VISUAL IMPACT ASSESSMENT

PROPOSED BAYVIEW WIND FARM
NELSON MANDELA BAY METROPOLITAN MUNICIPALITY
EASTERN CAPE, SOUTH AFRICA

Prepared for:
Bayview Wind Power (Pty) Ltd Building 1 Country Club Estate, 21 Woodlands Drive, Woodmead, 2191.
Prepared by:
EOH Coastal & Environmental Services EAST LONDON 25 Tecoma Street , Berea East London, 5201 043 742 3302 *Also in Grahamstown, Port Elizabeth, Cape Town, Johannesburg and Maputo* www.cesnet.co.za

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EXECUTIVE SUMMARY

The project area consists of three farm portions: portion 4 of 202, remaining extent of 201, and the remaining extent of portion 8 of 230 located within the Nelson Mandela Bay Metropolitan Municipality. The project area is 2813 hectares in extent. The project area lies between the R334, the R335 and the Sunday's river. The nearest towns include Addo (~12km away), Motherwell (~12km away) and Colchester (~10km away). The project area is currently used for low-intensity game farming. No established agricultural infrastructure (i.e. irrigated fields, canals, crushes, sheds, etc.) exist in the project area.

The project area is planned to host:

- Up to 47 wind turbines with a hub-height of 150m (worst case scenario), and three blades of 75m in length (worst case scenario);
- Foundations (unit upon which the turbine is anchored to the ground);
- A 15 ha temporary hardstand area which will serve as an assembly point, storage area (turbine main components) and will accommodate the erection of the crane boom;
- A 6 ha laydown area for OHL and office components storage (to be rehabilitated post construction);
- A gate house with security – approximately 36 m^2 (0.0036 ha);
- Operational and maintenance buildings such as a control centre, offices, warehouse, workshop, canteen, visitors centre and staff lockers – approximately 1 ha;
- Concrete batching plant – approximately 5000 m^2 (0.5 ha);
- A main access road of approximately 10 m in width consisting of gravel;
- Internal access roads approximately 25 – 30 km in length and 6 – 8 m in width;
- An onsite substation of approximately 1 ha in size
- Underground cabling to connect the various turbines to an onsite (facility) substation at medium voltage (MV) level;
- A high voltage (HV) level (132 kV) overhead line (OHL), of approximately 22m tall, connecting the substation to the designated Eskom Point of Connection (POC).

A site visit was undertaken from the 1st to the 3rd of November 2017 by an EOH consultant, Mr Thomas King, to assess the visual character of the area and visit potentially sensitive viewpoints. The study area is a modified, peri-urban, mixed land use area. Quarries, workshops, and storage facilities are present in a patchy agricultural environment. Disturbed areas, rubble heaps, and cleared bush areas are common throughout the study area. The Coega Industrial Development Zone is located approximately 7km to the south of the project area. The study area contains the following roads:

- The R335 running north/south connecting Motherwell and Addo;
- The R334 running east /west connecting the R102 and Uitenhage;
- The N2 running northeast/southwest connecting Colchester and Port Elizabeth;
- Numerous unpaved district roads including farm tracks.

The study area varies in height between 0 and 173 metres above sea level (m.a.m.s.l). The study area is therefore a typical flat coastal plain. The study area is drained by the Sundays River. The vegetation of the area consists of grassland with islands of thicket patches. The height of the thicket patches does not exceed about 3 metres. Tall trees are rare. The vegetation of the area therefore will not screen views of the wind turbines.

In terms of identified sensitive receptors:

- The Addo Elephant National Park is considered the most sensitive receptor and is located roughly 4.5km from the nearest wind turbine. Turbines will be visible from sections of the park. This is considered a sensitive visual receptor.

The following impacts were identified:

	Pre-Mitigation	Post Mitigation
CONSTRUCTION PHASE		
Impact 1: Visual impact of construction activity	MODERATE-	MODERATE-
OPERATIONAL PHASE		
Impact 1: Impact of wind turbines on visually sensitive points and areas	HIGH-	HIGH-
Impact 2: Impact of overhead power lines on visually sensitive points and areas	MODERATE-	MODERATE-
Impact 3: Impact of nightlights on existing landscape	MODERATE-	MODERATE-
Impact 4: Impact of shadow flicker	LOW-	LOW-
DECOMMISSIONING PHASE		
Impact 4: Visual impact of decommissioning activity	MODERATE-	MODERATE-

	Pre-Mitigation	Post Mitigation
CUMULATIVE IMPACTS		
Impact 1: Visual impact of facility construction and operation	HIGH-	HIGH-

	Pre-Mitigation	Post Mitigation
NO-GO ALTERNATIVE		
Impact 1: Impact of wind turbines on sensitive visual receptors	NONE	NONE

Four Alternative powerline routes are proposed. From a visual perspective, the proposed Alternative 1 powerline route will be preferred as it will be less visually intrusive.

A preliminary layout for the proposed Bayview Wind Farm was produced during the scoping phase of the project. This layout has been assessed throughout this report. The proposed Wind Turbines 34, 35, 46 and 47 were identified to have the highest visual exposure to the AENP.

Subsequently a new “refined” turbine layout has been proposed which takes specialist and stakeholder input into consideration. From a visual perspective the most significant changes are the removal of Wind Turbine 35, 46 and 47 and the change in the proposed location of wind turbine 34. Although the overall significance of the identified impacts will not change, the changes to the layout have ensured that no proposed turbines are located within 5km of the AENP, reducing the visual exposure of the AENP to LOW.

<u>Concluding Remarks:</u>
The Bayview Wind Farm will undoubtedly impose the visual landscape for nearby visual receptors. While the HIGH residual visual impacts cannot be completely mitigated, these should be considered within the context of the following:

- The neighbouring Grassridge Wind Farm already imposes on the visual landscape for nearby visual receptors.
- The wind farm is not permanent and the turbines and other superstructure will be removed on decommissioning of the wind farm;
- The landscape can be restored through rehabilitation prior to decommissioning;
- Although limited, certain mitigation recommendations in this report can mitigate the impacts to some extent;
- Although there are local losses in terms of visual impacts, there will also be local, regional and national environmental, social and economic gains in the form of:
    - Economic investment
    - Job creation and skills development
    - Energy security

    - Climate change mitigation
- In terms of the REIPPPP, certain benefits will accrue to:
    - Local communities through the establishment of local community trusts, and
    - BBBEE partners through shareholding targets.

It is also very important to note that renewable energy (including wind) forms an integral part of the National Development Plan (NDP) both in terms of energy security and climate change mitigation.

It is concluded that potential losses of scenic resources are not sufficiently significant to present a fatal flaw to the proposed project. It is, therefore, recommended that the project proceed.

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SPECIALIST CHECKLIST

Section	*NEMA 2014 Regs - Appendix 6(1) Requirement*	Position in report
1	A specialist report prepared in terms of these Regulations must contain—	
(a)	details of-	
	(i) the specialist who prepared the report; and	Section 6.1 and Appendix A
	(ii) the expertise of that specialist to compile a specialist report including a curriculum vitae;	Section 6.1 and Appendix A
(b)	a declaration that the person is independent in a form as may be specified by the competent authority;	Appendix B
(c)	an indication of the scope of, and the purpose for which, the report was prepared;	Chapter 4
(d)	the date and season of the site investigation and the relevance of the season to the outcome of the assessment;	Section 1.3 and Section 3.1
(e)	a description of the methodology adopted in preparing the report or carrying out the specialised process;	Chapter 2 and Chapter 3
(f)	the specific identified sensitivities of the site related to the activity and its associated structures and infrastructure;	Section 5.3 and Section 8.1.3
(g)	an identification of any areas to be avoided, including buffers;	Section 8.5
(h)	a map superimposing the activity including the associated structures and infrastructure on the environmental sensitive of the site including areas to be avoided, including buffers;	Figure 4 and Figure 6
(i)	a description of any assumptions made and any uncertainties or gaps in knowledge;	Section 5.1
(j)	a description of the findings and potential implications of such findings on the impact of the proposed activity, including identified alternatives on the environment;	Chapter 8
(k)	any mitigation measures for inclusion in the EMPr;	Chapter 8
(l)	any conditions for inclusion in the environmental authorization;	Chapter 8
(m)	any monitoring requirements for inclusion in the EMPr or environmental authorisation;	Chapter 8
(n)	a reasoned opinion- (i) as to whether the proposed activity or portions thereof should be authorized and (ii) if the opinion is that the proposed activity of portion thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan;	Chapter 9
(o)	a description of any consultation process that was undertaken during the course of preparing the specialist report;	Refer to summary report
(p)	a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	Any comments, which were received, relating to the Visual Impact Assessment have been included in the Issues and Response Trail (IRT) in the Final EIR and, where necessary, responses were provided by the relevant specialist.

Section	*NEMA 2014 Regs - Appendix 6(1) Requirement*	Position in report
(q)	any other information requested by the competent authority.	Not Applicable

GLOSSARY OF TERMS

Project area
The farm portions that will have project infrastructure built on them.

Study area
The area surrounding the project area, and including the project area, that will experience visual impacts.

Viewshed
The outer boundary defining a view catchment area, usually along crests and ridgelines.

Viewpoint
A selected point in the landscape from which views of a particular project or other feature can be obtained.

View corridor
A linear geographic area, usually along movement routes, that is visible to users of the route.

Visually sensitive point
A point feature in the study area that is considered to be sensitive to views of the project’s infrastructure components.

Visually sensitive area
An area in the study area that is considered to be sensitive to views of the project’s infrastructure components.

View catchment area
A geographic area, usually defined by the topography, within which a particular project or other feature would generally be visible. Sometimes called the visual envelope.

Sense of place
The unique quality or character of a place, whether natural, rural or urban. Relates to uniqueness, distinctiveness or strong identity. Sometimes referred to as genius loci meaning 'spirit of the place'.

Visual absorption capacity
The ability of an area to visually absorb development as a result of screening topography, vegetation or structures in the landscape.

1 INTRODUCTION

EOH Coastal and Environmental Services (EOH CES) has been appointed by Bayview Wind Power (Pty) Ltd as independent environmental assessment practitioners to undertake an Environmental Impact Assessment (EIA) of the proposed Bayview Wind Farm. One of the significant environmental issues identified during the scoping phase of the Bayview Wind Farm EIA process was the visual impact of the proposed development on the landscape. A Visual Impact Assessment (VIA) is therefore included as part of the EIA process.

This report provides specialist visual assessment input into the EIA process relating to the proposed Bayview Wind Farm project. The proposed project will include a maximum of 47 wind turbines, with a potential power output of 140 megawatts (MW).

For the purposes of conducting the VIA, guidance has been taken from the Provincial Government of the Western Cape, Department of Environmental Affairs and Development Planning (DEA&DP) Guideline for Involving Visual and Aesthetic Specialists in the EIA Process (Oberholzer, 2005). These are the only VIA guidelines that have been issued in South Africa.

Oberholzer (2005) notes that visual, scenic and cultural components of the environment can be seen as a resource, much like any other resource, which has a value to individuals, to society and to the economy of the region. In addition, this resource may have a scarcity value, be easily degraded, and is usually not replaceable. Therefore the guidelines recommend that the following specific concepts should be considered during the visual input into the EIA process:

- An awareness that 'visual' implies the full range of visual, aesthetic, cultural and spiritual aspects of the environment that contribute to the area's sense of place.
- The consideration of both the natural and the cultural landscape, and their inter-relatedness.
- The identification of all scenic resources, protected areas and sites of special interest, together with their relative importance in the region.
- An understanding of the landscape processes, including geological, vegetation and settlement patterns, which give the landscape its particular character or scenic attributes.
- The need to include both quantitative criteria, such as 'visibility', and qualitative criteria, such as aesthetic value or sense of place.
- The need to include visual input as an integral part of the project planning and design process, so that the findings and recommended mitigation measures can inform the final design, and hopefully the quality of the project.
- The need to determine the value of visual/aesthetic resources through public involvement.

1.1 Terms of Reference

The specific Terms of reference for the VIA are as follows:

1. Conduct a site reconnaissance visit and photographic survey of the proposed project site.
2. Conduct a desk top mapping exercise to establish visual sensitivity:
   - Describe and rate the scenic character and sense of place of the area and site;
   - Establish extent of visibility by mapping the view-sheds and zones of visual influence;
   - Establish visual exposure to viewpoints; and
   - Establish the inherent visual sensitivity of the site by mapping slope grades, landforms, vegetation, special features and land use and overlaying all relevant above map layers to assimilate a visual sensitivity map.
3. Review relevant legislation, policies, guidelines and standards.
4. Preparation of a Visual Baseline/Sensitivity report:
   - Assessing visual sensitivity criteria such as extent of visibility, the sites inherent sensitivity, visual sensitivity of the receptor’s, visual absorption capacity of the area and visual intrusion on the character of the area;
   - Assess the proposed project against the visual impact criteria (visibility, visual exposure, sensitivity of site and receptor, visual absorption capacity and visual intrusion) for the site;

- Assess impacts based on a synthesis of criteria for each site (criteria = nature of impact, extent, duration, intensity, probability and significance); and
- Establish mitigation measures/recommendations with regards to minimizing visual risk areas.

1.2 Legislative context

A Scoping and Environmental Impact Assessment is being undertaken in accordance with Government Notice Regulation 982 published on 4 December 2014 as amended in 2017.

This VIA has been undertaken in accordance with the Department of Environmental Affairs and Development Planning's Guideline: "Guideline for involving visual and aesthetic specialists in EIA processes" (Oberholzer, 2005).

Spatial Development Frameworks (SDFs) are considered and discussed in the Environmental Impact Assessment Reports.

The Visual Impact Assessment was available for a thirty (30) day Public Review period, as part of the Public Participation Process (PPP) on the Draft Environmental Impact Report (EIR), from the 20th of August 2018 until the 20th of September 2018. The comments, which were received, relating to the Visual Impact Assessment have been included in the Issues and Response Trail (IRT) in the Final EIR and, where necessary, responses were provided by the relevant specialist.

1.3 Seasonal Changes

In terms of Appendix 6 of the 2014 EIA Regulations, a specialist report must contain information on "*the date and season of the site investigation and the relevance of the season to the outcome of the assessment*". The site visit was undertaken in Spring (November). The season in which the site visit was undertaken does not have any considerable effect on the significance of the impacts identified, the mitigation measures, or the conclusions of the assessment since the vegetation cover does not vary significantly over the seasons.

1.4 Information Base

The following information was used to conduct the VIA:

- Documentation supplied by the client;
- Information from the EOH CES scoping report;
- ToR for the visual specialist;
- Photographs and information captured during the site visit;
- Google Earth software and data (aerial imagery - 2018);
- Sentinel-2 Satellite Imagery (2018);
- SRTM Digital Elevation Model;
- South African National Landcover dataset (2014); and
- Wind turbine model.

1.5 Assumptions and Limitations

1.5.1 Spatial data accuracy

Spatial data used for visibility analysis originate from various sources and scales. Inaccuracy and errors are, therefore, inevitable. Where relevant, these are highlighted in the report. Every effort was made to minimize their effect.

1.5.2 Viewshed calculations

a) Calculation of the viewsheds is based on the use of the Shuttle Radar Topography Mission (SRTM) Digital Elevation Models (DEMs) downloaded from the USGS Earth Explorer Website. These raster images have a resolution of 30 metres, which means that each pixel of the raster covers an area of 30 m x 30 m (900 m^2), and is assigned a single height value.
b) An observer in the surrounding landscape was assumed to be 1.8m tall.
c) Calculation of the viewsheds does not take into account the potential screening effect of vegetation and buildings. Due to the size and height of the wind turbines, and the relatively low vegetation cover in the region, the screening potential of vegetation is likely to be minimal over most distances.

1.5.3 Simulated views

In this report a simulated view will be defined as a view generated by using a 3D Wind Turbine model in Google Earth Pro (Section).

1.6 Authors Details

1.6.1 Michael Johnson, author

Michael holds a BSc in Geoinformatics, a BSc (Hons) cum laude in Geoinformatics and an MSc in Geoinformatics from Stellenbosch University. Michael's Master's thesis examined the use of Remote Sensing and computer vision technologies for the extraction of near-shore ocean wave characteristic parameters. For the duration of his Master's, he was based at the CSIR in Stellenbosch. During this time, in addition to his Master's studies, he conducted work in collaboration with the CSIR Coastal Systems Research Group and provided GIS and Remote Sensing tutoring and technical assistance to the junior staff and fellow students. Michael graduated in March 2018 and has been working for CES since.

1.6.2 Alan Carter, reviewer

Dr Alan Carter, Executive of the East London Office, has over 25 years of experience in both environmental science and financial accounting disciplines including with international accounting firms in South Africa and the USA. He holds a PhD in Plant Sciences and a BCom Honours degree in financial accounting. Alan is a member of a number of professional bodies including American Institute of Certified Public Accountants (AICPA) and Institute of Waste Management South Africa (IWMSA). He is also certified as an Environmental Assessment Practitioner in South Africa (EAPSA) and as an ISO14001 EMS auditor with the American National Standards Institute. Areas of specialization include: impact assessment, coastal management, waste management, climate change and emissions inventories, aquaculture and environmental accounting and auditing.

2 TRIGGERS FOR SPECIALIST VISUAL INPUT

The DEA&DP guideline suggests various triggers for conducting a Visual Impact Assessment (VIA). With respect to the proposed Bayview Wind Farm, a number of aspects of the development would trigger the need for a VIA. These include:

- Areas lying outside a defined urban edge line;
- Areas with important vistas or scenic corridors;
- Areas with visually prominent ridgelines or skylines; and
- Possible visual intrusion in the landscape.

The purpose of conducting a VIA is to determine:

- The visibility of the proposed project;
- The potential visual impact on visual/scenic resources;
- The nature, extent, duration, magnitude, probability and significance of impacts, as well as measures to mitigate negative impacts and enhance benefits; and
- The character and visual absorption capacity of the landscape.

2.1 Selecting appropriate approach for the visual impact assessment

The category of development influences the level of visual impact to be expected. As is illustrated in Table 1, a wind energy facility is considered a category five development.

Table 1: Key to categories of Development

Category 1 development: e.g. nature reserves, nature-related recreation, camping, picnicking, trails and minimal visitor facilities.
Category 2 development: e.g. low-key recreation / resort / residential type development, small-scale agriculture / nurseries, narrow roads and small-scale infrastructure.
Category 3 development: e.g. low density resort / residential type development, golf or polo estates, low to medium-scale infrastructure.
Category 4 development: e.g. medium density residential development, sports facilities, small-scale commercial facilities / office parks, one-stop petrol stations, light industry, medium-scale infrastructure.
Category 5 development: e.g. high density township / residential development, retail and office complexes, industrial facilities, refineries, treatment plants, power stations, wind energy farms, power lines, freeways, toll roads, large-scale infrastructure generally. Large-scale development of agricultural land and commercial tree plantations. Quarrying and mining activities with related processing plants.

Table 2 indicates that VIAs become more critical where wilderness or protected landscapes are involved, as well as when high density urban development or large scale infrastructure are being considered. In the context of the Eastern Cape Province as a whole, the Bayview Wind Farm area is considered in this report to be of medium scenic, cultural or historical significance. Based on the table, it is deemed that a “High Visual Impact is expected” for the proposed Bayview Wind Farm.

Table 2: Categorization of issues to be addressed by the visual assessment (DEA&DP Guidelines)

Type of environment	Type of development (see Box 3) Low to high intensity				
	Category 1 development	Category 2 development	Category 3 development	Category 4 development	Category 5 development
Protected/wild areas of international, national, or regional significance	Moderate visual impact expected	High visual impact expected	High visual impact expected	Very high visual impact expected	Very high visual impact expected
Areas or routes of high scenic, cultural, historical significance	Minimal visual impact expected	Moderate visual impact expected	High visual impact expected	High visual impact expected	Very high visual impact expected
Areas or routes of medium scenic, cultural or historical significance	Little or no visual impact expected	Minimal visual impact expected	Moderate visual impact expected	High visual impact expected	High visual impact expected
Areas or routes of low scenic, cultural, historical significance / disturbed	Little or no visual impact expected. Possible benefits	Little or no visual impact expected	Minimal visual impact expected	Moderate visual impact expected	High visual impact expected
Disturbed or degraded sites / run-down urban areas / wasteland	Little or no visual impact expected. Possible benefits	Little or no visual impact expected. Possible benefits	Little or no visual impact expected	Minimal visual impact expected	Moderate visual impact expected

Table 3 describes the category of VIA. With regards to the proposed Bayview Wind Farm, a noticeable change in the visual character of the area, and potential intrusions on protected landscapes or scenic resources may be expected.

Table 3: Description of the key categories of visual impact expected

Very high visual impact expected:
Potentially significant effect on wilderness quality or scenic resources;
Fundamental change in the visual character of the area;
Establishes a major precedent for development in the area.

High visual impact expected:
Potential intrusion on protected landscapes or scenic resources;
Noticeable change in visual character of the area;
Establishes a new precedent for development in the area.

Moderate visual impact expected:
Potentially some effect on protected landscapes or scenic resources;
Some change in the visual character of the area;
Introduces new development or adds to existing development in the area.

Minimal visual impact expected:
Potentially low level of intrusion on landscapes or scenic resources;
Limited change in the visual character of the area;
Low-key development, similar in nature to existing development.

Little or no visual impact expected:
Potentially little influence on scenic resources or visual character of the area;
Generally compatible with existing development in the area;
Possible scope for enhancement of the area.

Based on the above considerations, the approach adopted for the Bayview Wind Farm VIA is that prescribed for a development or activity where a high visual impact is expected.

According to the DEA&DP guideline, this will require a Level 4 Visual Assessment

Approach	**Type of issue (see Box 4)**				
	Little or no visual impact expected	**Minimal visual impact expected**	**Moderate visual impact expected**	**High visual impact expected**	**Very high visual impact expected**
Level of visual input recommended	**Level 1** visual input	**Level 2** visual input	**Level 3** visual assessment	**Level 4** visual assessment	

A Level 4 Visual Assessment consists of the following main elements:

- Identification of issues raised in scoping phase, and site visit;
- Description of the receiving environment and the proposed project;
- Establishment of view catchment area, view corridors, viewpoints and receptors;
- Indication of potential visual impacts using established criteria;
- Description of alternatives, mitigation measures and monitoring programmes; and
- 3D modelling and simulations.

3 METHODOLOGY

3.1 Site Visit and Photographic Survey

The field survey (conducted from the 1st to the 3rd of November 2017) provided an opportunity to:

- Determine the actual or practical extent of potential visibility of the proposed development, by assessing the screening effect of landscape features;
- Conduct a photographic survey of the landscape surrounding the development; and
- Identify sensitive landscape and visual receptors.

Viewpoints were chosen using the following criteria:

- High visibility – sites from where most of the wind farm will be visible;
- High visual exposure – sites at various distances from the proposed site; and
- Sensitive areas and viewpoints such as nature reserves and game farms from which turbines will potentially be seen.

3.2 Baseline Description

A desktop study was conducted to establish and describe the landscape character of the receiving environment. A combination of Geographic Information System (GIS), literature review and photographic survey was used to analyse land cover, landforms and land use in order to gain an understanding of the current landscape within which the development will take place (GLVIA, 2002). Landscape features of special interest were identified and mapped, as were landscape elements that may potentially be affected by the development.

3.3 Visual Impact Assessment

A GIS was used to calculate viewsheds for the various components of the proposed development. These included the 47 wind turbines and four power line alternatives.

Other structures (such as the switching station, operational and maintenance buildings and gate house) will also be built, however the visual impact of these features is not considered as important as those of the turbines and overhead power lines (which are much taller). For this reason, such other structures were not considered in the VIA.

The viewsheds and information gathered during the field survey were used to define criteria such as visibility, viewer sensitivity, visual exposure and visual intrusion for the proposed development. These criteria are, in turn, used to determine the intensity of potential visual impacts on sensitive viewers. All information and knowledge acquired as part of the assessment process were then used to determine the potential significance of the impacts according to the standardised rating methodology as described in Section 8.2 of this document.

4 VISUAL ASSESSMENT INFORMATION

4.1 Relevant project information

Bayview Wind Power (Pty) Ltd proposes to develop a wind farm, approximately thirty kilometres (30 km) north of Port Elizabeth in the Eastern Cape Province (Figure 1). The proposed wind farm falls within Ward 53 of the Nelson Mandela Bay Metropolitan Municipality (NMBMM). The wind farm will host a maximum of 47 turbines, with a total maximum output capacity of 140 MW, and will have an anticipated life span of 20 – 25 years.

The proposed site for the Bayview Wind Farm is located between the R334 connecting Colchester and Motherwell (to the south), the R335 connecting Motherwell and Addo (to the west) and the Sunday's river flowing from Addo to Colchester (to the east) (Figure 1). The closest towns to the proposed site are Addo (~18 km by road, ~12 km geodesic distance), Motherwell (~17 km by road, ~12 km geodesic distance) and Colchester (~ 35 km by road, ~10 km geodesic distance). The Coega Industrial Development Zone (IDZ) is located to the south (~7 km geodesic distance)

The proposed Bayview Wind Farm falls across three farm portions (provided in Table 4 and seen in Figure 1). These farm portions cover a cumulative area of 2813 ha and are collectively referred to as the "**project area**". When this report refers to the "**study area**", it is referring to the area within a certain fixed distance of the project area that will fall within the turbines' viewshed. The project area can be accessed via the R335 that connects Motherwell and Addo. There are a number of existing local, untarred roads providing access within the project area.

Table 4: Farm portions on which the proposed development is located

AFFECTED PROPERTY	SG CODE	EXTENT (HA)
Oliphants Kop 201, Remaining Extent	C07600000000020100000	1078 ha
Steins Valley 202, Portion 4	C07600000000020200004	900 ha
Ebb and Vloed 230, Remaining Extent of Portion 8	C07600000000023000008	835 ha

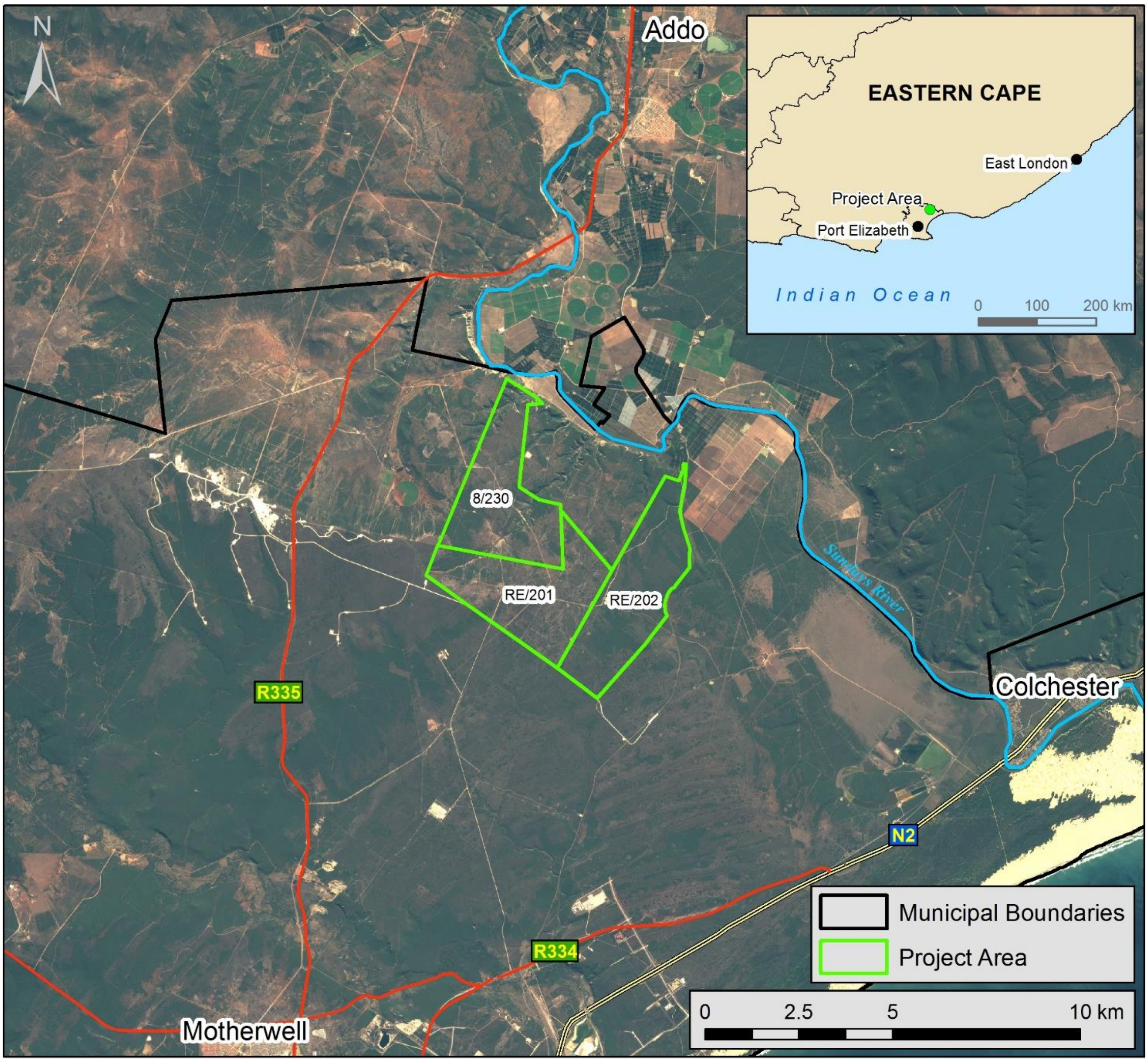

Figure 1: Location of the proposed Bayview Wind Farm

4.1.1 Details and nature of structures

The wind farm will include up to 47 turbines (2 – 4.5 MW output each), with a maximum net generating output capacity of 140 MW. The components of a typical wind turbine subsystem include:

- A rotor, or blades, which are the portion of the wind turbine that collect energy from the wind and convert the wind's energy into rotational shaft energy to turn the generator. The speed of rotation of the blades is controlled by the nacelle, which can turn the blades to face into the wind ('yaw control'), and change the angle of the blades ('pitch control') to make the most use of the available wind.
- A nacelle (enclosure) containing a drive train, usually including a gearbox (some turbines do not require a gearbox) and a generator. The generator is what converts the turning motion of a wind turbine's blades (mechanical energy) into electricity. Inside this component, coils of wire are rotated in a magnetic field to produce electricity. The nacelle is also fitted with brakes, so that the turbine can be switched off during very high winds, such as during storm events. This prevents the turbine from being damaged. All this information is recorded by computers and is transmitted to a control centre, which means that operators don't have to visit the turbine very often, but only occasionally for a mechanical check.
- A tower, to support the rotor and drive train: The tower on which a wind turbine is mounted is not only a support structure, but it also raises the wind turbine so that its blades safely clear the ground and so can reach the stronger winds at higher elevations. The tower must also be strong enough to support the wind turbine and to sustain vibration, wind loading, and the overall weather elements for the life time of the turbine.
- The foundation unit upon which the turbine is anchored to the ground.
- Electronic equipment such as controls, electrical cables, ground support equipment, and interconnection equipment.

Dimensions of the turbines components will be dependent on the technology used. It is anticipated that the hub height for each turbine will not exceed 150 m (worst case scenario). The rotor diameter is anticipated to be a maximum of 150 m (worst case scenario). The blade length of each turbine is anticipated to be approximately 75 m in length. At the current phase of the project, the exact turbine technology has not yet been selected. This report will therefore assess the worst case scenario (i.e. a blade tip height of 225m) Figure 2 provides a South African example of a set of wind turbines and Figure 3 provides a conceptual view of a turbine at multiple distances.

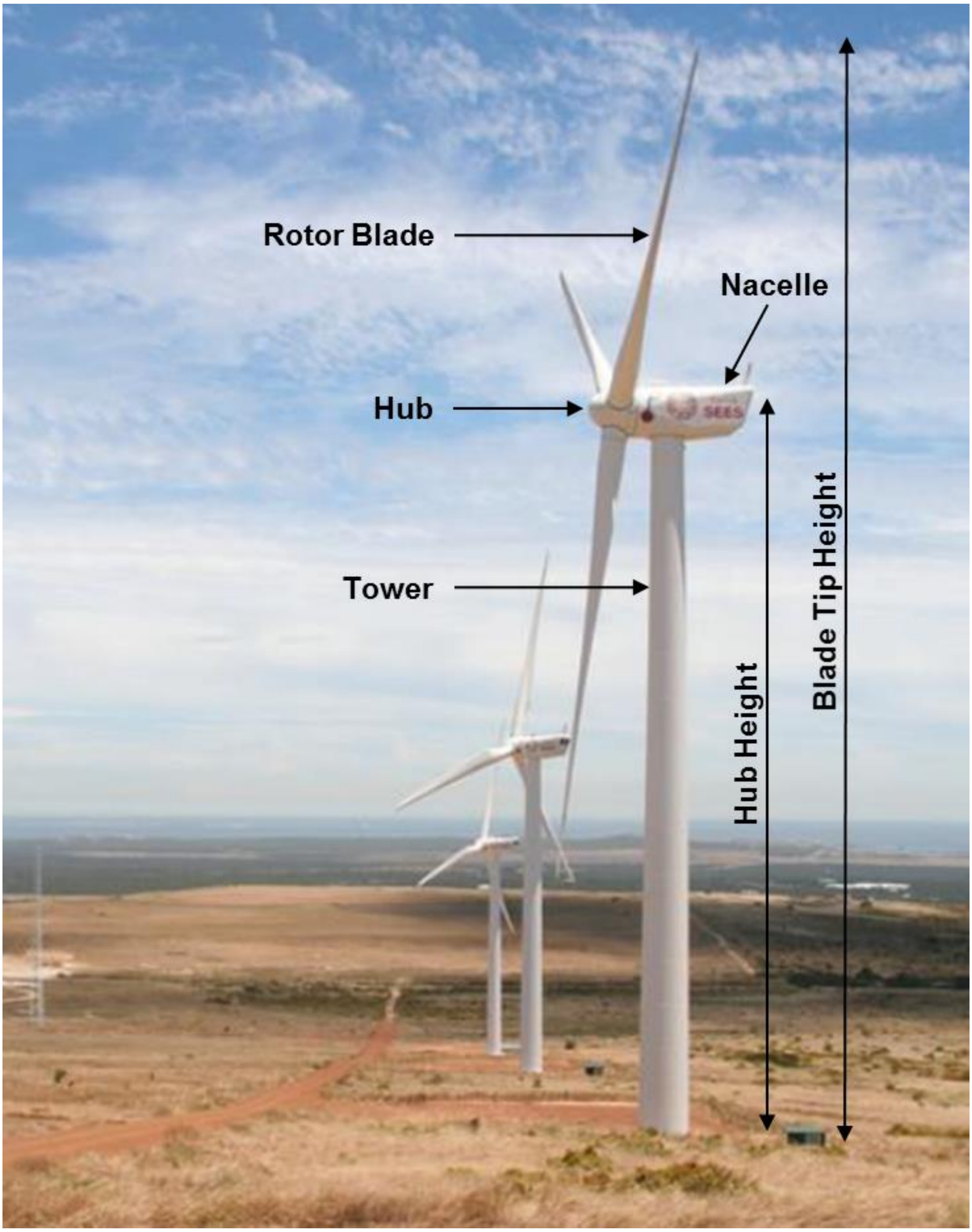

Figure 2: Example of wind turbines - Darling Wind Farm, Western Cape, South Africa

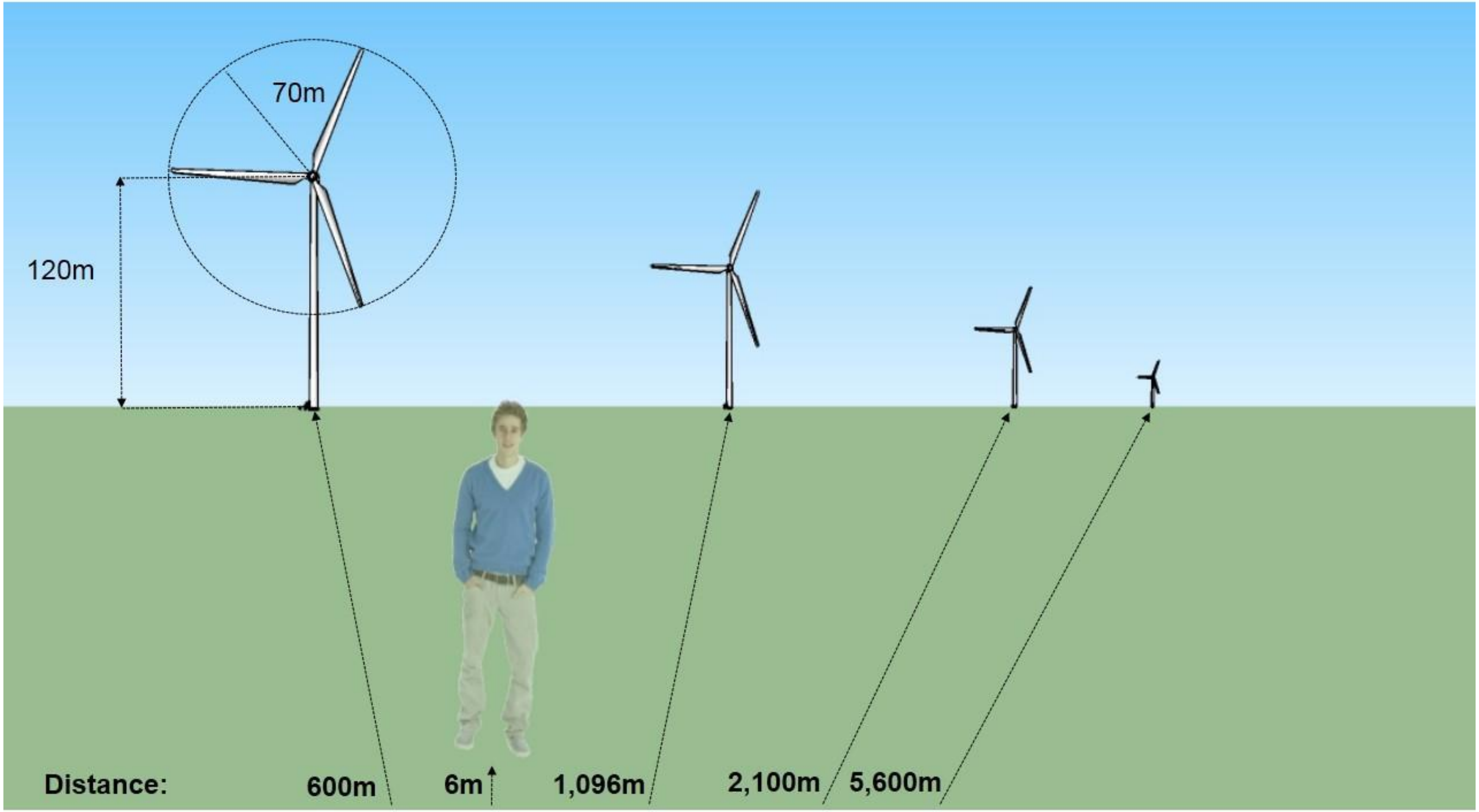

Figure 3: Conceptual view of a 120m high turbine, with a 140m rotor diameter

4.1.2 Other structures and activities

Control buildings and hard stand areas

Initially, a 15 ha temporary hardstand area will be required. This area will serve as an assembly point, storage area (turbine main components) and will accommodate the erection of the crane boom. In addition, a 6 ha laydown area will be required (OHL and office components storage), which will be rehabilitated once construction is complete. Other infrastructure required will include:

- A gate house with security – approximately 36 m^2 (0.0036 ha)
- Operational and maintenance buildings such as a control centre, offices, warehouse, workshop, canteen, visitors centre and staff lockers – approximately 1 ha
- Concrete batching plant – approximately 5000 m^2 (0.5 ha)

Access roads

Existing roads will be used as far as practically possible, to gain access during the construction and operational phase (maintenance purposes) of the project. Additional access roads may need to be created / upgraded, which may include the following:

- A main access road of approximately 10 m in width consisting of gravel. The length of this road at this stage is unknown;
- Internal access roads approximately 25 – 30 km in length and 6 – 8 m in width; and
- Jeep tracks which will be used for routine maintenance of overhead powerlines during the operational phase.

The new internal roads created will remain a permanent feature as these will be used for routine maintenance and access to the turbines.

Servitude, Powerline and Substation

Underground cabling will be required to connect the various turbines to an onsite (facility) substation at medium voltage (MV) level. Here it will be stepped up to a high voltage (HV) level of 132 kV via the main power transformer, and then evacuated via overhead line (OHL) into the designated Eskom Point of Connection (POC). This line will be approximately 22 m above ground level and will be supported either on monopole or lattice tower structures. Currently there are four options for the grid connection under discussion with Eskom (in order of preference):

- Powerline Alternative 1 (preferred): A loop-in loop-out (LILO) on the Grassridge/Nooitgedacht 132 kV OHL;
- Powerline Alternative 2: A new 132 kV OHL direct to Dedisa Substation;
- Powerline Alternative 3: A new 132 kV OHL direct to Grassridge Substation;
- Powerline Alternative 4: A 132 kV OHL within the CDC IDZ Existing Corridor to Dedisa.

The servitude width required for the 132 kV OHL will be approximately 31 – 36 m in width. An 8 m wide strip is generally required to be cleared (trees and shrubs) down the centre of the distribution power line servitude for stringing purposes only. For the purposes of assessing the best location of the line within the servitude, a 300 m corridor (150 m each side) around each overhead line alternative will be assessed. Should the preferred distribution line corridor receive environmental authorisation from DEA, the optimal tower sizes and positions will be identified and verified through a comprehensive ground survey of the preferred route.

An onsite substation will be required of approximately 1 ha in size, where all the turbines will connect to via underground MV cabling. Where required, bird flight deflectors may need to be fitted to the OHL during the construction phase. The placement of these deflectors will be decided with input from an ornithologist that will do a walk-down on the final route of the power line before construction commences.

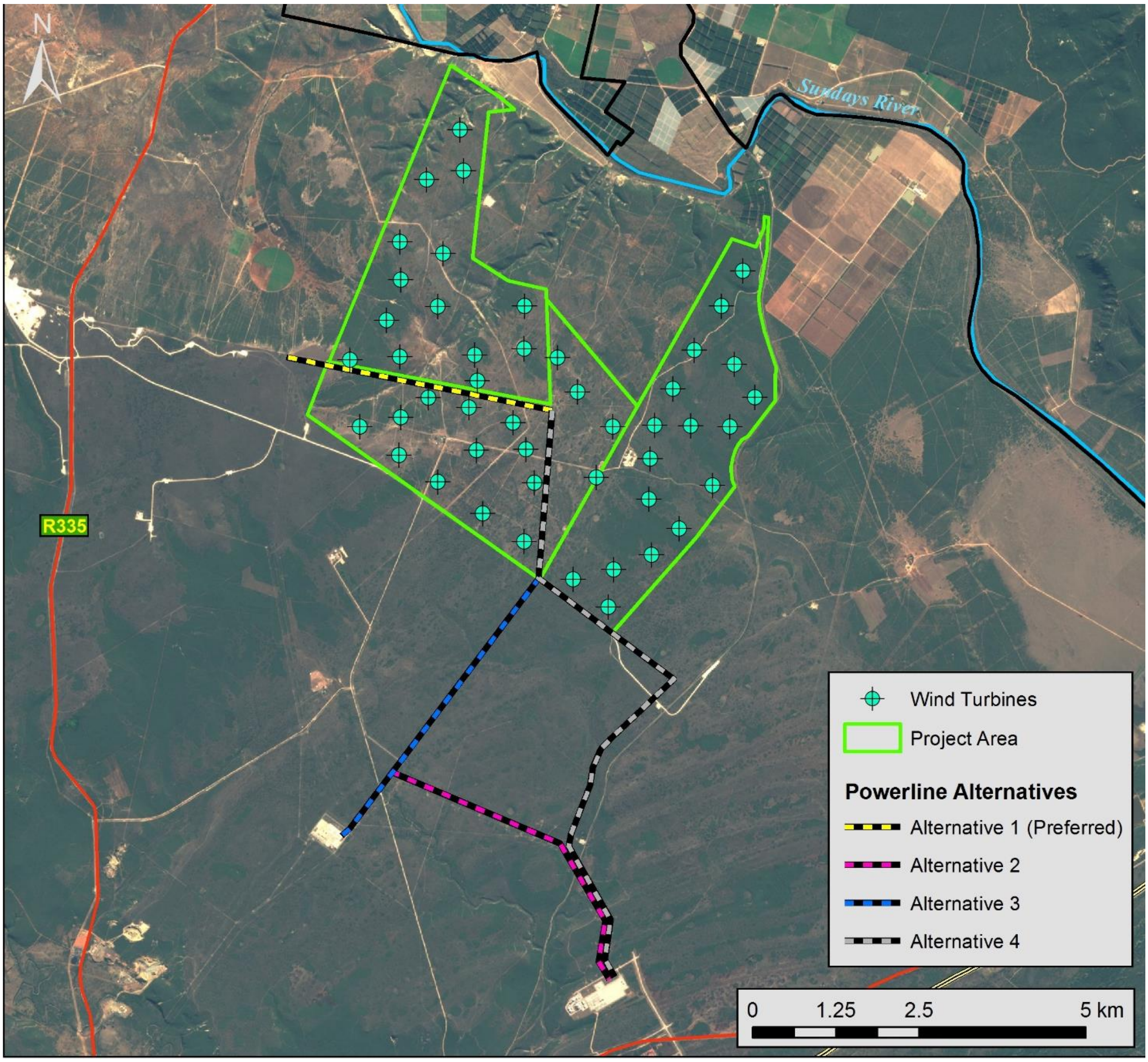

Figure 4: Proposed layout of the Bayview Wind Farm

5 BASELINE DESCRIPTION

5.1 Description of the affected physical environment

The study area is partially characterised as:

- Peri-urban (towards the south, on the outskirts of Motherwell and Colchester);
- Partially stock, game and wind farming towards the centre and west;
- Citrus and dairy farming in the north (on the outskirts of Addo); and
- Protected area in the east (the Addo Elephant National Park).

Quarries, workshops, and storage facilities are present in a patchy agricultural environment. Disturbed areas and cleared areas are also common throughout the study area.

The main affected properties are either vacant vegetated land or used for low-intensity game grazing. There are no agricultural infrastructure (irrigated lands, crushes, etc.) other than farm houses and game and livestock trophs. A number of high voltage power lines are present within in the study area. In addition, at least one Wind Energy Facility (WEF) is operational and a number of other WEFs are proposed within the immediate area.

These WEFs will be described further in the cumulative impacts section of this report. The Coega Industrial Development Zone (IDZ) is located approximately 12km to the south of the project area. There are a number of existing roads present within the study area.

5.1.1 Climate

The Eastern Cape Province of South Africa has a complex climate due to its location at the confluence of two climatic regimes, namely temperate and subtropical. As a result there are wide variations in temperature, rainfall and wind patterns, mainly as a result of movements of air masses, altitude, mountain orientation and the proximity of the Indian Ocean.

Port Elizabeth has a bimodal rainfall pattern with an average of 624 mm annually, with peaks in spring and autumn. On average, October and November has the highest precipitation with July having the least. The average daily temperature ranges from 24°C (summer) to 12°C (winter). February has the highest mean temperature (28°C) with June and July having the lowest (7°C) overnight average temperature.

5.1.1 Topography

The Eastern Cape Province contains a wide variety of landscapes, from the stark Karoo (the semi-desert region of the central interior) to mountain ranges and gentle hills rolling down to the sea. The topography of the NMBMM area can be described as a combination of flat, seaward sloping coastal plains averaging 75 m above mean sea level to high, mountain terrains in the north-western parts.

The topography of the study area is characterised by undulating hills with altitudes ranging from approximately 70 meters above mean sea level (m.a.m.s.l) to about 173 m.a.m.s.l giving rise to relatively steep valleys as well as plateaus and ridges with rocky outcrops.

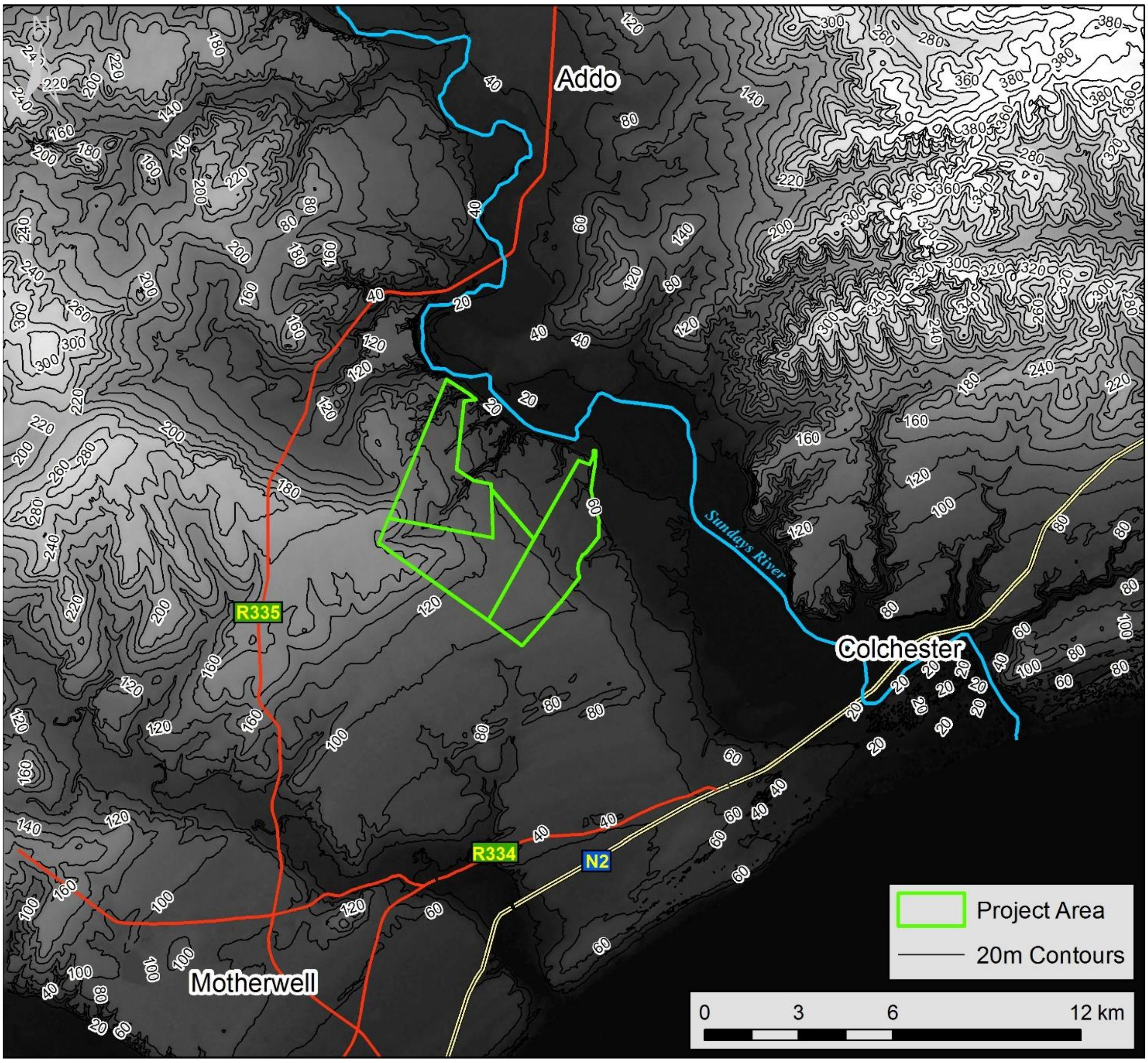

Figure 5: Topography and drainage

5.1.2 Geology

The project site is directly underlain by three different geological units namely the Sundays River Formation, the Alexandria Formation and Quaternary sediments.

The Sundays River Formation is the uppermost unit of the Uitenhage Group and consists of thin, grey sandstone, siltstone and shale.

An angular unconformity separates the Sundays River Formation from the much younger Alexandria Formation. The latter consists of a conglomerate base overlain by calcareous sandstone interbedded with coquina and thinner conglomerates.

The Quaternary sediments within the proposed study area occur between the Swartkops River and Sundays River valleys and extend no further than 15 km inland from the coastline. Previously referred to as the Bluewater Bay Formation, these sediments consist of alluvial sheet gravel and sand which has been consolidated in calcrete and unconformably overlies the Alexandria Formation (Toerien, 1983).

5.1.3 Vegetation

The study area falls within the Thicket biome. The Thicket biome occurs within the Western and the Eastern Cape, and is one of the seven biomes found in South Africa (Knight and Cowling, 2003). Its distribution ranges down the coast, up the river valleys and into the dry mountainous areas of the South-west.

I. South African National Biodiversity Institute (SANBI)

Mucina and Rutherford (2012) updated the National Vegetation map as part of a South African National Biodiversity Institute (SANBI) funded project "…in order to provide floristically based vegetation units of South Africa, Lesotho and Swaziland at a greater level of detail than had been available before." The map was developed using a wealth of data from several contributors and resulted in the best national vegetation map to date. The map and accompanying book describe each vegetation type in detail, along with the most important species, including endemic species and those that are biogeographically important. This is the most comprehensive data for vegetation types in South Africa. The SANBI Vegetation map informs finer scale bioregional plans such as STEP.

This SANBI Vegmap project has two main aims:

- "to determine the variation in and units of southern African vegetation based on the analysis and synthesis of data from vegetation studies throughout the region, and
- to compile a vegetation map. The aim of the map was to accurately reflect the distribution and variation on the vegetation and indicate the relationship of the vegetation with the environment. For this reason the collective expertise of vegetation scientists from universities and state departments were harnessed to make this project as comprehensive as possible."

Mucina and Rutherford (2012) identified two vegetation types in the study area namely Coega Bontveld and Sundays Thicket.

Coega Bontveld occurs on moderately undulating plains where a mosaic of low thicket (2-3M) built mainly of bushclumps grows. Secondary open grassland occurs over wide stretches. This unit is often restricted to 'islands' in a matrix of typical valley thicket. The species present are a mixture of Fynbos, Grassland and Succulent Karoo elements. The conservation status of this vegetation type is classified as 'Least Threatened'. The conservation target (percent of area) as set by the NSBA is 19%. A total of 10% of this vegetation unit is protected in the Greater Addo Elephant National Park and almost 4% was protected in the private Grassridge Nature Reserve (which has recently been de-proclaimed). Some 4% of Coega Bontveld has been altered by cultivation and 2% by urbanisation. Majority of the Wind Farm components and large sections of the powerline will occur within this vegetation type.

However, it should be noted that the conservation status and significance of the Coega Bontveld has come under debate by various specialists and research scientists and is considered to be poorly protected. This is a result of its localised distribution in the Eastern Cape and due to the direct threat from mining activities in the area. Watson (2002) believes that development could push this vegetation type to near extinction unless it is properly managed.

Sundays Thicket occurs in the Eastern Cape Province and is characterised by undulating plains and low mountains and foothills covered with tall dense thicket. The Sundays Thicket is composed of a mosaic of predominantly spinescent species that include trees, shrubs and succulents. It is classified as 'Least Threatened' with a conservation target of 19%. Approximately 6% has been transformed by cultivation and urban development. Four (4) turbines and small portions of the powerline alternatives are located within this vegetation type.

II. Subtropical Thicket Ecosystem Planning (STEP) Project

The Subtropical Thicket Ecosystem Planning (STEP, 2006) Project aimed to identify priority areas that would ensure the long-term conservation of the subtropical thicket biome and to ensure that the conservation of this biome was considered in the policies and practices of the private and public sector that are responsible for land-use planning and the management of natural resources in the region (Pierce et al. 2005). STEP looked specifically at the thicket biome and provided a finer scale map of the study area than the Mucina and Rutherford map.

According to STEP, the study area is situated largely within the Grassridge Bontveld vegetation unit, with smaller portions of the affected areas being classified as Sundays Valley Thicket and Sundays Spekboom Thicket vegetation units.

Grassridge Bontveld is a valley thicket mosaic type consisting of small patches of Sundays Valley Thicket in a matrix of veld that consists of a combination of species that are characteristic of fynbos (Acmadenia obtusata, Euryops ericifolius), succulent karoo (Pteronia incana) and grassland (Themeda triandra, Eustachys paspaloides). This unit contains many highly localized endemics and is generally restricted to outcrops of limestone (Nanaga formation), often as ‘islands’ in a matrix of Valley Thicket. Several rare and localised endemic plant species occur here, such as Anginon rugosum, Bulbine inae, Euphorbia globosa, Lotononis micrantha and Rhombophyllum rhomboideum. This vegetation type is classified as ‘Currently Not Vulnerable’. Majority of the Wind Farm components and powerline will occur within this vegetation type.

Sundays Valley Thicket is a vegetation type dominated by Schotia afra and Euclea undulata while Euphorbia ledienii and Aloe africana are reliable indicator species of this vegetation type. This vegetation type is classified as ‘Currently not vulnerable’. Two turbines and small portions of the powerline alternatives are located within this vegetation type.

Sundays Spekboom Thicket is a unit of Sundays Valley Thicket that contains Spekboom (Portulacaria afra). Pappea capensis (dopprium) usually dominates the tree component, while suurnoors (Euphorbia ledienii) and wilde granaat (Rhigozum obovatum) are characteristically common. In arid sites (such as those south of Kirkwood). In higher rainfall sites (such as in the Addo National Park) the woody component is much better developed than in arid areas (south of Kirkwood) with Pappea capensis, Putterlickia verrucosa, Rhigozum obovatum, Rhus pterota, Rhus longispina and Schotia afra being abundant, but Euphorbia ledienii is rare here. The local soil condition also affects the species composition. On, for instance, deep alluvial soils next to the Sundays River Spekboom and several other succulent species are abundant, the woody component is very poorly developed. There is thus a fair amount of heterogeneity within the Sundays Spekboom Thicket unit, which could be distinct subtypes that are not recognised here. Two turbines are located within this vegetation type. This vegetation type is classified as ‘Vulnerable’.

III. Nelson Mandela Bay Metropolitan Open Space System

The NMBMM has implemented a systematic conservation assessment and plan to conserve a representative proportion of all biodiversity in the Municipality – The Metropolitan Open Space System (NMB MOSS, 2009). To achieve this goal, a suite of Critical Biodiversity Areas (CBAs) and Critical Ecosystem Support Areas (CESAs) were identified. These areas, if safe guarded, will facilitate the long-term persistence of a representative portion of all biodiversity patterns, ecological processes and species of conservation concern (NMB MOSS, 2009). This Conservation Plan was gazetted in March 2015 as part of the Metropolitan Bioregional Plan and is now widely used as the most recent and applicable fine scale conservation assessment in the NMBM.

The NMB MOSS (2009) identifies three vegetation types in the study area namely Grassridge Bontveld, Sundays Spekboom Thicket and Sundays Valley Thicket.

Grassridge Bontveld is a subtropical Valley Thicket habitat unit consisting of small clumps of Sundays Valley Thicket in a matrix of veld that consists of a combination of species that are characteristic of fynbos (Acmadenia obtusata, Euryops ericifolius), succulent karoo (Pteronia incana) and grassland (Themeda triandra, Eustachys paspaloides). This unit contains many highly localized endemics and is found on the Alexandria Formation. Approximately 90.9% of the intact vegetation remains. This vegetation type is classified as 'Vulnerable'. 31 turbines are located within this vegetation unit.

Sundays Valley Thicket is a subtropical Valley Thicket habitat unit dominated by Boerboon (Schotia afra) and Gwarrie (Euclea undulata) trees. Suurnoors (Euphorbia ledienii) and the Uitenhage aalwyn (Aloe africana) are also reliable indicator species. This unit is generally present on red, loamy to clayey soils derived from the Sundays River and Kirkwood formations. Approximately 74.8% of the intact vegetation remains. This vegetation type is classified as 'Vulnerable'. Six turbines affect this vegetation type.

Sundays Spekboom Thicket is a unit of Valley Thicket dominated by Spekboom (Portulacaria afra). Pappea capensis generally dominates the tree component while Suurnoors (Euphorbia ledienii) and wilde granaat (Rhigozum obovatum) are characteristically common. This vegetation unit is generally present on deep alluvial soils. Approximately 77.4% of the intact vegetation remains. This vegetation type is classified as 'Vulnerable'.10 turbines are located within this vegetation unit.

From a visual impact assessment perspective, the most important features of the vegetation of the area are its height and density. The vegetation of the area consists of grassland with islands of thicket patches. The height of the thicket patches does not exceed about 3 metres. Tall trees are rare. The vegetation of the area therefore will not screen views of the wind turbines.

5.2 Description of the affected socio-economic environment

The site for the Bayview Wind Farm falls within NMBMM, within the Cacadu (now known as Sarah Baartman) District Municipality. It is likely that the development of the Bayview Wind Farm will have socio-economic impacts on the local municipal area and its population.

The NMBMM encompasses the towns of Port Elizabeth, Uitenhage, Despatch and the surrounding agricultural areas.

The NMBMM has a total population of 1,152,115 (Census, 2011). From 2001 to 2011, the population grew by 1.36% annually. The age distribution of the municipality is as follows:

- 0 – 14 years: 25.5 % of the population or 293,789 people.
- 15 – 35 years: 37.1 % of the population or 427,435 people.
- 36 – 64 years: 31.4 % of the population or 361,764 people.
- 65 +: 6 % of the population or 69,127 people.

It is a major seaport and automotive manufacturing centre. The largest economic sectors in the NMBMM are manufacturing, finance, community services and transport. Community services, trade and manufacturing sectors are the sectors that create the most employment in the metro.

5.3 Identified sensitive receptors

Visually sensitive receptors are locations or areas where people may have a significantly increased visual sensitivity or exposure to changes in the surrounding environment.

Within the study area, the following visually sensitive receptors were identified and can be classified into two categories:

1. Visually sensitive points, comprising of
    a. Farm homesteads, and
    b. Guest accommodation.
2. Visually sensitive areas, comprising of
    a. The urban areas of Motherwell, Addo and Colchester,
    b. The Addo Elephant National Park, and
    c. The R335.

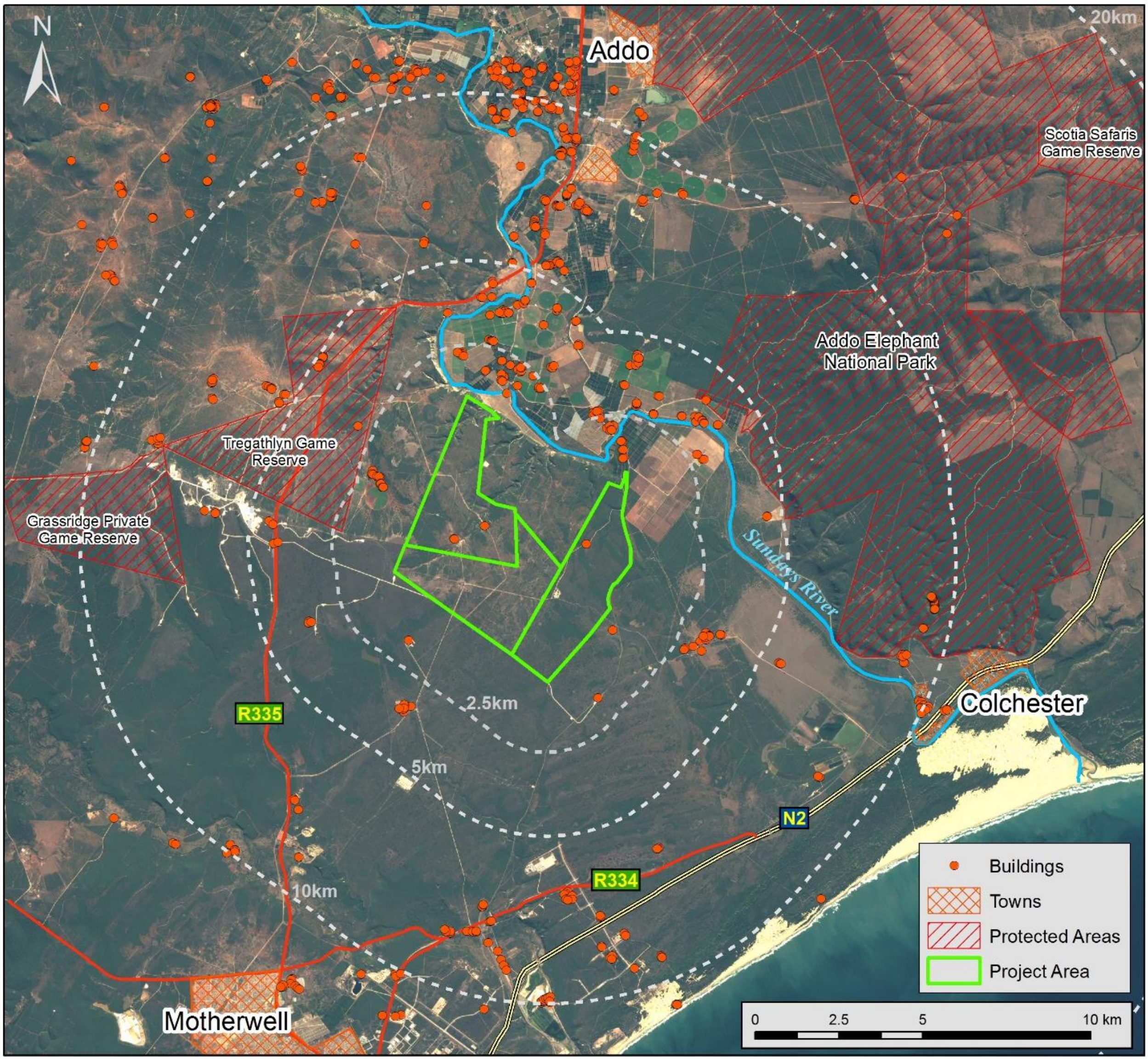

Figure 6: Possible Visually Sensitive Receptors

6 DESCRIPTION OF ALTERNATIVES

Integral to the EIA process is the consideration and evaluation of alternatives to the proposed development plan. This is also applicable when conducting specialist studies including VIAs. A detailed description of the process involved in selecting the preferred alternative, and other alternatives considered, is provided in the Environmental Impact Assessment Report (EIAR) for this project. For the purposes of this VIA, the following alternatives have been assessed.

6.1 Fundamental alternatives

6.1.1 Location alternative

Only the project area described in this report has been considered.

6.1.2 On-site substation location alternatives

Two substation alternatives have been proposed. The alternatives are approximately 800m apart and located in the centre of the proposed turbine layout. The viewshed of these substation alternatives have not been considered as they are considered to be “swallowed” by the much more significant viewshed of the turbines and overhead power lines.

6.1.3 Overhead line alternatives

Four overhead power line alternatives have been considered.

6.1.4 Operational and maintenance building alternatives

Two O&M building alternatives have been proposed. These are located adjacent to the two substation alternatives. For the same reason as the substation alternatives, the viewshed of these alternatives have not been considered.

6.1.5 Technology alternatives

One technology alternative namely, a wind farm.

6.2 Incremental alternatives

6.2.1 Turbine layout alternatives

One turbine layout of 47 positions has been assessed.

6.3 No-go alternative

The no-go alternative is considered in Section 8.3.6.

7 SIMULATED VIEWS FROM SELECTED OBSERVER POINTS

Photographs from observer points were taken during the field visit (1st to the 3rd of November 2017). These observer points are provided on the map below (Figure 7) and are explained in the following pages. The explanation includes an assessment of each observer point based on the simulated view provided.

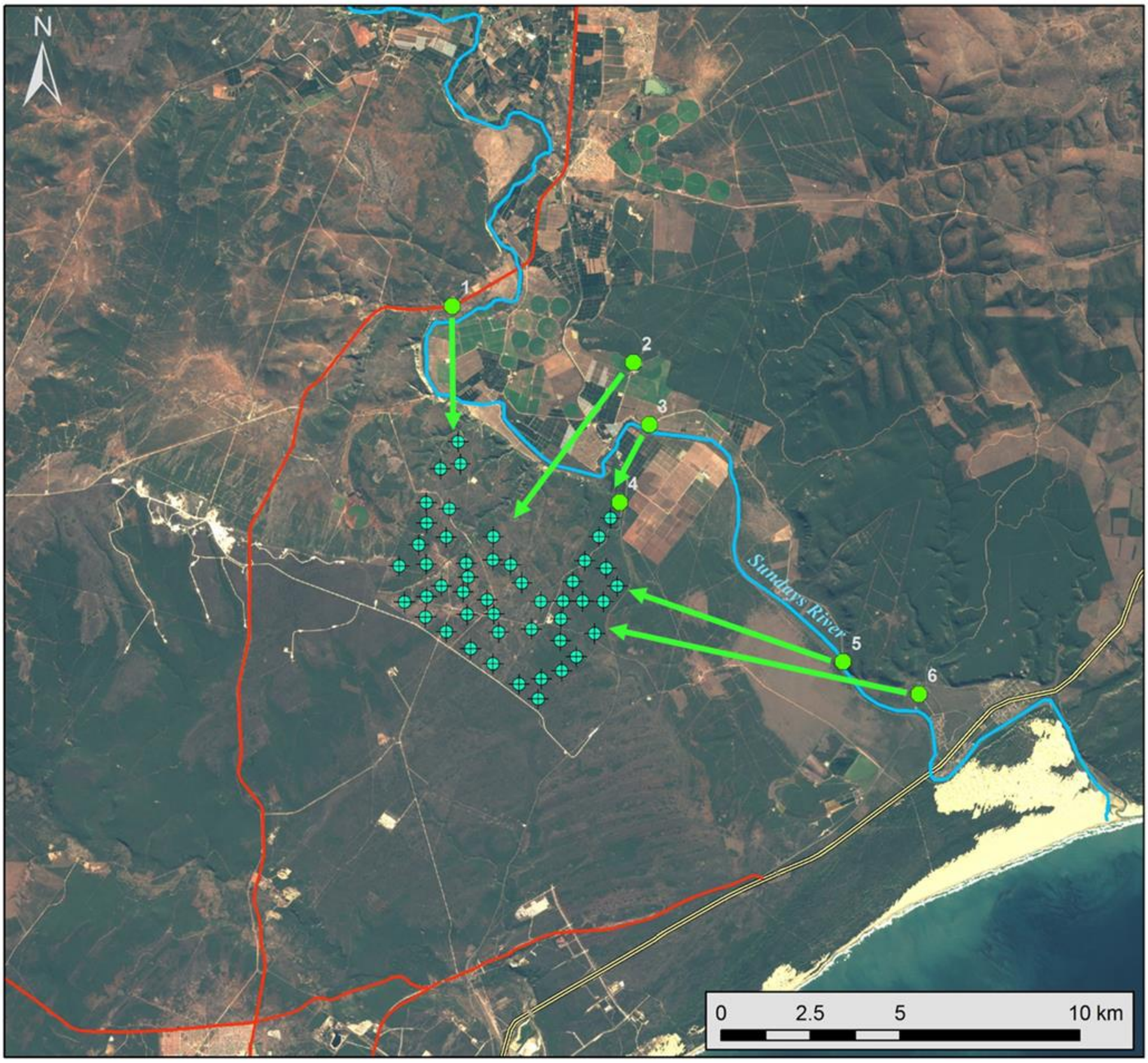

Figure 7: Location of viewpoints (green dots) in relation to the proposed turbines (blue dots)

7.1 Point 1

Coordinates: 33.590632° S *(Latitude)*, 25.654270° E *(Longitude)*

Closest turbine: 3 788m

Figure 8 is an indication of the visibility of the proposed WEF from viewpoint 1. Figure 8a is panoramic photograph of the landscape and Figure 8b is a Google Earth image comprising actual-sized turbine models as a respresentation of the visual impact that the proposed WEF will have on the surrounding landscape.

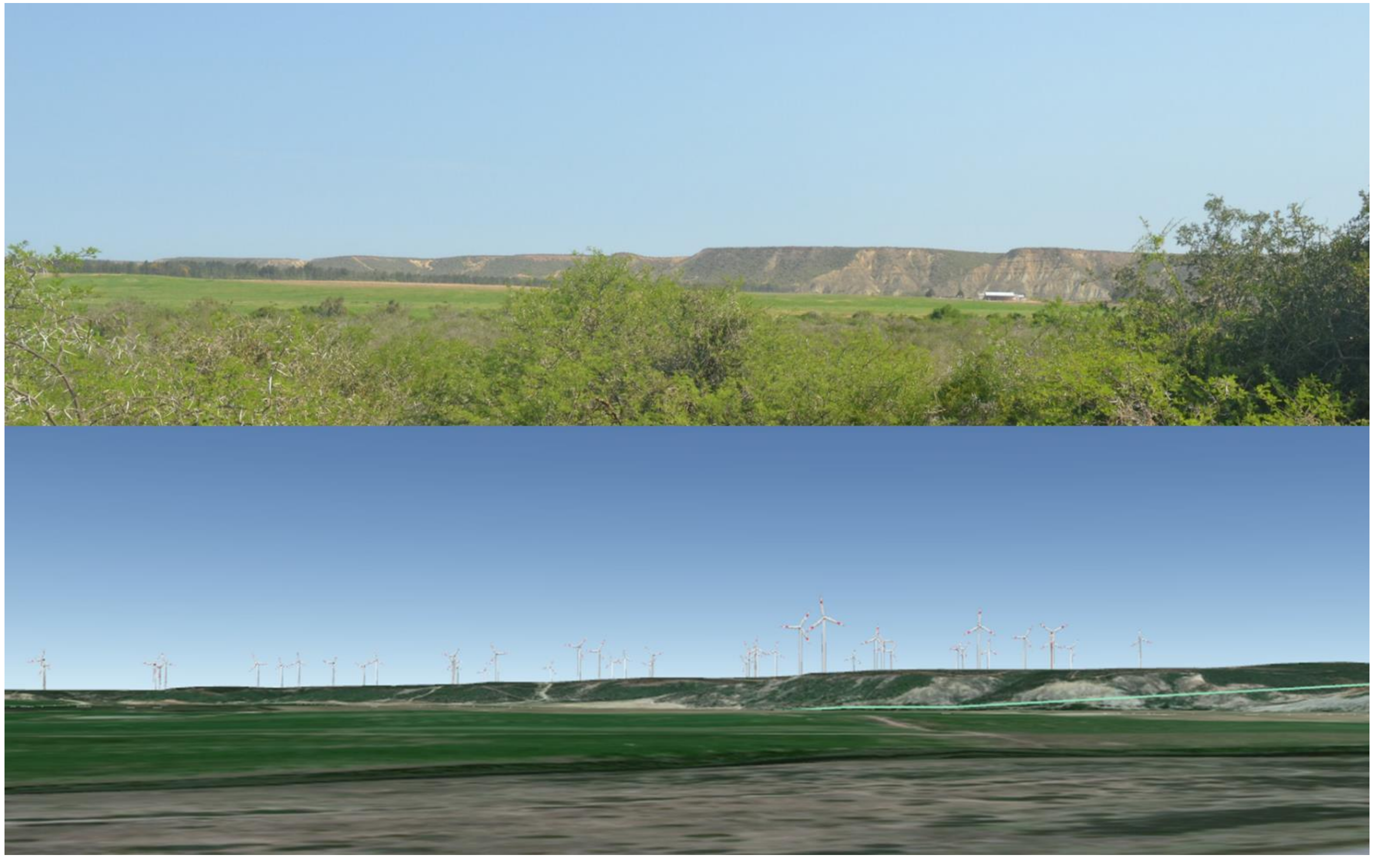

Figure 8: a) Panoramic photograph of the landscape and b) simulated view for viewpoint 1

7.2 Point 2

Coordinates: 33.605367° S *(Latitude)*, 25.708452° E *(Longitude)*

Closest turbine: 4 358m

Figure 9 is an indication of the visibility of the proposed WEF from viewpoint 2. Figure 9a is panoramic photograph of the landscape and Figure 9b is a Google Earth image comprising actual-sized turbine models as a respresentation of the visual impact that the proposed WEF will have on the surrounding landscape.

Figure 9: a) Panoramic photograph of the landscape and b) simulated view for viewpoint 2

7.3 Point 3

Coordinates: 33.621110° S *(Latitude)*, 25.713068° E *(Longitude)*

Closest turbine: 2 792m

Figure 10 is an indication of the visibility of the proposed WEF from viewpoint 3. Figure 10a is panoramic photograph of the landscape and Figure 10b is a Google Earth image comprising actual-sized turbine models as a respresentation of the visual impact that the proposed WEF will have on the surrounding landscape.

Figure 10: a) Panoramic photograph of the landscape and b) simulated view for viewpoint 3

7.4 Point 4

<u>Coordinates</u>: 33.604531° S *(Latitude)*, 25.709802° E *(Longitude)*

<u>Closest turbine</u>: 499m

Figure 11 is an indication of the visibility of the proposed WEF from viewpoint 4. Figure 11a is panoramic photograph of the landscape and Figure 11b is a Google Earth image comprising actual-sized turbine models as a respresentation of the visual impact that the proposed WEF will have on the surrounding landscape.

Figure 11: a) Panoramic photograph of the landscape and b) simulated view for viewpoint 4

7.5 Point 5

Coordinates: 33.681362° S *(Latitude)*, 25.770424° E *(Longitude)*

Closest turbine: 6 657m

Figure 12 is an indication of the visibility of the proposed WEF from viewpoint 5. Figure 12a is panoramic photograph of the landscape and Figure 12b is a Google Earth image comprising actual-sized turbine models as a representation of the visual impact that the proposed WEF will have on the surrounding landscape.

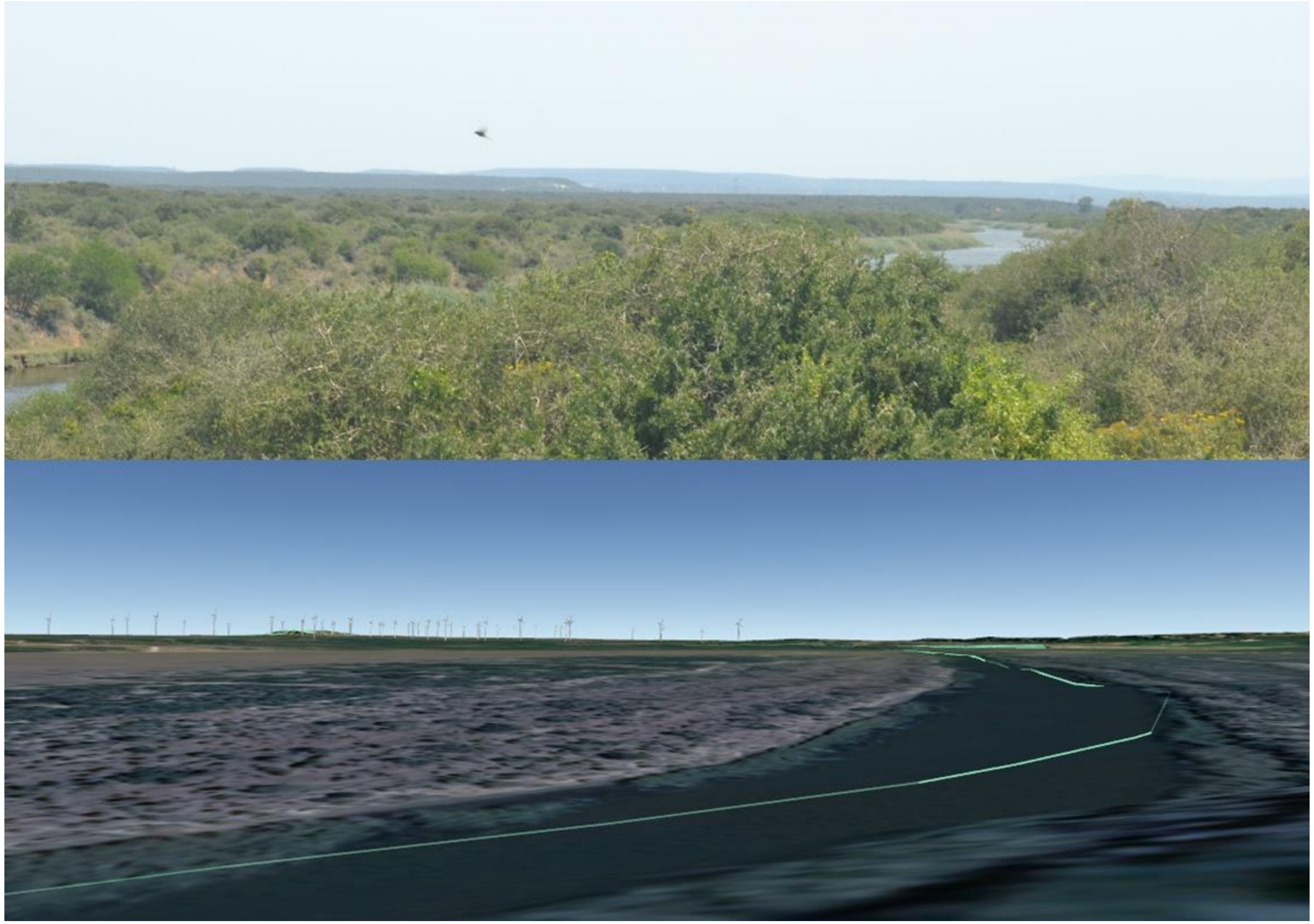

Figure 12: a) Panoramic photograph of the landscape and b) simulated view for viewpoint 5

7.6 Point 6

<u>Coordinates</u>: 33.689679° S *(Latitude)*, 25.793128° E *(Longitude)*

<u>Closest turbine</u>: 8 943m

Figure 13 is an indication of the visibility of the proposed WEF from viewpoint 6. Figure 13a is panoramic photograph of the landscape and Figure 13b is a Google Earth image comprising actual-sized turbine models as a representation of the visual impact that the proposed WEF will have on the surrounding landscape.

Figure 13: a) Panoramic photograph of the landscape and b) simulated view for viewpoint 6

8 ASSESSMENT OF IMPACTS

The assessment and mitigation of impacts should be conducted in the following way:

- Identify visual impact criteria (key theoretical concepts);
- Conduct a visibility analysis; and
- Assess the impacts of the proposed wind farm taking into consideration factors such as sensitive viewers and viewpoints, visual exposure and visual intrusion.

Oberholzer (2005) notes that thresholds of significance define the level or limit at which point an impact changes from low to medium significance, or medium to high significance. These thresholds are often determined by current societal values which define what would be acceptable or unacceptable to society and may be expressed in the form of legislated standards, guidelines or objectives. However, unlike water quality or air quality, thresholds for visual or scenic quality cannot be easily quantified, as they tend to be abstract, and often relate to cultural values or perceptions. A second difficulty is that natural, rural and urban landscapes are constantly changing, and the assessment will therefore need to consider this in determining the significance of impacts. A third difficulty may be the divergence of opinion on what constitutes 'acceptable' change, by the individual, the community or society in general.

The visual assessment should recognise that some change to the landscape over time is inevitable with the expansion of urban areas and introduction of new technologies, such as communication masts. This will have a bearing on significance ratings, particularly in identified growth areas.

8.1 Visual impact assessment criteria used in assessing the magnitude and significance of the project

Oberholzer (2005) recommends that the following specific visual impact assessment criteria should be considered. This provides a way to measure the magnitude and determine the significance of the potential impact. The proposed project should be considered against these criteria before attempting to assess the significance of the visual impacts.

Table 5: Visual Assessment Criteria

Criteria	High	Moderate	Low
Visibility of the project – the geographic area from which the project will be visible, or view catchment area. (The actual zone of visual influence of the project may be smaller because of screening by existing trees and buildings). This also relates to the number of receptors affected.	*High visibility* – visible from a large area (e.g. several square kilometres).	*Moderate visibility* – visible from an intermediate area (e.g. several hectares).	*Low visibility* – visible from a small area around the project site.
Visual exposure – based on distance from the project to selected viewpoints. Exposure or visual impact tends to diminish exponentially with distance.	*High exposure* – dominant or clearly noticeable;	*Moderate exposure* – recognisable to the viewer;	*Low exposure* – not particularly noticeable to the viewer;
Visual sensitivity of the area – the inherent visibility of the landscape, usually determined by a combination of topography, landform, vegetation cover and settlement pattern. This translates into visual sensitivity.	*High visual sensitivity* – highly visible and potentially sensitive areas in the landscape.	*Moderate visual sensitivity* – moderately visible areas in the landscape.	*Low visual sensitivity* – minimally visible areas in the landscape.

Visual sensitivity of Receptors – The level of visual impact considered acceptable is dependent on the type of receptors.	*High sensitivity* – e.g. residential areas, nature reserves and scenic routes or trails;	*Moderate sensitivity* – e.g. sporting or recreational areas, or places of work;	*Low sensitivity* – e.g. industrial, mining or degraded areas.
Visual absorption capacity (VAC) - the potential of the landscape to conceal the proposed project, i.e.	*Low VAC* - e.g. little screening by topography or vegetation.	*Moderate VAC* - e.g. partial screening by topography and vegetation;	*High VAC* – e.g. effective screening by topography and vegetation;
Visual intrusion – the level of compatibility or congruence of the project with the particular qualities of the area, or its 'sense of place'. This is related to the idea of context and maintaining the integrity of the landscape or townscape.	*High visual intrusion* – results in a noticeable change or is discordant with the surroundings;	*Moderate visual intrusion* – partially fits into the surroundings, but clearly noticeable;	*Low visual intrusion* – minimal change or blends in well with the surroundings.
Note: *Various components of the project, such as the structures, lighting or power-lines, may have to be rated separately, as one component may have fewer visual impacts than another. This could have implications when formulating alternatives and mitigations.*			

8.1.1 Visibility of the project

The visibility of the project is an indication of where in the region the development will potentially be visible from. The rating is based on viewshed size only and is an indication of how much of a region will potentially be affected visually by the development. A high visibility rating does not necessarily signify a high visual impact, although it can if the region is densely populated with sensitive visual receptors.

The calculated viewsheds (Figures 14-18) indicate not only where the Bayview Wind Farm will be visible from, but also indicates how many turbines will be visible from that point or area. As expected the visibility is high in terms of area due to the turbine heights and their location on relatively elevated land.

Visibility of the Bayview Wind Farm: **HIGH**

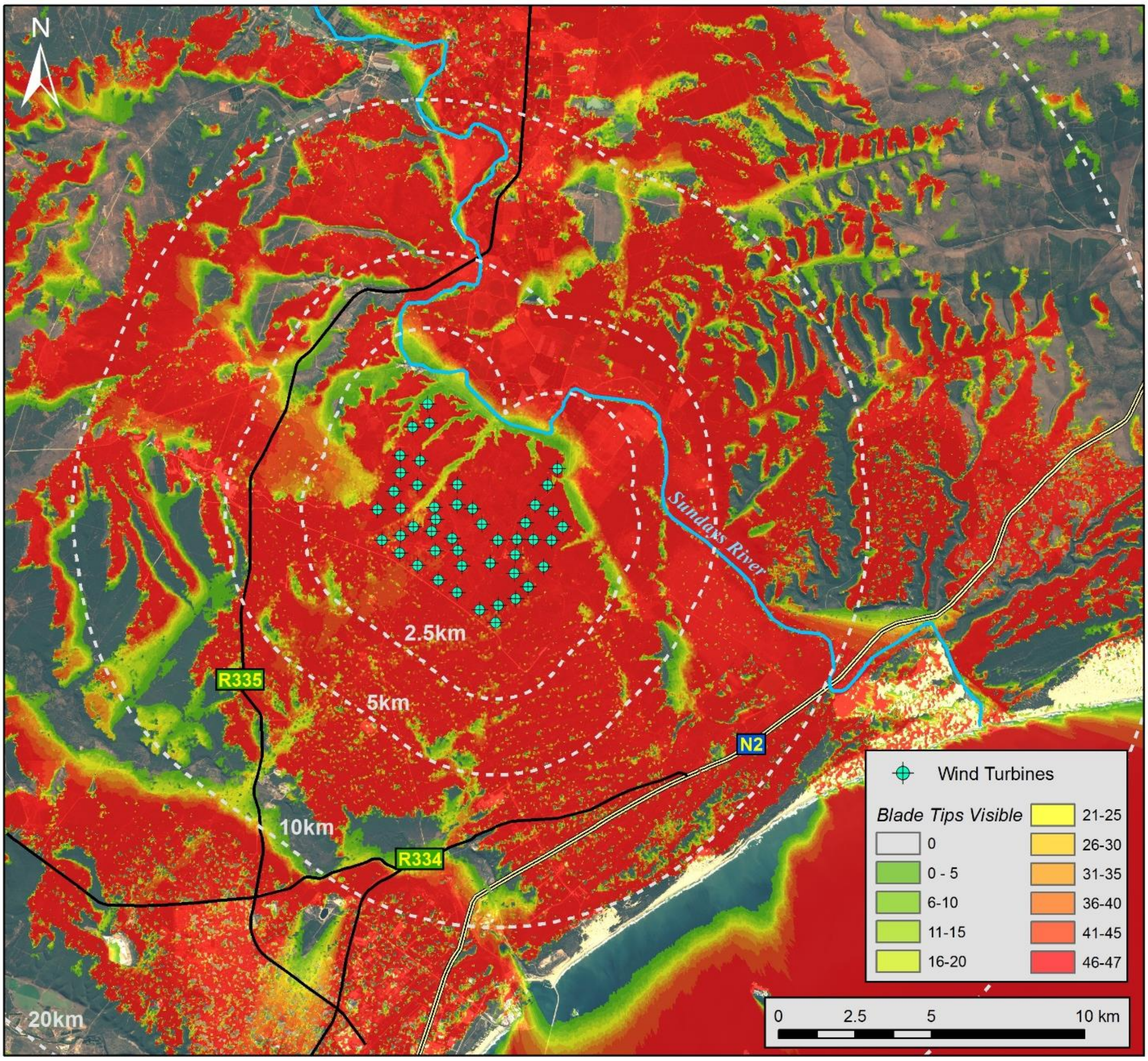

Figure 14: Cumulative viewshed of the 47 proposed wind turbines

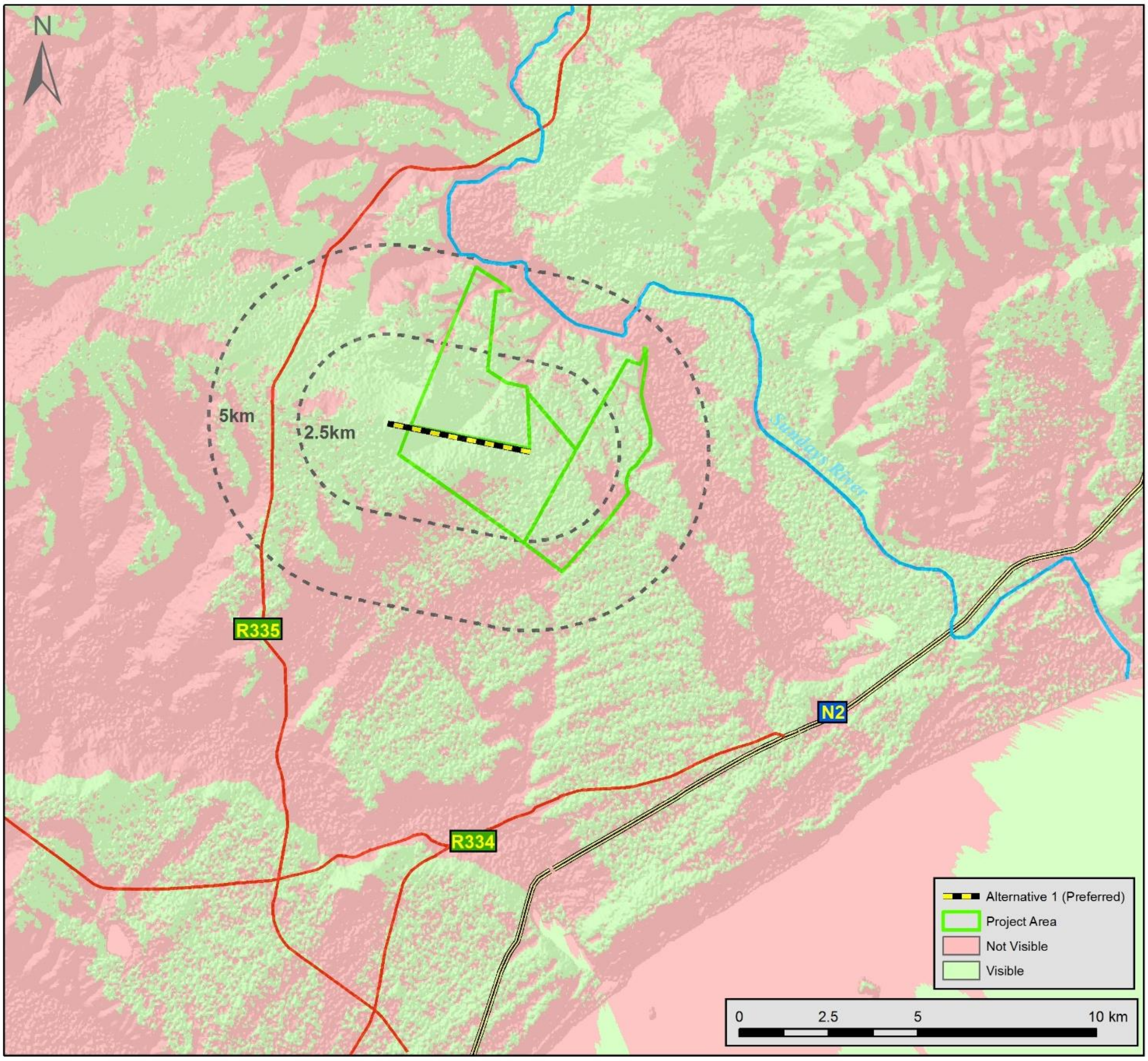

Figure 15: Viewshed of powerline alternative 1 (preferred)

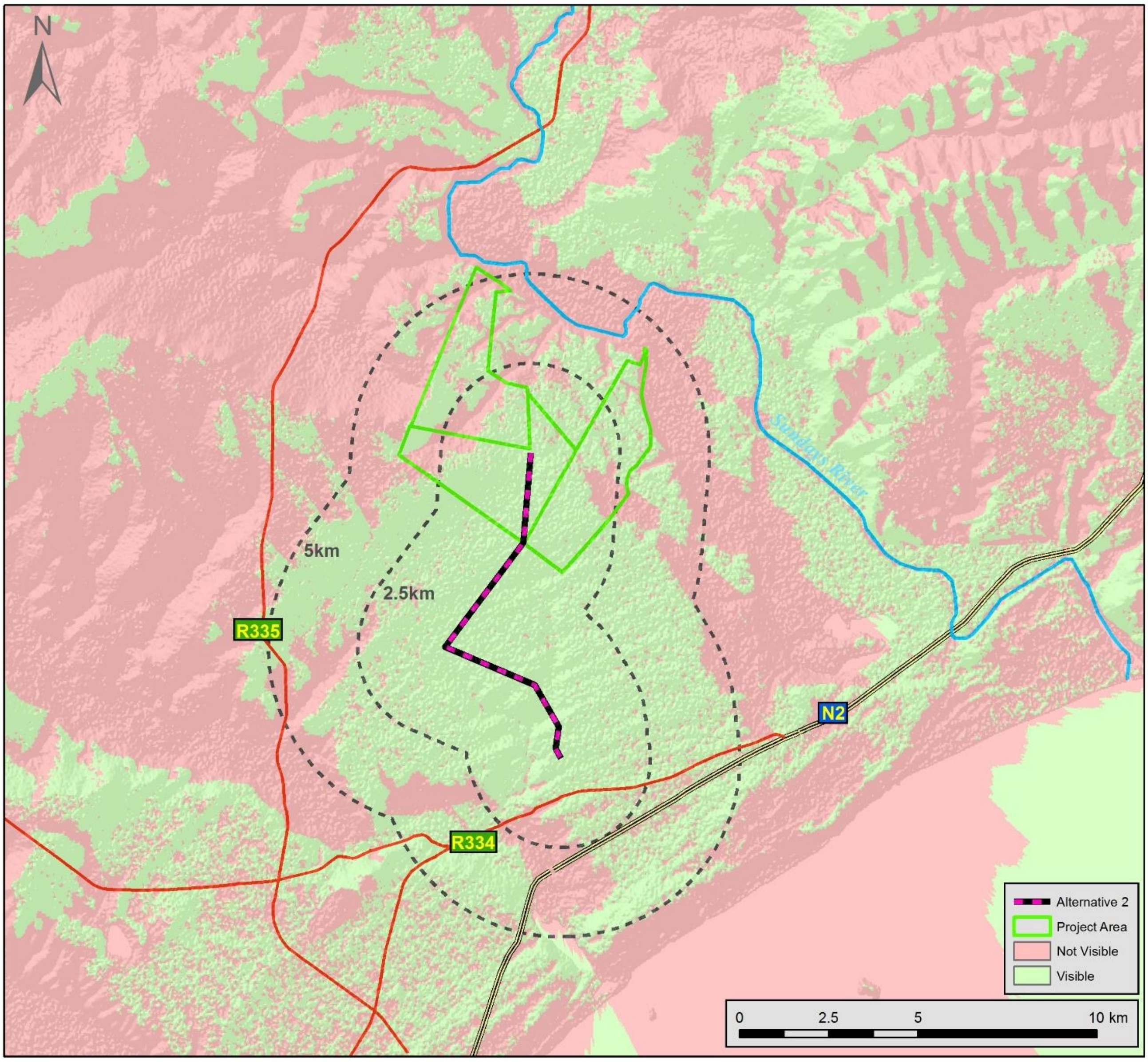

Figure 16: Viewshed of powerline alternative 2

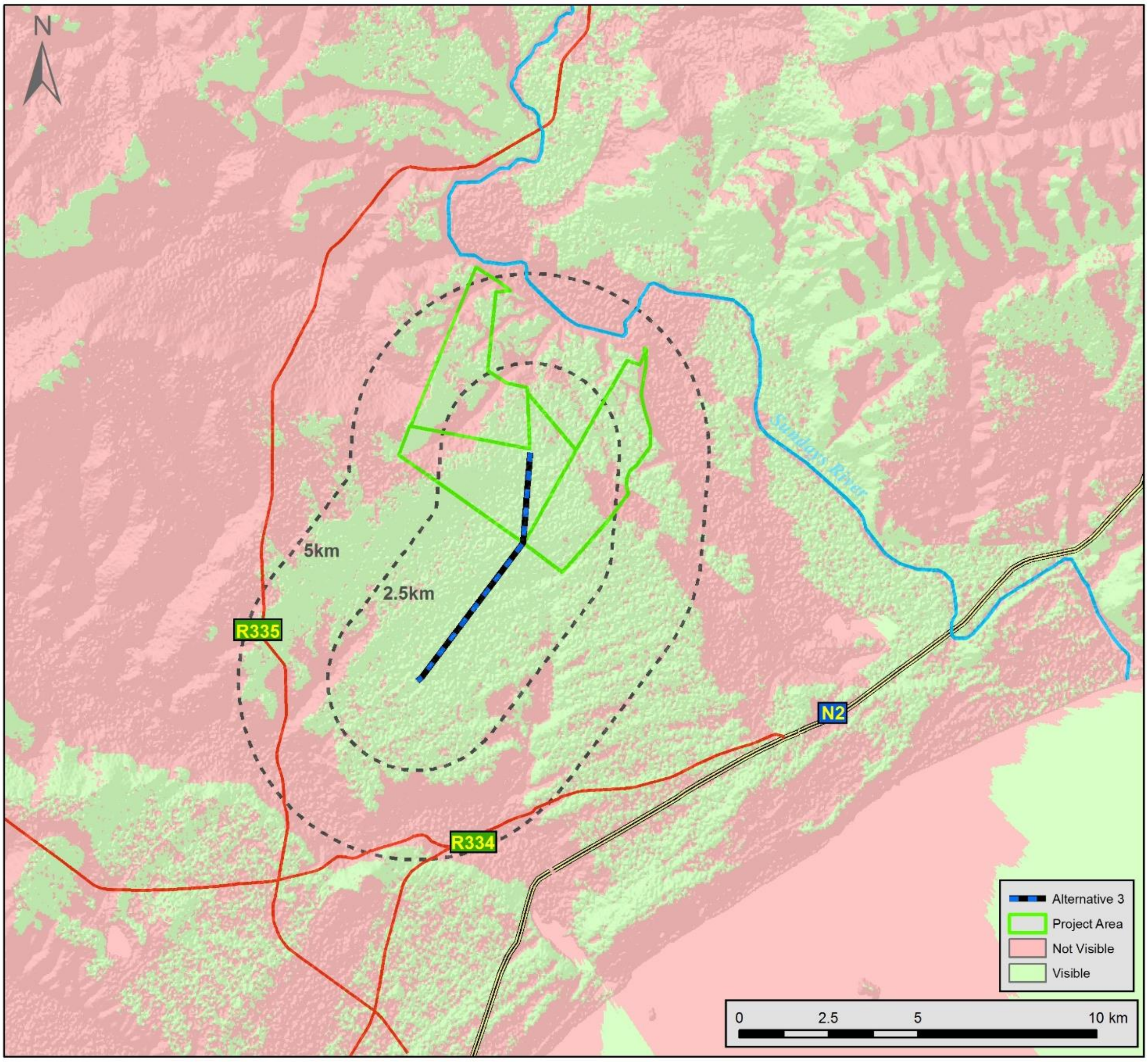

Figure 17: Viewshed of powerline alternative 3

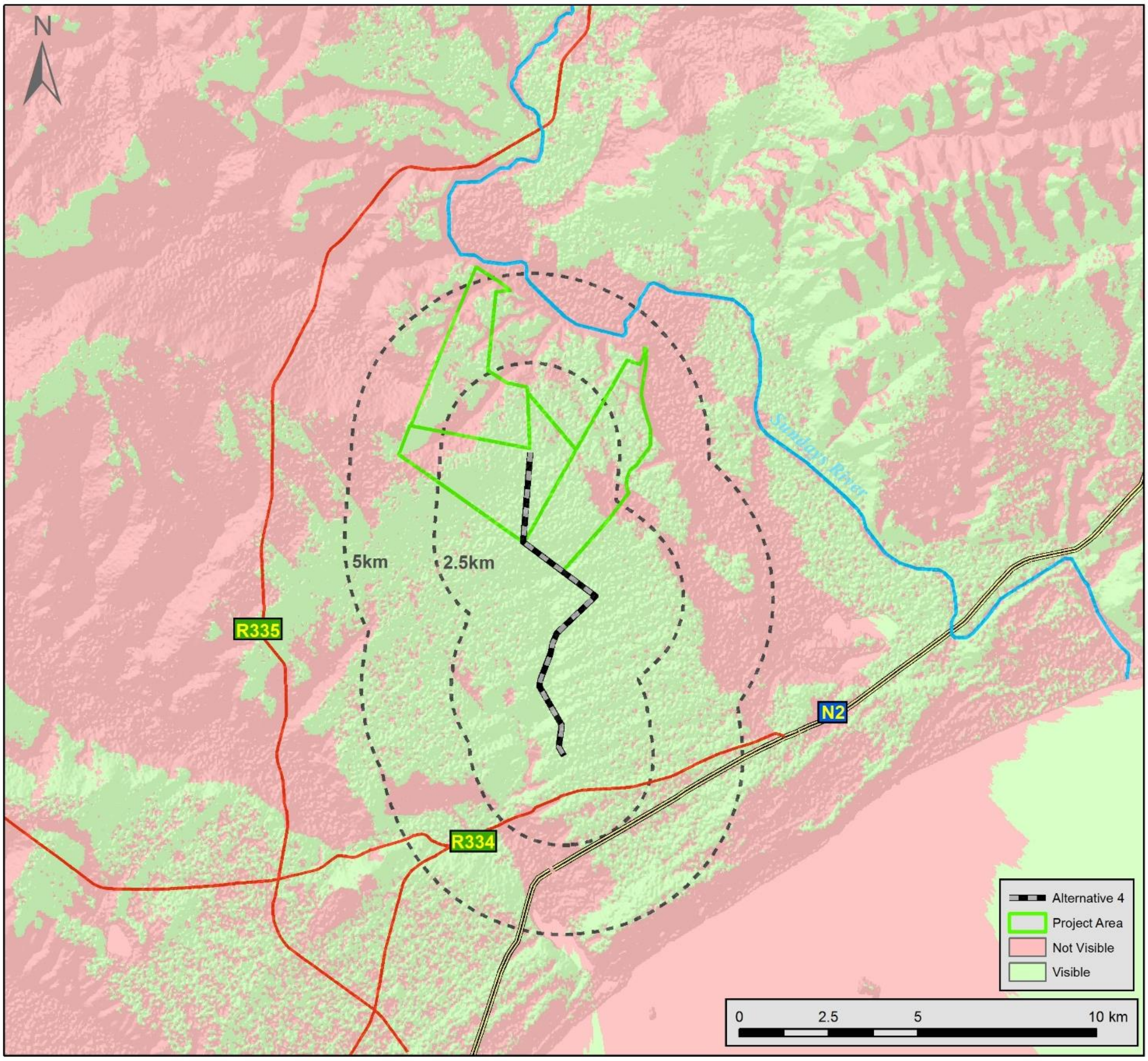

Figure 18: Viewshed of powerline alternative 4

8.1.2 Visual Sensitivity

Visual sensitivity is the inherent visibility of the landscape, usually determined by a combination of topography, landform, vegetation cover and settlement pattern. This translates into visual sensitivity.

Turbines are generally located at the highest altitudes in the local environment in order to capture the strongest possible winds. In addition to this the vegetation of the area consists of grassland with islands of thicket patches. The height of the thicket patches does not exceed about 3 metres and tall trees are rare. The vegetation of the area, therefore, will not screen views of the wind turbines. As expected, the visual sensitivity is high due to the turbine heights, their location on relatively elevated land and the relatively low surrounding vegetation.

Visual Sensitivity of the Bayview Wind Farm: **HIGH**

8.1.3 Visual Sensitivity and Exposure of Receptors

Viewer (or visual receptor) sensitivity is a measure of how sensitive potential viewers of the development are to changes in their views. The sensitivity of viewer groups depends on their activity and awareness within the affected landscape, their preferences, preconceptions and their opinions. Visual receptors are identified by looking at the development viewshed, and include scenic viewpoints, residents, motorists and recreational users of facilities within the viewshed. A large number of highly sensitive visual receptors can be a predictor of a high intensity/magnitude visual impact although their distance from the development (measured as visual exposure) and the current composition of their views (measured as visual intrusion – Section 8.1.4) will have an influence on the significance of the impact.

The following visually sensitive features (as per Figure 6) were identified within the study area:

1. Visually sensitive points, comprising:
    a. Farm homesteads, and
    b. Guest accommodation.
2. Visually sensitive areas, comprising:
    a. The urban areas of Motherwell, Addo and Colchester,
    b. The Addo Elephant National Park, and
    c. The R335.

In this report the following distances from the site are used as proxy for categories of exposure:
- High exposure – 0 to 2.5km from the development.
- Moderate exposure – 2.6 to 5km from the development.
- Low exposure – greater than 5km from the development.

Visual Exposure & Sensitivity of Receptors: **LOW / MODERATE / HIGH**

Visually Sensitive Features	Sensitivity	Exposure
Farm Houses	**HIGH**	**HIGH - LOW**
Guest Accommodation	**HIGH**	**MODERATE - LOW**
Urban Areas (Motherwell, Addo and Colchester)	**HIGH**	**LOW**
Addo Elephant National Park	**HIGH**	**MODERATE - LOW**
R335	**MODERATE**	**MODERATE - LOW**

8.1.4 Visual Intrusion

Visual intrusion is the level of compatibility or congruence of the project with the particular qualities of the area, or its 'sense of place'. This is related to the idea of context and maintaining the integrity of the landscape or townscape.

- High visual intrusion – results in a noticeable change or is discordant with the surroundings;
- Moderate visual intrusion – partially fits into the surroundings, but clearly noticeable;
- Low visual intrusion – minimal change or blends in well with the surroundings.

Sense of place is defined by (Oberholzer 2005) as: 'The unique quality or character of a place... relates to uniqueness, distinctiveness or strong identity.' It describes the distinct quality of an area that makes it memorable to the observer.

The Visual Intrusion of the proposed wind farm is rated as moderate considering that there are other wind farms in the area and would therefore partially fit into the surroundings.

Visual Intrusion of the Bayview Wind Farm: **MODERATE**

8.2 Impact Rating Methodology

The following standard rating scales have been defined for assessing and quantifying the identified impacts. This is necessary since impacts have a number of parameters that need to be assessed. The identified impacts have been assessed against the following criteria:

- Relationship of the impact to **temporal scales** - the temporal scale defines the significance of the impact at various time scales, as an indication of the duration of the impact.
- Relationship of the impact to **spatial scales** - the spatial scale defines the physical extent of the impact.
- The **likelihood of the impact occurring** - the likelihood of impacts taking place as a result of project actions differs between potential impacts. There is no doubt that some impacts would occur (e.g. loss of vegetation), but other impacts are not as likely to occur (e.g. vehicle accident), and may or may not result from the proposed development. Although some impacts may have a severe effect, the likelihood of them occurring may affect their overall significance.
- The **severity of the impact** - the severity/beneficial scale is used in order to scientifically evaluate how severe negative impacts would be, or how beneficial positive impacts would be on a particular affected party.

  The severity of impacts should be evaluated with and without mitigation in order to demonstrate how serious the impact is when nothing is done about it. The word ‘mitigation’ means not just ‘compensation’, but also the ideas of containment and remedy. However, mitigation must be practical, technically feasible and economically viable.

Table 6: Criteria used to rate the significance of an impact

Temporal scale (*the duration of the impact*)	
Short term	Less than 5 years (Many construction phase impacts are of a short duration).
Medium term	Between 5 and 20 years.
Long term	Between 20 and 40 years (From a human perspective almost permanent).
Permanent	Over 40 years or resulting in a permanent and lasting change that will always be there.
Spatial scale (*the area in which any impact will have an effect*)	
Localised	Impacts affect a small area of a few hectares in extent. Often only a portion of the project area.
Study Area	The proposed site and its immediate surroundings.
Municipal	Impacts affect the Nelson Mandela Bay Metropolitan Municipality, or any towns within the municipality.
Regional	Impacts affect the wider area or the Eastern Cape Province as a whole.
National	Impacts affect the entire country.
International/Global	Impacts affect other countries or have a global influence
Likelihood (*the confidence with which one has predicted the significance of an impact*)	
Definite	More than 90% sure of a particular fact. Should have substantial supportive data.
Probable	Over 70% sure of a particular fact, or of the likelihood of that impact occurring.
Possible	Only over 40% sure of a particular fact, or of the likelihood of an impact occurring.
Unlikely	Less than 40% sure of a particular fact, or of the likelihood of an impact occurring.

Table 7: Impact severity rating

Impact severity *(The severity of negative impacts, or how beneficial positive impacts would be on a particular affected system or affected party)*	
Very severe	**Very beneficial**
An irreversible and permanent change to the affected system(s) or party(ies) which cannot be mitigated. For example the permanent loss of land.	A permanent and very substantial benefit to the affected system(s) or party(ies), with no real alternative to achieving this benefit. For example the vast improvement of sewage effluent quality.
Severe	**Beneficial**
Long term impacts on the affected system(s) or party(ies) that could be mitigated. However, this mitigation would be difficult, expensive or time consuming, or some combination of these. For example, the clearing of forest vegetation.	A long term impact and substantial benefit to the affected system(s) or party(ies). Alternative ways of achieving this benefit would be difficult, expensive or time consuming, or some combination of these. For example an increase in the local economy.
Moderately severe	**Moderately beneficial**
Medium to long term impacts on the affected system(s) or party (ies), which could be mitigated. For example constructing a sewage treatment facility where there was vegetation with a low conservation value.	A medium to long term impact of real benefit to the affected system(s) or party(ies). Other ways of optimising the beneficial effects are equally difficult, expensive and time consuming (or some combination of these), as achieving them in this way. For example a 'slight' improvement in sewage effluent quality.
Slight	**Slightly beneficial**
Medium or short term impacts on the affected system(s) or party(ies). Mitigation is very easy, cheap, less time consuming or not necessary. For example a temporary fluctuation in the water table due to water abstraction.	A short to medium term impact and negligible benefit to the affected system(s) or party(ies). Other ways of optimising the beneficial effects are easier, cheaper and quicker, or some combination of these.
No effect	**Don't know/Can't know**
The system(s) or party(ies) is not affected by the proposed development.	In certain cases it may not be possible to determine the severity of an impact.

Table 8: Matrix used to determine the overall significance of the impact based on the likelihood and effect of the impact

		Effect													
		3	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**
Likelihood	**1**	4	5	6	7	8	9	10	11	12	13	14	15	16	17
	2	5	6	7	8	9	10	11	12	13	14	15	16	17	18
	3	6	7	8	9	10	11	12	13	14	15	16	17	18	19
	4	7	8	9	10	11	12	13	14	15	16	17	18	19	20

Table 9: The significance rating scale

Significance	Description
Low	These impacts will usually result in medium to short term effects on the social and/or natural environment. Impacts rated as LOW will need to be considered by the public and/or the specialist as constituting a fairly unimportant and usually short term change to the (natural and/or social) environment. These impacts are not substantial and are likely to have little real effect.
Moderate	These impacts will usually result in medium to long term effects on the social and/or natural environment. Impacts rated as MODERATE will need to be considered by society as constituting a fairly important and usually medium term change to the (natural and/or social) environment. These impacts are real but not substantial.
High	These impacts will usually result in long term effects on the social and/or natural environment. Impacts rated as HIGH will need to be considered by society as constituting an important and usually long term change to the (natural and/or social) environment. Society would probably view these impacts in a serious light.
Very High	These impacts would be considered by society as constituting a major and usually permanent change to the (natural and/or social) environment, and usually result in severe or very severe effects, or beneficial or very beneficial effects.

The ***environmental significance*** scale is an attempt to evaluate the importance of a particular impact. This evaluation needs to be undertaken in the relevant context, as an impact can either be ecological or social, or both. The evaluation of the significance of an impact relies heavily on the values of the person making the judgment. For this reason, impacts of especially a social nature need to reflect the values of the affected society.

Prioritising

The evaluation of the impacts, as described above is used to assess the significance of identified impacts and determine which impacts require mitigation measures.

Negative impacts that are ranked as being of "**VERY HIGH**" and "**HIGH**" significance will be investigated further to determine how the impact can be minimised or what alternative activities or mitigation measures can be implemented. These impacts may also assist decision makers i.e. numerous **HIGH** negative impacts may bring about a negative decision. For impacts identified as having a negative impact of "**MODERATE**" significance, it is standard practice to investigate alternate activities and/or mitigation measures. The most effective and practical mitigations measures will then be proposed. For impacts ranked as "**LOW**" significance, no investigations or alternatives will be considered. Possible management measures will be investigated to ensure that the impacts remain of low significance.

8.3 Assessment of Impacts

8.3.1 Construction phase impacts

The visual impacts during the construction phase of a wind farm are considered less significant than the impacts during the operations phase, due to the fact that:

- The construction phase has a much shorter duration than the operations phase,
- The size of the viewshed is much smaller, due to the fact that the construction equipment is much shorter than the erected wind turbines.

However, the construction of a wind farm of the size proposed will still require a large extent of construction activity, which will be a strong contrast to the current activity levels in the area. Therefore, some level of impact significance is expected and has been assessed.

<u>Construction Phase Impact 1: Visual impact of construction activity</u>

Cause and comment

There are various activities which will take place during the construction phase which may have impacts on sensitive visual receptors:

- Large areas of vegetation will need to be cleared to make way for digging of the turbine foundations, hardstand areas, substation footprints, access roads, laydown areas, workshops and storage yards.
- Construction of wind turbines will potentially draw attention if they are exposed above the skyline.
- There will be a large increase in the movement of vehicles in the area: large trucks delivering supplies and construction material; graders, excavators and bulldozers; light vehicle movement around site; large trucks hauling rubble and construction waste, etc. This may disrupt traffic.
- Soil stockpiles and heaps of vegetation debris.
- Dust emissions from construction activity.
- Activity at night is also probable since transport of large turbine components may occur after work hours to minimise disruption of traffic on main roads.

Construction activities and large vehicles on busy roads in the region around the Coega IDZ (located to the South of the proposed Bayview Wind Farm) is currently a familiar occurrence and therefore the construction phase will not seem out of place.

Mitigation measures

The following mitigation measures are proposed:

- The construction contractor should clearly demarcate construction areas so as to minimise site disturbance.
- Clearance of indigenous vegetation should be minimised and rehabilitation of cleared area should start as soon as possible.
- Treat roads to reduce dust emissions.
- The site should be kept neat and tidy. Littering should be fined and the ECO should organise rubbish clean-ups on a regular basis.
- Night lighting of the construction sites should be minimised within requirements of safety and efficiency. See section on lighting for more specific measures.

Significance statement

The duration of the construction phase impacts will be "*Short Term*". The extent is *"Municipal"* as construction activity will be visible beyond the immediate environs of the site. The severity of the impact is expected to be *"Moderate"* should mitigation measures not be employed. If they are, the impact is expected to be "*Slight*". The likelihood of people in surrounding areas having their views impacted by construction activity is "*Definite*".

Impact	Effect			Risk or Likelihood	Overall Significance
	Temporal Scale	Spatial Scale	Severity of Impact		
Without Mitigation	Short term	Municipal	Moderate	Definite	**MODERATE**
With Mitigation	Short term	Municipal	Slight	Definite	**MODERATE**

8.3.2 Operational phase impacts

Operations Phase Impact 1: Impact of wind turbines on visually sensitive points and areas

Cause and comment

The hub of the turbines proposed will be 150m (worst case scenario) above the ground. The blade length of each turbine is anticipated to be approximately 75 m in length. Therefore the viewshed calculation has calculated the 47 turbines' viewshed using a blade tip height of 225m.

As seen in the cumulative viewshed, most of the turbines will be visible from the surrounding areas. Notable features in this area include: Motherwell, Addo, Colchester, the R335 and multiple homesteads. More importantly to note is that all 47 turbines will be visible in some areas of the Addo Elephant National Park and it is these areas that are considered to be sensitive to the presence of the wind farm.

Mitigation and management

Other than avoiding the site completely there are no mitigation measures that will reduce the visual intrusion of the wind turbines due to their size, height and visibility, and the lack of screening opportunities in the landscape. However there are a number of measures and suggestions that can enhance the positive aspects of the impact.

- Turbines must be properly maintained. A spinning rotor is perceived as being useful. If a rotor is stationary when the wind is blowing it is seen as not fulfilling its purpose and a negative impression is created (Gipe 1995).
- Signs near wind turbines should be avoided unless they serve to inform the public about wind turbines and their function. Advertising billboards should be avoided.
- According to the Aviation Act, 1962, Thirteenth Amendment of the Civil Aviation Regulations, 1997: "Wind turbines shall be painted bright white to provide maximum daytime conspicuousness. The colours grey, blue and darker shades of white should be avoided altogether. If such colours have been used, the wind turbines shall be supplemented with daytime lighting, as required."
- Lighting must be designed to minimise light pollution without compromising safety. Investigate using motion sensitive lights for security lighting. Turbines are to be lit according to Civil Aviation regulations (see Operations Phase Impact 4).

Significance Statement

The duration of the impact will be "*Long Term*". The extent is "Municipal". The severity of the impact is expected to be *"Severe"*. The likelihood of people in surrounding areas having their views impacted is "*Definite*".

Impact	Effect			Risk or Likelihood	Overall Significance
	Temporal Scale	Spatial Scale	Severity of Impact		
Without Mitigation	Long Term	Municipal	Severe	Definite	**HIGH**
With Mitigation	Long Term	Municipal	Severe	Definite	**HIGH**

Operations Phase Impact 2: Impact of overhead powerlines on visually sensitive points and areas

Cause and comment

Powerlines and associated structures are normally experienced as impacting negatively on the aesthetics of a landscape. They often introduce an industrial aspect to otherwise rural landscapes. They are large structures (due to their length) and often highly visible (due to the height of pylons – in this case 22m) and can therefore potentially affect many visual receptors.

Four alternatives for the power lines have been proposed. Viewsheds have been calculated for each alternative. Considering the size and nature of the structures. These will have a far less visual impact that the proposed wind turbines.

Mitigation and management

The following mitigation measures are proposed:

- Areas cleared temporarily during construction should be rehabilitated;
- Towers should be located in such a way as to maximize the screening effect of existing topography – areas where towers will be exposed against the skyline should be avoided where possible;
- Lattice towers are preferred to solid towers since they create lower visual contrast with natural landscape features;
- Towers and structures should have a non-reflective finish;
- The use of strain towers (used where the power line changes direction of more than 3°) should be minimised since the denser lattice pattern is more intrusive on views than the normal suspension towers;
- Powerlines should be built in existing utilities corridors where possible.

Significance Statement

Alternative 1

The duration of the impact will be "*Long Term*". The extent is *"Study Area"*. The severity of the impact is expected to be *"Moderate"*. The likelihood of people in surrounding areas having their views impacted is "Probable".

Impact	Effect			Risk or Likelihood	Overall Significance
	Temporal Scale	Spatial Scale	Severity of Impact		

Without Mitigation	Long Term	Study Area	Moderate	Probable	**MODERATE**
With Mitigation	Long Term	Study Area	Moderate	Possible	**MODERATE**

Alternative 2-4
The duration of the impact will be "*Long Term*". The extent is *"Study Area"*. The severity of the impact is expected to be *"Moderate"*. The likelihood of people in surrounding areas having their views impacted is "*Definite"* without mitigation measures implemented and "*Probable"* with mitigation measures implemented.

Impact	Effect			Risk or Likelihood	Overall Significance
	Temporal Scale	Spatial Scale	Severity of Impact		
Without Mitigation	Long Term	Study Area	Moderate	Definite	**MODERATE**
With Mitigation	Long Term	Study Area	Moderate	Probable	**MODERATE**

Operations Phase Impact 3: Impact of nightlights on existing landscape

Cause and comment

Wind farms are required by law to be lit at night as they represent hazards to aircraft due to the height of the turbines. Marking of turbines depends on wind farm layout and not all turbines need to be lit. Marking consists of a red flashing light of medium intensity (2000 candela).

Mitigation and management

- The aviation standards must be followed (no mitigation measures are applicable in terms of marking the turbines).
- Lighting of ancillary buildings and structures should be designed to minimise light pollution without compromising safety. Motion sensitive lighting can be used for security purposes.

Significance Statement

The duration of the impact will be "*Long Term*". The extent is *"Study Area"*. The severity of the impact is expected to be *"Slight"*. The likelihood of people in surrounding areas having their views impacted is "Probable*"*.

Impact	Effect			Risk or Likelihood	Overall Significance
	Temporal Scale	Spatial Scale	Severity of Impact		
Without Mitigation	Long Term	Study Area	Slight to Moderate	Probable	**MODERATE**
With Mitigation	Long Term	Study Area	Slight to Moderate	Probable	**MODERATE**

Operations Phase Impact 4: Shadow Flicker

Cause and comment

Shadow flicker results from the shade cast by a wind turbine and its rotating blades. The shade cast by the blades “flicker” from the point of view of a stationary observer as the blades rotate. This is most pronounced when the shadow is cast through a building’s opening, such as a window, especially when the window is one of the main sources of light in a room.

The impact of shadow flicker caused by wind turbines appears to be a minor issue in most countries where wind farms are common. There are no official regulations governing the levels of exposure to shadow flicker and it is unclear what the health risks are. Most reports on shadow flicker suggest that the threshold for a significant impact is 30 hours per year or more and many countries have adopted this as an informal regulation, following a court judgement made in Germany (EDR 2009).

England’s Companion Guide to PPS22 (2004) and Northern Ireland’s Best Practice Guidance to PPS18 (2009) state that only properties within 130 degrees either side of north of a particular turbine can be affected by shadows (Parsons Brinckerhoff, 2011). We assume therefore that the situation in South Africa is opposite i.e. only properties within 130 degrees either side of south of a particular turbine can be affected by shadows.

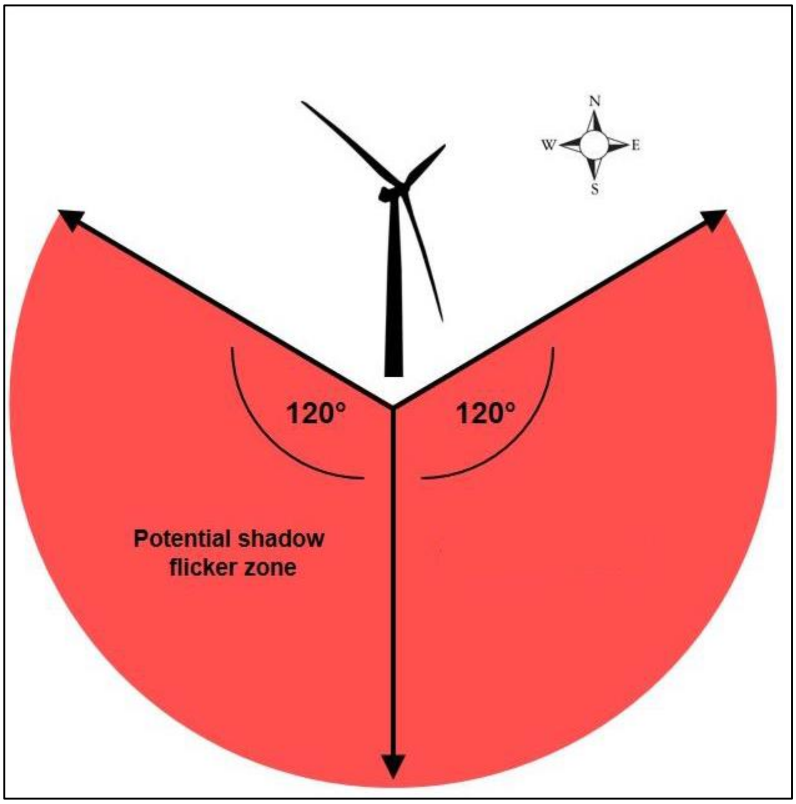

Figure 19: Potential shadow flicker zone in the southern hemisphere

When considering shadow flicker, local conditions also need to be taken into account. These include:

1. <u>The latitude of the sight</u>

Turbines at lower latitudes will cast longer shadows because the sun spends more time closer the horizon. In Australia the South Australian Planning Bulletin (2002) notes that shadow flicker is unlikely to be a significant issue at distances greater than 500 m. Australia lies within approximately the same lines of latitude as South Africa (South Africa: 22°S to 35°S; Australia: 10°S to 44°S).

2. The hub height
   When the hub is higher, the same shadow will be spread over a larger area resulting in a reduced intensity of shadow in the vicinity of the turbine. The turbines to be used in the Bayview Wind Farm have a hub height of 150m (worst case scenario).

3. Intervening vegetation
   Vegetation may screen shadows. In the study area, vegetation is not dense or tall enough to reduce potential shadow flicker impacts.

Shadow flicker only needs to be considered relevant to buildings that are occupied most of the time: residential dwellings and places-of-work. It is not relevant to unoccupied structures, such as storage sheds. Furthermore, shadow flicker is only relevant to occupied buildings that have a window which faces the turbine. Shadow flicker cast against a wall will not impact occupants. As stated previously, it will only be a nuisance to occupants when that shadow temporarily blocks light streaming through a window, resulting in the “flicker” effect.

According to the data sets available to the author there are a few buildings within 500m of a wind turbine. Of these buildings none of them fall within 130 degrees either side of south of a particular turbine and are therefore unlikely to experience shadow flicker.

Mitigation and management

The following mitigation measures are possible if a receptor experiences shadow flicker, however due to the above discussion, it is unlikely that this impact will occur:

1. Blinds should be installed;
2. Increase the visual absorption capacity of the landscape around the receptor by supporting tree-planting programmes;
3. Temporary turbine shut-down. This can be done when a particular turbine is causing shadow flicker at a particular time of the day.

Significance Statement

The duration of the impact will be “*Long Term”*. The extent is *“Local”*. The severity of the impact is expected to be *“Moderate”* without mitigation and *“slight”* with mitigation. The likelihood of people in surrounding areas having their views impacted is “*Unlikely”*.

Impact	Effect			Risk or Likelihood	Overall Significance
	Temporal Scale	Spatial Scale	Severity of Impact		
Without Mitigation	Long Term	Local	Moderate	Unlikely	**LOW**
With Mitigation	Long Term	Local	Slight	Unlikely	**LOW**

8.3.3 Decommissioning phase impacts

Decommissioning Phase Impact 1: Visual impact of decommissioning activity

Cause and comment

Wind farms are typically designed for a 25 year life. After 25 years, the proposed Bayview Wind Farm may either be refurbished (re-powered) or decommissioned. If it is decommissioned, the impacts during the decommissioning phase will be very similar to those identified in the construction phase. The mitigation measures applicable to the construction phase will be applicable during the decommissioning phase as well.

Significance statement

The duration of the decommissioning phase impact will be "*Short Term*". The extent is *"Municipal"* as activity will be visible beyond the immediate environs of the site. The severity of the impact is expected to be *"Moderate"* should mitigation measures not be employed. If they are, the impact is expected to be "*Slight*". The likelihood of people in surrounding areas having their views impacted is "*Definite*".

Impact	Effect			Risk or Likelihood	Overall Significance
	Temporal Scale	Spatial Scale	Severity of Impact		
Without Mitigation	Short term	Municipal	Moderate	Definite	**MODERATE**
With Mitigation	Short term	Municipal	Slight	Definite	**MODERATE**

8.3.4 Cumulative Impacts

Cumulative Impact 1: Visual impact of facility construction and operation

Cause and comment

Sadler (1996) defines cumulative impacts as the "the net result of environmental impact from a number of projects and activities".

There are other wind energy developments and electrical infrastructure proposed and existing in close proximity to the Bayview Wind Farm. These facilities are in various stages of development ranging from application phase to authorisation (environmental authorisation and preferred bidder).

The following projects are located within a 50km radius around Bayview Wind Farm:

- One (1) Operational WEF –
    - Grassridge Wind Farm (20 turbines).

- Three (3) approved WEFs –
    - Coega West WEF (12 turbines),
    - Sonop WEF (12 turbines), and
    - Universal WEF (20 turbines).

- Two (2) WEF Applications under consideration by DEA (in amendments process) –
    - Ukomeleza WEF (28 turbines) (Part of Grassridge II),
    - Motherwell WEF (22 turbines) (Part of Grassridge II), and
    - Dassiesridge WEF (67 Turbines).

- Two (2) WEF applications under way –
    - Scarlet Ibis Wind Farm (private) (9 turbines), and
    - This project, the Bayview Wind Farm (Max 47 turbines).

Mitigation and management

There are no feasible mitigation measures to reduce the cumulative visual impact of the wind farms in the surrounding areas. If each wind farm implements the mitigation measures suggested in their individual VIAs and Environmental Management Programmes, this will serve to reduce the cumulative impact to some extent.

Significance Statement

The duration of the impact will be "*Long Term*". The extent is *"Regional"*. The severity of the impact is expected to be *"Severe"*. The likelihood of the impact occurring is "*Definite*".

Impact	Effect			Risk or Likelihood	Overall Significance
	Temporal Scale	Spatial Scale	Severity of Impact		
Without Mitigation	Long Term	Regional	Severe	Definite	**HIGH**
With Mitigation	Long Term	Regional	Severe	Definite	**HIGH**

8.3.5 No-Go Impacts

No-Go Impact 1: Impact of wind turbines on sensitive visual receptors

Cause and comment

The "no-go" option should always be considered as an alternative. This is not automatically the optimal environmental option, as a site may not have intrinsic conservation value. In addition, from a socio-economic perspective a development of the site may contribute to some extent to socio-economic upliftment through, for example local investment in the area. In the case of the Bayview Wind Farm, the development can have local job-creation benefits, while at the same time adding to the energy security of the region.

Mitigation and management

Not applicable to the no-go option.

Significance Statement

Impact	Effect			Risk or Likelihood	Overall Significance
	Temporal Scale	Spatial Scale	Severity of Impact		
Without Mitigation	N/A	N/A	N/A	N/A	**NONE**
With Mitigation	N/A	N/A	N/A	N/A	**NONE**

8.4 Powerline Alternatives

The impact rating is MODERATE for all four powerline alternatives. However, the likelihood of the impact occurring is lower for Alternative 1 than it is for Alternative 2, Alternative 3 and Alternative 4. From a visual perspective, the proposed Alternative 1 powerline route will be preferred as it will be less visually intrusive. The reasons for this include:

- The length of the proposed Alternative 1 powerline route is less than half the length of the powerline routes proposed in other three alternative routes;
- There are less visual receptors in close proximity (2km);
- The Alternative 1 powerline route is located within the proposed turbine layout. The viewshed of alternative 1 is therefor considered to be “swallowed” by the much more significant viewshed of the turbines and overhead power lines (i.e. no additional areas being impacted);
- The proposed layout for the Alternative 1 powerline route is a simple straight line.

8.5 The Addo Elephant National Park

The most sensitive visual receptor within the study area is considered to be the Addo Elephant National Park (AENP). The Sundays River runs between the study area and the AENP. The nearest wind turbine is located roughly 4.5km away from the AENP.

The AENP is on the eastern side of the Sundays River. The topography rises quite steeply eastwards of the River and then drops down into a number of valleys that the AENP encompasses. This natural landscape topography will lower visibility of the turbines to some degree. Based on the viewshed analysis, all 47 turbines will be visible from some sections of the park. However the viewshed analysis does not consider the height of surrounding vegetation. The thicket vegetation of the AENP is very dense in parts, with vegetation well-above shoulder height of the average person. This will aid in the screening of the proposed wind turbines.

The elimination of a few individual wind turbines will not reduce the overall significance rating of the impacts. However the elimination of wind turbine 47, wind turbine 46, wind turbine 35 and wind turbine 34 will ensure that no wind turbines will be constructed within 5km of the AENP. This will reduce the visual exposure (see Section 8.1.3) of this sensitive receptor.

8.6 Beneficiaries and losers in regard to impacts

In assessing the significance of impacts, Oberholzer (2005) recommends that beneficiaries and losers be specifically identified. In the case of the Bayview Wind Farm, the benefits are likely to be both local and regional in character.

Local benefits accrue in terms of job creation and local economic development, including short term and permanent direct jobs (e.g. construction, maintenance and security), and indirect jobs associated with supporting services.

Regional and National benefits accrue in regard to energy security (particularly in the context of national energy shortages) and national obligations for the reduction of greenhouse gas emissions.

9 LAYOUT AMENDMENTS

A preliminary layout for the proposed Bayview Wind Farm was produced during the scoping phase of the project. This layout has been assessed throughout this report.

Subsequently a new "refined" turbine layout has been proposed which takes specialist and stakeholder input into consideration. The figures below show changes to the layout. From a visual perspective the most significant changes are the removal of Wind Turbine 35, 46 and 47 and the change in the proposed location of wind turbine 34. Although the overall significance of the identified impacts will not change, the changes to the layout have ensured that no proposed turbines are located within 5km of the AENP, reducing the visual exposure of the AENP to LOW.

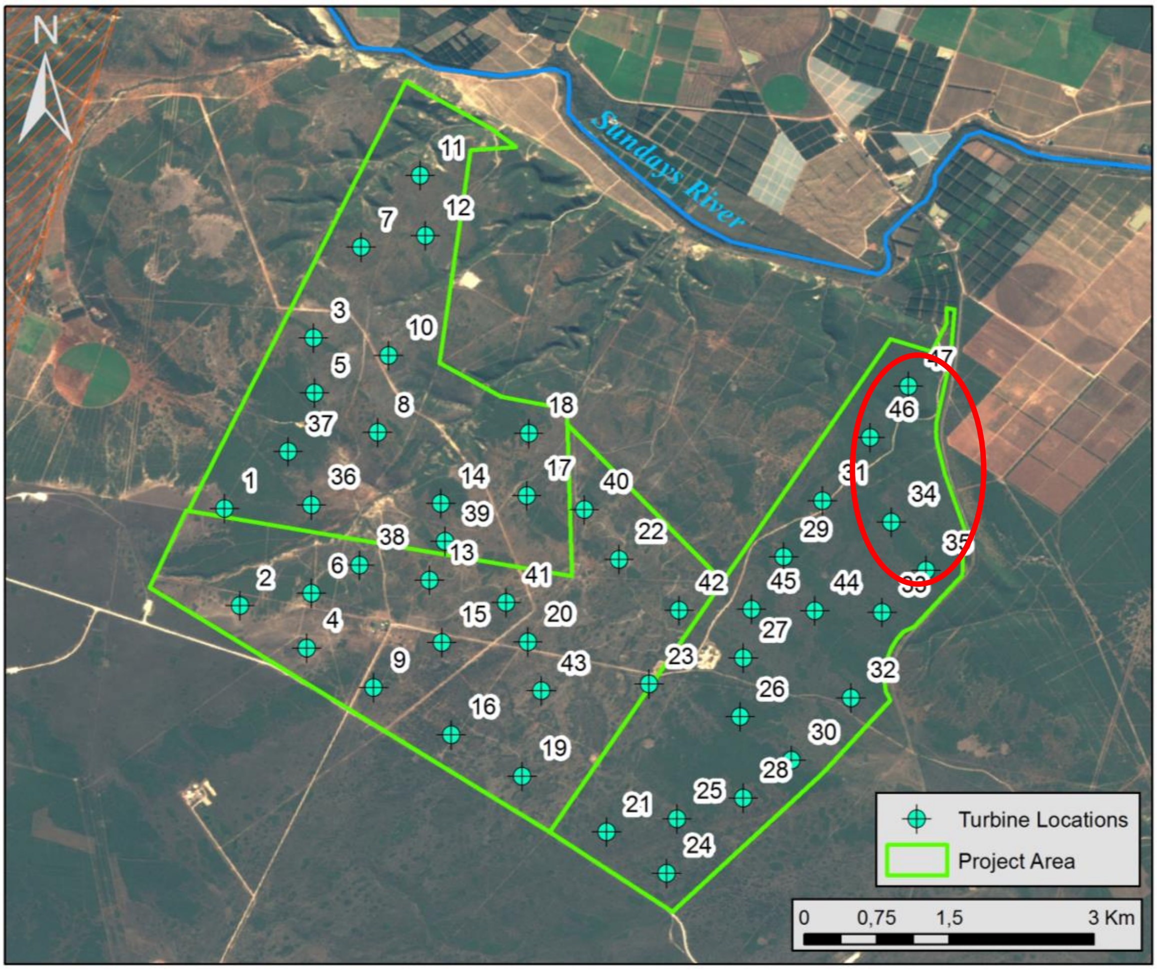

Figure 20: Original turbine layout of the proposed Bayview Wind Farm

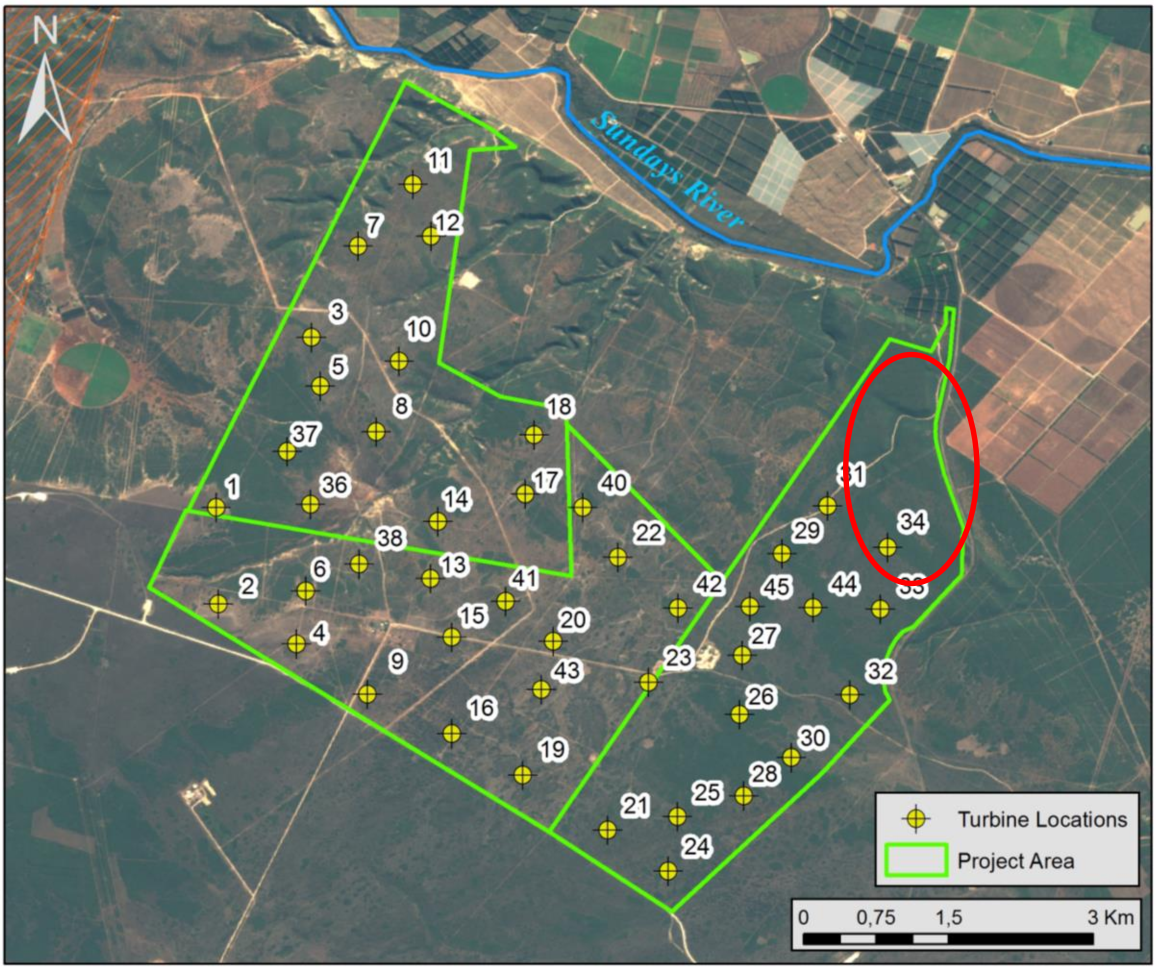

Figure 21: Refined turbine layout of the proposed Bayview Wind Farm

10 CONCLUSIONS AND RECOMMENDED MANAGEMENT ACTIONS

The Bayview Wind Farm covers a large area of land which is visible from the R334, local farm houses and farm roads as well as the Addo Elephant National Park (AENP). Generally, the development is positioned in such a way that a portion of the structures are sheltered by natural vegetation or the topography of the landscape.

The assessment of these impacts was undertaken in terms of the following visual assessment criteria:

- Visibility of the project;
- Visual exposure;
- Visual sensitivity of the area;
- Visual sensitivity of receptors;
- Visual absorption capacity; and
- Visual intrusion.

Each impact was rated in terms of the following:

- Temporal Scale;
- Spatial Scale;
- Likelihood; and
- Severity.

The following receptors were identified:

- Farm homesteads;
- Guest accommodation;
- The urban areas of Motherwell, Addo and Colchester;
- The Addo Elephant National Park; and
- The R335.

Summary of impacts:

	Pre-Mitigation	Post Mitigation
CONSTRUCTION PHASE		
Impact 1: Visual impact of construction activity	MODERATE-	MODERATE-
OPERATIONAL PHASE		
Impact 1: Impact of wind turbines on visually sensitive points and areas	HIGH-	HIGH-
Impact 2: Impact of overhead power lines on visually sensitive points and areas	MODERATE-	MODERATE-
Impact 3: Impact of nightlights on existing landscape	MODERATE-	MODERATE-
Impact 4: Impact of shadow flicker	LOW-	LOW-
DECOMMISSIONING PHASE		
Impact 4: Visual impact of decommissioning activity	MODERATE-	MODERATE-

	Pre-Mitigation	Post Mitigation
CUMULATIVE IMPACTS		
Impact 1: Visual impact of facility construction and operation	HIGH-	HIGH-

	Pre-Mitigation	Post Mitigation
NO-GO ALTERNATIVE		
Impact 1: Impact of wind turbines on sensitive visual receptors	NONE	NONE

In assessing the direct impacts to visual resources, it has been recognised that, although the lifespan of the project is likely to extend for 20-25 years, all of the components of the superstructures can be removed on decommissioning, after which the landscape will be rehabilitated back to a near natural state. This means that although the proposed facility will undoubtedly have an impact on the visual resources of the area, it does not represent a completely irreversible loss of scenic resources.

From a visual perspective, the proposed Alternative 1 powerline route will be preferred as it will be less visually intrusive.

A preliminary turbine layout for the proposed Bayview Wind Farm was produced during the scoping phase of the project. This layout has been assessed throughout this report. The proposed Wind Turbines 34, 35, 46 and 47 were identified as having the highest visual exposure to the AENP.

Subsequently a new “refined” turbine layout has been proposed which takes specialist and stakeholder input into consideration. From a visual perspective the most significant changes are the removal of Wind Turbine 35, 46 and 47 and the change in the proposed location of wind turbine 34. Although the overall significance of the identified impacts will not change, the changes to the layout have ensured that no proposed turbines are located within 5km of the AENP, reducing the visual exposure of the AENP to LOW.

Concluding Statement

The Bayview Wind Farm will undoubtedly impose the visual landscape for nearby visual receptors. While the HIGH residual visual impacts cannot be completely mitigated, these should be considered within the context of the following:

- The neighbouring Grassridge Wind Farm already imposes on the visual landscape for nearby visual receptors.
- The wind farm is not permanent and the turbines and other superstructure will be removed on decommissioning of the wind farm;
- The landscape can be restored through rehabilitation prior to decommissioning;
- Although limited, certain mitigation recommendations in this report can mitigate the impacts to some extent;
- Although there are local losses in terms of visual impacts, there will also be local, regional and national environmental, social and economic gains in the form:
  - Economic investment
  - Job creation and skills development,
  - Energy security
  - Climate change mitigation
- In terms of the REIPPPP, certain benefits will accrue to:
  - Local communities through the establishment of local community trusts.
  - BBBEE partners through shareholding targets.

It is also very important to note that renewable energy (including wind) forms an integral part of the National Development Plan (NDP) both in terms of energy security and climate change mitigation.

It is concluded that potential losses of scenic resources are not sufficiently significant to present a fatal flaw to the proposed project. It is, therefore, recommended that the project proceed.

11 REFERENCES

Gipe, P. 1995. Design as if People Matter: Aesthetic Guidelines for the Wind Industry. Design as if
People Matter: Aesthetic Guidelines for the Wind Industry.

GLVIA, 2002. Guidelines for Landscape and Visual Impact Assessment 2nd ed., United Kingdom:
Spon Press.

Government of South Australia, 2002, Planning Bulletin – Wind Farms (Draft for Consultation)

Oberholzer, B. 2005. Guideline for involving visual & aesthetic specialists in EIA processes: Edition 1. CSIR Report No ENV-S-C 2005 053 F. Republic of South Africa, Provincial Government of the Western Cape, Department of Environmental Affairs & Development Planning, Cape Town.

Parsons Brinckerhoff, 2011. Update of UK Shadow Flicker Evidence Base - Final Report, London, England: Department of Energy and Climate Change.

APPENDIX A – CURRICULUM VITAE

MICHAEL JOHNSON

CONTACT DETAILS

Name of Company	EOH Coastal & Environmental Services
Designation	Environmental Consultant
Profession	Environmental Consultant
E-mail	michael.johnson@eoh.com m.johnson@cesnet.co.za
Office number	082 746 43610
Nationality	South African

Key areas of expertise

- Remote Sensing
- Geographic Information Systems

PROFILE

Michael holds a BSc in Geoinformatics, a BSc (Hons) cum laude in Geoinformatics and an MSc in Geoinformatics from Stellenbosch University. Michael's Master's thesis examined the use of Remote Sensing and computer vision technologies for the extraction of near-shore ocean wave characteristic parameters. For the duration of his Master's, he was based at the CSIR in Stellenbosch. During this time, in addition to his Master's studies, he conducted work in collaboration with the CSIR Coastal Systems Research Group and provided GIS and Remote Sensing tutoring and technical assistance to the junior staff and fellow students. Michael graduated in March 2018 and has been working for CES since.

EMPLOYMENT EXPERIENCE

Consultant, EOH Coastal and Environmental Services
May 2018 - present

Sub consultant, EOH Coastal and Environmental Services
April 2018 – May 2018

Student/Junior project researcher, CSIR
February 2016 – November 2018

Course tutor, Stellenbosch University
February 2016 – November 2018

ACADEMIC QUALIFICATIONS

Stellenbosch University, South Africa
MSc: Geoinformatics
2016- March 2018

Stellenbosch University, South Africa
BSc (Hons) cum laude: Geoinformatics
2015

Stellenbosch University, South Africa
BSc: Geoinformatics
2012-2014

COURSES

Rhodes University and CES, Grahamstown
EIA Short Course 2017

CONFERENCE PROCEEDINGS

37th Symposium of Remote Sensing of the Environment
Extracting near-shore ocean wave characteristic parameters using remote se3nsing and computer vision technologies
March 2017

Society of South African Geographers Student Conference
Deriving bathymetry from multispectral Landsat 8 imagery in South Africa
September 2016

CSIR NRE Science week
Detection of coastal ocean wave characteristics from remotely sensed imagery
April 2016

CONSULTING EXPERIENCE
2018.

King Cetshwayo Environmental management Framework.

-Creating, updating and mapping Landcover

Buffalo City Metropolitan Municipality Invasive Alien Species Plan. 2018.
-Mapping of alien plant species using remote sensing

Swartland Municipality Invasive Alien Plant Species Plan. 2018.
-Mapping of alien plant species

Northcliff Nature Reserve
-Environmental Management Plan

SANBI Kwelera National Botanical Gardens
-Viewshed analysis for visual impact study

CERTIFICATION

I, the undersigned, certify that to the best of my knowledge and belief, this CV correctly describes me, my qualifications, and my experience. I understand that any wilful misstatement described herein may lead to my disqualification or dismissal, if engaged.

Michael Johnson Date: 18 June 2018

ALAN CARTER

CONTACT DETAILS

Name of Company	**EOH Coastal & Environmental Services**
Designation	**Executive**
Profession	Environmental Consultant
Years with firm	16 Years
E-mail	alan.carter@eoh.co.za a.carter@cesnet.co.za
Office number	**043-726 7809 / 8313**
Nationality	South African
Professional body	**SACNASP**: South African Council for Natural Scientific Profession **EAPSA:** Environmental Assessment Practitioners Southern Africa **IWMSA**: Institute Waste Management Southern Africa **TSBPA:** Texas State Board of Public Accountancy (USA)
Key areas of expertise	Marine Ecology Environmental and coastal management Waste management Financial accounting and project feasibility studies Environmental management systems, auditing and due-diligence

PROFILE

Alan has extensive training and experience in both financial accounting and environmental science disciplines with international accounting firms in South Africa and the USA. He is a member of the American Institute of Certified Public Accountants (licensed in Texas) and holds a PhD in Plant Sciences. He is also a certified ISO14001 EMS auditor with the American National Standards Institute. Alan has been responsible for leading and managing numerous and varied consulting projects over the past 25 years.

Employment Experience	• October 2013 – Present: Executive (EOH Coastal & Environmental Services, East London, South Africa) • January 2002 – September 2013: Director (Coastal & Environmental Services, East London, South Africa) • January 1999 – December 2001: Manager (Arthur Andersen LLP, Public Accounting Firm, Chicago, Illinois USA) • December 1996 – December 1998: Senior Accountant/Auditor (Ernst & Young LLP, Public Accounting Firm, Austin, Texas, USA).) • January 1994 – December 1996: Senior Accountant/Auditor (Ernst & Young, Charteris & Barnes, Chartered Accountants, East London, South Africa) • July 1991 – December 1994: Associate Consultant (Coastal & Environmental Services, East London, South Africa) • March 1989 – June 1990: Data Investigator (London Stock Exchange, London, England, United Kingdom)
Academic Qualifications	• Ph.D. Plant Science (Marine) Rhodes University 1987 • B. Compt. Hons. Accounting Science University of South Africa 1997 • B. Com. Financial Accounting Rhodes University 1995 • B.Sc. Hons. Plant Science Rhodes University 1983 • B.Sc. Plant Science & Zoology Rhodes University 1982
Courses	• Environmental Management Systems Lead Auditor Training Course - American National Standards Institute and British Standards Institute (2000) • ISO 14001:2015 Implementing Changes - British Standards Institute (2015) • Numerous other workshops and training courses
CONSULTING EXPERIENCE	**<u>Environmental Impact Assessment, Feasibility and Pre-feasibility Assessments</u>** • Managed numerous projects and prepared environmental impact assessment (EIA) reports in terms of relevant EIA legislation and regulations for development proposals including: Infrastructure projects: bulk water and waste water, roads, electrical, mining, ports, aquaculture, renewable energy (solar and wind), industrial processes, housing developments, golf estates and resorts, etc. (2002 – present). • Projects have also included preparation of applications in terms of other statutory requirements, such as water-use and mining licence /permit applications. • Managed projects to develop pre-feasibility and feasibility assessments for various projects, including various tourism developments, infrastructure projects, etc. • Managed project for the East London Industrial Development Zone (ELIDZ) to develop a Conceptual Framework for a Mariculture Zone within the ELIDZ (2009). • Managed pre-feasibility study to establish a Mariculture Zone within the Coega Industrial Development Zone (2014). • Assisted City of Johannesburg in the process to proclaim four nature reserves in terms of relevant legislation (2015-2016).

- Acted as Environmental Control Officer (ECO) for numerous projects including solar and wind farms, roads, industrial processes, etc.

Strategic Environmental Assessment

- Managed Strategic Environmental Assessment (SEA) project toward the development of a Biofuel Industry in the Eastern Cape Province of South Africa (2014-2016)
- Managed Strategic Environmental Assessment (SEA) projects for two South African ports (2006 – 2007).
- Managed Strategic Environmental Assessment (SEA) projects for five (5) local municipalities in the Eastern Cape as part of the municipal Spatial Development Framework plans (2004 – 2005).
- Involved in the financial assessment of various land-use options and carbon credit potential as part of a larger Strategic Environmental Assessment (SEA) for assessing forestry potential in Water Catchment Area 12 in the Eastern Cape of South Africa (2006).

Climate change, emissions trading and renewable energy

- Provided specialist peer review services for National Department of Environmental Affairs relating to climate change impact assessments for large infrastructure projects (2017-2018).
- Conducted climate change impact assessment for a proposed coal-fired power station in Africa (2017-2018).
- Participated in the development of a web-based Monitoring & Evaluation (M&E) system for climate change Mitigation and Adaptation in South Africa for National Department of Environmental Affairs (DEA) (2015-2016.
- Managed project to develop a Climate Change Strategy for Buffalo City Metro Municipality (2013).
- Managed projects to develop climate change strategies for two district municipalities in the Eastern Cape Province (2011).
- Conducted specialist carbon stock and greenhouse gas emissions impact and life cycle assessment as part of the Environmental, Social and Health Impact Assessment for a proposed sugarcane to ethanol project in Sierra Leone (2009 - 2010) and a proposed Jatropha bio-diesel project in Mozambique (2009 - 2010).
- Managed project to develop the Eastern Cape Province Climate Change Strategy (2010).
- Managed project to develop a Transnet National Ports Authority Climate Change Risk Strategy (2009)
- Participated in a project to develop a Renewable Energy roadmap for the East London Industrial Development Zone (ELIDZ) (2013).
- Participated in a project for the East London Industrial Development Zone (ELIDZ) and Eastern Cape Government to prepare a Renewable Energy Strategy (2009).
- Contributed to the development of Arthur Andersen LLP's International Climate Change and Emissions Trading Services (2001).
- Conducted carbon credit (Clean Development Mechanism - CDM) feasibility assessment for a variety of renewable energy projects ranging from biogas to solar PV.
- Participated in the preparation of CDM applications for two solar PV projects in the Eastern Cape.

Waste Management

- Managed project to develop Integrated Waste Management Plans for six local municipalities on behalf of the Sarah Baartman District Municipality in the Eastern Cape Province (2016).
- Managed project to develop Integrated Waste Management Plans for four local municipalities on behalf of Alfred Nzo District Municipality in the Eastern Cape Province (2015).
- Managed project to develop Integrated Waste Management Plans for eight local municipalities on behalf of Chris Hani District Municipality in the Eastern Cape Province (2011).
- Managed a project to develop a zero-waste strategy for a community development in the Eastern Cape Province (2010).
- Managed waste management status quo analysis for a District Municipality in the Eastern Cape Province (2003).
- For three consecutive years, managed elements of the evaluation of the environmental financial reserves of the three largest solid waste companies (Waste Management, Inc., Republic Services, Inc., Allied Waste, Inc.) and number of smaller waste companies in the USA as part of the annual financial audit process for SEC reporting purposes. Ensured compliance with RCRA and CERCLA environmental regulations.
- Managed elements of the evaluation of the environmental financial reserves of the largest hazardous waste company in the USA (Safety-Kleen, Inc.), as part of the audit process for SEC reporting purposes. Ensured compliance with RCRA and CERCLA environmental regulations.

Environmental Due Diligence and Business Risk

- Participated in the
- Conducted environmental due diligence projects on behalf of the German Development Bank for a forestry pulp and paper operation in Swaziland (2010) and for a large diversified South African agricultural/agro-processing company (2011)
- Managed project for the Transnet National Ports Authority to identify the environmental risks and liabilities associated with the operations of the Port of Durban as part of a broader National initiative to assess business and financial risks relating to environmental management (2006).
- Managed project to determine the financial feasibility of various proposed tourism developments for the Kouga Development Agency in the Eastern Cape Province (2006)
- Contributed significantly to a study to determine the financial and environmental feasibility of three proposed tourism development projects at Coffee Bay on the Wild Coast (2004).
- Conducted sustainability and cost/benefit analysis of various waste water treatment options (including a marine pipeline at Hood Point) for the West Bank of East London (2004).
- Conducted analysis of permit fees and application processing costs for off-road vehicle use on the South African coastline for the Department of Environmental Affairs and Tourism, Marine & Coastal Management (2003).
- Involved in the determination of the historical cost element of environmental remediation insurance claims for a number of

multinational companies, including Dow Chemicals, Inc. and International Paper, Inc.
- Evaluated the environmental budgeting process of the US Army and provided best practice guidance for improving the process.

Policy and Guidelines
- Development of Administration / Application Fee Structure for the Reclamation of Land, Coastal Use Permits, Coastal Waters
- Discharge Permits, Dumping Of Waste at Sea, Off-Road Vehicle Regulations Promulgated in Terms of the National Environmental Management Act: Integrated Coastal Management Act (Act No. 24 Of 2008) (2017).
- Managed project to develop an Estuarine Management Plan for the Buffalo River Estuary for the National Department of Environmental Affairs (2017).
- Managed project to develop a Coastal Management Programme for Amathole District Municipality, Eastern Cape (2015 – 2016).
- Managed project to develop a sustainability diagnostic report as part of the development of the Eastern Cape Development Plan and Vision 2030 (2013).
- Managed project for the Department of Environmental Affairs and Tourism, Marine & Coastal Management to determine the cost implications associated with the implementation of the Integrated Coastal Management Act (2007).
- Managed project to develop a Conservation Plan and Municipal Open Space System (MOSS) for Buffalo City Municipality (2007)
- Managed project to develop a Sanitation Policy and Strategy for Buffalo City Municipality, Eastern Cape (2004 – 2006).
- Managed project to develop an Integrated Environmental Management Plan and Integrated Coastal Zone Management Plan for Buffalo City Municipality, Eastern Cape (2004 – 2005).
- Managed projects to develop and implement an Environmental Management System (EMS) for the Chris Hani and Joe Gqabi (formerly Ukhahlamba) District Municipalities in the Eastern Cape generally in line with ISO14001 EMS standards (2004 – 2005).
- Managed project to develop a State of the Environment Report and Environmental Implementation Plans for Amathole, Chris Hani, OR Tambo and Joe Gqabi District Municipalities in the Eastern Cape Province (2005 – 20010).
- Conducted analysis of permit fees and application processing costs for off-road vehicle use on the South African coastline for the Department of Environmental Affairs and Tourism, Marine & Coastal Management (2003).

Environmental auditing and compliance
- Conducted environmental legal compliance audit for various large Transnet Freight Rail facilities (2018).
- Managed projects to develop Environmental & Social Management Systems (ESMS) in line with IFC Performance Standards for three (3) wind farms in South Africa (2015-2018).
- Managed project to develop an Environmental & Social Management System (ESMS) in line with IFC Performance Standards for a telecoms company in Zimbabwe on behalf of the German Development Bank (2013)

- Participated in numerous ISO14001 Environmental Management System (EMS) audits for large South African corporations including SAPPI, BHP Billiton, SAB Miller, Western Platinum Refinery, Dorbyl Group and others (2002 – present).
- Reviewed the SHE data reporting system of International Paper, Inc. (IP) for three successive years as part of the verification of the IP SHE Annual Report, which included environmental assessments of 12 IP pulp and paper mills located throughout the USA.
- Conducted Environmental Management System (EMS) reviews for a number of large US corporations, including Gulfstream Aerospace Corporation

Public financial accounting

- While with Ernst & Young LLP, (USA), functioned as lead financial auditor for various public and private companies, mostly in the technology business segment of up to $200 million in annual sales. Client experience included assistance in a $100 million debt offering, a $100 million IPO and SEC annual and quarterly reporting requirements.
- Completed three years of articles (training contract) in fulfilment of the certification requirements of the South African Institute of Chartered Accountants which included auditing, accounting and preparation of tax returns for many small to medium sized commercial entities.

Publications

Refereed Publications

- Carter, A.R. 1985. Reproductive morphology and phenology, and culture studies of Gelidium pristoides (Rhodophyta) from Port Alfred in South Africa. Botanica Marina 28: 303-311.
- Carter, A.R. 1993. Chromosome observations relating to bispore production in Gelidium pristoides (Gelidiales, Rhodophyta). Botanica Marina 36: 253-256.
- Carter, A.R. and R.J. Anderson. 1985. Regrowth after experimental harvesting of the agarophyte Gelidium pristoides (Gelidiales: Rhodophyta) in the eastern Cape Province. South African Journal of Marine Science 3: 111-118.
- Carter, A.R. and R.J. Anderson. 1986. Seasonal growth and agar contents in Gelidium pristoides (Gelidiales, Rhodophyta) from Port Alfred, South Africa. Botanica Marina 29: 117-123.
- Carter, A.R. and R.H. Simons.1987. Regrowth and production capacity of Gelidium pristoides (Gelidiales, Rhodophyta) under various harvesting regimes at Port Alfred, South Africa. Botanica Marina 30: 227-231.
- Carter, A.R. and R.J. Anderson. 1991. Biological and physical factors controlling the spatial distribution of the intertidal alga Gelidium pristoides in the eastern Cape Province, South Africa. Journal of the Marine Biological Association of the United Kingdom 71: 555-568.

Published reports

- Water Research Commission. 2006. Profiling Estuary Management in Integrated Development Planning in South Africa with Particular Reference to the Eastern Cape. Project No. K5/1485.
- Turpie J., N. Sihlophe, A. Carter, T, Maswime and S. Hosking. 2006. Maximising the socio-economic benefits of estuaries through

integrated planning and management: A rationale and protocol for incorporating and enhancing estuary values in planning and management. Un-published Water Research Commission Report No. K5/1485

Conference Proceedings

- Carter, A.R. 2002. Climate change and emission inventories in South Africa. Invited plenary paper at the 5th International System Auditors Convention, Pretoria. Held under the auspices of the South African Auditor & Training Certification Association Conference (SAATCA).
- Carter, A.R. 2003. Accounting for environmental closure costs and remediation liabilities in the South African mining industry. Proceedings of the Mining and Sustainable Development Conference. Chamber of Mines of South Africa, Vol. 2: 6B1-5
- Carter, A.R. and S. Fergus. 2004. Sustainability analysis of wastewater treatment options on the West Bank of East London, Buffalo City. Proceedings of the Annual National Conference of the International Association for Impact Assessment, South African Affiliate: Pages 295-301.
- Carter, A., L. Greyling, M. Parramon and K. Whittington-Jones. 2007. A methodology for assessing the risk of incurring environmental costs associated with port activities. Proceedings of the 1st Global Conference of the Environmental Management Accounting Network.
- Hawley, GL, McMaster AR and Carter AR. 2009, Carbon, carbon stock and life-cycle assessment in assessing cumulative climate change impacts in the environmental impact process. Proceedings of the Annual National Conference of the International Association for Impact Assessment, South African Affiliate.
- Hawley, GL, McMaster AR and Carter AR. 2010. The Environmental and Social Impact Assessment and associated issues and challenges. African, Caribbean and Pacific Group of States (ACP), Science and Technology Programme, Sustainable Crop Biofuels in Africa.
- Carter, A.R. 2011. A case study in the use of Life Cycle Assessment (LCA) in the assessment of greenhouse gas impacts and emissions in biofuel projects. 2nd Environmental Management Accounting Network- Africa Conference on Sustainability Accounting for Emerging Economies. Abstracts: Pages 69-70.

CERTIFICATION

I, the undersigned, certify that to the best of my knowledge and belief, this CV correctly describes me, my qualifications, and my experience. I understand that any wilful misstatement described herein may lead to my disqualification or dismissal, if engaged.

ALAN CARTER Date: 18th April 2018

APPENDIX B – SPECIALIST DECLERATION