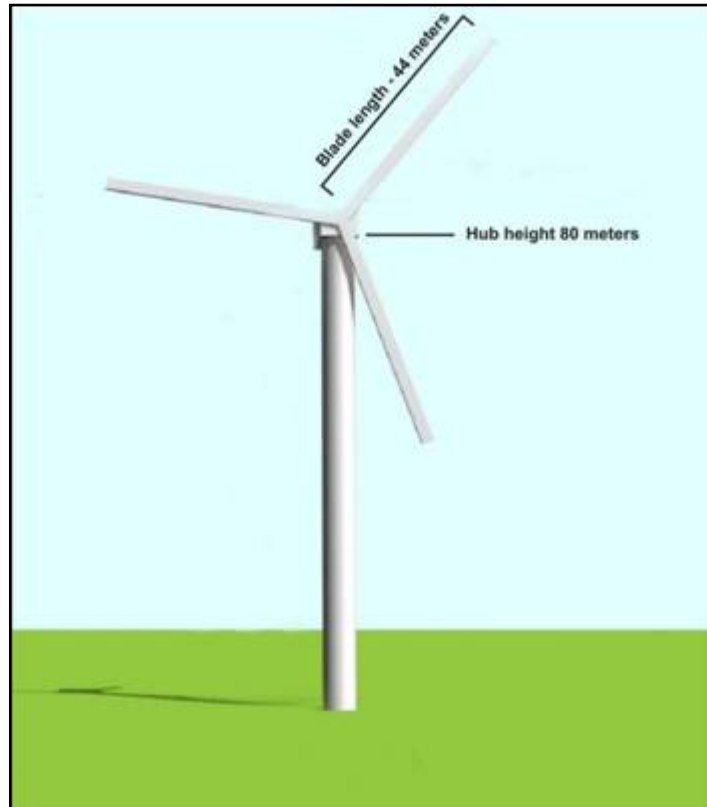


Figure 1: Scaled model of the wind turbine being considered for the WEF.

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



Map 1: Locality map and proposed layout of the proposed Exxaro West Coast WEF showing the provisional placement of infrastructure and shaded relief (topography and elevation above sea level)

2. SCOPE OF WORK

The study area for the visual assessment encompasses a geographical area of 1,618km² (the extent of the maps displayed below) and includes a minimum 20km buffer zone from the proposed development site.

The study area includes a number of homesteads/farm settlements, the Namakwa Sands Mine, the Salt Works in the Sout River, a number of secluded bays (remote holiday destinations) and a section of secondary road to the north-east of the study area.

The scope of work includes the determination of the potential visual impacts in terms of nature, extent, duration, magnitude, probability and significance of the construction and operation of the proposed infrastructure. In this regard specific issues related to the visual impact were identified during a site visit to the affected environment. Issues related to the proposed Wind Energy Facility include:

- The visibility of the facility to, and potential visual impact on, observers travelling along the secondary roads within the study area as well as the local access roads leading to the coastline.
- The visibility of the WEF to, and visual impact on homesteads and farm settlements identified within the study area. Some situated within close proximity of the proposed development site include Rietfontein, Brand-se-Baai, Baievlei, Graafwater, Kalkvlei, Rooiputs, Hendriksvlei, Voorspoed, Goerap, Sandkop, Houtkraal, Rooivleitjie, Witkoppies and Peddie-se-Kop etc.
- The visibility of the WEF to, and visual impact on tourism, with particular reference to holiday destinations (bays) along the coastline. These include Hoek Bay, Keffer Bay, Strand Bay, Tieties Bay, Hamieter Bay, Melkop Bay, Piet Booie se Baai, Blinkwater Bay, Brand-se-Baai, Floors se Gat, Geustyn se Gat, Jakkalshok and Skulp Bay.
- The visibility of the WEF to, and visual impact on the *buffer area* of the Knersvlakte Biosphere Reserve.
- The potential cumulative visual impact of multiple WEFs anticipated within the region (i.e. specifically the approved Eskom-Sere facility to be constructed some 20km to the south east of this facility, near Koekenaap).
- The potential visual impact of the construction of ancillary infrastructure (i.e. the substation, the power lines and the internal access roads) on observers residing in close proximity to the facility.
- The potential visual impact of operational, safety and security lighting of the facility at night on observers residing in close proximity of the facility.
- The potential visual impact of shadow flicker. This only occurs when the sky is clear, and when the 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, a 500m buffer along the edge of the facility is submitted as the zone within which there is a risk of shadow flicker occurring.
- The visual absorption capacity of the natural vegetation (if applicable).
- Potential visual impacts associated with the construction phase.
- The potential to mitigate visual impacts and inform the design process.

3. METHODOLOGY

The study was undertaken using Geographic 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 study area was created from 20m interval contours supplied by the Surveyor General.

Site visits were undertaken to source information regarding land use, vegetation cover, topography and general visual quality of the affected environment. It further served the purpose of verifying the results of the spatial analyses and to identify other possible mitigating/aggravating circumstances related to the potential visual impact.

The approach utilised to identify issues related to the visual impact included the following activities:

- The creation of a detailed digital terrain model (DTM) of the potentially affected environment
- The sourcing of relevant spatial data. This included cadastral features, vegetation types, land use activities, topographical features, site placement, etc
- The identification of sensitive environments upon which the proposed facility could have a potential impact
- The creation of viewshed analyses of the proposed development area in order to determine the visual exposure and the topography's potential to absorb the potential visual impact. The viewshed analyses take into account the dimensions of the proposed structures.

This report (visual impact assessment) sets out to identify and quantify the possible visual impacts related to the proposed WEF and related infrastructure mentioned above, as well as offer potential mitigation measures, where required.

The following methodology has been followed for the assessment of visual impact:

- **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 the proposed WEF and associated infrastructure were not visible, no impact would occur.

Viewshed analyses of the proposed WEF facility and the related infrastructure, based on a 20 m interval digital terrain model of the study area, indicate the potential visibility.

- **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 each type of structure.

Proximity radii for the proposed development site 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**

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 therefore 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, and purpose of sighting which would create a myriad of options.

- **Determine the Visual Absorption Capacity of the natural vegetation**

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 digital terrain model utilised in the calculation of the visual exposure of the facility does not incorporate the potential visual absorption capacity (VAC) of the natural vegetation of the region. It is therefore necessary to determine the VAC by means of the interpretation of the vegetation cover, supplemented with field observations.

- **Determine the Visual impact index**

The results of the above analyses are merged in order to determine where the areas of likely visual impact would occur. These areas were further analysed in terms of the previously mentioned issues (related to the visual impact) and in order to judge the severity of each impact.

4. THE AFFECTED ENVIRONMENT

The location of the proposed area for the development of the Wind Energy Facility is on the farm Rietfontein Ext. 151.

This farm is located within the Western Cape Province some 50km north-west of Koekenaap and approximately 170 km south of Springbok. The site is located on the coast of the Atlantic Ocean.

The proposed development site (covering a section of the farm listed above) encompasses a surface area of approximately 19 km². The final surface area to be utilised for the WEF may be smaller, depending on the number of turbines erected, the final site layout and the placement of the wind turbines.



Figure 2: General environment of the area to the north, of the proposed WEF, including a view of Peddie-se-kop.



Figure 3: General environment of the area to the east of the proposed WEF.



Figure 4: General environment of the area to the south and south-west of the proposed WEF, including a view of the salt works.



Figure 5: General environment of the area to the west of the proposed WEF (Sout River mouth).

Sheep farming and surface-based mining dominate the general land-use character of this region. The towns of Vredendal, Lutzville and Koekenaap, located just beyond the study area to the south east, account for the highest population concentration within the region, which has less than 10 people per km².

The dominant topographical unit or terrain type of the study area is described as *undulating plains and hills*. The facility is proposed on flat terrain south east of the Sout River and south of the Great Goerap River (a tributary of the Sout River). See **Map 1** above as well as **Figures 2, 3, 4 and 5** above.

The arid climate of the region (rainfall of less than 300mm per annum) and the general absence of surface water, accounts for the low crop production activities within the study area. Very few man-made structures occur beyond the Namakwa Sands mining area and the salt works perimeter, leaving large tracts of land in a predominantly natural state.

The region has a rural character with a number of farming homesteads occurring within the study area. The natural vegetation type is predominantly *shrubland and low fynbos*.

Industrial type development includes the power lines running parallel to the main access route and to the mine, as well as the Namakwa Sands Mine itself. These features represent a contrast within the otherwise natural region (see **Figure 6** below).

There are no formal conservation or protected areas in close proximity of the proposed facility, but the study area for the visual impact assessment does contain a section of the Knersvlakte Biosphere Reserve's buffer area/zone (see **Map 2**).

Sources: DEAT (ENPAT Eastern Cape), NBI (Vegetation Map of South Africa, Lesotho and Swaziland) and NLC2000 (ARC/CSIR).



Figure 6: Power line infrastructure traversing the study area.



Map 2: Broad land Cover and Land Use within the study area.

5. RESULTS

5.1. Potential Visual Exposure

The visibility analysis was undertaken from each of the preliminary wind turbine positions (27 in total) at an offset of 80m (turbine hub height) above average ground level in order to simulate a worst-case scenario.

The result of the viewshed analysis for the proposed WEF's provisional layout is shown on **Map 3**. This viewshed analysis not only indicates areas from where the wind turbines would be visible (any number of turbines with a minimum of one turbine), but also indicates the potential frequency of visibility (i.e. how many turbines are expected to be visually exposed).

The visibility map clearly illustrates the influence of the topography - the WEF is proposed in an elevated position which means it can be viewed from a large area within the study area, and that a large number of turbines may be viewed at any one time. Overall, the following should be noted:

- The highest frequency of potential visual exposure is expected within the site itself, and to the immediate north and south of the WEF. The number of turbines that can be viewed at any one time from both the north and south is high (i.e. up to 27 turbines may be visible).
- Potential visual exposure to the far north, north-west, north-east, and south-east is fragmented and discontinuous. This is because the WEF is shielded from view by raised topography. Frequency of visibility is moderate to high (i.e. between 3 and 18 turbines).
- Overall, potential visual exposure along the coastline is of a low frequency, if this occurs at all. The exception is the Sout River mouth near the proposed site, where the frequency of potential visual exposure will be high.
- Secondary and other access routes in close proximity of the site will potentially be exposed to moderate to high frequencies of visual exposure, but for short and discontinuous sections. This includes a section of the coastal road that runs through Brands-se-Baai, giving access to a number of secluded holiday destinations along the coastline.
- Watercourses (i.e. the Sout and Little Goerap Rivers) will potentially experience high frequencies of visual exposure in close proximity of the proposed WEF. Further away visibility is reduced by the incision of the rivers into the landscape.
- The facility will also be visible from a number of individual homesteads and farm settlements located within a 10km radius. These homesteads and farmsteads usually consist of small settlements of a domestic scale (i.e. a family residence with a few outbuildings and possibly some servants' quarters). The frequency of exposure is anticipated to be mostly high.
- The proposed WEF is not expected to be visible from more than a small core area surrounding Baievlei and the very periphery of the Knersvlakte Biosphere Reserve *buffer zone*.

The visibility map clearly illustrates the influence of the topography on the potential frequency of exposure. The proposed WEF would have a relatively large area of potential visual exposure as a result of its elevated position in the landscape and the tall wind turbine infrastructure.

Notwithstanding the industrial nature of the mine and salt works close to the proposed site, it is envisaged that the nature of the structures would create a significant contrast to the relatively natural state of the environment and the rural character of the study area. It is thus anticipated that the wind generation

structures would be easily and comfortably visible, especially within a 10km radius of the WEF and would constitute a high visual prominence, potentially resulting in a high visual impact.

5.2. Visual distance/observer proximity to the WEF

MetroGIS determined the proximity radii based on the anticipated visual experience of the observer over varying distances. The distances are adjusted upwards for larger facilities and downwards for smaller facilities (i.e. depending on the size and nature of the proposed infrastructure). MetroGIS developed this methodology in the absence of any known and/or acceptable standards for South African wind energy facilities. The proposed Exxaro West Coast WEF is considered to be a relatively small facility.

The proximity radii (calculated from the boundary lines of the farm selected for the WEF) are shown on **Map 4** and are as follows:

- 0 - 5km. Short distance view where the wind energy facility infrastructure would dominate the frame of vision and constitute a very high visual prominence.
- 5 - 10km. Medium distance view where the structures would be easily and comfortably visible and constitute a high visual prominence.
- 10 - 20km. Medium to longer distance view where the facility would become part of the visual environment, but would still be visible and recognisable. This zone constitutes a medium visual prominence.
- Greater than 20km. Long distance view of the facility where the facility could potentially still be visible, though not as easily recognisable. This zone constitutes a medium to low visual prominence for the facility.

5.3. Viewer incidence/viewer perception

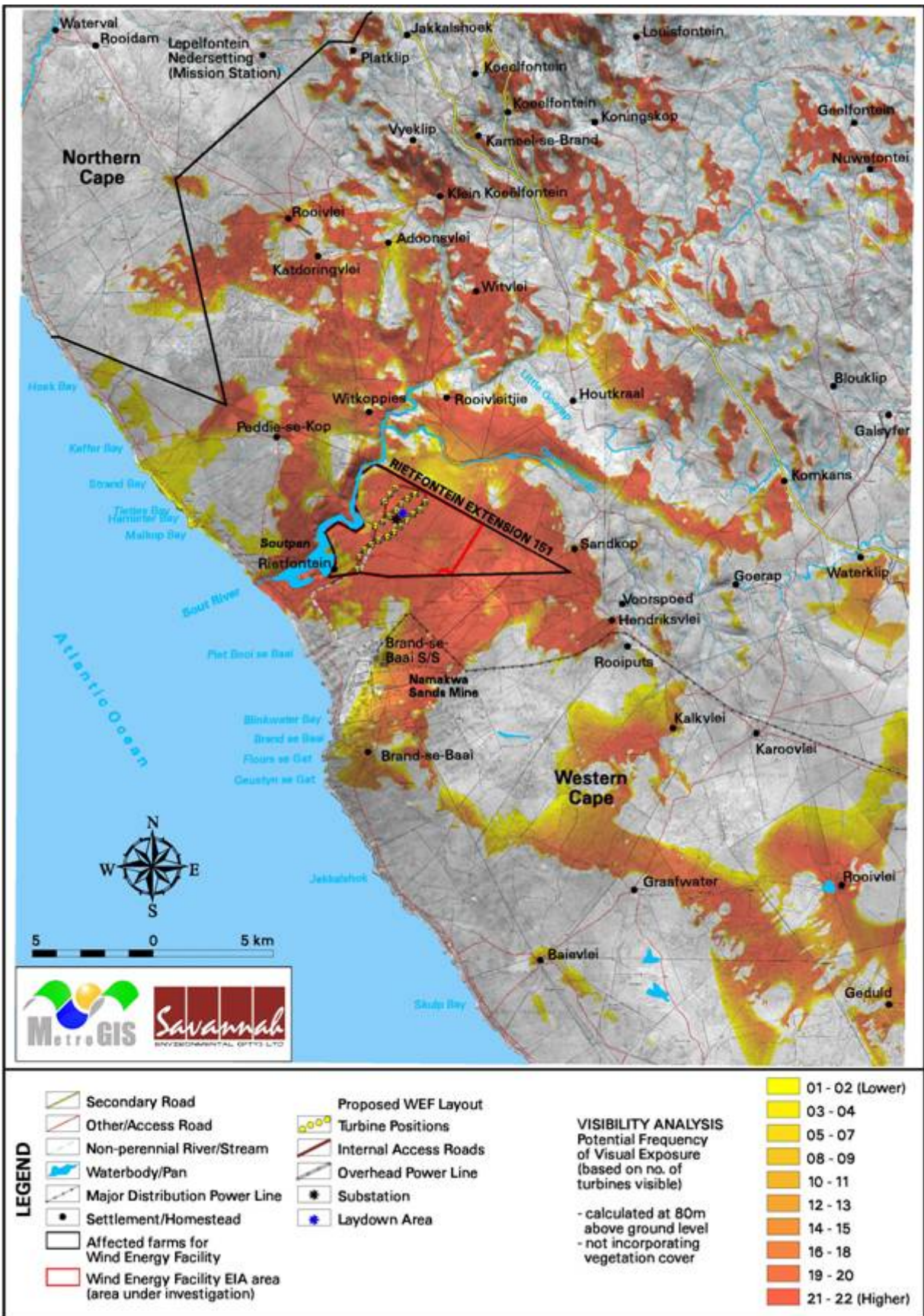
Refer to **Map 4**. A number of specific areas of higher viewer incidence and potentially negative perception of the proposed WEF were identified for the study area. These areas include the secondary road in the north east of the study area and the coastal road giving access to holiday destinations along the coast.

Other than along the above roads, viewer incidence is within a 10km radius of the proposed WEF is limited to homesteads, farm settlements, the Salt Works and the Namakwa Sands Mine. A number of coastal holiday towns are also located within this zone.

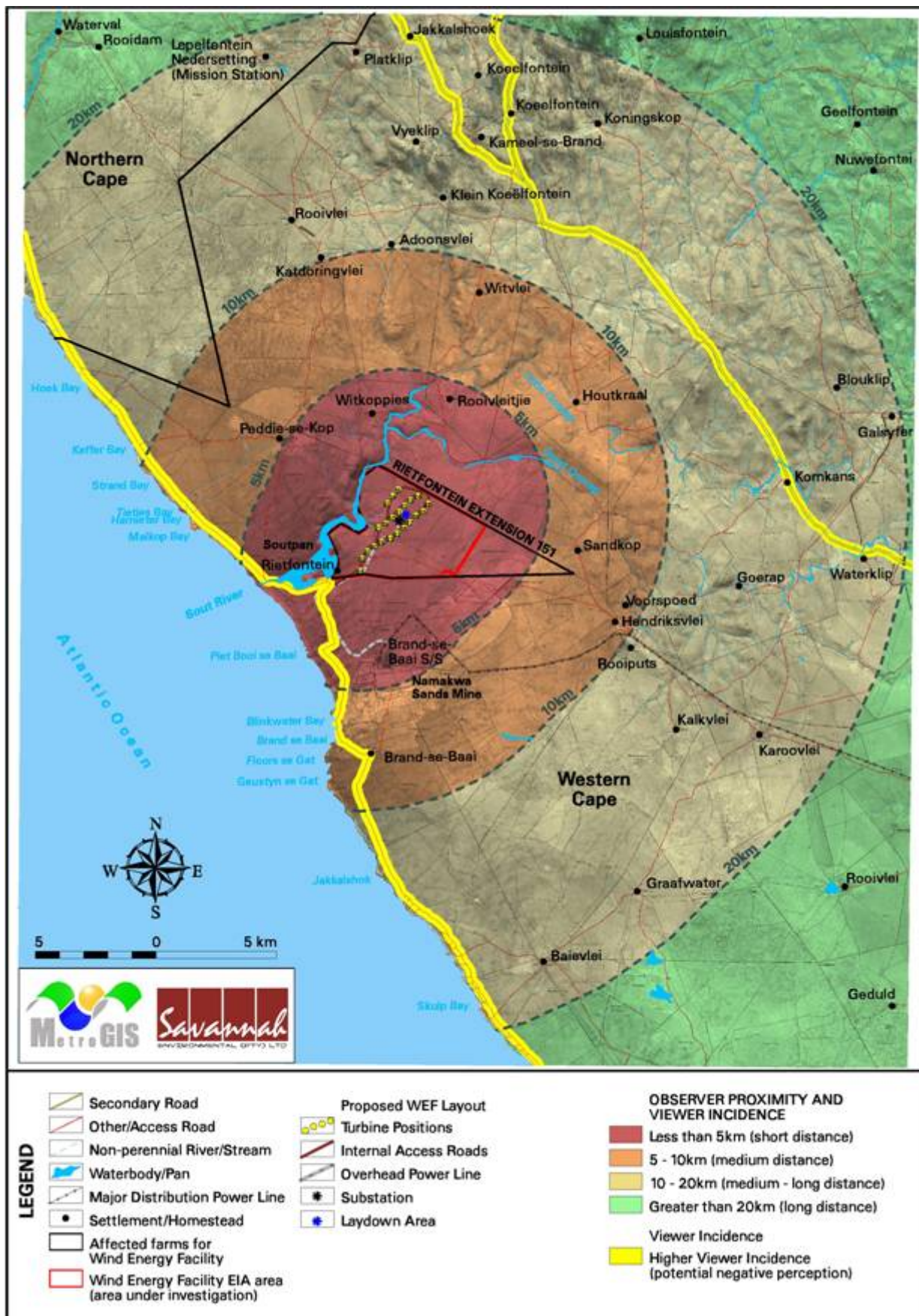
It is uncertain whether all of the potentially affected settlements are inhabited or not. It stands to reason that settlements that are not currently inhabited will not be visually impacted upon at present. These settlements do, however retain the potential to be affected visually should they ever become inhabited again in the future. For this reason, the author of this document operates under the assumption that they are all inhabited.

The region has a tourism value and potential, not to mention an inherent sense of place based on the local (pastoral) culture and history. Residents and visitors to this area are therefore seen as sensitive visual receptors upon which the construction of the WEF could have a negative visual impact.

The majority of the study area consists of agricultural lands, and there are some visual receptors in the form of farmsteads and homesteads. The severity of the visual impact on these receptors decreases with increased distance from the proposed facility.



Map 3: Potential visual exposure of the proposed Exxaro West Coast WEF.



Map 4: Observer proximity to the proposed Exxaro West Coast WEF and areas of high viewer incidence.

5.4 Visual Absorption Capacity of the natural vegetation

Site inspections revealed that the visual absorption capacity of the vegetation (*predominantly shrubland and low fynbos and agricultural fields*) would not influence the outcome of the visual impact assessment. Therefore, the VAC is deemed to be low to negligible for the study area.

5.5. Visual impact index

The combined results of the visual exposure, viewer incidence/perception and visual distance of the proposed WEF and ancillary infrastructure are displayed on **Map 5**. Here the weighted impact and the likely areas of impact are indicated as a visual impact index. Values were assigned for each potential visual impact per data category and merged in order to calculate the visual impact index (note that this excludes the influence of any vegetation as discussed in 5.4 above).

An area with short distance, high frequency visual exposure to the proposed facility, a high viewer incidence and a predominantly negative perception would therefore have a higher value (greater impact) on the index. This helps in focussing the attention to the critical areas of potential impact when evaluating the issues related to the visual impact.

The visual impact index map clearly indicates the core area of potentially **high** visual impact within a 5km radius of the proposed WEF. This core area is located primarily on undulating plains to the immediate south of the proposed WEF, as well as on the low hills and mountains to the immediate north and north-west of the facility.

Potential areas of **very high** visual impact within a 5km radius of the WEF include limited stretches of the coastal road in the vicinity of *Soutpan*. Homesteads / farm settlements expected to experience high visual impact include Rooivleijtjie, Witkoppies and Rietfontein.

Between the 5km and 10km radii of the WEF, areas of potentially **high** visual impact are limited to interrupted stretches of the above-mentioned coastal road (i.e. south of Brand-se-Baai, and between Strand Baai and Melkop Bay) as well as the following homesteads / farm settlements:

- Brand-se-Baai
- Hendriksvlei
- Sandkop
- Witvlei and
- Peddie-se-kop

Other visually exposed areas between 5km and 10km of the propose WEF are expected to experience **moderate** to **low** visual impact.

The Sout and Little Goerap Rivers may experience a **high** visual impact within the radius of 5km from the site. Beyond 5km the watercourses, including Voelvlei Dam, are expected to experience a **moderate** to **low** visual impact.

Holiday destinations along the coast will potentially be exposed to **low** visual impact. These include the following, located between 5km and 10km from the proposed facility:

- Strand Bay
- Tieties Bay
- Hamieter Bay

- Brand-se-Baai
- Floors se Gat and
- Geustyn se Gat.

The Knersvlakte Biosphere Reserve *buffer zone* falls within the study area but only the immediate area surrounding Baievlei will experience a **very low** visual impact. Some peripheral areas of the *buffer zone* will be exposed to low and very low visual impact. The remainder of the *buffer zone* will not be affected visually at all.

Beyond 10km from the proposed WEF visual impacts are reduced to **low** and **very low**.

The figure below helps to place the above explanations in context, illustrating what scale a turbine structure will be perceived at different viewing distances.

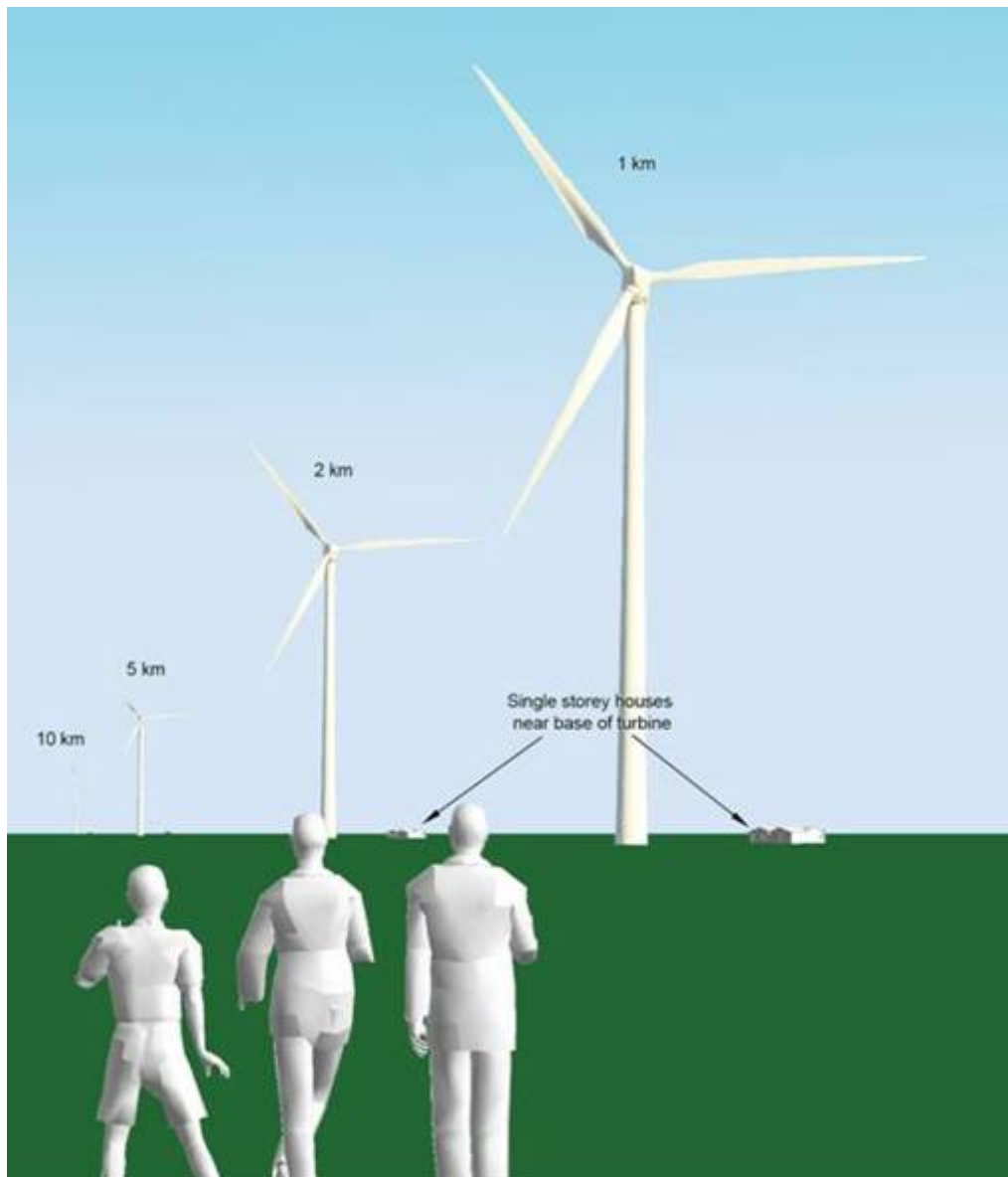
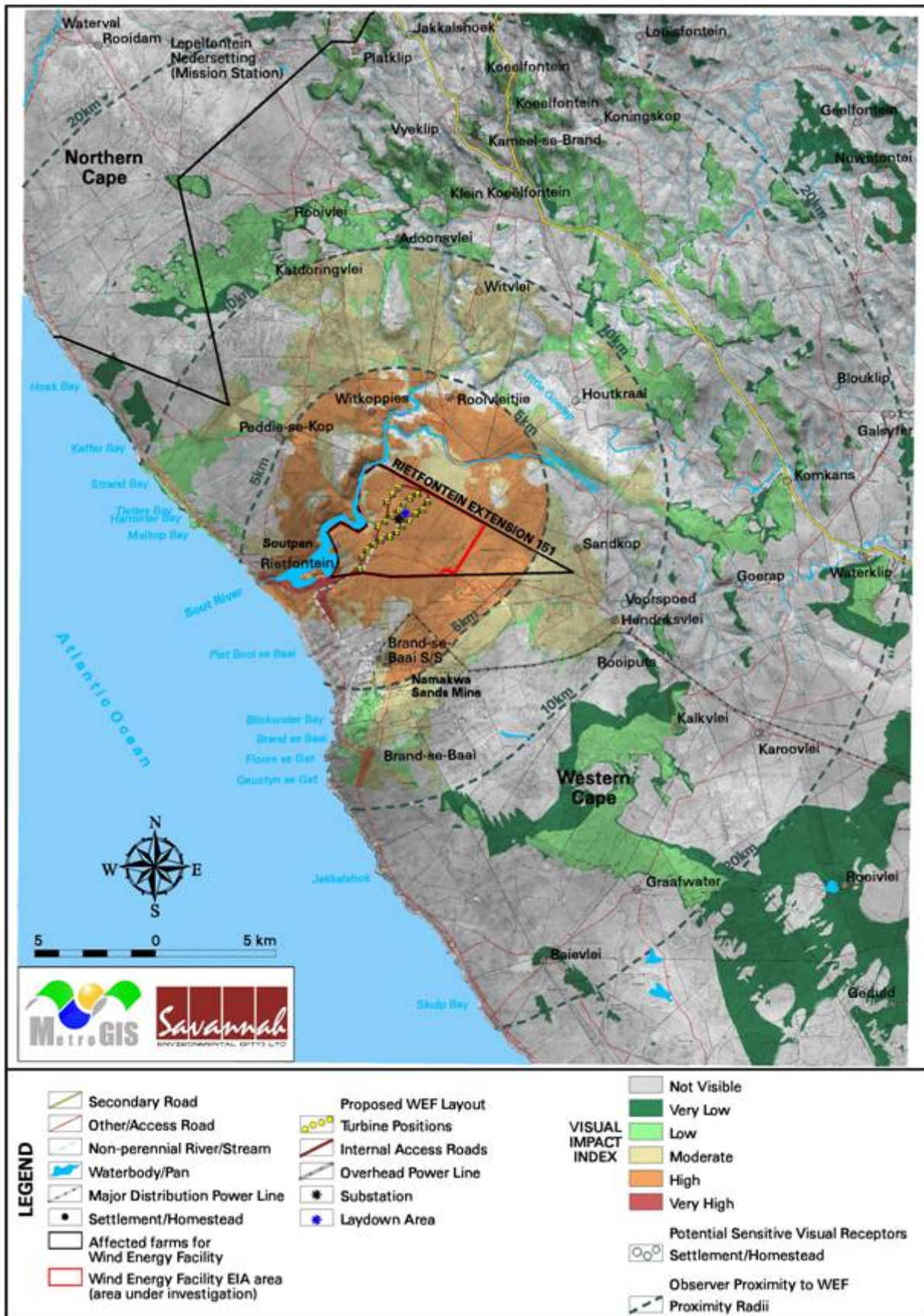


Figure 7: Visual experience of a wind turbine structure at a distance of 1km, 2km, 5km and 10km.



Map 5: Visual impact index of the proposed Exxaro West Coast WEF.

5.6. Visual impact assessment

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 2: 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 WEF) and includes a table quantifying the potential visual impact according to the following criteria:

- **Extent** - site only (very high = 5), local (high = 4), regional (medium = 3), national (low = 2) or international (very low = 1)
- **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)
- **Probability** – very improbable (= 1), improbable (= 2), probable (= 3), highly probable (= 4) and definite (= 5)
- **Status** - positive, negative and neutral
- **Reversibility** - reversible, recoverable and irreversible
- **Significance** - low, medium and 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 extent, duration and magnitude (i.e. **significance = consequence (extent + duration + magnitude) 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)
- 31-60 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)

*Please note that due to the declining visual impact over distance, the **extent** (or spatial scale) rating is reversed (i.e. a localised visual impact has a higher value rating than a national or regional value rating). This implies that the visual impact is highly unlikely to have a national or international extent, but that the local or site-specific impact could be of high significance.*

No mitigation measures (e.g. painting the turbines a sky blue colour) are proposed as the colour scheme and lighting fixtures are legally required by the Civil Aviation Authority and cannot be altered.

5.6.1 The WEF

Potential visual impact on users of secondary and other access roads in close proximity of the WEF.

Visual impacts on roads within a radius of 5km of the proposed facility are expected to be **very high**.

The table below illustrates this impact assessment.

Table 1: Impact table summarising the significance of visual impacts on users of secondary and other roads in close proximity to the WEF

Nature of Impact:		
Potential visual impact on users of secondary and other roads in close proximity to the WEF		
	No mitigation	Mitigation considered
Extent	Local (4)	N/a
Duration	Long term (4)	N/a
Magnitude	Very high (10)	N/a
Probability	Probable (3)	N/a
Significance	Moderate (54)	N/a
Status (positive or negative)	Negative	N/a
Reversibility	Recoverable (3)	N/a
Irreplaceable loss of resources?	No	N/a
Can impacts be mitigated during operational phase?	No	N/a
Mitigation:		
Decommissioning: removal of the wind turbines and ancillary infrastructure after 20 to 30 years.		
Cumulative impacts:		
The construction of the WEF will increase the cumulative visual impact of industrial type infrastructure within the region. Contributing infrastructure include the existing Namakwa Sands Mine, the Salt Works, the existing power line infrastructure and the Eskom-Sere facility to be constructed some 20km to the south east of the facility, near Koekenaap.		
The development of 27 turbines at a rate of one turbine per week may create the impression of a cumulative visual impact on uninformed observers (i.e. observers who are not aware of the total extent of the facility).		
Residual impacts:		
None. The visual impact will be removed after decommissioning.		

Potential visual impact on residents of homesteads and farm settlements in close proximity of the proposed WEF.

The visual impact on a number of homesteads and farm settlements within a 5 km radius of the proposed WEF is expected to be **very high**.

The table below illustrates this impact assessment.

Table 2: Impact table summarising the significance of visual impacts on residents of homesteads and farm settlements in close proximity of the proposed WEF

Nature of Impact: Potential visual impact on residents of homesteads and farm settlements in close proximity of the proposed WEF		
	No mitigation	Mitigation considered
Extent	Local (4)	N/a
Duration	Long term (4)	N/a
Magnitude	Very high (10)	N/a
Probability	Probable (3)	N/a
Significance	Moderate (54)	N/a
Status (positive or negative)	Negative	N/a
Reversibility	Recoverable (3)	N/a
Irreplaceable loss of resources?	No	N/a
Can impacts be mitigated during operational phase?	No	N/a
Mitigation: Decommissioning: removal of the wind turbines and ancillary infrastructure after 20 to 30 years.		
Cumulative impacts: The construction of the WEF will increase the cumulative visual impact of industrial type infrastructure within the region. Contributing infrastructure include the existing Namakwa Sands Mine, the Salt Works, the existing power line infrastructure and the Eskom-Sere facility to be constructed some 20km to the south east of the facility, near Koekenaap.		
Residual impacts: None. The visual impact will be removed after decommissioning.		

Potential visual impact on sensitive visual receptors (users of roads and residents of homesteads and farm settlements) within the region

The visual impact on the homesteads and farm settlements within the region (between the 5km and 10km radius) is expected to be **high**.

The table below illustrates this impact assessment. This impact is expected to be low beyond the 10km radius, and has not been assessed

Table 3: Impact table summarising the significance of visual impacts on sensitive visual receptors within the region

Nature of Impact:		
Potential visual impact on sensitive visual receptors within the region		
	No mitigation	Mitigation considered
Extent	Regional (3)	N/a
Duration	Long term (4)	N/a
Magnitude	High (8)	N/a
Probability	Probable (3)	N/a
Significance	Moderate (45)	N/a
Status (positive or negative)	Negative	N/a
Reversibility	Recoverable (3)	N/a
Irreplaceable loss of resources?	No	N/a
Can impacts be mitigated during operational phase?	No	N/a
Mitigation:		
Decommissioning: removal of the wind turbines and ancillary infrastructure after 20 to 30 years.		
Cumulative impacts:		
The construction of the WEF will increase the cumulative visual impact of industrial type infrastructure within the region. Contributing infrastructure include the existing Namakwa Sands Mine, the Salt Works, the existing power line infrastructure and the Eskom-Sere facility to be constructed some 20km to the south east of the facility, near Koekenaap.		
Residual impacts:		
None. The visual impact will be removed after decommissioning.		

Potential visual impact on tourist routes and destinations within the region

The potential visual impact on tourist routes and destinations is expected to be **low** within the region.

The table below illustrates this impact assessment.

Table 4: Impact table summarising the significance of visual impacts on tourist routes and destinations within the region

Nature of Impact:		
Potential visual impact on tourist routes and destinations within the region		
	No mitigation	Mitigation considered
Extent	Regional (3)	N/a
Duration	Long term (4)	N/a
Magnitude	Low (4)	N/a
Probability	Probable (3)	N/a
Significance	Low (30)	N/a
Status (positive or negative)	Negative	N/a
Reversibility	Recoverable (3)	N/a
Irreplaceable loss of resources?	No	N/a
Can impacts be mitigated during operational phase?	No	N/a
Mitigation:		
Decommissioning: removal of the wind turbines and ancillary infrastructure after 20 to 30 years.		
Cumulative impacts:		
The construction of the WEF will increase the cumulative visual impact of industrial type infrastructure within the region. Contributing infrastructure include the existing Namakwa Sands Mine, the Salt Works, the existing power line infrastructure and the Eskom-Sere facility to be constructed some 20km to the south east of the facility, near Koekenaap.		
Residual impacts:		
None. The visual impact will be removed after decommissioning.		

Potential visual impact on protected areas within the region

A small core area surrounding Baievlei within the Knersvlakte Biosphere Reserve (Buffer area/zone) will experience a **low** visual impact.

The table below illustrates this impact assessment.

Table 5: Impact table summarising the significance of visual impacts on protected areas within the region

Nature of Impact: Potential visual impact on protected areas within the region		
	No mitigation	Mitigation considered
Extent	Regional (3)	N/a
Duration	Long term (4)	N/a
Magnitude	Low (4)	N/a
Probability	Improbable (2)	N/a
Significance	Low (22)	N/a
Status (positive or negative)	Negative	N/a
Reversibility	Recoverable (3)	N/a
Irreplaceable loss of resources?	No	N/a
Can impacts be mitigated during operational phase?	No	N/a
Mitigation: Decommissioning: removal of the wind turbines and ancillary infrastructure after 20 to 30 years.		
Cumulative impacts: The construction of the WEF will increase the cumulative visual impact of industrial type infrastructure within the region. Contributing infrastructure include the existing Namakwa Sands Mine, the Salt Works, the existing power line infrastructure and the Eskom-Sere facility to be constructed some 20km to the south east of the facility, near Koekenaap.		
Residual impacts: None. The visual impact will be removed after decommissioning.		

5.6.2. Ancillary infrastructure

Potential visual impact of ancillary infrastructure located within the proposed WEF footprint

All visible ancillary infrastructure (i.e. the substation and the access roads) is expected to be overshadowed by the much taller wind turbine structures and will thus fall within the anticipated viewshed for the turbines as indicated on **Map 3**.

Within the WEF footprint, access roads will be required, firstly to construct each turbine (construction phase), and secondly to maintain the turbines (operational phase). This network of roads has the potential of manifesting as a network of landscape scarring, and a potential visual impact within the viewshed areas.

The table below illustrates the assessment of this anticipated impact, which is likely to be of **medium** significance, and may be mitigated to **low**.

Table 6: Impact table summarising the significance of visual impact of ancillary infrastructure located within the proposed WEF footprint

Nature of Impact:		
Potential visual impact of ancillary infrastructure located within the proposed WEF footprint.		
	No mitigation	Mitigation considered
Extent	Local (4)	Local (4)
Duration	Long term (4)	Long term (4)
Magnitude	Moderate (6)	Moderate (6)
Probability	Probable (3)	Improbable (2)
Significance	Medium (42)	Low (28)
Status (positive or negative)	Negative	Negative
Reversibility	Recoverable (3)	Recoverable (3)
Irreplaceable loss of resources?	No	No
Can impacts be mitigated during operational phase?	No	No
Mitigation:		
Planning: layout and construction of roads and infrastructure with due cognisance of the topography. Decommissioning: removal of the wind turbines and ancillary infrastructure after 20 to 30 years.		
Cumulative impacts:		
The construction of the WEF will increase the cumulative visual impact of industrial type infrastructure within the region. Contributing infrastructure include the existing Namakwa Sands Mine, the Salt Works, the existing power line infrastructure and the Eskom-Sere facility to be constructed some 20km to the south east of the facility, near Koekenaap.		
Residual impacts:		
None. The visual impact will be removed after decommissioning.		

Potential visual impact of the power line

The 132kV power lines from the WEF will connect to the grid at a turn-in point on the existing power line between Juno Substation and Brand-se-Baai Substation. The lines will run from the West Coast WEF substation, leaving the site in the south west, and following the coastal road to the south east, before turning to the north east to connect with the grid.

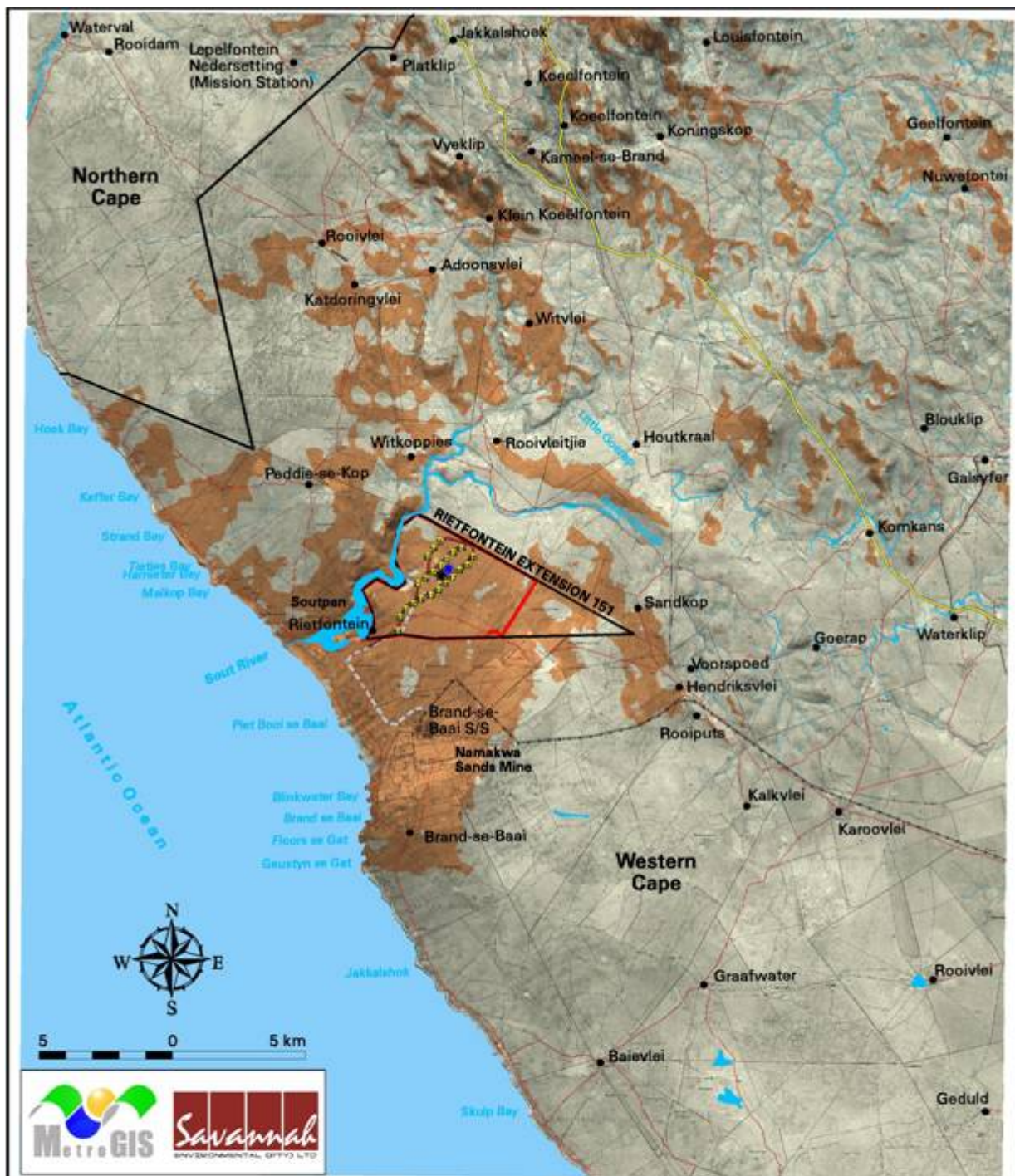
As this will be a 'turn-in' line, there will be 2 lines, which could be constructed as 2 lines in parallel or a double circuit line. The pylons are expected to be approximately 20m in height.

Map 6 below illustrates the potential visual exposure of the proposed power line. Comparing this map with the potential visual exposure of the WEF facility (Map 3) reveals that for the most part, the visual impact of the power lines will fall within the viewshed analyses for the facility. Small exceptions are to the south, near Brand-se-Baai and in the vicinity of the Namakwa Sands Mine. The visually affected zone is slightly larger in these areas.

The table below illustrates the assessment of this anticipated impact, which is likely to be of **medium** significance, and may be mitigated to **low**.

Table 7: Impact table summarising the significance of visual impact of the power line

Nature of Impact: Potential visual impact of the power line		
	No mitigation	Mitigation considered
Extent	Local (4)	Local (4)
Duration	Long term (4)	Long term (4)
Magnitude	Moderate (6)	Minor (2)
Probability	Probable (3)	Very improbable (1)
Significance	Medium (42)	Low (10)
Status (positive or negative)	Negative	Negative
Reversibility	Recoverable (3)	Recoverable (3)
Irreplaceable loss of resources?	No	No
Can impacts be mitigated during operational phase?	No	No
Mitigation: Planning: placing the power line underground and rehabilitating the servitude. Decommissioning: removal of the wind turbines and ancillary infrastructure after 20 to 30 years.		
Cumulative impacts: The construction of the WEF will increase the cumulative visual impact of industrial type infrastructure within the region. Contributing infrastructure include the existing Namakwa Sands Mine, the Salt Works, the existing power line infrastructure and the Eskom-Sere facility to be constructed some 20km to the south east of the facility, near Koekenaap.		
Residual impacts: None. The visual impact will be removed after decommissioning.		



LEGEND		OVERHEAD POWER LINE VISIBILITY ANALYSIS	
	Secondary Road		Potentially visible
	Other/Access Road		Not visible
	Non-perennial River/Stream	- calculated at 20m above ground level - not incorporating vegetation cover	
	Waterbody/Pan		
	Major Distribution Power Line		
	Settlement/Homestead		
	Affected farms for Wind Energy Facility		
	Wind Energy Facility EIA area (area under investigation)		
	Proposed WEF Layout		
	Turbine Positions		
	Internal Access Roads		
	Overhead Power Line		
	Substation		
	Laydown Area		

Map 6: Potential visual exposure of the 132kV power lines.

5.7. Secondary visual impacts

5.7.1. Lighting impacts

Potential visual impact of lighting on visual receptors in close proximity of the proposed WEF.

The area earmarked for the placement of the substation will be within the development footprint. The adjacent area (i.e. within a 10km radius) is in close proximity to a number of homesteads and other potential sensitive receptors such as Melkop Bay, Harmieter Bay, Tieties Bay and Strand Bay.

Although these are not densely populated areas, they are seen as potentially sensitive receptors, and the light trespass and glare from the security and after-hours operational lighting for the substation will have some significance. Although this lighting will be low-intensity in nature, the sense of place and pastoral ambiance of the local area increases its sensitivity to lighting intrusions.

Another source of light 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.

The Civil Aviation Authority (CAA) prescribes these warning lights and the potential to mitigate their visual impacts is low (see discussion on '*the potential to mitigate visual impacts*' below). The WEF is not required to have a light fitted to each turbine, but it is compulsory to have synchronous flashing lights on the turbines representing the outer perimeter of the facility. In this manner, fewer warning lights may be utilised to delineate the facility as one large obstruction, thereby lessening the potential visual impact.

The regulations for the CAA's *Marking of Obstacles* should be strictly adhered to, as the failure of complying with these guidelines may result in the developer being required to fit additional light fixtures at closer intervals thereby aggravating the visual impact.

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. The WEF may contribute to the effect of sky glow in an otherwise dark environment (i.e. where there is no presence of urban lighting from homes, shops or streetlights).

Table 8: Impact table summarising the significance of visual impact of lighting on visual receptors in close proximity of the proposed WEF

Nature of Impact: Potential visual impact on of lighting on visual receptors in close proximity of the proposed WEF.		
	No mitigation	Mitigation considered
Extent	Local (4)	Local (4)
Duration	Long term (4)	Long term (4)
Magnitude	Moderate (8)	Low (4)
Probability	Probable (3)	Improbable (2)
Significance	Moderate (48)	Low (24)
Status (positive or negative)	Negative	Negative
Reversibility	Recoverable (3)	Recoverable (3)
Irreplaceable loss of resources?	No	No
Can impacts be mitigated during operational phase?	No	No
Mitigation: Planning: reducing extent and magnitude of required lighting for the facility through appropriate planning and design intervention. Decommissioning: removal of the wind turbines and ancillary infrastructure after 20 to 30 years.		
Cumulative impacts: The construction of the WEF will increase the cumulative visual impact of lighting from industrial type infrastructure within the region. Contributing infrastructure include the existing Namakwa Sands Mine, the Salt Works, the existing power line infrastructure and the Eskom-Sere facility to be constructed some 20km to the south east of the facility, near Koekenaap.		
Residual impacts: None. The visual impact will be removed after decommissioning.		

5.7.2. Potential visual impacts associated with shadow flicker

Shadow flicker only occurs when the sky is clear, and when the 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, a 500m buffer along the edge of the facility is submitted as the zone within which there is a risk of shadow flicker occurring.

Due to the fact that no visual receptors have been identified within 500m of the structures, no impact is anticipated at all.

5.7.3. Potential visual impacts associated with the construction phase

The duration of the construction phase of the WEF is dependent on the number of turbines being constructed and is expected to take approximately 22 weeks to complete (a conservative estimation not taking natural weather conditions etc. into account). During this time there will 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 land owners in the area.

5.8. The potential to mitigate visual impacts

- The primary visual impact, namely the appearance of the Wind Energy Facility (mainly the wind turbines) is not possible to mitigate. The functional design of the structures 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. The overall potential for mitigation is generally low or non-existent.

- Mitigation of secondary visual impacts associated with the construction of roads and other infrastructure (especially pipelines and cables) include careful planning, taking due cognisance of the topography. Roads should be laid out along the contour wherever possible, and should never traverse slopes at 90 degrees. Construction of roads should be undertaken properly, with adequate drainage structures in place to forego potential erosion problems.

Also, the construction areas, including road servitudes, cut and fill slopes and trenches must be appropriately rehabilitated after construction. This rehabilitation must also be monitored and maintained in order to minimise the visual impact.

- The potential visual impact of the power line may be mitigated by laying the power line underground. Provided the trenches are properly backfilled, compacted and then rehabilitated, this anticipated visual impact may be drastically reduced, if not removed completely.
- Mitigation of lighting impacts includes the pro-active design, planning and specification lighting for the facility by a lighting engineer. The correct specification and placement of lighting and light fixtures for both the

turbines and the ancillary infrastructure will go far to contain rather than spread the light. Additional 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.
- Visual impacts associated with the construction phase, albeit temporary, should be managed according to the following principles:
 - Reduce the construction period through careful planning and productive implementation of resources.
 - Restrict the activities and movement of construction workers and vehicles to the immediate construction site.
 - Ensure that the general appearance of construction activities, construction camps (if required) and lay-down areas are maintained by means of the timely removal of rubble and disused construction materials.
 - Restrict construction activities to daylight hours (if possible) in order to negate or reduce the visual impacts associated with lighting.

The possible mitigation of both primary and secondary visual impacts as listed above should be implemented and maintained on an ongoing basis.

6. PHOTO SIMULATIONS

Photo simulations were undertaken (in addition to the above spatial analyses) in order to illustrate the potential visual impact of Exxaro West Coast Wind Energy Facility (27 turbines) within the receiving environment.

The purpose of the photo simulation exercise is to support the findings of the VIA, and is not an exercise to illustrate what the facility will look like from all directions.

The photo simulations indicate the anticipated visual alteration of the landscape from various sensitive visual receptors located at different distances from the WEF's. The simulations are based on the wind turbine dimensions and layout as indicated on Figure 1 and Map 1 respectively.

The photograph positions are indicated on the map below and should be referenced with the photo simulation being viewed in order to place the observer in spatial context.

The simulated views show the placement of the wind turbines during the longer-term operational phase of the facility's lifespan. It is assumed that the necessary post-construction phase rehabilitation and mitigation measures, as proposed by the various specialists in the environmental impact assessment report, have been undertaken.

It is imperative that the natural vegetation be restored to its original (current) status for these simulated views to ultimately be realistic. These photographs can therefore be seen as an ideal operational scenario (from a visual impact point

of view) that should be aspired to. The additional infrastructure (e.g. the proposed power lines, substation, access roads, etc.) associated with the facility is not included in the photo simulations as detailed layout and design information is not finalised.

Each photographic simulation is preceded by a panoramic overview of the landscape from the specified viewpoint being discussed. The panoramic overview allows for a more realistic viewer scale that would be representative of the distance over which the turbines are viewed. Each panoramic overview indicates the section that was enlarged to show a more detailed view of the WEF.

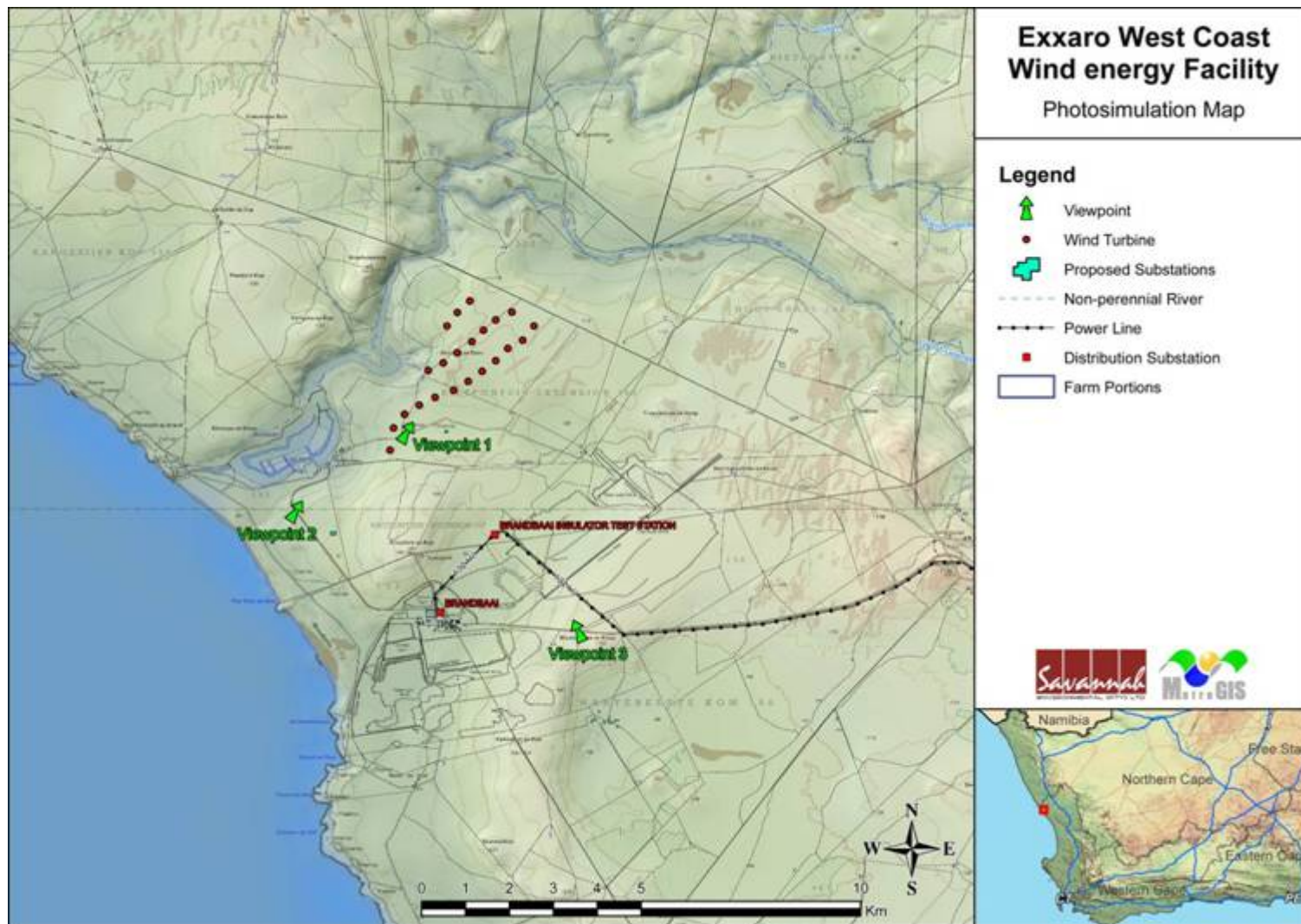
The simulated wind turbines, as shown on the photographs, were adapted to the atmospheric conditions present when the original photographs were taken. This implies that factors such as haze and solar glare were also simulated in order to realistically represent the observer's potential view of the facility.

The following technical data are of relevance:

- The camera used to take the initial photographs is a standard Canon EOS 1000D with an 18-55mm lens.
- Photos intended for panoramas are taken with focal length at 55mm to minimize edge distortion and to facilitate the panoramic software's stitching process.
- Canon's stitching software (Photostitch v3.1.21) is used to create the panoramas. This software automatically compensates for slight variations in the focal length on each photo used in the panorama (i.e. the camera model, focal length, F-number, etc are embedded into each photo, so the software recognizes these parameters and adjusts the output image accordingly).
- The photo simulation process begins with the DTM, as this is effectively the "ground surface" of the virtual environment. The accuracy of the DTM in representing the Earth's surface is very much dependent on the quality of available contour data as this is what it is derived from. The raster DTM that is used to show shaded relief in a map is usually the same dataset that is used as the virtual ground surface.
- The DTM is visualised in 3D with an application called ArcScene. ArcScene works in much the same way as ArcMap except that the geometry and attributes of shapefiles cannot be edited, and of course, that is displayed in a Cartesian plane. Any existing shapefile can be added into the 3D environment and will automatically be displayed in its correct geographic position. Shapes that do not contain Z-values (height above mean sea level) can be assigned height values using the DTM. Point shapefiles, for example, will typically already have X/Y coordinates but can be placed at the virtual ground level, or at any height above ground level as specified in the attribute table. Lines and polygons work in the same way, thus enabling any vector shapefile to be "draped" onto the 3D terrain surface. Furthermore, points can be extruded to create lines of any specified length; lines may be extruded to create 3D polygons; and 3D polygons may be extruded to create 3D volumes.
- 3D models from such applications as 3D StudioMax or Sketchup are compatible with the ArcScene environment and work by assigning a model to be rendered at points geographically specified by a point shapefile. Each model itself consists of many polygons, and depending on the number of models used, can impact severely on a computer's performance in displaying the virtual environment.
- For the purposes of placing wind turbines onto a virtual landscape, a layout of the exact turbine positions is required in the form of a point shapefile. This shapefile is added three times to the environment. The first

instance is displayed as a point at ground level to indicate where the turbine tower meets the ground level. The second instance is extruded to half the height of the tower and displayed in a certain colour. The third instance is extruded from half to the full height of the tower and displayed in a different colour. Thus, from any virtual viewpoint on the landscape, it can be determined which turbines will be in full view and which will be partially obscured by undulations of the terrain. The terrain can also be made semi-transparent to check whether anything is completely obscured.

- Each photo viewpoint is then recreated within the virtual environment by setting the "camera" coordinates to those of the GPS coordinates logged when each photo was taken. Several other data may be added for landmark purposes, such as roads, rivers, power lines, or even trees if they can be accurately digitized. The virtual output is then rendered at a focal length matching that of the photos originally used to create the panoramas (using a field-of-view calculator that also compensates for the digital equivalent of 35mm film cameras). Several virtual "snapshots" are taken in sequence in the same manner as for the panoramic photos as the virtual output suffers from the same edge distortion as a photo. These are then stitched in the same manner as the photographs.
- Both the panoramic photos and the virtual simulation output are now graphic formats that are loaded into Adobe Photoshop. Some enhancements of the panoramas may be necessary as weather conditions tend to adversely affect image quality. The horizon and landscape of the virtual viewpoint is then matched up to what can be seen in the panoramas and sample images of the wind turbines are then overlaid where the extruded points are visible. Scaling is maintained since the top and mid-point of the tower are usually visible, so the ground point can be established even though it may be obscured by the landscape. Some graphic editing is usually necessary to address such things intervening vegetation or power lines as well as sufficient blurring to mimic the effect of distance.
- The scene is then typically rendered twice as "before" and "after" views.



6.1 North easterly view

View 1 (short distance view)

Viewpoint 1 is located within the proposed WEF footprint, on the south-westerly extremity and on the existing access road running through the site. This position is very close to the closest turbines and is indicative of what will be seen from the south west. The viewing direction is north easterly and roughly 20 turbines will be fully visible in the landscape. This view is representative of a short distance visual experience that anyone moving through the footprint area will have of the proposed turbines.



Figure 8a: Pre-construction panoramic overview from Viewpoint 1.



Figure 8b: Post-construction panoramic overview from Viewpoint 1 (indicating enlarged photograph sections).



Figure 8c: View 1a (enlarged photograph section from Viewpoint 1).



Figure 8d: View 1b (enlarged photograph section from Viewpoint 1).



Figure 8e: View 1C (enlarged photograph section from Viewpoint 1).

6.2 North easterly view

View 2 (medium distance view)

Viewpoint 2 is located on the road serving as a current access for both the Salt Works and the proposed WEF footprint. This position is set at a medium distance from the closest turbines. The viewing direction is north easterly and roughly 15 turbines may be fully to partially visible in the landscape.

This view is representative of a medium distance visual experience that travellers will have, moving to and from the Salt Works, the proposed WEF facility footprint and to any other facilities to the north-east of the proposed facility.



Figure 9a: Pre-construction panoramic overview from Viewpoint 2.

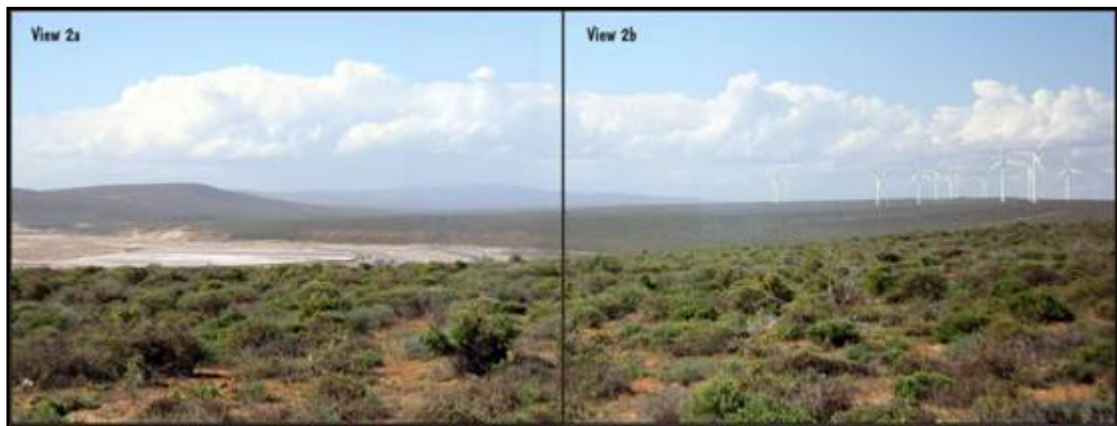


Figure 9b: Post-construction panoramic overview from Viewpoint 2 (indicating enlarged photograph sections).



Figure 9c: View 2a (enlarged photograph section from Viewpoint 2).



Figure 9d: View 2b (enlarged photograph section from Viewpoint 2).

6.3 North westerly view

View 3 (long distance view)

Viewpoint 3 is located on the main tar road leading to the Namakwa Sands Mine and Brand-se-Baai. This position is indicative of what will be seen from a long distance while driving in a westerly direction. Guests making use of tourism facilities in the vicinity of Bloukoppies se Knop will experience visual impacts similar to those depicted below. The viewing direction is north-westerly and roughly 22 turbines may be fully to partially visible in the landscape.



Figure 10a: Pre-construction panoramic overview from Viewpoint 3.



Figure 10b: Post-construction panoramic overview from Viewpoint 3 (indicating enlarged photograph sections).



Figure 10c: View 3a (enlarged photograph section from Viewpoint 3).



Figure 10d: View 3b (enlarged photograph section from Viewpoint 3).



Figure 10e: View 3C (enlarged photograph section from Viewpoint 3).

7. CONCLUSION/RECOMMENDATIONS

The construction and operation of the Exxaro West Coast Wind Energy Facility and its associated infrastructure will have a visual impact on the scenic resources and pastoral character of this region, especially within (but not restricted to) a 10km radius from the facility.

The author is, however, of the opinion that the WEF has an advantage over other more conventional power generating plants (e.g. coal-fired power stations). The facility utilises a renewable source of energy (considered as an international priority) to generate power and is therefore generally perceived in a more favourable light. It does not emit any harmful by-products or pollutants and is therefore not negatively associated with possible health risks to observers.

The facility further has a generally unfamiliar novel and futuristic design that invokes a curiosity factor not generally present with other conventional power generating plants. The advantage being that the WEF can become an attraction or a landmark within the region, that people would actually want to come and see. As it is impossible to hide the facility, the only option would be to promote it.

However, this opinion should not distract from the fact that the facility would be visible within a region is generally seen as having a pleasing landscape character, and some inherent tourism value and potential (especially along the coast), despite the presence of the industrial developments of the Salt Works and the Namakwa Sands Mine. The facility would thus visually impact on potentially sensitive visual receptors (i.e. tourists), albeit in small numbers, that should ideally not be exposed to additional industrial style structures.

There are also not many options as to the mitigation of the visual impact of the core facility as no amount of vegetation screening or landscaping would be able to hide structures of these dimensions. The following is, however recommended:

- Ancillary infrastructure (on site substations, internal access roads, cable alignments etc.) must be properly planned with due cognisance of the topography. In addition, all disturbed areas must be properly rehabilitated and all infrastructure and the site and general surrounds must be maintained in a neat and appealing way.
- Where practical, the power line must be laid underground and the excavated trenches properly backfilled, compacted and then rehabilitated.
- A lighting engineer should be consulted to assist in the planning and placement of light fixtures in order to reduce visual impacts associated with glare and light trespass.
- Secondary visual impacts associated with the construction phase, such as the sight of construction vehicles, dust and construction litter must be managed to reduce visual impacts. The use of dust-suppression techniques on the access roads (where required), timely removal of rubble and litter, and the erection of temporary screening will assist in doing this.
- The construction phase of the facility should be sensitive to potential observers in the vicinity of the construction site. The placement of lay-down areas and temporary construction camps should be carefully considered in order to not negatively influence the future perception of the facility.
- The facility should be dismantled upon decommissioning and the site and surrounding area should be rehabilitated to its original (current) visual status.

8. IMPACT STATEMENT

In light of the results and findings of the Visual Impact Assessment undertaken for the proposed Exxaro West Coast Wind Energy Facility, it is acknowledged that the wide-open views of the pastoral landscape surrounding the site will be transformed for the entire operational lifespan (approximately 25 years) of the facility, notwithstanding the industrial activities of the nearby Salt Works and Namakwa Sands Mine.

- The potential visual impact on users of roads in close proximity to the proposed WEF, as well as on residents of nearby settlements, will be of moderate significance.
- Within the greater region, the potential visual impact on sensitive visual receptors will be of moderate significance. Visual impact on regional tourist routes and destinations and on protected areas will be of low significance.
- Ancillary infrastructure (on site), the off-site power lines and security lighting are likely to result to visual impacts of medium significance, which may be mitigated to low.

These anticipated impacts are not, however, considered to be a fatal flaw from a visual perspective, considering the low incidence of visual receptors in the region, the relatively small size of the proposed facility and the contained area of potential visual exposure.

Furthermore, the visual impact is not likely to detract from the tourism appeal of the region, or of the nearby coastal holiday towns. The numbers of tourists visiting the area and the tourism potential of the region is also not expected to be affected, mainly due to the fact that visitors to the area are used to seeing some industrial type infrastructure along the route for limited periods of time. In addition, tourists frequenting the coastal holiday spots will be mostly shielded from visual impact once at their destinations.

It is therefore recommended that the development of the facility as proposed be supported, subject to the implementation of the recommended mitigation measures (chapter 7) and management actions (chapter 9).

9. MANAGEMENT PLAN

The 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. The management plan primarily focuses on the mitigation and management of potential secondary visual impacts, due to the fact that the primary visual impact (i.e. the wind turbines) has very low or limited mitigation potential.

Table 9: Management plan – ancillary infrastructure

OBJECTIVE: The mitigation of additional visual impacts associated with the construction and operation of the Exxaro West Coast Wind Energy Facility.

Project component/s	Construction site, access roads, substation, underground cabling and distribution power lines.	
Potential Impact	The potential scarring of the landscape due to the unnecessary removal of vegetation and failure to rehabilitate construction areas and trenches.	
Activity/risk source	The viewing of the abovementioned visual scarring by observers on or near the site.	
Mitigation: Target/Objective	Minimal disturbance to vegetation cover in close vicinity to the proposed WEF and its related infrastructure and the rehabilitation of disturbed areas.	
Mitigation: Action/control	Responsibility	Timeframe
Implement an environmentally responsive planning approach to roads and infrastructure to limit cut and fill requirements.	Exxaro Resources/contractors	Planning / Construction
Adopt responsible construction practices aimed at containing the construction activities to specifically demarcated areas thereby limiting the removal of natural vegetation to the minimum.	Exxaro Resources/contractors	Construction
Limit access to the construction sites to existing access roads.	Exxaro Resources/contractors	Construction / Operation
Rehabilitate all disturbed areas, including trenches and cut and fill slopes to acceptable visual standards.	Exxaro Resources/contractors	Construction / Operation
Maintain the general appearance of the facility in an aesthetically pleasing way.	Exxaro Resources	Construction / Operation
Performance Indicator	Vegetation cover that remains intact with no erosion.	
Monitoring	Monitoring of vegetation clearing and rehabilitation during the construction phase.	

Table 10: Management plan – 132 kV distribution power lines

OBJECTIVE: The mitigation of potential visual impacts caused by the construction of the 132 kV power line.

Project component/s	Distribution power line and servitude.	
Potential Impact	The impact of the pylons and the potential scarring of the landscape due to the servitude and new roads/tracks.	
Activity/risk source	The viewing of the abovementioned infrastructure and scarring by observers on or near the site.	
Mitigation: Target/Objective	Minimal disturbance to the landscape character and vegetation cover.	
Mitigation: Action/control	Responsibility	Timeframe
Lay the 132 kV cable underground.	Exxaro Resources/ESKOM	Planning/Operation.
Avoid the unnecessary removal of vegetation for the power line servitude and access roads.	Exxaro Resources/ESKOM	Construction
Rehabilitate all disturbed areas, including trenches and cut and fill slopes to acceptable visual standards.	Exxaro Resources/ESKOM	Construction
Limit access to the servitudes to existing access roads.	Exxaro Resources	Construction / Operation
Performance Indicator	Vegetation cover that remains intact with no erosion.	
Monitoring	Monitoring of vegetation clearing and rehabilitation during the construction phase.	

Table 11: Management plan - lighting

OBJECTIVE: The mitigation and possible negation of the potential visual impact of lighting at the WEF substation.

Project component/s	WEF substation lighting fixtures.	
Potential Impact	The potential night-time visual impact of lighting fixtures on observers in proximity to the WEF.	
Activity/risk source	The effects of glare and light trespass on motorists and observers.	
Mitigation: Target/Objective	<p>The containment of light emitted from the substation in order to eliminate the risk of additional night-time visual impacts.</p> <p>Minimal usage of security and other lighting.</p> <p>Minimal usage of red warning lights – limit placement to outer structures but still adhere to CAA rules and regulations.</p>	
Mitigation: Action/control	Responsibility	Timeframe
Ensure that proper planning is undertaken regarding the placement of lighting structures and that light fixtures only illuminate areas inside the substation site. Undertake regular maintenance of light fixtures.	Exxaro Resources/lighting engineer.	Construction/Operation.
Performance Indicator	The effective containment of the light on the site and no complaints from observers.	
Monitoring	The monitoring of the condition and functioning of the light fixtures during the operational phase of the project.	

10. REFERENCES/DATA SOURCES

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