WIND GARDEN WIND FARM

Eastern Cape Province

Basic Assessment Report

March 2021

savannah environmental

t +27 (0)11 656 3237
f +27 (0)86 684 0547
e info@savannahsa.com
w www.savannahsa.com

Prepared for:

Wind Garden (Pty) Ltd
Cyprus Mansions,
1 Beach Road,
Humewood,
Port Elizabeth,
6001

Prepared by:

savannah environmental

t +27 (0)11 656 3237 f +27 (0)86 684 0547 e info@savannahsa.com w www.savannahsa.com
First Floor, Block 2, 5 Woodlands Drive Office Park, Cnr Woodlands Drive & Western Service Road, Woodmead, 2191

PROJECT DETAILS

Title	:	Environmental Impact Assessment Process: Basic Assessment Report for the Wind Garden Wind Farm and Associated Infrastructure, Eastern Cape Province
Authors	:	Savannah Environmental (Pty) Ltd Lisa Opperman Jo-Anne Thomas
Client	:	Wind Garden (Pty) Ltd
Report Revision	:	Revision 0
Date	:	March 2021

When used as a reference this report should be cited as: Savannah Environmental (2021) Basic Assessment Report for the Wind Garden Wind Farm and Associated Infrastructure, Eastern Cape Province.

PURPOSE OF THE BASIC ASSESSMENT REPORT AND INVITATION TO COMMENT

Wind Garden (Pty) Ltd has appointed Savannah Environmental as the independent environmental consultant to undertake the Basic Assessment (BA) for the Wind Garden Wind Farm, Eastern Cape. The BA process is being undertaken in accordance with the requirements of the 2014 EIA Regulations promulgated in terms of the National Environmental Management Act (NEMA; Act No. 107 of 1998). Due to the geographical location of the project site within the Cookhouse Renewable Energy Development Zone (REDZ), one of the eight designated REDZ areas, the Wind Garden Wind Farm is now subject to a Basic Assessment (BA) and not a full EIA process, as well as a shortened timeframe of 57 days for the processing of an Application for Environmental Authorisation. The procedure to be followed in applying for environmental authorisation for a large-scale renewable energy project within a REDZ was formally gazetted on 16 February 2018 (in Government Notice (GN) GN114). The undertaking of a basic assessment process for the project is in-line with the requirements stated in GNR 114 of 16 February 2018.

This Basic Assessment (BA) report represents the findings of the BA process and contains the following chapters:

- **Chapter 1** provides background to the Wind Garden Wind Farm and the basic assessment process.
- **Chapter 2** provides a description of the wind farm and the infrastructure associated with the facility.
- **Chapter 3** provides the site selection information and identified project alternatives.
- **Chapter 4** describes wind energy as a power generation option and provides insight to technologies for wind energy.
- **Chapter 5** outlines the strategic regulatory and legal context for energy planning in South Africa and specifically for the proposed facility.
- **Chapter 6** describes the need and desirability of the Wind Garden Wind Farm within the project site.
- **Chapter 7** outlines the approach to undertaking the basic assessment process.
- **Chapter 8** describes the existing biophysical and socio-economic environment within and surrounding the project site.
- **Chapter 9** provides a sensitivity analysis of the project site.
- **Chapter 10** provides an assessment of the potential issues and impacts associated with the wind farm and associated infrastructure and presents recommendations for the mitigation of significant impacts.
- **Chapter 11** provides an assessment of the potential for cumulative impacts.
- **Chapter 12** presents the conclusions and recommendations based on the findings of the BA Report.
- **Chapter 13** provides references used in the compilation of the BA Report.

The BA report is available for review from **04 March 2021 – 07 April 2021**on the Savannah Environmental website (https://www.savannahsa.com/public-documents/energy-generation/)

Please submit your comments by **07 April 2021** to:
Nicolene Venter of **Savannah Environmental** PO Box 148, Sunninghill, 2157 Tel: 011-656-3237 Mobile: 060 978 8396 Fax: 086-684-0547 Email: publicprocess@savannahsa.com

Comments can be made as written submission via fax, post or email.

EXECUTIVE SUMMARY

Wind Garden (Pty) Ltd is proposing the development of a commercial wind farm and associated infrastructure on a site located approximately 17km north-west of Makhanda (previously known as Grahamstown) (measured from the centre of the site) within the Makana Local Municipality and the Sarah Baartman District Municipality in the Eastern Cape Province (**Figure 1**). The entire extent of the site falls within the Cookhouse REDZ and within the Eastern Corridor of the Strategic Transmission Corridors. The facility is known as the Wind Garden Wind Farm.

A preferred project site with an extent of ~4336ha has been identified by Wind Garden (Pty) Ltd as a technically suitable area for the development of the Wind Garden Wind Farm. The project site consists of five affected properties which make up the project site. The affected properties include:

» Remaining Extent of Farm Brackkloof No 183
» Portion 5 of Farm Hilton No 182
» Portion 8 of Farm Hilton No 182
» Portion 4 of Farm Vandermerweskraal No 132
» Portion 1 of Farm Thursford No183

A development envelope for the placement of the wind farm infrastructure (i.e. development footprint) has been identified within the project site and assessed as part of the BA process. The development envelope is ~3400ha in extent and the much smaller development footprint of ~66.6ha will be placed and sited within the development envelope. The development footprint will contain the following infrastructure to enable the wind farm to generate up to 264MW:

» Up to 47 wind turbines with a maximum hub height of up to 120m. The tip height of the turbines will be up to 200m.
» A 132kV switching station and a 132/33kV on-site collector substation to be connected via a 132kV overhead power line (twin turn dual circuit). The wind farm will be connected to the national grid through a connection from the 132/33kV collector substation via the 132kV power line which will connect to the 132kV switching station that will loop in and loop out of the existing Poseidon – Albany 132kV power line which will be located inside of the project site.
» Concrete turbine foundations and turbine hardstands.
» Temporary laydown areas which will accommodate the boom erection, storage and assembly area.
» Cabling between the turbines, to be laid underground where practical.
» Access roads to the site and between project components with a width of approximately 4,5m. The main access points will be 8m wide.
» A temporary concrete batching plant.
» Staff accommodation (temporary).
» Operation and Maintenance buildings including a gate house, security building, control centre, offices, warehouses, a workshop and visitor's centre

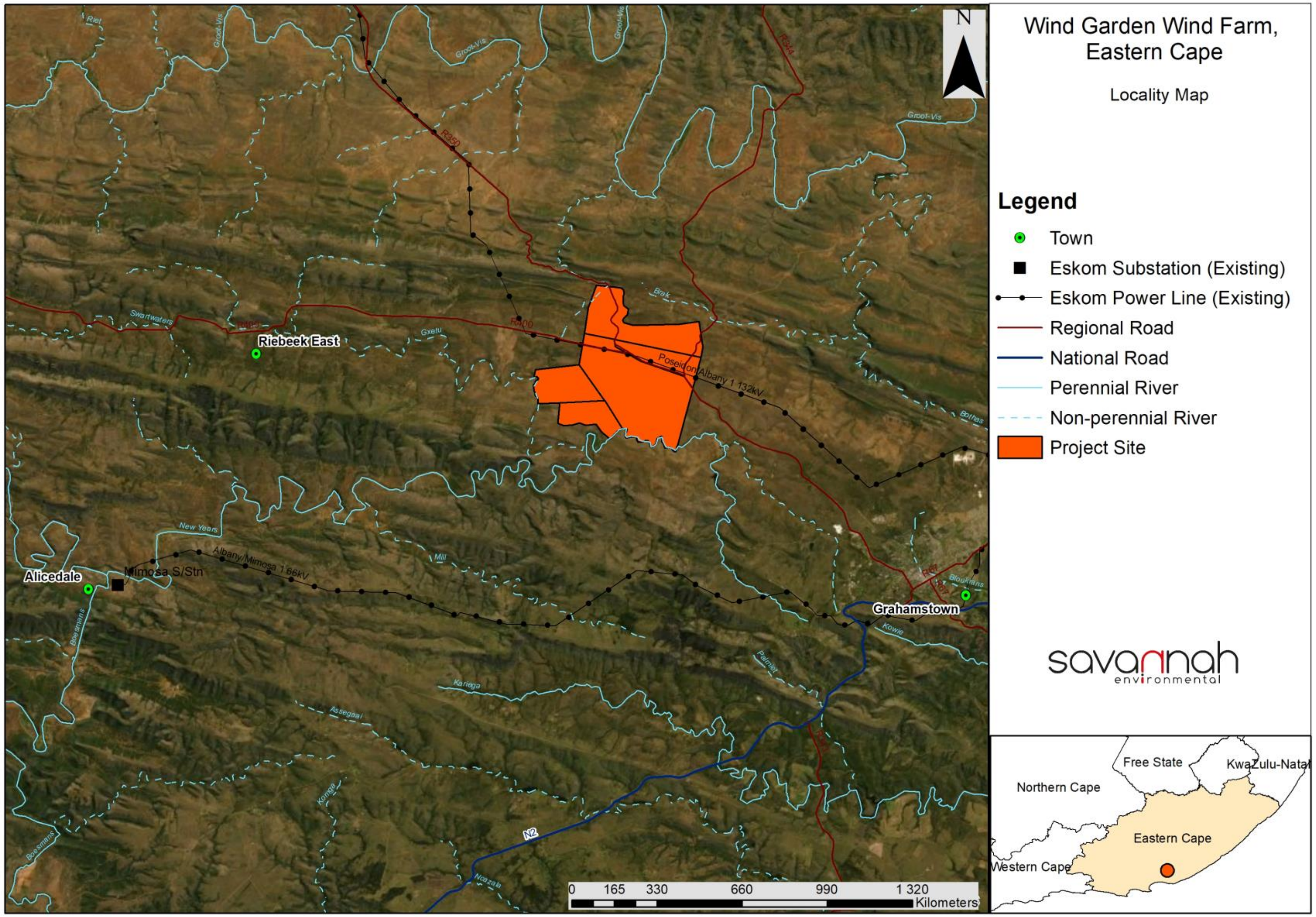

Figure 1: Locality map showing the location of the project site proposed for the development of the Wind Garden Wind Farm

A technically viable development footprint was proposed by the developer and assessed as part of the BA process. The assessment of the development footprint within the development envelope was undertaken by independent specialists and their findings have informed the results of this BA report.

The specialist findings have indicated that there are no identified fatal flaws associated with the implementation of the development footprint within the project site. The developer has designed a project development footprint in response to the identified sensitive environmental features and areas present within the project site. This approach is in line with the application of the mitigation hierarchy, where all the sensitive areas which could be impacted by the development have been avoided (i.e. tier 1 of the mitigation hierarchy).

The potential environmental impacts associated with the Wind Garden Wind Farm identified and assessed through the BA process include:

Impacts on Ecology

Based on the nature and significance of the post-mitigation ecological impacts, the Wind Garden Wind Farm development envelope and the development footprint is considered as a broadly suitable environment and placement of infrastructure for wind farm development from an ecological perspective. Overall, there are no specific long-term impacts likely to be associated with the development of the Wind Garden Wind Farm that cannot be reduced to a low significance. As such, there are no fatal flaws associated with the development and no terrestrial ecological considerations that should prevent it from proceeding.

Impacts on Aquatic Ecology

From the results of the aquatic assessment it is confirmed that the Wind Garden Wind Farm will not have direct impact on any very high sensitivity areas, mainstem riparian systems (outside of the development footprint) or pans that contain functioning aquatic environmental features of a high sensitivity with the implementation of the limited adjustments of the development footprint recommended by the specialist. The specialist indicates that the project can be authorised, subject to the implementation of the recommended mitigation measures.

Impacts on Avifauna

The avifauna described to be associated with Wind Garden Wind Farm project site and the impacts identified and assessed are based on the results of the four seasons of pre-construction monitoring which was conducted from June 2019 to August 2020 in accordance with the best practice guidelines. The Avifauna Impact Assessment identified that all impacts associated with the development of the Wind Garden Wind Farm development footprint will be of a medium significance before mitigation and can be mitigated to an acceptable level of impact (i.e. medium or low significance, depending on the impact being considered). No impacts of a high significance or fatal flaws are expected to occur with the implementation of the recommended mitigation measures.

Impacts on Bats

Pre-construction bat monitoring was undertaken within the Wind Garden Wind Farm project site in accordance with the best practice guidelines. The monitoring was designed to monitor bat activity across the area for the Wind Garden Wind Farm. The baseline environment was investigated by using acoustic monitoring to document bat activity between 13 March 2019 and 16 June 2020 (459 sample nights). Based on the bat activity recorded at the Wind Garden Wind Farm, the significance ratings for the majority of the impacts to bats posed by the development are predicted to be medium or high before mitigation. After mitigation, all impacts are predicted to be low. Based on the opportunity for reduction of the impacts through appropriate mitigation measures from a high or medium significance to a low acceptable significance no fatal flaws are expected to occur.

Impacts on Land Use, Soil and Agricultural Potential
The development envelope is considered to be mainly of a low and very low agricultural sensitivity, with some medium sensitivity patches and high sensitivity patches present within the central section of the development envelope. No areas of high sensitivity were identified within proximity to any of the proposed activities associated with the Wind Garden Wind Farm. All aspects considered during the impact assessment has been determined to have low or moderate post-mitigation significance. The worst-case impact scenario includes Moderate final significance ratings associated with Moderate sensitivity resources.

Impacts on Heritage Resources (archaeology, palaeontology and cultural landscape)
Majority of impacts identified on the heritage resources were either of a medium or low significance prior to the implementation of mitigation measures (except for the impact on historical structures of a high significance and graves and burial grounds). With the implementation of the mitigation measures the impact significance will be reduced to a low acceptable impact. No impacts of a high significance are expected to occur with mitigation.

Noise Impacts
Considering the ambient sound levels and character of the area, ambient sound levels are generally low and typical of a rural noise district during low wind conditions. Ambient sound levels will likely increase as wind speeds increase. Potential Noise Sensitive Developments (NSDs) were identified within the projects site and ambient noise levels were measured in specific locations. Noise impacts will be of low significance for daytime construction activities, of medium significance for night-time construction activities (with mitigation proposed to reduce the significance to low) and of low significance for both day- and night-time operation activities. No impacts of a high significance or fatal flaws were identified.

Visual Impacts
A visibility analysis was undertaken for the project. The result of the viewshed analysis displays the potential areas of visual exposure, as well as the potential frequency of exposure, and potential visual sensitive receptors. Negative impacts on visual receptors will occur during the undertaking of construction activities and the operation of the Wind Garden Wind Farm. It is likely that the Wind Garden Wind Farm will be met with concern and potential opposition from affected landowners and tour operators within the region from a visual perspective. The fact that the visual impact is expected to be of high significance is undisputed, however this is not considered to be a fatal flaw.

Socio-economic Impacts
Impacts are expected to occur with the development of the Wind Garden Wind Farm during the construction, operation and decommissioning phases. Both positive and negative impacts are identified and assessed. The net positive impacts associated with the development and operation of the Wind Garden Wind Farm are expected to outweigh the net negative effects. The project is also envisaged to have a positive stimulus on the local economy and employment creation, leading to the economy's diversification and a small reduction in the unemployment rate. The project should therefore be considered for development. It should, however, be acknowledged that the negative impacts would be

largely borne by the nearby farms and households residing on them, whilst the positive impacts will be largely concentrated in the local and national economies. Due to this imbalance, it is recommended that the mitigation measures suggested be strictly adhered to.

Impacts on Traffic

The traffic generated during the construction phase, although significant, will be temporary and impacts are considered to be negative and of medium significance before and of low significance after mitigation. During the operation phase impact would be minimal. The traffic generated during the decommissioning phase will be similar but less than the construction phase traffic and the impact on the surrounding road network will also be considered negative and of medium significance before and of low significance after mitigation. No impacts of high significance were identified and no fatal flaws are associated with the Wind Garden Wind Farm from a traffic perspective.

Cumulative Impacts

Based on the specialist cumulative assessment and findings, the development of the Wind Garden Wind Farm and its contribution to the overall impact of all wind energy facilities to be developed within a 30km radius, it can be concluded that the Wind Garden Wind Farm cumulative impacts will be of a medium to low significance, with impacts of a high significance mainly relating to positive socio-economic impacts and visual impacts on the landscape. It is concluded that the development of the Wind Garden Wind Farm will not result in unacceptable, high cumulative impacts and will not result in a whole-scale change of the environment.

Figure 2 provides an environmental sensitivity map of the development footprint assessed as part of the BA process, as well as the environmental sensitivities identified.

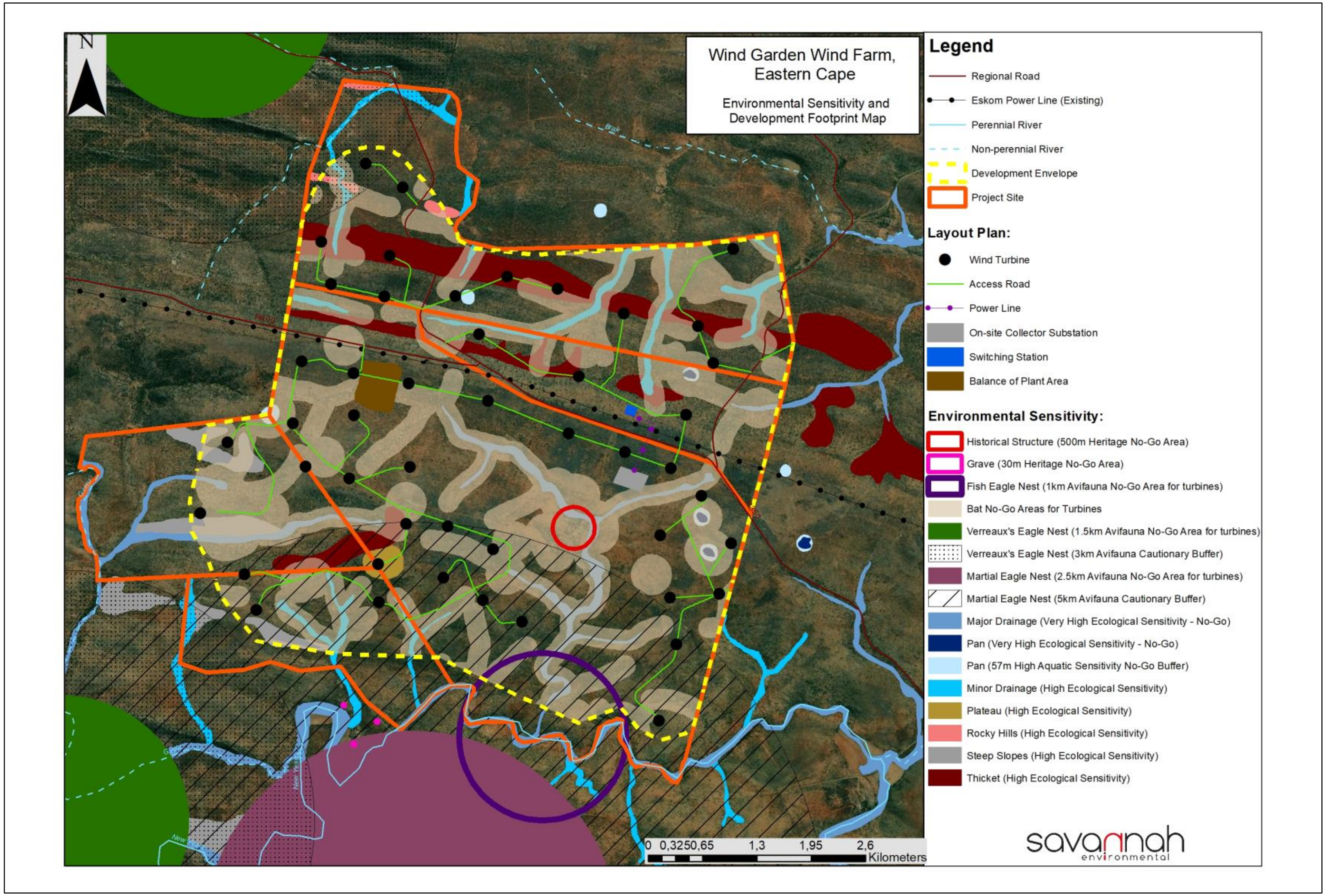

Figure 2: The development footprint (~66.6 ha) of the Wind Garden Wind Farm overlain on the identified environmental sensitive features (refer to **Appendix O** for A3 map)

DEFINITIONS AND TERMINOLOGY

Alternatives: Alternatives are different means of meeting the general purpose and need of a proposed activity. Alternatives may include location or site alternatives, activity alternatives, process or technology alternatives, temporal alternatives or the 'do nothing' alternative.

Betz Limit: It is the flow of air over the blades and through the rotor area that makes a wind turbine function. The wind turbine extracts energy by slowing the wind down. The theoretical maximum amount of energy in the wind that can be collected by a wind turbine's rotor is approximately 59%. This value is known as the Betz Limit.

Commence: The start of any physical activity, including site preparation and any other activity on site furtherance of a listed activity or specified activity, but does not include any activity required for the purposes of an investigation or feasibility study as long as such investigation or feasibility study does not constitute a listed activity or specified activity.

Commercial Operation date: The date after which all testing and commissioning has been completed and is the initiation date to which the seller can start producing electricity for sale (i.e. when the project has been substantially completed).

Commissioning: Commissioning commences once construction is completed. Commissioning covers all activities including testing after all components of the wind turbine are installed.

Construction: Construction means the building, erection or establishment of a facility, structure or infrastructure that is necessary for the undertaking of a listed or specified activity. Construction begins with any activity which requires Environmental Authorisation.

Cumulative impacts: Impacts that result from the incremental impact of the proposed activity on a common resource when added to the impacts of other past, present or reasonably foreseeable future activities (e.g. discharges of nutrients and heated water to a river that combine to cause algal bloom and subsequent loss of dissolved oxygen that is greater than the additive impacts of each pollutant). Cumulative impacts can occur from the collective impacts of individual minor actions over a period and can include both direct and indirect impacts.

Cut-in speed: The minimum wind speed at which the wind turbine will generate usable power.

Cut-out speed: The wind speed at which shut down occurs.

Decommissioning: To take out of active service permanently or dismantle partly or wholly, or closure of a facility to the extent that it cannot be readily re-commissioned. This usually occurs at the end of the life of a facility.

Direct impacts: Impacts that are caused directly by the activity and generally occur at the same time and at the place of the activity (e.g. noise generated by blasting operations on the site of the activity). These impacts are usually associated with the construction, operation, or maintenance of an activity and are generally obvious and quantifiable.

Disturbing noise: A noise level that exceeds the ambient sound level measured continuously at the same measuring point by 7 dB or more.

'Do nothing' alternative: The 'do nothing' alternative is the option of not undertaking the proposed activity or any of its alternatives. The 'do nothing' alternative also provides the baseline against which the impacts of other alternatives should be compared.

Endangered species: Taxa in danger of extinction and whose survival is unlikely if the causal factors continue operating. Included here are taxa whose numbers of individuals have been reduced to a critical level or whose habitats have been so drastically reduced that they are deemed to be in immediate danger of extinction.

Emergency: An undesired/ unplanned event that results in a significant environmental impact and requires the notification of the relevant statutory body, such as a local authority.

Endemic: An "endemic" is a species that grows in a particular area (is endemic to that region) and has a restricted distribution. It is only found in a particular place. Whether something is endemic or not depends on the geographical boundaries of the area in question and the area can be defined at different scales.

Environment: the surroundings within which humans exist and that are made up of:
i. The land, water and atmosphere of the earth;
ii. Micro-organisms, plant and animal life;
iii. Any part or combination of (i) and (ii) and the interrelationships among and between them; and
iv. The physical, chemical, aesthetic and cultural properties and conditions of the foregoing that influence human health and well-being.

Environmental impact: An action or series of actions that have an effect on the environment.

Environmental impact assessment: Environmental Impact Assessment, as defined in the NEMA EIA Regulations and in relation to an application to which scoping must be applied, means the process of collecting, organising, analysing, interpreting and communicating information that is relevant to the consideration of that application.

Environmental management: Ensuring that environmental concerns are included in all stages of development, so that development is sustainable and does not exceed the carrying capacity of the environment.

Environmental management programme: An operational plan that organises and co-ordinates mitigation, rehabilitation and monitoring measures in order to guide the implementation of a proposal and its ongoing maintenance after implementation.

Generator: The generator is what converts the turning motion of a wind turbine's blades into electricity.

Heritage: That which is inherited and forms part of the National Estate (Historical places, objects, fossils as defined by the National Heritage Resources Act of 2000).

Indigenous: All biological organisms that occurred naturally within the study area prior to 1800.

Indirect impacts: Indirect or induced changes that may occur because of the activity (e.g. the reduction of water in a stream that supply water to a reservoir that supply water to the activity). These types of impacts include all the potential impacts that do not manifest immediately when the activity is undertaken or which occur at a different place because of the activity.

Interested and affected party: Individuals or groups concerned with or affected by an activity and its consequences. These include the authorities, local communities, investors, work force, consumers, environmental interest groups, and the public.

Method statement: A written submission to the ECO and the site manager (or engineer) by the EPC Contractor in collaboration with his/her EO.

Mitigation hierarchy: The mitigation hierarchy is a framework for managing risks and potential impacts related to biodiversity and ecosystem services. The mitigation hierarchy is used when planning and implementing development projects, to provide a logical and effective approach to protecting and conserving biodiversity and maintaining important ecosystem services. It is a tool to aid in the sustainable management of living, natural resources, which provides a mechanism for making explicit decisions that balance conservation needs with development priorities

Nacelle: The nacelle contains the generator, control equipment, gearbox and anemometer for monitoring the wind speed and direction.

No-go areas: Areas of environmental sensitivity that should not be impacted on or utilised during the development of a project as identified in any environmental reports.

Pollution: A change in the environment caused by substances (radio-active or other waves, noise, odours, dust or heat emitted from any activity, including the storage or treatment or waste or substances.

Pre-construction: The period prior to the commencement of construction, this may include activities which do not require Environmental Authorisation (e.g. geotechnical surveys).

Rare species: Taxa with small world populations that are not at present Endangered or Vulnerable, but are at risk as some unexpected threat could easily cause a critical decline. These taxa are usually localised within restricted geographical areas or habitats or are thinly scattered over a more extensive range. This category was termed Critically Rare by Hall and Veldhuis (1985) to distinguish it from the more generally used word "rare."

Red data species: Species listed in terms of the International Union for Conservation of Nature and Natural Resources (IUCN) Red List of Threatened Species, and/or in terms of the South African Red Data list. In terms of the South African Red Data list, species are classified as being extinct, endangered, vulnerable, rare, indeterminate, insufficiently known or not threatened (see other definitions within this glossary).

Rotor: The portion of the wind turbine that collects energy from the wind is called the rotor. The rotor converts the energy in the wind into rotational energy to turn the generator. The rotor has three blades that rotate at a constant speed of about 15 to 28 revolutions per minute (rpm).

Significant impact: An impact that by its magnitude, duration, intensity, or probability of occurrence may have a notable effect on one or more aspects of the environment.

Tower: The tower, which supports the rotor, is constructed from tubular steel. It is between 80m and 120m tall. The nacelle and the rotor are attached to the top of the tower. The tower on which a wind turbine is mounted is not just a support structure. It also raises the wind turbine so that its blades safely clear the ground and so it can reach the stronger winds at higher elevations. The tower must be strong enough to support the wind turbine and to sustain vibration, wind loading and the overall weather elements for the lifetime of the wind turbine.

Wind power: A measure of the energy available in the wind.

Wind rose: The term given to the diagrammatic representation of joint wind speed and direction distribution at a particular location. The length of time that the wind comes from a particular sector is shown by the length of the spoke, and the speed is shown by the thickness of the spoke.

Wind speed: The rate at which air flows past a point above the earth's surface.

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APPENDICES LIST

CHAPTER 1: INTRODUCTION

Wind Garden (Pty) Ltd is proposing the development of a commercial wind farm and associated infrastructure on a site located approximately 17km north-west of Makhanda (previously known as Grahamstown) (measured from the centre of the site) within the Makana Local Municipality and the Sarah Baartman District Municipality in the Eastern Cape Province (**Figure 1.1**). The entire extent of the site falls within the Cookhouse Renewable Energy Development Zone (REDZ)[1] and within the Eastern Corridor of the Strategic Transmission Corridors[2]. The facility is known as the Wind Garden Wind Farm.

The wind farm is proposed in response to identified objectives of the national and provincial government, and local and district municipalities to develop renewable energy facilities for power generation purposes. It is the developer's intention to supply the electricity generated from the facilities to private off-takers nationally, with key customer focus areas primarily being within the industrial, mining, and commercial sectors where there is a need to shift towards cleaner and more sustainable sources of energy. The expected load requirements of potential customers are in excess of 1 000 GWh. The generated electricity will be evacuated through use of the national electricity grid and through a wheeling agreement with Eskom for the use of the existing grid connection infrastructure in the area. The development will aid in the diversification and stabilisation of the country's electricity supply, in line with the objectives of the Integrated Resource Plan (IRP).

As the project has the potential to impact on the environment, an Environmental Impact Assessment process is required to be completed in support of an application for Environmental Authorisation prior to the commencement of construction of the project. As the project falls within the Cookhouse REDZ, a Basic Assessment (BA) process is applicable as per GNR114 of February 2018. This BA Report describes and assesses this proposed project and consists of the following chapters:

- » **Chapter 1** provides background to the Wind Garden Wind Farm and the basic assessment process.
- » **Chapter 2** provides a description of the wind farm and the infrastructure associated with the facility.
- » **Chapter 3** provides the site selection information and identified project alternatives.
- » **Chapter 4** describes wind energy as a power generation option and provides insight to technologies for wind energy.
- » **Chapter 5** outlines the strategic regulatory and legal context for energy planning in South Africa and specifically for the proposed facility.
- » **Chapter 6** describes the need and desirability of the Wind Garden Wind Farm within the project site.
- » **Chapter 7** outlines the approach to undertaking the basic assessment process.

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[1] The REDZ are zones identified by the Department of Environment, Forestry and Fisheries (DEFF) as geographical areas of strategic importance for the development of large-scale solar PV and wind energy development activities and which have been earmarked for the development of renewable energy facilities within South Africa as per GNR114 of February 2018

[2] The Strategic Transmission Corridors are identified by the Department of Environment, Forestry and Fisheries (DEFF) as geographical areas of strategic importance for the development the supporting large scale electricity transmission and distribution infrastructure in terms of Strategic Integrated Project 10: Electricity Transmission and distribution. This is as per GNR113 of February 2018.

- **Chapter 8** describes the existing biophysical and socio-economic environment within and surrounding the project site.
- **Chapter 9** provides a sensitivity analysis of the project site.
- **Chapter 10** provides an assessment of the potential issues and impacts associated with the wind farm and associated infrastructure and presents recommendations for the mitigation of significant impacts.
- **Chapter 11** provides an assessment of the potential for cumulative impacts.
- **Chapter 12** presents the conclusions and recommendations based on the findings of the BA Report.
- **Chapter 13** provides references used in the compilation of the BA Report.

1.1 Legal Requirements as per the EIA Regulations, 2014 (as amended), for the undertaking of a Basic Assessment Report

This BA Report has been prepared in accordance with the requirements of the EIA Regulations published on 08 December 2014 (as amended in April 2017) promulgated in terms of Chapter 5 of the National Environmental Management Act (Act No 107 of 1998). This chapter of the BA Report includes the following information required in terms of Appendix 1: Content of basic assessment reports:

Requirement	Relevant Section
3(a) the details of the (i) EAP who prepared the report and (ii) the expertise of the EAP, including a curriculum vitae.	The details of the EAP who prepared the report and the expertise of the EAP is included in section 1.3. The curriculum vitae of the EAP, project team and independent specialists are included in **Appendix A**.
3(b) the location of the activity including (i) the 21 digit Surveyor General code of each cadastral land parcel, (ii) where available the physical address and farm name and (iii) where the required information in items (i) and (ii) is not available, the co-ordinates of the boundary of the property or properties.	The location of the Wind Garden Wind Farm is included in section 1.2, **Table 1.1** and **Figure 1.1**. The information provided includes the 21-digit Surveyor General code of the affected properties and the farm names. Additional information is also provided regarding the location of the development which includes the relevant province, local and district municipalities, ward and current land zoning.

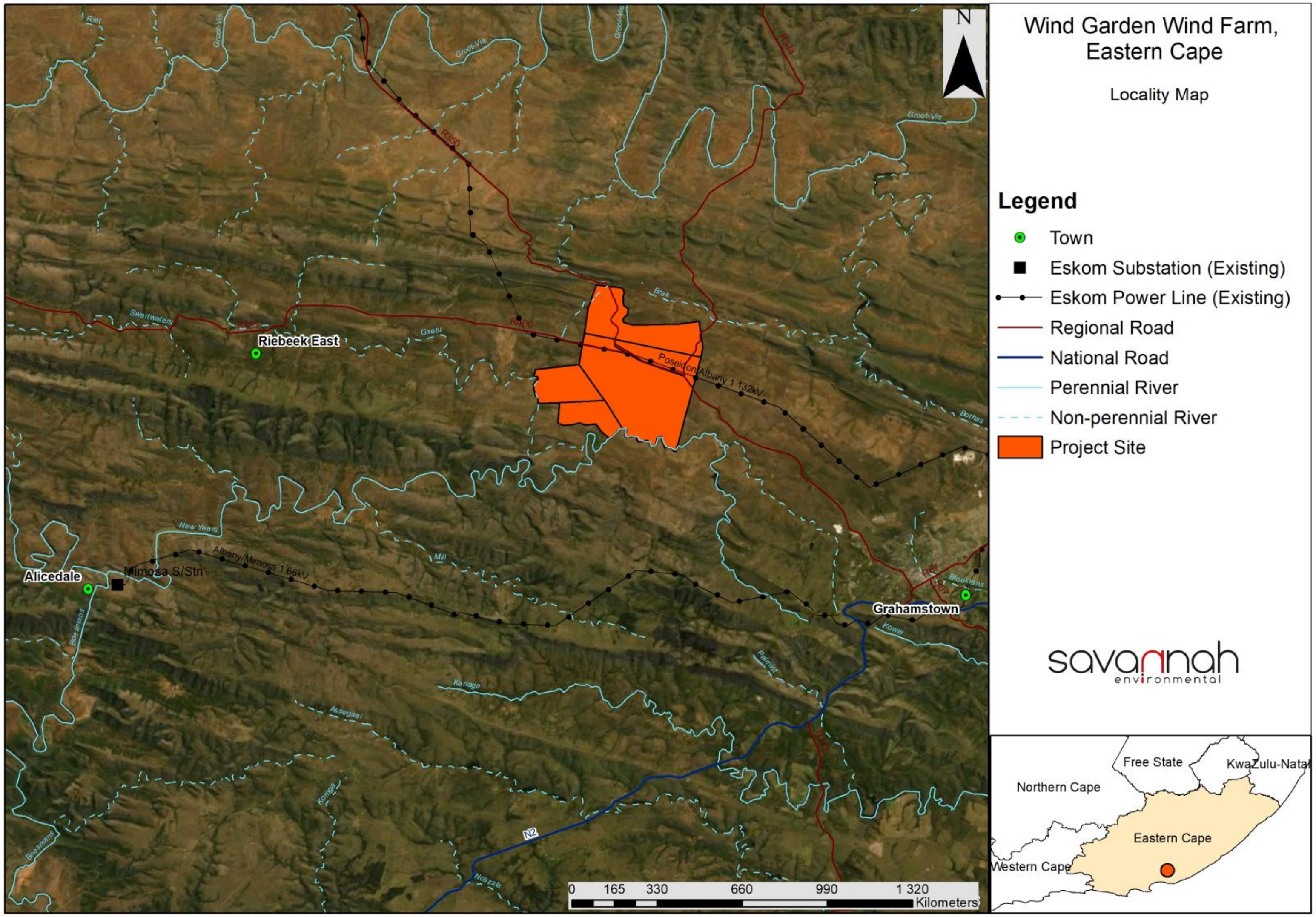

Figure 1.1: Locality map of the project site showing the location of the site in relation to the closest towns of the area

1.2 Project Overview

A preferred project site with an extent of ~4336ha has been identified by Wind Garden (Pty) Ltd as a technically suitable area for the development of the Wind Garden Wind Farm. The project site consists of five affected properties which make up the project site(**Figure 1.2** and **Table 1.1**). The affected properties include:

» Remaining Extent of Farm Brackkloof No 183
» Portion 5 of Farm Hilton No 182
» Portion 8 of Farm Hilton No 182
» Portion 4 of Farm Vandermerweskraal No 132
» Portion 1 of Farm Thursford No183

A development envelope for the placement of the wind farm infrastructure (i.e. development footprint) has been identified within the project site and assessed as part of the BA process. The development envelope is ~3400ha in extent and the much smaller development footprint[3] of ~66.6ha will be placed and sited within the development envelope. The development footprint will contain the following infrastructure to enable the wind farm to generate up to 264MW:

» Up to 47 wind turbines with a maximum hub height of up to 120m. The tip height of the turbines will be up to 200m.
» A 132kV switching station and a 132/33kV on-site collector substation to be connected via a 132kV overhead power line (twin turn dual circuit). The wind farm will be connected to the national grid through a connection from the 132/33kV collector substation via the 132kV power line which will connect to the 132kV switching station that will loop in and loop out of the existing Poseidon – Albany 132kV power line which will be located inside of the project site.
» Concrete turbine foundations and turbine hardstands.
» Temporary laydown areas which will accommodate the boom erection, storage and assembly area.
» Cabling between the turbines, to be laid underground where practical.
» Access roads to the site and between project components with a width of approximately 4,5m. The main access points will be 8m wide.
» A temporary concrete batching plant.
» Staff accommodation (temporary).
» Operation and Maintenance buildings including a gate house, security building, control centre, offices, warehouses, a workshop and visitor's centre.

The key infrastructure components that form part of the facility are described in greater detail in Chapter 2 of this BA Report.

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3 The development footprint of the Wind Garden Wind Farm will be located within the ~3400ha development envelope and will be a much smaller area within which the wind turbines and associated infrastructure will be constructed and operated in. The development footprint has been subject to detailed design by the developer through the consideration of sensitive environmental features identified by independent specialists, which need to be avoided by the wind farm.

Wind Garden (Pty) Ltd has confirmed that the project site is particularly suitable for wind energy development from a technical perspective due to the strength of the prevailing wind resources, access to the electricity grid, compatibility with the current land use and land availability. The wind resource of the project site has been confirmed through data collected by wind masts deployed on site since 2011.

Table 1.1: Detailed description of the Wind Garden Wind Farm project site

Province	Eastern Cape Province
District Municipality	Sarah Baartman District Municipality
Local Municipality	Makana Local Municipality
Ward number(s)	1
Nearest town(s) (measured from the centre of the project site)	Makhanda (~17km south-east); Riebeek East (~20km west) and Alicedale (~29km south-west)
Affected Properties: Farm name(s), number(s) and portion numbers	» Remaining Extent of Farm Brackkloof No 183 » Portion 5 of Farm Hilton No 182 » Portion 8 of Farm Hilton No 182 » Portion 4 of Farm Vandermerweskraal No 132 » Portion 1 of Farm Thursford No183
SG 21 Digit Code (s)	» Remaining Extent of Farm Brackkloof No 183 - C00200000000018300000 » Portion 5 of Farm Hilton No 182 - C00200000000018200005 » Portion 8 of Farm Hilton No 182 - C00200000000018200008 » Portion 4 of Farm Vandermerweskraal No 132 – C00200000000013200004 » Portion 1 of Farm Thursford No183 - C00200000000018300001
Current zoning and Land Use	Zoning: Agricultural Land Use: Grazing
Site co-ordinates (centre of project site)	33°13'20.26"S ; 26°22'9.38"E

The overarching objective for the planning process is to maximise electricity production through exposure to the wind resource, while minimising infrastructure, operational and maintenance costs, as well as social and environmental impacts. These aspects must now be considered within site-specific specialist studies and assessments through the BA process in order to delineate areas of sensitivity within the surrounding area, project site and development envelope and ultimately inform the placement of the wind turbines and associated infrastructure within the areas considered suitable for development.

The Wind Garden Wind Farm forms part of a larger cluster of renewable energy facilities. The cluster consists of various project sites located between Somerset East and Grahamstown within the Cookhouse REDZ, as well as the Eastern Strategic Transmission Corridor. The cluster consists of nine (9) projects which includes six (6) wind farms, two (2) solar energy facilities and one (1) Main Transmission Substation (MTS). The cluster is divided into a western section and an eastern section, with the Wind Garden Wind Farm forming part of the eastern section (**Figure 1.3**). Each project proposed as part of this cluster is the subject of a separate EIA application process.

The remaining generated MWs produced by the cluster of renewable energy facilities will be used for alternative means of energy generation, including green hydrogen generation.

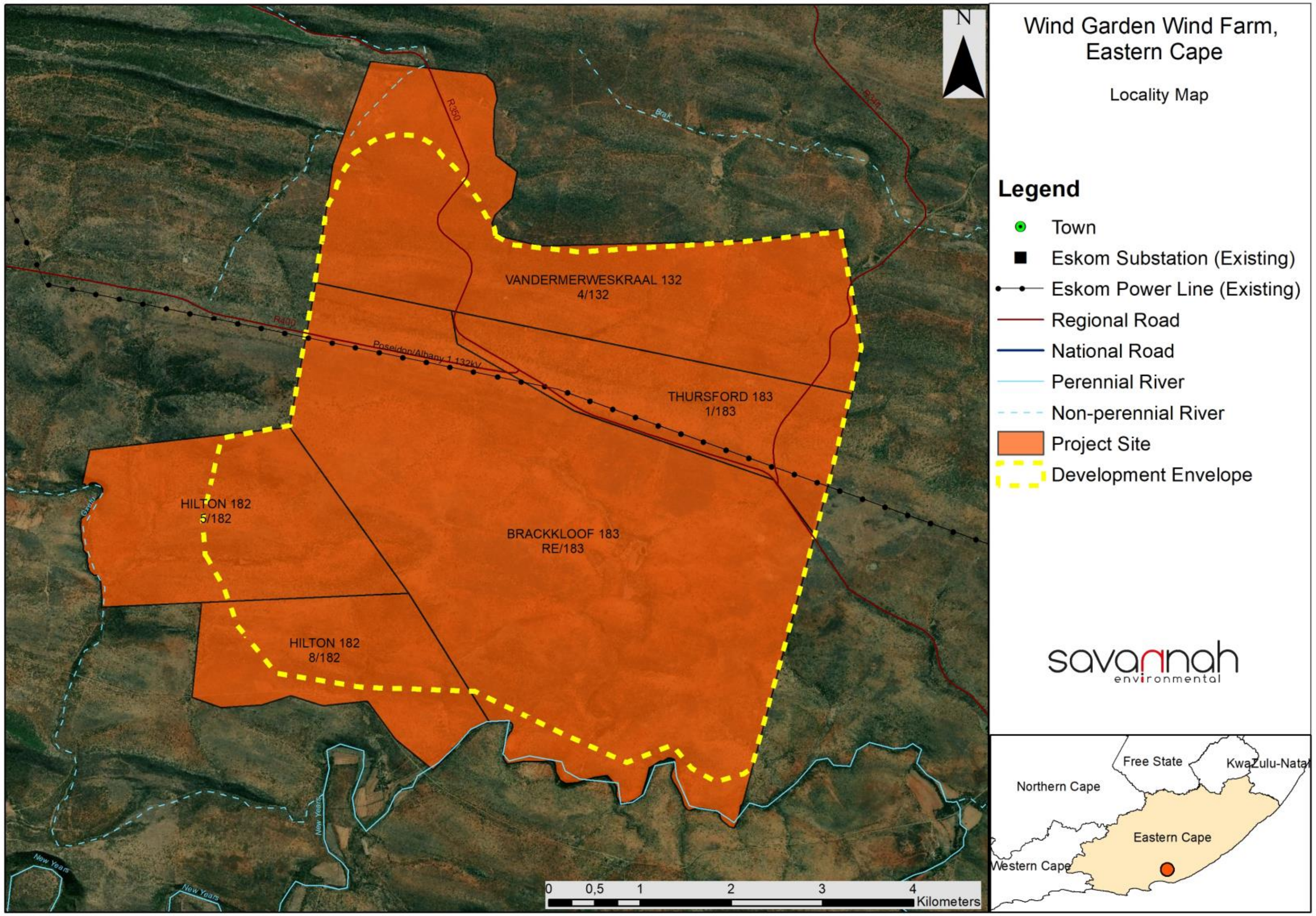


Figure 1.2: Details of the project site and the location of the development envelope within the project site

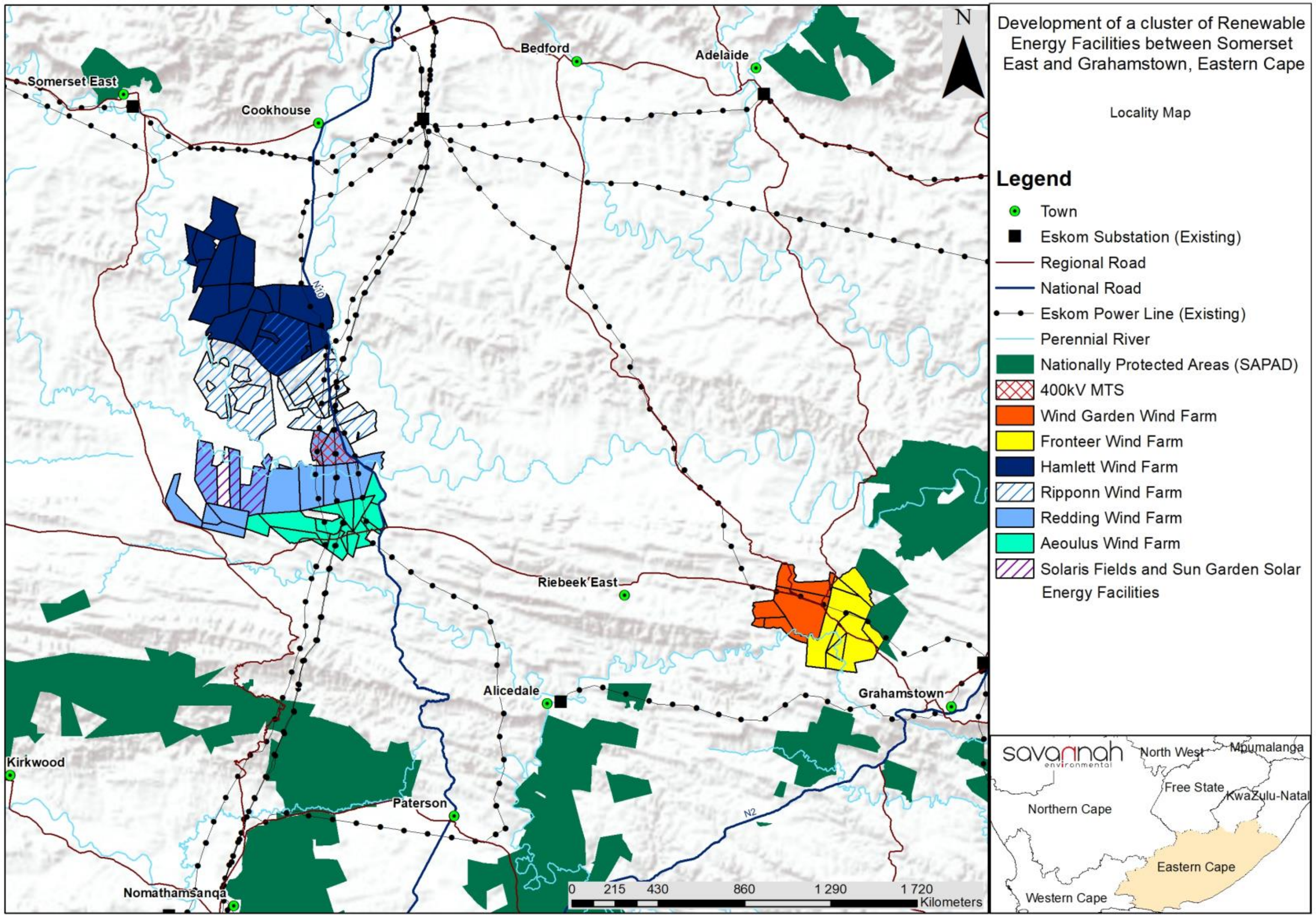


Figure 1.3: The cluster of proposed renewable energy facilities that the Wind Garden Wind Farm forms part of

1.3 Details of the Environmental Assessment Practitioner and Expertise to conduct the BA process

In accordance with Regulation 12 of the 2014 EIA Regulations (GNR 326), Wind Garden (Pty) Ltd has appointed Savannah Environmental (Pty) Ltd as the independent Environmental Assessment consultant to undertake the Basic Assessment and prepare the BA Report for the Wind Garden Wind Farm. Neither Savannah Environmental nor any of its specialists are subsidiaries of, or are affiliated to Wind Garden (Pty) Ltd. Furthermore, Savannah Environmental does not have any interests in secondary developments that may arise out of the authorisation of the proposed project.

Savannah Environmental is a specialist environmental consulting company providing a holistic environmental management service, including environmental assessment and planning to ensure compliance and evaluate the risk of development, and the development and implementation of environmental management tools. Savannah Environmental benefits from the pooled resources, diverse skills and experience in the environmental field held by its team.

The Savannah Environmental team have considerable experience in basic assessments and environmental management, and have been actively involved in undertaking environmental studies, for a wide variety of projects throughout South Africa, including those associated with electricity generation.

» *Lisa Opperman*, the principle author of this report. She holds a Bachelor degree with Honours in Environmental Management and has 6 years of experience in the environmental field. Her key focus is on environmental impact assessments, public participation, environmental management plans and programmes, as well as mapping using ArcGIS for a variety of environmental projects. She has been the lead author of more than 20 EIAs for renewable energy projects across the country, including wind and solar developments.
» *Nicolene Venter,* Board Member of IAPSA (International Association for Public Participation South Africa). She holds a Higher Secretarial Diploma and has over 21 years of experience in public participation, stakeholder engagement, awareness creation processes and facilitation of various meetings (focus group, public meetings, workshops, etc.). She is responsible for project management of public participation processes for a wide range of environmental projects across South Africa and neighbouring countries.
» *Jo*-Anne *Thomas,* is a registered EAP with the Environmental Assessment Practitioners Association of South Africa (EAPASA). She provides technical input for projects in the environmental management field, specialising in Strategic Environmental Advice, Environmental Impact Assessment studies, environmental auditing and monitoring, environmental permitting, public participation, Environmental Management Plans and Programmes, environmental policy, strategy and guideline formulation, and integrated environmental management. Her Key focus is on integration of the specialist environmental studies and findings into larger engineering-based projects, strategic assessment, and providing practical and achievable environmental management solutions and mitigation measures. Responsibilities for environmental studies include project management (including client and authority liaison and management of specialist teams); review and manipulation of data; identification and assessment of potential negative environmental impacts and benefits; review of specialist studies; and the identification of mitigation measures. She has managed the EIA processes for more than 100 renewable energy projects (including wind, solar and hydro) across South Africa.

In order to adequately identify and assess potential environmental impacts associated with the proposed wind farm, the following specialist consultants have provided input into this BA Report:

Specialist	Field of Study
Simon Todd of 3foxes Biodiversity Solutions	Terrestrial Ecology (including fauna and flora)
Adri Barkhuysen of East Cape Diverse Consultants and Dr Steve Percival of Ecology Consulting and Peer Review by Owen Davies of Arcus Consultancy Services South Africa	Avifauna (including monitoring)
Michael Brits and Mark Hodgson of Arcus Consultancy Services South Africa	Bats (including monitoring)
Dr Brian Colloty of EnviroSci	Aquatic
Andrew Husted of The Biodiversity Company	Soil, Land Use, Land Capability and Agricultural Potential
Cherene de Bruyn and Wouter Fourie of PGS Heritage and Elize Butler of Banzai Environmental	Heritage (including archaeology, palaeontology and cultural landscape)
Morné de Jager of Enviro Acoustic Research (EAR)	Noise
Lourens du Plessis of LOGIS	Visual
Conrad Swart and Matthew Keeley of Urban-Econ	Socio-economic
Iris Wink and Adrian Johnson of JG Africa	Traffic

Appendix A includes the curricula vitae for the environmental assessment practitioners from Savannah Environmental and the specialist consultants.

CHAPTER 2: PROJECT DESCRIPTION

This chapter provides an overview of the Wind Garden Wind Farm and details the project scope, which includes the planning/design, construction, operation and decommissioning activities required for the development.

2.1. Legal Requirements as per the EIA Regulations, 2014 (as amended), for the undertaking of a Basic Assessment Report

This chapter of the BA Report includes the following information required in terms of the EIA Regulations, 2014 - Appendix 1: Content of basic assessment reports:

Requirement	Relevant Section
3(b) the location of the activity including (i) the 21 digit Surveyor General code of each cadastral land parcel, (ii) where available the physical address and farm name and (iii) where the required information in items (i) and (ii) is not available, the coordinates of the boundary of the property or properties.	The location of the proposed project is detailed in Chapter 1, **Table 1.1**, as well as section 2.2.1 below.
3(c)(i)(ii) a plan which locates the proposed activity or activities applied for as well as the associated structures and infrastructure at an appropriate scale, or, if it is a linear activity, a description and coordinates of the corridor in which the proposed activity or activities is to be undertaken; or on land where the property has not been defined, the coordinates within which the activity is to be undertaken	A layout map illustrating the development footprint of the Wind Garden Wind Farm, including associated infrastructure is included as **Figure 2.3**. This development footprint has been assessed within this BA Report and the independent specialist studies.
3(d)(ii) a description of the scope of the proposed activity, including a description of the activities to be undertaken including associated structures and infrastructure	A description of the activities to be undertaken with the development of project is included in **Table 2.1** and **Table 2.2**.

2.2 Nature and extent of the Wind Garden Wind Farm

The development of the Wind Garden Wind Farm and associated infrastructure will make electricity capacity available for use by private off takers. The project will be developed in a single phase which will comprise of up to 47 wind turbines with a total contracted capacity of up to 264MW. The optimum turbine for use at the project site is yet to be determined, however it is considered that each turbine could have a generating capacity of up to 5,6MW[4], with a hub height of up to 120m and a tip height of up to 200m. The final turbine capacity and model will be dependent on what is deemed suitable for the project site in

[4] The 5.6MW capacity of the individual turbines is a predicted maximum capacity per turbine.

relation to, among other things, further studies of the wind regime, terrain, and outcome of the final engineering, procurement and construction (EPC) tendering process.

2.2.1. Project Site, Development Envelope and Development Footprint

The preferred project site (with an extent of ~4336ha) consists of five affected properties including the Remaining Extent of Farm Brackkloof No 183, Portion 5 of Farm Hilton No 182, Portion 8 of Farm Hilton No 182, Portion 4 of Farm Vandermerweskraal No 132 and Portion 1 of Farm Thursford No183. The project site is located within the Makana Local Municipality and the Sarah Baartman District Municipality, with the entire extent of the site located within the Cookhouse REDZ.

A development envelope for the placement of the wind farm infrastructure (i.e. development footprint) has been identified within the project site and assessed as part of the BA process. The development envelope is ~3400ha in extent and the permanent development footprint[5] of ~66.6ha will be placed and sited within the development envelope. The development footprint proposed amounts to ~1,54% of the project site.

Access to the project site is ample with the presence of existing roads mainly consisting of national and regional roads. The project site is situated between two national roads, namely the N10 and N2 (**Figure 2.1**). The R400, R350 and R344 provides direct access to the project site and the development envelope. These routes will be utilised for accessing the project site, development envelope and development footprint (**Figure 2.2**).

5 The development footprint of the Wind Garden Wind Farm will be located within the ~3400ha development envelope and will be a much smaller area within which the wind turbines and associated infrastructure will be constructed and operated in. The development footprint has been subject to detailed design by the developer through the consideration of sensitive environmental features identified by independent specialists, which need to be avoided by the wind farm.

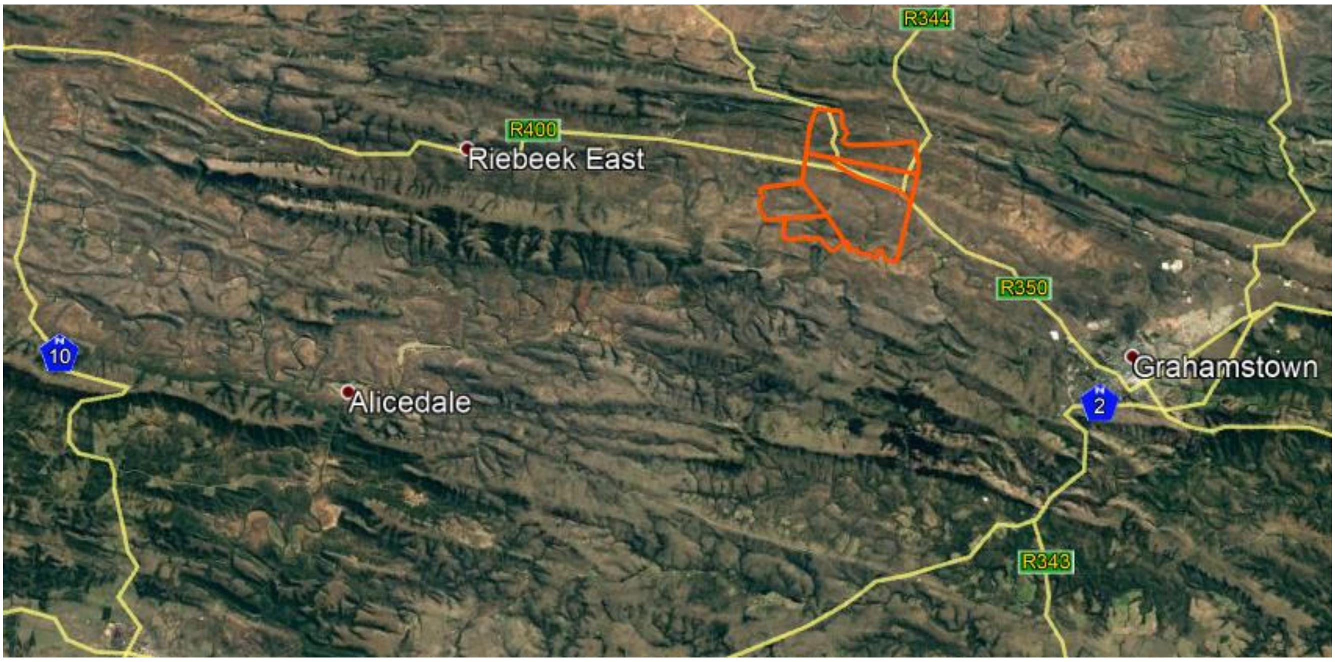


Figure 2.1: Location of the N10 and N2 national roads in relation to the Wind Garden Wind Farm project site (project site outlined in orange).

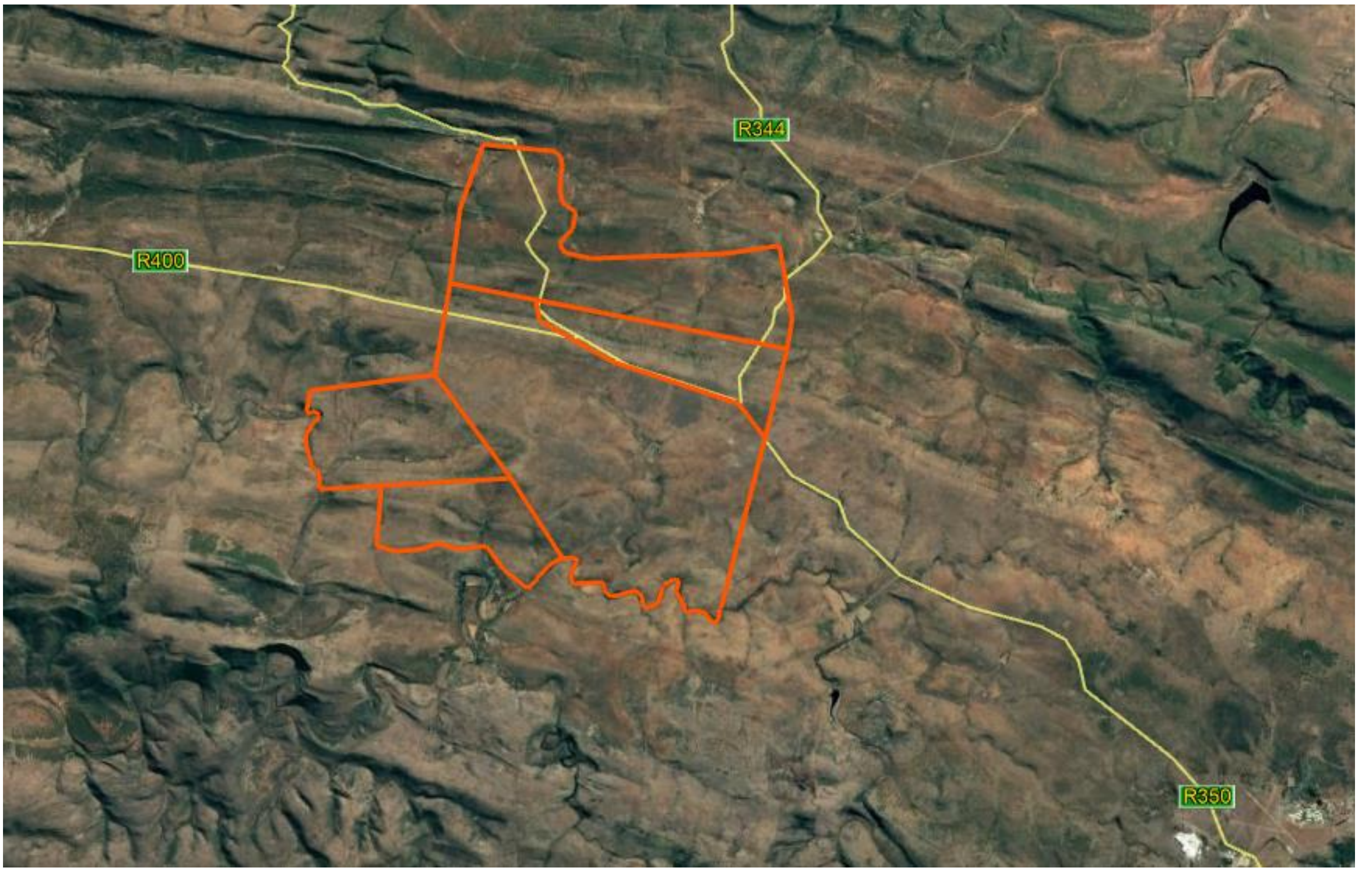


Figure 2.2: Location of the project site (outline in orange) in relation to the R400, R350 and R344, which provides direct access to the project site, development envelope and the development footprint).

2.2.2. Components of the Wind Garden Wind Farm

The project site is proposed to accommodate both the wind turbines as well as the associated infrastructure which is required for such a facility, and will include:

- Up to 47 wind turbines with a maximum hub height of up to 120m. The tip height of the turbines will be up to 200m.
- A 132kV switching station and a 132/33kV on-site collector substation to be connected via a 132kV overhead power line (twin turn dual circuit). The wind farm will be connected to the national grid through a connection from the 132/33kV collector substation via the 132kV power line which will connect to the 132kV switching station that will loop in and loop out of the existing Poseidon – Albany 132kV line within the project site.
- Concrete turbine foundations and turbine hardstands.
- Temporary laydown areas which will accommodate the boom erection, storage and assembly area.
- Cabling between the turbines, to be laid underground where practical.
- Access roads to the site and between project components with a width of approximately 4,5m. The main access points will be 8m wide.
- A temporary concrete batching plant.
- Staff accommodation (temporary).
- Operation and Maintenance buildings including a gate house, security building, control centre, offices, warehouses, a workshop and visitor's centre.

A summary of the details and dimensions of the planned infrastructure associated with the project is provided in **Table 2.1.** The confirmed details and dimensions of the facility development footprint was assessed as part of the independent specialist studies undertaken as part of the Basic Assessment process. **Figure 2.3** illustrates the proposed development footprint of the Wind Garden Wind Farm assessed as part of this BA report.

Table 2.2 provides the details regarding the requirements and the activities to be undertaken during the project development phases, and **Table 2.3** provides photographs of the construction phase of a wind farm similar in nature to the Wind Garden Wind Farm.

Table 2.1: Confirmed details or dimensions of the proposed development footprint of the Wind Garden Wind Farm

Infrastructure	**Footprint and dimensions**
Development footprint (permanent infrastructure) area	~66.6ha (including all associated infrastructure)
Number of turbines	Maximum of 47 turbines
Turbine hub height	Up to 120m
Turbine tip height	Up to 200m
Contracted capacity of the facility	Up to 264MW (individual turbines up to 5,6MW in capacity each)
Tower type	Steel or concrete towers (or hybrid) can be utilised at the site. Alternatively, the towers can be of a hybrid nature, comprising concrete towers with top steel sections.
Area occupied by the switching station	~1ha (a larger area of 1.2ha is being assessed for the placement of the infrastructure as part of the development footprint to allow for the avoidance of sensitive environmental features)
Capacity of on-site switching station	132kV
Area occupied by the on-site collector substation	~1ha (a larger area of 6.9ha is being assessed for the placement of the infrastructure as part of the development footprint to allow for the avoidance of sensitive environmental features)
Capacity of on-site collector substation	132/33kV
Length of the power line	~1000m
Capacity and circuit of the power line	132kV twin turn dual circuit
Height of the power line towers (pylons)	Up to 26m
Power line servitude width	Up to 35m
Area occupied by the Balance of Plant and the infrastructure it contains	The Balance of Plant (BoP) area will be ~18ha in extent and will include the following infrastructure: » Temporary laydown areas. » A temporary concrete batching plant. » Staff accommodation (temporary). » Operation and Maintenance buildings including a gate house, security building, control centre, offices, warehouses, a workshop and visitor's centre. (a larger area of 26ha is being assessed for the placement of the infrastructure as part of the development footprint to allow for the avoidance of sensitive environmental features)
Access and internal roads	Existing roads on the affected properties will be used where feasible and practical. The width of the roads at the access

Infrastructure	Footprint and dimensions
	points will be up to 8m. The internal access roads will be up to 4.5m wide, and will have a servitude of up to 13,5m.
Turbine hardstand	~75m x 60m
Turbine foundation	~22m x 22m per turbine
Grid connection	A 132kV switching station and a 132/33kV on-site collector substation is proposed to be developed which will be connected via a 132kV overhead power line (twin turn dual circuit). The wind farm will be connected to the national grid through a connection from the 132/33kV collector substation via the 132kV power line which will connect to the 132kV switching station that will loop in and loop out of the existing Poseidon – Albany 132kV line located within the project site.
Underground cabling	Underground cabling will be installed to connect the turbines to the on-site facility substation. The cabling will have a capacity of up to 33kV.
Temporary infrastructure	Temporary infrastructure (including staff accommodation, laydown areas, hardstand areas and a concrete batching plant) will be required during the construction phase. All temporary infrastructure will be rehabilitated following the completion of the construction phase, where it is not required for the operation phase.

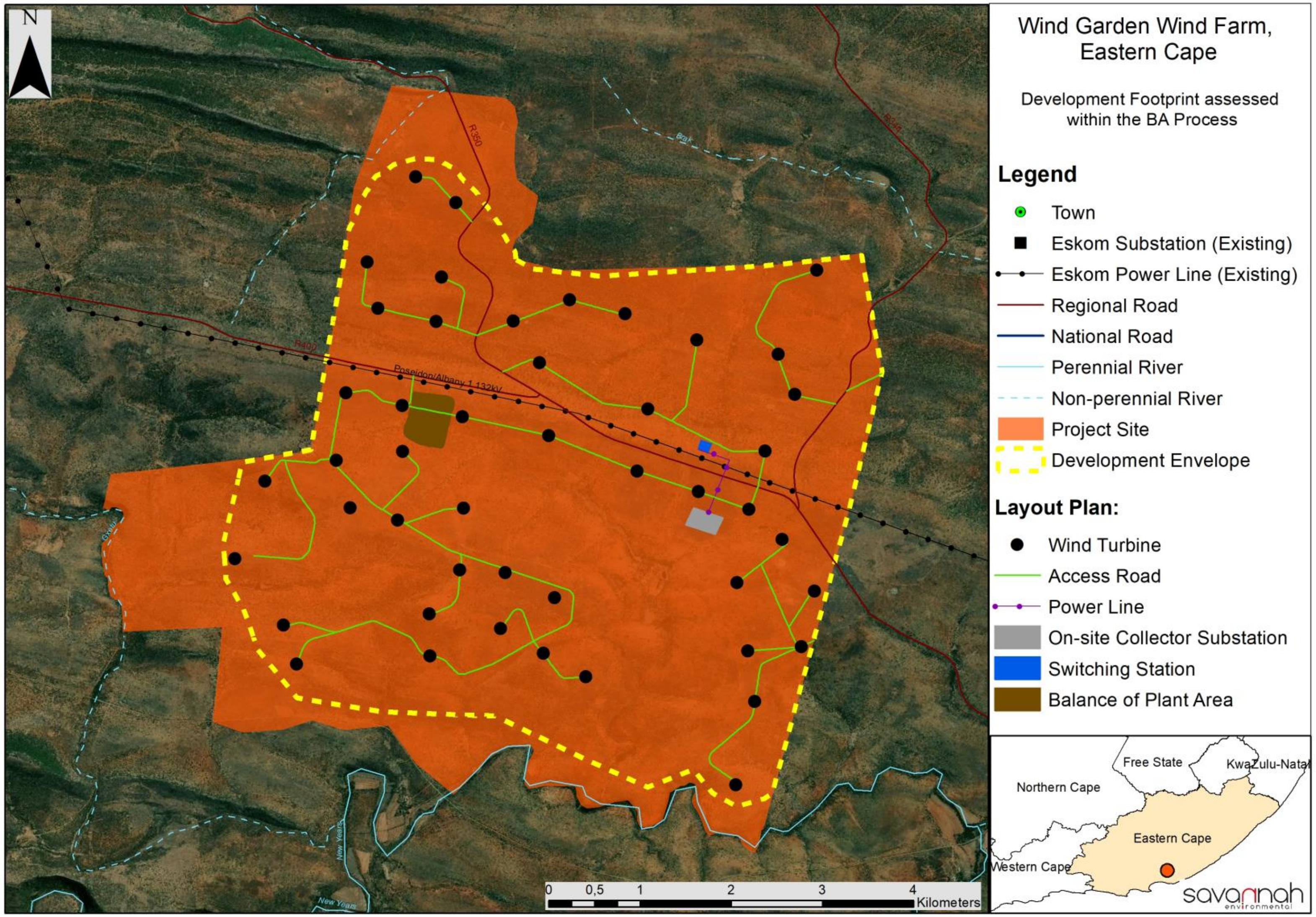


Figure 2.3: Development footprint (~66.6ha) assessed within this BA Report for the Wind Garden Wind Farm

2.2.3 Project Development Phases associated with the Wind Garden Wind Farm

Table 2.2: Details of the project development phases (i.e. construction, operation and decommissioning)

Construction Phase	
Requirements	» Project requires Environmental Authorisation from DEFF, a generation license issued by NERSA, and a wheeling agreement secured with Eskom. » Duration dependent on the number of turbines; expected to be up to 30 months for the Wind Garden Wind Farm. » Create direct construction employment opportunities: Up to 620 jobs created and maintained for approximately two and a half years. » Staff accommodation will be provided on site during the construction phase which will house approximately 479 employees over the 30 months of construction. It is anticipated that the highest number of staff living on site throughout construction will be 211 employees at the peak of the construction phase. » Security staff will also be present during the night-time of the construction phase. » Waste removal and sanitation will be undertaken by a sub-contractor or the municipality, where possible. Waste containers, including containers for hazardous waste, will be located at easily accessible locations /turbine positions on site as well as within the BoP area when construction activities are undertaken. » Electricity required for construction activities will be generated by a generator or will be sourced from available 11kV or 22kV Eskom distribution networks in the area. » Water will be required for the construction phase, which will be approximately 19014.12kl in total for the construction activities and 12686.98kl for human consumption. Water will be sourced from existing boreholes in the area.
Activities to be undertaken	
Conduct surveys prior to construction	» Including, but not limited to: a geotechnical survey, site survey and confirmation of the turbine micro-siting footprint, survey of the on-site substation sites (i.e. switching station and collector substation to determine and confirm the locations of all associated infrastructure).
Establishment of access roads to the Site	» Access/haul roads and internal access roads within the site will be established at the commencement of construction. » Existing access roads will be utilised where possible to minimise impact and upgraded where required. » Access roads to the site will have a width of up to 8m. » Access roads to be established between the turbines for construction and/or maintenance activities within the development footprint. » Internal service road alignment will be approximately 4,5m wide, and will have a servitude of 13,5m.
Undertake site preparation	» Including the clearance of vegetation at the footprint of each turbine, establishment of the laydown areas, the establishment of internal access roads and excavations for foundations. » Stripping of topsoil to be stockpiled, backfilled, removed from site and/or spread on site. » To be undertaken in a systematic manner to reduce the risk of exposed ground being subjected to erosion. » Include search and rescue of floral species of concern (where required) and the identification and excavation of any sites of cultural/heritage value (where required).

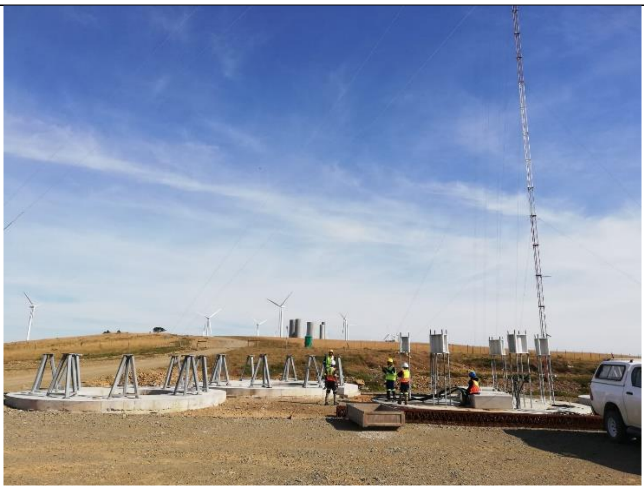
Establishment of laydown areas and batching plant on site	» A laydown area for the storage of wind turbine components, including the cranes required for tower/turbine assembly and civil engineering construction equipment. » The laydown area will also accommodate building materials and equipment associated with the construction of buildings. » A crane hardstand at each turbine position where the main lifting crane will be erected and/or disassembled. » Infilling or depositing materials will be sourced from licenced borrow pits within the surrounding areas. The identification and permitting process of required borrow pits has been commenced as part of a separate EIA process and the Application for Environmental Authorisation is independent of the Wind Garden Wind Farm EIA application. » A temporary concrete batching plant of 50m x 50m in extent to facilitate the concrete requirements for turbine foundations. This will be located within the Balance of Plant area.
Construct foundation	» Concrete foundations of approximately 600m^3 in extent to be constructed at each turbine location. » Excavations to be undertaken mechanically. » Concrete foundation will be constructed to support a mounting ring. » Depending on geological conditions, the use of alternative foundations may be considered (e.g. reinforced piles).
Transport of components and equipment to and within the site	» Turbine units to be transported includes the tower segments, hub, nacelle, and three rotor blades. » Components to be transported to the site in sections on flatbed trucks by the turbine supplier. Imported components to be transported from the Port of Ngqura to the project site via the N2 past Colchester and Nanaga towards Makhanda. » Transportation will take place via appropriate National and Provincial roads, and the dedicated access/haul road to the site. » Components considered as abnormal loads in terms of Road Traffic Act (Act No 29 of 1989) due to dimensional limitations (abnormal length of the blades) and load limitations (i.e. the nacelle) will require a permit for the transportation of the abnormal loads on public roads. » Specialised construction and lifting equipment to be transported to site to erect the wind turbines. » Civil engineering construction equipment to be brought to the site for the civil works (e.g. excavators, trucks, graders, compaction equipment, cement trucks, site offices etc.). » Components for the establishment of the switching station and collector substation (including transformers) and associated infrastructure to be transported to site.
Construction of the turbine	» A lifting crane will be utilised to lift the tower sections, nacelle and rotor into place. » Approximately 1 week is required to erect a single turbine depending on climatic conditions. » Lifting cranes are required to move between the turbine sites.
Construction of the substation	» One switching station and one on-site collector substation to be constructed within the development footprint. » Substations will be constructed with a high-voltage yard footprint.
Connection of wind turbines to the collector substation	» Each wind turbine is to be connected to the on-site collector substation via underground electrical cables. » Excavation of trenches are required for the installation of the cables. Trenches will be approximately 1.2m deep. » Underground cables are planned to follow the internal access roads, as far as possible.
Establishment of	» Operation and Maintenance buildings including a gate house, security building, control centre, offices, warehouses, a workshop and visitors

ancillary infrastructure	centre. » Temporary staff accommodation is required for the duration of construction. » Establishment will require the clearing of vegetation, levelling and the excavation of foundations prior to construction.
Connect substation to the power grid	» A 132kV switching station and a 132/33kV on-site collector substation is proposed to be developed which will be connected via a 132kV overhead power line (twin turn dual circuit). The wind farm will be connected to the national grid through a connection from the 132/33kV collector substation via the 132kV power line which will connect to the 132kV switching station that will loop in and loop out of the existing Poseidon – Albany 132kV line located within the project site.
Undertake site rehabilitation	» Commence with rehabilitation efforts once construction is completed in an area, and all construction equipment is removed. » On commissioning, access points to the site that will not be required for the operation phase will be closed and prepared for rehabilitation.
Operation Phase	
Requirements	» Duration will be 20-25 years. » Requirements for security and maintenance of the facility. » Employment opportunities relating mainly to operation activities and maintenance. Up to 15 full-time employment opportunities will be available. » Current land-use activities, i.e. farming activities, being undertaken within the project site can continue during the operation of the wind farm.
Activities to be undertaken	
Operation and Maintenance	» Full time security, maintenance and control room staff. » All turbines will be operational except under circumstances of mechanical breakdown, inclement weather conditions, or maintenance activities. » Wind turbines to be subject to periodic maintenance and inspection. » Disposal of waste products (e.g. oil) in accordance with relevant waste management legislation. » Areas which were disturbed during the construction phase to be utilised should a laydown area be required during operation.
Decommissioning Phase	
Requirements	» Decommissioning of the Wind Garden Wind Farm infrastructure at the end of its economic life. » Potential for repowering of the facility, depending on the condition of the facility at the time. » Expected lifespan of approximately 20 - 25 years (with maintenance) before decommissioning is required. » Decommissioning activities to comply with the legislation relevant at the time.
Activities to be undertaken	
Site preparation	» Confirming the integrity of site access to accommodate the required equipment and lifting cranes. » Preparation of the site (e.g. laydown areas and construction platform). » Mobilisation of construction equipment.
Disassemble and	» Large crane required for the disassembling of the turbine and tower sections.

remove turbines	» Components to be reused, recycled, or disposed of in accordance with regulatory requirements. » All parts of the turbine would be considered reusable or recyclable except for the blades. » Concrete will be removed to a depth as defined by an agricultural specialist and the area rehabilitated. » Cables will be excavated and removed, as may be required.
Components to be disposed of or recycled.	» Foundation » Tower » Electrical facilities in tower base » Rotor » Generator » Machine house » Regarding the foundation body and sub-base of the tower, the concrete will undergo crushing and be used as combined base/wearing course » Reinforcing steel will go through cleansing and milling to re-melt the components

It is expected that the areas of the project site affected by the wind farm infrastructure (development footprint) will revert back to their original land-use (i.e. primarily grazing) once the Wind Garden Wind Farm has reached the end of its economic life and all infrastructure has been decommissioned.

Table 2.3: Photographs of the construction phase of a wind farm similar to the Wind Garden Wind Farm



CHAPTER 3: ALTERNATIVES

This chapter details the preferred site location, activity and technology alternatives as well as the 'do nothing' option for the Wind Garden Wind Farm.

3.1. Legal Requirements as per the EIA Regulations, 2014 (as amended), for the undertaking of a Basic Assessment Report

This chapter of the BA Report includes the following information required in terms of the EIA Regulations, 2014 - Appendix 1: Content of basic assessment reports:

Requirement	Relevant Section
3(g) a motivation for the preferred site, activity and technology alternative	The identification and motivation for the preferred project site, the development footprint within the development envelope, the proposed activity and the proposed technology is included in sections 3.3.1, 3.3.2 and 3.3.3.
3(h)(i) details of the alternative considered	The details of all alternatives considered as part of the Wind Garden Wind Farm is included in sections 3.3.1 – 3.3.4. A summary of the alternative is also included in section 3.3.
3(h)(ix) the outcome of the site selection matrix	The site selection process followed by the developer in order to identify the preferred project site, development envelope and development footprint is described in section 3.3.1.
3(h)(x) if no alternatives, including alternative locations for the activity were investigation, the motivation for not considering such	Where no alternatives have been considered, motivation has been included. This is included in section 3.3.

3.2 Alternatives Considered during the BA Process

In accordance with the requirements of Appendix 1 of the 2014 Environmental Impact Assessment (EIA) Regulations (GNR 326), reasonable and feasible alternatives including but not limited to site and technology alternatives, as well as the "do-nothing" alternative should be considered.

The DEA Guideline for determining alternatives states that the key criteria for consideration when identifying alternatives are that they should be "practicable", "feasible", "relevant", "reasonable" and "viable". Essentially there are two types of alternatives:

» Incrementally different (modifications) alternatives to the project.
» Fundamentally (totally) different alternatives to the project.

In this instance, 'the project' refers to Wind Garden Wind Farm, a wind energy facility with capacity of up to 264MW$_{AC}$ and associated infrastructure proposed to be developed by an Independent Power Producer (IPP) and intended to provide electricity to private off takers.

3.2.1 *Consideration of Fundamentally Different Alternatives*

Fundamentally different alternatives are usually assessed at a strategic level and, as a result, project-specific environmental impact assessments (including BA processes) are therefore limited in scope and ability to address fundamentally different alternatives. At a strategic level, electricity generating alternatives have been addressed as part of the DMRE's current Integrated Resource Plan for Electricity 2010 – 2030 (IRP)[6], and will continue to be addressed as part of future revisions (refer to Chapter 5 for more details). In this regard, the need for renewable energy power generation from wind energy facilities has been identified as part of the technology mix for power generation in the country for the next 20 years.

The fundamental energy generation alternatives were assessed and considered within the development of the IRP and the need for the development of renewable energy projects has been defined. Therefore, fundamentally different alternatives to the proposed project are not considered within this BA process.

3.2.2 *Consideration of Incrementally Different Alternatives*

Incrementally different alternatives relate specifically to the project under investigation. "Alternatives", in relation to a proposed activity, means different ways of meeting the general purposes and requirements of the activity, which may include alternatives for:

» The property on which, or location where the activity is proposed to be undertaken.
» The type of activity to be undertaken.
» The design or layout of the activity.
» The technology to be used in the activity.
» The operational aspects of the activity.

In addition, the option of not implementing the activity (i.e. the "do-nothing" alternative) must also be considered.

The sections below describe the incrementally different alternatives being considered as part of the Wind Garden Wind Farm. Where no alternative is being considered, a motivation has been provided as required by the EIA Regulations, 2014.

3.3 Project Alternatives under Consideration for the Wind Garden Wind Farm

Table 3.1 provides an overview of the alternatives being considered as part of the project:

[6] The Integrated Resource Plan (IRP) is legislated policy which regulates power generation planning.

Table 3.1: Summary of the alternatives considered as part of the Wind Garden Wind Farm project.

Nature of Alternatives Considered	Description of the Alternative relating to the Wind Garden Wind Farm
Site-specific and Layout Alternatives	One preferred project site has been identified for the development of the Wind Garden Wind Farm due to site specific characteristics such as the wind resource, land availability, topographical considerations and environmental features. The project site is 4336ha in extent which is considered to be sufficient for the development of a wind farm with a contracted capacity of up to 264MW. The location of the project site within a REDZ has also been a significant determination for site site-specific identification.
Activity Alternatives	Only the development of a renewable energy facility is considered by Wind Garden (Pty) Ltd. Due to the location of the project site and the suitability of the wind resource, only the development of a wind farm is considered feasible considering the natural resources available to the area and the current land-use activities undertaken within the project site (i.e. grazing activities).
Technology Alternatives	Only the development of a wind farm is considered due to the characteristics of the site, including the natural resources available. The use of wind turbines for the generation of electricity is considered to be the most efficient technology for the project site. Solar development within the project site was also considered, however the topography limits the availability of flat land required for large scale generation.
'Do-nothing' Alternative	This is the option to not construct the Wind Garden Wind Farm. No impacts (positive or negative) are expected to occur on the social and environmental sensitive features or aspects located within or within the surrounding areas of the project site. The opportunities associated with the development of the wind farm for the Makhanda area and other surrounding towns in the area will not be made available.

These alternatives are described in more detail in the sections which follow.

3.3.1 Site-specific and Layout Alternatives

The Wind Garden Wind Farm project site is planned for the area between Makhanda (Grahamstown) and Somerset East. This area falls within the Cookhouse REDZ and the Eastern Strategic Transmission Corridor. The area was designated as a REDZ and Strategic Transmission Corridor by virtue of the favourable wind resource and existing and planned grid connection infrastructure. As a result, Wind Garden (Pty) Ltd identified this area as a suitable area for the development of a commercial wind farm with the main aim to supply the electricity generated to private off-takers who have a need to shift towards cleaner and more sustainable sources of energy.

The preferred project site for the development of the Wind Garden Wind Farm was identified through an investigation of prospective sites and properties in the area between Makhanda and Somerset East in the Eastern Cape. The investigation involved the consideration of specific characteristics within Province and specifically within the areas near Makhanda. The characteristics considered were identified by the developer as the main aspects that play a role in the opportunities and limitations for the development of a wind farm. The characteristics considered, and the results thereof, are discussed in the sections below. The developer considered that should these characteristics not be favourable for the development of a wind farm, then some limitations and challenges may be expected and potentially hinder such development.

» *Wind Resource* – The developer firstly considered the available wind resource for the Eastern Cape and the Makhanda area through the consideration of various datasets and variables, as well as existing site-specific wind data for the site (monitoring has been undertaken on site since 2011). Through the consideration of the datasets, involving wind presence and wind speed, as well as meteorological information and geographical factors it was confirmed that the area, and in particular the Wind Garden Wind Farm project site, is suitable for the development of a wind farm. Refer to **Figure 3.1**.

The consideration and the confirmation of the wind presence and wind speed at a desktop level (through the consideration of existing data) and the extensive on-site measurements taken at the project site confirmed the wind resource and ultimately the suitability of the resource for the development of a commercial wind farm.

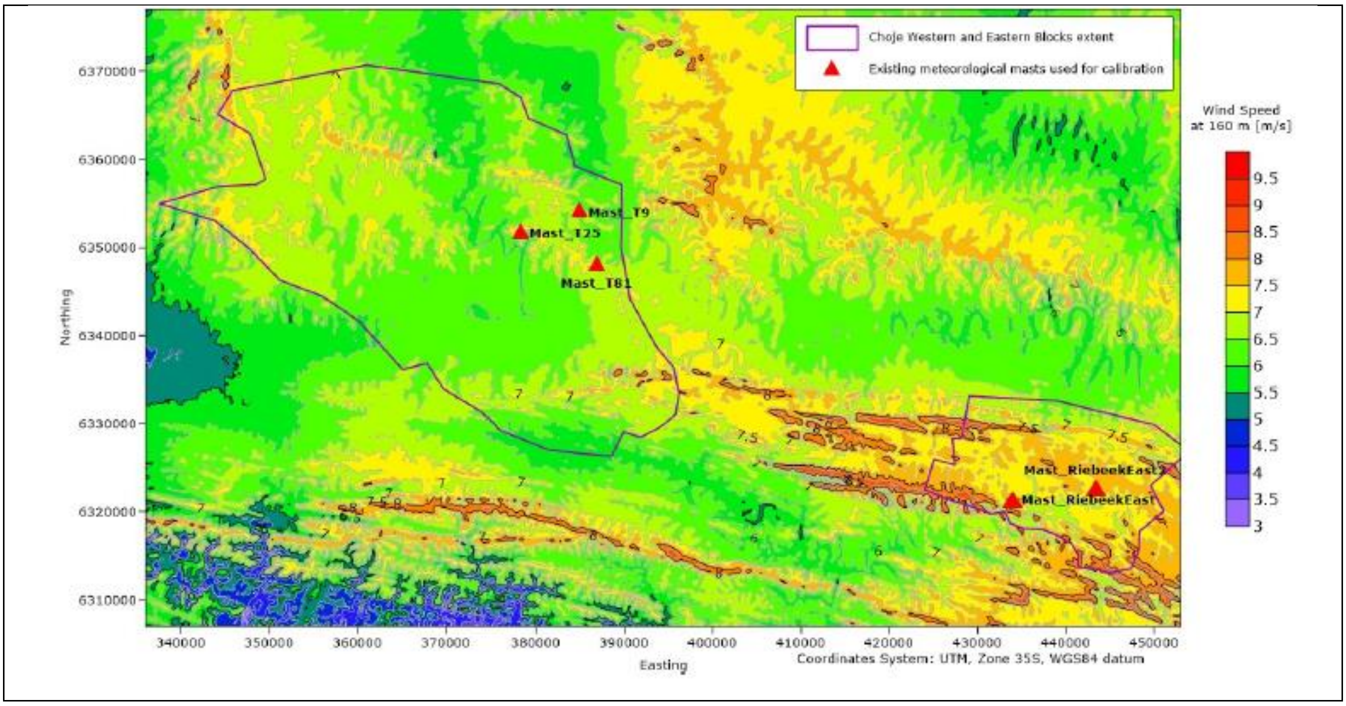


Figure 3.1: Average wind speed (as per raw data) expected at the Wind Garden Wind Farm project site

» *Land Availability* – In order to develop the Wind Garden Wind Farm with a contracted capacity of up to 264MW sufficient space is required. The preferred project site was identified within the Eastern Cape Province and in the Makhanda area following the confirmation of the wind resource. The properties included in the project site are privately-owned parcels available in the area for a development of this nature through agreement with the landowners and are deemed technically feasible by the project developer for such development to take place. The combination of the affected properties has an extent of ~4336ha, which was considered by the developer as sufficient for the development of the ~66.6ha development footprint. This footprint was informed by the consideration of environmental constraints and sensitivities, as discussed further below.

» *Access to the National Grid* – Following the confirmation of sufficient available land for the development of the wind farm, the developer considered the possible grid connection points in order to evacuate the generated electricity into the national grid. This was considered as a vital aspect by the developer for the project in order to reduce transmission costs and environmental and social impact as much as possible. The developer consulted with the Eskom network planners to understand the current capacity of the existing grid connection infrastructure and to identify feasible connection points for the wind farm. The existing Poseidon – Albany 132kV line located within the project site (traversing the project site in an east-west direction) was identified as the preferred grid connection point for the project.

» *Geographical and Topographical Considerations and Existing Infrastructure* – The greater area surrounding the project site has agricultural activities (mainly grazing and game farming) and eco-tourism (including nationally protected areas) as the dominant land uses. The developer considered the potential opportunity for the Wind Garden Wind Farm to bring some relief to the area and the affected landowners and surrounding communities in terms of socio-economic development, skills development and upliftment. The entire project site is also located within the Cookhouse REDZ and the development of the wind farm within the REDZ is considered to be a strategic placement as supporting transmission and distribution infrastructure (required for the development of renewable energy developments) is readily available on the project site to enable renewable energy development and the evacuation of the generated power.

The availability of existing infrastructure was also considered by the client as this will enable the wind farm development to make use of infrastructure already available and reduce the disturbance associated with the construction of the associated infrastructure. The existing road network within the surrounding areas and within the project site makes access to the development area readily available. The developer also considered the fact that the project site has little infrastructure related to residential uses, which may be affected by the development of a wind farm.

From a topographical perspective there are very few physical constraints present which would have an effect on the wind speed and direction as well as the construction of the wind farm.

» *Environmental Screening and consideration of sensitive environmental features* – Following the confirmation of the Wind Garden Wind Farm preferred project site as being technically feasible for the development of a wind farm, the developer commenced with the environmental screening of the site, and assess the main constraints and opportunities and determine whether or not there were any potential fatal flaws or significant no-go areas that might compromise or limit the development of the Wind Garden Wind Farm and the potential for generating 264MW. The screening exercise took place prior to the commencement of the BA process and included specialist investigations of a broader area which considered the development of 128 wind turbines within the eastern section of the cluster (**Figure 3.2**). The sensitivity spatial data compiled by the specialist team for this broader area was provided to the applicant prior to the lodging of the application for environmental authorisation. Through the integration of the specialist sensitivity data obtained, based on field-survey, the developer optimised the development footprint to consider areas and features of high environmental sensitivity through avoidance and reduction of wind farm infrastructure (**Figure 3.3**). Where avoidance was not possible, the developer provided details of technical mitigation planned to reduce the significance of the potential environmental impacts associated with the project. This has resulted in the consideration of a development footprint as part of the BA process which is designed to be environmentally appropriate as far as possible.

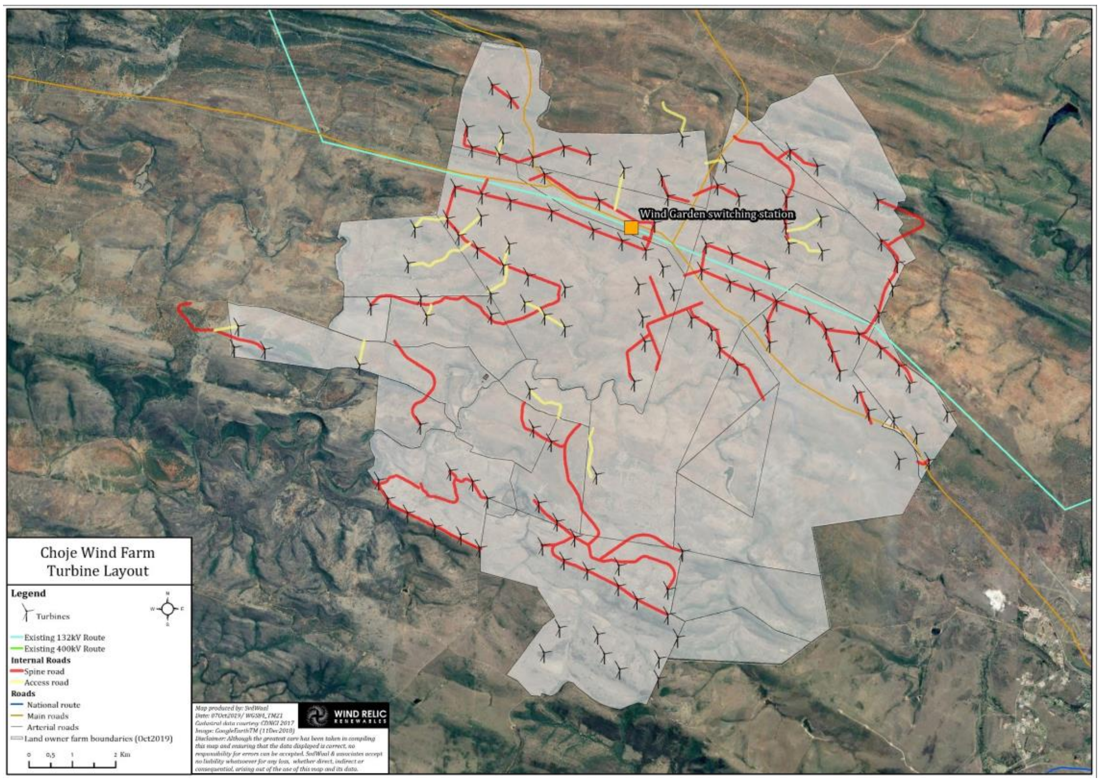


Figure 3.2: Broader area considered for the development of 128 wind turbines within the eastern section of the cluster

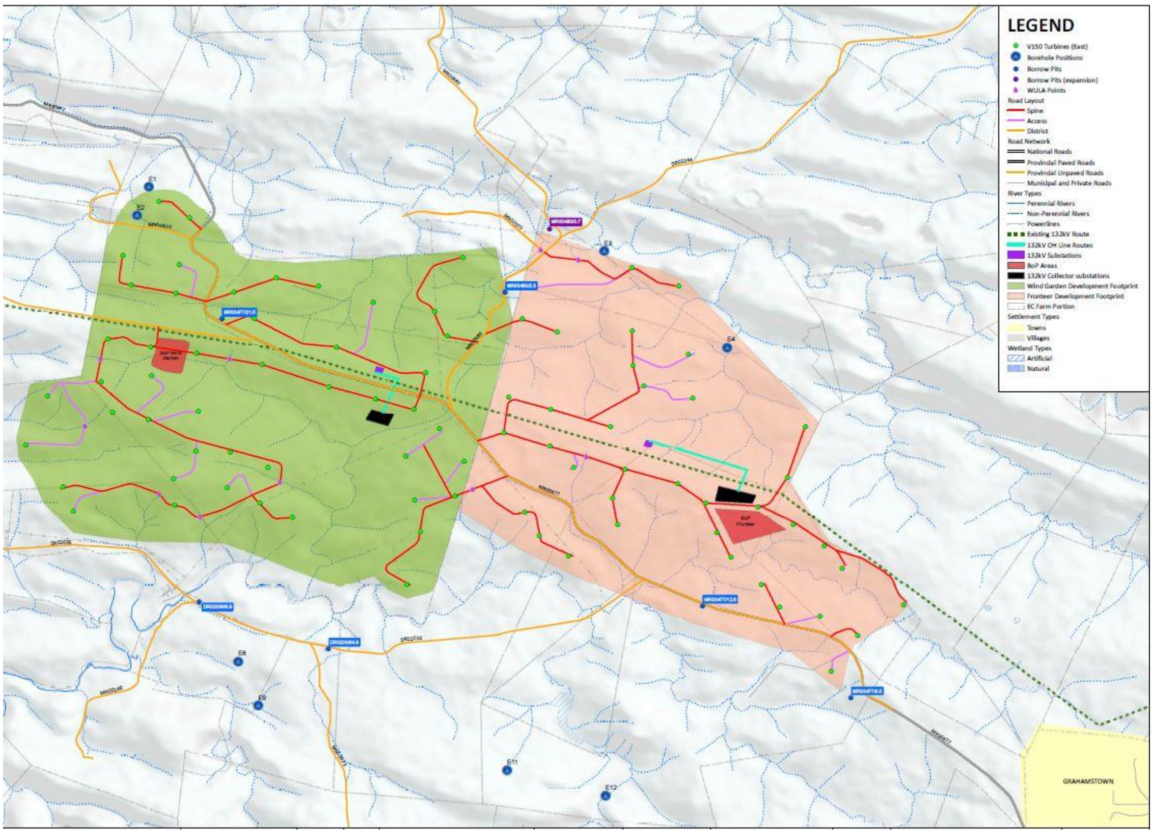


Figure 3.3: Optimised layout with a reduced number of turbines (~85) following consideration of specialist sensitivity inputs

Based on the above considerations, the Wind Garden Wind Farm project site was identified by the developer as being the most technically feasible and viable project site within the broader area for further investigation in support of an application for authorisation. No feasible alternative sites were identified for assessment as part of this BA process. The site selection and layout optimisation process applied by the developer (which includes the process followed above) demonstrates due consideration of the suitability of the project site for the Wind Garden Wind Farm in line with a typical mitigation hierarchy:

1. First Mitigation: avoidance of adverse impacts as far as possible by use of preventative measures (in this instance an environmental screening and integration process assisted in the avoidance of identified sensitive areas).
2. Second Mitigation: minimisation or reduction of adverse impacts to 'as low as practicable' through implementation of mitigation and management measures (in this instance the development of technical mitigation solutions as well as recommendations from the various environmental specialists).
3. Third Mitigation: remedy or compensation for adverse residual impacts, which are unavoidable and cannot be reduced further.

As part of the site selection process and environmental screening, as described above, the first tier of avoidance has already been applied prior to the BA process. No feasible alternative layouts have been identified for investigation. Therefore, as part of the BA process the optimised development footprint has been fully assessed and the impact of the wind farm ground-truthed by independent specialists. The significance of the impacts associated with the proposed development footprint and the appropriateness of the layout has been assessed and is included in Chapter 9 and **Appendices D – M.**

Where any further conflicts in terms of the development footprint and environmental and social sensitivities or features occur, the mitigation strategy will be further implemented to refine the layout in order to meet the objectives of the mitigation hierarchy (i.e. avoid, minimise, mitigate). This application of the mitigation strategy will result in the identification of the preferred optimised development footprint for the project.

3.3.2 Activity Alternatives

Wind Garden (Pty) Ltd is a renewable energy project developer and as such will only consider renewable energy activities in accordance with the need for such development within the IRP. Considering the available natural energy resources within the area and the current significant restrictions placed on other natural resources such as water, it is considered that wind energy is the preferred option for the development of a wind farm within the preferred project site. Based on the wind data collected from the area since 2011, the available wind resource has been confirmed. Based on available information, it is concluded by the developer that there are a limited number of sites in South Africa with a wind resource as good as the proposed site, making development of a wind farm on the proposed site technically and economically feasible. The project site is therefore considered best suited for the development of a wind farm. In addition, grid connection infrastructure to connect the wind farm to the national grid is present within the project site which enables an easy and short connection.

Considering the suitability of the project site for the development of a wind farm, the current land-use activities being undertaken within the project site which relate to grazing and compatibility thereof with the proposed development, the size of the development footprint for the wind farm (i.e. ~66.6ha) and the minimal loss to grazing carrying capacity as a result of the development, the activity (i.e. the development of a wind farm) is considered to be appropriate. Therefore, no activity alternatives are considered within this Basic Assessment.

3.3.3 Technology Alternatives

As Wind Garden (Pty) Ltd is an IPP, only renewable energy technologies are being considered for the generation of up to 264MW (contracted capacity) of electricity. Considering the local resources available (i.e. wind and solar irradiation) for such technologies, the footprint requirements for such developments, the topography of the project site and the current land use in the project site (i.e. agriculture), the project site is considered most suitable for the establishment of a wind farm. This has been confirmed through the on-site wind measurement campaign undertaken since 2011 and other technical characteristics available within and within the surrounding areas of the project site.

Once environmental constraining factors have been determined through the BA process, and more detailed site-specific wind data and turbine specifications are available from the wind monitoring on site, Wind Garden (Pty) Ltd will be considering various wind turbine options. The preferred option will be informed by efficiency as well as environmental impact and constraints (such as noise associated with the turbine and sensitive biophysical features). The wind turbines being proposed for the Wind Garden Wind Farm will be up to 5.6 MW[7] in capacity. The turbines are proposed to have a hub height of up to 120m, with an overall tip height of up to 200m.

There is a limited range of alternative technologies (turbines) available for commercial-scale wind energy facilities. In addition, the technology is constantly evolving. **Table 3.2** summarises the types of variables associated with existing wind turbine technologies.

Table 3.2: Variables associated with existing wind turbine technologies.

Variables	**Description**
Type	The horizontal axis wind turbine completely dominates the commercial scale wind turbine market.
Size	Typical land-based utility scale wind turbines are currently in the 600 kW to 6MW range internationally.
Foundation	The foundation is usually poured reinforced concrete. Its size and shape is dictated by the size of the wind turbine and local geotechnical considerations. The foundation for the Wind Garden Wind Farm will be 22m x 22m.
Tower	Towers are typically constructed from steel and/or concrete and can be hybrid. The towers used for the Wind Garden Wind Farm will be up to 120m in height.
Rotor	3- Bladed rotor is standard.
Rotor Speed Control	Fixed or variable speed rotors.
Gears	Geared and gearless.
Generator	Standard high speed generator (geared) or custom low-speed ring generator (gearless).

[7] The 5.6MW capacity of the individual turbines is a predicted maximum per turbine and the final decision regarding the final turbine capacity will be based on the final facility layout and technical and environmental considerations.

Other variables	Yaw gears, brakes, control systems, lubrication systems and all other turbine components are similar on modern wind turbines.

Wind Garden (Pty) Ltd therefore confirms wind energy technology as the preferred technology alternative for the development of the Wind Garden Wind Farm. No further technology alternatives will be considered.

3.3.4. The 'do-nothing' Alternative

The 'do-nothing' alternative is the option of wind Garden (Pty) Ltd not constructing the Wind Garden Wind Farm on the proposed site. This would result in no environment or social impacts (positive or negative) as a result of the development of a wind farm within the preferred project site. This alternative is assessed in detail within Chapter 9 of this BA Report.

CHAPTER 4: WIND AS A POWER GENERATION TECHNOLOGY

Environmental pollution and the emission of CO_2 from the combustion of fossil fuels through the implementation of conventional power plants constitute a threat to the environment. The use of fossil fuels is reportedly responsible for ~70% of greenhouse gas emissions worldwide. The approach to addressing climate change needs to include a shift in the way that energy is generated and consumed. Worldwide, many solutions and approaches are being developed to reduce emissions. However, it is important to acknowledge that the most cost-effective solution in the short-term is not necessarily the least expensive long-term solution. This holds true not only for direct project costs, but also indirect project costs such as impacts on the environment. Renewable energy is considered a 'clean source of energy' with the potential to contribute greatly to a more ecologically, socially and economically sustainable future. The challenge however is to ensure that wind energy projects are able to meet all economic, social and environmental sustainability criteria through the appropriate placement of these facilities.

Compared with other renewable energy sources such as solar and bio-energy, wind energy generates the highest energy yield while affecting the smallest physical land space. Wind technologies convert the energy of moving air masses at the earth's surface to mechanical power that can be used directly for mechanical needs (e.g. milling or water pumping) or converted to electric power in a generator (i.e. a wind turbine). The use of wind for electricity generation is essentially a non-consumptive use of a natural resource, and produces an insignificant quantity of greenhouse gases in its life cycle. A wind farm also qualifies as a Clean Development Mechanism (CDM) project (i.e. a financial mechanism developed to encourage the development of low carbon generating technologies) as it meets all international requirements in this regard.

This chapter explores the use of wind energy as a means of power generation.

4.1. Wind Resource as a Power Generation Technology

Using the wind resource for energy generation has the attractive attribute in that the fuel is free. The economics of a wind energy project crucially depend on the wind resource at the project site. Detailed and reliable information about the speed, strength, direction, and frequency of the wind resource is vital when considering the installation of a wind farm, as the wind resource is a critical factor to the success of the installation.

» **Wind power** is the conversion of wind energy into a useful form, such as electricity, using wind turbines.
» **Wind speed** is the rate at which air flows past a point above the earth's surface. Average annual wind speed is a critical siting criterion, since this determines the cost of generating electricity. The doubling of the wind speed increases the wind power by a factor of 8, so even small changes in wind speed can produce large changes in the economic performance of a wind farm. Wind turbines can start generating electricity at wind speeds of between ~3 m/s to 4 m/s (this is also known as the cut-in wind speed), with wind speeds greater than 6 m/s currently required for a wind farm to be economically viable. Wind speed can be highly variable and is also affected by a number of factors, including surface roughness of the terrain. The effect of height variation/relief in the terrain is seen as a speeding-up/slowing-down effect of the wind due to the topography of the landscape. Elevation in the topography influences the flow of air, and results in turbulence within the air stream, which has to be considered in the placement of turbines.

» **Wind direction** at a site is important to understand as it influences the turbulence over the site, and therefore the potential energy output. However, wind turbines can extract energy from any wind direction as the nacelle automatically turns to face the blades into the predominant wind direction at any point in time.

A wind resource measurement campaign and analysis programme must be conducted for the site proposed for development, as only measured data will provide a robust prediction of the wind farm's expected energy production over its lifetime. This is being undertaken for the project site through the on-site monitoring of the wind resource via wind masts installed in 2011.

The placement of the individual turbines within a wind farm must consider the following technical factors:

» Predominant wind direction, wind strength and frequency;
» Topographical features or relief affecting the flow of the wind (e.g. causing shading effects and turbulence of air flow); and
» Effects of adjacent turbines on wind flow and speed – specific spacing is required between turbines in order to reduce the effects of wake turbulence.

Wind turbines typically need to be spaced approximately 3 to 5 times the rotor diameter apart in order to minimise the induced wake effect that the turbines might have on each other (refer to **Figure 4.1**). Once a viable footprint for the establishment of the wind farm has been determined (through the consideration of both technical and environmental criteria) the spacing requirements will be considered through the process of micro-siting the turbines on the site.

4.1.1. How do wind turbines function

Wind turbines are mounted on a tower at height to capture the most energy. The kinetic energy of wind is used to turn a wind turbine to generate electricity. At an increased height above ground, they can take advantage of the faster and less turbulent wind. Turbines catch the wind's energy with their propeller-like blades. Generally a wind turbine consists of three rotor blades and a nacelle mounted at the top of a tapered steel or concrete tower. The mechanical power generated by the rotation of the blades is transmitted to the generator within the nacelle.

Turbines are able to operate at varying speeds. The amount of energy a turbine can harness depends on both the wind velocity and the length of the rotor blades. It is anticipated that the turbines utilised for the Wind Garden Wind Farm will have a hub height of up to 120m, and a tip height of up to 200m. The capacity of the wind farm will depend on the wind turbine selected by Wind Garden (Pty) Ltd (turbine capacity and model that will be deemed most suitable for the site). A maximum of 47 turbines are proposed for the project site.

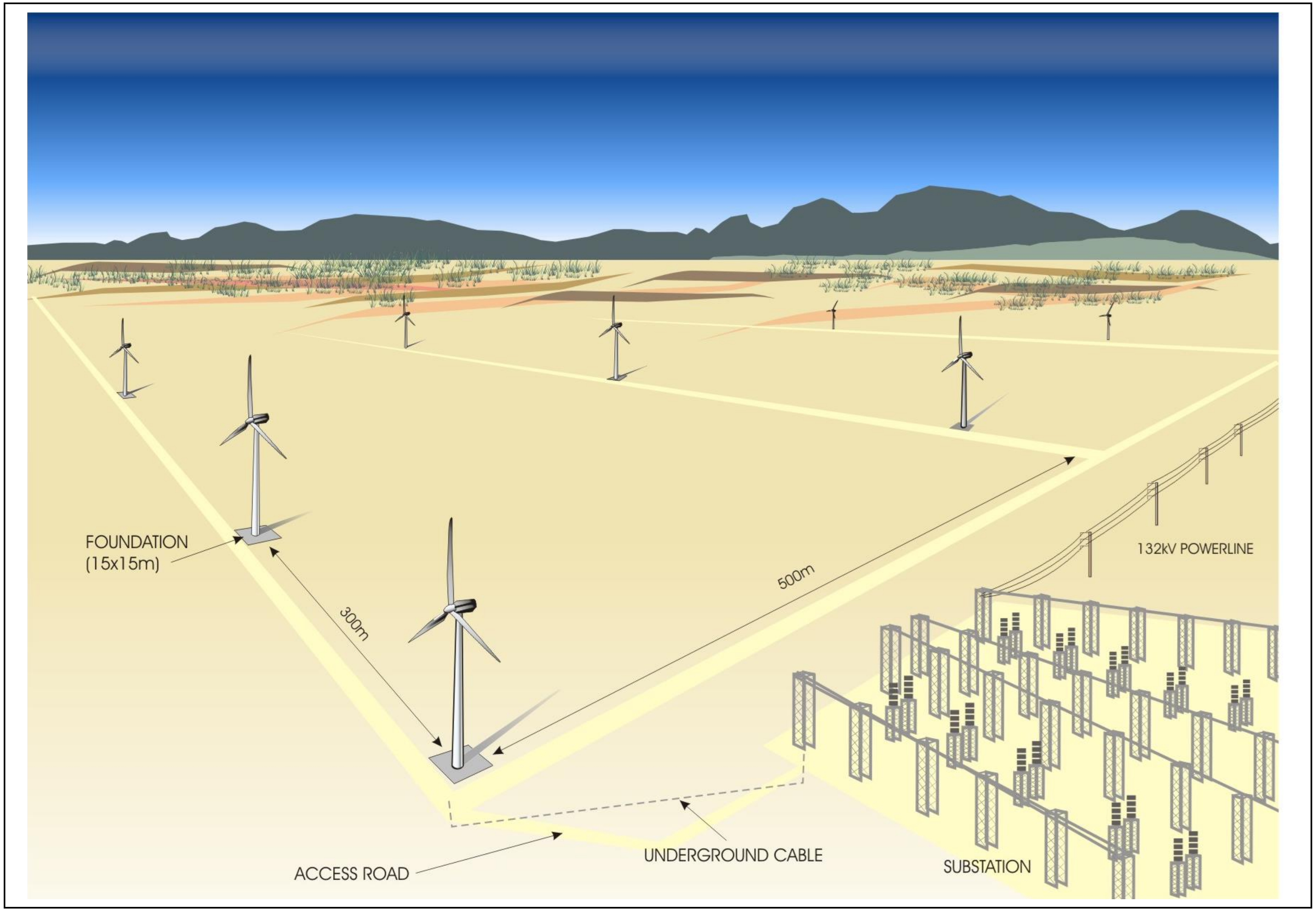


Figure 4.1: Artist's impression of a portion of a typical wind energy facility, illustrating the various components and associated infrastructure. Note that distances and measurements shown are indicative and for illustrative purposes only.

4.1.2. Main Components of a Wind Turbine

The turbine consists of the following major components (as shown in **Figure 4.2**):

» The foundation unit
» The tower
» The rotor
» The nacelle

The foundation

The foundation is used to secure each wind turbine to the ground. These structures are commonly made of reinforced concrete and are designed to withstand the vertical loads (weight) and lateral loads (wind).

The tower

The tower is a hollow structure (steel or concrete or a combination of the two materials, known as hybrid) allowing access to the nacelle (up to 120m in height). The height of the tower is a key factor in determining the amount of electricity a turbine can generate as the wind speed varies with height. Towers are typically delivered to site in sections and then erected and joined together on site. Most towers are made of steel however some are made of reinforced post-stressed concrete.

The tower on which a wind turbine is mounted is not just a support structure. It also raises the wind turbine so that its blades safely clear the ground and so it can reach the stronger winds at higher elevations. The tower must be strong enough to support the wind turbine and to sustain vibration, wind loading and the overall weather elements for the lifetime of the wind turbine.

Example of a tower on which the rotor is mounted

The Rotor

The portion of the wind turbine that collects energy from the wind is called the rotor. The rotor comprises of three rotor blades. The rotor blades use the latest advances in aeronautical engineering materials science to maximise efficiency. The greater the number of turns of the rotor the more electricity is produced. The rotor converts the energy in the wind into rotational energy to turn the generator. The rotor has three blades that rotate at about 15 to 28 revolutions per minute (rpm). The speed of rotation of the blades is controlled by turning the blades to face into the wind ('yaw control'), and changing the angle of the blades ('pitch control') to make the most use of the available wind.

The rotor blades function in a similar way to the wing of an aircraft, utilising the principles of lift**.** When air flows past the blade, a wind speed and pressure differential is created between the upper and lower blade surfaces. The pressure at the lower surface is greater and therefore acts to "lift" the blade. When blades are attached to a central axis, like a wind turbine rotor, the lift is translated into rotational motion. Lift-powered wind turbines are well suited for electricity generation.

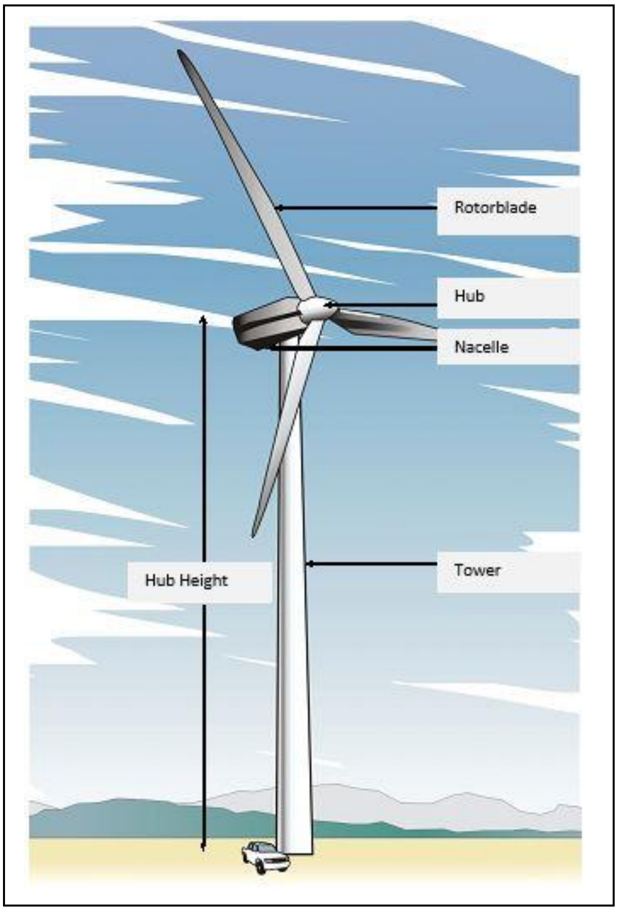


Figure 4.2: Illustration of the main components of a wind turbine

<u>The nacelle</u>

The nacelle at the top of the tower accommodates the gears, the generator, anemometer for monitoring the wind speed and direction, cooling and electronic control devices, and yaw mechanism. Geared nacelles generally have a longer form/ structure than gearless turbines.

The generator is what converts the turning motion of a wind turbine's blades into electricity. Inside this component, coils of wire are rotated in a magnetic field to produce electricity. The generator's rating, or size, is partly dependent on the length of the wind turbine's blades because more energy is captured by longer blades.

Other infrastructure associated with the facility includes internal access roads, a power line, switching station, an on-site collector substation and operation and maintenance buildings. The construction phase of the wind farm is dependent on the number of turbines erected and is estimated at a maximum of approximately 30 months (including all infrastructure). The lifespan of the facility (i.e. operation phase) is approximated at 20 to 25 years.

4.1.3. Operating Characteristics of a Wind Turbine

A turbine is designed to operate continuously, unattended and with low maintenance for more than 20 years or >120 000 hours of operation. Once operating, a wind farm can be monitored and controlled remotely, with a mobile team for maintenance, when required.

The cut-in speed is the minimum wind speed at which the wind turbine will generate usable power and is usually between ~3 m/s and 4 m/s. This wind speed is typically between 10 and 15 km/hr (i.e. ~3 m/s and 4 m/s).

At very high wind speeds, typically over 90 km/hr (25 m/s), the wind turbine will cease power generation and shut down. The wind speed at which shut down occurs is called the cut-out speed. Having a cut-out speed is a safety feature which protects the wind turbine from damage. Normal wind turbine operation usually resumes when the wind drops back to a safe level.

It is the flow of air over the blades and through the rotor area that makes a wind turbine function. The wind turbine extracts energy by slowing the wind down. The theoretical maximum amount of energy in the wind that can be collected by a wind turbine's rotor is approximately 59%. This value is known as the Betz Limit. Therefore, if a blade were 100% efficient then it would extract 59% of the energy as this is the maximum (due to Betz law). In practice, the typical collection efficiency of a rotor is 35% to 45%. A complete wind energy system incurs losses through friction and modern systems end up converting between 20-25% of the energy in the air into electricity which equates to 34 - 42% of the maximum (due to Betz Law).

However, because the energy in the air is free, describing how efficiently the energy is converted is only useful for system improvement and monitoring purposes. A more useful measurement is the Capacity Factor, which is also represented as a percentage. The Capacity Factor percentage is calculated from the actual MWh output of electricity from the entire wind farm over 1 year divided by the nameplate maximum theoretical output for the same period. It therefore also takes wind resource, wind variability and system availability (downtime, maintenance and breakdowns) into account. Wind Garden (Pty) Ltd has initial Net P50 predictions for Capacity Factors upward of 40%, which compares favourably with other best resource sites in South Africa. This figure will be predicted more accurately when more on-site wind data has been recorded and the most suitable turbine has been chosen.

Wind turbines can be used as stand-alone applications, or they can be connected to a utility power grid. For utility-scale sources of wind energy, a large number of wind turbines are usually erected close together (suitably spaced so as to minimise wake losses and wake induced turbulence) and then connected to an on-site substation where all power is transformed to the correct voltage and then exported via a linkage to the utility power grid. This is termed a wind farm.

CHAPTER 5: POLICY AND LEGISLATIVE CONTEXT

This Chapter provides an overview of the policy and legislative context within which the development of a wind energy facility such as the Wind Garden Wind Farm and its associated infrastructure is proposed. It identifies environmental legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks and instruments that are applicable to this activity and are to be considered in the assessment process which may be applicable to or have bearing on the proposed project. It also provides information which supports the need and justification for the project, as discussed in Chapter 6.

Further environmental legislation relevant to the project is described and considered in Chapter 7 of this BA Report.

5.1 Legal Requirements as per the EIA Regulations, 2014 (as amended), for the undertaking of a Basic Assessment Report

This chapter of the BA Report includes the following information required in terms of Appendix 1: Content of basic assessment reports:

Requirement	Relevant Section
(e) a description of the policy and legislative context within which the development is proposed including- (i) an identification of all legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks, and instruments that are applicable to this activity and have been considered in the preparation of the report. (ii) how the proposed activity complies with and responds to the legislation and policy context, plans, guidelines, tools frameworks, and instruments.	A description of the policy and legislative context within which the Wind Garden Wind Farm is proposed is included and considered within this chapter.

5.2 Strategic Electricity Planning in South Africa

The energy sector in South Africa has been, and continues to be, at the centre of the economic and social development. The industry directly affects the economy by using labour and capital to produce energy. As the country`s economy continues to grow, the Department of Mineral Resources and Energy (DMRE) is mandated to ensure that energy resources are available, and that there is access to energy services in an affordable, reliable and sustainable manner, while minimizing the associated adverse environmental impacts (Department of Energy, 2019).

The expansion of electricity generation capacity in South Africa is based on national policy and informed by on-going strategic planning undertaken by the DMRE. The hierarchy of policy and planning documentation that supports the development of renewable energy projects, such as wind energy facilities, is illustrated in **Figure 5.1**. These policies are discussed in more detail in the following sections, along with the provincial and local policies and plans that have relevance to the development of the Wind Garden Wind Farm.

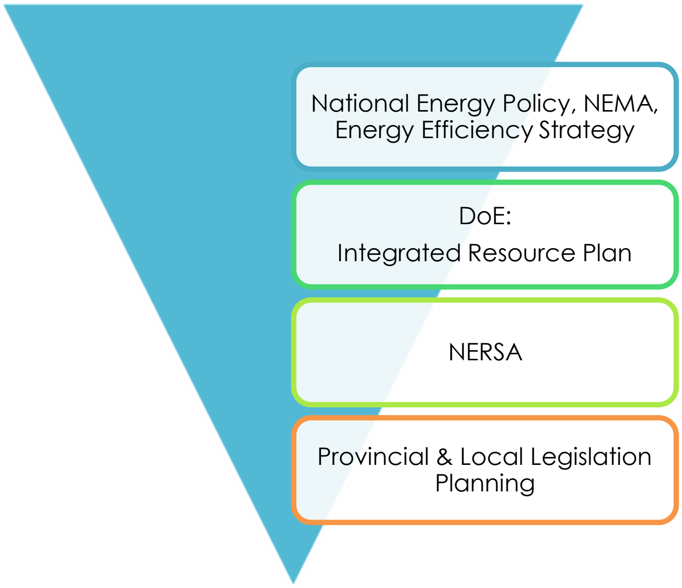


Figure 5.1: Hierarchy of electricity and planning documents

The South African energy industry is evolving rapidly, with regular changes to legislation and industry role-players. The regulatory hierarchy for an energy generation project of this nature consists of three tiers of authority who exercise control through both statutory and non-statutory instruments – that is National, Provincial and Local levels. As wind energy developments are a multi-sectoral issue (encompassing economic, spatial, biophysical, and cultural dimensions) various statutory bodies are likely to be involved in the approval process of a wind energy project and the related statutory environmental assessment process.

At **National Level**, the main regulatory agencies are:

- **Department of Mineral Resources and Energy (DMRE):** This Department is responsible for policy relating to all energy forms and for compiling and approving the Integrated Resource Plan (IRP) for electricity and since merging with the Department of Mineral Resources (DMR) is also responsible for granting approvals for the use of land which is contrary to the objects of the Mineral and Petroleum Resource Development Act (No. 28 of 2002) (MPRDA) in terms of Section 53 of the MPRDA. Therefore, in terms of the Act, approval from the Minister is required to ensure that the proposed activities do not sterilise mineral resources that may occur within the broader study area.
- **National Energy Regulator of South Africa (NERSA):** NERSA is responsible for regulating all aspects of the electricity sector and will ultimately issue licenses for IPP projects to generate electricity.
- **Department of Environment, Forestry and Fisheries (DEFF):** This Department is responsible for environmental policy and is the controlling authority in terms of NEMA and the 2014 EIA Regulations (GN R326) as amended. DEFF is the competent authority for this project (as per GNR 779 of 01 July 2016), and is charged with considering whether to grant an EA for the project under consideration. Furthermore, the Department is also responsible for issuing permits for the disturbance or destruction of protected tree species listed under Section 15 (1) of the National Forest Act (No. 84 of 1998) (NFA). The Department is also responsible for permits for Threatened or Protected Species (TOPS) under the National Environmental Management: Biodiversity Act.

- **The South African Heritage Resources Agency (SAHRA):** SAHRA is a statutory organisation established under the National Heritage Resources Act (No. 25 of 1999) (NHRA), as the national administrative body responsible for the protection of South Africa's cultural heritage.
- **South African National Roads Agency Limited (SANRAL):** This Agency is responsible for the regulation and maintenance of all national road routes.
- **Department of Human Settlements, Water and Sanitation (DHSWS):** This Department is responsible for effective and efficient water resource management to ensure sustainable economic and social development. This Department is also responsible for evaluating applications and issuing licenses pertaining to water use (i.e. Water Use Licenses (WUL) and General Authorisation).
- **The Department of Agriculture, Rural Development and Land Reform (DARDLD):** This Department is the custodian of South Africa's agricultural resources and is responsible for the formulation and implementation of policies governing the agricultural sector and the initiation, facilitation, coordination and implementation of integrated rural development programmes.
-

At **Provincial Level**, the main regulatory agencies are:

- **Eastern Cape Department of Economic Development, Environmental Affairs and Tourism (DEDEAT):** This Department is the commenting authority for the BA process for the project and is responsible for the issuing of other biodiversity and conservation-related permits.
- **Eastern Cape Department of Transport:** This Department provides traffic management and road safety towards a more secure environment.
- **Eastern Cape Provincial Heritage Resources Authority (ECHRA):** This Department identifies, conserves and manage heritage resources throughout the Eastern Cape Province.

At the **Local Level,** the local and district municipal authorities are the principal regulatory authorities responsible for planning, land use and the environment. In the Eastern Cape Province, both the local and district municipalities play a role. The affected local municipality is the **Makana Local Municipality** which forms part of the **Sarah Baartman District Municipality**. In terms of the Municipal Systems Act (No. 32 of 2000), it is compulsory for all municipalities to go through an Integrated Development Planning (IDP) process to prepare a five-year strategic development plan for the area under their control.

5.3 International Policy and Planning Context

A brief review of the most relevant international policies relevant to the establishment of the Wind Garden Wind Farm are provided below in **Table 5.1**. The Wind Garden Wind Farm is considered to be aligned with the aims of these policies, even if contributions to achieving the goals therein are only minor.

Table 5.1: International policies relevant to the Wind Garden Wind Farm

Relevant policy	Relevance to the Wind Garden Wind Farm
United Nations Framework Convention on Climate Change (UNFCCC) and Conference of the Party (COP)	The Conference of the Parties (COP), established by Article 7 of the UNFCCC, is the supreme body and highest decision-making organ of the Convention. It reviews the implementation of the Convention and any related legal instruments and takes decisions to promote the effective implementation of the Convention. The Conference of the Parties (COP) 21 was held in Paris from 30 November to 12 December 2015. From this conference, an agreement to tackle global warming was reached between 195 countries.

Relevant policy	Relevance to the Wind Garden Wind Farm
	South Africa signed the Agreement in April 2016 and ratified the agreement on 01 November 2016. The Agreement was assented to by the National Council of Provinces on 27 October 2016, and the National Assembly on 1 November 2016. South Africa's National Climate Change Response Policy (NCCRP) establishes South Africa's approach to addressing climate change, including adaptation and mitigation responses. The NCCRP formalises Government's vision for a transition to a low carbon economy, through the adoption of the 'Peak, Plateau and Decline' (PPD) GHG emissions trajectory whereby South Africa's emissions should peak between 2020 and 2025, plateau for approximately a decade, and then decline in absolute terms thereafter, and based on this the country has pledged to reduce emissions by 34% and 42% below Business As Usual (BAU) emissions in 2020 and 2025, respectively. The policy provides support for the Wind Garden Wind Farm which will contribute to managing climate change impacts, supporting the emergency response capacity, as well as assist in reducing GHG emissions in a sustainable manner.
The Equator Principles III (June 2013)	The Equator Principles (EPs) III constitute a financial industry benchmark used for determining, assessing, and managing project's environmental and social risks. The EPs are primarily intended to provide a minimum standard for due diligence to support responsible risk decision-making. The EPs are applicable to large infrastructure projects (such as the Wind Garden Wind Farm) and apply globally to all industry sectors. Such an assessment should propose measures to minimise, mitigate, and offset adverse impacts in a manner relevant and appropriate to the nature and scale of the Wind Garden Wind Farm. In terms of the EPs, South Africa is a non-designated country, and as such the assessment process for projects located in South Africa evaluates compliance with the applicable IFC Performance Standards on Environmental and Social Sustainability, and Environmental Health and Safety (EHS) Guidelines. The Wind Garden Wind Farm is currently being assessed in accordance with the requirements of the 2014 EIA Regulations, as amended (GN R706), published in terms of Section 24(5) of the National Environmental Management Act (No. 107 of 1998) (NEMA), which is South Africa's national legislation providing for the authorisation of certain controlled activities. Through this assessment, all potential social and environmental risks are identified and assessed, and appropriate mitigation measures proposed.
International Finance Corporation (IFC) Performance Standards and Environmental and Social Sustainability (January 2012)	The International Finance Corporation's (IFC) Performance Standards (PSs) on Environmental and Social Sustainability were developed by the IFC and were last updated on 1 January 2012. Performance Standard 1 requires that a process of environmental and social assessment be conducted, and an Environmental and Social Management System (ESMS) appropriate to the nature and scale of the project, and commensurate with the level of its environmental and social risks and impacts, be established and maintained. The above-mentioned standard is the overarching standard to which all the other standards relate. Performance Standards 2 through to 8 establish specific requirements to avoid, reduce, mitigate or compensate for impacts on people and the environment, and to improve conditions where appropriate. While all relevant social and environmental risks and potential impacts should be considered as part of the assessment, the standards 2 and 8 describe potential social and environmental impacts that require particular attention specifically within emerging markets. Where social or environmental impacts are anticipated, the developer is required to manage them

Relevant policy	Relevance to the Wind Garden Wind Farm
	through its ESMS consistent with Performance Standard 1. Given the nature of the Wind Garden Wind Farm, it is anticipated (at this stage of the process) that Performance Standards 1, 2, 3, 4, 6, and 8 may be applicable to the project.

5.4 National Policy

5.4.1 The National Energy Act (No. 34 of 2008)

The purpose of the National Energy Act (No. 34 of 2008) is to ensure that diverse energy resources are available, in sustainable quantities and at affordable prices, to the South African economy in support of economic growth and poverty alleviation, while taking into account environmental management requirements and interactions amongst economic sectors, as well as matters relating to renewable energy. The National Energy Act also provides for energy planning, increased generation and consumption of renewable energies, contingency energy supply, holding of strategic energy feedstocks and carriers, adequate investment in, appropriate upkeep and access to energy infrastructure. The Act provides measures for the furnishing of certain data and information regarding energy demand, supply and generation, and for establishing an institution to be responsible for promotion of efficient generation and consumption of energy and energy research.

The Act provides the legal framework which supports the development of power generation facilities.

5.4.2 White Paper on the Energy Policy of South Africa, 1998

The South African Energy Policy, published by the then Department of Minerals and Energy (DME) in December 1998 identifies five key objectives, namely:

» Increasing access to affordable energy services.
» Improving energy sector governance.
» Stimulating economic development.
» Managing energy-related environmental impacts.
» Securing supply through diversity.

In order to meet these objectives and the developmental and socio-economic objectives of South Africa, the country needs to optimally use available energy resources. The South African Government is required to address what can be done to meet these electricity needs both in the short and long-term. The Energy Policy identifies key objectives for energy supply, such as increasing access to affordable energy services, managing energy-related environmental impacts and securing energy supply through diversifying South Africa's electricity mix.

This policy recognises that renewable energy applications have specific characteristics which need to be considered. The Energy Policy is "*based on the understanding that renewables are energy sources in their own right, and are not limited to small-scale and remote applications, and have significant medium- and long-term commercial potential*." In addition, the Energy Policy states that "*Renewable resources* *generally operate from an unlimited resource base and, as such, can increasingly contribute towards a long-term sustainable energy future*".

The support for the Energy Policy is guided by a rationale that South Africa has a very attractive range of renewable resources, particularly wind and solar, and that renewable applications are, in fact, the least cost energy service in many cases from a fuel resource perspective (i.e. the cost of fuel in generating electricity from such technology), more so when social and environmental costs are taken into account. In spite of this range of resources, the National Energy Policy acknowledges that the development and implementation of renewable energy applications has been neglected in South Africa.

Government policy on renewable energy is therefore concerned with addressing the following challenges:

» Ensuring that economically feasible technologies and applications are implemented.
» Ensuring that an equitable level of national resources is invested in renewable technologies, given their potential and compared to investments in other energy supply options.
» Addressing constraints on the development of the renewable industry.

5.4.3 White Paper on the Renewable Energy Policy, 2003

The White Paper on Renewable Energy Policy supplements the Government's overarching policy on energy as set out in its White Paper on the Energy Policy of the Republic of South Africa (DME, 1998), which pledges '*Government support for the development, demonstration and implementation of renewable energy sources for both small and large-scale applications*'.

This White Paper on Renewable Energy sets out Government's vision, policy principles, strategic goals and objectives for promoting and implementing renewable energy in South Africa. The main aim of the policy is to create the conditions for the development and commercial implementation of renewable technologies. The position of the White Paper on Renewable Energy is based on the integrated resource planning criterion of:

"Ensuring that an equitable level of national resources is invested in renewable technologies, given their potential and compared to investments in other energy supply options."

The White Paper on Renewable Energy sets out the Government's vision, policy principles, strategic goals and objectives for promoting and implementing renewable energy in South Africa. It also informs the public and the international community of the Government's vision, and how the Government intends to achieve these objectives; and informs Government agencies and organs of their roles in achieving the objectives.

South Africa relies heavily on coal to meet its energy needs because it is well-endowed with coal resources in particular. However, South Africa is endowed with renewable energy resources that can be sustainable alternatives to fossil fuels, but which have so far remained largely untapped. This White Paper fosters the uptake of renewable energy in the economy and has a number of objectives that include:

» Ensuring that equitable resources are invested in renewable technologies.
» Directing public resources for implementation of renewable energy technologies.
» Introducing suitable fiscal incentives for renewable energy.

» Creating an investment climate for the development of renewable energy sector.

The objectives of the White Paper on Renewable Energy are considered in six focal areas, namely:

i) Financial instruments.
ii) Legal instruments.
iii) Technology development.
iv) Awareness raising.
v) Capacity building and education.
vi) Market based instruments and regulatory instruments.

This policy supports the investment in renewable energy facilities as they contribute towards ensuring energy security through the diversification of energy supply, reducing Greenhouse Gas (GHG) emissions and the promotion of renewable energy sources.

5.4.4 The Electricity Regulation Act (No. 04 of 2006) (ERA)

The Electricity Regulation Act (ERA) (No. 04 of 2006) as amended by the Electricity Regulation Act (No. 28 of 2007), replaced the Electricity Act (No. 41 of 1987), as amended, with the exception of Section 5B, which provides funds for the energy regulator for the purpose of regulating the electricity industry.

The ERA establishes a national regulatory framework for the electricity supply industry and made NERSA custodian and enforcer of the National Electricity Regulatory Framework. The ERA also provides for licences and registration as the manner in which the generation, transmission, distribution, reticulation, trading, and import and export of electricity is regulated.

5.4.5 The National Development Plan (NDP) 2030

The National Development Plan (NDP) 2030 offers a long-term plan for the country. It defines desired destinations where inequality and unemployment are reduced and poverty is eliminated so that all South Africans can attain a decent standard of living. Electricity is one of the core elements of a decent standard of living.

While the achievement of the objectives of the NDP requires progress on a broad front, three priorities stand out, namely:

» Raising employment through faster economic growth
» Improving the quality of education, skills development and innovation
» Building the capability of the state to play a developmental, transformative role

In terms of the Energy Sector's role in empowering South Africa, the NDP envisages that, by 2030, South Africa will have an energy sector that promotes:

» Economic growth and development through adequate investment in energy infrastructure. The sector should provide reliable and efficient energy service at competitive rates, while supporting economic growth through job creation.

- Social equity through expanded access to energy at affordable tariffs and through targeted, sustainable subsidies for needy households.
- Environmental sustainability through efforts to reduce pollution and mitigate the effects of climate change.

In formulating its vision for the energy sector, the NDP took the IRP 2010 as its point of departure. Therefore, although electricity generation from coal is still seen as part of the energy mix within the NDP, the plan sets out steps that aim to ensure that, by 2030, South Africa's energy system will look very different to the current situation: coal will contribute proportionately less to primary-energy needs, while gas and renewable energy resources – especially wind, solar, and imported hydroelectricity – will play a much larger role.

5.4.6 Integrated Energy Plan (IEP), November 2016

The purpose and objectives of the Integrated Energy Plan (IEP) are derived from the National Energy Act (No. 34 of 2008). The IEP takes into consideration the crucial role that energy plays in the entire economy of the country and is informed by the output of analyses founded on a solid fact base. It is a multi-faceted, long-term energy framework which has multiple aims, some of which include:

- To guide the development of energy policies and, where relevant, set the framework for regulations in the energy sector.
- To guide the selection of appropriate technologies to meet energy demand (i.e. the types and sizes of new power plants and refineries to be built and the prices that should be charged for fuels).
- To guide investment in and the development of energy infrastructure in South Africa.
- To propose alternative energy strategies which are informed by testing the potential impacts of various factors such as proposed policies, introduction of new technologies, and effects of exogenous macro-economic factors.

A draft version of the IEP was released for comment on 25 November 2016. The purpose of the IEP is to provide a roadmap of the future energy landscape for South Africa which guides future energy infrastructure investments and policy development. The development of the IEP is an ongoing continuous process. It is reviewed periodically to take into account changes in the macroeconomic environment, developments in new technologies and changes in national priorities and imperatives, amongst others.

The 8 key objectives of the integrated energy planning process are as follows:

- Objective 1: Ensure security of supply.
- Objective 2: Minimise the cost of energy.
- Objective 3: Promote the creation of jobs and localisation.
- Objective 4: Minimise negative environmental impacts from the energy sector.
- Objective 5: Promote the conservation of water.
- Objective 6: Diversify supply sources and primary sources of energy.
- Objective 7: Promote energy efficiency in the economy.
- Objective 8: Increase access to modern energy.

5.4.7 Integrated Resource Plan (IRP) for Electricity 2010 - 2030

The Integrated Resource Plan (IRP) for Electricity is a subset of the IEP and constitutes South Africa's National electricity plan. The IRP is an electricity infrastructure development plan based on least-cost electricity supply and demand balance, taking into account security of supply and the environment. The primary objective of the IRP is to determine the long term electricity demand and detail how this demand should be met in terms of generating capacity, type, timing and cost. The IRP also serves as input to other planning functions, including amongst others, economic development and funding, and environmental and social policy formulation.

The promulgated IRP 2010–2030 identified the preferred generation technology required to meet expected demand growth up to 2030. It incorporated government objectives such as affordable electricity, reduced greenhouse gas (GHG) emissions, reduced water consumption, diversified electricity generation sources, localisation and regional development.

Following the promulgation of the IRP 2010–2030, implementation followed in line with Ministerial Determinations issued under Section 34 of the Electricity Regulation Act (Act No. 4 of 2006). The Ministerial Determinations give effect to planned infrastructure by facilitating the procurement of the required electricity capacity.

Since the promulgated IRP 2010–2030, the following capacity developments have taken place:

- A total 6 422MW under the Renewable Energy Independent Power Producers Programme (REIPPP) has been procured, with 3 876MW operational and made available to the grid.
- IPPs have commissioned 1 005MW from two Open Cycle Gas Turbine (OCGT) peaking plants.
- Under the Eskom build programme, the following capacity has been commissioned:
  - 1 332MW of Ingula pumped storage, 1 588MW of Medupi, 800MW of Kusile and
  - 100MW of Sere Wind Farm.
- 18 000MW of new generation capacity has been committed to.

Besides capacity additions, a number of assumptions have changed since the promulgation of IRP 2010–2030. Key assumptions that changed include the electricity demand projection, Eskom's existing plant performance, as well as new technology costs. In addition, environmental considerations such as South Africa's contribution to Greenhouse gases which contribute to climate change, local air quality and water availability have come to the fore.

These considerations necessitated the review and update of the IRP and ultimately the promulgation of a revised plan in October 2019. In terms of the IRP 2019, South Africa continues to pursue a diversified energy mix that reduces reliance on a single or a few primary energy sources. In the period prior to 2030, the system requirements are largely for incremental capacity addition (modular) and flexible technology, to complement the existing installed inflexible capacity. South Africa is a signatory to the Paris Agreement on Climate Change and has ratified the agreement. In line with INDCs (submitted to the UNFCCC in November 2016), South Africa's emissions are expected to peak, plateau and from year 2025 decline.

Following consideration of all these factors, the following Plan was promulgated.

	Coal	Coal (Decommis-sioning)	Nuclear	Hydro	Storage	PV	Wind	CSP	Gas & Diesel	Other (Distributed Generation, CoGen, Biomass, Landfill)
Current Base	37,149		1 860	2,100	2 912	1 474	1 980	300	3 830	499
2019	2,155	-2,373					244	300		Allocation to the extent of the short term capacity and energy gap.
2020	1,433	-557				114	300			
2021	1,433	-1403				300	818			
2022	711	-844			513	400 1,000	1,600			
2023	750	-555				1000	1,600			500
2024			1,860				1,600		1000	500
2025						1000	1,600			500
2026		-1,219					1,600			500
2027	750	-847					1,600		2000	500
2028		-475				1000	1,600			500
2029		-1,694			1575	1000	1,600			500
2030		-1,050		2,500		1000	1,600			500
TOTAL INSTALLED CAPACITY by 2030 (MW)	33,364		1,860	4,600	5,000	8,288	17,742	600	6,380	
% Total Installed Capacity (% of MW)	43		2.36	5.84	6.35	10.52	22.53	0.76	8.1	
% Annual Energy Contribution (% of MWh)	58.8		4.5	8.4	1.2*	6.3	17.8	0.6	1.3	

- Installed Capacity
- Committed/Already Contracted Capacity
- Capacity Decommissioned
- New Additional Capacity
- Extension of Koeberg Plant Design Life
- Includes Distributed Generation Capacity for own use

- 2030 Coal Installed Capacity is less capacity decommissioned between years 2020 and 2030.
- Koeberg power station rated/installed capacity will revert to 1,926MW (original design capacity) following design life extension work.
- Other/ Distributed generation includes all generation facilities in circumstances in which the facility is operated solely to supply electricity to an end-use customer within the same property with the facility.
- Short term capacity gap is estimated at 2,000MW.

Figure 5.2: IRP 2019 as promulgated in October 2019[8]

This plan provides for the development of 17 743MW of capacity from large scale wind energy facilities by 2030, with an annual contribution of 1600MW from 2022. The Wind Garden Wind Farm project would contribute towards this goal through the generation of 264MW.

5.4.8 New Growth Path (NGP) Framework, 23 November 2010

The purpose of the New Growth Path (NGP) Framework is to provide effective strategies towards accelerated job-creation through the development of an equitable economy and sustained growth. The target of the NGP is to create 5 million jobs by 2020. With economic growth and employment creation as the key indicators identified in the NGP. The framework seeks to identify key structural changes in the economy that can improve performance in term of labour absorption and the composition and rate of growth.

[8] source: https://www.cliffedekkerhofmeyr.com/en/news/publications/2019/Corporate/energy-alert-22-october-The-Integrated-Resource-Plan-2019-A-promising-future-roadmap-for-generation-capacity-in-South-Africa.html

To achieve this, government will seek to, amongst other things, identify key areas for large-scale employment creation, as a result of changes in conditions in South Africa and globally, and to develop a policy package to facilitate employment creation in these areas.

5.4.9 National Climate Change Bill, 2018

On 08 June 2018 the Minister of Environmental Affairs published the National Climate Change Bill ("the Bill") for public comment. The purpose of the Bill is to build an effective climate change response and ensure the long-term, just transition to a climate resilient and lower carbon economy and society. This will be done within the context of sustainable development for South Africa, and will provide for all matters related to climate change.

The National Climate Change Bill addresses issues related institutional and coordination arrangement across the three spheres of government namely national, provincial and local. It further highlights the need for the spheres of government and entities, sectors as well business to respond to challenges of climate change. The Bill further addresses the matters relating to, the national adaptation to impacts of climate change, greenhouse gas emissions and removals, and policy alignment and institutional arrangements. The Bill provides a procedural outline that will be developed through the creation of frameworks and plans. The following objectives are set within the Bill:

a) Provide for the coordinated and integrated response to climate change and its impacts by all spheres of government in accordance with the principles of cooperative governance;
b) Provide for the effective management of inevitable climate change impacts through enhancing adaptive capacity, strengthening resilience and reducing vulnerability to climate change, with a view to building social, economic, and environmental resilience and an adequate national adaptation response in the context of the global climate change response;
c) Make a fair contribution to the global effort to stabilise greenhouse gas concentrations in the atmosphere at a level that avoids dangerous anthropogenic interference with the climate system within a timeframe and in a manner that enables economic, employment, social and environmental development to proceed in a sustainable manner.

Wind Garden Wind Farm comprises a renewable energy generation facility and would not result in the generation or release of emissions during its operation.

5.4.10 National Climate Change Response Policy, 2011

South Africa's National Climate Change Response Policy (NCCRP) establishes South Africa's approach to addressing climate change, including adaptation and mitigation responses. The NCCRP formalises Government's vision for a transition to a low carbon economy, through the adoption of the 'Peak, Plateau and Decline' (PPD) GHG emissions trajectory whereby South Africa's emissions should peak between 2020 and 2025, plateau for approximately a decade, and then decline in absolute terms thereafter, and based on this the country has pledged to reduce emissions by 34% and 42% below Business As Usual (BAU) emissions in 2020 and 2025, respectively.

As an integral part of the policy, a set of near-term priority flagship programmes will be implemented to address the challenges of climate change, one of which includes the Renewable Energy Flagship Programme. This flagship programme includes a scaled-up renewable energy programme, based on the current programme specified in the IRP 2010, and using the evolving South African Renewables Initiative led by the Department of Public Enterprise and Department of Trade and Industry (DTI), as a driver for the deployment of renewable energy technologies. The programme will be informed by enhanced domestic manufacturing potential and the implementation of energy efficiency and renewable energy plans by local government.

The development of the Wind Garden Wind Farm is aligned with the Renewable Energy Flagship Programme identified under South Africa's NCCRP and could therefore be argued to be aligned with the country's approach to addressing climate change.

5.4.11 National Climate Change Response Strategy for South Africa, 2004

The need for a national climate change policy for South Africa was identified as an urgent requirement during the preparations for the ratification of the UNFCCC in 1997. A process to develop such a policy was thus instituted under the auspices of the National Committee for Climate Change (NCCC), a non-statutory stakeholder body set up in 1994 to advise the Minister on climate change issues and chaired by the then Department of Environmental Affairs and Tourism (DEAT). It was determined that a national climate change response strategy will promote integration between the programmes of the various government departments involved to maximise the benefits to the country as a whole, while minimising negative impacts. Further, as climate change response actions can potentially act as a significant factor in boosting sustainable economic and social development, a national strategy specifically designed to bring this about is clearly in the national interest, supporting the major objectives of the government including poverty alleviation and the creation of jobs.

A number of principles and factors guided the conception of the strategy and is required to be implemented. These are:

- » Ensuring that the strategy is consistent with national priorities, including poverty alleviation, access to basic amenities including infrastructure development, job creation, rural development, foreign investment, human resource development and improved health, leading to sustainable economic growth;
- » Ensuring alignment with the need to consistently use locally available resources;
- » Ensuring compliance with international obligations;
- » Recognizing that climate change is a cross cutting issue that demands integration across the work programmes of other departments and stakeholders, and across many sectors of industry, business and the community;
- » Focussing on those areas that promote sustainable development;
- » Promoting programmes that will build capacity, raise awareness and improve education in climate change issues;
- » Encouraging programmes that will harness existing national technological competencies;
- » Reviewing the strategy constantly in the light of national priorities and international trends;
- » Recognizing that South Africa's emissions will continue to increase as development is realised.

The strategy was devised through an integrated approach and considers policies and programmes of other government departments and the fact that South Africa is a developing country. This will ensure that the principles of sustainable development are adequately served and do not conflict with existing development policies.

5.4.12 Strategic Integrated Projects (SIPs)

The Presidential Infrastructure Coordinating Committee (PICC) is integrating and phasing investment plans across 18 Strategic Infrastructure Projects (SIPs) which have five core functions: to unlock opportunity, transform the economic landscape, create new jobs, strengthen the delivery of basic services and support the integration of African economies. A balanced approach is being fostered through greening of the economy, boosting energy security, promoting integrated municipal infrastructure investment, facilitating integrated urban development, accelerating skills development, investing in rural development and enabling regional integration. SIP 8 and 9 of the energy SIPs supports the development of the wind energy facility:

» SIP 8: Green energy in support of the South African economy: Support sustainable green energy initiatives on a national scale through a diverse range of clean energy options as envisaged in the Integrated Resource Plan (IRP 2010 – 2030) and supports bio-fuel production facilities.
» SIP 9: Electricity generation to support socio-economic development: The proposed Wind Garden Wind Farm is a potential SIP 9 Project as electricity will be generated and social and economic upliftment, development and growth will take place within the surrounding communities. It would become a SIP 9 project if selected as a Preferred Bidder project by the Department Mineral Resources and Energy. SIP 9 supports the acceleration of the construction of new electricity generation capacity in accordance with the IRP 2010 to meet the needs of the economy and address historical imbalances.

The Wind Garden Wind Farm could be registered as a SIP project once it is under development. The project would then contribute to the above-mentioned SIPs.

5.4.13 Renewable Energy Development Zones (REDZ) (GNR 114 of February 2018)

The Strategic Environmental Assessment for Wind and Solar Photovoltaic Energy in South Africa, 2015, has identified 8 Renewable Energy Development Zones (REDZs) that are of strategic importance for large-scale wind and solar photovoltaic energy development, including the roll-out of its supporting transmission and distribution infrastructure, in terms of Strategic Integrated Project (SIP) 8: Green Energy in support of the South African Economy. The Wind Garden Wind Farm is located within the Cookhouse REDZ.

5.5 Provincial Planning and Context

5.5.1. Eastern Cape Provincial 2030 Draft Development Plan (PDP), 2014

The Eastern Cape Provincial 2030 Draft Provincial Development Plan (PDP) states that one of the five goals for the Province is an inclusive, equitable and growing economy for the province in order to ensure sustainable development. The Province considers people centred development and economic development as imperative in order to address the most significant challenge facing the Eastern Cape, which is material poverty and deprivation.

The PDP draws from the 2010 BRICS Rural Transformation Conference's resolutions to be cognisant of the climate and environmental challenges, enhance environmental resilience and sustainability, use scarce natural resources efficiently, promote renewable sources of energy and leverage a green agenda for new jobs and income for the poor.

The PDP identifies key strategic objectives and actions in achieving the goal of a growing and inclusive economy. In support of the Strategic *Objective 1.1.* which is *Improved Economic Infrastructure that promotes new economic activity*; strategic actions are proposed within the PDP. *Strategic Action 1.1.6* refers to the need to position the province as a key investment hub in the energy sector and ensure reliable energy supply to high potential sectors. Serious institutional hindrances to wind farm development were identified particularly in the former homelands where there are land tenure issues. The province indicates that pre- authorisation arrangement in the "renewable energy zones" will allow this industry to expand to its full potential. Further to this, the "green/renewables" sector was identified as one of the industries for potential expansion based on the existing pipeline of new wind farms within the Province.

In addition, the Eastern Cape Vision 2030 Provincial Development Plan states that municipalities need to improve their maintenance and upgrading of electricity distribution and review their mark-ups on electricity prices. It is also stated that this work should be led by the Department of Economic Development, Environmental Affairs and Tourism (DEDEAT).

The overall energy objective for the Province also includes promoting the development of renewable energy supply schemes which are considered to be strategically important for increasing the economic opportunities for the affected communities, while also minimising the detrimental environmental impacts. The implementation of sustainable renewable energy is also to be promoted within the Province through appropriate financial and fiscal instruments.

Considering the above, the Wind Garden Wind Farm falls within the overall energy objective for the Province.

5.5.2. The Eastern Cape Climate Change Response Strategy (2011)

The Eastern Cape Climate Response Strategy (ECCCRS) was initiated by the Eastern Cape Provincial Department of Economic Development, Environmental Affairs and Tourism (DEDEAT) in January 2010. The province recognised itself as a contributor of climate change whilst simultaneously being vulnerable to the effects of climate change. The key aspects of the Eastern Cape Climate Change Response Strategy (ECCCRS) Report were discussed in the MEC's (DEDEA: Department of Economic Development, Environmental Affairs) 2011 budget speech: "*The recent completion of the Eastern Cape Climate Change Response Strategy paves the way for the Province to explore alternative industrial models supporting a Green Economy and Decent Work. Avenues that hold potential include alternate building materials, reducing emissions, and the establishment of alternate energy generation. We concur with the Ministers of Economic Development and Environmental Affairs, who believe that the renewable energy industry could boost Government's plans to halve unemployment by 2014. Minister Patel estimates that up to 300 000 jobs can be created in the green economy over ten years. He projects that the benefits, which include health and pollution management, waste collection, disposal and storage activities, could generate between
R22 billion and R36 billion within the environment sector*".

Key points from the ECCCRS in line with the MEC's address include the DEDEAT's commitment to develop and implement policy in accordance with the National Green Paper for the National Climate Change

Response Strategy (2010), and an acknowledgement of the Eastern Cape Province's vulnerability to climate-change. The development and promotion of a provincial green economy, including green jobs, and environmental learnership is regarded as an important provincial intervention in addressing climate change. The renewable energy sector, including solar and wind energy (including also biofuels and energy from waste), is explicitly indicated as an important element of the Provincial Climate Change Response Strategy.

The ECCCRS further indicated that by mid-2010 more than 30 separate wind farms ranging from 8MW to over 100MW had been planned for the Eastern Cape.

The development of the Wind Garden Wind Farm will assist in achieving the promotion of the provincial green economy of the Eastern Cape, albeit only to a limited extent.

5.5.3 Eastern Cape Sustainable Energy Strategy (2012)

The Eastern Cape Sustainable Energy Strategy identifies six (6) goals to assist in achieving the Province's vision of creating an enabling environment for sustainable energy investment and implementation, and these goals include:

» Job creation and skills development
» Alleviate energy poverty
» Alleviate CO2 emissions and environmental pollution
» Improve industrial competitiveness
» Promote renewable energy production in the Province
» Promote the development of a renewable energy manufacturing industry and technology development

Considering the goal to promote renewable energy production and the associated manufacturing industry in the Province, the development of the Wind Garden Wind Farm is considered to contribute to the goals.

5.5.4 Eastern Cape Climate Change Strategy (2011)

According to strategy, wind energy was the fastest growing energy technology sector, which accounted for more than 50% of worldwide clean energy investment, in 2009 as well as almost half of the installed clean energy capacity worldwide. The South African Wind Energy Association called for 25% of the overall electricity generation mix by 2025 to be derived from renewable energy, with 80% of this target potentially coming from wind power.

As part of the strategy, Greenhouse Gas (GHG) mitigation programmes have been developed and include the following:

» Mainstreaming GHG mitigation in provincial and local government and in industry
» Promotion of renewable energy in the Eastern Cape
» Mitigation and opportunities for rural livelihoods
» Mitigation in solid waste and wastewater treatment
» Greenhouse gas mitigation in transport

The development of the Wind Garden Wind Farm contributes towards the strategy as it is in line with some of the mitigation measures that have been developed in an effort to reduce GHG emissions.

5.6 Local Policy and Planning Context

The local tiers of government within which the Wind Garden Wind Farm is located is the Makana Local Municipality which falls within the jurisdiction of the Sarah Baartman District Municipality. The development instruments or policies at both the district and local level contain objectives which are in line with the development of the Wind Garden Wind Farm. These include, economic growth, job creation, community upliftment and poverty alleviation.

Table 5.2: Relevant district and local legislation and policies for the Wind Garden Wind Farm

Relevant policy	Relevance to the Wind Garden Wind Farm
Sarah Baartman District Municipality Final Reviewed Integrated Development Plan for 2017/2022 (2018/2019 Draft)	The vision of the Sarah Baartman District Municipality (DM) is “An innovative and dynamic municipality striving to improve the quality of life for all communities in the District”. The mission of the Sarah Baartman DM is to “Co-ordinate, support and provide sustainable services and promote socio-economic development”. The following strategic and local economic development objectives have been identified for the Sarah Baartman DM: » Facilitate Investment in natural capital to contribute towards government's target of creating "green" and “blue” jobs by 2020. » Broaden economic participation and inclusion by increasing the number and support to small enterprises. » Developing skills and an education base by increasing the number of semi-skilled and skilled employment opportunities. » Regenerating at least one core town as a service and economic hub. » Building local and regional networks and collaboration through the creation of partnerships with government, the private sector and education / research. The DM has determined that the creation of new generation green jobs and local income streams are rooted in renewable energy. The anticipated growth in the renewable energy sector provides major opportunities for growth in job creation in the province because of the potential of the area to host renewable energy generation infrastructure as well as the potential to be a major manufacturer of such infrastructure leveraging off the automotive sector. The development of the Wind Garden Wind Farm is in line with the objectives of the IDP and will contribute to the achieving of the objectives, albeit to a

Relevant policy	Relevance to the Wind Garden Wind Farm
	limited extent.
Sarah Baartman Spatial Development Framework (SDF) Final Report (2018/2019 Draft) [Adopted 21 August 2013]	The IDP (as discussed above) identified the following 7 pillars as being important for development and the Sarah Baartman Council's envisagement for fulfilment of basic needs, the maintenance of existing assets (be they infrastructural or social in nature) and the potential for future growth and development: 1. Environment 2. Economic 3. Infrastructure 4. Rural Development 5. Human Settlement & Social Development 6. Governance 7. Human Resources According to the Sarah Baartman DM SDF accommodation of renewable energy was identified as a key issue. The implementation of the Wind Garden Wind Farm is not considered to be in conflict with the Sarah Baartman DM SDF. In addition, contributions towards local economic development and social upliftment, to be focused on benefitting local communities within the vicinity of the project site will be undertaken by the Applicant.
Makana Local Municipality Final Integrated Development Plan (IDP) (2019-2020)	The Makana Local Municipality has identified six development priorities. These include: 1. Basic Service Delivery and Infrastructure Development 2. Community and Social Development 3. Local Economic and Rural Development 4. Institutional Development and Financial Viability 5. Good Governance and Public Participation 6. Human Settlement Management The main goal of the Community and Social Development Plan development priority is a safe, healthy and secure living environment. One of the main strategic objectives for reaching the goal is a reduction of ecological footprint through the development of renewable energy sources. Further to the above, the municipality is considering innovative energy sourcing methods and has developed a draft policy which sets out the criteria which will enable the evaluation of renewable energy generation infrastructure to be developed in a manner that will limit the potential negative impacts thereof. The development of the Wind Garden Wind Farm is not

Relevant policy	Relevance to the Wind Garden Wind Farm
	considered to be in conflict with the Makana Local Municipality IDP

CHAPTER 6: NEED AND DESIRABILITY

One of the objectives of the EIA process is to motivate for "*the need and desirability for the proposed development, including the need and desirability of the activity in the context of the preferred development footprint*". The need and desirability of a development needs to consider whether it is the right time and right place for locating the type of land-use/activity being proposed. Need and desirability is therefore equated to the wise use of land and should be able to answer the question of what the most sustainable use of land is.

This chapter provides a description of the need and desirability of the Wind Garden Wind Farm at the project site considered to be reasonable and feasible by the project Applicant.

6.1. Legal Requirements as per the EIA Regulations, 2014 (as amended), for the undertaking of a Basic Assessment Report

This chapter of the BA report includes the following information required in terms of the EIA Regulations, 2014 - Appendix 1: Content of basic assessment reports:

Requirement	**Relevant Section**
3(f) a motivation for the need and desirability for the proposed development, including the need and desirability of the activity in the context of the preferred location.	The need and desirability of the Wind Garden Wind Farm is included and discussed as a whole within this chapter. The need and desirability for the development of the Wind Garden Wind Farm has been considered from an international, national, regional and site-specific perspective.

6.2 Need from an International Perspective

The need and desirability of the Wind Garden Wind Farm, from an international perspective, can be described through the project's alignment with internationally recognised and adopted agreements, protocols, and conventions. South Africa is signatory to a number of international treaties and initiatives, including the United Nation's Development Programme's (UNDP's) Sustainable Development Goals (SDGs). The SDGs address social and economic development issues such as poverty, hunger, health, education, climate change, gender equality, water, sanitation, energy, urbanization, environment and social justice. The SDGs comprise 17 global goals set by the United Nations. The 17 SDGs are characterised by 169 targets, and 304 indicators.

Goal 7 of the SGDs relates to "Affordable and Clean Energy", with the aim of the goal being to ensure access to affordable, reliable, sustainable and modern energy for all. The following targets and indicators have been set for Goal 7:

Targets		**Indicators**	
7.1	By 2030, ensure universal access to affordable, reliable and modern energy services.	7.1.1 7.1.2	Proportion of population with access to electricity. Proportion of population with primary reliance on clean fuels and technology.
7.2	By 2030, increase substantially the share of	7.2.1	Renewable energy share in the total final energy

Targets		Indicators	
	renewable energy in the global energy mix.		consumption.
7.3	By 2030, double the global rate of improvement in energy efficiency.	7.3.1	Energy intensity measured in terms of primary energy and GDP.
7.A	By 2030, enhance international cooperation to facilitate access to clean energy research and technology, including renewable energy, energy efficiency and advanced and cleaner fossil-fuel technology, and promote investment in energy infrastructure and clean energy technology.	7.A.1	Mobilised amount of United States dollars per year starting in 2020 accountable towards the $100 billion commitment.
7.B	By 2030, expand infrastructure and upgrade technology for supplying modern and sustainable energy services for all in developing countries, in particular least developed countries, small island developing States, and land-locked developing countries, in accordance with their respective programmes of support.	7.B.1	Investments in energy efficiency as a percentage of GDP and the amount of foreign direct investment in financial transfer for infrastructure and technology to sustainable development services.

The development of the Wind Garden Wind Farm would contribute positively towards achieving Goal 7 (and specifically 7.2.1) of the SGDs through the following means:

- » By generating up to 264MW (contracted capacity) of affordable and clean energy.
  - ∗ A study published by the CSIR on 14 October 2016 ("Cost of new power generators in South Africa Comparative analysis based on recent IPP announcements", Dr Tobias Bischof-Niemz and Ruan Fourie), which took into consideration the results of the cost prices bid successfully under the DoE's REIPPP and Coal Baseload IPP Procurement (CBIPPP) Programmes, found that wind and solar PV were 40% cheaper than new baseload coal (i.e. R0.62/kWh for wind and PV vs R1.03 for coal).
  - ∗ Wind power technology is one of the cleanest electricity generation technologies, as it is not a consumptive technology and does not result in the release of emissions during its operation.
- » By contributing towards South Africa's total generation capacity, specifically through the utilisation of renewable energy resources.

The Kyoto Protocol (1997) is also relevant to the need of the development of the Wind Garden Wind Farm from an international perspective. The protocol calls for the reduction of South Africa's greenhouse gas emissions through actively cutting down on using fossil fuels, or by utilising more renewable resources. The development of the Wind Garden Wind Farm will add capacity to the renewable energy sector of the country and strengthen the commitment and action plan to achieve the requirements, as set out in the protocol, through the generation of energy without the emission of greenhouse gasses.

6.3 Need from a National Perspective

The National Development Plan (NDP) envisages that, by 2030, South Africa will have an energy sector that provides reliable and efficient energy service at competitive rates; that is socially equitable through expanded access to energy at affordable tariffs; and that is environmentally sustainable through reduced emissions and pollution. Historically, coal has provided the primary fuel resource for baseload electricity generation in South Africa. Consequently, Eskom, who is the main electricity generating company in the country, generates approximately 85% of the country's electricity from coal resources (Stats SA, 2016), resulting in a large carbon footprint. Taking into consideration the need to ensure adequate supply of electricity and meet international obligations in terms of addressing climate change, Government has identified the need to diversify the energy mix within the country.

The Wind Garden Wind Farm is proposed in specific response to the identified energy mix of South Africa as per the requirements set out in the IRP with regards to renewable energy targets. As a result, the need and desirability of the project from a national perspective can largely be assimilated from the project's alignment with national government policies, plans, and programmes which have relevance to energy planning and production (as discussed in detail in Chapter 5). The following key policies have been developed by Government to take into account South Africa's current energy production and projected future demands, and provides the necessary framework within which energy generation projects can be developed:

» Integrated Energy Plan (IEP)
» Integrated Resource Plan (IRP)

The above-mentioned policies have been extensively researched and are updated on an on-going basis to take into consideration changing scenarios, new information, developments in new technologies, and to reflect updated demands and requirements for energy production within the South African context. These plans form the basis of South Africa's energy generation sector and dictate national priorities for energy production.

The IEP is intended to provide a roadmap of South Africa's future energy landscape which guides future energy infrastructure investments and policy development. South Africa has a good wind resource for the development and generation of wind energy.

In terms of electricity generation, the IEP states that South Africa should continue to pursue a diversified energy mix which reduces reliance on a single or a few primary energy sources, and includes the following statement regarding wind energy's contribution to the diversified energy mix:

» *Wind energy should continue to play a role in the generation of electricity. Allocations to ensure the development of wind energy projects aligned with the IRP should continue to be pursued.*

The IRP for Electricity 2010 – 2030 (gazetted in 2019) is a subset of the IEP, and constitutes South Africa's current gazetted energy plan. The purpose of the plan is to ensure sustainable electricity development which takes into consideration technical, economic, and social constraints, and identifies investments in the electricity sector which are required to meet the country's forecasted electricity demands at minimum costs. This plan provides for the development of 17 743MW of capacity from large scale wind energy facilities by 2030, with an annual contribution of 1600MW from 2022.

In addition to the policy considerations detailed above, Government has prioritised post COVID-19 turnaround plans in terms of renewable energies within the Just Energy Transition (JET), coupled with key development objectives of the various spheres of government. These policies share the same ideals, such as:

» The utilisation, application and investment in renewable energy resources in South Africa is considered to be an essential means of reducing the carbon footprint of the country,
» Diversifying the national economy,
» Reducing poverty, and

» Providing critical additional energy to that of Eskom.

Government has compiled an Economic Reconstruction and Recovery Plan which was presented to Parliament in October 2020. According to this plan, the economic survey will rely on a massive investment in infrastructure, including energy, telecommunications, ports and rail. The core elements of the Economic Reconstruction and Recovery Plan are as follows:

1. Priority interventions for economic recovery: the plan sets out eight priority interventions that will ignite South Africa's recovery and reconstruction effort. These are the flagship initiatives that all of society will rally around to build a new economy (**Figure 6.1**).
2. Enabling conditions for growth: these are growth-enhancing reforms and other preconditions for an inclusive, competitive and growing economy.
3. Macroeconomic framework: economic reconstruction and recovery requires careful mobilisation of resources to ensure fiscal sustainability.
4. Institutional arrangements: the plan focuses on execution, and is supported by enhanced institutional arrangements to ensure implementation and accountability.

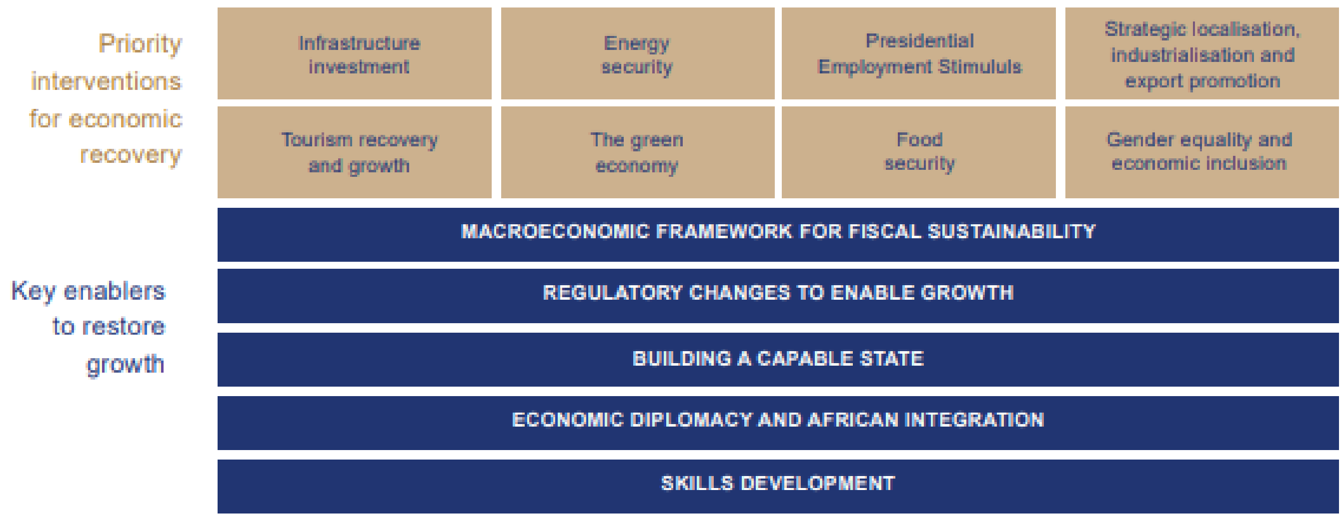


Figure 6.1: Core elements of the Economic Reconstruction and Recovery Plan (source: Building a new economy - Highlights of the Reconstruction and Recovery Plan, Presidency of the Republic of South Africa)

The plan recognises energy security as the most important prerequisite for the recovery agenda and states that renewed investment in a diversified energy mix can be achieved within a short time horizon, while alleviating a crippling energy crisis and facilitating a necessary transition to a less carbon-intensive economy. One of the key commitments of the plan is therefore to implement the IRP 2019 without delay to provide a substantial increase in the contribution of renewable energy sources by 2030, alongside other sources including battery storage, gas and clean coal. The transition to green energy is recognised as contributing towards the realisation of the low-carbon, climate-resilient and inclusive economy envisaged by the National Development Plan. The development of the Wind Garden Wind Farm is identified as a mechanism for securing additional power generation capacity for private off-takers, reducing the reliance for electricity on Eskom.

The cluster of renewable energy facilities, which the Wind Garden Wind Farm forms part of, will ensure the optimisation of a supply of steady state baseload type power, as well as play a significant role in the Just Energy Transition ("JET") by supplying low-cost energy to the national grid. At the same time, it will contribute to a JET fund to assist in transitioning jobs from the fossil fuel sector in Mpumalanga to renewable energy. The high-quality wind resource, proximity to the transmission infrastructure and scale of the portfolio may also play a possible role in in contributing to the hydrogen economy in South Africa, with Europe as a possible export market.

It is the developer's intention to supply the electricity generated from the Wind Garden Wind Farm to private off-takers in the region, with key customer focus areas primarily being within the industrial, mining and commercial sectors where there is a need to shift towards cleaner and more sustainable sources of energy. The project therefore does not form part of the Renewable Energy Independent Power Producer Procurement (REIPPP) programme of the DMRE. The expected load requirements of potential customers are in excess of 1 000 GWh. The remaining generated MWs produced by the cluster of renewable energy facilities will be used for alternative means of energy generation, including green hydrogen generation.

Recently green hydrogen, produced with renewable sources such as wind and solar energy, is getting a more prominent place in global policy thinking to limit global warming in the context of the Paris agreement. This has been accelerated in the wake of current global political and economic policies not achieving the agreed climate targets. At present, industry is already using large quantities of hydrogen, but this mainly produced from natural gas. Replacement with green hydrogen and expansion to more end-user segments contributes significantly to the (deep) decarbonisation of otherwise hard-to-decarbonize markets.

South Africa is well-positioned to become a major player of green hydrogen in the world. The country has abundant land available and in combination with excellent potential solar and wind resources this could provide a solid base to produce one of the lowest cost green hydrogen in the world.

The South African government has identified the green economy as one of 12 job drivers that could help contribute to creating 5 million additional jobs by 2020. The New Growth Path, in which the sectoral jobs targets are disaggregated, envisages that as many as 300 000 new direct jobs could be created in the areas of natural resource management and renewable energy construction (Department of Energy, 2019). Even though the project will not form part of the REIPPP programme, the Applicant will implement similar social and economic development strategies, including amongst others, job creation, local content, skills development, enterprise and supplier development, and socio-economic development. In addition to electricity generation and supply the project will therefore also contribute positively towards socio-economic development of a region, over and above job creation.

The need for new power generation from wind energy has therefore been identified and assessed by Government at a national scale considering the national energy requirements as well as international commitments to address climate change under the Paris Agreement, and provision has been made for the inclusion of new wind power generation capacity in South Africa's energy mix. The implementation of the Wind Garden Wind Farm, therefore, has the potential to contribute positively towards the identified national need, while simultaneously contributing to job creation and socio-economic development, which is identified as a need for the country within the National Development Plan. The wind farm will make use of renewable energy technology and would contribute positively towards reducing South Africa's GHG emissions and the Just Energy Transition of the country. In addition, by making use of wind power technology, the project would have reduced water requirements, when compared with some other generation technologies such as coal and gas, in alignment with one of the vision 2030 themes of DWS's National Water Resource Strategy 2 (2013) (i.e. transitioning to a low carbon economy through stimulating renewable energy and retrofitting buildings).

6.4 Need from a Provincial Perspective

South Africa's electricity generation mix has historically been dominated by coal. This can be attributed to the fact that South Africa has abundant coal deposits, which are relatively shallow with thick seams, and are therefore easy and comparatively cost effective to mine. In 2016, South Africa had a total generation capacity of 237 006GWh; approximately 85.7% (equivalent to 203 054GWh) of this figure was generated by coal, and only 0.9% (equivalent to 2 151GWh) was generated by wind (refer to **Figure 6.2**).

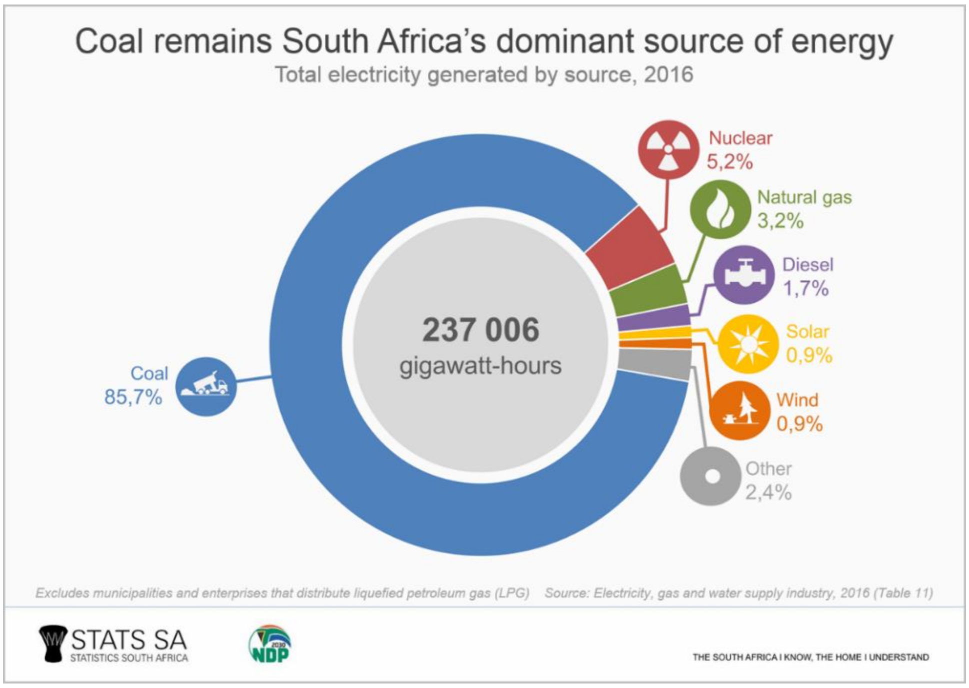


Figure 6.2: Overview of South Africa's electricity generation by source (source: StatsSA 2016 Electricity, gas and water supply industry)

Whereas the majority of South Africa's electricity generation infrastructure is currently located within Mpumalanga Province due to the location of coal resources within this province, the Eastern Cape Province ("the Province") has been identified as an area where the development of wind farms is a feasible and suitable option for electricity generation.

The Eastern Cape Provincial 2030 Draft Development Plan indicates that sustainable development must be ensured in the Province and that people-centred development and economic development is imperative to address the most significant challenge facing the Eastern Cape, i.e. material poverty and deprivation. The Province also acknowledges climate and environmental challenges, the need to enhance environmental resilience and sustainability, the efficient use of scarce natural resources, the promotion of renewable sources of energy and new jobs and income for the poor in terms of a green agenda.

The overall energy objective for the Province also includes promoting the development of renewable energy supply schemes which are considered to be strategically important for increasing the economic opportunities for affected communities, while also minimising the detrimental environmental impacts. The implementation of sustainable renewable energy is also to be promoted within the Province through appropriate financial and fiscal instruments.

The Province has also been identified as a major source of electricity in South Africa, with the largest number of operational wind energy facilities currently located within the Province. The location of the Province is suited for wind generation based on the wind flows present along the coast and the strong and steady wind current between Cookhouse and the western border of Lesotho. The availability of existing grid infrastructure in the wind areas of the Province makes for ease of access to connect the projects to the national grid and evacuate the generated electricity[9].

6.5 Need District and Local Perspective

The Makhanda area has been confirmed as an area with sufficient wind resources and wind speeds for a wind farm development (Refer to **Figure 6.3**). The confirmation of the wind resource has also been confirmed through the wind data collection at the project site since 2011.

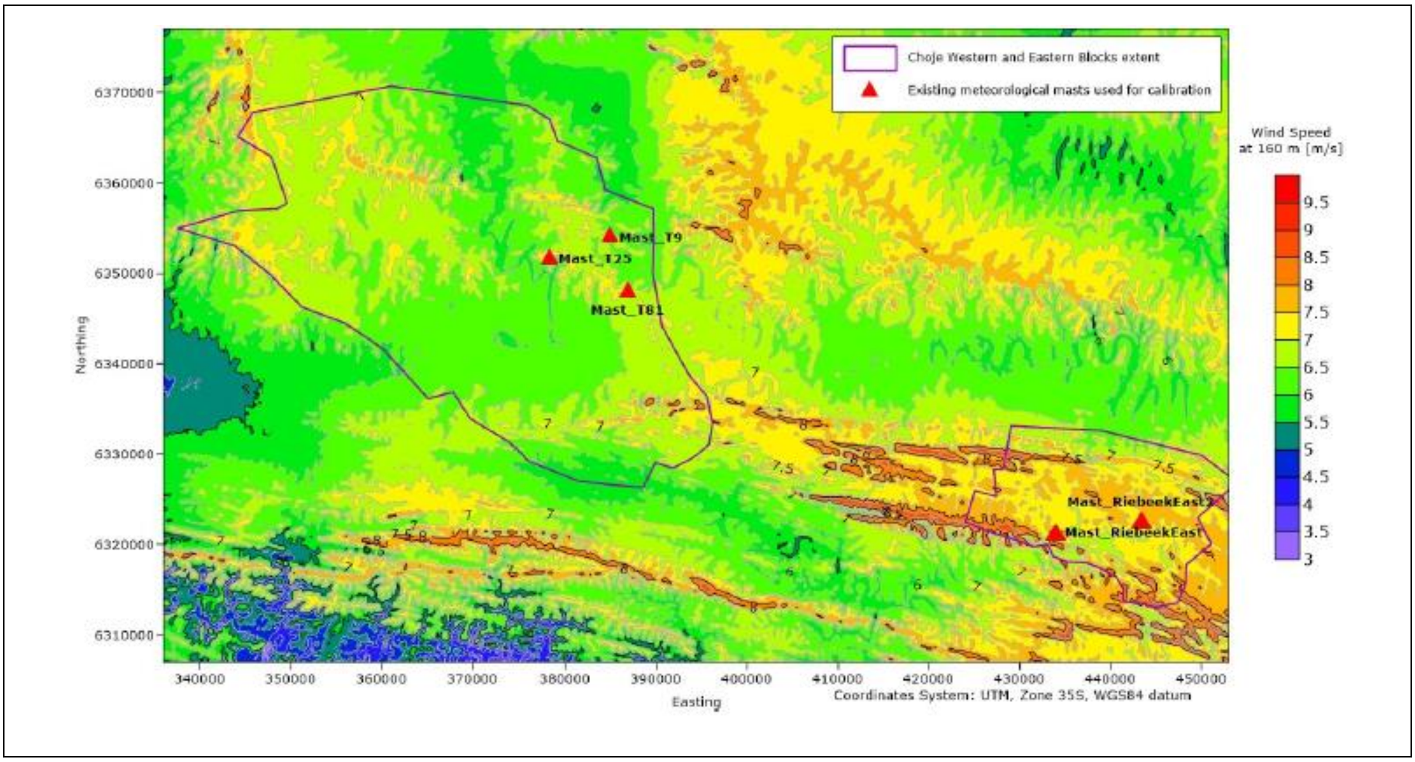


Figure 6.3: Average wind speed (as per raw data) expected at the Wind Garden Wind Farm project site

Considering the above, it can be confirmed that from a regional perspective there is a need and desirability for the development of wind farms within the Eastern Cape and specifically the regional area of the project site.

[9] https://www.businessinsider.co.za/trending/eastern-cape-primed-to-become-wind-power-hub-of-sa-this-map-shows-why-2020-11

From a district level the need for the development of the Wind Garden Wind Farm is reflected within the Sarah Baartman District Municipality and Makana Local Municipality planning documentation. The following planning policies make reference to the need for the development of renewable energy facilities within the municipal area:

» The Sarah Baartman District Municipality Final Reviewed Integrated Development Plan for 2017/2022 has determined that the creation of new generation green jobs and local income streams are rooted in renewable energy. The anticipated growth in the renewable energy sector provides major opportunities for growth in job creation in the province because of the potential of the area to host renewable energy generation infrastructure as well as the potential to be a major manufacturer of such infrastructure leveraging off the automotive sector.

» The Makana Local Municipality Final Integrated Development Plan (2019-2020) indicates that the municipality is considering innovative energy sourcing methods and has developed a draft policy which sets out the criteria which will enable the evaluation of renewable energy generation infrastructure to be developed in a manner that will limit the potential negative impacts thereof. The reduction of ecological footprint through the development of renewable energy sources is also identified as a main strategic objective.

Considering the requirements and needs and desirability for the development of a wind farm within the municipal area, it is considered that there is a definite need for developments of such a nature considering the development plans of the relevant local and district municipalities and the reliance of the affected areas on such developments.

6.6 Receptiveness and Desirability of the project site to develop the Wind Garden Wind Farm

The feasibility of the project site and development envelope for the development of the Wind Garden Wind Farm also provides an indication of the desirability of the development within the site-specific location. The section below provides a description of the site-specific considerations that contribute to the desirability of the Wind Garden Wind Farm within the identified project site.

The Wind Garden Wind Farm is proposed to be constructed outside of the urban edge of the surrounding towns on privately-owned properties currently used mainly for agricultural practises. The affected farm portions have not been considered for an alternative land use such as urban development or mining, and therefore the proposed wind farm does not conflict with the current land use of the project site (i.e. the affected properties).

The site falls within the Cookhouse REDZ, an area which has become a node for wind energy projects, as well as within the Eastern Corridor of the Strategic Transmission Corridors. The Strategic Environmental Assessment for Wind and Solar Photovoltaic Energy in South Africa, 2015, has identified 8 Renewable Energy Development Zones (REDZs) that are of strategic importance for large-scale wind and solar photovoltaic energy development, including the roll-out of its supporting transmission and distribution infrastructure, in terms of Strategic Integrated Project (SIP) 8: Green Energy in support of the South African Economy.

The project site proposed for the development of the Wind Garden Wind Farm displays characteristics which contribute to the overall desirability. These include:

Extent of the project site: The affected properties desirable for and available for the wind farm development cover an area of ~4336ha. This area is sufficient to accommodate the proposed Wind Garden Wind Farm, and considered to be sufficient space for the development footprint to be designed and to consider the identified environmental sensitivities. A development footprint of ~66.6ha is required for the wind farm, which is less than 2% of the entire project site.

Site access: Access to the project site is ample with the presence of existing roads mainly consisting of national and regional roads. The project site is situated between two national roads, namely the N10 and N2. The R400, R350 and R344 provide direct access to the project site and the development envelope. These routes will be utilised for accessing the project site, development envelope and development footprint.

Land availability: The majority of the land in the Makhanda area is used for agricultural and eco-tourism purposes, with only a few properties privately-owned and available for development. The properties affected by the Wind Garden Wind Farm project site are some of the few available privately-owned land parcels suitable for a wind farm development. The applicant has obtained the required landowners consent from the affected landowners which confirm the availability of the project site for the development.

Topographical considerations and existing infrastructure: The Wind Garden Wind Farm project site is characterised by topography which has limited constraints that could have an effect on wind speed and direction. The topography is favourable for the construction and maintenance activities associated with the development of a wind farm. The project site is located at an average elevation of 587m above sea level and is located on a plateau that spans from Riebeek East in the west to Makhanda in the east. The plateau is located south of the Great Fish River and provides a flat, yet elevated table-like quality to the landscape. The Swartwatersberge (mountains) form the southern escarpment of the plateau, dropping down into the New Year's River valley, located south-west of the site.

Current land use and character: The Wind Garden Wind Farm project site has a rural and natural character with very few built structures outside of Makhanda and surrounds. Exceptions occur where homesteads (rural residences or dwellings) are found and the existing Waainek Wind Energy Facility. Other than the Waainek Wind Energy Facility and the Poseidon - Albany 132kV power line traversing the project site, there are no major transmission networks or high voltage distribution power lines within the study area. The region to the north has very limited agricultural activity and crop production, and the general land use is predominantly cattle/sheep farming and game farming. Due to the absence of crop production, the larger part of the study area is still in a natural state. There are a number of protected areas in the region. Besides the formally protected areas, there are also a number of informal private protected areas and game farms surrounding the project site. The nature reserves and game farms are tourist attractions that operate commercial lodges and game viewing activities or hunting and other associated outdoor activities.

The development of renewable energy projects within this region provides an opportunity to relieve the area, to some extent, which has suffered severe socio-economic challenges in terms of unemployment and poverty. The current land-use within the project site is agricultural activities, specifically grazing. The development of the Wind Garden Wind Farm on the affected properties will introduce a new land-use to these properties, which is considered a more productive land-use than that of grazing, due to the water resource constraints and drought experienced in the area.

Grid connection and capacity: The Wind Garden Wind Farm will be connected to the national grid through a loop-in loop-out connection to the existing Poseidon – Albany 132kV line located within the project site. The grid connection point location within the project site is considered to be a benefit as this reduces the power line extent required to connect the facility to the national grid and removes the need to impact and disturb properties outside of the project site by linear infrastructure.

Wind resource: This is considered as the primary criteria determining the feasibility of the wind farm development, as the wind resource affects the efficiency and economic viability of the wind farm. The developer has confirmed suitability of the Makhanda area and the project site from a wind resource perspective. Wind data has been obtained from the site since 2011 and the developer has 10 years of data to confirm the resource. The average wind speed for the project site is approximately between 7.5 and 8.1m/s, as an average measured on site since 2011.

Proximity to Towns with a Need for Socio-Economic Upliftment: The unemployment rate of the Makana Local Municipality is 45.5%. Approximately 45.5% of the total population is currently receiving some form of social grant (Makana Local Municipality Final Integrated Development Plan (IDP) (2019-2020)). The dependency on grant funding reinforces the need to stimulate the local economy by creating labour intensive growth opportunities and optimizing the job creation elements in the area. The need for economic development and growth is therefore considered to be significant. With the development of the Wind Garden Wind Farm secondary social benefits can be expected in terms of additional spend in the nearby towns due to the increased demand for goods and services.

Considering the above, it is clear that a need for employment opportunities and skills development is present within the area, as well as the socio-economic benefits which will be associated with it. These benefits would include an increase in the standard of living for the local residents within the area, as well as overall financial and socio-economic upliftment.

Transportation of Material and Components: As material and components would need to be transported to the site during the construction phase of the Wind Garden Wind Farm, accessibility was a key factor in determining the technical viability of the project, particularly taking transportation costs into consideration (direct and indirect) and the impact of this on project economics. The presence of national roads available for use from the Port of Ngqura is considered beneficial as access to the site is available from the port for equipment during the construction and operation of the wind farm.

6.7 Need for and Benefits of Renewable Energy in the South African Environment

The generation of electricity from renewable energy resources offers a range of potential socio-economic and environmental benefits for South Africa. These benefits include:

Increased energy security: Given that renewables can often be deployed in a short timeframe and in a decentralised manner close to consumers, they offer the opportunity for improving grid strength and supply quality in the short-term, while reducing expensive distribution losses. As a result of the power constraints in the first half of 2015, power generators, meant to be the "barely-ever-used" safety net for the system (diesel-fired gas turbines), were running at > 30% average load factor in the first half of 2015. Load shedding occurred during 82 days in the first half of 2015 (out of 181 days). Results of a CSIR Energy Centre study for the period January to June 2015 (CSIR, August 2015), concluded that the already implemented renewable projects (wind and solar) within the country avoided 203 hours of so-called 'unserved energy'. During these hours the supply situation was so tight that some customers' energy supply would have had to be curtailed ('unserved') if it had not been for the renewables. The avoidance of unserved energy cumulated into the effect that during 15 days from January to June 2015, load shedding was avoided entirely, delayed, or a higher stage of load shedding was prevented due to the contribution of the wind and PV projects[10].

Resource saving: It is estimated that the achievement of the targets in the Renewable Energy White Paper will result in water savings of approximately 16.5 million kilolitres per annum. As an already water-stressed nation, it is critical that South Africa engages in a variety of water conservation measures, particularly due to the detrimental effects of climate change on water availability. Renewable energy also translates into revenue savings, as fuel for renewable energy facilities is free compared to the continual purchase of fuel for conventional power stations. Results of a CSIR Energy Centre study for January to June 2015 (CSIR, August 2015) have quantified the contribution from renewable energy to the national power system and the economy over the first 6 months of 2015 compared to the 12 months of 2014:

2014 (12 months)	**2015 (6 months)**
R3.64 billion saving in diesel and coal fuel costs	R3.60 billion saving in diesel and coal fuel costs
120 hours of unserved energy avoided, saving at least an additional R1.67 billion for the economy	200 hours of unserved energy avoided, saving at least an additional R1.20 billion–R4.60 billion for the economy
Generated R0.8 billion more financial benefits than cost	Generated R4.0 billion more financial benefits than cost

The overview of the Independent Power Producers Procurement Report (March 2019), has indicated that water savings of 42.8 million kilolitres has been realised by the programme from inception until the end of March 2019, of which 3.4 million kilolitres is reported on in this 2019 reporting quarter.

Exploitation of our significant renewable energy resource: At present, valuable renewable resources including biomass by-products, solar radiation and wind power remain largely unexploited. The use of these energy flows will strengthen energy security through the development of a diverse energy portfolio in South Africa.

By the end of March 2019, the REIPPPP had made the following significant impacts in terms of energy supply:

» 6 422MW of electricity had been procured from 112 Renewable Energy Independent Power Producers (IPPs) in seven bid rounds;
» 3 976 MW of electricity generation capacity from 64 IPP projects has been connected to the national grid;
» 35 669 GWh6 of energy has been generated by renewable energy sources procured under the REIPPPP since the first project became operational. Renewable energy IPPs have proved to be very

[10] (http://ntww1.csir.co.za/plsql/ptl0002/PTL0002_PGE157_MEDIA_REL?MEDIA_RELEASE_NO=7526896)

reliable. Of the 64 projects that have reached COD, 62 projects have been operational for longer than a year. The energy generated over the past 12 month period for these 62 projects is 10 648 GWh , which is 96% of their annual energy contribution projections of 11 146 GWh over a 12 month delivery period. Twenty eight (28) of the 62 projects (45%) have individually exceeded their projections.

Economics: As a result of the excellent resource and competitive procurement processes, both wind power and solar PV power are now proven in South Africa as cheaper forms of energy generation than coal power. They offer excellent value for money to the economy and citizens of South Africa while benefitting society as a whole through the development of clean energy.

The following has been achieved by the IPP programme (March 2019) in terms of investment and economics:

» Investment (equity and debt) to the value of R209.7 billion10 , of which R41.8 billion (20%) is foreign investment, was attracted;
» Socio-economic development contributions of R860.1 million to date, of which R81.1 million was spent in this 2019 reporting quarter; and
» Enterprise development contributions of R276.7 million to date, of which R26.5 million was spent in this 2019 reporting quarter.

Pollution reduction: The release of by-products through the burning of fossil fuels for electricity generation has a particularly hazardous impact on human health and contributes to ecosystem degradation. The use of solar radiation or wind for power generation is a non-consumptive use of a natural resource which produces zero emissions during its operation.

The overview of the Independent Power Producers Procurement Report (March 2019) indicates that carbon emission reductions of 36.2 Mton CO_2 has been realised by the IPP programme from inception to date, of which 2.91 Mton is in this 2019 reporting quarter.

Climate friendly development: The uptake of renewable energy offers the opportunity to address energy needs in an environmentally responsible manner and thereby allows South Africa to contribute towards mitigating climate change through the reduction of greenhouse gas (GHG) emissions. South Africa is estimated to be currently responsible for approximately 1% of global GHG emissions (and circa half of those for which Africa is responsible) and is currently ranked 9th worldwide in terms of per capita carbon dioxide emissions. The renewable energy sector saved South Africa 1.4 million tons of carbon emissions over the first 6 months of 2015[11].

Support for international agreements: The effective deployment of renewable energy provides a tangible means for South Africa to demonstrate its commitment to its international agreements under the Kyoto Protocol and the Paris Agreement, and for cementing its status as a leading player within the international community.

[11] http://www.iol.co.za/capetimes/renewable-energy-saving-sa-billions-csir-1.1903409#.VkNjdJq6FeU

Employment creation: The development, procurement, installation, maintenance and management of renewable energy facilities have significant potential for job creation and skills development in South Africa. The construction phase will create temporary employment opportunities and the operation phase will create limited full-time employment opportunities.

The overview of the Independent Power Producers Procurement Report (March 2019), indicates that all IPP projects to date have created 40 134 job years for South African citizens.

Acceptability to society: Renewable energy offers a number of tangible benefits to society including reduced pollution concerns, improved human and ecosystem health, the use of clean energy and climate friendly development.

Support to a new industry sector: The development of renewable energy offers the opportunity to establish a new industry within the South African economy, which will create jobs and skill local communities and result in community upliftment for the affected areas.

Protecting the natural foundations of life for future generations: Actions to reduce the disproportionate carbon footprint can play an important part in ensuring the human role in preventing dangerous anthropogenic climate change, thereby securing the natural foundations of life for generations to come; this is the basis of sustainable development.

CHAPTER 7: APPROACH TO UNDERTAKING THE BASIC ASSESSMENT PROCESS

In terms of the EIA Regulations of December 2014 (as amended in April 2017) published in terms of the NEMA (Act No. 107 of 1998) as amended, the construction and operation of the Wind Garden Wind Farm is a listed activity requiring environmental authorisation. In terms of GN R114 of February 2018, the application for environmental authorisation is required to be supported by a BA process based on the location of the project site within the Cookhouse REDZ.

The BA process aims at identifying and describing potential environmental issues associated with the development of the proposed wind farm and the associated infrastructure. In order to ensure that a comprehensive assessment is provided to the competent authority and I&APs regarding the impacts of the facility, detailed independent specialist studies were undertaken as part of the BA process.

South Africa has been subject to the enforcement of Government Gazette 43096 which places the country in a national state of disaster limiting the movement of people to curb the spread of the COVID-19 virus. The status of national state of disaster was still relevant at the commencement of the BA process. Considering the limitations in place, a comprehensive consultation process was designed and implemented to cater for the undertaking of a full-scale, innovative public participation process which included I&APs, the competent authority, directly impacted landowners/occupiers, adjacent landowners/occupiers, relevant Organs of State departments, ward councillors and other key stakeholders, while remaining within the limits as stipulated by the National Government. This chapter serves to outline the process that was followed during the BA process.

7.1 Legal Requirements as per the EIA Regulations, 2014 (as amended), for the undertaking of a Basic Assessment Report

This chapter of the BA report includes the following information required in terms of the EIA Regulations, 2014 - Appendix 1: Content of basic assessment reports:

Requirement	Relevant Section
3(d)(i) a description of the scope of the proposed activity, including all listed and specified activities triggered and being applied for.	All listed activities triggered as a result of the development of the Wind Garden Wind Farm have been included in section 7.2, **Table 7.1**. The specific project activity relating to the relevant triggered listed activity has also been included in **Table 7.1**.
3(h)(ii) details of the public participation process undertaken in terms of Regulation 41 of the Regulations, including copies of the supporting documents and inputs.	A public participation plan was prepared and approved by the DEFF (**Appendix C1**). The details of the public participation process undertaken have been included and described in section 7.3.2.
3(h)(iii) a summary of the issues raised by interested and affected parties, and an indication of the manner in which the issues were incorporated, or the reasons for not including them.	All comments received from the commencement of the BA process has been included and responded to in the Comments and Responses (C&R) Report (**Appendix C9**). All comments raised during the 30-day review and comment period of the BA Report and through on-going consultation with I&APs will be included and responded to as part of a C&R report (**Appendix C9**) to be submitted as part of the Final BA Report to DEFF for decision-making.

Requirement	Relevant Section
3(h)(vi) the methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks associated with the alternatives.	The methodology used to assess the significance of the impacts of the Wind Garden Wind Farm has been included in section 7.4.
(o) a description of any assumptions, uncertainties, and gaps in knowledge which relate to the assessment and mitigation measures proposed.	The assumptions and limitations of the BA process being undertaken for the Wind Garden Wind Farm is included in section 7.6.

7.2 Relevant legislative permitting requirements

The legislative permitting requirements applicable to the Wind Garden Wind Farm, as identified at this stage in the process, are described in more detail under the respective sub-headings.

7.2.1 National Environmental Management Act (No. 107 of 1998) (NEMA)

NEMA is South Africa's key piece of national environmental legislation that provides for the authorisation of certain controlled activities known as "listed activities". In terms of Section 24(5) of NEMA, the potential impact on the environment associated with listed activities must be considered, investigated, assessed and reported on to the competent authority (the decision-maker) charged by NEMA with granting of the relevant EA. Due to the fact that the wind farm is a power generation project and therefore relates to the IRP 2010 – 2030, the National Department of Environment, Forestry and Fisheries (DEFF) has been determined as the Competent Authority in terms of GN R779 of 01 July 2016. The Provincial Eastern Cape Department of Economic Development, Environmental Affairs and Tourism (DEDEAT) is the Commenting Authority on the project.

The need to comply with the requirements of the EIA Regulations published under the NEMA ensures that proponents are provided the opportunity to consider the potential environmental impacts of their activities early in the project development process, and also allows for an assessment to be made as to whether environmental impacts can be avoided, minimised or mitigated to acceptable levels. Comprehensive, independent environmental studies are required to be undertaken in accordance with the EIA Regulations to provide the competent authority with sufficient information in order for an informed decision to be taken regarding the project and Application for Environmental Authorisation.

The BA process being conducted for the Wind Garden Wind Farm is undertaken in accordance with Section 24(5) of the NEMA, which defines the procedure to be followed in applying for Environmental Authorisation, and requires that the potential consequences for, or impacts of, listed or specified activities on the environment be considered, investigated, assessed, and reported on to the competent authority. Listed Activities are activities identified in terms of Section 24 of the NEMA which are likely to have a detrimental effect on the environment, and which may not commence without an EA from the competent authority subject to the completion of an environmental assessment process (either a Basic Assessment (BA) or full Scoping and EIA).

As the proposed development is located within Zone 3 of the REDZ (also known as the Cookhouse REDZ), one of the eight (8) designated REDZ areas, the EIA process to be followed for the wind farm will be as per GN R114, as formally gazetted on 16 February 2018. The Wind Garden Wind Farm is now subject to a Basic Assessment process and not a full EIA process, as well as a shortened timeframe of 57 days for the processing of an application for environmental authorisation.

Table 7.1 details the listed activities in terms of the EIA Regulations, 2014 (as amended) that apply to the Wind Garden Wind Farm, and for which an application for Environmental Authorisation has been submitted to the DEFF. The table also includes a description of the specific project activities that relate to the applicable listed activities.

Table 7.1: Listed activities as per the EIA regulations that are triggered by the Wind Garden Wind Farm

Indicate the number and date of the relevant notice:	Activity No (s) (in terms of the relevant notice):	Describe each listed activity as per project description
GN R327, 08 December 2014 (as amended on 07 April 2017)	11(i)	The development of facilities or infrastructure for the transmission and distribution of electricity - (i) outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kilovolts. ***The Wind Garden Wind Farm will require the construction and operation of a 132kV switching station and a 132/33kV on-site collector substation to be connected via a 132kV overhead power line (twin turn dual circuit) to facilitate the connection of the facility to the national grid. The connection point of the facility will be the existing Poseidon – Albany 132kV line present within the project site. The project site assessed for the siting of the Wind Garden Wind Farm is located outside of an urban area.***
GN R327, 08 December 2014 (as amended on 07 April 2017)	12(ii)(a)(c)	The development of (ii) infrastructure or structures with a physical footprint of 100 square meters or more; where such development occurs (a) within a watercourse or (c) within 32 meters of a watercourse, measured from the edge of a watercourse. ***The development of the Wind Garden Wind Farm will require the establishment of infrastructure (including internal access roads) with a physical footprint exceeding 100m² within a watercourse or within 32m of a watercourse identified within the project site. The development footprint of the wind farm will be ~66.6ha in extent.***
GN R327, 08 December 2014 (as amended on 07 April 2017)	14	The development and related operation of facilities or infrastructure, for the storage, or for the storage and handling, of a dangerous good, where such storage occurs in containers with a combined capacity of 80 cubic meters or more but not exceeding 500 cubic meters. ***The development and operation of the Wind Garden Wind Farm will require infrastructure for 120 cubic metres of storage of dangerous goods, which will include flammable and combustible liquids such as oils associated with the on-site collector substation and switching station transformers, lubricants and solvents.***
GN R327, 08 December 2014 (as amended on 07 April 2017)	19	The infilling or depositing of any material of more than 10 cubic meters into, or the dredging, excavation, removal or moving of soil, sand shells, shell grit, pebbles or rock of more than 10 cubic meters from a watercourse.

Indicate the number and date of the relevant notice:	Activity No (s) (in terms of the relevant notice):	Describe each listed activity as per project description
		The development footprint is located within watercourses and pans. Therefore, during the construction phase, 10 cubic metres of rock and soil will be removed from the watercourses for the development of the Wind Garden Wind Farm and associated infrastructure.
GN R327, 08 December 2014 (as amended on 07 April 2017)	24(ii)	The development of a road with a reserve wider than 13,5 meters, or where no reserve exists the road is wider than 8 meters. ***The main access roads providing access to the wind farm will be up to 8m wide.***
GN R327, 08 December 2014 (as amended on 07 April 2017)	28(ii)	Residential, mixed, retail, commercial, industrial, or institutional developments where such land was used for agriculture, game farming, equestrian purposes or afforestation on or after 01 April 1998 and where such development (ii) will occur outside an urban area, where the total land to be developed is bigger than 1 hectare. ***The Wind Garden Wind Farm (considered to be an industrial development) will be constructed and operated on land currently used for agricultural purposes, mainly grazing. The development footprint considered for the establishment of the wind farm is ~66.6ha in extent and is located outside an urban area.***
GN R325, 08 December 2014 (as amended on 07 April 2017)	1	The development of facilities or infrastructure for the generation of electricity from a renewable resource where the electricity output is 20 megawatts or more. ***The Wind Garden Wind Farm will make use of wind energy as a renewable energy resource. The project will have a contracted capacity of up to 264MW.***
GN R325, 08 December 2014 (as amended on 07 April 2017)	15	The clearance of an area of 20 hectares or more of indigenous vegetation. ***The project will require the clearance of an area of ~66.6ha (equivalent to the development footprint) of vegetation. The project is proposed on a property where the predominant land use is grazing and comprises of indigenous vegetation. The project would therefore result in the clearance of an area of indigenous vegetation greater than 20ha in extent.***
GN R324, 08 December 2014 (as amended on 07 April 2017)	4(a)(i)(ee)	The development of a road wider than 4 metres with a reserve less than 13,5 metres (a) in the Eastern Cape, (i) outside urban areas, (ee) within critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans. ***The Wind Garden Wind Farm will require main access roads up to 8m wide and internal access roads up to 4,5m wide. The project site is located within the Eastern Cape Province, outside of an urban area and falls within critical biodiversity areas1 and 2 as per***

Indicate the number and date of the relevant notice:	Activity No (s) (in terms of the relevant notice):	Describe each listed activity as per project description
		the Eastern Cape Biodiversity Plan .
GN R324, 08 December 2014 (as amended on 07 April 2017)	12(a)(ii)	The clearance of an area of 300 square metres or more of indigenous vegetation (a) in the Eastern Cape, (ii) within critical biodiversity areas identified within bioregional plans. ***The Wind Garden Wind Farm requires the clearance of ~66.6ha of indigenous vegetation. The project site is located within the critical biodiversity areas as per the Eastern Cape Biodiversity Plan.***
GN R324, 08 December 2014 (as amended on 07 April 2017)	14(ii)(a)(c)(a)(i)(ff)	The development of (ii) infrastructure or structures with a physical footprint of 10 square metres or more, where such development occurs (a) within a watercourse, and (c) if no development setback has been adopted , within 32 metres of a watercourse, measured from the edge of a watercourse, (a) in the Eastern Cape, (i) outside urban areas and (ff) within critical biodiversity areas or ecosystem service areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans. ***The development of the Wind Garden Wind Farm will require the establishment of infrastructure (including internal access roads) with a physical footprint exceeding 10m² within a watercourse or within 32m of a watercourse identified within the project site. The development footprint of the wind farm will be ~66.6ha in extent. The project site is located within the Eastern Cape, outside of an urban area and within areas identified as critical biodiversity areas as identified in the Eastern Cape Biodiversity Plan.***
GN R324, 08 December 2014 (as amended on 07 April 2017)	18(a)(i)(ee)(ii)(KK)	The widening of a road by more than 4 metres, or the lengthening of a road by more than 1 kilometre (a) in the Eastern Cape, (i) outside urban areas, (ee) within critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans; (ii) in areas on the watercourse side of the development setback line or within 100 metres from the edge of a watercourse where no such setback line has been determined and (KK) within a watercourse. ***Existing roads within the project site will need to be upgraded and widened by more than 4m. The project site is located in the Eastern Cape, outside of urban areas and include critical biodiversity areas as per the Eastern Cape Biodiversity Plan. Watercourses are present within the project site.***

7.2.2 National Water Act (No. 36 of 1998) (NWA)

In accordance with the provisions of the National Water Act (No. 36 of 1998) (NWA), all water uses must be licensed with the Competent Authority (i.e. the Regional Department of Human Settlements, Water and Sanitation). Water use is defined broadly, and includes taking and storing water, activities which reduce stream flow, waste discharges and disposals, controlled activities (activities which impact detrimentally on a water resource), altering a watercourse, removing water found underground for certain purposes, and recreation.

Table 7.1 lists the possible Water Uses associated with the proposed project and identified in terms of the NWA which require licensing either in the form of a General Authorisation (GA), or in the form of a Water Use License (WUL). The table also includes a description of those project activities which relate to the applicable Water Uses.

Table 7.1: List of Water Uses published under Section 21 of NWA, as amended.

Activity No.	Description of Water Use
Section 21 (a)	Taking water from a water resource. ***Groundwater from existing boreholes will be abstracted for use during the construction and operation phases of the wind farm.***
Section 21 (c)	Impeding or diverting the flow of water in a watercourse. ***The development footprint considered for the establishment of the wind farm is associated with the presence of watercourses and pans. Activities pertaining to the establishment of the wind farm might encroach on watercourses/pans which may lead to an impediment and diversion of the flow of water in the watercourses.***
Section 21 (g)	Disposing of waste in a manner which may detrimentally impact on a water resource. ***Typically, the conservancy tanks at construction camps and then O/M buildings require a license (GA if volumes are below 10 000 m^3), however the relevance of this to the Wind Garden Wind Farm is still to be determined.***
Section 21 (i)	Altering the bed, banks, course or characteristics of a watercourse. ***The development footprint considered for the establishment of the wind farm is associated with the presence of watercourses and pans. Activities pertaining to the establishment of the wind farm might encroach on watercourses/pans which may lead to the altering of the characteristics of the watercourses/pans.***

In the event that any of the above activities are relevant for the project then licensing would be required. An application would need to be made for a WUL as internal access roads will cross watercourses. This will need to be in accordance with the requirements of the Regulations Regarding the Procedural Requirements for Water Use License Applications and Appeals (GN R267), or a GA registered in accordance with the requirements of Revision of General Authorisation. The process of applying for a WUL or GA registration will only be completed once a positive EA has been received. This is in line with the requirements of the Department of Water and Sanitation.

7.2.3 National Heritage Resources Act (No. 25 of 1999) (NHRA)

The National Heritage Resources Act (No. 25 of 1999) (NHRA) provides an integrated system which allows for the management of national heritage resources and to empower civil society to conserve heritage resources for future generations. Section 38 of NHRA provides a list of activities which potentially require the undertaking of a Heritage Impact Assessment.

<u>Section 38: Heritage Resources Management</u>

1). *Subject to the provisions of subsections (7), (8) and (9), any person who intends to undertake a development categorised as –*
   a. *the construction of a road, wall, power line, pipeline, canal or other similar form of linear development or barrier exceeding 300m in length;*
   b. *the construction of a bridge or similar structure exceeding 50m in length;*
   c. *any development or other activity which will change the character of a site –*
      i). *exceeding 5 000m² in extent; or*
      ii). *involving three or more existing erven or subdivisions thereof; or*
      iii). *involving three or more erven or divisions thereof which have been consolidated within the past five years; or*
      iv). *the costs of which will exceed a sum set in terms of regulations by SAHRA or a provincial heritage resources authority;*

   Must at the very earliest stages of initiating such a development, notify the responsible heritage resources authority and furnish it with details regarding the location, nature and extent of the proposed development.

In terms of Section 38(8), approval from the heritage authority is not required if an evaluation of the impact of such development on heritage resources is required in terms of any other legislation (such as NEMA), provided that the consenting authority ensures that the evaluation of impacts fulfils the requirements of the relevant heritage resources authority in terms of Section 38(3) and any comments and recommendations of the relevant resources authority with regard to such development have been taken into account prior to the granting of the consent. However, should heritage resources of significance be affected by the Wind Garden Wind Farms, a permit is required to be obtained prior to disturbing or destroying such resources as per the requirements of Section 48 of the NHRA, and the SAHRA Permit Regulations (GN R668).

7.3 Overview of the Basic Assessment Process for the Wind Garden Wind Farm

Key tasks undertaken for the BA included:

» Consultation with relevant decision-making and regulating authorities (at National, Provincial and Local levels).
» Submission of the completed Application for Environmental Authorisation to the competent authority (i.e. DEFF) in terms of Regulations 5 and 6 of the EIA Regulations, 2014 (GNR 326), as amended.
» Undertaking a public participation process in accordance with Chapter 6 of GNR326, and the Department of Environmental Affairs (2017), Public Participation guidelines in terms of NEMA EIA Regulations, Department of Environmental Affairs, Pretoria, South Africa (hereinafter referred to as "the Guidelines") in order to identify issues and concerns associated with the proposed project.
» Undertaking of independent specialist studies in accordance with Appendix 6 of the EIA Regulations, 2014 (GNR326), as amended, and the requirements of the Specialist Protocols published in Regulation GNR 320, issued 20 March 2020 and 30 October 2020.
» Preparation of a BA Report and EMPr in accordance with the requirements of Appendix 1 and Appendix 4 of GN R326.
» 30-day public and authority review period of the BA report.
» Compilation of a C&R report detailing the comments raised by I&APs, addressing these comments in detail and finalisation of the BA report.
» Submission of a final BA report to the DEA for review and decision-making.

The tasks are discussed in detail in the sub-sections below.

7.3.1. Authority Consultation and Application for Authorisation in terms of the 2014 EIA Regulations (as amended)

In terms of Government Notice 779 of 01 July 2016, the National Department of Environment, Forestry and Fisheries (DEFF) is the competent authority for all projects related to the IRP. As the project is located within the Eastern Cape Province, the Provincial Eastern Cape Department of Economic Development, Environmental Affairs and Tourism (DEDEAT) is the commenting authority. Consultation with the regulating authorities (i.e. DEFF and DEDEAT) as well as with all other relevant Organs of State will continue throughout the BA process. To date, this consultation has included the following:

- Holding of a Pre-application Meeting with the DEFF on 09 October 2020 (via the Microsoft Teams Platform) during which the project details, progress and proposed Public Participation Plan was presented. The Public Participation Plan was approved following the pre-application meeting by the Case Officer (Mr Lunga Dlova) via email on 02 November 2020.
- Submission of the application form for Environmental Authorisation to the DEFF via the use of the DEA Novell Filr System.
- Submission of the BA Report for review and comment by:
    - The competent and commenting authorities.
    - State departments that administer laws relating to a matter affecting the environment relevant to an application for Environmental Authorisation.
    - Organs of State which have jurisdiction in respect of the activity to which the application relates.

The submissions, as listed above, were undertaken electronically, as required by the DEFF (in line with the directions for new Applications for Environmental Authorisations provided for in GNR650 of 05 June 2020).

A record of all authority correspondence undertaken during the BA process is included in **Appendix B** and **Appendix C**.

7.3.2. Public Participation Process

Public participation is an essential and regulatory requirement for an environmental authorisation process and is guided by Regulations 41 to 44 of the EIA Regulations 2014 (GN R326) (as amended). The purpose of public participation is clearly outlined in Regulation 40 of the EIA Regulations 2014 (GN R326) (as amended) and is being followed for this proposed project.

The Public Participation Process undertaken for the proposed development of the Wind Garden Wind Farm considers the restrictions and limitations imposed by Government through section 27 (2) of the Disaster Management Act (Act No. 57 of 2002) of 2002 and the Directions issued by the Minister of Forestry and Fisheries (DEFF) in terms of consultations with I&APs. A Public Participation Plan was prepared and submitted to the DEFF. Approval of the Plan was provided by the DEFF Case Officer via email on 02 November 2020 following the pre-application meeting (**Appendix B**).

The alternative means of undertaking consultation have been designed and implemented by Savannah Environmental to ensure that I&APs are afforded sufficient opportunity to access project information and raise comments on the project through an interactive web-based platform (i.e. online stakeholder engagement platform) readily available and accessible to any person registering their interest in the project, and ensures that the public participation process is undertaken in line with Regulations 41 to 44 of the EIA Regulations, 2014 as amended. The Public Participation Plan (**Appendix C1**) considers the limitations applied by the Disaster Management Act Regulations prohibiting the gathering of people, as well as limitations which certain I&APs may have in terms of access to computers and internet as well as access to public spaces currently not open for operation that inhibits access to hard copy documentation. The online stakeholder engagement platform implemented by Savannah Environmental for the project allowed the EAP to visually present details regarding the project as well as consultation documentation, including project maps and plans, presentations and posters. The platform also contains the BA report available for review. The use of an online tool enables stakeholders and I&APs to explore the project-specific content in their own time, and still enables them to participate in a meaningful way in the consultation process. The online platform allows for instant feedback and comments to be submitted, in so doing saving time for the stakeholder and also giving the assurance that their comments have been submitted for inclusion in the project reporting.

The sharing of information forms the basis of the public participation process and offers the opportunity for I&APs to become actively involved in the BA process from the outset. The public participation process is designed to provide sufficient and accessible information to I&APs in an objective manner. The public participation process affords I&APs opportunities to provide input into and receive information regarding the BA process in the following ways:

During the BA process:

- provide an opportunity to submit comments regarding the project;
- assist in identifying reasonable and feasible alternatives;
- contribute relevant local information and knowledge to the environmental assessment;
- allow registered I&APs to verify that their comments have been recorded, considered and addressed, where applicable, in the environmental investigations;
- foster trust and co-operation;
- generate a sense of joint responsibility and ownership of the environment; and
- comment on the findings of the environmental assessments.

During the decision-making phase:

- to advise I&APs of the outcome of the competent authority's decision, and how and by when the decision can be appealed.

The public participation process therefore aims to ensure that:

- Information containing all relevant facts in respect of the application is made available to potential stakeholders and I&APs for their review.
- The information presented during the public participation process is presented in such a manner, i.e. local language and technical issues, that it avoids the possible alienation of the public and prevents them from participating.
- Public participation is facilitated in such a manner that I&APs are provided with a reasonable opportunity to comment on the project.
- Various ways are provided to I&APs to correspond and submit their comments i.e. fax, post, email, SMS, WhatsApp or by sending a Please-call-me notification.
- An adequate review period is provided for I&APs to comment on the findings of the BA Report.

In terms of the requirement of Chapter 6 of the EIA Regulations of December 2014, as amended, the following key public participation tasks are required to be undertaken:

» Fix a notice board at a place conspicuous to the public at the boundary or on the fence of—
  - (i) the site where the activity to which the application relates is or is to be undertaken; and
  - (ii) any alternative site mentioned in the application;
» Give written notice to:
  - (i) the owner or person in control of that land if the applicant is not the owner or person in control of the land;
  - (ii) the occupiers of the site where the activity is or is to be undertaken or to any alternative site where the activity is to be undertaken;
  - (iii) owners and occupiers of land adjacent to the site where the activity is or is to be undertaken or to any alternative site where the activity is to be undertaken;
  - (iv) the municipal councillor of the ward in which the site or alternative site is situated and any organisation of ratepayers that represent the community in the area;
  - (v) the municipality which has jurisdiction in the area;
  - (vi) any organ of state having jurisdiction in respect of any aspect of the activity; and
  - (vii) any other party as required by the competent authority.
» Place an advertisement in one local newspaper and one regional newspaper.
» Open and maintain a register of I&APs and Organs of State.
» Release of a BA Report for a 30-day review and comment period.
» Prepare a Comments and Responses (C&R) report which documents the comments received on the BA process and during the 30-day review and comment period and the responses provided by the project team.

In compliance with the requirements of Chapter 6: Public Participation of the EIA Regulations, 2014 (as amended), and the approved Public Participation Plan, the following summarises the key public participation activities implemented. The schematic below provides an overview of the tools that are available to I&APs and stakeholders to access project information and interact with the public participation team to obtain project information and resolve any queries that may arise, and to meet the requirements for public participation.

i. <u>Stakeholder identification and Register of Interested and Affected Parties</u>

42. A proponent or applicant must ensure the opening and maintenance of a register of I&APs and submit such a register to the competent authority, which register must contain the names, contact details and addresses of –
    (a) All persons who, as a consequence of the public participation process conducted in respect of that application, have submitted written comments or attended meetings with the proponent, applicant or EAP;
    (b) All persons who have requested the proponent or applicant, in writing, for their names to be placed on the register; and
    (c) All organs of state which have jurisdiction in respect of the activity to which the application relates.

I&APs have been identified through a process of networking and referral, obtaining information from Savannah Environmental's existing stakeholder database, liaison with potentially affected parties in the greater surrounding area and a registration process involving the completion of a reply form. Key stakeholders and affected and surrounding landowners (including occupiers) have been identified and registered on the project database. Other stakeholders are required to formally register their interest in the project through either directly contacting the Savannah Environmental Public Participation team via phone, message (SMS and WhatsApp), email or fax, or registering their interest via the online stakeholder engagement platform. An initial list of key stakeholders identified and registered is listed in **Table 7.3**.

i. Stakeholder identification and register of I&APs	• Register as an I&AP on the online platform or via completion of a form and provison of contact information, by responding to an advert, or sending a 'please call me' which will be responded to with a telephone call. • State interest in the project. • Receive all project related information via email, post or other appropriate means.
ii. Advertisments and notifications	• Advertisements, site notices and radio announcements and notifications provide information and details on the project and where to access project information. • Notifications regarding the EIA process and availability of project report for public review to be sent via email, post or SMS notifications.
iii. Public Involvement and consultation	• Distribution of a BID providing details on the project and how I&APs can become involved in the process. • Submission of comments or queries via the online platform, email or post to the PP team. • Virtual presentations (both English and Afrikaans, and a summary of the presentation in Xhosa) available via the online platform. • Availability of project information via the online platform, email, post and telephonic platforms such as WhatsApp, and including telephonic discussions to provide description of information verbally. • An opportunity for I&APs and stakeholders to request virtual meetings with the project team.
iv. Comment on the BA Report	• Availability of the project report via the online platform for 30-day comment period. Hard copies to be available only where sanitary conditions can be assured. • Submission of comments via the online platform, email or post to the PP team. • Comments recorded and responded to, as part of the process.
v. Identification and recording of comments	• Comments and Responses Report, including all comments received to be included in the reporting. • Comments received prior to report release for review to be included in the draft reports. • Comments received during full process to be included within the final Report for decision-making.

Table 7.3: Initial list of Stakeholders identified for the inclusion in the project database during the public participation process for the Wind Garden Wind Farm

Organs of State
National Government Departments

Department of Environment, Forestry and Fisheries
Department of Mineral Resources and Energy
Department of Agriculture, Land Reform and Rural Development
Department of Human Settlements, Water and Sanitation
Government Bodies and State-Owned Companies
Eskom Holdings SOC Limited
National Energy Regulator of South Africa (NERSA)
South African Civil Aviation Authority (CAA)
South African Heritage Resources Agency (SAHRA)
South African National Roads Agency Limited (SANRAL)
South African Radio Astronomy Observatory (SARAO)
Telkom SA SOC Limited
Transnet SA SOC Limited
Provincial Government Departments
Eastern Cape Department of Economic Development, Environmental Affairs and Tourism
Eastern Cape Department of Transport
Eastern Cape Provincial Heritage Resources Authority
Local Government Departments
Sarah Baartman District Municipality
Makana Local Municipality – including the Ward Councillor, ward committee members, community representative or local community forum members
Commenting Stakeholders
BirdLife South Africa
Endangered Wildlife Trust (EWT)
SENTECH
Wildlife and Environment Society of South Africa (WESSA)
Landowners
Affected landowners, tenants and occupiers
Neighbouring landowners, tenants and occupiers

As per Regulation 42 of the EIA Regulations, 2014 (as amended), all relevant stakeholder and I&AP information has been recorded within a register of I&APs (refer to **Appendix C2** for a listing of the recorded parties). In addition to the above-mentioned EIA Regulations, point 4.1 of the Public Participation Guidelines has also been followed. The register of I&APs contains the names[12] of:

» all persons who requested to be registered on the database through the use of the online stakeholder engagement platform or in writing and disclosed their interest in the project;
» all Organs of State which hold jurisdiction in respect of the activity to which the application relates; and

[12] Contact details and addresses have not been included in the I&AP database as this information is protected by the Protection of Personal Information Act (No 4 of 2013).

» all persons who submitted written comments or attended virtual meetings and viewed the narrated presentations on the Savannah Environmental online platform during the public participation process.

I&APs have been encouraged to register their interest in the BA process from the onset of the project, and the identification and registration of I&APs will be on-going for the duration of the BA process. The database of I&APs will be updated throughout the BA process and will act as a record of the I&APs involved in the public participation process.

ii. Advertisements and Notifications

40.(2)(a)	Fixing a notice board at a place conspicuous to and accessible by the public at the boundary, on the fence or along the corridor of – (i) The site where the activity to which the application or proposed application relates is or is to be undertaken; and (ii) Any alternative site.
40.(2)(b)	Giving written notice, in any of the manners provided for in section 47Dof the Act, to – (i) The occupiers of the site and, if the proponent or applicant is not the owner or person in control of the site on which the activity is to be undertaken, the owner or person in control of the site where the activity is or is to be undertaken and to any alternative site where the activity is to be undertaken; (ii) Owners, persons in control of, and occupiers of land adjacent to the site where the activity is or is to be undertaken and to any alternative site where the activity is to be undertaken; (iii) The municipal councillor of the ward in which the site and alternative site is situated and any organisation of ratepayers that represent the community in the area; (iv) The municipality which has jurisdiction in the area; (v) Any organ of state having jurisdiction in respect of any aspect of the activity; and (vi) Any other party as required by the competent authority.
40.(2)(c)	Placing an advertisement in – (i) One local newspaper; or (ii) Any official Gazette that is published specifically for the purpose of providing public notice of applications or other submissions made in terms of these Regulations;
40.(2)(d)	Placing an advertisement in at least one provincial newspaper or national newspaper, if the activity has or may have an impact that extends beyond the boundaries of the metropolitan or district municipality in which it is or will be undertaken: Provided that this paragraph need not be complied with if an advertisement has been placed in an official Gazette referred to in paragraph (c)(ii); and
40.(2)(e)	Using reasonable alternative methods, as agreed to by the competent authority, in those instances where a person is desirous of but unable to participate in the process due to – (i) Illiteracy; (ii) Disability; or (iii) Any other disadvantage.

The BA process was announced with an invitation to the Organs of State, potentially affected and neighbouring landowners (including occupiers) and general public to register as I&APs and to actively participate in the process. This was achieved via the following:

» Compilation of a background information document (BID) (refer to **Appendix C4**) providing technical details on the project, details of the EIA process being undertaken and how I&APs can become involved in the BA process. The BID and the BA process notification letter announcing the BA process and inviting I&APs to register on the project's database were distributed via email on **17 November**

2020. The evidence of the distribution is contained in **Appendix C** of the BA Report. The BID is also available electronically on the Savannah Environmental website (https://www.savannahsa.com/public-documents/energy-generation/eastern-cape-cluster-of-renewable-energy-facilities/).

» Placement of site notices announcing the BA process at visible points along the boundary of the project site (i.e. the boundaries of the affected properties), in accordance with the requirements of the EIA Regulations on **03 December – 06 December 2020**. Photographs of the site notices are included in **Appendix C3** of the BA Report.
» Placement of an advertisement in two newspapers on **12 November 2020** at the commencement of the BA process (**Appendix C3**). These adverts:
  * announced the project and the associated BA process, and
  * provided all relevant details to access the Savannah Environmental online stakeholder engagement platform.
» An English advert was placed in a regional newspaper, known as the Herald and an Afrikaans advert was placed in a local newspaper, known as Hartland Nuus. These newspapers are available and published in the areas affected by the project. A copy of the newspaper advert as sent to the newspapers and the newspaper advert tear sheets are included in **Appendix C3** of the BA Report.
» Placement of an advertisement in the above-mentioned two newspapers on **04 March 2021** at the commencement of the 30-day review and comment period (**Appendix C3**). This advert:
  * announced the availability of the BA report, the review period, and where it is accessible for review, and invited comment on the BA Report,
  * announced the virtual public meeting planned for the project, and
  * provided all relevant details to access the Savannah Environmental online stakeholder engagement platform.

  A copy of the newspaper advert as sent to the newspaper is included in **Appendix C3** of the BA Report. The newspaper advert tear sheet will be included in the Final BA Report in **Appendix C3.**
» A Radio Live Read by Radio Grahamstown (102.1Fm) **04 March 2020** (in both English and Afrikaans) at the commencement of the 30-day review and comment period (**Appendix C3**). Further Radio Live Read segments have also been undertaken at Radio Grahamstown as a reminder of the availability of the BA report for review and comment, and the details of the virtual public meeting on **12 March 2021** and **31 March 2021** (undertaken in both English and Afrikaans). Radio Grahamstown is the local radio station covering the study area.
» The BA Report has been made available for review by I&APs for a 30-day review and comment period from **04 March 2020** to **07 April 2020.** The BA Report has been made available on the Savannah Environmental website and all registered I&APs have been notified of the availability on **03 March 2021** via email which included the link to access the report on the Savannah Environmental website. The evidence of distribution of the BA Report will be included in the final BA Report, which will be submitted to the DEA.

iii. <u>Public Involvement and Consultation</u>

In order to accommodate the varying needs of stakeholders and I&APs within the surrounding area, as well as capture their views, comments, issues and concerns regarding the project, various opportunities have been and will continue to be provided to I&APs to note their comments and issues. I&APs are being consulted through the following means:

Table 7.4: Public involvement for the Wind Garden Wind Farm

Activity	Date
Announcement of the BA process in one regional and one local newspaper: » Regional – Herald Newspaper (English advertisement) » Local – Hartland Nuus (Afrikaans advertisement)	12 November 2020
Distribution of the BID, process notification letters and stakeholder reply form announcing the BA process and inviting I&APs to register on the project database. The BID and electronic reply form was also made available on the online stakeholder engagement platform.	17 November 2020
Placement of site notices, including placement of further notices and distributions of the BID at the Public Libraries in Makhanda and Somerset East.	Public Libraries located within the Local municipal area: » Makhanda Public Library – 03 December 2020 » Duna Public Library – 04 December 2020 » Extension 6 Public Library – 04 December 2020 Public Libraries located outside the Local municipal area: » Langenhoven Library – 07 January 2021 » Dr NG Cipe Library – 08 January 2021 WD West Library - 12 January 2021
Consultation with the affected and adjacent landowners at the commencement of the BA process	03 December 2020
Announcement of the availability of the BA Report for a 30-day review and comment period, including details on how to access the BA Report via the online stakeholder engagement platform, in one regional and one local newspaper: » Regional – Herald Newspaper (English advertisement) » Local – Hartland Nuus (Afrikaans advertisement)	03 March 2021
Radio Live Read by the Radio Grahamstown (102.1Fm) advertising the availability of the BA Report for a 30-day review and comment period, and the details of how to get involved and how contact with Savannah Environmental can be made. The Live Read was undertaken in both English and Afrikaans	04 March 2021 12 March 2021 31 March 2021
Distribution of notification letters announcing the availability of the BA Report for a 30-day review and comment period. These letters were distributed to Organs of State, Government Departments, Ward Councillors, landowners within the surrounding area (including neighbouring landowners), registered I&APs and key stakeholder groups.	03 March 2021
30-day review and comment period of the BA Report.	04 March 2021 - 07 April 2021
Virtual public meetings	15 March 2021 – 16 March 2021
Virtual meetings through the use of virtual platforms as determined through discussions with the relevant stakeholder group:	15 March 2021 – 16 March 2021

Activity	Date
» Landowners » Authorities and key stakeholders (including Organs of State, local municipality and official representatives of community-based organisations. » Where an I&AP does not have access to a computer and/or internet to participate in a virtual meeting telephonic discussions (including WhatsApp video call) will be set-up and minuted for inclusion. The preferred language of the I&AP has been considered when setting up these discussions. » Face-to-face meetings could be held where sanitary conditions can be assured.	
On-going consultation (i.e. telephone liaison; e-mail communication) with all I&APs.	Throughout BA process

iv. Registered I&APs entitled to Comment on the BA Report

43.(1) A registered I&AP is entitled to comment, in writing, on all reports or plans submitted to such party during the public participation process contemplated in these Regulations and to bring to the attention of the proponent or applicant any issues which that party believes may be of significance to the consideration of the application, provided that the interested and affected party discloses any direct business, financial, personal or other interest which that party may have in the approval or refusal of the application.

(2) In order to give effect to section 24O of the Act, any State department that administers a law relating to a matter affecting the environment must be requested, subject to regulation 7(2), to comment within 30 days.

44.(1) The applicant must ensure that the comments of interested and affected parties are recorded in reports and plans and that such written comments, including responses to such comments and records of meetings, are attached to the reports and plans that are submitted to the competent authority in terms of these Regulations.

(2) Where a person desires but is unable to access written comments as contemplated in subregulation (1) due to –

(a) A lack of skills to read or write;
(b) Disability; or
(c) Any other disadvantage;

Reasonable alternative methods of recording comments must be provided for.

I&APs registered on the database have been notified via letter of the release of the BA Report for a 30-day review and comment period, invited to provide comment on the BA Report, and informed of the manner in which, and timeframe within which such comment must be made. The report has been made available in soft copies to I&APs due to restrictions and limitations on public spaces during the national state of disaster related to COVID-19. No hard copies of the report have been made available for review and comment in accordance with the approved public participation plan.

The BA Report has also been made available on the Savannah Environmental website (i.e. online stakeholder engagement platform) (https://www.savannahsa.com/public-documents/energy-generation/). The notification was distributed at the commencement of the 30-day review and comment period, on **03 March 2021**. Where I&APs were not able to provide written comments (including SMS and WhatsApp), other means of consultation, such as telephonic discussions will be used to provide the I&APs with a platform to verbally raise their comments on the proposed development.

All comments raised as part of the discussions and written comments submitted during the 30-day review and comment period will recorded and included in **Appendix C** of the BA Report.

v. Identification and Recording of Comments

Comments raised by I&APs to date have been collated into a Comments and Responses (C&R) Report which is included in **Appendix C9** of the BA Report. The C&R Report includes detailed responses from members of the EIA project team and/or the project proponent to the issues and comments raised. The C&R Report will consist of written comments received.

Meeting notes of all the telephonic discussions and virtual meetings conducted at the commencement of the BA process are included in **Appendix C8**. Meeting notes of all virtual meetings and discussions undertaken during the 30-day review and comment period will be included in **Appendix C8** of the final BA Report.

The C&R Report will be updated with all comments received during the 30-day review and comment period and will be included as **Appendix C9** in the final BA Report that will be submitted to the DEFF for decision-making.

7.4. Outcomes of the DEA Web-Based Screening Tool

In terms of GN R960 (promulgated on 5 July 2019) and Regulation 16(1)(b)(v) of the 2014 EIA Regulations (as amended), the submission of a Screening Report generated from the national web based environmental screening tool is compulsory for the submission of applications in terms of Regulations 19 and 21 of the EIA Regulations.

The requirement for the submission of a Screening Report (included as **Appendix R(1)** of the BA Report) for the Wind Garden Wind Farm is applicable as it triggers Regulation 19 of the EIA Regulations, 2014 (as amended). **Table 7.5** provides a summary of the specialist assessments identified in terms of the screening tool and responses to each assessment from the project team considering the development area under consideration.

Table 7.5: Sensitivity ratings from the DEFF's web-based online Screening Tool associated with the development of the Wind Garden Wind Farm

Specialist Assessment	Sensitivity Rating as per the Screening Tool (relating the to need for the study)	Project Team Response
Agricultural Impact Assessment	High	The Soils, Land Use and Agriculture Impact Assessment is included in this BA Report as **Appendix H**.
Landscape/Visual Impact Assessment	Very high	A Visual Impact Assessment has been undertaken for the wind farm and is included in this BA Report as **Appendix K.**
Archaeological and Cultural Heritage Impact Assessment	High	A Heritage Impact Assessment (which covers both archaeological and cultural aspects of project site and development footprint) has been undertaken for the wind farm and is included in this BA Report as **Appendix I**.
Palaeontology Impact Assessment	High	The Heritage Impact Assessment (included as **Appendix I(1)**) of the BA Report includes an assessment of palaeontological resources within the project site and development footprint.
Terrestrial Biodiversity Impact Assessment	Very high	An Ecological Impact Assessment (including flora and fauna) has been undertaken for the wind farm and is included as

Specialist Assessment	Sensitivity Rating as per the Screening Tool (relating the to need for the study)	Project Team Response
		Appendix D of the BA Report.
Aquatic Biodiversity Impact Assessment	Very high	An Aquatic Impact Assessment has been undertaken for the wind farm and is included as **Appendix G** of the BA Report.
Avian Impact Assessment	High	An Avifauna Impact Assessment Report (including 12-months monitoring as per the BirdLife SA Best Practice Guidelines) has been undertaken for the Wind Farm and included as **Appendix E** of the BA Report.
Civil Aviation Assessment	Medium	The Civil Aviation Authority will be consulted throughout the BA process to obtain input.
Defence Assessment	High	The project site is located to the west of the 6 South African Infantry Battalion. The military base will be consulted for inputs as part of the BA process.
RFI Assessment	High	The project site under consideration for the development of the Wind Garden Wind Farm, is outside the radius of the Karoo Central Astronomy Advantage Area declared in terms of the Astronomy Geographic Advantage Act (Act No. 21 of 2007) of 2007. The South African Radio Astronomy Observatory (SARAO) will however be consulted during the 30-day review and comment period of the BA Report to provide written comment on the proposed development.
Noise Impact Assessment	Very high	A Noise Impact Assessment has been undertaken for the wind farm and is included as **Appendix J** of the BA Report.
Flicker Assessment	Very high	A Visual Impact Assessment has been undertaken for the wind farm and is included in this BA Report as **Appendix K**, and considers the impact of flicker associated with the development.
Traffic Impact Assessment	The screening report does not indicate a rating for this theme.	A Traffic Impact Assessment has been undertaken for the wind farm and is included as **Appendix M** of the BA Report.
Geotechnical Assessment	The screening report does not indicate a rating for this theme.	A technical report considering Geotechnical aspects of the site is included as **Appendix R(2)** of the BA Report.
Socio-Economic Assessment	The screening report does not indicate a rating for this theme.	A Socio-Economic Impact Assessment has been undertaken and is included in the BA Report as **Appendix L**.
Plant Species Assessment	Medium	An Ecological Impact Assessment (including flora and fauna) has been undertaken for the Wind Garden Wind Farm and is included as **Appendix D** of the BA Report.
Animal Species Assessment	High	

It must be noted that the appointment of specialists for the Wind Garden Wind Farm commenced prior to the Gazetting of the specialist protocols in March 2020. Therefore, the protocols are not considered to be specifically relevant, however the protocols have been considered by specialists where deemed relevant. Refer to **Appendix R(1).**

7.5. Assessment of Issues Identified through the BA Process

Issues identified as requiring investigation, as well as the specialist consultants involved in the assessment of these impacts are indicated in **Table 7.6** below.

Table 7.6: Specialist consultants appointed to evaluate the potential impacts associated with the Wind Garden Wind Farm

Specialist	Field of Study	Appendix
Simon Todd of 3foxes Biodiversity Solutions	Terrestrial Ecology (including fauna and flora)	Appendix D
Adri Barkhuysen of East Cape Diverse Consultants and Dr Steve Percival of Ecology Consulting	Avifauna (including monitoring)	Appendix E
Michael Brits and Mark Hodgson of Arcus Consultancy Services South Africa	Bats (including monitoring)	Appendix F
Dr Brian Colloty of EnviroSci	Aquatic	Appendix G
Andrew Husted of The Biodiversity Company	Soil, Land Use, Land Capability and Agricultural Potential	Appendix H
Cherene de Bruyn and Wouter Fourie of PGS Heritage and Elize Butler of Banzai Environmental	Heritage (including archaeology, palaeontology and cultural landscape)	Appendix I
Morné de Jager of Enviro Acoustic Research (EAR)	Noise	Appendix J
Lourens du Plessis of LOGIS	Visual	Appendix K
Conrad Swart and Matthew Keeley of Urban-Econ	Socio-economic	Appendix L
Iris Wink and Adrian Johnson of JG Africa	Traffic	Appendix M

Specialist studies considered direct and indirect environmental impacts associated with the development of all components of the Wind Garden Wind Farm. Issues were assessed in terms of the following criteria:

» The **nature**, a description of what causes the effect, what will be affected, and how it will be affected;
» The **extent**, wherein it is indicated whether the impact will be local (limited to the immediate area or site of development), regional, national or international. A score of between 1 and 5 is assigned as appropriate (with a score of 1 being low and a score of 5 being high);
» The **duration**, wherein it is indicated whether:
  * The lifetime of the impact will be of a very short duration (0–1 years) – assigned a score of 1;
  * The lifetime of the impact will be of a short duration (2-5 years) - assigned a score of 2;
  * Medium-term (5–15 years) – assigned a score of 3;
  * Long term (> 15 years) - assigned a score of 4;
  * Permanent - assigned a score of 5.
» The **magnitude**, quantified on a scale from 0-10, where a score is assigned:
  * 0 is small and will have no effect on the environment;
  * 2 is minor and will not result in an impact on processes;
  * 4 is low and will cause a slight impact on processes;
  * 6 is moderate and will result in processes continuing but in a modified way;
  * 8 is high (processes are altered to the extent that they temporarily cease);
  * 10 is very high and results in complete destruction of patterns and permanent cessation of processes.
» The **probability of occurrence**, which describes the likelihood of the impact actually occurring. Probability is estimated on a scale, and a score assigned:

  * Assigned a score of 1–5, where 1 is very improbable (probably will not happen);
  * Assigned a score of 2 is improbable (some possibility, but low likelihood);
  * Assigned a score of 3 is probable (distinct possibility);
  * Assigned a score of 4 is highly probable (most likely);
  * Assigned a score of 5 is definite (impact will occur regardless of any prevention measures).
- The **significance**, which is determined through a synthesis of the characteristics described above (refer formula below) and can be assessed as low, medium or high;
- The **status**, which is described as either positive, negative or neutral;
- The degree to which the impact can be reversed;
- The degree to which the impact may cause irreplaceable loss of resources;
- The degree to which the impact can be mitigated.

The **significance** is determined by combining the criteria in the following formula:

S = (E+D+M) P; where

S = Significance weighting.
E = Extent.
D = Duration.
M = Magnitude.
P = Probability.

The **significance weightings** for each potential impact are as follows:
- **< 30 points:** Low (i.e. where this impact would not have a direct influence on the decision to develop in the area);
- **30-60 points:** Medium (i.e. where the impact could influence the decision to develop in the area unless it is effectively mitigated);
- **> 60 points:** High (i.e. where the impact must have an influence on the decision process to develop in the area).

Specialist studies also considered cumulative impacts associated with similar developments within a 30km radius of the proposed project. The purpose of the cumulative assessment is to test if such impacts are relevant to the proposed project in the proposed location (i.e. whether the addition of the proposed project in the area will increase the impact). In this regard, specialist studies considered whether the construction of the proposed development will result in:

- Unacceptable risk
- Unacceptable loss
- Complete or whole-scale changes to the environment or sense of place
- Unacceptable increase in impact

A conclusion regarding whether the proposed development will result in any unacceptable loss or impact considering all the projects proposed in the area is included in the respective specialist reports.

As the proponent has the responsibility to avoid or minimise impacts and plan for their management (in terms of the EIA Regulations, 2014 (as amended)), the mitigation of significant impacts is discussed. An assessment of impacts with mitigation is made in order to demonstrate the effectiveness of the proposed mitigation measures. An Environmental Management Programme (EMPr) that includes all the mitigation measures recommended by the specialists for the management of significant impacts is included as **Appendix N**.

7.6 Assumptions and Limitations of the BA Process

The following assumptions and limitations are applicable to the studies undertaken within this BA process:

» All information provided by the developer and I&APs to the environmental team was correct and valid at the time it was provided.
» It is assumed that the project site, development envelope and development footprint for the wind farm identified by the developer represents a technically suitable site for the establishment of the Wind Garden Wind Farm which is based on the design undertaken by technical consultants for the project.
» This report and its investigations are project-specific, and consequently the environmental team did not evaluate any other power generation alternatives.

Refer to the specialist studies in **Appendices D – M** for specialist study specific limitations.

7.7 Legislation and Guidelines that have informed the preparation of this Basic Assessment Report

The following legislation and guidelines have informed the scope and content of this BA Report:

» National Environmental Management Act (Act No. 107 of 1998);
» EIA Regulations of December 2014, published under Chapter 5 of NEMA (as amended);
» Department of Environmental Affairs (2017), Public Participation guidelines in terms of NEMA EIA Regulations;
» Procedures for the assessment and minimum criteria for reporting on identified environmental themes in terms of sections 24(5)(a) and (h) and 44 of the National Environmental Management Act, 1998, when applying for environmental authorisation; and
» International guidelines – the Equator Principles, the IFC Performance Standards, the Sustainable Development Goals, World Bank Environmental and Social Framework, and the and World Bank Group Environmental, Health, and Safety Guidelines (EHS Guidelines).

Table 7.7 provides an outline of the legislative permitting requirements applicable to the Wind Garden Wind Farm as identified at this stage in the project process.

Table 7.7: Applicable Legislation, Policies and/or Guidelines associated with the development of the Wind Garden Wind Farm

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
National Legislation			
Constitution of the Republic of South Africa (No. 108 of 1996)	In terms of Section 24, the State has an obligation to give effect to the environmental right. The environmental right states that: "*Everyone has the right –* » *To an environment that is not harmful to their health or well-being, and* » *To have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that:* ∗ *Prevent pollution and ecological degradation,* ∗ *Promote conservation, and* ∗ *Secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development*."	Applicable to all authorities	There are no permitting requirements associated with this Act. The application of the Environmental Right however implies that environmental impacts associated with proposed developments are considered separately and cumulatively. It is also important to note that the "right to an environment clause" includes the notion that justifiable economic and social development should be promoted, through the use of natural resources and ecologically sustainable development.
National Environmental Management Act (No 107 of 1998) (NEMA)	The 2014 EIA Regulations have been promulgated in terms of Chapter 5 of NEMA. Listed activities which may not commence without EA are identified within the Listing Notices (GNR 327, GNR 325 and GNR 324) which form part of these Regulations (GNR 326). In terms of Section 24(1) of NEMA, the potential impact on the environment associated with these listed activities must be assessed and reported on to the competent authority charged by NEMA with granting of the relevant environmental authorisation. Considering the location of the project site within the Cookhouse Renewable Energy Development Zone and the requirements GNR114 of 16 February 2018, a Basic Assessment Process is required to be undertaken for the	DEFF – Competent Authority Eastern Cape DEDEAT – Commenting Authority	The listed activities triggered by the proposed project have been identified and are being assessed as part of the BA process currently underway for the project. The BA process will culminate in the submission of a final BA Report to the competent authority in support of the application for EA.

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	proposed project. All relevant listing notices for the project (GN R327, GN R325 and GN R324) will be applied for.		
National Environmental Management Act (No 107 of 1998) (NEMA)	In terms of the "Duty of Care and Remediation of Environmental Damage" provision in Section 28(1) of NEMA every person who causes, has caused or may cause significant pollution or degradation of the environment must take reasonable measures to prevent such pollution or degradation from occurring, continuing or recurring, or, in so far as such harm to the environment is authorised by law or cannot reasonably be avoided or stopped, to minimise and rectify such pollution or degradation of the environment. In terms of NEMA, it is the legal duty of a project proponent to consider a project holistically, and to consider the cumulative effect of a variety of impacts.	DEFF Eastern Cape DEDEAT	While no permitting or licensing requirements arise directly by virtue of the proposed project, this section finds application through the consideration of potential cumulative, direct, and indirect impacts. It will continue to apply throughout the life cycle of the project.
Environment Conservation Act (No. 73 of 1989) (ECA)	The Noise Control Regulations in terms of Section 25 of the ECA contain regulations applicable for the control of noise in the Provinces of Limpopo, North West, Mpumalanga, Northern Cape, Eastern Cape, and KwaZulu-Natal Provinces. The Noise Control Regulations cover the powers of a local authority, general prohibitions, prohibitions of disturbing noise, prohibitions of noise nuisance, use of measuring instruments, exemptions, attachments, and penalties. In terms of the Noise Control Regulations, no person shall make, produce or cause a disturbing noise, or allow it to be made, produced or caused by any person, machine, device or apparatus or any combination thereof (Regulation 04).	DEFF Eastern Cape DEDEAT Makana Local Municipality	Noise impacts are expected to be associated with the construction and operation phases of the project. A Noise Impact Assessment (**Appendix J**) has been undertaken for the Wind Garden Wind Farm which indicates that the impact of the project will have a medium and low significance from a noise perspective.

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
National Water Act (No. 36 of 1998) (NWA)	A water use listed under Section 21 of the NWA must be licensed with the Regional DWS, unless it is listed in Schedule 1 of the NWA (i.e. is an existing lawful use), is permissible under a GA, or if a responsible authority waives the need for a licence. Water use is defined broadly, and includes consumptive and non-consumptive water uses, taking and storing water, activities which reduce stream flow, waste discharges and disposals, controlled activities (activities which impact detrimentally on a water resource), altering a watercourse, removing water found underground for certain purposes, and recreation. Consumptive water uses may include taking water from a water resource (Section 21(a)) and storing water (Section 21(b)). Non-consumptive water uses may include impeding or diverting of flow in a water course (Section 21(c)), and altering of bed, banks or characteristics of a watercourse (Section 21(i)).	Regional Department of Water and Sanitation	Watercourses and pans are present within the development footprint of the Wind Garden Wind Farm as identified in the Aquatic Impact Assessment (**Appendix G**). Where the development activities impede or divert the flow of water in a watercourse, or alter the bed, banks, course or characteristics of a watercourse, Section 21(c) and 21(i) of the NWA (Act 36 of 1998) would be triggered and the project proponent would need to apply for a WUL or register a GA with the DWS.
Minerals and Petroleum Resources Development Act (No. 28 of 2002) (MPRDA)	In accordance with the provisions of the MPRDA a mining permit is required in accordance with Section 27(6) of the Act where a mineral in question is to be mined, including the mining of materials from a borrow pit.	Department of Mineral Resources and Energy (DMRE)	Any person who wishes to apply for a mining permit in accordance with Section 27(6) must simultaneously apply for an Environmental Authorisation in terms of NEMA. No borrow pits are expected to be required for the construction of the project, and as a result a mining permit or EA in this regard is not required to be obtained.
	Section 53 of the MPRDA states that any person who intends to use the surface of any land in any way which may be contrary to any object of the Act, or which is		In terms of Section 53 of the MPRDA approval is required from the Minister of Mineral Resources and Energy to ensure

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	likely to impede any such object must apply to the Minister for approval in the prescribed manner.		that the proposed development does not sterilise a mineral resource that might occur on site.
National Environmental Management: Air Quality Act (No. 39 of 2004) (NEM:AQA)	The National Dust Control Regulations (GNR 827) published under Section 32 of NEM:AQA prescribe the general measures for the control of dust in all areas, and provide a standard for acceptable dustfall rates for residential and non-residential areas. In accordance with the Regulations (GNR 827) any person who conducts any activity in such a way as to give rise to dust in quantities and concentrations that may exceed the dustfall standard set out in Regulation 03 must, upon receipt of a notice from the air quality officer, implement a dustfall monitoring programme. Any person who has exceeded the dustfall standard set out in Regulation 03 must, within three months after submission of the dustfall monitoring report, develop and submit a dust management plan to the air quality officer for approval.	Eastern Cape DENC / Sarah Baartman District Municipality	In the event that the project results in the generation of excessive levels of dust the possibility could exist that a dustfall monitoring programme would be required for the project, in which case dustfall monitoring results from the dustfall monitoring programme would need to be included in a dust monitoring report, and a dust management plan would need to be developed. However, with mitigation measures implemented, the Wind Garden Wind Farm is not anticipated to result in significant dust generation.
National Heritage Resources Act (No. 25 of 1999) (NHRA)	Section 07 of the NHRA stipulates assessment criteria and categories of heritage resources according to their significance. Section 35 of the NHRA provides for the protection of all archaeological and palaeontological sites, and meteorites. Section 36 of the NHRA provides for the conservation and care of cemeteries and graves by SAHRA where this is not the responsibility of any other authority.	South African Heritage Resources Agency (SAHRA) Eastern Cape Provincial Heritage Resources Authority – provincial heritage authority	A full Heritage Impact Assessment (HIA) (with field work) has been undertaken as part of the BA process (refer to **Appendix I** of this BA Report). Sites of varying significance have been identified within the project site and specific mitigation measures have been recommended by the specialist with regards to each identified find. Should a heritage resource be impacted upon, a permit may be required from

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	Section 38 of the NHRA lists activities which require developers or any person who intends to undertake a listed activity to notify the responsible heritage resources authority and furnish it with details regarding the location, nature, and extent of the proposed development. Section 44 of the NHRA requires the compilation of a Conservation Management Plan as well as a permit from SAHRA for the presentation of archaeological sites as part of tourism attraction.		SAHRA or the Eastern Cape Provincial Heritage Resources Authority in accordance with of Section 48 of the NHRA, and the SAHRA Permit Regulations (GN R668). This will be determined as part of the final walk through survey once the final location of the development footprint and its associated infrastructure has been determined.
National Environmental Management: Biodiversity Act (No. 10 of 2004) (NEM:BA)	Section 53 of NEM:BA provides for the MEC / Minister to identify any process or activity in such a listed ecosystem as a threatening process. Three government notices have been published in terms of Section 56(1) of NEM:BA as follows: » Commencement of TOPS Regulations, 2007 (GNR 150). » Lists of critically endangered, vulnerable and protected species (GNR 151). » TOPS Regulations (GNR 152). It provides for listing threatened or protected ecosystems, in one of four categories: critically endangered (CR), endangered (EN), and vulnerable (VU) or protected. The first national list of threatened terrestrial ecosystems has been gazetted, together with supporting information on the listing process including the purpose and rationale for listing ecosystems, the criteria used to identify listed ecosystems, the implications of listing ecosystems, and summary statistics and national maps of listed ecosystems (NEM:BA: National list of ecosystems that are threatened and in need of protection, (Government Gazette 37596,	DEFF Eastern Cape DEDEAT	Under NEM:BA, a permit would be required for any activity that is of a nature that may negatively impact on the survival of a listed protected species. The Ecological Impact Assessment (**Appendix D**) identified listed species. Based on the SANBI POSA records for the site and surrounding area, 14 species of conservation concern are potentially present on the site. Species of concern that are potentially present include *Brachystelma luteum* (VU), *Eriospermum bracteatum* (VU), *Apodolirion macowanii* (VU), *Ornithogalum britteniae* (VU) and *Agathosma bicornuta* (EN).

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	GNR 324), 29 April 2014).		
National Environmental Management: Biodiversity Act (No. 10 of 2004) (NEM:BA)	Chapter 5 of NEM:BA pertains to alien and invasive species, and states that a person may not carry out a restricted activity involving a specimen of an alien species without a permit issued in terms of Chapter 7 of NEM:BA, and that a permit may only be issued after a prescribed assessment of risks and potential impacts on biodiversity is carried out. Applicable, and exempted alien and invasive species are contained within the Alien and Invasive Species List (GNR 864).	DEFF Eastern Cape DEDEAT	The Ecological Impact Assessment (**Appendix D**) identified some woody aliens present in the area and additional alien plant invasion following construction is highly likely and regular alien plant clearing activities would be required.
Conservation of Agricultural Resources Act (No. 43 of 1983) (CARA)	Section 05 of CARA provides for the prohibition of the spreading of weeds. Regulation 15 of GN R1048 published under CARA provides for the classification of categories of weeds and invader plants, and restrictions in terms of where these species may occur. Regulation 15E of GN R1048 published under CARA provides requirement and methods to implement control measures for different categories of alien and invasive plant species.	Department of Agriculture, Land Reform and Rural Development (DALRD)	CARA will find application throughout the life cycle of the project. In this regard, soil erosion prevention and soil conservation strategies need to be developed and implemented. In addition, a weed control and management plan must be implemented. In terms of Regulation 15E (GN R1048) where Category 1, 2 or 3 plants occur a land user is required to control such plants by means of one or more of the following methods: » Uprooting, felling, cutting or burning. » Treatment with a weed killer that is registered for use in connection with such plants in accordance with the directions for the use of such a weed killer. » Biological control carried out in

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
			accordance with the stipulations of the Agricultural Pests Act (No. 36 of 1983), the ECA and any other applicable legislation. » Any other method of treatment recognised by the executive officer that has as its object the control of plants concerned, subject to the provisions of sub-regulation 4. » A combination of one or more of the methods prescribed, save that biological control reserves and areas where biological control agents are effective shall not be disturbed by other control methods to the extent that the agents are destroyed or become ineffective.
National Forests Act (No. 84 of 1998) (NFA)	According to this Act, the Minister may declare a tree, group of trees, woodland or a species of trees as protected. Notice of the List of Protected Tree Species under the National Forests Act (No. 84 of 1998) was published in GNR 734. The prohibitions provide that "no person may cut, damage, disturb, destroy or remove any protected tree, or collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree, except under a licence granted by the Minister".	Department of Agriculture, Land Reform and Rural Development (DALRD)	A licence is required for the removal of protected trees. It is therefore necessary to conduct a survey that will determine the number and relevant details pertaining to protected tree species present in the development footprint for the submission of relevant permits to authorities prior to the disturbance of these individuals. The Ecological Impact Assessment (**Appendix D**) identified listed species. Based on the SANBI POSA records for the site and surrounding area, 14 species of conservation concern are potentially present on the site. Species of concern that are potentially

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
			present include *Brachystelma luteum* (VU), *Eriospermum bracteatum* (VU), *Apodolirion macowanii* (VU), *Ornithogalum britteniae* (VU) and *Agathosma bicornuta* (EN).
National Veld and Forest Fire Act (No. 101 of 1998) (NVFFA)	Chapter 4 of the NVFFA places a duty on owners to prepare and maintain firebreaks, the procedure in this regard, and the role of adjoining owners and the fire protection association. Provision is also made for the making of firebreaks on the international boundary of the Republic of South Africa. The applicant must ensure that firebreaks are wide and long enough to have a reasonable chance of preventing a veldfire from spreading to or from neighbouring land, it does not cause soil erosion, and it is reasonably free of inflammable material capable of carrying a veldfire across it. Chapter 5 of the Act places a duty on all owners to acquire equipment and have available personnel to fight fires. Every owner on whose land a veldfire may start or burn or from whose land it may spread must have such equipment, protective clothing and trained personnel for extinguishing fires, and ensure that in his or her absence responsible persons are present on or near his or her land who, in the event of fire, will extinguish the fire or assist in doing so, and take all reasonable steps to alert the owners of adjoining land and the relevant fire protection association, if any.	DEFF	While no permitting or licensing requirements arise from this legislation, this Act will be applicable during the construction and operation of the Wind Garden Wind Farm, in terms of the preparation and maintenance of firebreaks, and the need to provide appropriate equipment and trained personnel for firefighting purposes.
Hazardous Substances Act (No. 15 of 1973) (HAS)	This Act regulates the control of substances that may cause injury, or ill health, or death due to their toxic, corrosive, irritant, strongly sensitising or inflammable nature or the generation of pressure thereby in certain instances and for the control of certain electronic products. To provide for the rating of such substances or	Department of Health (DoH)	It is necessary to identify and list all Group I, II, III, and IV hazardous substances that may be on site and in what operational context they are used, stored or handled. If applicable, a license would be required to be obtained from the Department of

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	products in relation to the degree of danger, to provide for the prohibition and control of the importation, manufacture, sale, use, operation, modification, disposal or dumping of such substances and products. » Group I and II: Any substance or mixture of a substance that might by reason of its toxic, corrosive etc., nature or because it generates pressure through decomposition, heat or other means, cause extreme risk of injury etc., can be declared as Group I or Group II substance » Group IV: any electronic product, and » Group V: any radioactive material. The use, conveyance, or storage of any hazardous substance (such as distillate fuel) is prohibited without an appropriate license being in force.		Health (DoH).
National Environmental Management: Waste Act (No. 59 of 2008) (NEM:WA)	The Minister may by notice in the Gazette publish a list of waste management activities that have, or are likely to have, a detrimental effect on the environment. The Minister may amend the list by – » Adding other waste management activities to the list. » Removing waste management activities from the list. » Making other changes to the particulars on the list. In terms of the Regulations published in terms of NEM:WA (GNR 912), a BA or EIA is required to be undertaken for identified listed activities. Any person who stores waste must at least take steps, unless otherwise provided by this Act, to ensure that:	DEFF – Hazardous Waste Eastern Cape DEDEAT – general waste	No waste listed activities are triggered by the Wind Garden Wind Farm, therefore, no Waste Management License is required to be obtained. General and hazardous waste handling, storage and disposal will be required during construction and operation. The National Norms and Standards for the Storage of Waste (GNR 926) published under Section 7(1)(c) of NEM:WA will need to be considered in this regard.

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	» The containers in which any waste is stored, are intact and not corroded or in » Any other way rendered unlit for the safe storage of waste. » Adequate measures are taken to prevent accidental spillage or leaking. » The waste cannot be blown away. » Nuisances such as odour, visual impacts and breeding of vectors do not arise, and » Pollution of the environment and harm to health are prevented.		
National Road Traffic Act (No. 93 of 1996) (NRTA)	The technical recommendations for highways (TRH 11): "Draft Guidelines for Granting of Exemption Permits for the Conveyance of Abnormal Loads and for other Events on Public Roads" outline the rules and conditions which apply to the transport of abnormal loads and vehicles on public roads and the detailed procedures to be followed in applying for exemption permits are described and discussed. Legal axle load limits and the restrictions imposed on abnormally heavy loads are discussed in relation to the damaging effect on road pavements, bridges, and culverts. The general conditions, limitations, and escort requirements for abnormally dimensioned loads and vehicles are also discussed and reference is made to speed restrictions, power/mass ratio, mass distribution, and general operating conditions for abnormal loads and vehicles. Provision is also made for the granting of permits for all other exemptions from the requirements of the National Road Traffic Act and the relevant	South African National Roads Agency (SANRAL) – national roads Eastern Cape Department of Transport	An abnormal load/vehicle permit will be required to transport the various components to site for construction. These include: » Route clearances and permits will be required for vehicles carrying abnormally heavy or abnormally dimensioned loads. » Transport vehicles exceeding the dimensional limitations (length) of 22m. » Depending on the trailer configuration and height when loaded, some of the project components may not meet specified dimensional limitations (height and width).

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	Regulations.		
Astronomy Geographic Advantage Act (Act No. 21 of 2007)	The Astronomy Geographic Advantage (AGA) Act (No. 21 of 2007) provides for the preservation and protection of areas within South Africa that are uniquely suited for optical and radio astronomy; for intergovernmental co-operation and public consultation on matters concerning nationally significant astronomy advantage areas and for matters connected thereto. Chapter 2 of the Act allows for the declaration of astronomy advantage areas whilst Chapter 3 pertains to the management and control of astronomy advantage areas. Management and control of astronomy advantage areas include, amongst others, the following: * Restrictions on use of radio frequency spectrum in astronomy advantage areas * Declared activities in core or central astronomy advantage area * Identified activities in coordinated astronomy advantage area; and Authorisation to undertake identified activities.	Department of Science and Technology.	The site proposed for the development of the Wind Garden Wind Farm is located within the Eastern Cape Province and therefore falls outside of the areas considered to be uniquely suited in terms of nationally significant astronomy advantage areas.
Aviation Act (Act No 74 of 1962) 13th amendment of the Civil Aviation Regulations (CARS) 1997	Any structure exceeding 45m above ground level or structures where the top of the structure exceeds 150m above the mean ground level, the mean ground level considered to be the lowest point in a 3km radius around such structure. Structures lower than 45m, which are considered as a danger to aviation shall be marked as such when specified.	Civil Aviation Authority (CAA)	This Act will find application during the operation phase of the Wind Garden Wind Farm. Appropriate marking on the project infrastructure is required to meet the specifications as detailed in the CAR Part 139.01.33. An obstacle approval for the Wind Garden Wind Farm is required to be obtained from the CAA.

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	Overhead wires, cables etc., crossing a river, valley or major roads shall be marked and in addition their supporting towers marked and lighted if an aeronautical study indicates it could constitute a hazard to aircraft. Section 14 of Obstacle limitations and marking outside aerodrome or heliport – CAR Part 139.01.33 relates specifically to appropriate marking of wind energy facilities.		
Provincial Policies / Legislation			
Nature and Environmental Conservation Ordinance (Act 19 of 1974)	This Act provides for the establishment of nature reserves, conservation measures, protection of wild animals, protection of Rhinoceroses, protection of fish in inland waters and protection of flora. The Act also provides schedules of endangered wild animals, protected wild animals, endangered flora and protected floral. Permits will be required for the disturbance and destruction of any of the species listed on the respective schedules.	Eastern Cape DEDEAT	A collection/destruction permit must be obtained from the Eastern Cape DEDEAT for the removal of any protected plant or animal species found on site. The Ecological Impact Assessment (**Appendix D**) identified listed species. Based on the SANBI POSA records for the site and surrounding area, 14 species of conservation concern are potentially present on the site. Species of concern that are potentially present include *Brachystelma luteum* (VU), *Eriospermum bracteatum* (VU), *Apodolirion macowanii* (VU), *Ornithogalum britteniae* (VU) and *Agathosma bicornuta* (EN).

7.7.1 *The IFC EHS Guidelines*

The IFC EHS Guidelines are technical reference documents with general and industry specific examples of Good International Industry Practice (GIIP). The following IFC EHS Guidelines have relevance to the Wind Garden Wind Farm:

» IFC EHS General Guidelines
» IFC EHS Guidelines for Electric Power Transmission and Distribution

The General EHS Guidelines are designed to be used together with the relevant Industry Sector EHS Guidelines. The application of the General EHS Guidelines should be tailored to the hazards and risks associated with a project, and should take into consideration site-specific variables which may be applicable, such as host country context, assimilative capacity of the environment, and other project factors. In instances where host country regulations differ from the standards presented in the EHS Guidelines, whichever is the more stringent of the two in this regard should be applied.

The General EHS Guidelines include consideration of the following:

» Environmental:
  * Air Emissions and Ambient Air Quality
  * Energy Conservation
  * Wastewater and Ambient Water Quality
  * Water Conservation
  * Hazardous Materials Management
  * Waste Management
  * Noise
  * Contaminated Land
» Occupational Health and Safety:
  * General Facility Design and Operation
  * Communication and Training
  * Physical Hazards
  * Chemical Hazards
  * Biological Hazards
  * Radiological Hazards
  * Personal Protective Equipment (PPE)
  * Special Hazard Environments
  * Monitoring
» Community Health and Safety:
  * Water Quality and Availability
  * Structural Safety of Project Infrastructure
  * Life and Fire Safety (L&FS)
  * Traffic Safety
  * Transport of Hazardous Materials
  * Disease Prevention
  * Emergency Preparedness and Response
» Construction and Decommissioning:
  * Environment

- Occupational Health & Safety
- Community Health & Safety

7.7.2 IFC Environmental, Health and Safety Guidelines for Wind Energy (August, 2015)

The EHS Guidelines for wind energy include information relevant to environmental, health, and safety aspects of onshore and offshore wind energy facilities. It should be applied to wind energy facilities from the earliest feasibility assessments, as well as the environmental impact assessment, and continue to be applied throughout the construction and operation phases.

The guidelines list issues associated with wind energy facilities which need to be considered. These include:

- Environmental impacts associated with the construction, operation, and decommissioning of wind energy facilities activities may include, among others, impacts on the physical environment (such as noise or visual impact) and biodiversity (affecting birds and bats, for instance).
- Due to the typically remote location of wind energy facilities, the transport of equipment and materials during construction and decommissioning may present logistical challenges (e.g., transportation of long, rigid structures such as blades, and heavy tower sections).
- Environmental issues specific to the construction, operation, and decommissioning of wind energy projects and facilities include the following:
  - Landscape, Seascape, and Visual impacts
  - Noise
  - Biodiversity
  - Shadow Flicker
  - Water Quality

CHAPTER 8: DESCRIPTION OF THE RECEIVING ENVIRONMENT

This chapter provides a description of the local environment that will be affected by the development of the Wind Garden Wind Farm. This information is provided to assist the reader in understanding the features present within the project site and development envelope and the possible effects of the project on the environment within which it is proposed. Aspects of the biophysical, social and economic environment that could be directly or indirectly affected by, or could affect, the proposed development have been described. This information has been sourced from both existing information available for the area as well as collected field data by specialist consultants, and aims to provide the context within which this BA process is being conducted.

8.1 Legal Requirements as per the EIA Regulations, 2014 (as amended), for the undertaking of a Basic Assessment Report

This chapter of the BA report includes the following information required in terms of the EIA Regulations, 2014 - Appendix 1: Content of basic assessment reports:

Requirement	Relevant Section
3(h)(iv) the environmental attributes associated with the alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects	The environmental attributes associated with the project site and development envelope, as well as the broader environment, are described and considered within this chapter and includes the following:
	» The regional setting within which the project site and development envelope are located is described in section 8.2.
	» The climatic conditions of the area within which the project is located is discussed in section 8.3.
	» The biophysical characteristics of the project site, development envelope and the surrounding areas is described in section 8.4. This includes the topography and terrain, geology, soils and agricultural potential and the ecological profile of the site (i.e. broad-scale vegetation patterns, fine-scale vegetation patterns, critical biodiversity areas and broad-scale processes, surface water features, terrestrial fauna, bats and avifauna).
	» The heritage of the project site, development envelope and the surrounding areas (including the archaeology, palaeontology and cultural landscape) is discussed in section 8.5.
	» The noise levels and developments sensitive to noise are described in section 8.6.
	» The visual quality of the affected environment is discussed in section 8.7.
	» The current traffic conditions for the area surrounding the project site are included in section 8.8.
	» The social context within which the project site is located is described in section 8.9.

A more detailed description of each aspect of the affected environment is included in the specialist reports contained within the **Appendices D - M**.

8.2. Regional Setting

The Wind Garden Wind Farm project site is situated in an area which is known as the Frontier Country route which is based on the literal meaning of the 19th century frontier between the British Cape Colony and the Xhosa territories. The project site is located approximately 17km north-west of Makhanda (previously known as Grahamstown), 20km east of Riebeek East and 29km north-east of Alicedale. Makhanda is the largest and closest town to the project site. The town's name change from Grahamstown to Makhanda was officially gazetted on 29 June 2018. The town was officially renamed to Makhanda in memory of the Xhosa warrior and prophet Makhanda ka Nxele. Refer to **Figure 8.1**.

Makhanda is the hub of the Makana Local Municipality and has more than 70 declared National Heritage Sites. One of these is the highest church spire in the country. Makhanda was founded in 1812 and is entrenched in historical events. It also hosts some of the oldest schools and is the seat of Rhodes University, as well as other prominent and internationally acclaimed primary and high schools. Rhodes University is a 104-year-old internationally recognised institution with a well-established reputation.

The Wind Garden Wind Farm project site has a rural and natural character with very few built structures outside of Makhanda and surrounds. Exceptions occur where homesteads (rural residences or dwellings) are found and where the existing Waainek Wind Energy Facility is located. Other than the Waainek Wind Energy Facility and the Poseidon - Albany 132kV power line traversing the project site, there are no major energy generation facilities or transmission infrastructure within the study area. The region to the north has very limited agricultural activity and crop production, and the general land use is predominantly cattle/sheep farming and game farming. Due to the absence of crop production, the larger part of the study area is still in a natural state. Refer to **Figure 8.2** and **Figure 8.3**.

There are a number of formally protected areas and nature reserves in the region, namely; the Kudu Nature Reserve, Buffalo Kloof Protected Environment, and the Kwandwe, Phumba and Shamwari Nature Reserves. The latter three of these reserves are part of the Indalo Protected Environment, which was formally recognised and registered in 2018 by the then Department of Environmental Affairs (now known as the Department of Environment, Forestry and Fisheries) as part of the National Protected Area Expansion Strategy (NPAES) for South Africa. Besides the formally protected areas, there are also a number of informal private protected areas, game farms and stock farms surrounding the project site.

The nature reserves and game farms in the study area are tourist attractions that operate commercial lodges and game viewing activities or hunting and other associated outdoor activities. As such they are considered as tourist destinations that rely on the natural environment of the region to operate.

The study area has a relatively low population density (approximately 23 people per km^2) with the highest concentrations occurring in the towns of Makhanda, Alicedale and Riebeek East. Other than the residents of these towns, there are homesteads (farm residences) located throughout the surrounding area.

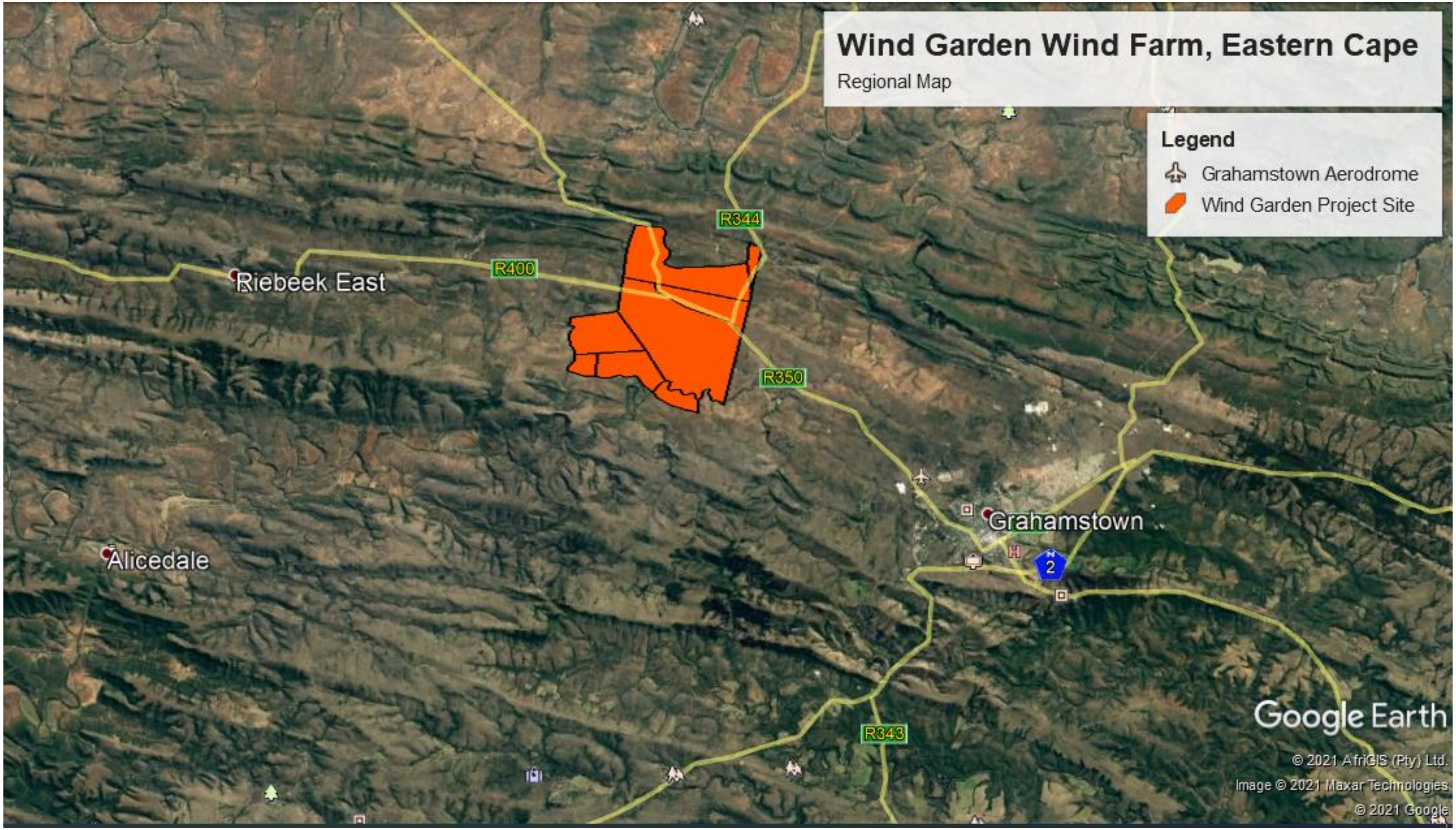


Figure 8.1: Map indicating the regional setting of the Wind Garden Wind Farm project site. A Google Earth image is provided to give context of the topography of the area

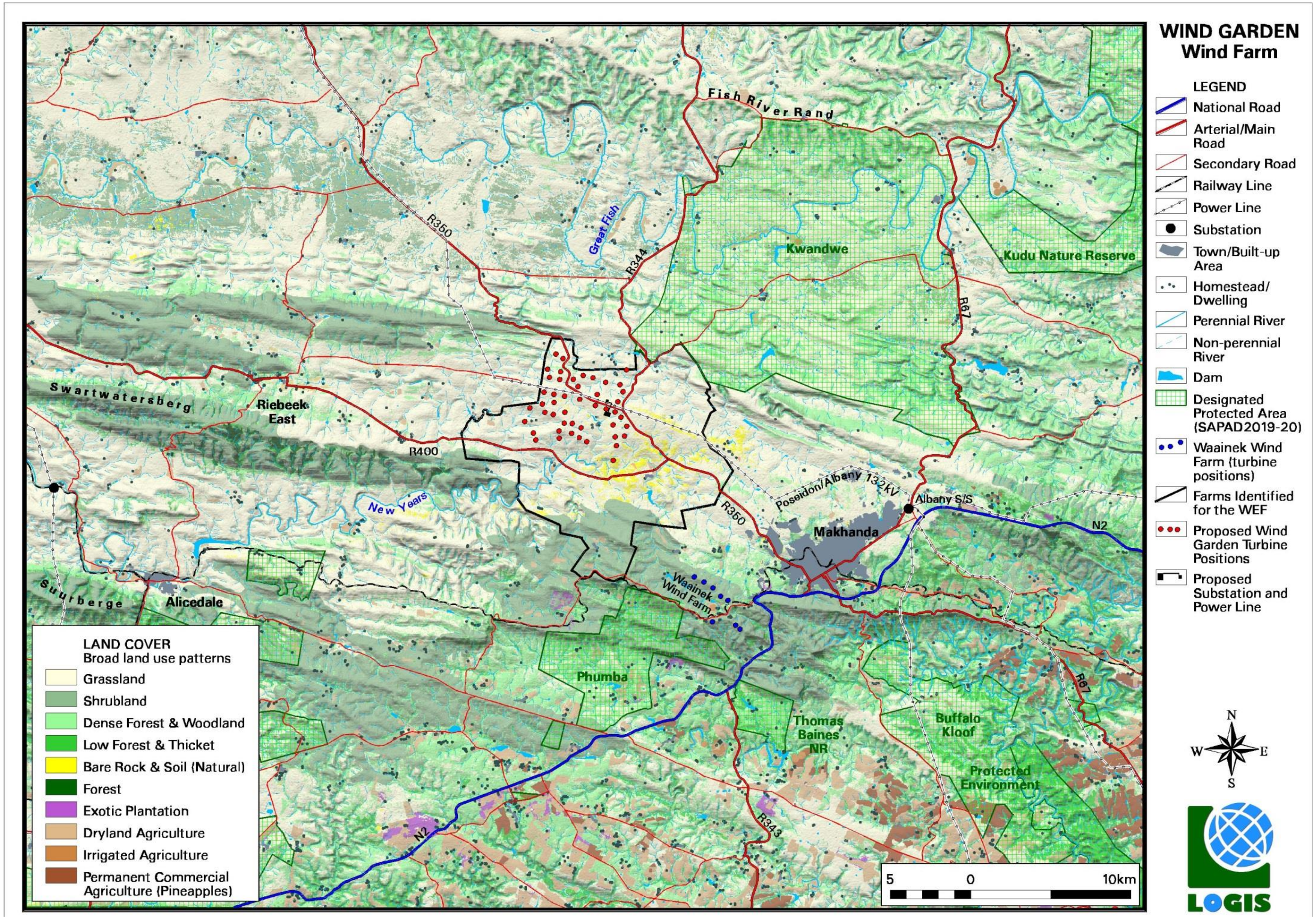


Figure 8.2: Land cover map for the Wind Garden Wind Farm project site and surrounding area

	
Wind turbines at the Waainek Wind Energy Facility	View from the project site to the existing Waainek Wind Energy Facility
	
Outskirts of Makhanda (Grahamstown)	Kwandwe Nature Reserve

Figure 8.3: Typical landscape characteristics surrounding the Wind Garden Wind Farm project site

The N2 national road provides motorised access to the region from the city of Port Elizabeth, the largest urban centre closest to the site (approximately 130km by road to Makhanda). The R350 Regional road will bring you from the Mahkanda CBD to the eastern edge of the project site. Other regional roads that traverse the site include the R400 (to Riebeek East) and the R344 (to Adelaide). Continuing northwards along the R350 towards Bedford and Cookhouse various existing and operational wind energy facilities are encountered, all located within the Cookhouse Renewable Energy Development Zone (REDZ), which includes:

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

The project site is located within Ward 1 of the Makana Local Municipality which forms part of the greater Sarah Baartman District Municipality. The Sarah Baartman District Municipality (previously Cacadu District

Municipality) is a Category C municipality and stretches from Graaff-Reinet in the north to the Indian Ocean in the south and between the Great Fish River in the east and Bloukrans River in the west. Sarah Baartman is the biggest district in the province, making up approximately a third of its geographical area. The main economic sectors of the District Municipality include agriculture (mainly mohair production from the Angora Goat) and tourism. The Makana Local Municipality is a Category B municipality and has nearly a million hectares devoted to game farming and related activities such as eco-tourism. A range of public and private nature reserves (including formally protected areas) span the area, including Shamwari in the west and the Kwandwe Reserves in the east. The main economic sectors of the Local Municipality include Government (51.5%), trade (15.6%), finance and business services (15.3%), manufacturing (7.1%), agriculture (4.4%), transport and communication (2.9%), construction (2.1%).

Further to this, the entire project site is located within the Cookhouse Renewable Energy Development Zone (REDZ) and the Eastern Corridor of the Strategic Transmission Corridors.

8.3. Climatic Conditions

The climate in Makhanda is warm and temperate and receives significant rainfall, even in the driest month. The average annual temperature is 16.6 °C and about 590 mm of precipitation falls annually. Refer to **Figure 8.4.**

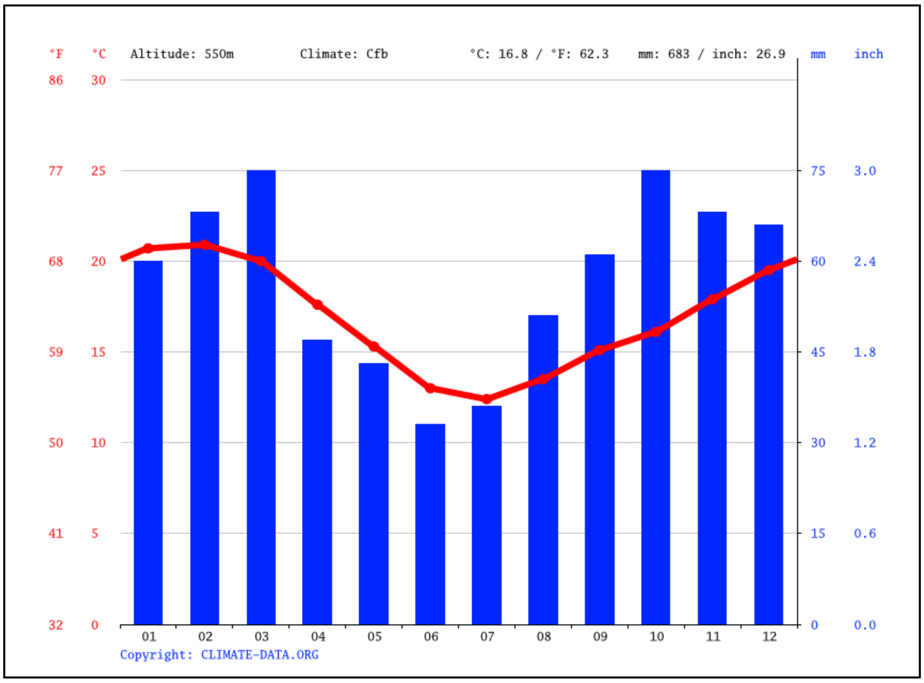


Figure 8.4: Climate graph of Makhanda, Eastern Cape Province

8.4. Biophysical Characteristics of the Study Area

8.4.1. Topography and Terrain

The project site and surrounding area occurs on land that ranges in elevation from approximately 60m (in the south-east) to 932m (at the top of the mountains north of Riebeek East). The terrain surrounding the project site is predominantly flat with an even slope towards the north and the south. The Wind Garden Wind Farm development envelope itself is located at an average elevation of 587m above sea level.

The project site is located on a plateau that spans 19km from Riebeek East in the west and 17km from Makhanda in the east. The plateau is located south of the Great Fish River and provides a flat, yet elevated table-like quality to the landscape. The Great Fish River valley spans the entire width of the area and is enclosed to the north by the Fish River Rand (ridge or escarpment). The Swartwatersberge (mountains) form the southern escarpment of the plateau, dropping down into the New Year's River valley, located south-west of the project site.

The terrain morphology of the plateau is described as undulating plains and strongly undulating plains and hills. The escarpments are described as mountains and tall hills.

8.4.2. Geology, Soils and Agricultural Potential

Geological Setting of the Project Site

The project site is underlain by the Dwyka Group, Witteberg Group, Witpoort Formation and the Weltevrede Formation of the Cape Supergroup.

The Permo-Carboniferous Dwyka Group is the oldest deposit in the Karoo Supergroup and spans the Late Carboniferous to Early Permian. The Dwyka Group overlies the glaciated Precambrian bedrocks in the north and unconformably and paraconformably the Cape Supergroup in the south. In the east, it overlies the Natal Group and Msikaba Formation unconformably. Glacial pavements underlying the Dwyka Group has well-developed striations.

The Cape Supergroup is about 10 km thick and represents approximately 170 million years of Earth's history from the Early Ordovician to the Early Carboniferous. The Witteberg Group decreases in thickness from the eastern part to the southwestern part of the basin. This Group consists basically of micaceous mudrock and quartzitic sandstone which occur in almost equal proportions.

Soil Forms, Land Capability and Agricultural Potential of the Project Site

According to the land type database, the development site falls within the Fc744, Fc 745 and Fc 747 land types. The Fc land type consists of Glenrosa and/or Mispah soil forms with the possibility of other soils occurring throughout. Lime is rare or absent within this land type in upland soils but generally present in low-lying areas.

Soil profiles were studied up to a depth of 1.2 m[13] to identify specific diagnostic horizons which are vital in the soil classification process as well as determining the agricultural potential and land capability. **Table 8.1** provide the diagnostic horizons that were identified within the project site.

Table 8.1: Diagnostic profiles identified within the project site

Diagnostic Profile	Description
Orthic topsoil	Orthic topsoil are mineral horizons that have been exposed to biological activities and varying intensities of mineral weathering.
Lithocutanic horizon	For the Lithocutanic horizon, in situ weathering of rock underneath topsoil results in a well-mixed soil-rock layer. The colour, structure and consistency of this material must be directly related to the parent material of the weathered rock. The Lithocutanic horizon is usually followed by a massive rock layer at shallow depths. Hard rock, permeable rock and horizontally layered shale usually is not associated with the weathering processes involved with the formation of this diagnostic horizon.
Pedocutanic horizon	A Pedocutanic horizon has a well-developed blocky structure as well as a high concentration of clay due to illuvial processes leaching clay particles to the horizon. For red Pedocutanic horizons, an abrupt transition between the sub soil horizon and the topsoil can be expected.
Prismacutanic horizon	The Prismacutanic is characterised by a dense soil formation and a higher clay percentage than the overlying topsoil together with a columnar structure and abrupt transitions. These soil horizons are located throughout sub-humid to semi-arid climates and is associated with mudstone and shale as parent material. These horizons are characterised by low organic material and a high exchangeable sodium or magnesium content. Mica, smectite and kaolinite dominate the clay minerology which increase the erosion sensitivity of these soils in exposed areas.
Hard rock horizon	The hard rock layer disallows infiltration of water or root systems and occur in shallow profiles. Horizontally layered, hard sediments without evidence of vertical seems fall under this category

The land capability was determined by using the guidelines described in "The farming handbook". The delineated soil forms were clipped into the four different slope classes (0-3%, 3-7%, 7-12% and >12%) to determine the land capability of each soil form. These land capabilities were then grouped together in five different land capability classes (land capability 2, 3, 4, 5 and 6). **Table 8.2** provides the land capability classes present within the project site.

Table 8.2: Land capability of the soils present within the project site

Land Capability Class	Definition of Class	Conservation Need	Use-Suitability	Percentage Within Project Area	Land Capability Group
2	Slight limitations. High arable potential. Low erosion hazard	Adequate run-off control	Annual cropping with special tillage or ley (25%)	0.2	Arable

[13] It must be noted that a Preliminary Geotechnical Investigation was undertaken for the project site. Core drilling was up to 30m (**Appendix R(2)**).

3	Moderate limitations. Some erosion hazard	Special conservation practice and tillage methods	Rotation crops and ley (50%)	5.7	Arable
4	Severe limitations. Low arable potential.	Intensive conservation practice	Long term leys (75%)	2	Arable
5	Water course and land with wetness limitations	Protection and control of water table	Improved pastures, suitable for wildlife	0.1	Grazing
6	Limitations preclude cultivation. Suitable for perennial vegetation	Protection measures for establishment, e.g. sod-seeding	Veld, pastures and afforestation	92	Grazing

8.4.3. Ecological Profile of the Broader Study Area and the Project Site

i. Broad-Scale Vegetation Patterns

The majority of the Wind Garden Wind Farm project site is mapped as falling within the Albany Broken Veld and Bhisho Thornveld vegetation types, with a smaller proportion of Kowie Thicket in the north of the site. All three of these vegetation types are classified as Least Threatened and have not experienced a high degree of transformation. These are briefly described below and illustrated in **Figure 8.5**.

» *Albany Broken Veld*
Albany Broken Veld is part of the Nama Karoo Biome and occurs in the Eastern Cape Province from north of the Zuurberg Mountains and south of Middlewater. It is associated with low mountain ridges and hills with an open grassy karroid dwarf shrubland with scattered low trees (*Boscia oleoides*, *Euclea undulata*, *Pappea capensis*, *Schotia afra* var. *afra*) with a matrix of dwarf shrubs (*Becium burchellianum*, *Chrysocoma ciliata*) and grasses (*Eragrostis obtusa*). Albany Broken Veld is classified as Least Threatened as less than 5% has been lost to transformation.

» *Bisho Thornveld*
Bhisho Thornveld occurs in the Eastern Cape from near Mthatha in a band parallel to but inland on the coast to north of East London, turning to run along the southern side of the Amathole Mountains as far as Fort Beaufort. It also occurs on the dissected hills and low mountains around Makhanda (Grahamstown), especially to the southwest, and in a few fragments in valleys north-east of the Amathole Mountains. It is associated with undulating to moderately steep slopes, sometimes in shallow, incised drainage valleys. It comprises an open savannah characterised by small trees of *Acacia natalitia* with a short to medium, dense, sour grassy understorey, usually dominated by *Themeda triandra* when in good condition. A diversity of other woody species also occur, often increasing under conditions of overgrazing.

» *Kowie Thicket*
Kowie Thicket occurs in the Eastern Cape Province along the river valleys of the Bushmans, Kariega, Kowie, Kleinemonde and Kap Rivers from near the Great Fish River Mouth to Kenton-on-Sea, extending inland up these valleys past Makhanda (Grahamstown) to just past Riebeeck East and Alicedale to north of the Zuurberg. Kowie Thicket is usually associated with steep and north-facing (dry) slopes. It consists of thickets dominated by succulent euphorbias and aloes with a thick understorey composed

of thorny shrubs, woody lianas (*Capparis*, *Secamone*, *Rhoicissus*, *Aloe*), and shrubby succulents (*Crassulaceae*, *Asphodelaceae*). Moister south-facing slopes support thorny thickets dominated by low evergreen trees (*Cussonia*, *Euclea*, *Hippobromus*, *Pappea*, *Ptaeroxylon*, *Schotia*) and shrubs (*Azima*, *Carissa*, *Gymnosporia*, *Putterlickia*) with fewer succulent shrubs and trees. The herbaceous layer is poorly developed.

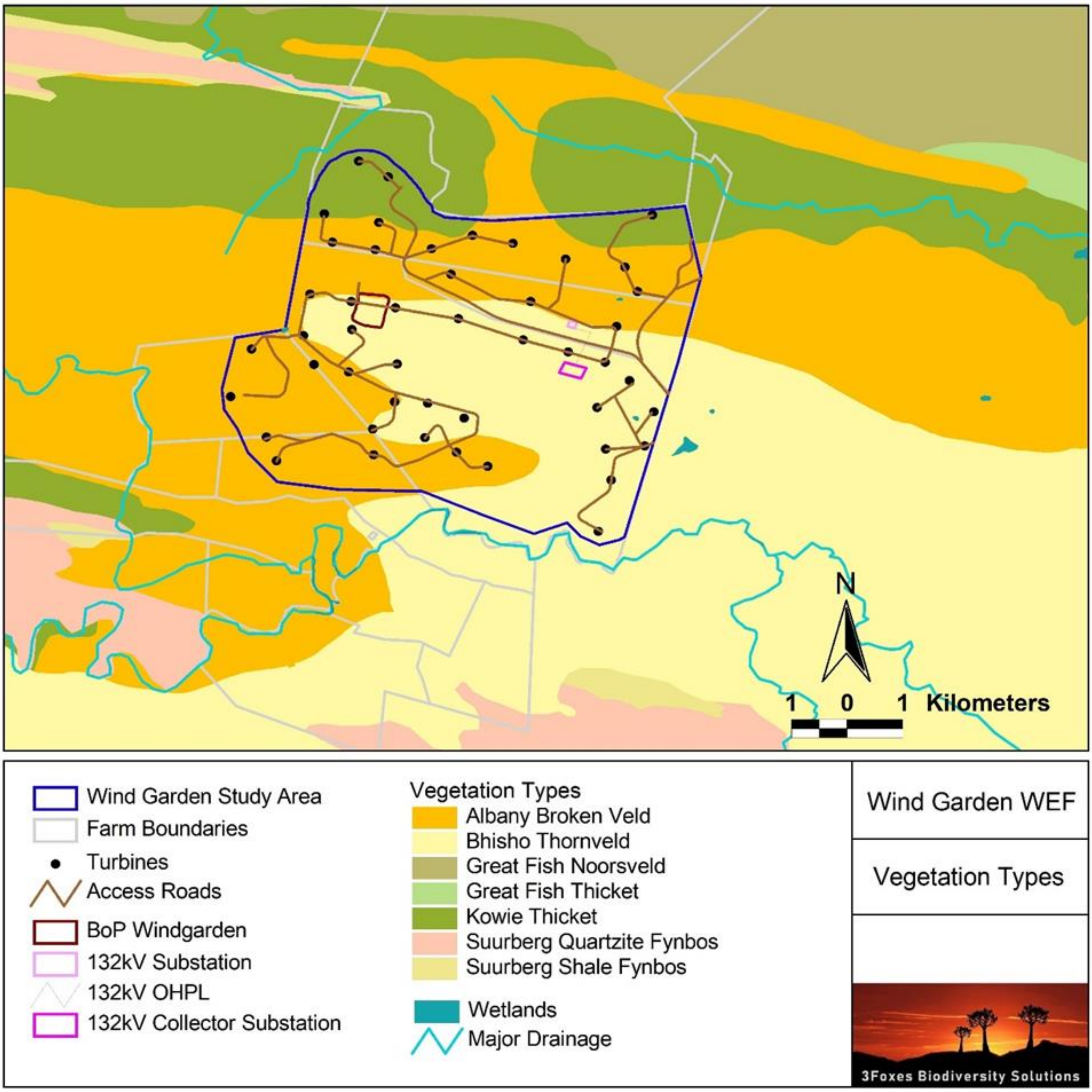


Figure 8.5: Vegetation types, as per the national vegetation map, for the Wind Garden Wind Farm project site.

ii. Fine-scale Vegetation Patters

The site survey undertaken by the specialist has revealed that the VegMap provides a relatively coarse reflection of the vegetation of the site, which is much more heterogenous than the VegMap suggests. The primary drivers of vegetation differentiation at the project site include elevation, substrate and aspect. In addition, the VegMap does not map fine-scale features such as drainage lines and pans which also have different vegetation communities from the surrounding habitats. The various plant communities that were recognised at the project site are mapped (**Figure 8.6**) and then described in **Table 8.3**.

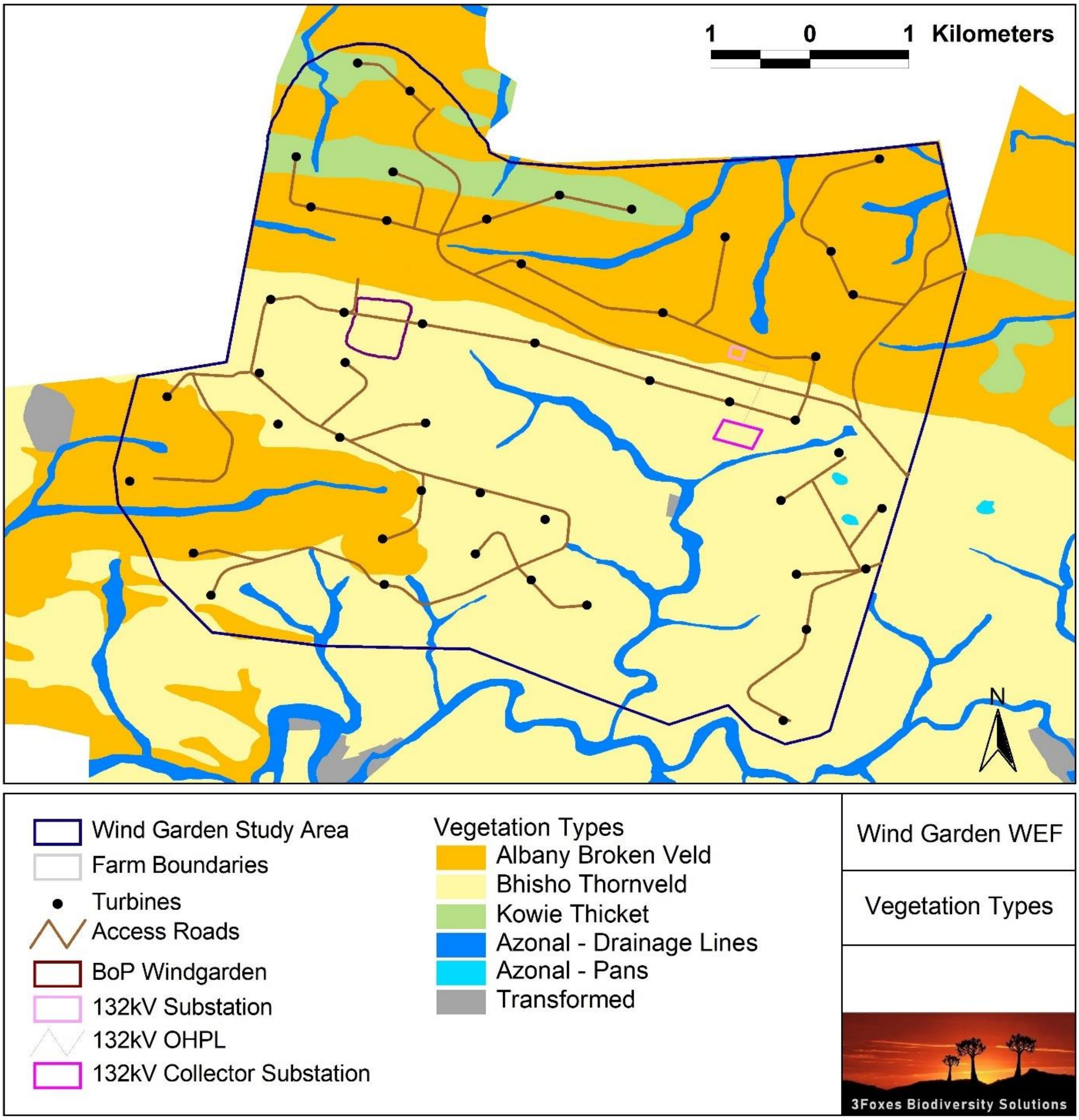


Figure 8.6 Fine-scale vegetation map of the Wind Garden Wind Farm site, illustrating the different vegetation types and habitats present at the site and their distribution.

Table 8.2: Details of the fine-scale vegetation communities identified and confirmed within the Wind Garden Wind Farm project site

Community 1: Albany Broken Veld	
 	The warmer aspects and elevations of the project site, especially in the centre and north of the site are generally composed of Albany Broken Veld. Some areas show signs of degradation. There are however some habitats present such as quartzite ridges. In addition, Albany Broken Veld grades to some degree at least with both Bhisho Thornveld and Kowie Thicket. This is most obvious with Bhisho Thornveld, where there are frequent patches of thicket in favourable habitats or bush clumps scattered within the more typical open grassland of the Bhisho Thornveld. Within the project site, typical and characteristic species include trees such as *Acacia natalitia*, *Euclea undulata*, *Pappea capensis*, *Schotia afra* var. *afra*, *Boscia oleoides* and *Cussonia spicata*. Common and dominant shrubs include *Grewia robusta*, *Lycium cinereum*, *Putterlickia pyracantha*, *Rhigozum obovatum*, *Rhus incisa* var. *effusa*, *Asparagus striatus*, *A. suaveolens*, *Becium burchellianum*, *Chrysocoma ciliata*, *Selago fruticosa*, *Eriocephalus ericoides* subsp. *ericoides*, *Felicia filifolia*, *F. muricata*, *Gnidia cuneata*, *Helichrysum dregeanum*, *Hermannia linearifolia*, *Indigofera sessilifolia*, *Pentzia incana* and *Rosenia humilis*. Succulent shrubs present include *Cotyledon campanulata*, *Drosanthemum lique*, *Euphorbia meloformis*, *E.stellata* and *Mestoklema tuberosum*. Forbs and herbs present include *Gazania krebsiana*, *Hermannia pulverata*, *Hibiscus pusillus*, *Bulbine frutescens* and *Drimia anomala*. Perennial and annual grasses dominate between the bush clumps and include *Aristida congesta*, *Eragrostis obtusa*, *Sporobolus fimbriatus*, *Tragus berteronianus*, *Cynodon incompletus*, *Digitaria eriantha*, *Ehrharta calycina*, *Eragrostis curvula*, *Setaria sphacelate* and *Tragus koelerioides*. No listed species were observed within this vegetation type within the project site, although given the extent of the site, it is still possible that such species are occasionally present.

Community 2: Bhisho Thornveld

The gentle hills and open plains of the central and southern parts of the project site consist of Bhisho Thornveld. The extent of woody plant cover within this vegetation type varies significantly, from open areas largely devoid of trees on the higher-elevation plains and hills of the site, to quite well-wooded valleys and slopes which are wetter or better protected from fire. This community includes localised steep slopes and fire-protected rocky outcrops. Typical and dominant species include *Acacia natalita*, *Chrysocoma ciliata*, *Felicia muricata*, *Eragrostis plana*, *Heteropogon contortus*, *Hyparrhenia hirta*, *Sporobolus africanus*, *Themeda triandra*, *Cynodon dactylon*, *Digitaria eriantha*, *Eragrostis chloromelas*, *E.curvula*, *Commelina africana*, *Helichrysum nudifolium*, *H.rugulosum* and *Moraea polystachya*. There are occasional bush clumps present within many areas of Bhisho Thornveld within the project site. The species associated with these bush clumps are species associated with the adjacent Albany Broken Veld and are usually composed of species such as *Euclea undulata*, *Pappea capensis*, *Cussonia spicata*, *Carissa bispinosa*, *Grewia robusta* and *Putterlickia pyracantha*.

Community 3: Kowie Thicket

Kowie Thicket is restricted to the slopes and hills of the northern extent of the project site and mixes with Albany Broken Veld on aspects and soils less favourable for Kowie Thicket. This pattern is also likely exacerbated by overgrazing of intact thicket, transforming it to a state more similar to Albany Broken Veld. Dominant and characteristic species observed within the site include *Euphorbia triangularis*, *Aloe speciosa*, *Schotia afra* var. *afra*, *Acacia natalitia*, *Cussonia spicata*, *Elaeodendron croceum*, *Maytenus undata*, *Pappea capensis*, *Ptaeroxylon obliquum*, *Sideroxylon inerme*, *Azima tetracantha*, *Gymnosporia polyacantha*, *Allophylus decipiens*, *Carissa bispinosa* subsp. *bispinosa*, *Clausena anisata*, *Ehretia rigida*, *Euclea undulata*, *Grewia occidentalis*, *Gymnosporia heterophylla*, *Mystroxylon aethiopicum*, *Olea europaea* subsp. *africana*, *Putterlickia pyracantha*, *Rhus longispina*, *R. lucida*, *Crassula cultrata*, *Portulacaria afra*, *Cotyledon orbiculata*, *C.velutina*, *C.tetragona*, *Kalanchoe rotundifolia*, *Mestoklema tuberosum*, *Pelargonium peltatum*, *Sarcostemma viminale*, *Plumbago auriculata*, *Asparagus aethiopicus*, *Jasminum angulare*, *Rhoicissus digitata*, *Cynodon dactylon*, *C.incompletus*, *Eragrostis curvula*, *Sporobolus fimbriatus*, *Themeda triandra*, *Eragrostis obtusa*, *Panicum maximum*, *Sansevieria aethiopica* and *S.hyacinthoides*.

Community 4: Azonal Habitats

Although there are no large drainage systems or perennial rivers within the project site, there are numerous minor drainage lines present with associated vegetation. Species present along the drainage lines include *Acacia natalita*, *Searsia pyroides* var. *gracilis*, *Cyperus textilis*, *Sporobolus fimbriatus*, *Limonium* sp., *Phragmites australis*, *Galenia sarcophylla* and *Cynodon incompletus*. The drainage lines are considered important habitats for fauna and flora. There are also a few small pans present on the project site, usually on the top of the low hills. These represent important breeding sites for amphibians and species observed around the pans include Bubbling Kassinia, Snoring Puddle Frog, Bronze Caco and Common Caco.

iii. Listed Plant Species

Based on the SANBI POSA records for the site and surrounding area, 14 species of conservation concern are potentially present. These are listed below in **Table 8.3** and while the majority of these species are associated with the wetter fynbos and high elevation grasslands that occur towards Makhanda, there are several that potentially occur within the project site and development envelope. Although none of these species were observed within the site, such species are by their nature rare and their presence within the site cannot be completely excluded. Species of concern that are potentially present include *Brachystelma luteum* (VU), *Eriospermum bracteatum* (VU), *Apodolirion macowanii* (VU), *Ornithogalum britteniae* (VU) and *Agathosma bicornuta* (EN). These listed species are all known from outside of the project site and there are currently no known populations from within the project site.

Table 8.3: List of plant species of conservation concern that are known to occur in the wider area around the site and their potential to be present within the site based on their recorded distribution and habitat requirements.

Family	Genus	Species		Subsp.	Status	Comment
Asphodelaceae	*Aloe*	*micracantha*			NT	Restricted to Fynbos. Not likely to occur within the project site.
Iridaceae	*Gladiolus*	*huttonii*			VU	Fynbos and sandy soils only. Not likely to occur within the project site as the required habitat is not present.
Apocynaceae	*Brachystelma*	*luteum*			VU	Occurs in Grahamstown Grassland Thicket, Albany Valley Thicket habitat types. It is associated with rocky grassland and may occur in the south of the project site.
Orchidaceae	*Disa*	*lugens*	var.	*lugens*	VU	Cape Peninsula to Somerset East and Cathcart. Not likely to occur within the project site. Existing observations are from the grasslands near Makhanda.
Ruscaceae	*Eriospermum*	*bracteatum*			VU	Occurs in the Makhanda district within the Grahamstown Grassland Thicket habitat type. Known from two locations and potentially threatened by harvesting for medicinal use, invasive alien plants and crop cultivation. The observation from near the site is along the R350 east of the project site. Potentially present on the site.
Amaryllidaceae	*Apodolirion*	*macowanii*			VU	There is a population on the farm Slaaikraal outside Makhanda. It is possibly more common than collections indicate, as the species is cryptic and easily overlooked. The known locations are east of the project site, but it is possible that it may occur in the south of the site.
Ericaceae	*Erica*	*glumiflora*			VU	Wilderness to East London and extending inland around Makhanda. Associated with Fynbos vegetation and would not occur within the site.
Hyacinthaceae	*Ornithogalum*	*britteniae*			VU	Known from one location on Table Farm near Makhanda. Potentially threatened by trampling by livestock. The known location is outside of the project site. Flat rocky areas in karroid scrub. Possibly present within the south

Family	Genus	Species		Subsp.	Status	Comment
						of the site.
Aizoaceae	*Corpuscularia*	*lehmannii*			CR	Coega to Port Elizabeth. Not likely to occur within the project site.
Isoetaceae	*Isoetes*	*wormaldii*			CR	The only known population occurs in a small wetland on a privately owned farm near Makhanda. The observation is from Strowan Farm, well east of the site.
Rutaceae	*Agathosma*	*gonaquensis*			CR	Uitenhage to Port Elizabeth. Not likely to occur within the project site.
Hyacinthaceae	*Lachenalia*	*convallarioides*			CR	Suurberg Quartzite Fynbos. South-facing rocky quartzite outcrops, 17-1800 m. Not likely to occur within the project site.
Anacardiaceae	*Searsia*	*albomarginata*			CR	Known from fewer than 50 mature individuals from an EOO of 27 km². Albany, west of Makhanda. Grassy fynbos in rocky, red sandstone soils. Not likely to occur within the project site.
Rutaceae	*Agathosma*	*bicornuta*			EN	Saltaire Karroid Thicket, Grahamstown Grassland Thicket, Albany Bontveld. Transition between grassy fynbos (on Ecca quartz) and Nama Karoo (on Dwyka formation) on south-facing ridges. Potentially occurs in the north of the project site within the areas of Kowie Thicket.

iv. Critical Biodiversity Areas (CBA) and Broad-Scale Processes

An extract of the 2019 Eastern Cape Biodiversity Plan for the study area is illustrated in **Figure 8.7**. This biodiversity assessment identifies Critical Biodiversity Areas (CBA) which represent biodiversity priority areas that should be maintained in a natural to near natural state.

The majority of the project site is classified as an Ecological Support Area (ESA), while there is a small extent of CBA 1 within the central part of the project site and some CBA 2 in the south and west of the project site. The areas classified as "other natural areas" are simply natural areas that do not fall into any of the other categories and are not required to meet any targets. The reasons layer associated with the CBA map indicates that the CBA 1 is based on the presence of two vegetation types (Albany Broken Veld and Kowie Thicket) as well as the presence of a listed reptile, which although not specified can be assumed to be the Albany Sandveld Lizard. Although this reptile was previously listed as Near Threatened, it has been down listed to Least Concern in the most recent assessment. The CBA 2 in the west of the project site is based on the presence of two vegetation types (Albany Broken Veld and Bhisho Thornveld), while the CBA 2 in the south of the site is due to the presence of the same two vegetation types as well as the presence of a listed plant species which is not identified.

Based on the above information, the CBAs within the project site are based largely on ecological processes such as transitions between vegetation types. The CBAs are not based on the known presence of specific biodiversity features of high value.

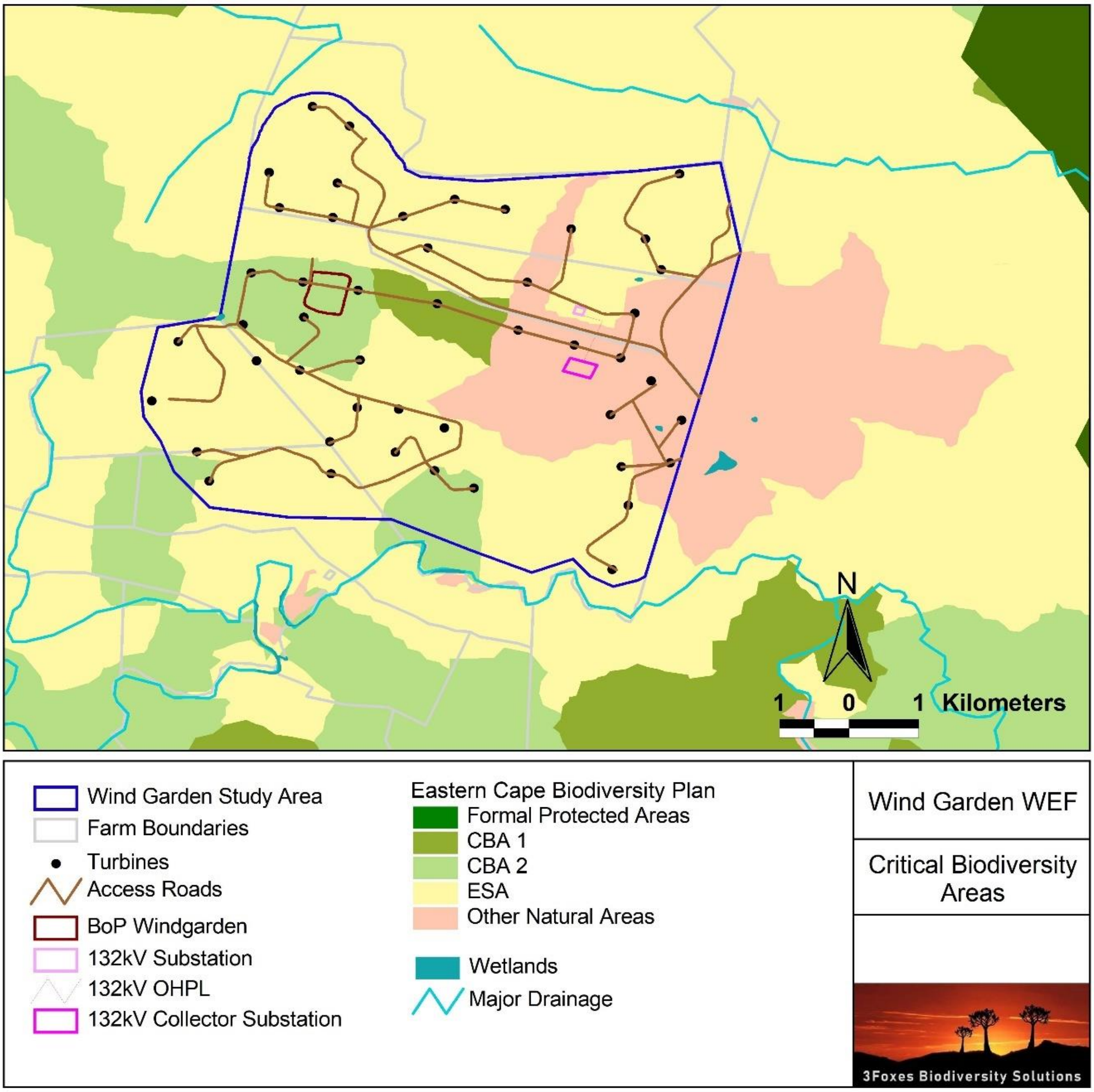


Figure 8.7: 2019 Eastern Cape Biodiversity Plan extract showing the CBAs and ESAs present within the Wind Garden Wind Farm project site

In addition, the 2016 National Protected Areas Expansion Strategy (NPAES) does not include any focus areas near to the site and the closest expansion focus areas are around the Great Fish River Nature Reserve more than 20km to the north-east.

v. Aquatics and Surface Water Features

The Wind Garden Wind Farm occurs within the following Subquaternary (Quinary) catchments with the respective mainstem rivers all within the Southern Folded Mountains Ecoregion:

- » Q91B Great Fish River
- » Q91C Brak River
- » P10A New Year's River
- » P10B Gxetu / New Year's River

The development envelope contains short tributaries that link to these systems, consisting mostly of non-perennial rivers, within incised valleys that contain narrow riparian systems, more typical of the Drought Corridor Ecoregion, 9km north of the area.

Overall, these watercourses are largely in a natural state, when compared to the Great Fish River, which is considered Largely Modified. Current or existing impacts occur in localised areas within the development envelope and these include existing roads /tracks, evidence of grazing (livestock), bush encroachment (*Vachellia karroo*) and various farm dams (surface water impoundments).

The National Wetland Inventory v5.2 spatial data (NWI), only indicates natural riverine systems and depressions/pans within the area, as well as a high number of artificial farm dams. The only natural wetlands observed within or in close proximity to the development envelope, included eight Depression/Pans.

The watercourses present within the development envelope are ephemeral and only carried water for short periods, therefore the observed systems do not support any wide riparian zones. The vegetation associated with these watercourses was between 0.25 m and 20 m wide and contain mostly terrestrial species. The only dense riparian vegetation was found along reaches of the Fish and Brak Rivers, dominated by sedges and grasses (*Cynodon dactylon, Cyperus textilis, Phragmites australis*) on the river edge, while tall trees on the steep banks (*Searsia lancea, Combretum caffrum*), and thicket trees and shrubs on the upper slope of the banks included *Azima tetracantha, Buddleja saligna, Ehretia rigida, Gymnosporia heterophylla, Lycium spp., Olea europea subsp. africana, Vachellia karroo* and *Ziziphus mucronate*. Climbers, including Asparagus spp. and Cynanchum spp., dwarf shrubs (Felicia spp.), and grasses (*Panicum deustum, P. maximum*) and succulents (*Drosanthemum hispidum, Malephora lutea*) occur in the open patches and disturbed margins of the riparian zones.

The National Freshwater Ecosystems Priority Areas (NFEPA), also earmarked sub-quaternaries, based either on the presence of important biota (e.g. rare or endemic fish species) or conversely the degree of riverine degradation, i.e. the greater the catchment degradation the lower the priority to conserve the catchment. The important catchment areas are then classified as Freshwater Ecosystems Priority Areas (FEPAs). The development envelope spans an Upstream Support Area, which is earmarked as a support catchment for FSAs (Fish Support Areas) and a Phase 2 FEPA, while portions of the development envelope are located within a Freshwater Ecological Support Area Type 1 as per the Eastern Cape Biodiversity Conservation Plan or ECBCP (ECBCP, 2019).

No aquatic species of special concern were observed within the development envelope.

Refer to **Figure 8.8**, **Figure 8.9** and **Figure 8.10.**

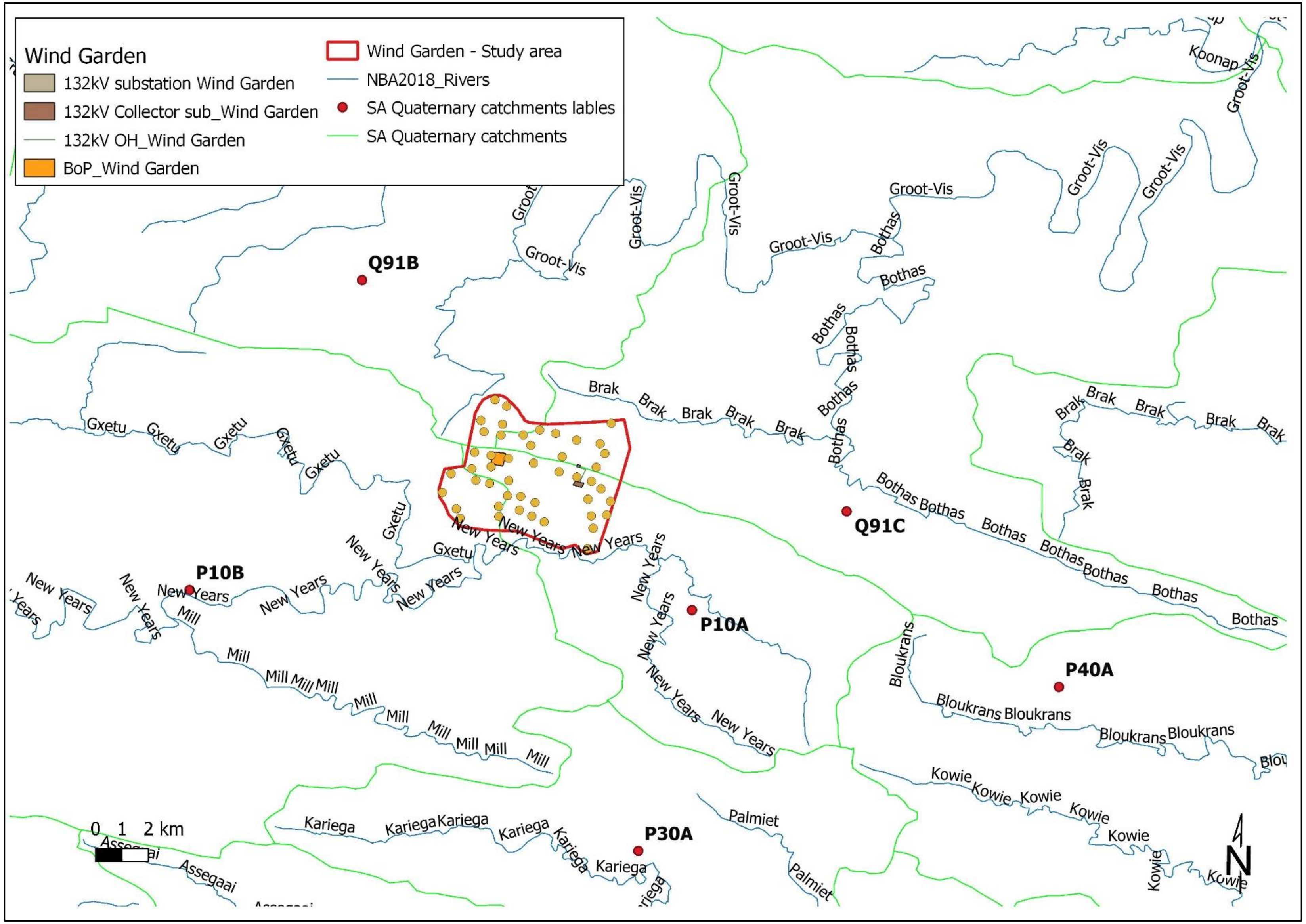


Figure 8.8: The various quaternary catchment boundaries in relation to the Wind Garden Wind Farm development envelope

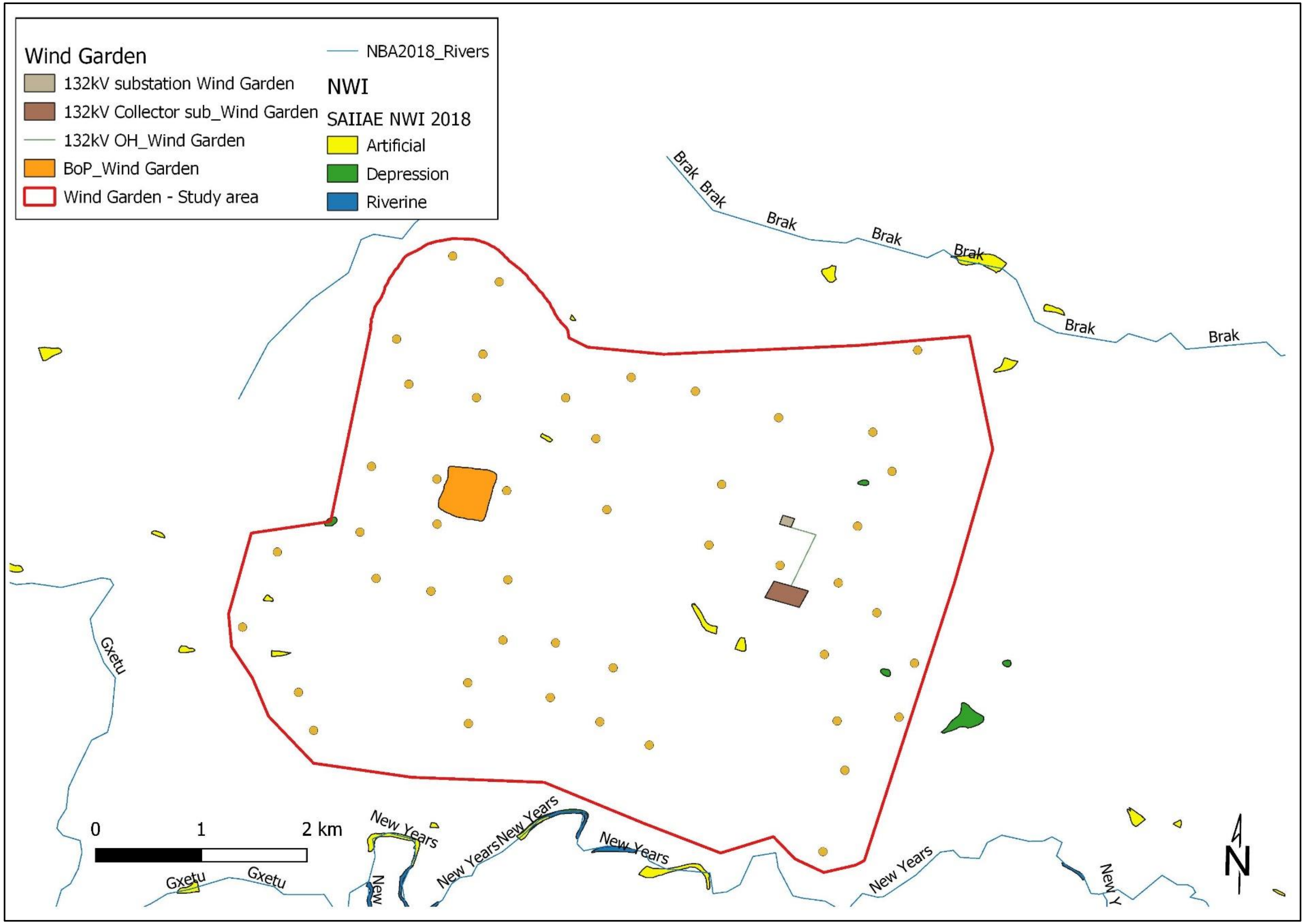


Figure 8.9: The various waterbodies identified in the National Wetland Inventory as shown in the National Spatial Biodiversity Spatial data for the development envelope. The orange dots represent the proposed turbine locations proposed for Wind Garden Wind Farm.

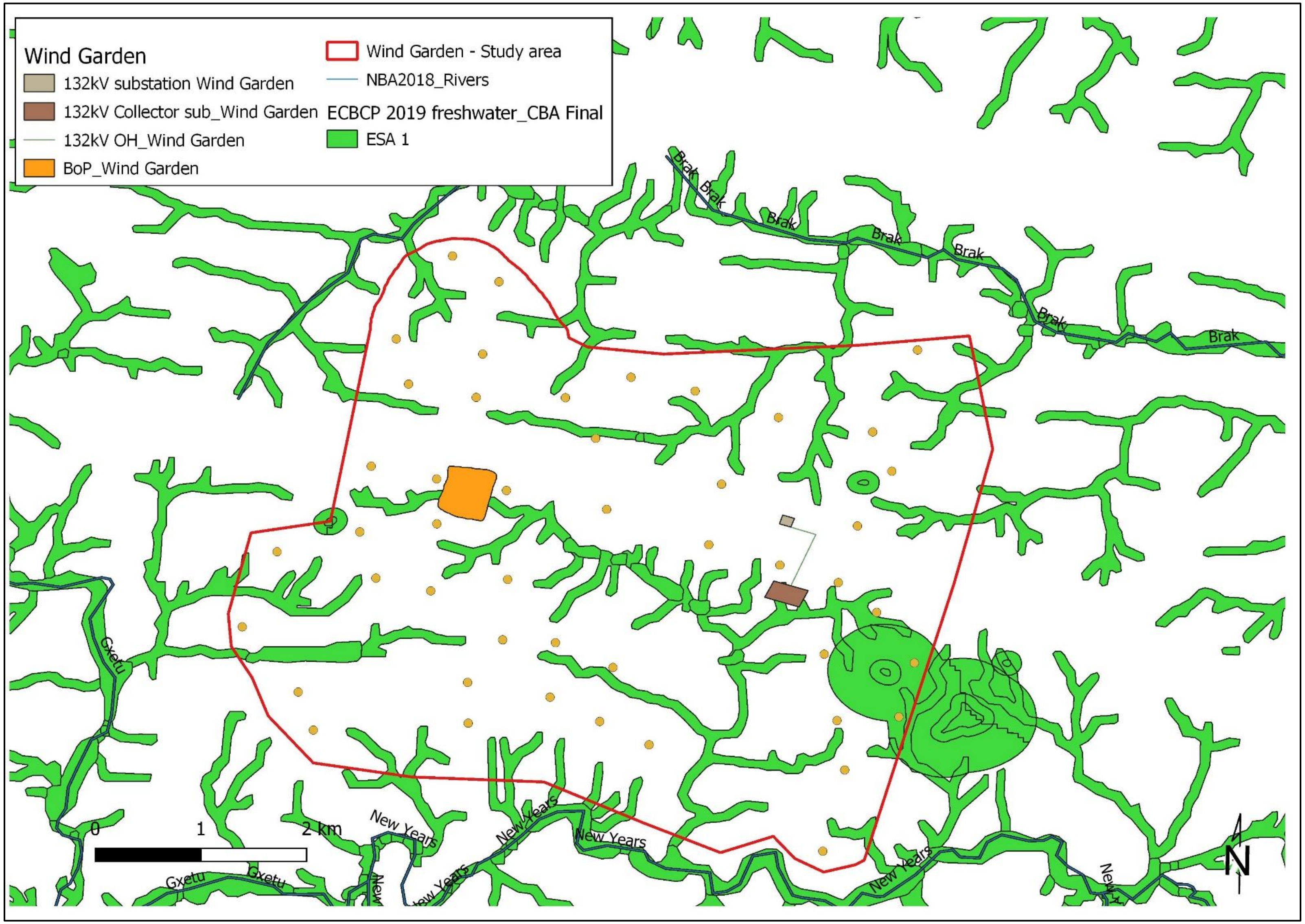


Figure 8.10: Freshwater CBA extract for the Wind Garden Wind Farm development envelope. The orange dots represent the proposed turbine locations proposed for Wind Garden Wind Farm.

vi. Terrestrial Fauna

Mammals

As many as 50 different naturally-occurring mammal species have been recorded from the vicinity of the Wind Garden Wind Farm project site. Common species observed include Steenbok, Common Duiker, Kudu, Cape Porcupine, South African Ground Squirrel, Springhare, Aardvark, Grey Mongoose, Yellow Mongoose, Cape Hare, Bat-eared Fox, Vervet Monkey, Chacma Baboon, Suricate, Caracal and Black-backed Jackal. There is also a lot of game farming in the area, with the result that there are also many introduced or farmed species present in the area, but as these populations are mostly maintained and managed by the landowners within game farms, they are not considered further. Apart from the above common species, there are also several red-listed mammals which are confirmed present in the area or which may be present. These include Brown Hyena, Serval, African Clawless Otter, African Striped Weasel, Blue Duiker, Black-footed Cat, Leopard and Mountain Reedbuck. The majority of these species occur in the wider area at a low density and do not have well-established populations outside of conservation areas and larger game farms. Of greatest potential concern is likely to be the Mountain Reedbuck and Black-footed Cat which are the only two listed species likely to maintain free-ranging populations within the affected area. However, both have large national and provincial distribution ranges. The other listed species may be present in the wider area are habitat specialists and are not likely to occur regularly.

Reptiles

Based on the ADU database, sixty reptile species have been recorded from the area around the Wind Garden Wind Farm project site. This is a relatively high total, indicating that reptile diversity in the area is quite high and can be ascribed to the high diversity of habitats in the area, but also suggests that the area has been relatively well sampled. Common species observed (**Figure 8.11**) or on previous projects in the immediate area include Thin-tailed Legless Skink, Southern Rock Agama, Cape Girdled Lizard, Spotted Gecko, Leopard Tortoise, Rock Monitor and Puff Adder. The drainage lines with dense riparian vegetation and the rocky hills and especially those with large rocky outcrops are considered to represent the most important reptile habitat at the project site. Although no listed species are known from the area, the Albany Sandveld Lizard *Nucras taeniolata* is a narrow endemic that was previously listed as Near Threatened but as of 2017 has been assessed as being of Least Concern. This species has a distribution range of 15453 km^2 and occurs in the Eastern Cape Province in the Algoa Bay region. Distribution extends from the Double Drift Game Reserve in the north, southwards through the Albany district to just north of Port Elizabeth, and westwards through Addo Elephant National Park to Groendal Wilderness Area and the Gamtoos Valley near Thornhill. According to the SANBI species account for this species, *Nucras taeniolata* is well represented in several existing protected areas and a number of mega-conservancy networks and park expansions are earmarked for the region in which it occurs. The species is therefore likely to maintain a viable long-term presence.

Figure 8.11: Reptiles observed at the site include, from top left, the Rock Monitor, Spotted Grass Snake (Skaapsteker) and Thin-tailed Legless Skink.

Amphibians

Amphibian diversity within the project site is likely to be relatively low. A total of 15 species are known from the area according to the ADU database and includes no species of conservation concern. Within the area, the ephemeral pans, farm dams and larger drainage lines are the most important habitats for amphibians. Species observed in the area include Raucous Toad, Bubbling Kassinia, Common Platanna, Bronze Caco and Common River Frog. The amphibian community can be broadly divided into those species strongly associated with water bodies such as River Frogs and Platanna and those species which are able to range more freely such as toads and Caco's which may breed in streams and ponds, but are more terrestrial in nature.

vii. Bats

Pre-construction monitoring was undertaken within the Wind Garden Wind Farm project site. The monitoring was designed to monitor bat activity across the area for the Wind Garden Wind Farm. The baseline environment was investigated by using acoustic monitoring to document bat activity between 13 March 2019 and 16 June 2020 (459 sample nights).

Habitats for bats

There is a range of suitable habitat for bats that can be used for roosting, foraging and commuting in the project site. This includes thicket and woodland habitats which provide a variety of clutter conditions and are known to be important for bats, particularly woodland. Land use in the area is primarily agricultural including grazing, stock farming and game farming and bats are known to be attracted to areas with livestock for foraging. Cultivated areas are found along the two river systems that bisect the broader area (located outside of the project site) namely the Little and Great Fish Rivers. Cultivated areas are important foraging areas as some species forage over monoculture agricultural fields and prey on insect pests. Farmsteads contain lighting which at night will attract insects and in turn bats to hunt for prey.

Water sources are important for bats as a direct resource for drinking and because these areas tend to attract insects and promote the growth of vegetation (e.g. riparian vegetation). Therefore, besides providing drinking water, bats can also be attracted to water sources as potential foraging and roosting sites. There are numerous artificial and natural wetlands, reservoirs and farms dams in the area that will be attractive to bats. Rivers, canals and drainage lines will be equally important for foraging and commuting. Bats are known to use linear landscape features such as these, in addition to tree lines, for commuting routes to get to and from foraging sites, roost sites, to access water sources and because they provide protection to bats from predators, shelter from wind, and orientation cues.

The suitability of habitat for bats is also dictated by the roosting potential. Habitats with roosting spaces are likely to be more favoured compared to areas where roosts are limited. The availability of roosting spaces is a critical factor for bats and a major determinant of whether bats will be present in a landscape, and the diversity of species that can be expected. A major bat roost is located approximately 5 km south-east of the Wind Garden Wind Farm. Rocky crevices are also used as roosts by some species and these features can be found in the mountainous parts of the area. Man-made infrastructure in the area may be used by bats as well (e.g. Cape serotine and Egyptian free-tailed bat). A number of free-tailed bats and plain-faced bats may roost in trees in woodland habitats, including in dead trees. Evidence suggests that trees with larger trunks are preferentially selected by bats.

<u>Bat Species</u>

The project site falls within the actual or predicted distribution range of approximately 21 species of bat (**Table 8.4**). However, the distributions of some bat species in South Africa, particularly rarer species, are poorly known so it is possible that more (or fewer) species may be present. Several echolocation calls characteristic of species in the Plain-faced bat family were recorded during the pre-construction monitoring programme, but these calls were unable to be separated into distinct species. Since most of the species that these calls could belong to have a conservation status of Least Concern, these calls were grouped together and referred to as Unidentified plain-faced bat (**Table 8.4**). However, some calls could potentially be from *Myotis tricolor*, but its presence has not been confirmed.

Seven high risk and five medium-high risk species have been confirmed to occur in the broader area (including the project sites) and of these, fatalities at operational wind farms in South Africa are known for at least six, namely Cape serotine, Egyptian free-tailed bat, Natal long-fingered bat, Egyptian rousette, Egyptian slit-faced bat and Wahlberg's epauletted fruit bat.

Table 8.4: Bat species which may potentially occur at the project site

Species	Code	# of Passes	Conservation Status			Risk from Wind Energy
			National	Global	Population Trend	
Egyptian free-tailed bat *Tadarida aegyptiaca*	EFB	174,090	Least Concern	Least Concern	Unknown	**High**
Little free-tailed bat *Chaerephon pumilus*	LFB	17,016	Least Concern	Least Concern	Unknown	**High**
Natal long-fingered bat *Miniopterus natalensis*	NLB	48,811	Least Concern	Least Concern	Unknown	**High**
Lessor long-fingered bat *Miniopterus fraterculus*	LLB	-	Least Concern	Least Concern	Unknown	**High**
Mauritian tomb bat *Taphozous mauritianus*	MTB	-	Least Concern	Least Concern	Unknown	**High**
Cape serotine *Neoromicia capensis*	CS	81,574	Least Concern	Least Concern	Stable	**High**
Roberts's flat-headed bat *Sauromys petrophilus*	RFB	3,810	Least Concern	Least Concern	Stable	**High**
Wahlberg's epauletted fruit bat *Epomophorus wahlbergi*	WFB	-	Least Concern	Least Concern	Stable	**Medium-High**
Egyptian rousette *Rousetus aegyptiacus*	ER	-	Least Concern	Least Concern	Stable	**Medium-High**
Yellow-bellied house bat *Scotophilus dinganii*	YHB	7	Least Concern	Least Concern	Unknown	**Medium-High**
Temminck's myotis *Myotis tricolor*	TM	-	Least Concern	Least Concern	Unknown	**Medium-High**
Unidentified plain-faced bat* *Vespertilionidae species*	VSP	2,739	-	-	-	**Medium-High**
Dusky pipistrelle *Pipistrellus hesperidus*	DP	16,199	Least Concern	Least Concern	Unknown	**Medium**
Long-tailed serotine *Eptesicus hottentotus*	LTS	2,551	Least Concern	Least Concern	Unknown	**Medium**
Cape horseshoe bat** *Rhinolophus capensis*	CHB	2,142	Least Concern	Least Concern	Stable	**Low**
Geoffroy's horseshoe bat *Rhinolophus clivosus*	GHB	49	Least Concern	Least Concern	Unknown	**Low**
Bushveld horseshoe bat *Rhinolophus simulator*	BHB	-	Least Concern	Least Concern	Decreasing	**Low**
Swinny's horseshoe bat *Rhinolophus swinnyi*	SHB	-	Vulnerable	Least Concern	Unknown	**Low**
Lesueur's wing-gland bat** *Cistugo lesueuri*	LWB	-	Least Concern	Least Concern	Decreasing	**Low**
Egyptian slit-faced bat *Nycteris thebaica*	ESB	-	Least Concern	Least Concern	Unknown	**Low**
Lesser woolly bat *Kerivoula lanosa*	LWB	-	Least Concern	Least Concern	Unknown	**Low**

*Not able to be assigned to a specific species therefore identified to Family level only.
** Endemic to South Africa.

viii. Avifauna

It is estimated that a total of 9 priority bird species occur in the broader area and the project site. The avifauna described to be associated with Wind Garden Wind Farm project site is based on the results of the four seasons of pre-construction monitoring which was conducted from June 2019 to August 2020.

Avifaunal Microhabitats

To determine which bird species are more likely to occur on the Wind Garden Wind Farm project site, it is important to understand the habitats available to birds at a smaller spatial scale, i.e. micro-habitats. Micro-habitats are shaped by factors other than vegetation, such as topography, land use, food sources and man-made factors as mentioned above.

» *Albany Thicket Vegetation* – Most of the Wind Garden Wind Farm falls within the Albany Subtropical Thicket (Valley bushveld) biome, particularly associated with slopes of the ridges and hills. These areas generally coincide with Kowie thicket vegetation type. In pristine and natural vegetation these can be 6-8m tall. On the southern slopes (being more moist and shadier) the Thicket is more dense (close canopy) while on the northern slopes (being more sunny and arid) the Thicket is less dense, having more a savanna pattern of cover. Small bush birds inhabit the Thicket.

» *Nama Karoo Veld* - The second most abundant vegetation type within the project site is the Nama-Karoo biome with Karoo shrubland (bossie veld) vegetation and is described as a complex mix of dwarf shrub (30-40cm) and a grass dominated vegetation type. Large Terrestrial birds inhabit and forage in this Bossieveld.

» *Rivers and Drainage Lines* - No permanent rivers occur in the project site. There are, however, many dry drainage lines that may not always carry water, but these features are dominated by dense *Acacia karroo* trees and generally have a higher abundance of small bird life than the surrounding vegetation. These drainage lines are flyways followed by many bird species on daily foraging trips.

» *Farm Dams* - Dams are important attractions for various bird species in the Karoo landscape, and are often the only source of water during the dry season in the area. No large dams are present in the Wind Garden Wind Farm project site, but many small dams are present and attract various waterfowl, herons and African Spoonbill. African Fish Eagle is often seen at these dams while Blue Cranes use small farm dams as roost sites at night.

» *Cliffs and Rocky Areas* - Cliffs in deep eroded draining kloofs (small valleys) below ridges occur in the project site, especially in the southern areas. These cliffs and the surrounding bush with tall trees, especially on south-facing slopes, are important breeding areas for various raptors, e.g. Rock Kestrel, Lanner falcon, African Harrier-Hawk, Jackal Buzzard, Martial eagle and Verreaux's eagle. Rock dassies frequent rocky areas, which are the main prey of Verreaux's eagles.

» *Natural Forest* - Although no forests occur within the project site, small clumps of Yellowwood trees occur, one such clump has an active Crowned Eagle nest; however this is outside the Wind Garden Wind Farm project site. Some deep south draining kloofs has small patches with tall trees, this is where, for example, Martial eagles nest.

» *Ridge Slopes and Thermal Areas* - Many raptors use the wind blowing over slopes of ridges and hills for slope soaring to gain lift and to hunt. Importantly, wind conditions change daily therefore a change in raptor abundance is noted during a change in wind direction and strength. Verreaux's Eagles appear to use such windy conditions. In contrast with the above, many areas, especially bare ground and especially in the summer on hot days, bake hotter than their surroundings, this causes the rising of hot air, which attracts large raptors such as Martial Eagles. These two conditions are difficult to pin down.

» *Power Lines* - One large 132kV (single steel pole) power line crosses the Wind Garden Wind Farm project site from Makhanda to the west. Raptors use the poles of this power line as hunting perches.

» *Farmsteads and Livestock Kraals* - Farmsteads are disturbed areas surrounding farmhouses or areas of human activity, while feeding kraals are areas where livestock gather for food, shelter and water provided by the farmers. These habitats are frequented by a high diversity of small passerine birds while often have Spotted eagle-owl and Barn Owl breeding around homesteads.

» *Stands of Alien Trees* - Stands of alien trees such as blue gums occur scattered around the landscape, mainly near farmsteads, rivers and drainage lines. These are utilised as roosts and/or perches by raptors while African Fish Eagle often have nests in such clumps.

» *Bhisho Thornveld* - The 'Bhisho Thornveld' vegetation type (whether disturbed or natural, depending on land use practises) occurs to the south outside the Wind Garden Wind Farm project site. These areas have low vegetation cover and may be important for various priority species.

» *Fynbos Vegetation* - The topmost areas of ridges and hills have rocky patches and sometimes Fynbos vegetation with mainly Renosterbos, but Proteas were often present.

Avifauna present within the project site

Key raptor breeding locations were identified within and near the project site. An eagle nest is a confirmed breeding site while a territory is a suspected nest site based on the fact that eagles were seen displaying, carry prey, etc. Two Martial Eagle nest sites are located in close proximity to the project site, however outside of the development envelope.

Two Verreaux's Eagle nest sites were identified with one located to the south-west and one to the north-west and outside of the Wind Garden Wind Farm project site. Three Crowned Eagle nests and territories were identified outside of the project site (~5km away), at Palmietfontein (active), Hellspoort (one historic site) and at Smoerfontein (a potential site). All are located relatively far away from the Wind Garden Wind Farm project site. One African Fish-eagle territories were located on the edge and south of the Wind Garden Wind Farm. Other breeding locations identified included two Secretarybird territories and three Jackal Buzzards nests.

Refer to **Figure 8.12**.

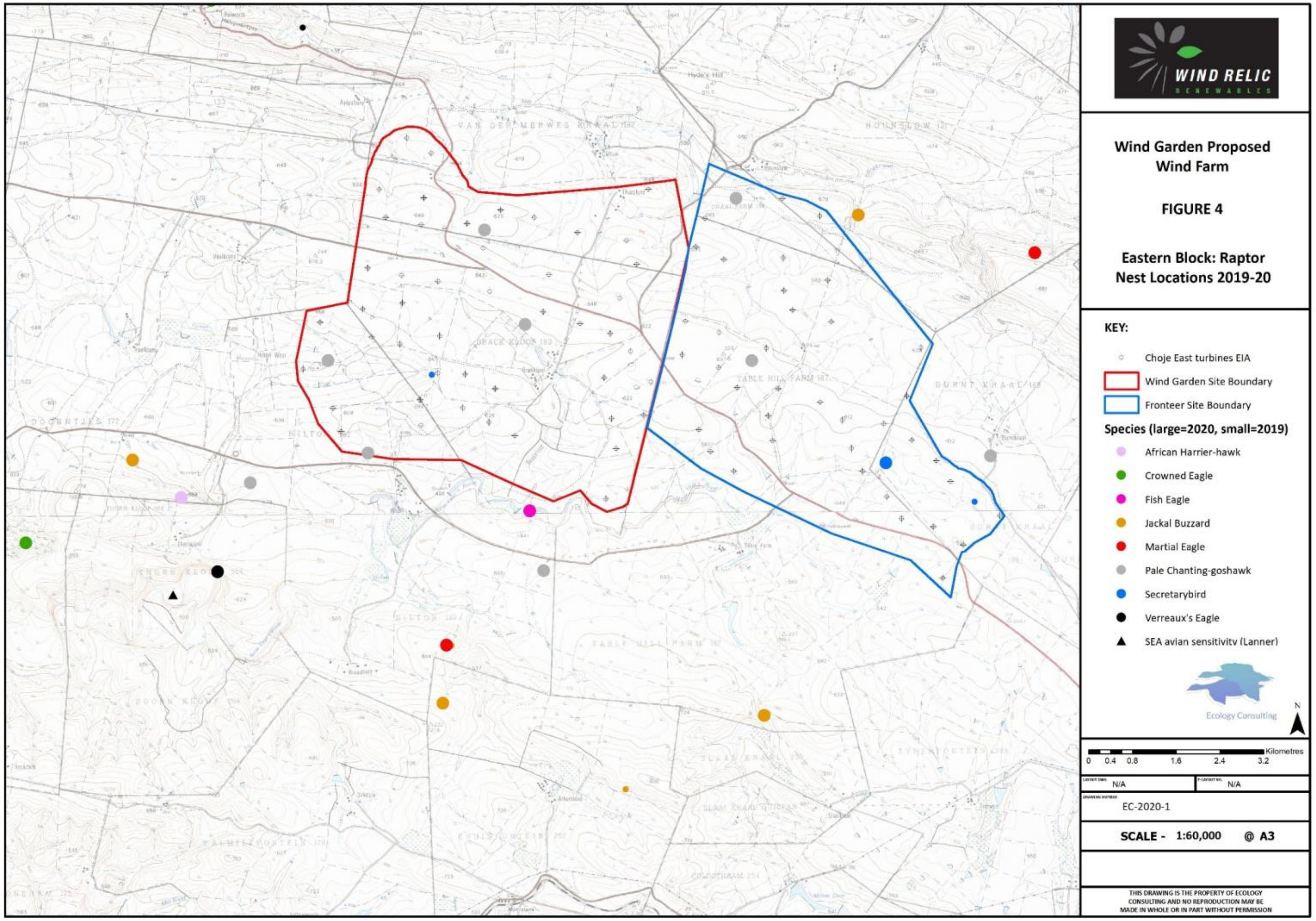


Figure 8.12: Raptor nest locations identified within the Wind Garden Wind Farm development envelope. The proposed and directly adjacent Fronteer Wind Farm development envelope is also displayed on the map for reference purposes.

The Vantage Point (VP) surveys undertaken for the Wind Garden Wind Farm recorded nine key species of higher conservation importance: Blue Crane, Ludwig's Bustard, Denham's Bustard, Southern Black Bustard, Secretarybird, Martial Eagle, Verreaux's Eagle, Black Harrier and Lanner Falcon. No particular concentrations of flight activity of any of these species was noted in this area. The bustard species were more frequent in the northern (more open, flatter) part of the project site. Eagle and other raptor flights were widely scattered.

Only a low number of species was recorded during the road transect/wetland surveys. No important concentrations of wetland birds were recorded within the Wind Garden Wind Farm project site. The records of cranes and bustards during these surveys are all widely scattered across the area, with no particular concentration identified. Nine species of higher conservation importance were noted in the road transect survey across the broader area as a whole: Blue Crane, Ludwig's Bustard, Denham's Bustard, Southern Black Bustard, Martial Eagle, Verreaux's Eagle, African Marsh-harrier, Black Harrier and Lanner Falcon, though the number of records of all of these were low. Three of these were recorded within the Wind Garden wind Farm project site, namely, Blue Crane, Southern Black Bustard and Martial Eagle.

From the walking transect surveys only low numbers of species were recorded. These surveys did record a high diversity of small terrestrial species, although only four species of higher conservation importance (Blue Crane, Southern Black Bustard, Martial Eagle and African Rock Pipit) were recorded.

8.5. Integrated Heritage including Archaeology, Palaeontology and the Cultural Landscape

Heritage resources are unique and non-renewable. Various heritage resources were identified within the project site which includes archaeological and historical sites that vary in significance from grade IIIC[14] to IIIA[15].

8.5.1 Identified Heritage Resources

During the site survey 12 heritage sites were identified. Three (3) labourer houses (EWF1-01, EWF1-05, EWF1-06), two (2) sheds (EWF1-02 and EWF1-09), one (1) farmhouse (EWF1-03) and one (1) reservoir (EWF1-08) was identified. The ruins of one (1) house (EWF1-07) was also identified. This site has a rating of IIIC. A farmstead (EWF1-04) was also identified. This site has a heritage rating of IIIB. Further to the above, a total of three (3) burial grounds (EWF1-10 – EWF1-12) were identified. Graves have heritage rating of IIIA. **Figure 8.13** provides a locality map of the heritage resources identified within the project site and **Figure 8.14** provides a photographic record of some of the heritage finds.

[14] Such a resource is of contributing significance and is considered to be of a low heritage significance.

[15] Such a resource must be an excellent example of its kind or must be sufficiently rare. Current examples: Varschedrift; Peers Cave; Brobartia Road Midden at Bettys Bay. Such resources are of a high heritage significance.

8.5.2. Palaeontology

The Wind Garden Wind Farm is underlain by the Dwyka Group, the Witpoort Formation, the Weltevrede Formation, which are part of the Witteberg Group of the Cape Supergroup. As such, there is a moderate to high chance of finding fossils in this area. No visible evidence of fossiliferous outcrops was found during the site survey.

8.5.3. Cultural Landscape

The Cultural Landscape of the area between and surrounding Makhanda and Somerset East is sparsely populated with several farmsteads and their associated structures located on the valley floors of this hilly and mountainous region. The farmsteads are connected through several farm roads and old historic ox-wagon routes that link the local communities to the busy towns of Makhanda and Somerset East. Many of the old farm buildings, stone houses and the Churches in the area contain architectural elements greater than 60 years of age and fall with the general protection of the National Heritage Resources Act (25 of 1999) (NHRA). The area comprises of both Local and Provincial heritage sites, consisting of palaeontological sites, rock art, burial grounds and graves, monuments and memorials, stonewalling, as well as historical structures. The grading of the cultural landscape elements ranged from IIIC to II[16].

[16] Heritage resources that contribute to the environmental quality or cultural significance of a larger area and fulfils one of the criteria set out in section 3(3) of the Act but that does not fulfil the criteria for Grade II status. Grade III sites may be formally protected by placement on the Heritage Register.

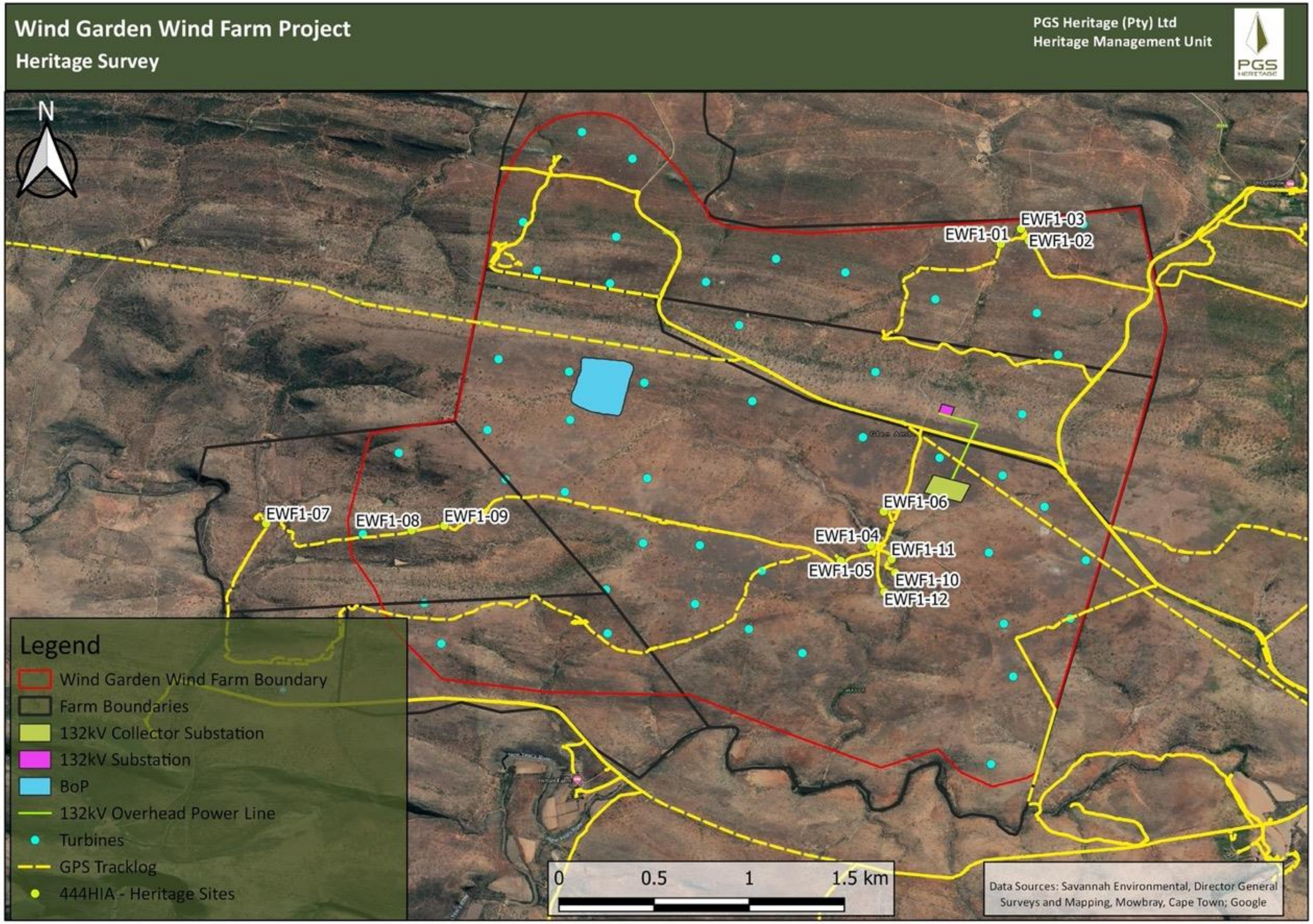


Figure 8.13: Locality map of the heritage resources identified within the Wind Garden Wind Farm project site


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Figure 8.14: Photographic record of some of the heritage resources found within the project site

8.6. Ambient sound levels and Noise Sensitive Developments

Considering the ambient sound levels and character of the area, ambient sound levels are generally low and typical of a rural noise district during low wind conditions. Ambient sound levels will likely increase as wind speeds increase.

Potential Noise Sensitive Developments (NSDs) were identified within the projects site and ambient noise levels were measured in specific locations (refer to **Figure 8.15**). The results of the measurements have indicated the following:

- At WRLTSL01 there are a number of large trees at residential dwellings that may increase Wind-induced Noises (WIN)during periods of increased winds. Bird calls were dominant, with a crow clearly audible at times. Slight WIN was experienced.
- At WRLTSL02 there are a significant number of trees which influences WIN experienced in the area. Bird calls were dominant, with insects clearly audible. Music from the house was also audible.
- At WRLTSL03 was located near the front entrance of a residential house, next to the garage. Bird communication was dominant, with a rooster audible at times.
- At WRLTSL04 was located in a parking area next to a house, which is considered to be an area slightly sheltered from direct winds. The house is located on the edge of a mountain with the side of the mountain and valley densely vegetated. The location is generally very quiet, though very loud noises (sources unknown) were measured at night. WIN is dominant in the area with wind gusts, with birds audible. Wind through trees in the far distance is audible and constant.
- At WRLTSL05 was located next to an access road to the main farm dwelling, close to the house of a worker. Crickets were audible and dominant with slight WIN. Sounds from the house were also measured, with times where the birds and WIN were the dominant noise.

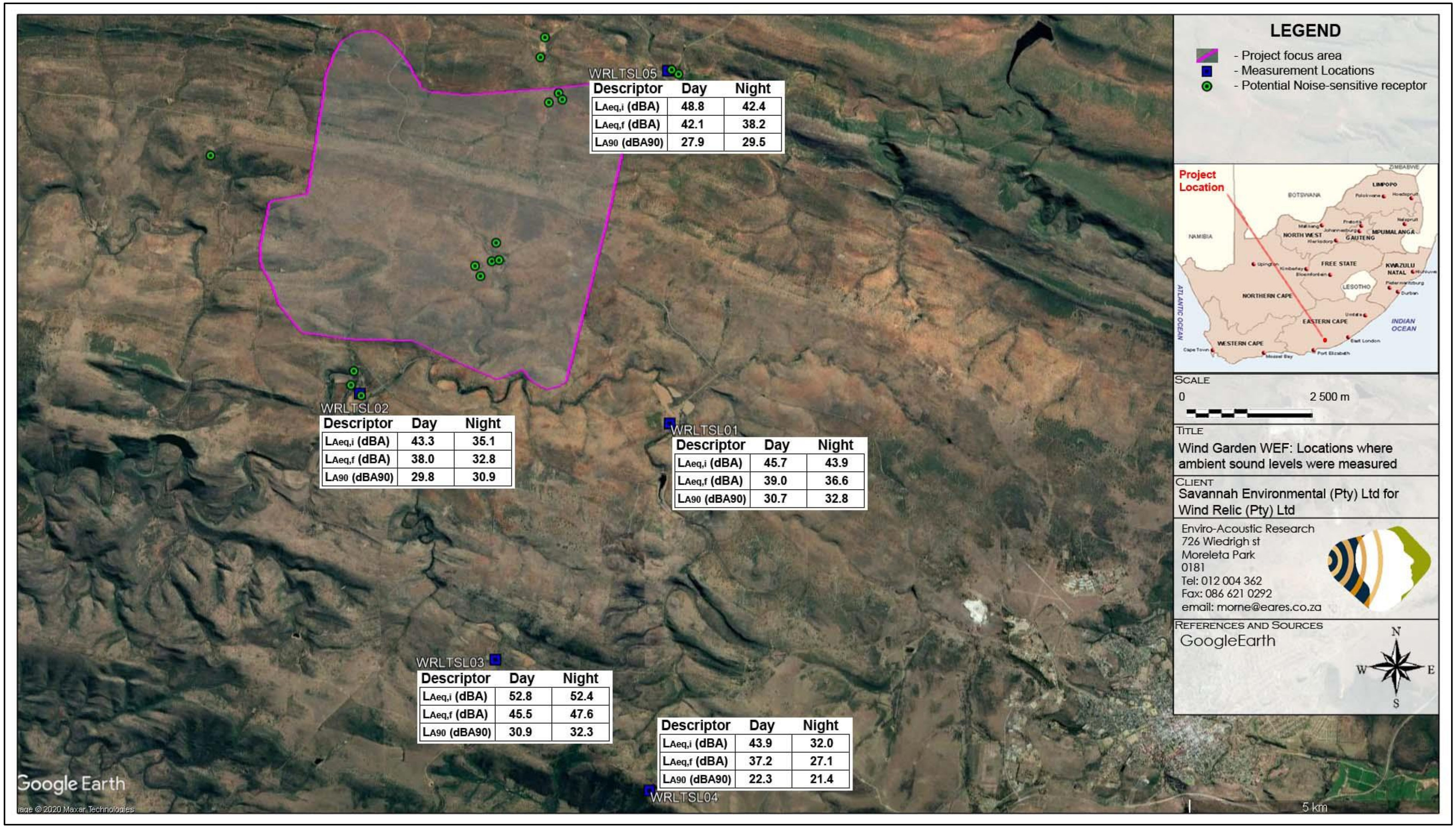


Figure 8.15: Noise-sensitive developments located within the surrounding area and the project site and the locations at which the ambient noise levels were measured

8.7. Visual Quality

i Potential Visual Exposure

A visibility analysis was undertaken for the project. The result of the viewshed analysis displays the potential areas of visual exposure, as well as the potential frequency of exposure, and potential visual sensitive receptors (**Figure 8.16**). The following homesteads and roads were identified in terms of potential exposure:

Less than 5km from the project (wind turbines):

» Broadfield
» Vaalkrans
» Thornkloof
» Table Farm
» Brakkloof
» Clifton
» Aylesbury 1
» Thursford
» Hounslow
» Hilton
» The R400, R350 and R344 arterial roads

Located within a 5 - 10km radius:

» Oakdale
» Rockdale
» Tea Fountain
» Palmietfontein
» Aylesbury 2
» Burntkraal
» Strowan
» Slaaikraal
» Lynton
» Henley
» Kranzdrift (1 and 2 Kwandwe Nature Reserve)
» Lindsay

Located within a 10 - 20km radius:

» Witteklip
» Shenfield
» Dalton
» Kleindeel
» Coldsprings
» Hillandale
» Coldsprings Annexe
» Mooimeisiesfontein
» Uitspan
» Moreson

- Grootfontein
- Carlisle Bridge
- Middleton
- Rockhurst
- Skelmdrif
- The Echo
- Willowford
- Peninsula
- Mayfair
- Coniston
- Kromkrans
- Markwood
- Kleinfontein
- Die Hoek
- Fonteinskloof (Kwandwe Nature Reserve)
- Douglas Heights (Kwandwe Nature Reserve)
- Cranford (Kwandwe Nature Reserve)
- Heatherton Towers (Kwandwe Nature Reserve)
- Melton (Kwandwe Nature Reserve)
- Beaumont (Kwandwe Nature Reserve)
- Vetteweiden (Kwandwe Nature Reserve)
- Glen Craig
- Mayfield
- Hay
- Cloudlands
- Dikkop Flats
- Signal Kop

Located beyond 20km:

- Nuwejaarsdrif
- Grootfontein
- Grootfontein
- De Hoop
- Steenbokhoek
- Salisbury Plain
- Eerstelyn
- Sunny Side
- Schelmdrift
- Ettrick Hills
- Boschgift (Kwandwe Nature Reserve)
- Killarney
- Rus-oord
- Grasslands
- Munster
- Leinster
- Glen Ovis

ii Visual Absorption Capacity (VAC)

This is the capacity of the receiving environment to absorb the potential visual impact of the proposed facility. The VAC is primarily a function of the vegetation, and will be high if the vegetation is tall, dense and continuous. Conversely, low growing sparse and patchy vegetation will have a low VAC. The VAC would also be high where the environment can readily absorb the structure in terms of texture, colour, form and light / shade characteristics of the structure. On the other hand, the VAC for a structure contrasting markedly with one or more of the characteristics of the environment would be low.

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

The land cover is dominated by grassland and shrubland. Grassland is defined as Natural / semi-natural grass dominated areas, where typically the tree and / or bush canopy densities are typically < ± 20 %, but may include localised denser areas up to ± 40 %, (regardless of canopy heights). It includes open grassland, and sparse bushland and woodland areas, including transitional wooded grasslands. Shrub lands are Communities dominated by low, woody, self-supporting, multi-stemmed plants, branching at or near the ground, between 0.2 and 2 m in height. Total tree cover < 0.1. Typical examples are low Fynbos, Karoo and Lesotho (alpine) communities.

Overall, the VAC of the receiving environment and especially the area in close proximity to the proposed wind farm is deemed low by virtue of the nature of the vegetation (grassland) and the low occurrence of urban development. Where thicket and dense bushland occurs, or where exotic vegetation had been planted along roads, or at homesteads and settlements, the VAC will be higher.

Within the built-up areas of Makhanda, Riebeek East and Alicedale the VAC will be of relevance, due to the presence of buildings and structures, referred to as visual clutter. In this respect, the presence of the built-up environment will have a high absorption capacity.

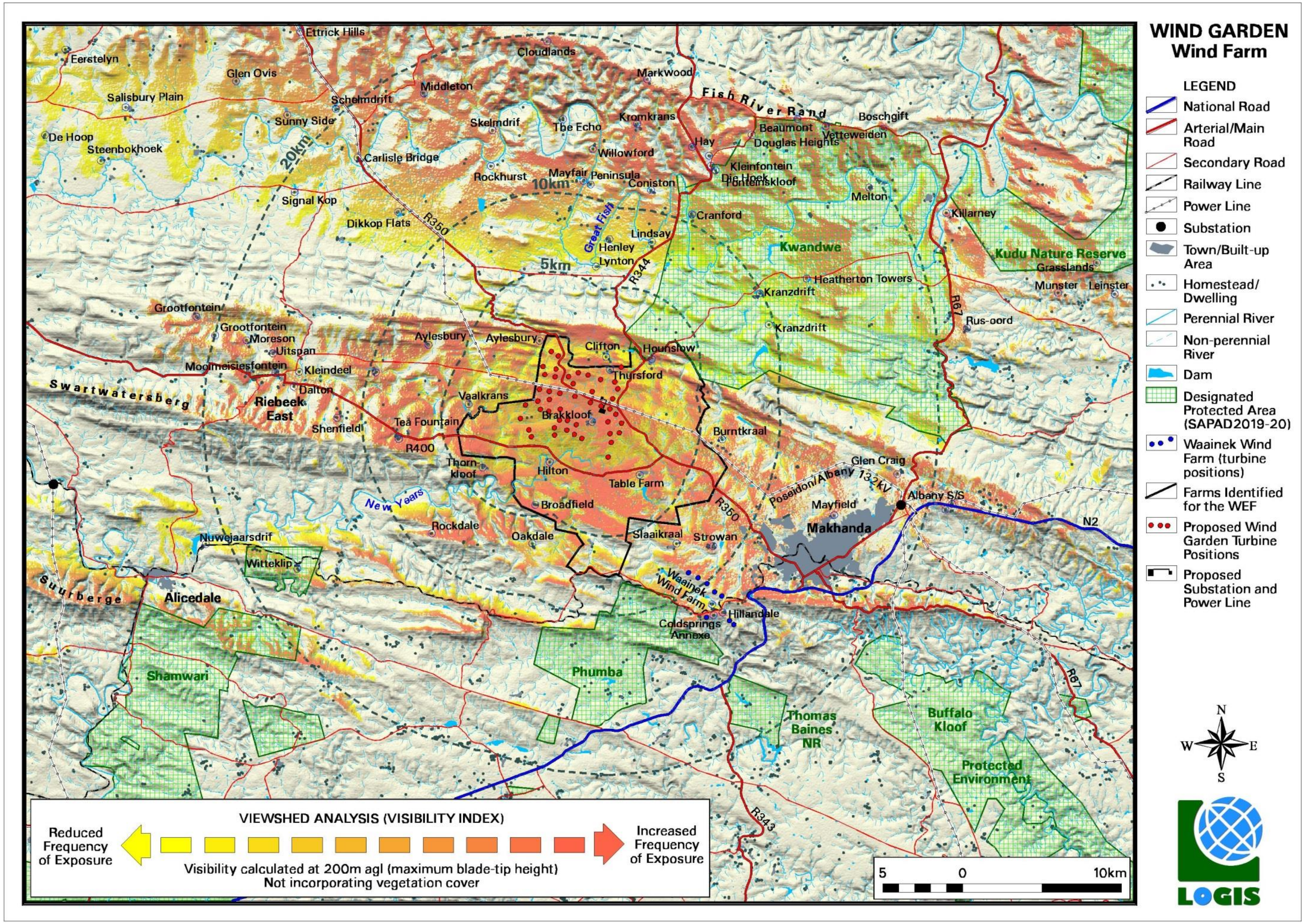
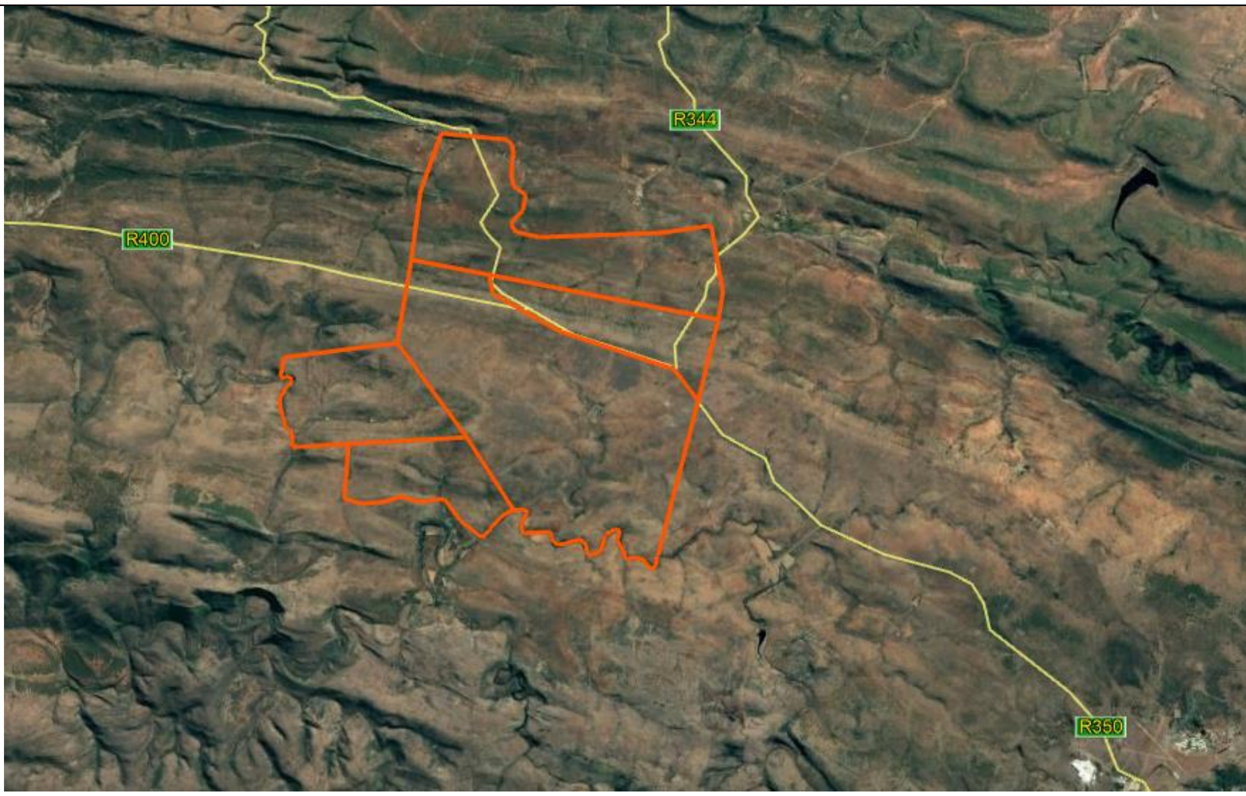


Figure 8.16: Viewshed analysis and potential sensitive visual receptors that may be affected by the development

8.8 Traffic Conditions

The project site is traversed by existing roads, namely the R350, R400 and R344 (**Figure 8.14**). In general, the traffic of the area is considered to be low.



		
R350 westbound	R344 northbound	R400 westbound

Figure 8.17: Main Routes providing direct access to the project site

8.9 Socio-Economic Profile

<u>i Profile of the Broader Area</u>

The Makana Local Municipality falls within the Sarah Baartman District Municipality and collectively account for 19% of the population, and 18% of the households in the district. The Makana Local Municipality is the second most populous local municipality after the Kouga Local Municipality in the district.

Population growth between 2008 and 2018 was 1,3% year-on-year for the Makana Local Municipality which compared favourably to the Sarah Baartman District (1%) and Eastern Cape (0,2%) over the same period.

Table 8.5 provide an overview of the population structures.

Table 8.5: Overview of the population structures on a provincial, district and local level

Indicator	**Eastern Cape**	**Sarah Baartman District**	**Makana Local Municipality**
Area (km^2)	168 966	58 243	4 376
Population	6 522 734	463 934	86 682
Number of Households	1 659 171	128 423	22 694
Population density (km^2)	38,6	8	19,8
Average household size	3,9	3,6	3,8
Annual population growth (2008-2018)	0,24%	1%	1,27%
Average monthly household income	R 9 139	R 10 758	R 12 406

Source: Quantec Standardised Regional (2020); Stats SA (2011) forecast to 2020

The disposable average monthly income of households in the Makana Local Municipality was R 12 406 which was 15% higher than the average for Sarah Baartman District Municipality (R 10 758) and 36% higher than the average for the Eastern Cape. The number of households with no formal income in Makana is 13% which is similar to the average for the district at 12,7% but, lower than the provincial level of 15% (**Table 8.5**).

Table 8.5: Employment profile

Indicator	Eastern Cape	Sarah Baartman District	Makana Local Municipality
Employed	1 228 511	152 437	24 218
Unemployment Rate	32,8%	19,1%	28,8%
Not Economically Active	1 986 792	110 127	24 620
Labour force participation rate	47,9%	63,1%	58%

Source: Quantec Standardised Regional (2020)

The review of the employment profile of Makana indicates that almost a third of the economically active population within the municipality is formally unemployed. The unemployment rate and labour force participation rate in the Makana Local Municipality were also notably worse than that of the Sarah Baartman District Municipality (Unemployment rate: 19,1%; Labour force participation rate: 63,1%).

The relatively high unemployment rate and lower labour force participation relative to the district averages further suggests that the Makana Local Municipality is subject to outward migration due to the limited number of employment opportunities available within the local municipality.

<u>i Profile of the Immediately Affected Area</u>

in terms of the land use profile, the land on which the proposed Wind Garden Wind Farm will be located is currently used for agriculture (predominant use). This farming is in the form of livestock farming with the predominant form of livestock being beef and sheep and goats. Very little crop farming (both dryland and irrigated) is undertaken within the area which is largely utilised for animal feed. Game breeding for the purposes of resale to game farms or hunting is present. None of the farms are solely utilised for agriculture with other revenue earning activities taking place such as game farming, hunting or tourist accommodation.

The area surrounding the proposed wind farm is also used for game farming, hunting and eco-tourism purposes. Tourists (predominantly local hunters or visitors) will visit the farms to hunt (normally for biltong), hike or utilise bike trails.

It is estimated that agricultural operations (including hunting and tourism) in the directly affected area employ approximately 30 people, the majority of whom are permanent employees. Most of the employees live on the farms and are those who do not live in Makhanda. An additional 94 people live on the farms who are not labourers.

It is recognised that many farms in the area practice a combination of crop, livestock and hunting activity. As such, most farms are involved in all three land uses. The dominant activity currently undertaken on farms that were surveyed was agriculture but, significant numbers of tourist activities occur on the farms. The following observations were made regarding land use:

» All of the farmers are commercial farmers.
» Goats and sheep were the most common animals found in the area (3 200 animals) but, beef cattle (386 animals) were present across all respondents surveyed.
» The average size of property owned was 1 913 and ranged between 350 and 2 990 ha.
» The majority of labourers live on the farms they work on with their family members.
» Livestock animals reared for sale and kept for production of food products include goats, sheep and cattle.
» All of the farms were the primary residence of the farm owner.
» Approximately 42 international tourists visited the area in a year (32 for hunting purposes, 5 for leisure or game viewing, and 5 for eco- or adventure purposes).
» Approximately 335 domestic tourists visited the area in a year (115 for hunting purposes, 70 for leisure or game viewing, and 150 for eco- or adventure purposes).
» Domestic hunters made up the largest proportion of the respondents total turnover.
» Some of the farms have accommodation facilities for visitors.
» Farms receive visitors mostly between April and December.
» Some of the game farms earn income through the trading of live game.
» Eco-based tourism in forms such as photography, trails is also undertaken in the area but to a lesser extent than hunting.

The immediate area surrounding the Wind Garden Wind Farm is very similar in terms of land use. There are also farms that cater to mixed land uses including tourism and agriculture.

CHAPTER 9: SENSITIVITY ANALYSIS

This chapter serves to provide the reader with an understanding of the sensitivities associated with the environmental features, areas and habitats as identified within the affected environment (Chapter 8) within which the Wind Garden Wind Farm is proposed to be developed. With an understanding of the sensitivities applied to the environmental characteristics present, the reader can place value on the features present within the area that may be impacted by the proposed development. It must be noted that this analysis is based on quantitative information and specialist field studies with on-the-ground findings. Consideration of visual, socio-economic and traffic is not considered herein as these aspects do not directly influence the location of infrastructure within the development envelope.

Where specific features or areas of sensitivity have been identified which need to be considered for the placement of infrastructure, these features are analysed and detailed in the sections which follow. The impact assessment provided in Chapter 10 is based on the sensitivity analysis and the outcomes detailed in this chapter. The sensitivity analysis focusses on the development envelope and the development footprint of the Wind Garden Wind Farm and provides input to be considered as part of the mitigation hierarchy being applied for the project, with the main objective being avoidance of sensitive features and areas within the affected environment.

9.1. Legal Requirements as per the EIA Regulations, 2014 (as amended), for the undertaking of a Basic Assessment Report

This chapter of the BA report includes the following information required in terms of the EIA Regulations, 2014 - Appendix 1: Content of basic assessment reports:

Requirement	Relevant Section
3(l)(ii) a map at an appropriate scale which superimposes the proposed activity and its associated structures and infrastructure on the environmental sensitivities of the preferred site indicating any areas that should be avoided, including buffers	The chapter as a whole is the approach followed to provide an overall sensitivity map of the development envelope and development footprint and in turn to inform the necessary avoidance required through the placement of infrastructure. This chapter therefore gives guidance on the mitigation hierarchy for the Wind Garden Wind Farm facility layout.

9.2. Ecological Features and Associated Sensitivity

Various ecological features and habitats are present within the project site and development envelope within which the development footprint has been sited. These features, their location within the development envelope and the associated ecological sensitivity is described below. Also refer to **Figure 9.1**.

- » Areas and features of **very high sensitivity** were identified within the development envelope, which consist primarily of water features and include:
  - ∗ Major drainage features are located within the southern portion of the development envelope, within the eastern and western sections.
  - ∗ Three small pan features are present along the eastern boundary of the development envelope.

Areas of very high sensitivity are essentially no-go areas from a developmental perspective and should be avoided as much as possible. Where linear Very High sensitivity features need to be traversed, existing roads or disturbance footprints should be used as far as possible.

» Areas and features of **high ecological sensitivity** are located along and within the northern and southern sections of the development envelopes. These include water features, specific landscape characteristics and habitat, as described below:
   * Minor drainage features are primarily located within the northern section of the development envelope, with some also present within the south-eastern portion.
   * An area considered to be a plateau is located within the south-western section of the development envelope.
   * Rocky hills are located in the north-western corner of the development envelope.
   * Steep slopes are located within the south-western corner of the development envelope.
   * Thicket habitat is present in patches within the northern section of the development envelope, with one other patch present within the south-western corner of the envelope.

» Areas and features of **medium ecological sensitivity** are distributed within the entire extent of the development envelope, and include and are described as:
   * A hillside area is located within the south-western corner of the development envelope.
   * Thicket habitat is present in large tracts within the northern section of the development envelope. It must be noted that patches of thicket considered to be of a high sensitivity is located in this area (as described under the high ecological sensitivities above).
   * Valley landscapes are present mainly along the western boundary of the development envelope, with a small area located within the south-eastern corner. These features seems to be associated with the major and minor drainage features present within the development envelope.
   * Lowlands are present mainly within the central portion of the development envelope and seem to be associated with the major drainage lines located within this area.

Areas and features of **low ecological sensitivity** are located within majority of the development envelope which includes plains and transformed pockets. These areas are mainly located within the southern portion of the development envelope, from the thicket habitat moving south.

Further to the specific features and areas present the specialist has also considered the sensitivity and receptiveness of the Critical Biodiversity Areas (CBAs) located within the development area in terms of the placement of wind farm infrastructure (**Figure 9.2**). In terms of the 2019 Eastern Cape Biodiversity Plan, the majority of the development envelope is classified as ESA, while there is a small extent of CBA 1 within the central part of the site and some CBA 2 in the south and west of the site. The reasons layer associated with the CBA map indicates that the CBA 1 is based on the presence of two vegetation types (Albany Broken Veld and Kowie Thicket) as well as the presence of a listed reptile, which although not specified can be assumed to be the Albany Sandveld Lizard. Although this reptile was previously listed as Near Threatened, it has been down listed to Least Concern in the most recent assessment. The CBA 2 in the west of the site is based on the presence of two vegetation types (Albany Broken Veld and Bhisho Thornveld), while the CBA 2 in the south of the site is due to the presence of the same two vegetation types as well as the presence of a listed plant species which is not identified.

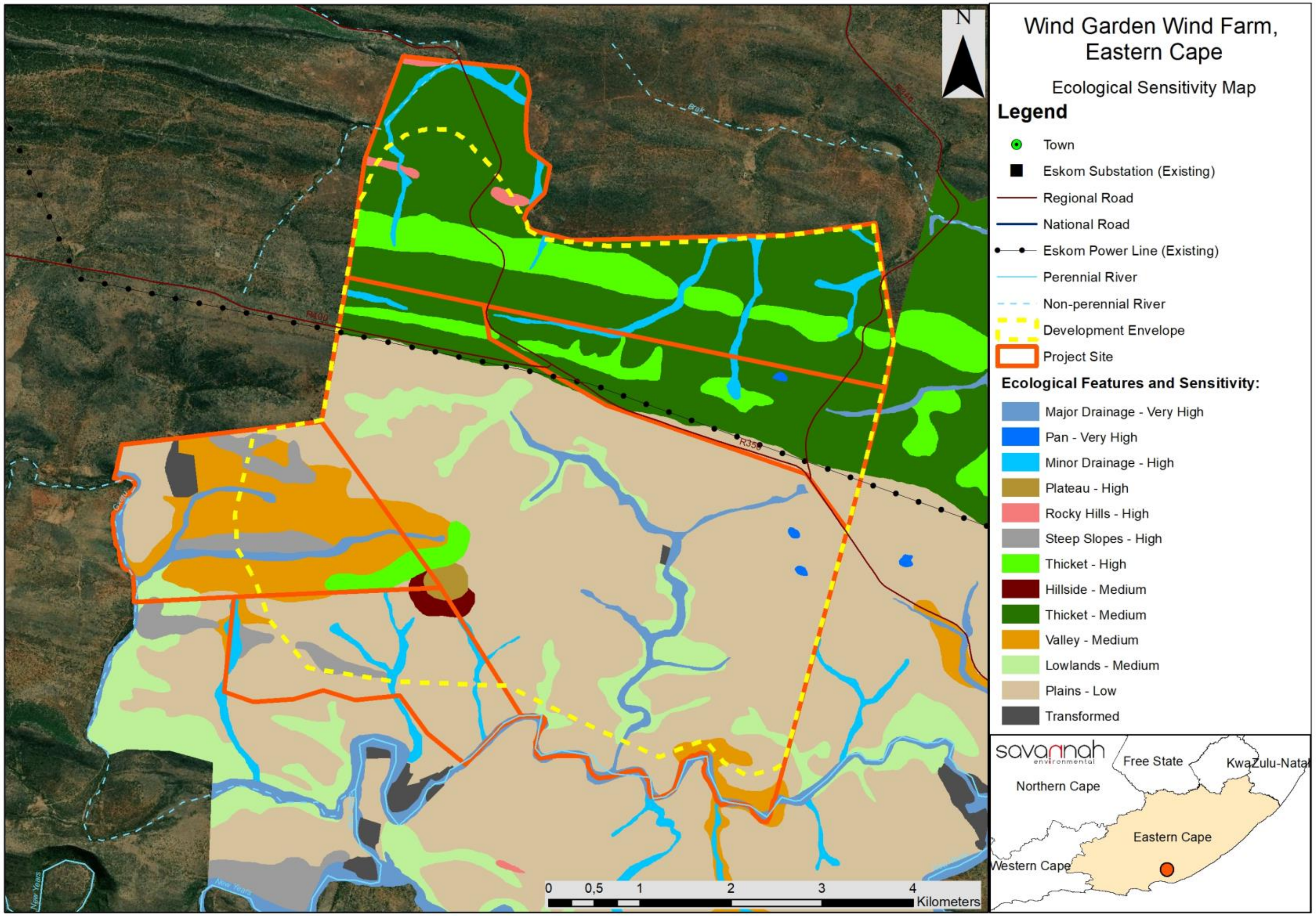


Figure 9.1: Ecological sensitivity map illustrating the sensitive ecological areas and features present within the development envelope and the ecological sensitivity ratings associated with the identified features

There is a single turbine within a CBA 1 and seven turbines within CBA 2 areas, with the majority of the remainder of the site being an ESA. The CBAs present are based largely on broad-scale ecological patterns and processes such as transitions between vegetation types. The development of the wind farm would add to transformation in the area and increase fragmentation of the landscape to some degree. However, the total footprint is low (<80ha) and very unlikely to compromise the overall ecological functioning of the affected CBAs and the receiving landscape in general. Since, the CBAs are not based on the known presence of specific biodiversity features of high value, the wind farm is considered largely compatible with biodiversity maintenance in the area and as such, the potential impact on the affected CBAs and ESAs is considered acceptable.

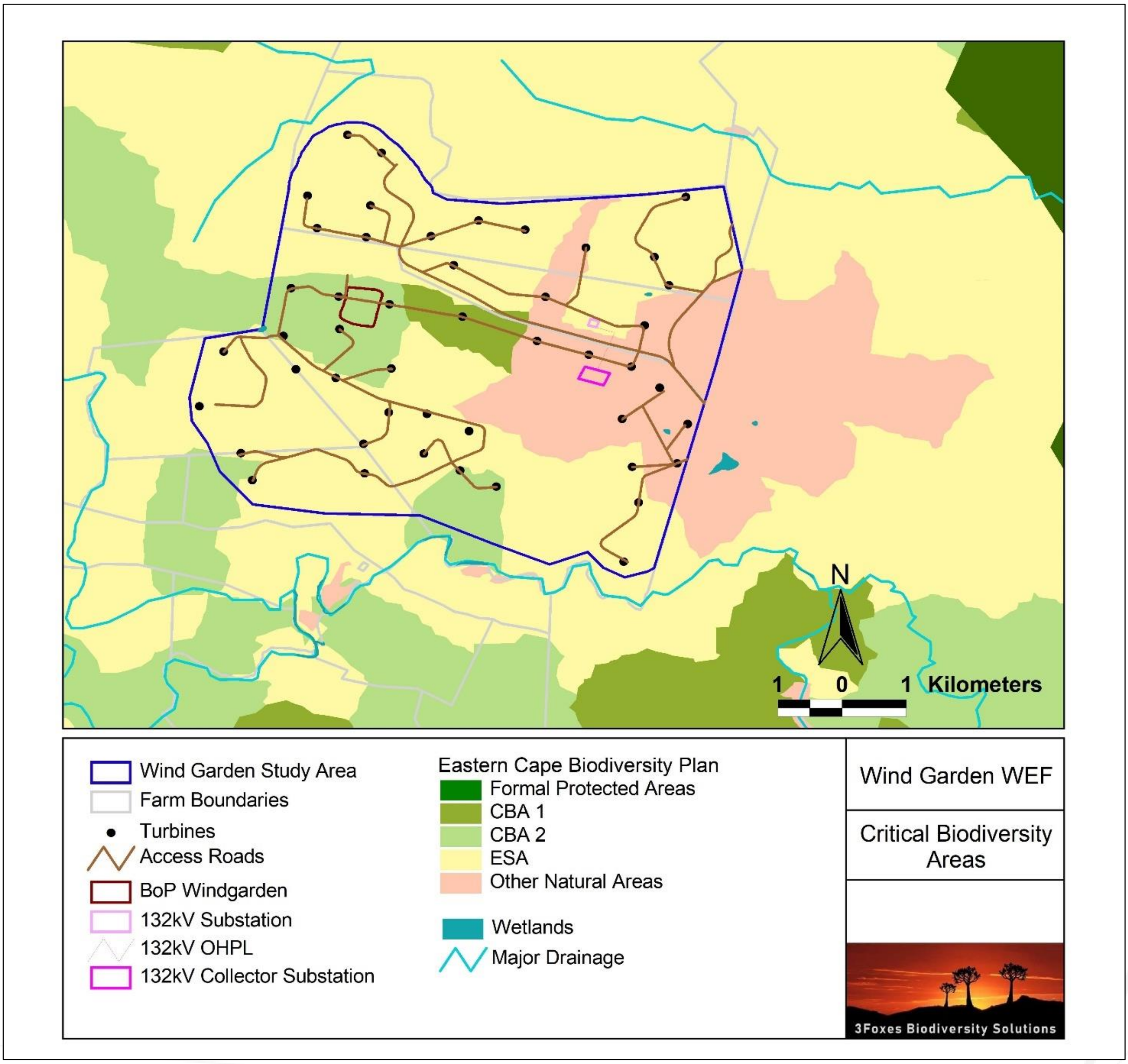


Figure 9.2: Critical Biodiversity Areas present within the Wind Garden Wind Farm development envelope

9.2.1 *Sensitivity Analysis against the development footprint*

Under the development footprint considered for the assessment, there are no turbines within the very high sensitivity areas. Although there is a small footprint of the proposed access roads within the very high sensitivity areas, this is along an existing road and is considered acceptable.

The ecologist has considered and calculated for each sensitivity rating present within the development area a limit of acceptable change. Limits of acceptable change for each sensitivity category are indicated below (**Table 9.1** and **Figure 9.3**) considering the proposed development footprint and the placement of infrastructure within specific areas of ecological sensitivity. This refers to the extent of on-site habitat loss within each sensitivity category that is considered acceptable for the development envelope, before significant ecological impact that is difficult to mitigate and which may compromise the development, is likely to occur. This provides a guide for ensuring that the spatial distribution of impact associated with the development is appropriate with respect to the sensitivity of the site.

The extent of the development footprint within each class is well within the specified acceptable limits and as such, there are no fatal-flaws from a purely technical standpoint in terms of the ecological sensitivity mapping. Although there is some footprint within the Very High sensitivity areas, this is along existing road alignments and actual habitat loss in these areas would be very low. The acceptability of the development must also be considered overall in terms of general ecological and cumulative impacts. However, given the avoidance of sensitive features at the site under the proposed development footprint and the relatively limited total estimated footprint, these are also within acceptable limits and no high post-mitigation impacts are likely to occur as a result of the development.

Table 9.1: Limits of acceptable change considering and the extent of the development footprint within the different sensitivity categories of the site.

Sensitivity	Acceptable Loss (%)	Site Extent (ha)	Acceptable Loss (Ha)	Development Footprint (Ha)	Actual Loss (%)
Low	10%	1562	156	54.5	3.49
Medium	5%	1325	66	29.0	2.19
High	2%	434	8.68	5.2	1.2
Very High/No-Go	<1%	90	0.9	0.04	0.044

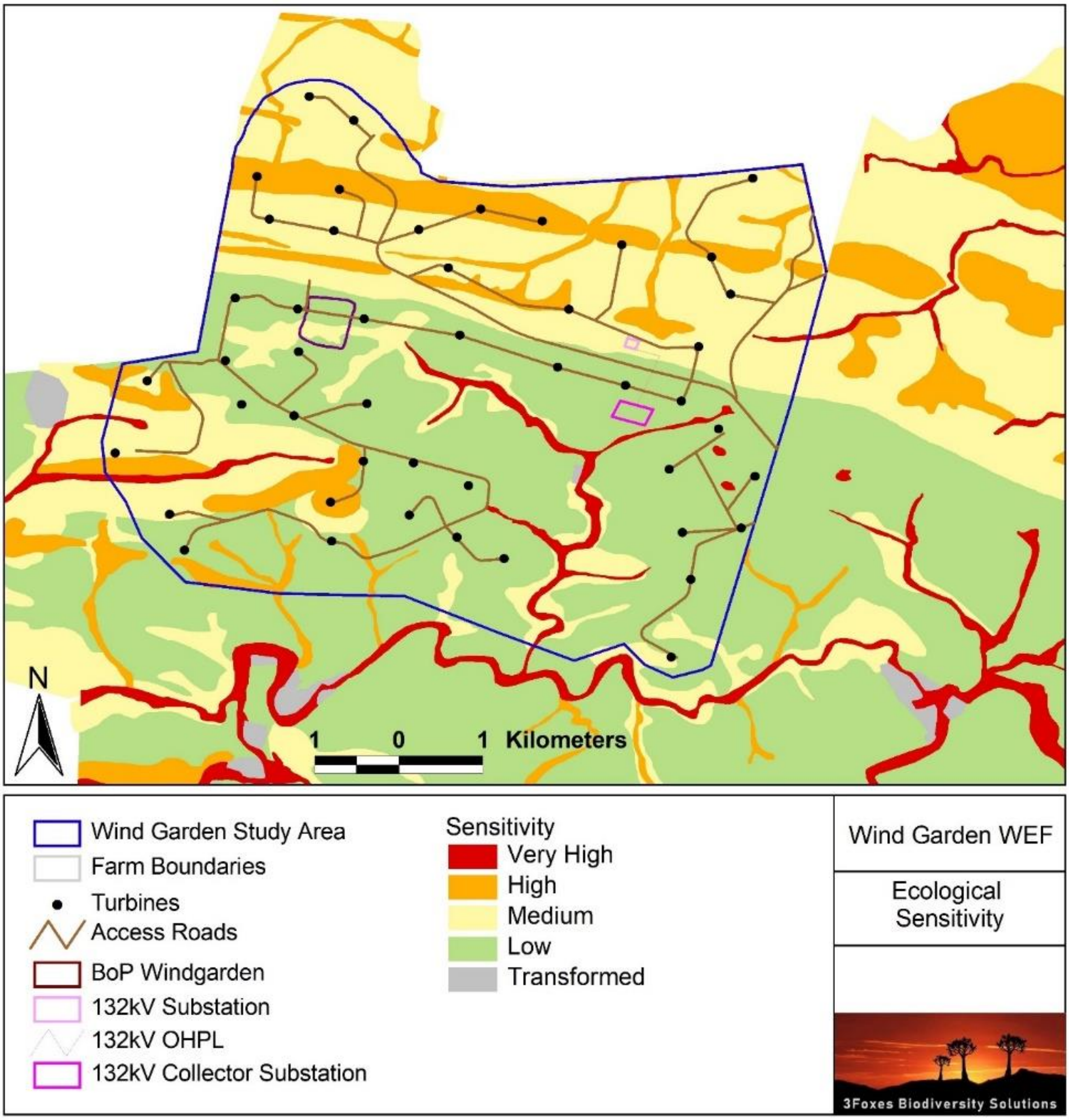


Figure 9.3: Ecological Sensitivity Map for the Wind Garden Wind Farm

9.3. Aquatic Features and Associated Sensitivity

Aquatic features have been identified within the project site and development envelope of the Wind Garden Wind Farm. These features include eight (8) delineated wetlands/pans and various watercourses which are distributed throughout the project site. Three of the pans are located outside of the development envelope to the north and east, with five pans located within the development envelope situated along the northern, eastern and western boundaries (**Figure 9.4**).

From a sensitivity perspective, the pans have been identified as being of a high aquatic sensitivity and a 57m high sensitivity buffer has been defined which needs to be avoided by the placement of infrastructure. The watercourses are ephemeral and only carried water for short periods. Therefore the observed systems do not support any wide riparian zones and the vegetation associated with these watercourses were between 0.25 m and 20 m wide and contain mostly terrestrial species. Based on this, a low aquatic sensitivity has been applied to these features.

9.3.1 Sensitivity Analysis against the development footprint

Considering the development footprint proposed for the Wind Garden Wind Farm, small adjustments to the placement of infrastructure is required, as recommended by the specialist. In some areas of the development footprint internal access roads cross the pan features and the associated 57m buffers. These roads require a slight adjustment to ensure the acceptability of the placement.

With regard to the watercourses, none of the complex riparian zones are located within the development footprint, with only small drainage lines and watercourses being affected by the access roads connecting the wind turbines. These systems have been rated as Moderately Modified, mostly due to grazing activities, and a low Ecological Importance and Sensitivity Score due to the features being ephemeral with little to no aquatic features. Even with these features being considered as low sensitivity, they must still be avoided by the larger infrastructure (turbines, hardstands and buildings/substations). Therefore, all road crossings of these small drainage features are considered to be acceptable from an aquatic perspective. The Balance of Plant area is located within such a low sensitivity watercourse and therefore the infrastructure placement must be adjusted to ensure avoidance, especially with the areas which house large infrastructure such as buildings.

With the above-mentioned required minor adjustments, the development footprint will be considered as acceptable from an aquatic perspective.

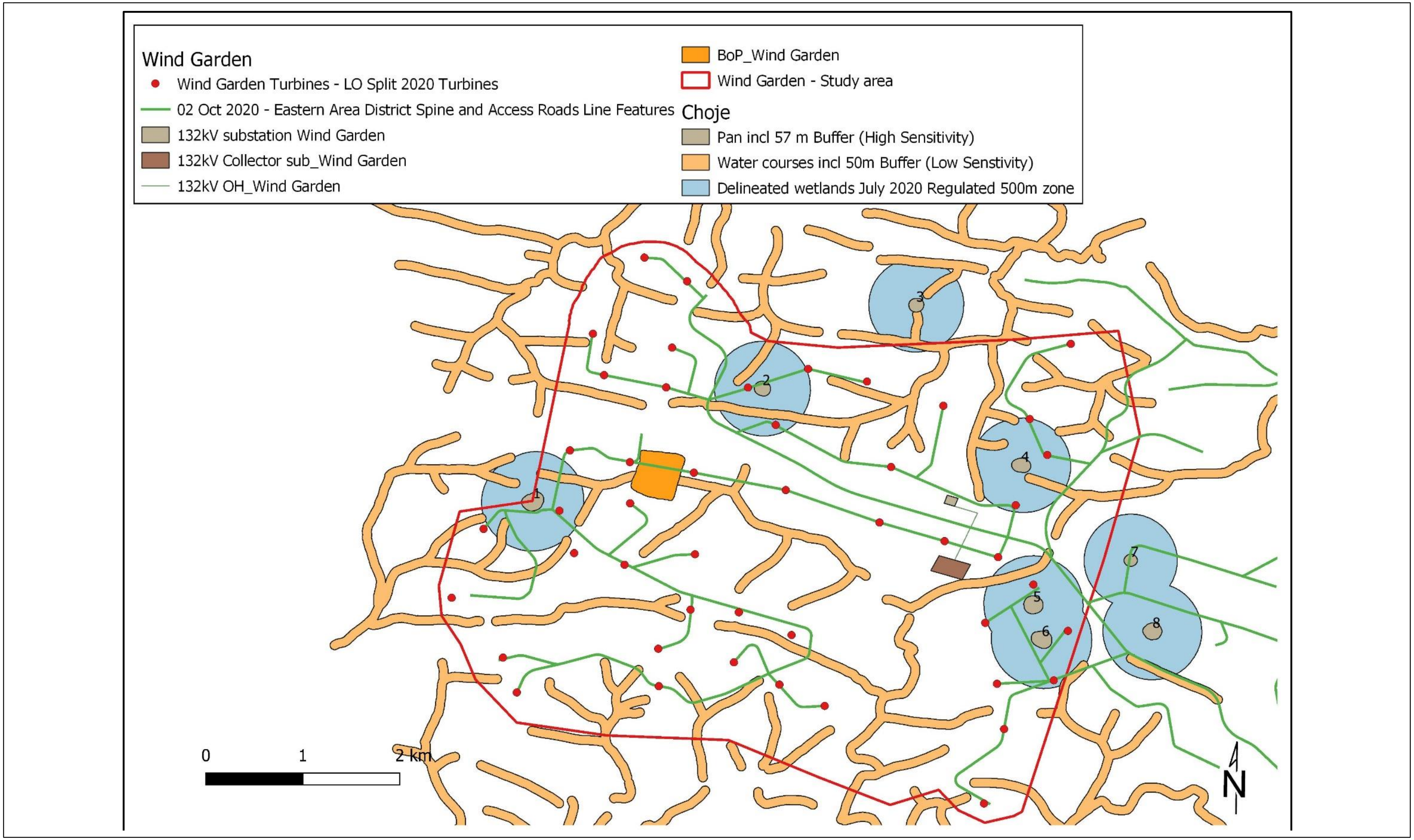


Figure 9.4: Aquatic sensitivity map showing the sensitive aquatic features identified and the associated sensitivity rating, overlain with the development footprint considered for the Wind Garden Wind Farm

9.4. Avifauna and Associated Sensitivity

Key avifaunal sensitivities have been identified within and within the surrounding area of the project site. Furthermore, key species have been identified as those of higher conservation value that would be at risk from the proposed Wind Garden Wind Farm. Through the pre-construction monitoring undertaken (from June 2019 – August 2020) a range of sensitivities have been identified. These sensitivities include:

» One active Verreaux's Eagle nest was confirmed 3.4km from the nearest proposed turbine location. Another potential site was found 2.8km to the north of the nearest proposed turbine location. The vantage point (VP) surveys did not indicate any areas of notably higher flight activity.

» Two territories for Martial Eagle were found in proximity to the wind farm, and a third further to the west outside the surveyed area. A nest site on the eastern edge of the survey area (7.2km from the nearest Wind Garden Wind Farm turbine location) was recorded in May 2019 with prey delivery and the second at a new location, 4.0km from the nearest Wind Garden Wind Farm turbine location was recorded in June 2020. The VP surveys did not indicate any areas of notably higher flight activity.
»
» A pair of African Fish Eagle was found nesting 1.4km from the nearest Wind Garden Wind Farm turbine location, but very little flight activity was observed through the wind farm site. Though this species is of lower conservation importance (Least Concern at both international and South Africa level), as a larger raptor it is likely to be at higher risk of collision.
»
» A breeding location for Crowned Eagle was identified 4km from any Wind Garden Wind Farm turbine location; however this species was not observed flying through the wind farm site. This species is of lower conservation importance but as a larger raptor may be at increased risk of collision.
»
» Blue Crane, Denham's Bustard, Southern Black Bustard and Secretarybird were all recorded during the baseline surveys within/in proximity to the Wind Garden wind Farm site. All are species of higher conservation importance. No particular concentrations of flight activity of any of these species was noted in this area during the VP surveys, and all were widely scattered at low density across the survey area during the vehicle transect surveys with no particularly important areas identified.
»
» Two Lanner Falcon nests adjacent to the site were reported previously, though the 2019-20 surveys did not find either territory to be occupied. One is 4.3km from the nearest proposed wind turbine location for the Wind Garden Wind Farm, the other 8.7km (both are historic records). This species was recorded on only three occasions during the VP surveys and three times during the road transect surveys, with no evidence found of nesting within the survey area.
»
» There was a very low level of use by the Black Harrier in the survey area and no evidence of breeding within the Wind Garden Wind Farm site was recorded. In 2019, a single harrier was regularly seen hunting on the road verges of the R335 located within the Wind Garden Wind Farm project site. The harrier however disappeared and returned a few months later and then left again. It was never recorded in 2020.

Considering the avifauna features identified within the project site and surrounding areas, specific buffers have been recommended by the specialist for the placement of infrastructure, as well as buffers where turbine placement must be avoided and mitigation increased (**Figure 9.5**).

The implementation of buffers from known eagle nest sites were put in place primarily to reduce collision risk, but also removes the possibility of disturbance to these eagle nest sites. The main residual disturbance issue would therefore be the loss of foraging habitat around the wind farm as a result of displacement. From experience at existing wind farms, birds are likely to avoid the close proximity of the wind turbines.

For the Verreaux's Eagle nests a buffer of 1.5km has been recommended which is the area around the nest sites within which no turbines must be placed (i.e. no-go area for the placement of turbines). Furthermore, a 3km buffer has been identified within which the number of turbines must be minimised and caution must be taken. It must be noted that none of the nests are present within the development envelope and development footprint. A 3km caution buffer does however infringe into the north-western corner of the development envelope with one (1) turbine proposed to be placed here. This is considered acceptable with the implementation of the relevant mitigation measures as recommended by the specialist

For the Martial Eagle nests a buffer of 2.5km has been recommended which is the area around the nest sites within which no turbines must be placed (i.e. no-go area for the placement of turbines). Furthermore, a 5km buffer has been identified within which the number of turbines must be minimised and caution must be taken. It must be noted that none of the nests are present within the development envelope and development footprint. A 5km caution buffer does however infringe into the southern section of the development envelope with twelve (12) turbines proposed to be placed here. This is considered acceptable with the implementation of the relevant mitigation measures as recommended by the specialist

A 1km buffer has also been identified for other large eagle nests (Crowned Eagle and African Fish-Eagle) identified. The 1km buffers are considered to be no-go areas for the placement of turbines. It must be noted that the 1km buffer of a African Fish-Eagle nest site infringes into the southern boundary of the Wind Garden Wind Farm development envelope, the other nests are to the west and outside of the development envelope. No turbines are proposed within these buffer areas.

9.4.1 Sensitivity Analysis against the development footprint

Considering the placement of turbines within the development area, there are thirteen (13) turbines located within cautionary buffers which require the minimisation of turbine placement within these areas. The specialist has indicated that the development as proposed would be acceptable for authorisation, subject to the implementation of the recommended appropriate mitigation measures. Considering this, the specialist is not requiring further minimisation of turbines within the cautionary buffers of 3km and 5km, respectively. However, the specialist does recommend that all turbines located within the cautionary buffers have a single blade painted black during construction. Given this is a novel mitigation, which has been proven to be effective internationally, a post-construction monitoring scheme should be implemented to determine its effectiveness.

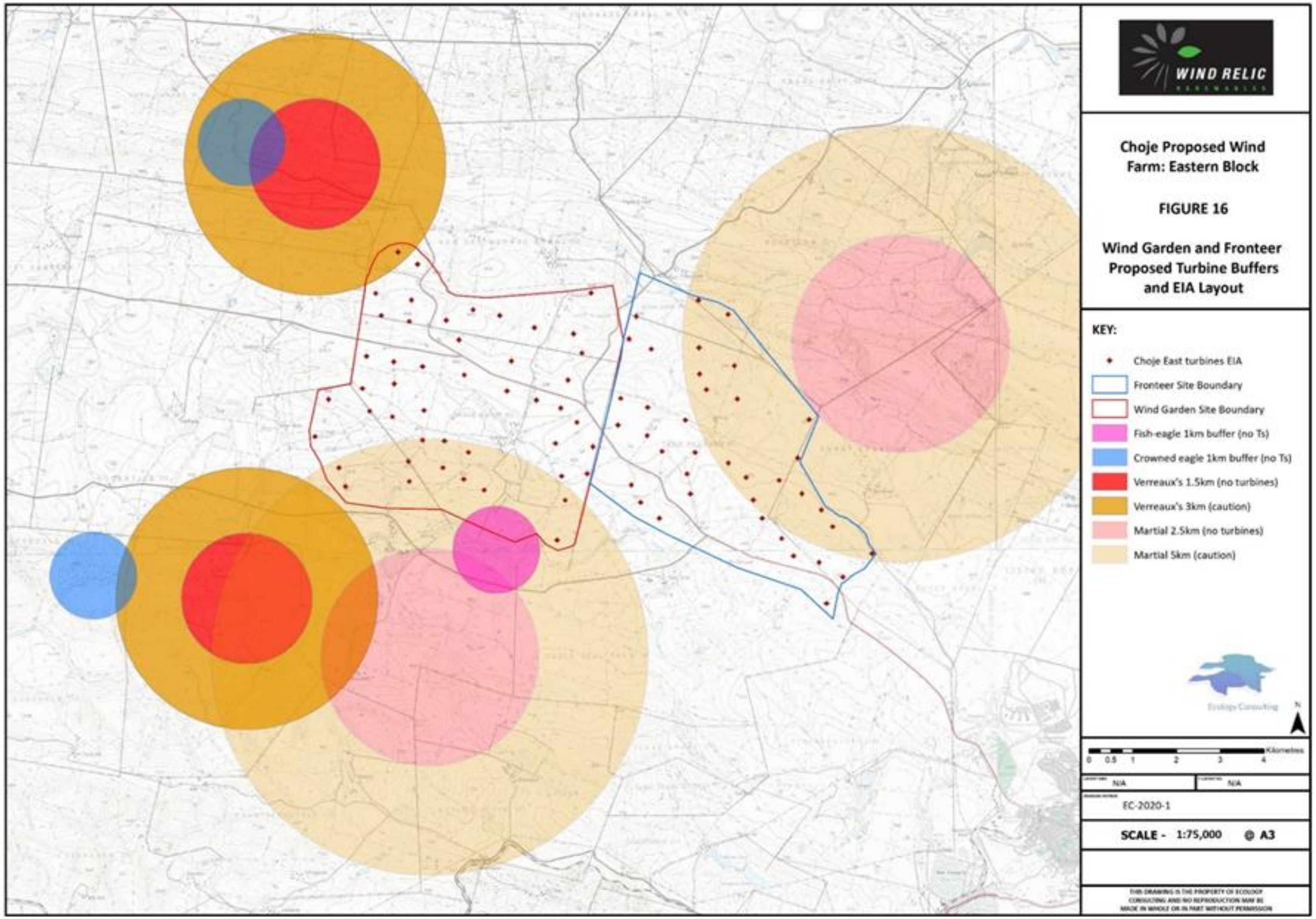


Figure 9.5: Areas of avifaunal sensitivity identified within and within the surrounding area of the Wind Garden Wind Farm development envelope, Fronteer Wind Farm is also illustrated on the map

9.5. Bats and Associated Sensitivity

Key habitat features have been identified for bats within the development envelope. These habitat features present specific uses and opportunities for bats including roosts, foraging resources and commuting resources. Roosting features within the landscape include rocky crevices, tunnels, trees and buildings. Foraging resources include trees, drainage areas, cultivated areas and aquatic habitat. Commuting resources include drainage areas due to the linear nature of the features. These specific features are considered to be sensitive from a bats perspective due to the opportunities presented (i.e. roosts, foraging and commuting).

All features, except for drainage lines and some specific roosts, were buffered by 260m to turbine base (i.e. 200m to blade tip based on turbines with a hub height of 120m (the lowest being considered)) and blade lengths of 80m (the longest being considered). Drainage lines were buffered by 100m to blade tip. A tunnel roost entrance was buffered by 2.5km, even though only 100 least concern, low risk bats are currently present in the roost (which would require a 1km buffer), the roost has been used in the past by Natal long-fingered bats and it is a regionally important roost, and is an active site for bat research for a number of local and international universities. No turbines are allowed to be placed within these buffers (i.e. no-go areas), including the blades (**Figure 9.6**). Adherence to these buffers is the primary mitigation measure to avoid impacts.

Construction of associated infrastructure is permitted in the no-go areas (except roost buffers, where no construction can take place), but should be avoided as much as possible.

9.5.1 Sensitivity Analysis against the development footprint

The development footprint proposed and assessed adheres to the no-go areas (buffers)[17] and is in accordance with current knowledge on how to promote bat conservation with respect to wind energy by minimizing risk. All buffers are to blade tip.

In terms of the grid connection infrastructure the specialist has recommended that adherence must be given to the bat sensitivity and no-go zones by trying to avoid building the collector substation and switching station within these areas (especially in mountainous and woodland areas) and strictly avoiding roost buffered areas.

[17] It must be noted that **Figure 9.6** illustrates that turbines are located within buffer areas, however this is only due to the scale of the map. The development footprint adheres to the no-go buffers as indicated by the specialist.

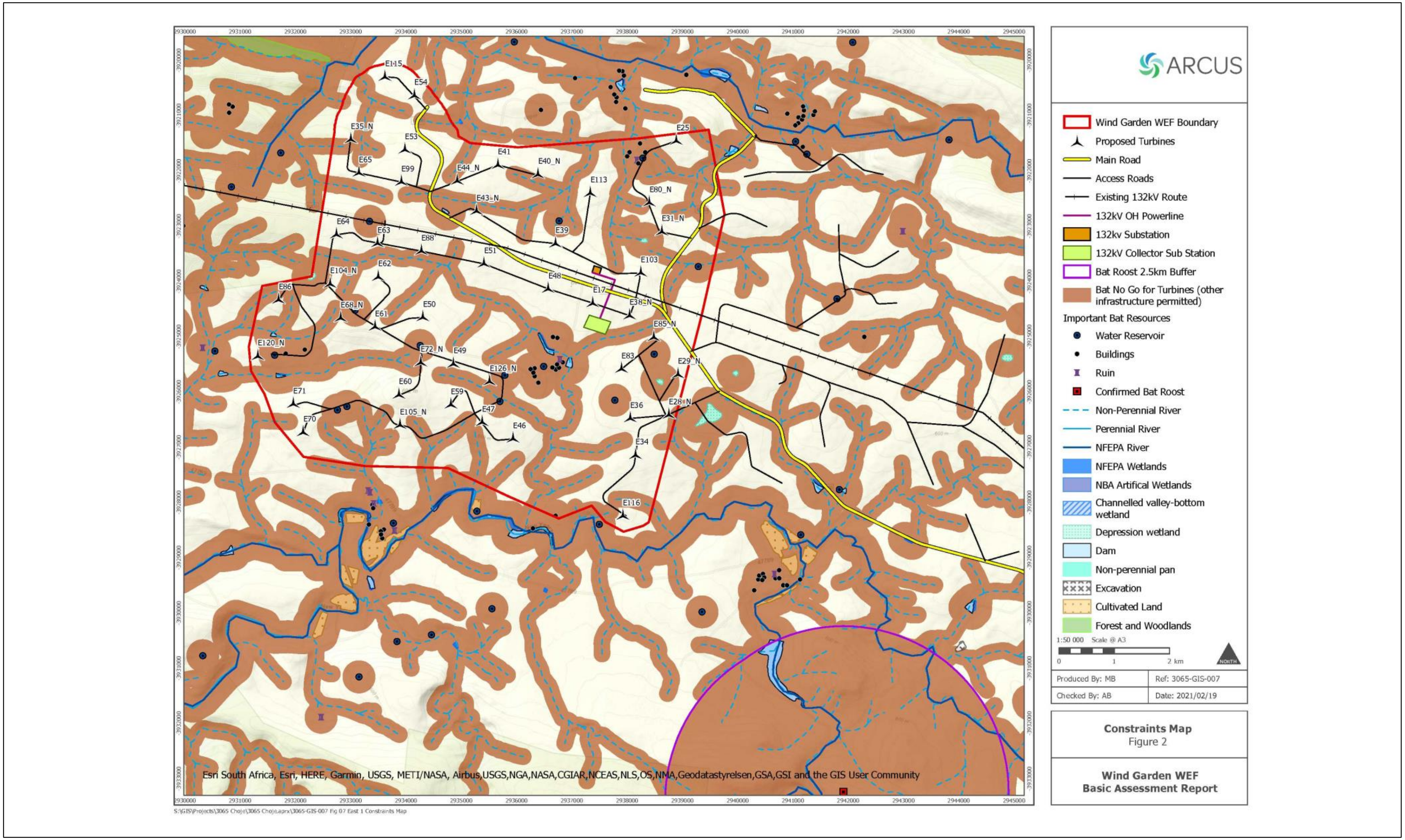


Figure 9.6: Bat sensitivity map showing all no-go area buffers which needs to be considered for the placement of wind turbines

9.6. Agriculture and Associated Sensitivity

Within the development envelope of the Wind Garden Wind Farm, areas of high, moderate/medium and low and very low sensitivity have been identified. The basis for these sensitive areas are linked to the baseline findings of the area and the DEFF Screening Tool Report (**Appendix R(1)**).

The development envelope is considered to be mainly of a low and very low agricultural sensitivity, with some medium sensitivity patches and high sensitivity patches present within the central section of the development envelope. Refer to **Figure 9.7** and **Figure 9.8**.

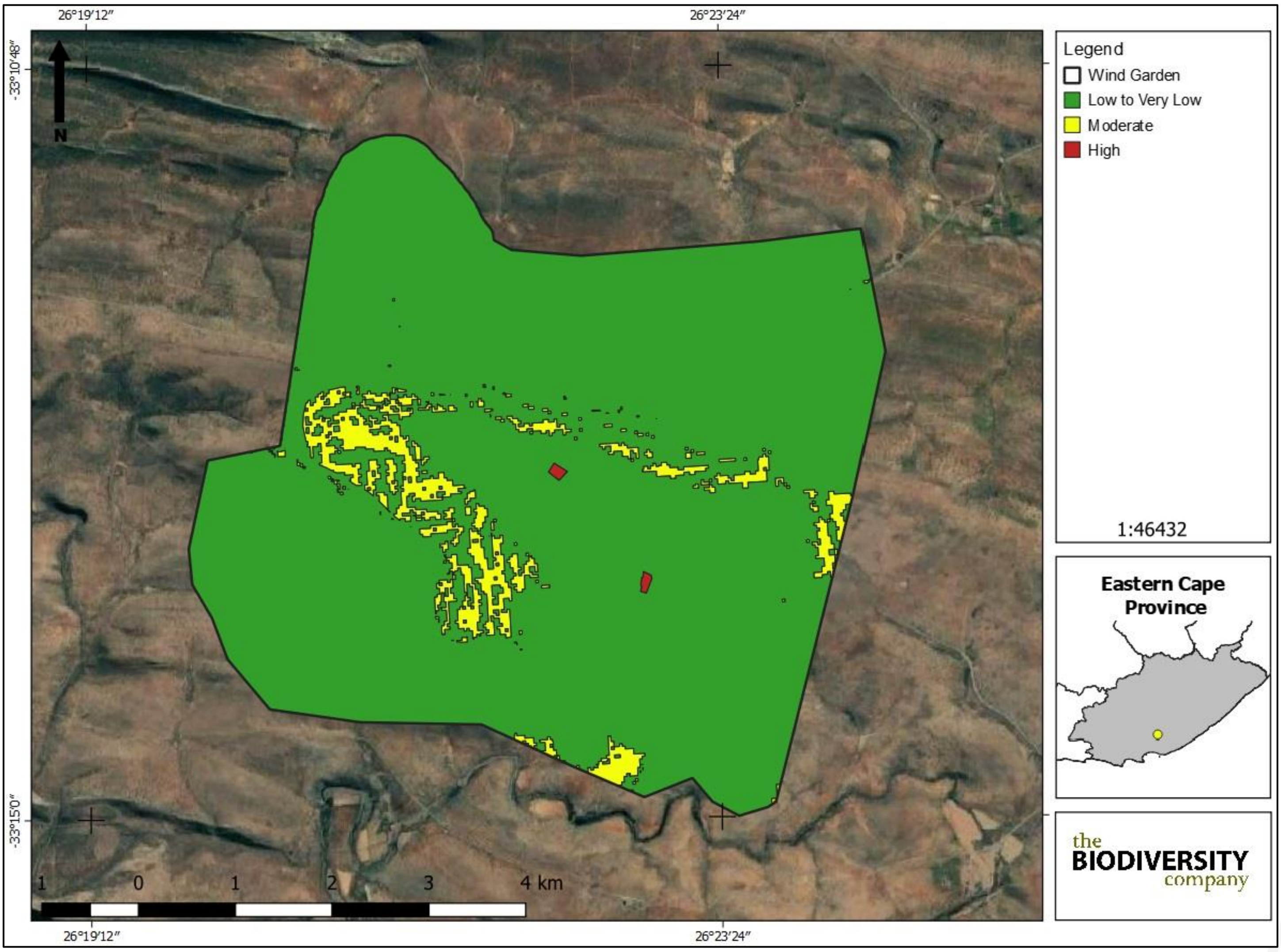


Figure 9.7: Agricultural Sensitivities associated with the Wind Garden Wind Farm development envelope

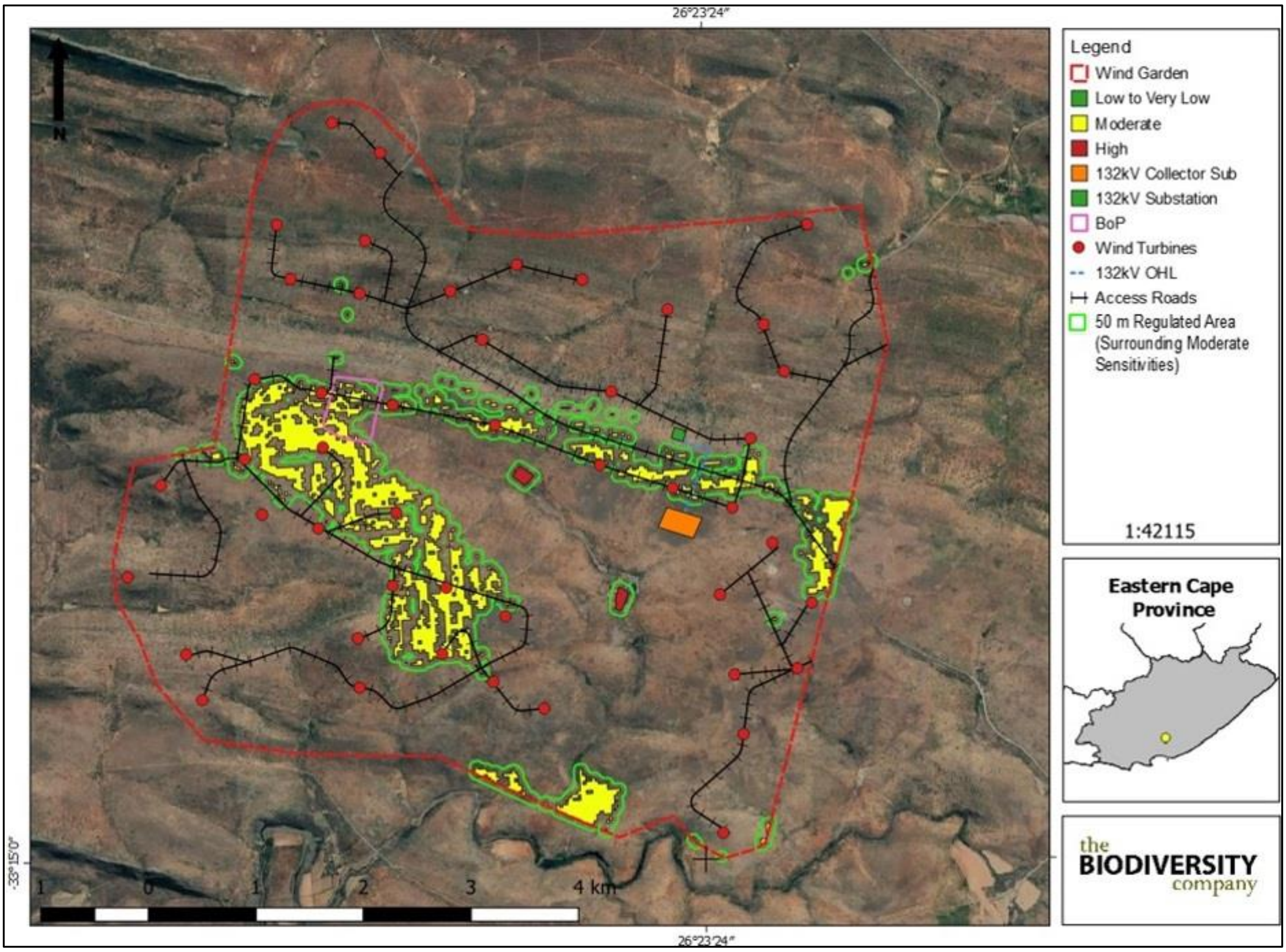


Figure 9.8: Agricultural Sensitivities associated with the Wind Garden Wind Farm development envelope overlain with the proposed development footprint assessed

9.6.1 Sensitivity Analysis against the development footprint

The specialist has considered the placement of the infrastructure associated with the development envelope in terms of the sensitivities identified.

For the placement of the proposed collector and switching substations it is confirmed that the footprints of the infrastructure will be placed within areas of a low sensitivity, with the 50m regulated area surrounding "Moderate" sensitivities being located outside of the footprint areas. Therefore, the placement of the infrastructure is considered to be acceptable.

For the placement of the wind turbines it is confirmed that the majority of the turbines are located within the low and very low sensitivity areas, with only nine located within 50m of moderate sensitivity resources. The placement of the turbines as proposed is considered to be acceptable.

In terms of linear infrastructure proposed, various sections of the access roads and the majority of the power line extent crosses through moderate sensitivity soil resources. The placement of the infrastructure is considered to be acceptable.

The extent of the Balance of Plant footprint is characterised by a combination of low and moderate sensitivities (although the majority of the area comprises of "Moderate" sensitivities). It is however confirmed that the placement of the infrastructure is acceptable from an agricultural perspective.

No areas of high sensitivity were identified within proximity to any of the proposed activities associated with the Wind Garden Wind Farm. Considering the lack of sensitivity and the measures put in place in regard to stormwater management and erosion control, it is the specialist's opinion that all activities will have an acceptable impact on agricultural productivity. Also, no adjustment of infrastructure placement is required.

9.7. Heritage Resources and Associated Sensitivity

Various heritage resources were identified within the project site and development envelope which includes historical structures and graves and grave yards. Palaeontological aspects were also surveyed, however no visible evidence of fossiliferous outcrops was found.

Twelve (12) sites were identified and of these sites, nine (9) sites (EWF1-01 to EWF1-09) consist of structures (Farmhouses, Labourer houses, farm sheds and kraals), and three (3) sites contain graves (EWF1-10 to EWF1-12).

In terms of the historical structures, most finds were rated as not conservation worthy and of no heritage significance. The ruins of one (1) house (EWF1-07) was identified, and has a low heritage significance. A farmstead (EWF1-04) was also identified and has been rated to be of a medium heritage significance.

A total of three (3) burial grounds (EWF1-10 – EWF1-12) have been identified and are considered to be of a high heritage significance.

The locations of the heritage resources are included in **Figure 9.9**.

9.7.1 Sensitivity Analysis against the development footprint

Specific buffers for the avoidance of impacts on the heritage resources were identified. These are listed below:

» Historical Structures (EWF1-04) that were rated as high heritage significance must include a no-go-buffer-zone of at least 500m from the outer perimeter of the farmstead (which is currently occupied) from the closest infrastructure (including substation, turbines, facilities and roads) (**Figure 9.10**). No infrastructure proposed as part of the development footprint is located within this buffer area.
» Graves and Burial grounds (EWF1-10 to EWF1-12) must be demarcated with a 30-meter no-go-buffer-zone and the graves should be avoided and left *in situ* (**Figure 9.11**). No infrastructure proposed as part of the development footprint is located within the buffer areas.

It is confirmed by the specialist that turbines have been placed in acceptable locations considering the identified heritage resources.

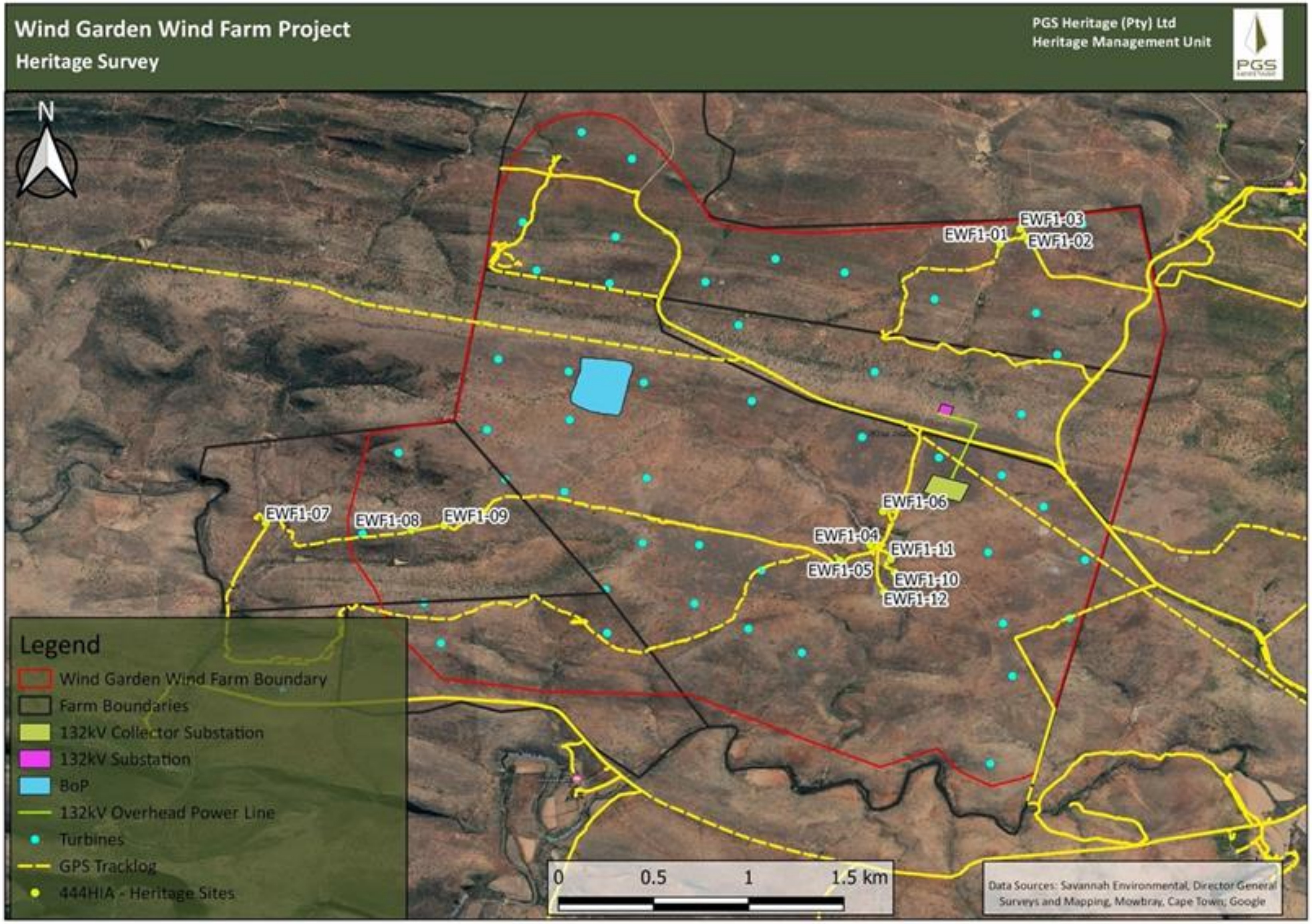


Figure 9.9: Heritage resources identified within the Wind Garden Wind Farm project site and development envelope

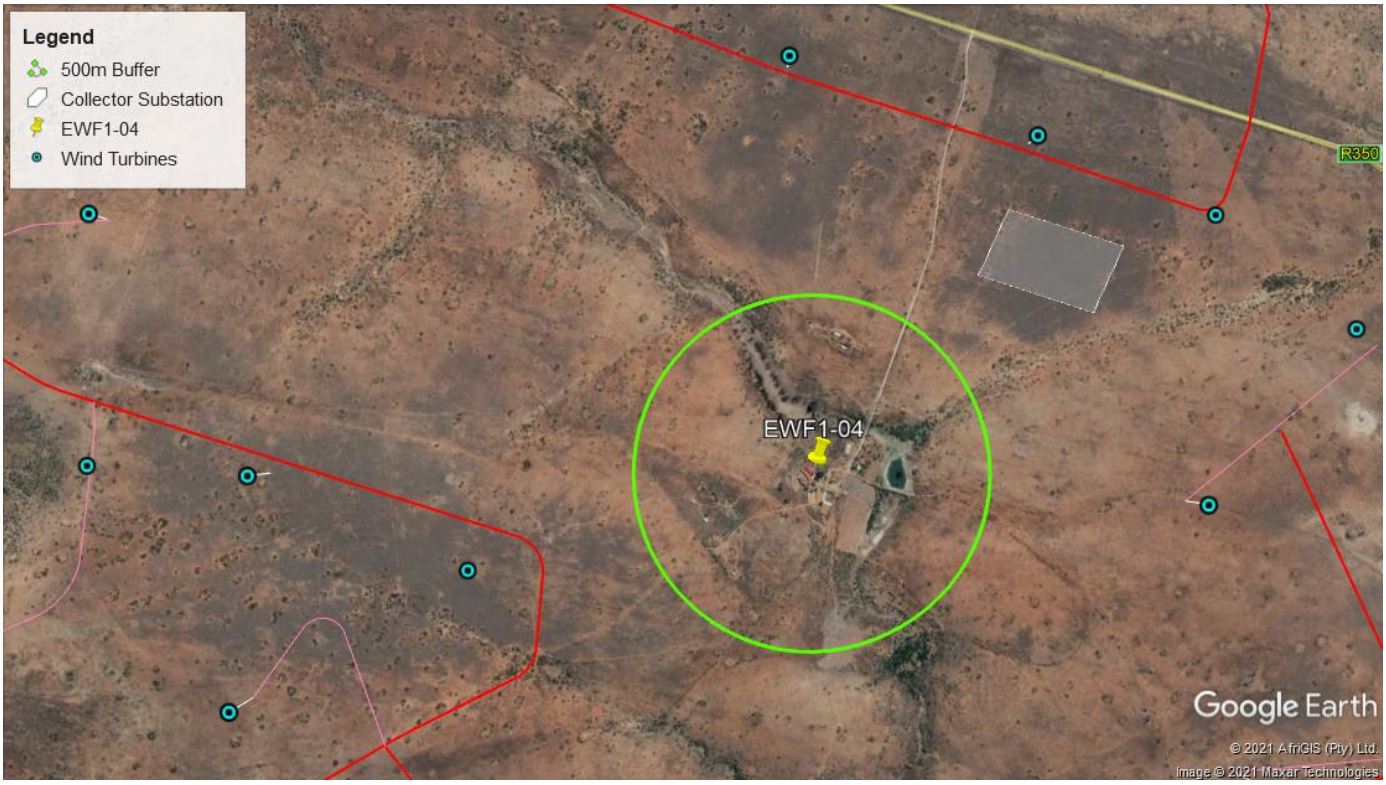


Figure 9.10: A 500m no-go buffer around EWF1-04. No infrastructure is proposed within this area.

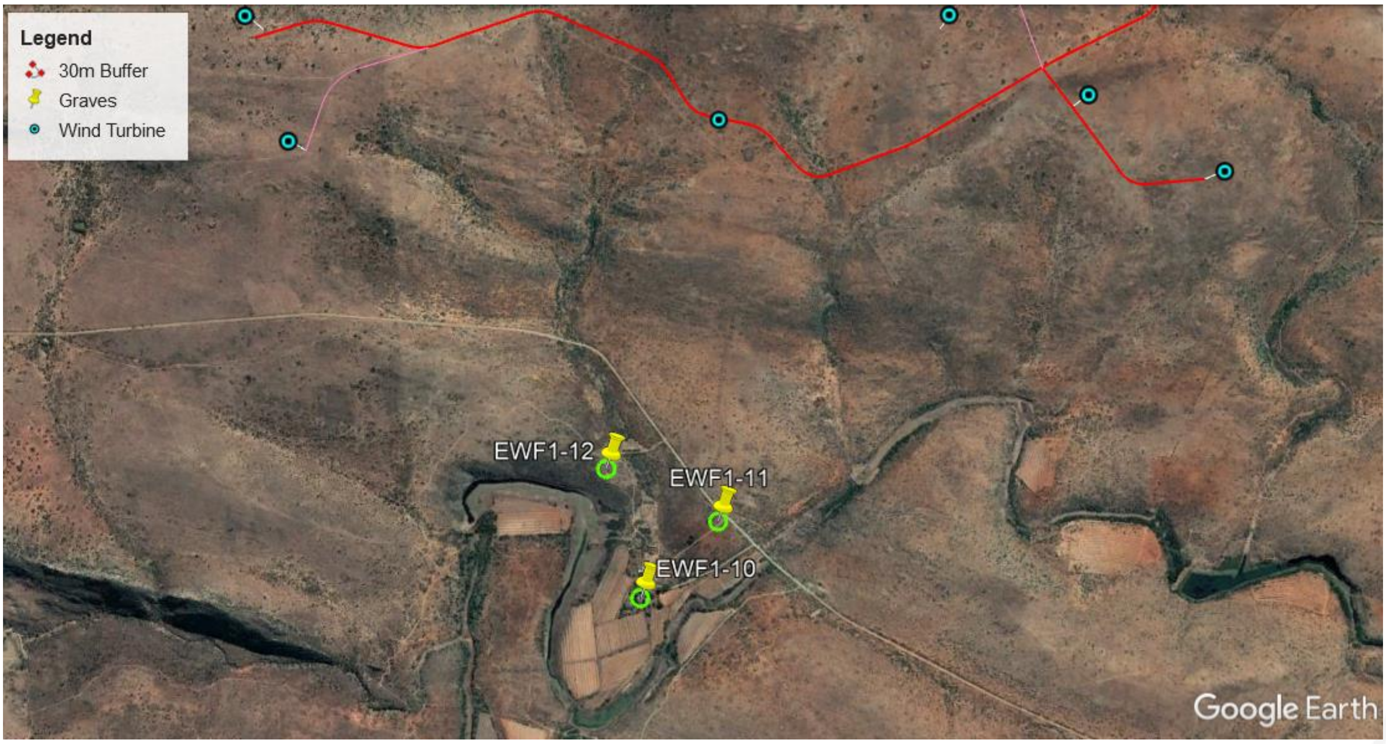


Figure 9.11: A 30m no-go buffer located around graves identified (EWF1-10 to EWF1-12). No infrastructure is proposed within this area.

9.8. Noise and Associated Sensitivity

Noise sensitive developments (NSDs) were identified within and within the surrounding area of the development envelope. **Figure 9.12** illustrates the NSDs identified and the potential sensitivity in terms of noise that may be experienced at the locations.

9.8.1 Sensitivity Analysis against the development footprint

Based on the results of the Noise Impact Assessment no adjustments in terms of the proposed development footprint is required.

9.9. Overall Sensitivity Measured Against the Development Footprint and Implementation of the Mitigation Hierarchy

Considering the development envelope and the features and areas of sensitivity identified and applicable to the placement of the development footprint, there are certain aspects of the development footprint that need to be adjusted to optimise the layout and ensure that the facility will be appropriately placed within the affected environment.

The only specialist field which has indicated that adjustments are required is aquatic ecology. The adjustments required is the shifting of the roads to avoid the pan areas, including the associated buffers (which are of a high sensitivity), and the shifting of the Balance of Plant area which is located within a watercourse. The watercourse is of low sensitivity, however the placement of large infrastructure within this area is not considered to be acceptable.

An optimised layout, will therefore be provided by the developer and considered in Chapter 12 for the development of the Wind Garden Wind Farm. This approach is in line with the mitigation hierarchy which considers avoidance to be the best option for mitigation of impacts.

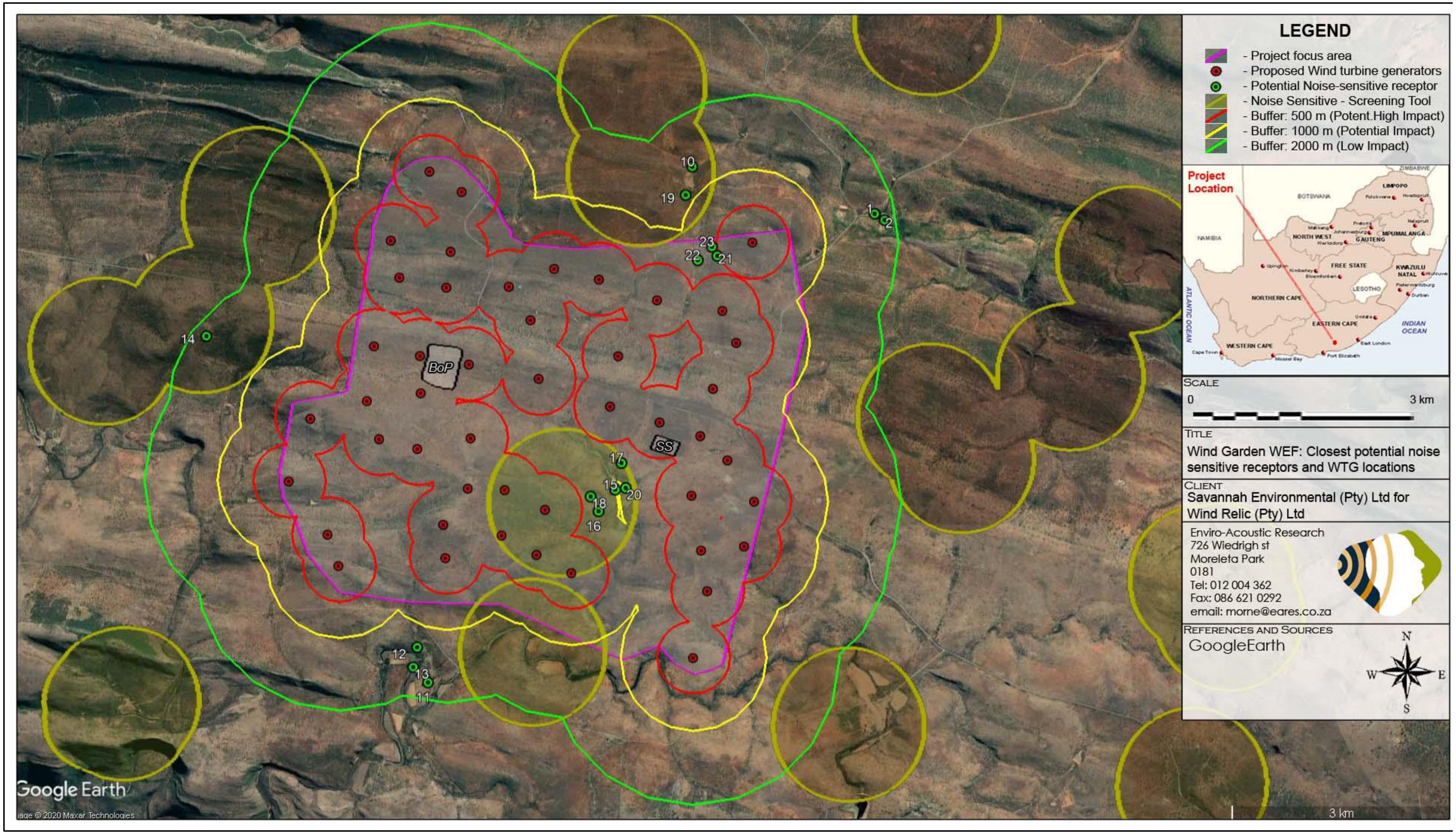


Figure 9.12: Noise site sensitivity and closest identified noise sensitive developments in relation to the Wind Garden Wind Farm

CHAPTER 10: ASSESSMENT OF IMPACTS

This chapter serves to assess the significance of the positive and negative environmental impacts (direct, indirect, and cumulative) expected to be associated with the development of the Wind Garden Wind Farm and associated infrastructure. This assessment has considered the construction of a wind farm with a contracted capacity of up to 264MW, within a development footprint[18] of approximately 66.6ha. The development footprint includes the following infrastructure:

» Up to 47 wind turbines with a maximum hub height of up to 120m. The tip height of the turbines will be up to 200m.
» A 132kV switching station and a 132/33kV on-site collector substation to be connected via a 132kV overhead power line (twin turn dual circuit). The wind farm will be connected to the national grid through a connection from the 132/33kV collector substation via the 132kV power line which will connect to the 132kV switching station that will loop in and loop out of the existing Poseidon – Albany 132kV power line which will be located inside of the project site.
» Concrete turbine foundations and turbine hardstands.
» Temporary laydown areas which will accommodate the boom erection, storage and assembly area.
» Cabling between the turbines, to be laid underground where practical.
» Access roads to the site and between project components with a width of approximately 4,5m. The main access points will be 8m wide.
» A temporary concrete batching plant.
» Staff accommodation (temporary).
» Operation and Maintenance buildings including a gate house, security building, control centre, offices, warehouses, a workshop and visitor's centre.

The full extent of the project site (~4336ha) and development envelope (~3400ha) was considered through the BA process. On-site sensitivities were identified through the review of existing information, desk-top evaluations and field surveys. The identification of a development footprint for the wind farm within the project site was undertaken by the developer through consideration of the sensitive environmental features and areas and application of a mitigation hierarchy which aimed at avoidance as the first level of mitigation. The specialist assessments undertaken as part of this BA process have considered the entire project site and development envelope, as well as the proposed development footprint (refer to **Figure 10.1**) which was provided by the developer.

18 The development footprint of the Wind Garden Wind Farm will be located within the ~3400ha development envelope and will be a much smaller area within which the wind turbines and associated infrastructure will be constructed and operated in. The development footprint has been subject to detailed design by the developer through the consideration of sensitive environmental features identified by independent specialists, which need to be avoided by the wind farm.

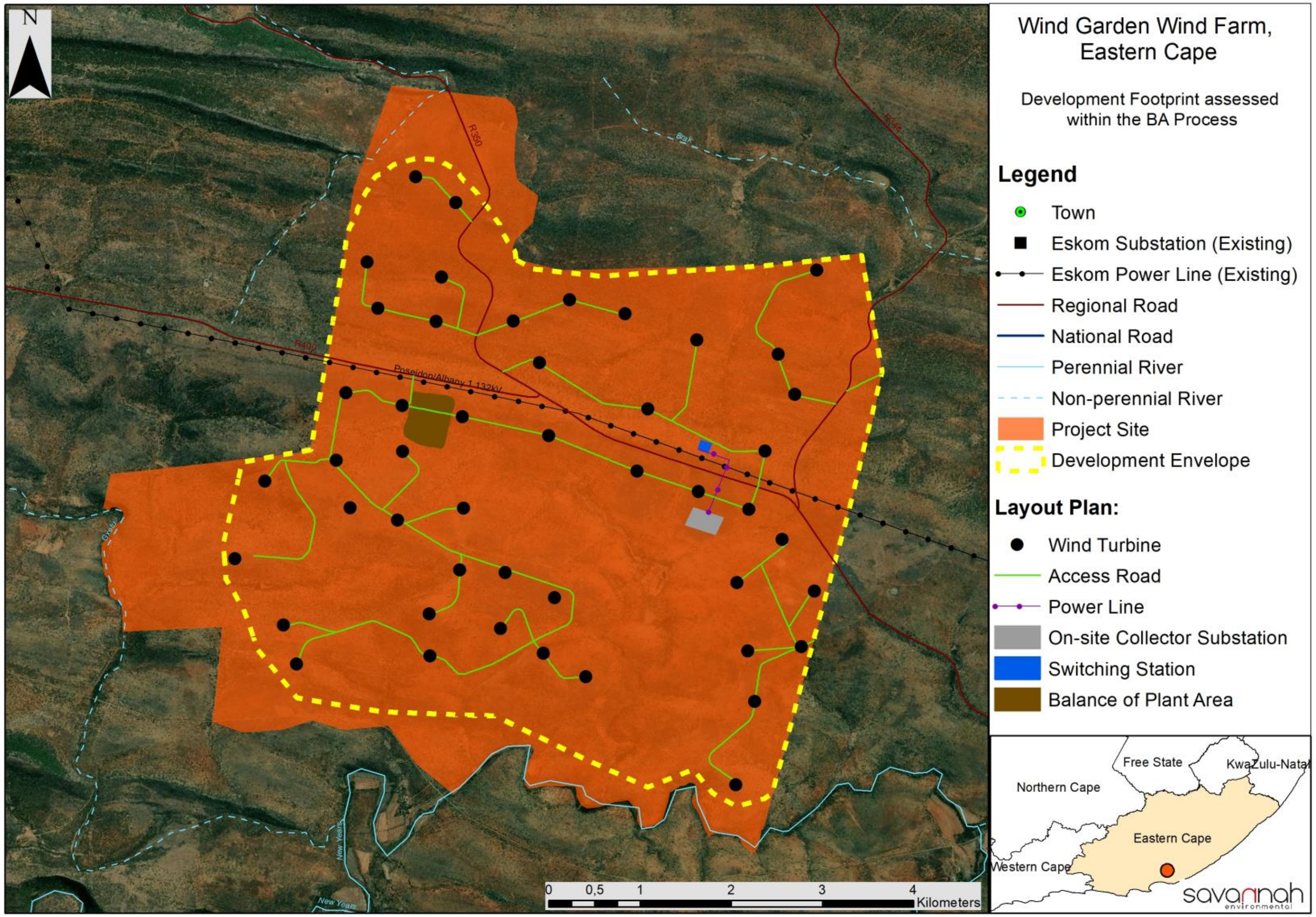


Figure 10.1: Map showing the development envelope within which development footprint for the Wind Garden Wind Farm and associated infrastructure has been placed and assessed as part of this BA process (refer to **Appendix O** for A3 maps).

The sections which follow provide a summary of the specialist input for each field of study in terms of the impacts which are expected to occur, the significance of the impacts, the opportunity for mitigation of the impacts to an acceptable level and the appropriate mitigation measures recommended for the reduction of the impact significance. Note that impacts associated with decommissioning are expected to be similar to those associated with construction activities. Therefore, these impacts are not considered separately within this chapter. This section of the report must be read together with the detailed specialist studies contained in **Appendix D** to **M**.

Where specific features or areas of sensitivity have been identified which need to be considered for the placement of infrastructure, these features are analysed and detailed in Chapter 9, which provides a sensitivity analysis of the project site and development envelope. The impact assessment provided below is based on the sensitivity analysis and the outcomes thereof.

The development of the Wind Garden Wind Farm will comprise the following phases:

» *Pre-Construction and Construction* – will include pre-construction surveys; site preparation; establishment of access roads, construction camps, batching plant, laydown areas, temporary staff accommodation, and facility infrastructure; construction of foundations involving excavations and cement pouring; the transportation of components/construction equipment to site, manoeuvring and operating cranes for unloading and installation of equipment; laying cabling; and commissioning of new equipment and site rehabilitation. The construction phase for the Wind Garden Wind Farm is dependent on the number of turbines to be erected, but is estimated at 30 months.
» *Operation* – will include the operation of the wind farm and the generation of electricity, which will be fed into the national grid via the 132kV switching station and a 132/33kV on-site collector substation and an overhead power line. The operation phase of the Wind Garden Wind Farm is expected to be approximately 20 - 25 years (with maintenance).
» *Decommissioning* – depending on the economic viability of the wind farm, the length of the operation phase may be extended beyond a 20 year period. At the end of the project's life, decommissioning will include site preparation, disassembling of the components of the wind farm, clearance of the relevant infrastructure at the site and rehabilitation.

10.1. Legal Requirements as per the EIA Regulations, 2014 (as amended), for the undertaking of a Basic Assessment Report

This chapter of the BA report includes the following information required in terms of the EIA Regulations, 2014 - Appendix 1: Content of basic assessment reports:

Requirement	Relevant Section
3(h)(v) the impacts and risks identified including the nature, significance, consequence, extent, duration and probability of the impacts, including the degree to which these impacts (aa) can be reversed, (bb) may cause irreplaceable loss of resources, and (cc) can be avoided, managed or mitigated.	The impacts and risk associated with the development of the Wind Garden Wind Farm, including the nature, significance, consequence, extent, duration and probability of the impacts and the degree to which the impact can be reversed and cause an irreplaceable loss of resources are included in sections 10.3.2, 10.4.2, 10.5.2, 10.6.2, 10.7.2, 10.8.2, 10.9.2, 10.10.2, 10.11.2 and 10.12.2.
3(h)(vii) positive and negative impacts that the proposed activity and alternatives will have on the environment and on the community that may be affected focusing on the geographical, physical, biological, social,	The positive and negative impacts associated with the development of the Wind Garden Wind Farm are included in sections 10.3.2, 10.4.2, 10.5.2, 10.6.2, 10.7.2, 10.8.2, 10.9.2, 10.10.2, 10.11.2 and 10.12.

Requirement	Relevant Section
economic, heritage and cultural aspects	
3(h)(viii) the possible mitigation measures that could be applied and the level of residual risk.	The mitigation measures that can be applied to the impacts associated with the Wind Garden Wind Farm are included in sections 10.3.2, 10.4.2, 10.5.2, 10.6.2, 10.7.2, 10.8.2, 10.9.2, 10.10.2, 10.11.2 and 10.12.
3(i) a full description of the process undertaken to identify, assess and rank the impacts the activity will impose on the preferred location through the life of the activity, including (i) a description of all environmental issues and risks that were identified during the environmental impact assessment process and (ii) an assessment of the significance of each issue and risk and an indication of the extent to which the issue and risk could be avoided or addressed by the adoption of mitigation measures,.	A description of all environmental impacts identified for the Wind Garden Wind Farm during the BA process, and the extent to which the impact significance can be reduced through the implementation of the recommended mitigation measures provided by the specialists are included in sections 10.3.2, 10.4.2, 10.5.2, 10.6.2, 10.7.2, 10.8.2, 10.9.2, 10.10.2, 10.11.2 and 10.12.
3(j) an assessment of each identified potentially significant impact and risk, including (i) cumulative impacts, (ii) the nature, significance and consequences of the impact and risk, (iii) the extent and duration of the impact and risk, (iv) the probability of the impact and risk occurring, (v) the degree to which the impact and risk can be reversed, (vi) the degree to which the impact and risk may cause irreplaceable loss of resources and, (vii) the degree to which the impact and risk can be avoided, managed or mitigated.	An assessment of each impact associated with the development of the Wind Garden Wind Farm, including the nature and significance, the extent and duration, the probability, the reversibility, and the potential loss of irreplaceable resources, as well as the degree to which the significance of the impacts can be mitigated are included in sections 10.3.2, 10.4.2, 10.5.2, 10.6.2, 10.7.2, 10.8.2, 10.9.2, 10.10.2, 10.11.2 and 10.12.
3(m) based on the assessment, and where applicable, impact management measures from specialist reports, the recording of the proposed impact management outcomes for the development for inclusion in the EMPr.	Mitigation measures recommended by the various specialists for the reduction of the impact significance are included in sections 10.3.2, 10.4.2, 10.5.2, 10.6.2, 10.7.2, 10.8.2, 10.9.2, 10.10.2, 10.11.2 and 10.12.

10.2. Quantification of Areas of Disturbance on the Site

Site-specific impacts associated with the construction and operation of the Wind Garden Wind Farm relate to the direct loss of vegetation and species of special concern, disturbance of animals and loss of habitat and impacts on soils. A wind farm is, however, dissimilar to most other power generation facilities in that it does not result in whole-scale disturbance or loss to a site (from a biophysical perspective). In order to assess the impacts associated with Wind Garden Wind Farm, it is necessary to understand the extent of the affected area.

The development footprint (**Figure 10.1**) will include affected areas, which will comprise turbine footprints (maximum of 47), each turbine will have a hardstand of 75mx60m and a foundation of 22mx22m, internal access roads (up to 4.5m in width with a servitude of up to 13.5m), a switching station and a collector substation (each with an extent of 1ha), a twin turn dual circuit power line with a length of 1000m (and a servitude of 35m), and Balance of Plant (BoP) area with an extent of 18ha which will include the temporary laydown areas, temporary concrete batching plant, temporary staff accommodation and operation and maintenance buildings. The maximum area of disturbance is approximated to be 66.6ha in extent (this is also the extent of the development footprint).

It should be noted that the site currently has several existing access roads (farm tracks) which are used for farming activities and travel through the area. It is planned that where existing access roads are able to be utilised within the development footprint, these are widened and upgraded for the wind farm, essentially reducing the extent of disturbance resulting from access road construction.

Based on the above, it can be concluded that considering the 47 turbine layout, less than 2% of the entire extent of the project site will be transformed and disturbed for the development footprint of the Wind Garden Wind Farm.

10.3. Potential Impacts on Ecology (Ecology, Flora and Fauna)

The development of the Wind Garden Wind Farm, is likely to result in a variety of impacts, associated largely with the disturbance, loss and transformation of intact vegetation and faunal habitat to hard infrastructure such as turbine foundations and service areas, roads, operations buildings etc. Potential impacts and the relative significance of the impacts are summarised below (refer to **Appendix D** for more details).

10.3.1 Description of Ecological Impacts

Impacts on the ecology of the project site are expected to occur during the construction, operation and decommissioning phases of the Wind Garden Wind Farm, as per the development footprint proposed by the developer. The following impacts are identified and assessed for the Wind Garden Wind Farm project

» <u>Impacts on vegetation and listed and protected plant species</u> – The development would require vegetation clearing for turbines, roads and other infrastructure. Apart from the direct loss of vegetation within the development footprint, listed and protected plant species may also be impacted. These impacts would occur during the construction phase of the development, with additional vegetation impacts during operation likely to be relatively low. This impact is therefore assessed for the construction phase only.

» <u>Direct faunal impacts</u> – Increased levels of noise, pollution, disturbance and human presence during construction will be detrimental to terrestrial fauna. Sensitive and shy fauna are likely to move away from the area during the construction phase as a result of the noise and human activities present, while some slow-moving species would not be able to avoid the construction activities and might be killed if proper management and monitoring is not in place. Traffic at the site during all phases of the project would pose a risk of collisions with fauna. Slower species such as tortoises, snakes and certain mammals would be most susceptible and the impact would be largely concentrated to the construction phase when vehicle activity was high. Some mammals and reptiles would be vulnerable to illegal collection or poaching during the construction phase as a result of the large number of construction personnel that are likely to be present. During the operation phase, noise generated by the operation of the turbines is likely to negatively affect at least some fauna. Faunal impacts will therefore be assessed during the construction and operation phase of the facility.

» <u>Increased Erosion Risk</u> – The large amount of disturbance created during construction would leave the site vulnerable to wind and water erosion. Soil disturbance associated with the development will render the impacted areas vulnerable to erosion and measures to limit erosion will need to be implemented. This impact is likely to manifest during construction and would persist into the operation phase and is therefore assessed for both phases.

» Alien Plant Invasion – The disturbance associated with the construction phase of the project will render the disturbed areas vulnerable to alien plant invasion. Some woody aliens are already present in the area and additional alien plant invasion following construction is highly likely and regular alien plant clearing activities would be required. Once the natural vegetation has returned to the disturbed areas, the site will be less vulnerable to alien plant invasion, however, the roadsides and turbine service areas are likely to remain foci of alien plant invasion for years. This impact would manifest during the operation phase, although some of the required measures to reduce this impact are required during construction.

10.3.2 Impact tables summarising the significance of impacts on ecology during construction, operation and decommissioning (with and without mitigation)

The impacts assessed below apply to the development footprint, including the turbines and associated infrastructure for the Wind Garden Wind Farm.

Construction Phase Impacts

Nature: *Impacts on vegetation and protected plant species* Vegetation clearing for access roads, turbines and their service areas and other infrastructure will impact on vegetation and protected plant species.		
	Without mitigation	**With mitigation**
Extent	Local (2)	Local (2)
Duration	Long-term (3)	Long-term (3)
Magnitude	Moderate to high (7)	Moderate (6)
Probability	Definite (5)	Probable (3)
Significance	**Medium (60)**	**Medium (33)**
Status (positive or negative)	Negative	Negative
Reversibility	This impact is not highly reversible as it would take a long time for any cleared areas to return to their former state and rehabilitation of arid environments is difficult.	
Irreplaceable loss of resources?	There would be loss as it would take a long time for any cleared areas to return to their former state and rehabilitation of arid environments is difficult.	
Can impacts be mitigated?	Yes	
Mitigation: » There should be no turbines within the Very High Sensitivity areas (as has been achieved under the assessed layout). » The footprint within ephemeral drainage lines should be minimized as much as possible. » Pre-construction walk-though of the approved development footprint must be undertaken to ensure that sensitive habitats and species are avoided where possible. » Ensure that laydown and other temporary infrastructure is placed within low sensitivity areas, preferably previously transformed areas, if possible. » Minimise the development footprint as far as possible and rehabilitate disturbed areas that are not required for the operation phase of the development. » A large proportion of the impact of the development stems from the access roads and the number of roads should be reduced to the minimum possible and routes should also be adjusted to avoid areas of high sensitivity as far as possible. Crossings of drainage features is considered acceptable contingent on the input of the freshwater		

specialist in this regard. » Pre-construction environmental induction for all construction staff on site to ensure that basic environmental principles are adhered to. This includes topics such as no littering, appropriate handling of pollution and chemical spills, avoiding fire hazards, minimizing wildlife interactions, remaining within demarcated construction areas etc. » Demarcate all areas to be cleared with construction tape or other appropriate and effective means. However, caution should be exercised to avoid using material that might entangle fauna.
Residual Impacts: Since vegetation clearing is an inevitable consequence of the development, this component of the development impact cannot be entirely mitigated and some residual habitat loss equivalent to the footprint of the development will remain.

Nature: Impacts on fauna due to construction phase activities Increased levels of noise, pollution, disturbance and human presence during construction will be detrimental to fauna. Sensitive and shy fauna are likely to move away from the area during the construction phase as a result of the noise and human activities present, while some slow-moving species would not be able to avoid the construction activities and might be killed if proper management and monitoring is not in place.		
	Without mitigation	**With mitigation**
Extent	Local (2)	Local (2)
Duration	Short-term (2)	Short-term (2)
Magnitude	Moderate (6)	Moderate (5)
Probability	Highly Likely (4)	Probable (3)
Significance	**Medium (40)**	**Low (27)**
Status (positive or negative)	Negative	Negative
Reversibility	Noise and disturbance are largely reversible but habitat loss due to transformation of intact habitat is not considered easily reversible.	
Irreplaceable loss of resources?	It is not likely that there would be significant irreplaceable loss of resources in terms of fauna.	
Can impacts be mitigated?	Yes	
Mitigation: » Pre-construction walk-through of the facility to micro-site roads and turbines. » During construction any fauna directly threatened by the construction activities should be removed to a safe location by the ECO or other suitably qualified person. » The illegal collection, hunting or harvesting of any plants or animals at the site should be strictly forbidden. Personnel should not be allowed to wander off of the construction site. » No fires should be allowed within the site as there is a risk of runaway veld fires. » No fuelwood collection should be allowed on-site. » If any parts of the site such as construction camps must be lit at night, this should be done with low-UV type lights (such as most LEDs) as far as practically possible, which do not attract insects and which should be directed downwards. » All hazardous materials should be stored in the appropriate manner to prevent contamination of the site. Any accidental chemical, fuel and oil spills that occur at the site should be cleaned up in the appropriate manner as related to the nature of the spill. » No unauthorized persons should be allowed onto the site and site access should be strictly controlled. » All construction vehicles should adhere to a low-speed limit (40km/h for cars and 30km/h for trucks) to avoid collisions with susceptible species such as snakes and tortoises and rabbits or hares. Speed limits should apply within the facility as well as on the public gravel access roads to the site. » All personnel should undergo environmental induction with regards to fauna and in particular awareness about not harming or collecting species such as snakes, tortoises and snakes which are often persecuted out of fear or superstition.		

Residual Impacts: Noise and disturbance would be transient and largely reversible but habitat loss due to transformation of intact habitat would be permanent.

Operation Phase Impacts

Nature: *Impacts on fauna due to operation phase activities* Fauna will be negatively affected by the operation of the wind farm due to the human disturbance, the presence of vehicles on the site and possibly by noise generated by the wind turbines as well.		
	Without mitigation	**With mitigation**
Extent	Local (2)	Local (2)
Duration	Long-term (3)	Long-term (3)
Magnitude	Medium Low (4)	Low (3)
Probability	Highly Likely (4)	Probable (3)
Significance	**Medium (36)**	**Low (24)**
Status (positive or negative)	Negative	Negative
Reversibility	Noise and disturbance are generally reversible impacts that would occur on an more or less persistent basis during the life of the wind farm, but cease thereafter.	
Irreplaceable loss of resources?	It is not likely that there would be significant irreplaceable loss of resources in terms of fauna.	
Can impacts be mitigated?	Yes	
Mitigation: » Management of the site should take place within the context of an Open Space Management Plan. » No unauthorized persons should be allowed onto the site. » Any potentially dangerous fauna such as snakes or fauna threatened by the maintenance and operational activities should be removed to a safe location. » The collection, hunting or harvesting of any plants or animals at the site should be strictly forbidden by anyone except landowners or other individuals with the appropriate permits and permissions where required. » If any parts of the site need to be lit at night for security purposes, this should be done with downward-directed low-UV type lights (such as most LEDs) as far as possible, which do not attract insects. » All hazardous materials should be stored in the appropriate manner to prevent contamination of the site. Any accidental chemical, fuel and oil spills that occur at the site should be cleaned up in the appropriate manner as related to the nature of the spill. » All vehicles accessing the site should adhere to a low-speed limit (40km/h max) to avoid collisions with susceptible species such as snakes and tortoises. » If parts of the facility such as the substation are to be fenced, then no electrified strands should be placed within 30cm of the ground as some species such as tortoises are susceptible to electrocution from electric fences as they do not move away when electrocuted but rather adopt defensive behavior and are killed by repeated shocks. Alternatively, the electrified strands should be placed on the inside of the fence and not the outside.		
Residual Impacts: Noise and disturbance are not avoidable during the operation of the wind farm with the result that some residual disturbance, expressed as habitat degradation for affected fauna will occur during operation of the facility.		

Nature: *Increased erosion risk* Following construction, the site will be highly vulnerable to soil erosion due to the disturbance created and likely low natural revegetation of disturbed areas.		
	Without mitigation	**With mitigation**
Extent	Local (2)	Local (1)
Duration	Long-term (4)	Medium-term (4)

Magnitude	Moderate (5)	Low (2)
Probability	Probable (3)	Improbable (2)
Significance	**Medium (33)**	**Low (14)**
Status (positive or negative)	Negative	Negative
Reversibility	Reversibility would be high for mild erosion but would become increasingly low with increasing severity of erosion.	
Irreplaceable loss of resources?	Large amounts of erosion would result in some irreplaceable loss of topsoil and ecosystem productivity, but with mitigation there would be no significant loss of resources.	
Can impacts be mitigated?	Yes	
Mitigation: » Erosion management at the site should take place according to the Erosion Management Plan and Rehabilitation Plan. » All roads and other hardened surfaces should have runoff control features which redirect water flow and dissipate any energy in the water which may pose an erosion risk. » Regular monitoring for erosion after construction to ensure that no erosion problems have developed as result of the disturbance must be undertaken, as per the Erosion Management and Rehabilitation Plans for the project. » All erosion problems observed must be rectified as soon as possible, using the appropriate erosion control structures and revegetation techniques. » All cleared areas must be revegetated with indigenous perennial shrubs and succulents from the local area. These can be cut when dry and placed on the cleared areas if natural recovery is slow		
Residual Impacts: Some low-level erosion due to wind and water impacts is likely to occur despite erosion control measures. With the effective implementation of the recommended mitigation, the magnitude of this residual impact can however be reduced to a low level.		

Nature: *Alien plant invasion risk* Following construction, the site will be highly vulnerable to alien plant invasion due to disturbance and the increased runoff created by the hard infrastructure. Drainage lines and other wetter areas are likely to be particularly vulnerable.		
	Without mitigation	**With mitigation**
Extent	Local (2)	Local (1)
Duration	Long-term (4)	Medium-term (3)
Magnitude	Moderate (4)	Low (2)
Probability	Probable (3)	Improbable (2)
Significance	**Medium (30)**	**Low (12)**
Status (positive or negative)	Negative	Negative
Reversibility	Reversibility would be high for mild infestation, but would become increasingly low with extensive invasion.	
Irreplaceable loss of resources?	It is not likely that there would be significant irreplaceable loss of resources if this impact is managed.	
Can impacts be mitigated?	Yes	
Mitigation: » Wherever excavation is necessary, topsoil should be set aside and replaced after construction to encourage natural regeneration of the local indigenous species. » Due to the disturbance at the site as well as the increased runoff generated by the hard infrastructure, alien plant species are likely to be a long-term problem at the site and a long-term control plan will need to be implemented. Problem plant species are already present in the area and are likely to increase rapidly if not controlled. » Regular monitoring for alien plants within the development footprint as well as adjacent areas which receive runoff from the facility must be undertaken as these are also likely to be prone to invasion problems. » Regular alien clearing should be conducted using the best-practice methods for the species concerned. The use		

of herbicides should be avoided as far as possible.
Residual Impacts: Although some alien plant invasion is likely to occur at the site, with mitigation, there would be minimal residual impact.

Nature: *Impact on CBAs and broad-scale ecological processes* Transformation and presence of the facility will contribute to cumulative habitat loss within the affected CBA 1, CBA 2 and wider ESA and may compromise the overall ecological functioning of the CBAs and their long-term biodiversity value.		
	Without mitigation	**With mitigation**
Extent	Local (2)	Local (2)
Duration	Long-term (4)	Long-term (4)
Magnitude	Moderate (5)	Moderate (4)
Probability	Highly Likely (4)	Likely (3)
Significance	**Medium (44)**	**Low (30)**
Status (positive or negative)	Negative	Negative
Reversibility	Moderate	Moderate
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation: » Minimise the development footprint within the high sensitivity areas. » There should be an integrated management plan for the development area during operation, which is beneficial to fauna and flora. » All disturbed areas that are not used such as excess road widths, should be rehabilitated with locally occurring shrubs and grasses after construction to reduce the overall footprint of the development. » Noise and disturbance on the site should be kept to a minimum during operation and maintenance activities.		
Residual Impacts: Habitat loss within the CBAs and ESAs cannot be fully mitigated and the noise and disturbance generated by the turbines during operation cannot be avoided with the result that some residual disturbance, expressed as habitat degradation for affected fauna will occur during operation of the facility within the CBAs.		

Decommissioning Phase Impacts

Nature: *Impacts on fauna due to decommissioning phase activities* Fauna will be negatively affected by the decommissioning of the wind farm due to the human disturbance, the presence and operation of vehicles and heavy machinery on the site and the noise generated.		
	Without mitigation	**With mitigation**
Extent	Local (2)	Local (2)
Duration	Short-term (2)	Short-term (2)
Magnitude	Moderate (5)	Low (2)
Probability	Highly probable (4)	Probable (3)
Significance	**Medium (36)**	**Low (18)**
Status (positive or negative)	Negative	Negative
Reversibility	Noise and disturbance would be of relatively short duration and are considered reversible.	
Irreplaceable loss of resources?	It is not likely that there would be significant irreplaceable loss of resources in terms of fauna.	
Can impacts be mitigated?	Yes	
Mitigation:		

» Any potentially dangerous fauna such as snakes or fauna threatened by the decommissioning activities should be removed to a safe location prior to the commencement of decommissioning activities. » All hazardous materials should be stored in the appropriate manner to prevent contamination of the site. Any accidental chemical, fuel and oil spills that occur at the site should be cleaned up in the appropriate manner as related to the nature of the spill. » All vehicles accessing the site should adhere to a low speed limit (40km/h max) to avoid collisions with susceptible species such as snakes and tortoises. » No excavated holes or trenches should be left open for extended periods as fauna may fall in and become trapped. » All above-ground infrastructure should be removed from the site. Below-ground infrastructure such as cabling can be left in place if it does not pose a risk, as removal of such cables may generate additional disturbance and impact, however, this should be in accordance with the facilities' decommissioning and recycling plan, and as per the agreements with the landowners concerned.
Residual Impacts: Noise and disturbance during decommissioning would be unavoidable, but would be transient and ultimately the site would be restored to a near-natural state.

Nature: Increased erosion risk due to decommissioning Following decommissioning, the site will be highly vulnerable to soil erosion due to the disturbance created by the removal of infrastructure from the site.		
	Without mitigation	**With mitigation**
Extent	Local (2)	Local (1)
Duration	Long-term (4)	Medium-term (3)
Magnitude	Moderate (5)	Minor (2)
Probability	Probable (3)	Improbable (2)
Significance	**Medium (33)**	**Low (12)**
Status (positive or negative)	Negative	Negative
Reversibility	Reversibility would be high for mild erosion but would become increasingly low with increasing severity of erosion.	
Irreplaceable loss of resources?	It is not likely that there would be significant irreplaceable loss of resources if this impact is managed.	
Can impacts be mitigated?	Yes	
Mitigation: » Any roads that will not be rehabilitated should have runoff control features which redirect water flow and dissipate any energy in the water which may pose an erosion risk. » There should be regular monitoring for erosion for at least 5 years after decommissioning by the applicant to ensure that no erosion problems develop as a result of the disturbance, and if they do, to immediately implement erosion control measures. » All erosion problems observed should be rectified as soon as possible, using the appropriate erosion control structures and revegetation techniques. » All disturbed and cleared areas should be revegetated with indigenous perennial shrubs and grasses from the local area.		
Residual Impacts: Some low-level erosion due to wind and water impacts are likely to occur following decommissioning despite erosion control measures. With the effective implementation of the recommended mitigation, the magnitude of this residual impact can however be reduced to a low level.		

Nature: Alien plant invasion risk following decommissioning Following decommissioning, the site will be highly vulnerable to alien plant invasion due to the large amount of

disturbance generated by decommissioning. Disturbed areas, drainage lines and other wetter areas are likely to be particularly vulnerable.		
	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Moderate (4)	Low (2)
Probability	Probable (3)	Improbable (2)
Significance	Low (27)	Low (14)
Status (positive or negative)	Negative	Negative
Reversibility	Reversibility would be high for mild infestation but would become increasingly low with extensive invasion.	
Irreplaceable loss of resources?	It is not likely that there would be significant irreplaceable loss of resources if this impact is managed.	
Can impacts be mitigated?	Yes	
Mitigation: » Wherever excavation is necessary, topsoil should be set aside and replaced after construction to encourage natural regeneration of the local indigenous species. » Due to the disturbance at the site as well as the increased runoff generated by the hard infrastructure, alien plant species are likely to be a long-term problem at the site and a long-term control plan will need to be implemented. Problem plant species are already present in the area and are likely to increase rapidly if not controlled. » Regular monitoring for alien plants within the development footprint as well as adjacent areas which receive runoff from the facility must be undertaken as these are also likely to be prone to invasion problems. » Regular alien clearing should be conducted using the best-practice methods for the species concerned. The use of herbicides should be avoided as far as possible.		
Residual Impacts: Although some alien plant invasion is likely to occur at the site, with mitigation, there would be minimal residual impact.		

10.3.3 Overall Result

The Ecological Impact Assessment has identified impacts of medium significance to be associated with the development of the Wind Garden Wind Farm prior to the implementation of appropriate recommendation and mitigation measures. With the implementation of the mitigation measures majority of impacts would be reduced to a low significance, with only one impact of a medium significance. All impacts are considered to be acceptable. No impacts of a high significance or fatal flaws are expected to occur after implementation of the recommended mitigation measures.

10.4. Potential Impacts on Aquatic Ecology

The development of the Wind Garden Wind Farm, is likely to result in a variety of impacts from an aquatic perspective Potential impacts and the relative significance of the impacts are summarised below (refer to **Appendix G** for more details).

10.4.1 Description of Impacts on Aquatic Ecology

The aquatic ecology impacts identified to be associated with the Wind Garden Wind Farm relate to fragmentation, changes in density, faunal and vegetation species, the hydrological regime or hydroperiod changes, streamflow regulation, erosion control, and water quality changes.

The aquatic impacts that were identified and assessed include the following:

» Loss of High Sensitivity systems, namely the pans identified within the site through physical disturbance.
» Impact on water courses, through physical disturbance.
» Impact on all watercourse and wetland systems through the possible increase in surface water runoff on riparian form and function through hydrological changes.
» Increase in sedimentation and erosion.
» Risks on the aquatic environment due to water quality impacts.

10.4.2 Impact tables summarising the significance of impacts on aquatic ecology during construction, operation and decommissioning (with and without mitigation)

Nature: Loss of high sensitivity systems

Disturbance within the project site and development envelope could possibly lead to the loss of pans where infrastructure is inappropriately placed.

	Without mitigation	**With mitigation**
Extent	Regional (3)	Local (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	High (7)	Low (4)
Probability	Definite (5)	Probable (3)
Significance	**High (70)**	**Low (27)**
Status (positive or negative)	Negative	Negative
Reversibility	Medium	Medium
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	

Mitigation:

» The most significant form of mitigation would be to select development options that avoided all aquatic features that were rated with a High sensitivity. It is recommended that the development footprint considers such changes and avoidance.
» All alien plant re-growth must be monitored and should these alien plants reoccur these plants should be re-eradicated. The scale of the development does however not warrant the use of a Landscape Architect and / or Landscape Contractor.
» A comprehensive rehabilitation / monitoring plan must be implemented from the project onset i.e. during the detailed design phase prior to construction, to ensure a net benefit to the environment within all areas that will remain undisturbed.

Residual Impacts:

Possible impact on the remaining catchment due to changes in run-off characteristics in the development envelope.

Nature: *Impact on watercourses through physical disturbance*

The physical removal of narrow strips of woody riparian zones within watercourses will impact on the features, however this would be localised as watercourses is of low sensitivity and located in areas with minimal vegetation (riparian) and/ or previously disturbed areas.

	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Low (4)	Low (4)
Probability	Definite (5)	Probable (3)
Significance	**Medium (45)**	**Low (27)**
Status (positive or negative)	Negative	Negative

<table>
<tr><td>Reversibility</td><td>High</td><td>High</td></tr>
<tr><td>Irreplaceable loss of resources?</td><td>No</td><td>No</td></tr>
<tr><td>Can impacts be mitigated?</td><td colspan="2">Yes</td></tr>
<tr><td colspan="3">Mitigation:
» The most significant form of mitigation would be to select a development envelope/footprint, which contained no drainage lines. The proposed layout has been developed to avoid the important systems, therefore requiring only crossings or footprints within areas rated as having a low sensitivity to physical disturbance. Hydrological function (surface flows) would still remain in these cases
» Vegetation clearing should occur in a phased manner in accordance with the construction programme to minimise erosion and/or run-off. Large tracts of bare soil will either cause dust pollution or quickly erode and then cause sedimentation in the lower portions of the catchment. Suitable dust and erosion control mitigation measures must be included in the Environmental Management Programme (EMPr) to mitigate these impacts.</td></tr>
<tr><td colspan="3">Residual Impacts:
Sizable portion of intact natural environment remain within the greater region, and therefore a low residual risk is expected.</td></tr>
</table>

<table>
<tr><td colspan="3">Nature: - <u>Impact on all watercourse and wetland systems through the possible increase in surface water runoff that could alter the aquatic state and function through hydrological changes during the operation phase</u>
An increase in hard surface areas, and roads that require stormwater management will increase the concentration of surface water flows that could result in localised changes to flows (volume) that would result in form and function changes within the aquatic systems, which are currently ephemeral, which will result in aquatic vegetation species composition changes, which then results in habitat change / loss.</td></tr>
<tr><td></td><td>Without mitigation</td><td>With mitigation</td></tr>
<tr><td>Extent</td><td>Local (1)</td><td>Local (1)</td></tr>
<tr><td>Duration</td><td>Long-term (4)</td><td>Long-term (4)</td></tr>
<tr><td>Magnitude</td><td>Low (2)</td><td>Low (2)</td></tr>
<tr><td>Probability</td><td>Definite (5)</td><td>Probable (3)</td></tr>
<tr><td>Significance</td><td>Medium (35)</td><td>Low (21)</td></tr>
<tr><td>Status (positive or negative)</td><td>Negative</td><td>Negative</td></tr>
<tr><td>Reversibility</td><td>Medium</td><td>Medium</td></tr>
<tr><td>Irreplaceable loss of resources?</td><td>No</td><td>No</td></tr>
<tr><td>Can impacts be mitigated?</td><td colspan="2">Yes</td></tr>
<tr><td colspan="3">Mitigation:
» A stormwater management plan must be developed in the pre-construction phase, detailing the stormwater structures and management interventions that must be installed to manage the increase of surface water flows directly into any natural systems. The stormwater control systems must be inspected on an annual basis to ensure these are functional. Effective stormwater management must include effective stabilisation (gabions and Reno mattresses) of exposed soil and the re-vegetation of any disturbed riverbanks.
» No runoff may be discharged or directed into the Pans, as these are not tolerant of excessive / regular volumes of water and would then change in nature and attributes, i.e. stormwater detention pond.</td></tr>
<tr><td colspan="3">Residual Impacts:
Possible impact on the remaining catchment due to changes in run-off characteristics in the development envelope.</td></tr>
</table>

<table>
<tr><td colspan="3">Nature: <u>Increase in sedimentation and erosion within the development footprint during the operation phase</u>
An increase in hard surface areas, and or roads that require stormwater management increases runoff from a site through the concentration of surface water flows. These higher volume flows, with increased velocity can result in downstream erosion and sedimentation if not managed.</td></tr>
<tr><td></td><td>Without mitigation</td><td>With mitigation</td></tr>
<tr><td>Extent</td><td>Local (1)</td><td>Local (1)</td></tr>
</table>

Duration	Long-term (4)	Long-term (4)
Magnitude	Low (2)	Low (1)
Probability	Definite (5)	Probable (3)
Significance	**Medium (35)**	**Low (18)**
Status (positive or negative)	Negative	Negative
Reversibility	Medium	Medium
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	

Mitigation:

» A stormwater management plan must be developed in the pre-construction phase, detailing the stormwater structures and management interventions that must be installed to manage the increase of surface water flows directly into any natural systems. The stormwater control systems must be inspected on an annual basis to ensure these are functional. Effective stormwater management must include effective stabilisation (gabions and Reno mattresses) of exposed soil and the re-vegetation of any disturbed riverbanks.
» No runoff may be discharged or directed into the Pans, as these are not tolerant of excessive / regular volumes of water and would then change in nature and attributes, i.e. stormwater detention pond.

Residual Impacts:

Possible impact on the remaining catchment due to changes in run-off characteristics in the development area.

Nature: *Impact on localised surface water quality*

During both pre-construction, construction and, to a limited degree, the operational activities, chemical pollutants (hydrocarbons from equipment and vehicles, cleaning fluids, cement powder, wet cement, shutter-oil, etc.) associated with site-clearing machinery and construction activities, as well as maintenance activities, could be washed downslope via the watercourses.

	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Low (2)	Low (1)
Probability	Definite (5)	Probable (3)
Significance	**Medium (35)**	**Low (18)**
Status (positive or negative)	Negative	Negative
Reversibility	Medium	Medium
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	

Mitigation:

» Strict use and management of all hazardous materials used on site.
» Strict management of potential sources of pollution (e.g. litter, hydrocarbons from vehicles & machinery, cement during construction, etc.) within demarcated / bunded areas.
» Containment of all contaminated water by means of careful run-off management on site.
» Appropriate ablution facilities should be provided for construction workers during construction and on-site staff during the operation of the facility. These must be situated outside of any delineated watercourses and pans/depressions or the buffers shown
» Strict control of the behaviour of construction workers in terms of works near watercourses.
» Appropriate waste management must be undertaken.
» Working protocols incorporating pollution control measures (including approved method statements by the contractor) should be clearly set out in the Construction Environmental Management Plan for the project and strictly enforced.

Residual Impacts:

Residual impacts will be negligible after appropriate mitigation is implemented.

While no specific impacts have been identified for the decommissioning phase, it is considered that the impacts expected for the construction phase, and the mitigation measures recommended will also be relevant to the decommissioning phase.

10.4.3 Overall Result

The Aquatic Impact Assessment has identified impacts of high and medium significance to be associated with the development of the Wind Garden Wind Farm prior to the implementation of appropriate recommendation and mitigation measures. With the implementation of the mitigation measures all impacts would be reduced to a low significance which is considered to be acceptable. No impacts of a high significance or fatal flaws are expected to occur after implementation of the recommended mitigation measures.

It must be noted however that the low significance is based on the update of the development footprint through the avoidance of pans and the shifting of the BoP area away from the drainage line located within the area (as discussed in Chapter 9 and Chapter 12).

Furthermore, a Water Use License (or General Authorisation) for water uses identified in Section 21 c and 21 i of the National Water Act (Act 36 of 1998) would be required where activities are undertaken within 500m of watercourses and pans.

10.5. Potential Impacts on Avifauna

Various impacts have been identified to be associated with the development of the Wind Garden Wind Farm from an avifaunal perspective. Potential impacts and the relative significance of the impacts are summarised below (refer to **Appendix E** for more details).

10.5.1 Description of Avifaunal Impacts

The development of the Wind Garden Wind Farm poses a risk to six priority species through the following impacts:

» *Habitat destruction during construction* – With the development of the Wind Garden Wind Farm ~66.6ha of natural vegetation will be removed which will consist mainly of Thicket vegetation. This impact will have a low effect on small bush birds, while in terms of priority species that prefer open habitat, the impact will also be of a low significance, especially for three large terrestrial birds - Blue Crane, Southern Black Korhaan and Ludwig's bustard. The potential percentage range loss was calculated to be 13.6% for Martial eagle for the affected nest and 2.7% for Verreaux's eagle for the affected nest, assuming complete displacement to 500m from turbines.

» *Disturbance during construction* – The avoidance measures already considered and applied to the buffer for the Martial Eagle, Verreaux's eagle and African Fish eagle nests and territory, and the avoidance of placement of infrastructure as part of the proposed development footprint within these buffer areas have reduced the significance of this impact. It is likely that all these Priority Species will stay clear of areas under construction, which includes Blue Crane, Southern Black Korhaan, Ludwig's bustard, Martial eagle, Verreaux's eagle and African Fish eagle.

» *Collision with turbines* – Human caused fatalities of Red listed or otherwise threatened bird species are always a cause for concern and should be avoided as far as possible. Estimated fatalities are therefore predicted and a cause for concern. There are currently no established thresholds for acceptable impacts on bird species in South Africa. The Collison Risk modelling for six Priority species, Ludwig's Bustard, Blue Crane, Southern Black korhaan, Martial Eagle, Verreaux's eagle and African Fish eagle is discussed in Chapter 9.

» *Displacement due to disturbance from the site once operational* – The indications from operational wind farms are that this impact may be of fairly low importance, although it is acknowledged that a longer term or more detailed means of measuring this impact may be required. Also disruption of flight paths and local movement patterns of Priority Species during operation of the wind farm may be relevant. Birds might use more energy to get to their normal feeding grounds by flying around the wind farm by avoiding directly flying through the development.

» *Electrocution with the power line* – Birds can get electrocuted on overhead power lines (although unlikely) or on substation and switching gear during the operation of the Wind Garden Wind Farm. Large raptors are more likely to get electrocuted on power line poles and structures.

» *Collision with the power line* – Birds can collide with power line conductors or substation and switching gear during the operation of the Wind Garden Wind Farm. Only a one kilometre stretch of new power line will be built between the collector substation and the switching station and therefore collision is considered to be unlikely. Large terrestrial birds are more prone to colliding with power line conductors.

» *Disturbance during the decommissioning phase* – Disturbance and displacement of birds during the decommissioning phase of the infrastructure is not likely to be significant.

10.5.2 *Impact tables summarising the significance of impacts on avifauna during construction, operation and decommissioning (with and without mitigation)*

Construction Phase Impacts

Nature: *Habitat loss for priority species during construction* Destruction of habitat used by birds during Construction (removal of natural vegetation)		
	Without mitigation	**With mitigation**
Extent	Regional (3)	Local (2)
Duration	Medium-term (3)	Medium-term (3)
Magnitude	Moderate (6)	Low (4)
Probability	Probable (4)	Probable (3)
Significance	**Medium (48)**	**Low (27)**
Status (positive or negative)	Negative	Negative
Reversibility	Yes – Areas disturbed during construction can be rehabilitated after construction and after decommissioning.	
Irreplaceable loss of resources?	No – rehabilitation of habitat is possible. There is extensive avifaunal habitat on the project site and beyond that will remain intact and be available for use.	
Can impacts be mitigated?	Yes –The total area of impact can be minimised.	

Mitigation:

- A site specific Construction Environmental Management Plan (CEMP) must be implemented, which gives appropriate and detailed description of how construction activities must be conducted to reduce unnecessary destruction of habitat.
- The Environmental Officer must oversee activities and ensure that the site-specific construction environmental management plan (CEMP) is implemented and enforced.
- High traffic areas and buildings such as offices, batching plants, storage areas etc. should, where possible, be situated in areas that are already disturbed.
- Existing roads and farm tracks should be used where possible.
- The minimum footprint areas of infrastructure should be used wherever possible, including road widths and lengths.
- No turbines should be constructed in no-go areas, while associated infrastructure should be avoided where possible in these areas.
- Prior to construction, an avifaunal specialist should conduct a site walk-through, covering the final road and power line routes as well as the final turbine positions, to identify any nests/breeding activity of sensitive species, as well as any additional sensitive habitats within which construction activities may need to be excluded. Should priority species nests be discovered, a protective buffer must be applied, within which construction activities may need to be restricted during the breeding season for that identified species.
- Any clearing of large trees (>5m in height) especially stands of large alien trees (e.g. Blue Gum or Pine) on site should be approved by an avifaunal specialist. Before, clearing, the location and description of the trees should be provided to the avifauna specialist, who may request the EO to inspect the trees for any nests prior to clearing.
- The construction Phase EO, the onsite Environmental Manager, and the client's representative on site (e.g. the resident engineer) are to be trained to identify Red Data and priority bird species, as well as their nests. If any nests or breeding locations for this species are located, an avifaunal specialist is to be contacted for further instruction.
- Following construction, rehabilitation of all areas disturbed (e.g. temporary access tracks and laydown areas) must be undertaken and to this end a habitat restoration plan is to be developed by a specialist and included within the EMPr.

Residual Impacts:

The rehabilitation of disturbed areas will help to mitigate the impact of the habitat transformation to some extent, but the fragmentation of the habitat due to the construction of the internal road network cannot be mitigated, and will remain an impact for the duration of the operational life-time of the wind farm.

Nature: *Disturbance of priority species during construction*

Disturbance or displacement of birds due to the construction activities

	Without mitigation	**With mitigation**
Extent	Local (2)	Local (2)
Duration	Medium-term (3)	Medium-term (3)
Magnitude	Moderate (6)	Low (5)
Probability	Probable (5)	Probable (4)
Significance	**Medium (55)**	**Medium (40)**
Status (positive or negative)	Negative	Negative
Reversibility	Partially – In some areas of the operational wind farm, birds disturbed during construction may return to their activities after completion of construction.	
Irreplaceable loss of resources?	Possible – Disturbance and potential displacement of birds may impact breeding and therefore impact on the population of a species.	
Can impacts be mitigated?	Partially– Some disturbance is inevitable with the activities associated with construction.	

Mitigation:

- A site specific Construction Environmental Management Plan (CEMP) must be implemented, which gives

appropriate and detailed description of how construction activities must be conducted. The Environmental Control Officer must oversee activities and ensure that the site-specific construction environmental management plan (CEMP) is implemented and enforced; » Prior to construction, the avifaunal specialist should conduct a site walk-through, covering the final infrastructure (e.g. road, substation, offices, turbine positions etc.) to identify any nests/breeding/roosting activity of sensitive species, as well as any additional sensitive habitats. The results of which may inform the final construction schedule, including abbreviating construction time, scheduling activities around avian breeding and/or movement schedules, and lowering levels of associated noise. Following the specialist site walk-through, any additional sensitive zones and no-go areas (e.g. nesting sites of Red Data species) are to be designated by the specialist who should advise on an appropriate buffer, within which construction activities may not occur during key breeding times. » The construction Phase EO, the onsite Environmental Manager, and the client's representative on site (e.g. the resident engineer) must be trained by an avifaunal specialist to identify the potential priority species and Red Data species as well as the signs that indicate possible breeding by these species. The EO must, during audits/site visits, make a concerted effort to look out for such breeding activities of Red Data species, and such efforts may include the training of construction staff (e.g. in toolbox talks) to identify Red Data species, followed by regular questioning of staff as to the regular whereabouts on site of these species. If any of the Red Data species are confirmed to be breeding (e.g. if a nest site is found), construction activities within 500m of the breeding site must cease, and an avifaunal specialist is to be contacted immediately for further assessment of the situation and instruction on how to proceed. » During the construction phase, an avifaunal specialist must conduct a nest survey/exploration of the wind farm site. This should be done during and after, the breeding season (i.e. approximately in April and again in June) of large Eagles (e.g. Martial and Verreaux's Eagle). The aim will be to locate any nest sites not yet found, so that these may continue to be monitored during the construction and operation phases, along with the monitoring of already identified nest sites. » Appoint a specialist to design and conduct monitoring of the breeding of raptors at the various nests identified to date as well as any additionally located nests. This monitoring can be combined with the exploration described above and should be conducted on two occasions (i.e. approximately in April and again in June) across each calendar year, during construction. The aim will be to monitor any disturbance to or displacement of the breeding birds during construction.
Residual Impacts: It is highly likely that most priority species will be temporarily displaced in the development envelope during the construction activities, due to the noise and activity. The significance will remain at a medium level collectively for priority species after mitigation.

Operation Phase Impacts

Nature: *Turbine collision fatalities during operation* Bird mortality caused by collision with wind turbine blades and/or towers.		
	Without mitigation	**With mitigation**
Extent	Local (2)	Local (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	Moderate (6)	Low (3)
Probability	Probable (4)	Probable (3)
Significance	**Medium (52)**	**Low (27)**
Status (positive or negative)	Negative	Negative
Reversibility	Partially – Bird fatalities caused by collisions with turbines are irreversible. However local populations may recover if the occurrence of deaths is low.	
Irreplaceable loss of resources?	Possibly – Collisions with turbines cause bird fatalities, which could significantly impact local and/or regional populations of certain	

	species.
Can impacts be mitigated?	Partially – The probability of the impact can potentially be reduced through informed placement of turbines.

Mitigation:

» The minimum number of turbines should be constructed to achieve the required MW output. It is preferable to have a reduced number of turbines with a larger rotor compared with more turbines with a smaller rotor.
» Turbines must not be constructed within any designated No-Go Areas. The turbine blade should not protrude into these areas, and therefore the bases should be constructed with sufficient distance from these areas to prevent this.
» The hierarchy of sensitivity zones identified should be considered where possible with preferential placement of turbines in areas with no sensitivity score, followed by low sensitivity, medium sensitivity and medium-high sensitivity.
» Develop and implement a carcass search programme for birds as a minimum during the first three years of operation followed by year 5, 10, 15, 20 and 25, in line with the applicable South African monitoring guidelines.
» Develop and implement a minimum 12-month post-construction bird activity monitoring program that mirrors the pre-construction monitoring surveys completed by Ecology Consulting/ECDC and is in line with the applicable South African post-construction monitoring guidelines. This program must include thorough and ongoing nest searches and nest monitoring. The results of this monitoring and the relevant specialist (including carcass searchers) should advise the need for any additional ongoing activity monitoring or nest surveys beyond the 12-month period.
» Conduct frequent and regular review of the operation phase monitoring data (activity and carcass) and results by an avifaunal specialist. This review should also establish the requirement for continued monitoring studies (activity and carcass) throughout the operational and decommissioning phases of the development.
» The above reviews should strive to identify sensitive locations at the development including turbines and areas of increased collisions with power lines that may require additional mitigation. If unacceptable impacts are observed (in the opinion of the bird specialist after consultation with BLSA, relevant stakeholders and an independent review), the specialist should conduct a literature review specific to the impact (e.g. collision and/or electrocution) and provide updated and relevant mitigation options to be implemented. Mitigations that may need to be implemented (and should be considered in the project's financial planning) include:
  a) Onsite and off-site habitat management. A habitat management plan which aims to prevent an influx/increase in preferred prey items in the turbine area due to the construction and operation activities, while improving raptor habitat and promoting prey availability away from the site.
  b) Implementing a carcass management plan on the wind farm site, to remove any dead livestock as soon as possible, to reduce the likelihood of attracting scavenging juvenile eagles to the wind farm site.
  c) Using deterrent devices (e.g. visual and noise deterrents) and/or shutdown systems e.g. automatic bird detectors (e.g. automated camera-based monitoring systems – McClure et. al. 2018) if commercially available; or Radar Assisted Shutdown on Demand (RASOD) to reduce collision risk.
  d) Identify options to modify turbine operation (e.g. temporary curtailment or shut-down on demand) to reduce collision risk if absolutely necessary and if other methods have not had the desired results.
  e) Possibly offset programmes if no suitable mitigation measures can be implemented to reduced impacts sufficiently.
» All turbines located within the cautionary buffers must have a single blade painted black during construction. Given this is a novel mitigation, which has been proven to be effective internationally, a post-construction monitoring scheme should be implemented to determine its effectiveness.

Residual Impacts:

The impact is likely to persist for the operational life-time of the project. Implementation of the proposed mitigation measures should reduce the probability and severity of the impact on priority species to such an extent that the overall significance of residual impact should be reduced to low.

Nature: *Disturbance and displacement of birds during operation*

Displacement due to disturbance of Priority Species during the operation phase.

	Without mitigation	**With mitigation**

Extent	Local (2)	Local (2)
Duration	Permanent (5)	Permanent (5)
Magnitude	Moderate (6)	Low (4)
Probability	Probable (3)	Probable (2)
Significance	**Medium (39)**	**Low (22)**
Status (positive or negative)	Negative	Negative
Reversibility	No - While it is expected that most species will continue to use the wind farm area, some species might do so in reduced densities, primarily due to the fragmentation of the habitat.	
Irreplaceable loss of resources?	Yes - While it is expected that most species will continue to use the wind farm area, some species might do so in reduced densities, primarily due to the fragmentation of the habitat.	
Can impacts be mitigated?	Yes - To some extent by ensuring that no impacts occur outside the immediate footprint.	

Mitigation:

» The recommendations of the Ecological Impact Assessment must be strictly adhered to.
» Where possible existing access roads should be used and upgraded during the construction while the construction of new roads should be kept to a minimum.
» Following construction, rehabilitation of all areas disturbed (e.g. temporary access tracks and laydown areas) must be undertaken and to this end a habitat restoration plan must be developed by a rehabilitation specialist.

Residual Impacts:

The rehabilitation of disturbed areas will help to mitigate the impact of the habitat transformation to some extent, but the fragmentation of the habitat due to the construction of the internal road network cannot be mitigated, and will remain an impact for the duration of the operational life-time of the facility.

Nature: *Electrocution of priority species on the power line during operation*
Direct mortality of priority species due to electrocution associated with the power line (and substation infrastructure).

	Without mitigation	**With mitigation**
Extent	Local (2)	Local (2)
Duration	Permanent (5)	Permanent (5)
Magnitude	Low (3)	Low (3)
Probability	Probable (3)	Probable (2)
Significance	**Medium (30)**	**Low (20)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	Yes	No
Can impacts be mitigated?	Yes	

Mitigation:

» Placement of electrical infrastructure should consider avifaunal sensitivity zones and avoid areas of higher sensitivities where possible.
» All new internal power lines linking the wind turbine generators to each other on site must be placed underground where technically and environmentally feasible. Certain spans can only be above ground if it is impossible and completely unfeasible to bury them or if there is a reasonable other environmental aspect present which prevents them being buried (e.g. a sensitive wetland area).
» Any new overhead power lines must be of a design that minimises electrocution risk by using adequately insulated 'bird friendly' monopole structures, with clearances between live components and possible bird perches (e.g. cross arms) of 1.8 m or greater. Each pylon should be fitted with a safe bird perch.
» Develop and implement a carcass search programme for birds during the first two years of operation, in line with the South African monitoring guidelines (Jenkins et al. 2015). This program must include monitoring of overhead power lines.

Residual Impacts:
The electrocution risk will persist as long as the lines are operational, but it can be completely eliminated at the onset, if bird-friendly structures are used.

Nature: *Priority species collision on the overhead power line during operation* Direct mortality of priority species due to collisions with the grid connection power line		
	Without mitigation	**With mitigation**
Extent	Local (2)	Local (2)
Duration	Permanent (5)	Permanent (5)
Magnitude	Moderate (4)	Low (2)
Probability	Probable (4)	Probable (3)
Significance	**Medium (44)**	**Low (27)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	Yes	No
Can impacts be mitigated?	Yes	
Mitigation: » All new internal power lines linking the wind turbine generators to each other on site must be placed underground where technically and environmentally feasible. Certain spans can only be above ground if it is impossible and completely unfeasible to bury them or if there is a reasonable other environmental aspect present which prevents them being buried (e.g. a sensitive wetland area). » Placement of electrical infrastructure should consider avifaunal sensitivity zones and avoid areas of higher sensitivities where possible - If some spans are to be above ground, where possible place new overhead power lines adjacent to existing power line or linear infrastructure (e.g. roads and fence lines). » Attach appropriate marking devices (BFDs – bird friendly devices) on all new overhead power lines to increase visibility. The advice of a specialist should be sought regarding the type, placement and spacing of the BFDs to be used and the type of pylon structure to be used. » Develop and implement a carcass search programme for birds during the first two years of operation, in line with the South African monitoring guidelines (Jenkins et al. 2015). This program must include monitoring of overhead power lines.		
Residual Impacts: The application of BFDs should reduce the probability and severity of the collision impact to a lower level, but it is likely to remain at the medium level, as the application of BFDs will reduce, but not eliminate the risk.		

Nature: *Disturbance of priority species due to decommissioning of turbines and grid infrastructure* Disturbance and displacement of birds will take place.		
	Without mitigation	**With mitigation**
Extent	Local (2)	Local (2)
Duration	Short-term (3)	Short-term (3)
Magnitude	Moderate (5)	Low (4)
Probability	Probable (4)	Probable (3)
Significance	**Medium (40)**	**Low (27)**
Status (positive or negative)	Negative	Negative
Reversibility	Yes, but it will be temporary	
Irreplaceable loss of resources?	Partially– Some disturbance is inevitable with the activities associated with decommissioning.	
Can impacts be mitigated?	Yes - To some extent, however the impact will be negated naturally after the closure phase.	
Mitigation:		

- A site specific Environmental Management Plan must be implemented for the decommissioning phase.
- The Environmental Officer must oversee activities and ensure that the site specific EMP is implemented and enforced.
- The appointed Environmental Officer (EO) must be trained by an avifaunal specialist to identify the potential priority species and Red Data species as well as the signs that indicate possible breeding by these species. The EO must then, during audits/site visits, make a concerted effort to look out for such breeding activities of Red Data species, and such efforts may include the training of construction staff (e.g. in toolbox talks) to identify Red Data species, followed by regular questioning of staff as to the regular whereabouts on site of these species. If any of the Red Data species are confirmed to be breeding (e.g. if a nest site is found), activities within 500m of the breeding site must cease, and an avifaunal specialist is to be contacted immediately for further assessment of the situation and instruction on how to proceed.

Residual Impacts:

The dismantling activities associated with all wind farm infrastructure (including turbines and power lines) could result in the short-term displacement of priority species from the site. The implementation of the proposed mitigation measures will greatly reduce the probability of disturbance of specifically raptors breeding on the power line.

10.5.3 Overall Result

The Avifauna Impact Assessment identified that all impacts associated with the development of the Wind Garden Wind Farm development footprint will be of a medium significance before mitigation and can be mitigated to an acceptable level of impact (i.e. medium or low significance, depending on the impact being considered). No impacts of a high significance or fatal flaws are expected to occur with the implementation of the recommended mitigation measures.

10.6. Potential Impacts on Bats

Various impacts have been identified for bats with the development of the Wind Garden Wind Farm. The potential impacts and the relative significance of the impacts are summarised below (refer to **Appendix F** for more details).

10.6.1 Description of Bat Impacts

Wind Farms have the potential to impact bats directly through collisions (with spinning turbine blades) and barotrauma resulting in mortality, and indirectly through the modification of habitats. Similarly, the grid connection may also impact bats directly through collisions (with transmission lines), and indirectly through habitat modification. Modification of habitat includes roost destruction, roost disturbance, and displacement from foraging areas and/or commuting routes. Direct impacts pose the greatest risk to bats and, in the context of the project, habitat modification impacts should not pose a significant risk because the project footprint (i.e. turbines, roads and other associated infrastructure) is small and because of limited roosting spaces at the site.

Direct impacts to bats posed by the turbines at Wind Garden Wind Farm will be limited to species that make use of the airspace in the rotor-swept zone of the wind turbines. Five of the bat species (and potentially more unidentified species) that were recorded on site exhibit behaviour that may bring them into contact with wind turbine blades. They are potentially at risk of negative impacts if not properly mitigated. This includes three high risk species (Egyptian free-tailed bat, Natal long-fingered bat and Robert's free-tailed bat) and one medium-high risk species (Cape serotine). The Egyptian free-tailed bat, Natal long-fingered bat and Cape serotine have all suffered mortality at operational wind energy facilities in South Africa. Direct impacts of the grid connection transmission lines would primarily be limited to fruit bats, however non were recorded on site.

Bat activity at Wind Garden Wind Farm was generally low during winter, very high during autumn (March and April) and moderate to high the rest of the year.

10.6.2 Impact tables summarising the significance of impacts on bats during the construction, operation and decommissioning phases (with and without mitigation)

Construction Phase Impacts

Nature: Roost Disturbance

Wind farms have the potential to impact bats directly through the disturbance of roosts during construction. Relevant activities include the construction of roads, Operation and Maintenance (O&M) buildings, sub-station(s), internal transmission lines and installation of wind turbines. Excessive noise and dust during the construction phase could result in bats abandoning their roosts, depending on the proximity of construction activities to roosts. This impact will vary depending on the species involved; species that may roost in trees are likely to be impacted more (e.g. Cape serotine and Egyptian free-tailed bats) because tree roosts are less buffered against noise and dust compared to roosts in buildings and rocky crevices. Roosts are limiting factors in the distribution of bats and their availability is a major determinant in whether bats would be present in a particular location. Reducing roosting opportunities for bats is likely to have negative impacts. There are two major bat roosts found on site. Roosting potential is also higher in the more mountainous areas on site and within woodland areas, especially in older and larger trees. Avoidance of known bat roosts and these high potential areas is critical for lowering the significance of this impact, with it unlikely that this impact will occur if mitigation measures are followed. Therefore, with mitigation the significance of this impact would be low and have a slight to no effect.

	Without mitigation	**With mitigation**
Extent	Local (2)	Local (2)
Duration	Very short-term (1)	Very short-term (1)
Magnitude	Minor (3)	Minor (2)
Probability	Probable (3)	Improbable (2)
Significance	**Low (12)**	**Low (10)**
Status (positive or negative)	Negative	Negative
Reversibility	Medium	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	

Mitigation:

- It may be possible to limit roost abandonment by avoiding construction activities near roosts, specifically the major roost found near C10 (near Wind Garden) and large mature trees within 50m of the turbine positions should be inspected for roosting bats.
- It is recommended that potential roosts, specifically trees, buildings and rocky crevices, are buffered by 200m, inside which no turbine infrastructure may be placed. These buffers have been mapped and are to blade tip. No turbines should be installed within 50m of large mature trees

Residual Impacts:

Even with all mitigation measures being implemented, undiscovered roosts close to construction may be disturbed due to noise and dust.

Nature: Roost Destruction

Wind farms have the potential to impact bats directly through the physical destruction of roosts during construction. Relevant activities include the construction of roads, O&M buildings, sub-station(s), grid connection transmission lines and installation of wind turbines. Potential roosts that may be impacted by construction activities include trees, crevices in rocky outcrops and buildings. Roost destruction can impact bats either by removing potential roosting spaces which reduces available roosting sites or, if a roost is destroyed while bats are occupying the roost, this could result in bat mortality. Reducing roosting opportunities for bats or killing bats during the process of destroying roosts will have negative impacts and could be severe. There is one major bat roosts found on site (near C10). Roosting potential is also higher in the more mountainous areas on site and within woodland areas, especially in older and larger trees. Destruction of these roosts and roosting areas could be severe for bat populations and must be avoided. Therefore, mitigation is essential for lowering the significance and effect on bats.

	Without mitigation	**With mitigation**
Extent	Local (2)	Local (2)
Duration	Permanent (5)	Permanent (5)
Magnitude	Moderate (6)	Low (5)
Probability	Improbable (2)	Improbable (2)
Significance	**Low (26)**	**Low (24)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes	

Mitigation:

» The wind farm must be designed and constructed in such a way as to avoid the destruction of potential and actual roosts, particularly large mature trees, buildings, rocky crevices (if blasting is required), woodland habitat, mountainous areas and the major roost found near Wind Garden.
» It is recommended that potential roosts, specifically trees, buildings and rocky crevices, are buffered by 200m, inside which no turbine infrastructure is allowed. These buffers have been mapped and are to blade tip. No turbines should be installed within 50m of large mature trees.

Residual Impacts:

Marginally less spaces for roosting bats and decrease in population if roosts are destroyed.

Nature: *Habitat Modification*

Bats can be impacted indirectly through the modification or removal of habitats and can also be displaced from foraging habitat by wind turbines. The removal of vegetation during the construction phase can impact bats by removing vegetation cover and linear features that some bats use for foraging and commuting. The modification of habitat could create linear edges which some bats use to commute or forage along. This modification could also create favourable conditions for insects upon which bats feed which would in turn attract bats. The woodland vegetation is important for bat ecology and foraging and clearing of this vegetation should be limited as much as possible. If mitigation measures are followed this impact will have a low significance and little effect on bats.

	Without mitigation	**With mitigation**
Extent	Local (2)	Local (2)
Duration	Medium-term (3)	Medium-term (3)
Magnitude	Moderate (6)	Low (4)
Probability	Probable (3)	Improbable (2)
Significance	**Medium (33)**	**Low (18)**
Status (positive or negative)	Negative	Negative
Reversibility	Medium	High
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes	

Mitigation:

» During construction laydown areas and temporary access roads should be kept to a minimum in order to limit direct vegetation loss and habitat fragmentation. Construction of the infrastructure should, where possible, be situated in areas that are already disturbed.

» This impact must be reduced by limiting the removal of vegetation, particularly large mature trees within 50m of turbine positions.
» Following construction, rehabilitation of all areas disturbed (e.g. temporary access tracks and laydown areas) must be undertaken and a habitat restoration plan must be developed by a specialist and included within the EMPr.

Residual Impacts:
Habitat fragmentation and destruction of vegetation could remain after construction, possibly impacting bats foraging and commuting.

Nature: *Roost Disturbance due to the grid connection infrastructure*
The grid connection infrastructure may impact bats directly through the disturbance of roosts during construction. Excessive noise and dust during the construction phase could result in bats abandoning their roosts, depending on the proximity of construction activities to roosts. This impact will vary depending on the species involved; species that may roost in trees are likely to be impacted more (e.g. Cape serotine and Egyptian free-tailed bats) because tree roosts are less buffered against noise and dust compared to roosts in buildings and rocky crevices. Roosts are limiting factors in the distribution of bats and their availability is a major determinant in whether bats would be present in a particular location. Reducing roosting opportunities for bats is likely to have negative impacts. However, this impact is predicted to have a slight to no effect on bats.

	Without mitigation	**With mitigation**
Extent	Low (2)	Low (1)
Duration	Very short-term (1)	Very short-term (1)
Magnitude	Low (5)	Low (4)
Probability	Improbable (2)	Improbable (2)
Significance	**Low (16)**	**Low (12)**
Status (positive or negative)	Negative	Negative
Reversibility	Medium	Medium
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	

Mitigation:
» Adhere to the bat sensitivity and no-go zones by trying to avoid building the collector substation and switching station within these areas (especially in mountainous and woodland areas) and strictly avoiding roost buffered areas.

Residual Impacts:
Undiscovered roosts close to construction may be disturbed due to noise and dust, but is unlikely to occur.

Nature: *Roost destruction due to the grid connection infrastructure*
The grid connection infrastructure may impact bats directly through the physical destruction of roosts during construction. Roosts are limiting factors in the distribution of bats and their availability is a major determinant in whether bats would be present in a particular location. Reducing roosting opportunities for bats is likely to have negative impacts. Potential roosts that may be impacted by construction activities include rocky crevices. Roost destruction can impact bats either by removing potential roosting spaces which reduces available roosting sites or, if a roost is destroyed while bats are occupying the roost, this could result in bat mortality. Reducing roosting opportunities for bats or killing bats during the process of destroying roosts will have negative impacts. However, no or a low number of roosts will likely need to be destroyed resulting in the significance of this impact being low and have a slight to no effect on bats.

	Without mitigation	**With mitigation**
Extent	Low (2)	Low (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Low (5)	Low (4)
Probability	Improbable (2)	Very Improbable (1)

Significance	**Low (22)**	**Low (9)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes	
Mitigation: » Adhere to the bat sensitivity and no-go zones by trying to avoid building the collector substation and switching station within these areas (especially in mountainous and woodland areas) and strictly avoiding roost buffered areas.		
Residual Impacts: Roost destruction is very unlikely to occur so there should not be any residual impacts.		

Operation Phase Impacts

Nature: *Bat mortality during commuting and /or foraging* The major potential impact of wind turbines on bats is direct mortality resulting from collisions with turbine blades and/or barotrauma. These impacts will be limited to species that make use of the airspace in the rotor-swept zone of the wind turbines. Five of the species of bat that were recorded at the project site are high risk and several are medium-high risk species that exhibit behaviour that may bring them into contact with wind turbine blades, so they are potentially at risk of negative impacts that could be severe.		
	Without mitigation	**With mitigation**
Extent	Regional (4)	Local (3)
Duration	Long-term (4)	Long-term (4)
Magnitude	High (9)	Moderate (6)
Probability	Highly Probable (4)	Improbable (2)
Significance	**High (68)**	**Low (26)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes	
Mitigation: » Designing the layout of the project to avoid areas that are more frequently used by bats will reduce the likelihood of mortality and should be the primary mitigation measure. These areas include key microhabitats such as water features, trees, buildings, and rocky crevices. The current layout proposed adheres to no-go areas in accordance with bat conservation. All buffers are to blade tip. » The height of the lower blade swept area must be maximised, and should not be lower than 36 m. » Operational acoustic monitoring and carcass searches for bats must be performed, based on best practice, to monitor mortality and bat activity levels. Acoustic monitoring should include monitoring at height (from more than one location i.e. such as on turbines) and at ground level. » Apply curtailment during spring, summer and autumn if mortality occurs beyond threshold levels as determined based on applicable guidance (MacEwan et al. 2018). The threshold calculations must be done at a minimum of once a quarter (i.e. not only after the first year of operational monitoring) so that mitigation can be applied as quickly as possible should thresholds be reached.		
Residual Impacts: Inevitably some bats may come into contact with turbines while commuting from nearby roosts or foraging. However, impacts will be far less severe with mitigation measures implemented.		

Nature: *Mortality during migration* It has been suggested that some bats may not echolocate when they migrate which could explain the higher numbers of migratory species suffering mortality in wind farm studies in North America and Europe. Therefore, the

direct impact of bat mortality may be higher when they migrate compared to when they are commuting or foraging. This is considered here as a separate impact of the wind farm on the Natal long-fingered bat, which is the only species recorded during pre-construction monitoring known to exhibit long-distance migratory behaviour. The majority of bat mortalities at wind farms in North America are migratory species. Evidence from the pre-construction monitoring may suggest migratory behaviour through the site due to the roost near C10, where there is historical evidence of this species. Mortality may, therefore, occur during migration periods. During the operating lifespan of the wind farm it may be possible that migration patterns and species distributions may change in response to climactic and/or habitat shifts. There may also be inter-annual variation in bat movement patterns which cannot be observed with a single year of data collection. With the current data the effects on bats are predicted to be moderately severe without mitigation and have little effect with mitigation.		
	Without mitigation	**With mitigation**
Extent	Regional (5)	Regional (4)
Duration	Long-term (4)	Long-term (4)
Magnitude	High (8)	Low (6)
Probability	Probable (3)	Improbable (2)
Significance	**Medium (51)**	**Low (28)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes	
Mitigation: » Designing the layout of the project to avoid areas that are more frequently used by bats may reduce the likelihood of mortality and should be the primary mitigation measure. These areas include key microhabitats such as water features, trees, buildings, and rocky crevices. The current layout proposed adheres to no-go areas is in accordance with bat conservation. All buffers are to blade tip. » The height of the lower blade swept area must be maximised, and should not be lower than 36 m. » Operational acoustic monitoring and carcass searches for bats must be performed, based on best practice, to monitor mortality and bat activity levels. Acoustic monitoring should include monitoring at height (from more than one location i.e. such as on turbines) and at ground level. » Apply curtailment during spring, summer and autumn if mortality occurs beyond threshold levels as determined based on applicable guidance. The threshold calculations must be done at a minimum of once a quarter (i.e. not only after the first year of operational monitoring) so that mitigation can be applied as quickly as possible should thresholds be reached.		
Residual Impacts: Although there is little evidence of a mass migration route through the site, migrations could still happen through the area and inter-annual changes in species migration could increase fatalities over different time periods of any given year.		

Nature: <u>Light pollution</u> Currently the local region experiences very little light pollution from anthropogenic sources and the construction of a wind farm will marginally increase light pollution. This excludes turbine aviation lights which do not appear to impact bats. During the operation of the wind farm, it is assumed that the only light sources would be motion sensor security lighting for short periods and lighting associated with the substations. This artificial lighting would impact bats indirectly via the mortality of their insect prey thereby reducing foraging opportunities for certain bat species. Lighting attracts and can cause direct mortality of insects. These local reductions in insect prey may reduce foraging opportunities for bats, particularly for species that avoid illuminated areas. This impact is likely to be low after mitigation because, relative to the large area in the region that would not be developed that likely supports large numbers of insects, the prey resource for bats is likely to be sufficient.

Other bat species actively forage around artificial lights due to the higher numbers of insects which are attracted to these lights. This may bring these species into the vicinity of the project and indirectly increase the risk of collision/barotrauma particularly for species that are known to forage around lights. These include the Cape serotine and the Egyptian free-tailed bat. This impact is likely to be low with mitigation but must be carefully considered because the consequence could be severe without mitigation. Lighting at the project should be kept to a minimum and appropriate types of lighting should be used to avoid attracting insects, and hence, bats. With mitigation this impact will have little effect.

	Without mitigation	**With mitigation**
Extent	Local (2)	Local (2)
Duration	Medium-term (3)	Medium-term (3)
Magnitude	Low (5)	Low (4)
Probability	Improbable (2)	Improbable (2)
Significance	**Low (20)**	**Low (18)**
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes	

Mitigation:

- This impact can be mitigated by using as little lighting as possible, and only where essential for operation of the facility.
- Where lights need to be used such as at the collector substation and switching station and elsewhere, these should have low attractiveness for insects such as low pressure sodium and warm white LED lights. High pressure sodium and white mercury lighting is attractive to insects and should not be used as far as possible.
- Lighting should be fitted with movement sensors to limit illumination and light spill, and the overall lit time. In addition, the upward spread of light near to and above the horizontal plane should be restricted and directed to minimise light trespass and sky glow.
- Increasing the spacing between lights, and the height of light units can reduce the intensity and volume of the light to minimise the area illuminated and give bats an opportunity to fly in relatively dark areas between and over lights.

Residual Impacts:

Lights that need to be kept on (e.g. for light when conducting maintenance in the dark) could bring opportunistic bats foraging into these lit areas on site that would increase their chance of coming into contact with turbine blades.

Nature: Bat mortality through collision with transmission lines

Insectivorous bats are unlikely to collide with transmission lines due to their ability to echolocate. They are therefore able to detect and avoid obstacles in their path, such as electrical cabling. Fruit bats do not echolocate in the same manner and can collide and become electrocuted by transmission lines. There is no published evidence of this in South Africa but these events do occur globally.

The existence of suitable caves for roosting and fruit trees along or across the power line route may increase the likelihood that fruit bats will be present however there are none of these features along the proposed grid connection route. Therefore, this impact is expected to have a slight to no effect on bats.

	Without mitigation	**With mitigation**
Extent	Low (1)	Low (1)
Duration	Medium-term (3)	Medium-term (3)
Magnitude	Minor (3)	Minor (3)
Probability	Very Improbable (1)	Very Improbable (1)
Significance	**Low (7)**	**Low (7)**
Status (positive or negative)	Negative	Negative

Reversibility	No	No
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes	
Mitigation: As this impact is unlikely to occur, no mitigation options are required.		
Residual Impacts: No mitigation measures are recommended so residual risks will remain the same and unlikely.		

The impacts to the bats during the decommissioning phase (for both the wind energy facility and the associated grid connection) are likely to be restricted to disturbance. This impact is expected to be low and therefore not assessed in any detail.

10.6.3 Overall Result

Based on the bat activity recorded at the Wind Garden Wind Farm, the significance ratings for the majority of the impacts to bats posed by the development are predicted to be medium or high before mitigation. After mitigation, all impacts are predicted to be low. Based on the opportunity for reduction of the impacts through appropriate mitigation measures from a high or medium significance to a low acceptable significance no fatal flaws are expected to occur.

10.7. Assessment of Impacts on Land Use, Soil and Agricultural Potential

Based on the sensitivity of the Wind Garden Wind Farm development envelope (see Chapter 9) a compliance statement was undertaken and not a full impact assessment in accordance with the relevant specialist protocols published in GNR320 of 20 March 2020. Therefore an impact statement is provided from a land use, soils and agricultural perspective. Potential impacts and the relative significance of the impacts are summarised below (refer to **Appendix H** – Soils Impact Assessment for more details).

10.7.1 Impact Statement and recommendations

The impact statement focusses on the activities occurring within the 50 m regulated area of the Moderate and High sensitivity resources, given the fact that these areas will be most vulnerable to degradation. Regardless, various recommendations and mitigation measures are prescribed to ensure the conservation of all resources, including those labelled as Low sensitivity. All proposed activities are expected to be long term (> 15 years) and have been considered permanent on this basis, which renders the decommissioning phase irrelevant. Various activities are proposed within the 50 m regulated area of Moderate and High sensitivity resources that are considered as part of this impact statement, which includes;

» Construction and operation of the 132kV collector and switching substations.
» Construction and operation of the Balance of Plant (BoP) area.
» Construction and operation of the wind turbines.
» Construction and operation of the 132kV Overhead Line (OHL).
» Construction and operation of the access roads.

<u>Construction and operation of the 132kV collector and switching substations</u>
The footprint of the collector substation is located within a Low sensitivity soil resource area, with the 50 m regulated area surrounding Moderate sensitivities being located approximately 100m away. The footprint

of the switching substation is located within a Low sensitivity area and approximately 60m north of the 50m regulated area surrounding the Moderate sensitivity resources.

The specialist indicates that the development of the two substations within the proposed locations will have an acceptable impact on the agricultural production capability of the area.

Wind turbines

From the 47 wind turbines only nine are located within 50m of Moderate sensitivity resources. Therefore, the focus of this impact assessment will be on the latter, with the remainder of the turbines (that are located within Low sensitivity areas) being covered by general mitigation.

The specialist indicates that the wind turbines will have an acceptable impact on the agricultural production capability of the area given the fact that only Low and Moderate sensitivities are associated with the footprint areas.

Linear activities (access roads and power line)

Various sections of the access roads and the majority of the power line's extent crosses through Moderate sensitivity soil resources. Access roads will be used to gain access to all the construction sites (i.e. turbines) with the power line connecting the two substations.

The specialist indicates that the linear activities will have an acceptable impact on the agricultural production capability of the area given the fact that only Low and Moderate sensitivities are associated with the footprint areas.

Balance of Plant (BoP) area

The extent of the BoP area is characterised by a combination of Low and Moderate sensitivities (although the majority of the area comprises of Moderate sensitivities).

The specialist indicates that the BoP will have an acceptable impact on the agricultural production capability of the area given the fact that only Low and Moderate sensitivities are associated with the footprint areas.

Recommendations and Mitigation

» General mitigations will ensure the conservation of all soil resources, regardless of the sensitivity of resources and the intensity of impacts.
  * Only the proposed access roads are to be used to reduce any unnecessary compaction.
  * Prevent any spills from occurring. Machines must be parked within hard park areas and must be checked daily for fluid leaks.
  * Proper invasive plant control must be undertaken quarterly.
  * All excess soil (soil that are stripped and stockpiled to make way for foundations) must be stored and rehabilitated to be used for rehabilitation of eroded areas.
  * If a spill occurs, it is to be cleaned up immediately and reported to the appropriate authorities.

» Restoring vegetation cover is the first step to successful rehabilitation. Vegetation cover decreases flow velocities and minimises erosion.

» All areas outside of the footprint areas that will be degraded (by means of vehicles, laydown yards etc.) must be ripped where compaction has taken place. According to the Department of Primary Industries and Regional Development, ripping tines must penetrate to just below the compacted horizons (approximately 300 – 400 mm) with soil moisture being imminent to the success of ripping. Ripping must take place within 1-3 days after seeding, and also following a rain event to ensure a higher moisture content. To summarise:
  * Rip all compacted areas outside of the developed areas that have been compacted.
  * This must be done by means of a commercial ripper that has at least two rows of tines.
  * Ripping must take place between 1 and 3 days after seeding and following a rainfall event (seeding must therefore be carried out directly after a rainfall event).

» All areas surrounding the development footprint areas that have been degraded by traffic, laydown yards etc. must be ripped and revegetated by means of indigenous grass species. Mixed stands or monocultures will work sufficiently for revegetation purposes. Mixed stands tend to blend in with indigenous vegetation species and are more natural. Monocultures however could achieve high productivity. In general, indigenous vegetation should always be preferred due to various reasons including the aesthetical presence thereof as well as the ability of the species to adapt to its surroundings.

» Plant phase plants which are characterised by fast growing and rapid spreading conditions. Seed germination, seed density and seed size are key aspects to consider before implementing revegetation activities. The amount of seed should be limited to ensure that competition between plants are kept to a minimum. During the establishment of seed density, the percentage of seed germination should be taken into consideration. *E curvula* is one of the species recommended due to the ease of which it germinates. This species is also easily sown by means of hand propagation and hydro seeding. The following species are recommended for rehabilitation purposes:
  * *Eragrostis teff;*
  * *Cynodon species* (Indigenous and altered types);
  * *Chloris gayana;*
  * *Panicum maximum;*
  * *Digitaria eriantha;*
  * *Anthephora pubescens; and*
  * *Cenchrus ciliaris.*

10.7.2 Overall Result

All impacts identified to be associated with the development of the Wind Garden Wind Farm are considered to be acceptable with the implementation of the recommendations and mitigation measures as provided by the specialist. No fatal flaws have been identified.

All aspects considered during the impact assessment has been determined to have low or moderate post-mitigation significance. The worst-case impact scenario includes Moderate final significance ratings associated with Moderate sensitivity resources. It is considered that erosion from increased overland flows following the development of various components is of most concern, given the fact that erosion could result in a direct loss of soil resources. Various mitigation measures and monitoring activities have been prescribed, which will remedy the potential effects that erosion might have on land capability.

10.8. Assessment of Impacts on Heritage Resources

Negative impacts on heritage resources have been identified based on the resources identified and discovered during the site survey. Potential impacts and the relative significance of the impacts are summarised below (refer to **Appendix I**).

10.8.1 Description of the Heritage Impacts

Heritage impacts are expected on historical structure, burial grounds and graves and palaeontology resources. During the survey, 12 sites were identified. Of these sites, nine (9) sites (EWF1-01 to EWF1-09) consist of structures (Farmhouses, Labourer houses, farm sheds and kraals), three (3) sites contain graves (EWF1-10 to EWF1-12).

The impacts will be due to the undertaking of construction activities which includes disturbance on the ground, including excavations.

<u>Historical Structures</u>
EWF1-01 to EWF1-03, EWF1-05 to EWF1-06, and EWF1-08 to EWF1-09 were rated as not conservation worthy and of no heritage significance. The impact significance before mitigation on the structures will be low negative The impact of the proposed development will be local in extent. The possibility of the impact occurring is probable. The expected duration of the impact is assessed as potentially permanent. Implementation of the recommended mitigation measures will reduce this impact rating to an acceptable low negative impact.

EWF1-07 has a low heritage significance and heritage rating of IIIC. The impact significance before mitigation on the structures will be low negative before mitigation. The impact of the proposed development will be local in extent. The possibility of the impact occurring is improbable. The expected duration of the impact is assessed as potentially permanent. Implementation of the recommended mitigation measures will reduce this impact rating to an acceptable low negative impact.

EWF1-04 has a high heritage significance and heritage rating of IIIB. The impact significance before mitigation on the structures will be moderate negative before mitigation. The impact of the proposed development will be local in extent. The possibility of the impact occurring is probable. The expected duration of the impact is assessed as potentially permanent. Implementation of the recommended mitigation measures will reduce this impact rating to an acceptable low negative impact.

<u>Burial Grounds and Graves</u>
The sites EWF1-10 to EWF1-12 have a high heritage significance and heritage rating of IIIA. These sites have high heritage sensitivity. The impact significance before mitigation on the graves will be moderate negative before mitigation. The impact of the proposed development will be local in extent. The possibility of the impact occurring is probable. The expected duration of the impact is assessed as potentially permanent. Implementation of the recommended mitigation measures will reduce this impact rating to an acceptable low negative impact.

<u>Palaeontology</u>

Within the project site and development envelope there is a moderate to high chance of finding fossils. The impact significance before mitigation on the Paleontological resources will be moderate negative before mitigation. The possibility of the impact occurring is very likely. The expected duration of the impact is assessed as potentially permanent. Implementation of the recommended mitigation measures will reduce this impact rating to an acceptable low negative impact.

10.8.2 Impact tables summarising the significance of impacts on heritage during construction, operation and decommissioning (with and without mitigation)

Nature: Impact to historical structures of no heritage significance

Historical Structures (EWF1-01 to EWF1-03, EWF1-05 to EWF1-06, and EWF1-08 to EWF1-09) have been identified during the survey, including farmhouses and labourer houses. These sites were rated as not conservation-worthy and of no heritage significance.

	Without mitigation	**With mitigation**
Extent	Low/Moderate (2)	Low (1)
Duration	Permanent (5)	Long Term (4)
Magnitude	Minor (2)	Minor (1)
Probability	Probable (3)	Unlikely (2)
Significance	**Low (27)**	**Low (12)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes	

Mitigation:

No mitigation is required.

Residual Impacts:

Considering the nature of the sites identified, the residual risk will be minimal.

Nature: Impact to historical structures of low significance

Historical Structures (EWF1-07) have been identified during the survey, including the ruins of houses. These sites were rated as having a low heritage significance and heritage rating of IIIC.

	Without mitigation	**With mitigation**
Extent	Moderate (3)	Low (1)
Duration	Permanent (5)	Short term (2)
Magnitude	Minor (2)	Minor (2)
Probability	Improbable (2)	Unlikely (2)
Significance	**Low (20)**	**Low (10)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes	

Mitigation:

» As EWF1-07 falls approximately 700m outside the proposed development envelope, no mitigation is required, as no impact is expected

Residual Impacts:

Considering the nature of the sites identified, the residual risk will be moderate.

Nature: *Impact to historical structures of high significance*

Historical Structures (EWF1-04) have been identified during the survey, including a farmhouse. This site was rated as having a medium heritage significance and heritage rating of IIIB.

	Without mitigation	**With mitigation**
Extent	Moderate/High (4)	Low (1)
Duration	Permanent (5)	Long Term (4)
Magnitude	High (8)	Low (2)
Probability	Highly Probable (4)	Unlikely (2)
Significance	**High (68)**	**Low (14)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes	

Mitigation:

» It is recommended that a no-go-buffer zone of at least 500m from the outer perimeter of the farmstead is kept to the closest wind farm infrastructure (including turbines, substation facilities and roads).
» If development occurs within 500m of EWF1-04, the main homesteads need to be satisfactorily studied and recorded before impact occurs.
» Recording of the buildings i.e. (a) map indicating the position and footprint of all the buildings and structures (b) photographic recording of all the buildings and structures (c) measured drawings of the floor plans of the principal buildings.
» A mitigation report must be compiled for the site within which the recorded drawings from the previous item as well as all existing information on the farmstead can be included.
» The completed mitigation report must be submitted to the relevant heritage authorities with a permit application to allow for the impact to occur.

Residual Impacts:

Considering the nature of the sites identified, the residual risk will be moderate.

Nature: *Impacts to graves and burial grounds*

Graves and Burial Grounds (EWF1-10, EWF1-11, and EWF1-12) have been identified during the survey. These sites are of high significance and rated as IIIA.

	Without mitigation	**With mitigation**
Extent	Moderate/High (4)	Low (1)
Duration	Permanent (5)	Long-term (4)
Magnitude	High (8)	Low (2)
Probability	Highly Probable (4)	Unlikely (2)
Significance	**High (68)**	**Low (14)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes	

Mitigation:

» The sites should be demarcated with a 30-meter no-go-buffer zone, as per the SAHRA BGG policy for General developments, and the graves should be avoided and left in situ.
» If an impact occurs within the 30m no-go-buffer zone, the graves need to be removed. A grave relocation process for these sites is recommended as a mitigation and management measure. This will involve the necessary social consultation and public participation process before grave relocation permits can be applied for with the SAHRA under the NHRA and National Health Act regulations.

Residual Impacts:

Considering the nature of the sites identified, the residual risk will be moderate.

Nature: *Impact to palaeontological resources*

The excavations and site clearance of the wind farm will involve extensive excavations into the superficial sediment cover as well as into the underlying bedrock. These excavations will change the existing topography and may destroy and seal-in fossils at or below the ground surface. These fossils will then be unavailable for research. Impacts on Palaeontological Heritage are likely to happen only within the construction phase. No impacts are expected to occur during the operation phase.

	Without mitigation	**With mitigation**
Extent	Development area (1)	Development area (1)
Duration	Permanent (5)	Medium-term (3)
Magnitude	High (8)	Minor (2)
Probability	Highly Probable (4)	Improbable (1)
Significance	**Medium (56)**	**Low (6)**
Status (positive or negative)	Negative	Neutral
Reversibility	Irreversible	
Irreplaceable loss of resources?	Yes	No
Can impacts be mitigated?	Yes	

Mitigation:

Chance Find Procedure:

» If a chance find is made the person responsible for the find must immediately stop working and all work must cease in the immediate vicinity of the find.

» The person who made the find must immediately report the find to his/her direct supervisor which in turn must report the find to his/her manager and the Environmental Officer (EO) (if appointed) or site manager . The EO must report the find to the relevant Heritage Agency (South African Heritage Research Agency, SAHRA). (Contact details: SAHRA, 111 Harrington Street, Cape Town. PO Box 4637, Cape Town 8000, South Africa. Tel: 021 462 4502. Fax: +27 (0)21 462 4509. Web: www.sahra.org.za). The information to the Heritage Agency must include photographs of the find, from various angles, as well as the GPS co-ordinates.

» A preliminary report must be submitted to the Heritage Agency within 24 hours of the find and must include the following: 1) date of the find; 2) a description of the discovery and a 3) description of the fossil and its context (depth and position of the fossil), GPS co-ordinates.

» Photographs (the more the better) of the discovery must be of high quality, in focus, accompanied by a scale. It is also important to have photographs of the vertical section (side) where the fossil was found.

Upon receipt of the preliminary report, the Heritage Agency will inform the EO (or site manager) whether a rescue excavation or rescue collection by a palaeontologist is necessary.

» The site must be secured to protect it from any further damage. No attempt should be made to remove material from their environment. The exposed finds must be stabilised and covered by a plastic sheet or sand bags. The Heritage agency will also be able to advise on the most suitable method of protection of the find.

» In the event that the fossil cannot be stabilised the fossil may be collected with extreme care by the EO (or site manager). Fossils finds must be stored in tissue paper and in an appropriate box while due care must be taken to remove all fossil material from the rescue site.

» Once Heritage Agency has issued the written authorisation, the developer may continue with the development.

Residual Impacts:

Loss of fossil heritage.

Nature: *Impact on Cultural Landscape*

The impact that the addition of this project will have on the cultural landscape and associated heritage resources (tangible and intangible) of the region, to such an effect that it alters how the communities/visitors experience the

visual and cultural landscape (usually this experience is less appealing or could be negative).		
	Without mitigation	**With mitigation**
Extent	Moderate (3)	Regional (3)
Duration	Long term (4)	Long Term (4)
Magnitude	Moderate (6)	Low (4)
Probability	Probable (3)	Improbable (2)
Significance	**Medium (39)**	**Low (22)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	Low
The irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Only best practise mitigation measures can be implemented to limit the impact on the overall cultural landscape.	

Mitigation:

» Mitigation measures as proposed reduces negative impacts to perceptual qualities, land use patterns and living heritage will reduce the impact of this facility on the overall load.

» Mitigation measures proposed for heritage resources will reduce the negative impact on the cultural landscape and should be implemented as recommended.

» According to the Visual impact assessment (VIA) of LOGIS by Du Plessis (2021) no mitigation of the impact on the sense of place of the region or the cultural landscape is possible as the structures will be visible regardless. However, the following general mitigation measures are proposed:
   * The natural vegetation in all areas outside of the development footprint/servitude must be maintained/re-established during the planning phase.
   * Maintain the general appearance of the facility as a whole during the operational phase
   * Remove the infrastructure not required for the post-decommissioning use and rehabilitate all areas.

Residual Impacts:

Considering the nature of the sites identified in the present study, the residual risk will be moderate.

The main impacts expected to occur on the heritage resources associated with the development of the Wind Garden wind Farm will be during the construction phase. No major impacts are expected during the decommissioning phase.

10.8.3 Overall Result

Majority of impacts identified on the heritage resources were either of a medium or low significance prior to the implementation of mitigation measures (except for the impact on historical structures of a high significance and graves and burial grounds). With the implementation of the mitigation measures the impact significance will be reduced to a low acceptable impact. No impacts of a high significance are expected to occur with mitigation.

Considering the development footprint, the specialist indicates that the placement of infrastructure is considered to be acceptable based on the avoidance of heritage resources. The overall impact of the Wind Garden Wind Farm on heritage resources are identified to be acceptably low with the implementation of the recommended mitigation measures.

10.9. Assessment of Noise Impacts

Wind turbines produce sound, primarily due to mechanical operations and aerodynamic effects of the blades. Modern wind turbine manufacturers have virtually eliminated the noise impact caused by mechanical sources and instituted measures to reduce the aerodynamic effects. But, as with many other activities, the wind turbines emit sound power levels at a level that can impact on areas at some distance away. When potentially sensitive receptors are nearby, care must be taken to ensure that the operations at the wind farm do not cause undue annoyance or otherwise interfere with the quality of life of the receptors. Potential noise impacts and the relative significance of the impacts are summarised below (refer to **Appendix J**).

10.9.1 Description of Noise Impacts

During the construction phase, the undertaking of specific activities will result in noise impacts. The activities include:

- Site survey and preparation;
- Establishment of site entrance, internal access roads, contractors compound and passing places;
- Civil works to sections of the public roads to facilitate turbine delivery;
- Construction of foundations;
- Transport of components and equipment to site;
- Establishment of laydown and hard standing areas;
- Erection of the turbines;
- Construction of the substation;
- Establishment of ancillary infrastructure; and
- Site rehabilitation.

Even though most construction activities are projected to take place only during day time, it might be required at times that construction takes place during the night due to:

- Concrete pouring: Large portions of concrete do require pouring and vibrating to be completed once started, and work is sometimes required until the early hours of the morning to ensure a well-established concrete foundation. However, the work force working at night for this work will be considerably smaller than during the day.
- Working late due to time constraints: Weather plays an important role in time management in construction. A spell of bad weather can cause a construction project to fall behind its completion date. Therefore, it is hard to judge beforehand if a construction team would be required to work late at night.

During the construction phase the expected daytime average ambient sound levels would be around 34 - 46 dBA with night-time ambient sound levels around 26 – 35 dBA.

For the operation phase, the significance of daytime noise impacts was considered, however times when a quiet environment is desired (at night for sleeping, weekends etc.) are more critical. Surrounding receptors would desire and require a quiet environment during the night-time (22:00 – 06:00) timeslot and ambient noise levels are critical. It should be noted that maintenance activities normally take place during the day, but normally involve one or two light-delivery vehicles moving around during the course of the day, an insignificant noise source. As such maintenance activities will not be considered.

With no potential noise sensitive developments (NSD) living within 500m from any wind turbines, the significance of the daytime noise impact would be less than the night-time impact during operation. The projected noise rating levels will be less than 45 dBA at all NSDs at a 9 m/s wind. Noise levels will be less in lower wind speeds.

10.9.2 *Impact tables summarising the significance of impacts on Noise during construction, operation and decommissioning (with and without mitigation)*

Construction Phase Impacts

Nature: *Construction activities during the day* Various construction activities taking place simultaneously during the day will increase ambient sound levels due to air-borne noise. Noise levels due to construction activities close to the NSDs may be as high as 51 dBA, depending on the number of simultaneous activities taking place close to these NSDs. It should be noted that potential construction activities are expected to be clearly audible at the closest receptors when multiple construction activities take place closer than 1 000m from these receptors.		
	Without mitigation	**With mitigation**
Extent	Local (2)	Local (2)
Duration	Temporary (1)	Temporary (1)
Magnitude	Low-medium (4)	Low-medium (4)
Probability	Improbable (1)	Improbable (1)
Significance	**Low (7)**	**Low (7)**
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	Medium	Medium
Can impacts be mitigated?	Yes, but not required	
Mitigation: » Significance of noise impacts is very low and therefore mitigation is not required		
Residual Impacts: None		

Nature: *Construction activities during the night* Various construction activities taking place simultaneously at night will increase ambient sound levels due to air-borne noise. Noise levels due to construction activities close to the NSD may be as high as 51 dBA, depending on the number of simultaneous activities taking place close to this receptor. Such an increased noise will be highly audible, potentially disturbing during the very quiet night-time periods. It should be noted that noises from construction activities will be significant at night and receptors may consider this to be disturbing, especially if the activities take place between the hours of 01:00 and 04:00 – quietest periods at night (activities closer than 1 000 m from these receptors).		
	Without mitigation	**With mitigation**
Extent	Regional (3)	Local (2)
Duration	Temporary (1)	Temporary (1)
Magnitude	Very High (10)	Medium (6)
Probability	Highly Likely (4)	Probable (2)
Significance	**Medium (56)**	**Low (18)**
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	Medium	Medium
Can impacts be mitigated?	Yes	
Mitigation: » There is a significant potential for a noise impact if multiple construction activities take place within 2 000m from the identified NSDs. Night-time construction activities (closer than 800 m) are not recommended and it should be minimised where possible, and only if these activities can be minimised to one location using minimum equipment.		

Residual Impacts:
Irritation with construction activities and loss of sleep.

Nature: *Construction of roads during the daytime* Construction of roads during the day may increase ambient sound levels temporarily. Construction activities closer than 100m from the identified NSDs could result in noise levels exceeding 55 dBA, higher than the recommended noise limits for residential use. Construction activities closer than 250 m from the identified NSDs could result in noise levels exceeding 45 dBA, higher than the zone sound levels for a rural area.		
	Without mitigation	**With mitigation**
Extent	Local (2)	Local (2)
Duration	Temporary (1)	Temporary (1)
Magnitude	Very high (10)	Very high (10)
Probability	Probable (2)	Probable (2)
Significance	**Low (26)**	**Low (26)**
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	Medium	Medium
Can impacts be mitigated?	Yes, but not required	
Mitigation: » Significance of noise impacts is very low and therefore mitigation is not required		
Residual Impacts: None		

Nature: *Daytime construction traffic* Various construction vehicles passing close to potential noise-sensitive receptors may increase ambient sound levels and create disturbing noises.		
	Without mitigation	**With mitigation**
Extent	Local (2)	Local (2)
Duration	Short (2)	Short (2)
Magnitude	Medium to Very High (6-10)	Medium to Very High (6-10)
Probability	Probable (2)	Probable (2)
Significance	**Low (20-28)**	**Low (20-28)**
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	Medium	Medium
Can impacts be mitigated?	Yes, but not required	
Mitigation: » Significance of noise impact is very low for the scenario as conceptualised. It is however recommended that roads not be constructed within 150m from occupied dwellings used for residential purposes (to reduce noise levels below 42 dBA if construction traffic may use the road at night).		
Residual Impacts: None.		

Operation Phase Impacts

Nature: *Operational activities at night (wind turbines operating simultaneously at night)*
Increases in ambient sound levels due to air-borne noise from the wind turbines. It is unlikely that the noise from the wind turbines will exceed the potential ambient sound levels (using a sound power emission level of 104.9 dBA re 1 pW)

and the noise levels from the wind turbines will be less than 45 dBA.		
	Without mitigation	**With mitigation**
Extent	Regional (3)	Regional (3)
Duration	Long term (4)	Long term (4)
Magnitude	Low-Medium (4)	Low-Medium (4)
Probability	Probable (2)	Probable (2)
Significance	**Low (22)**	**Low (22)**
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	Medium	Medium
Can impacts be mitigated?	Yes, but not required	
Mitigation: » Significance of noise impacts is very low and therefore mitigation is not required		
Residual Impacts: None, based on the low significance		

Decommissioning phase

Final decommissioning activities will have a noise impact lower than either the construction or operation phases. This is because decommissioning and closure activities normally take place during the day using minimal equipment (due to the decreased urgency of the project). While there may be various activities, there is a very small risk for a noise impact. The significance of any noise impact would be low.

10.9.3 Overall Result

From the noise impacts assessed it is stated that there will be a low significance for daytime construction activities, a medium significance for night-time construction activities (with mitigation proposed to reduce the significance to low) and a low significance for both night-time operation activities. No impacts of a high significance or fatal flaws were identified.

The specialist has indicated that a noise monitoring programme must be undertaken before the development of the wind farm as well as noise monitoring after the first year of operation of the wind farm. The acoustic consultant will need to recommend whether future noise monitoring is required.

10.10. Assessment of Visual Impacts

Negative impacts on visual receptors will occur during the undertaking of construction activities and the operation of the Wind Garden Wind Farm. Potential impacts and the relative significance of the impacts are summarised below (refer to **Appendix K**).

10.10.1 Visual Assessment

During the construction phase of the Wind Garden Wind Farm a noticeable increase in heavy vehicles utilising the roads will occur. This will result in a visual nuisance to other road users and landowners within the surrounding area.

The operation of the Wind Garden Wind Farm will have a high visual impact on observers/visitors residing at homesteads within a 5km radius of the proposed wind turbine structures. These homesteads include Vaalkrans, Aylesbury 1, Thornkloof, and Clifton. No mitigation of this impact is possible (i.e. the structures will be visible regardless), but general mitigation and management measures are recommended as best practice.

The operation of the Wind Garden Wind Farm is expected to have a high visual impact on observers traveling along the roads within a 5km radius of the wind turbines. This includes observers travelling along the R400, R350 and R344 arterial roads and the Riebeek East and Kwandwe secondary roads. No mitigation of this impact is possible (i.e. the structures will be visible regardless), but general mitigation and management measures are recommended as best practice.

The Wind Garden Wind Farm could have a high visual impact on residents of (or visitors to) homesteads within a 5 - 10km radius of the wind turbine structures. These include Oakdale and Rockdale, Tea Fountain, Palmietfontein and Aylesbury 2, Burntkraal, Strowan, Slaaikraal, Lynton, Henley and Lindsay, Kranzdrift (1Kwandwe Nature Reserve). No mitigation of this impact is possible (i.e. the structures will be visible regardless), but general mitigation and management measures are recommended as best practice.

The Wind Garden Wind Farm could have a high visual impact on objecting landowners and residents of (or visitors to) homesteads and tourist facilities within a 10 - 20km radius of the wind turbine structures. This includes residents of/visitors to Shenfield (Lanka Safaris), Peninsula and Fonteinskloof, Douglas Heights, Cranford, Heatherton Towers, Melton, Beaumont and Vetteweiden (all located within Kwandwe Nature Reserve). No mitigation of this impact is possible (i.e. the structures will be visible regardless), but general mitigation and management measures are recommended as best practice. Even though the above impact rating could be high, and in spite of the fact that no mitigation of this impact is possible (i.e. the structures will be visible regardless), the rating should be viewed in the context of the following potential moderating factors:

- In most instances the wind turbines will only be partially exposed.
- Fewer turbines is expected to be exposed to the north due to the shielding effect of the escarpment.
- The generally longer distances of observation (i.e. beyond 10km) is expected to mitigate the impact to some degree.

Additional to this, and according to the Socio-Economic Impact Assessment (**Appendix L**), objections are more likely to be received during the pre-construction stage of the Wind Garden Wind Farm, with more tolerance shown during operation. This is attributed to the fact that initially perceived negative impacts associated with wind energy facilities do not always come to fruition.

It was further found that the construction of the Wind Garden wind Farm wind turbines would not significantly negatively influence the tourism industry or impede the influx of visitors to tourist facilities or lodges within the region, nor is it expected to negatively impact on property and land values

The Wind Garden Wind Farm could have a moderate visual impact on residents of (or visitors to) homesteads within a 10 - 20km radius of the wind turbine structures. This includes residents of/visitors to Witteklip, Dalton, Kleindeel, Coldsprings, Hillandale, Coldsprings Annexe, Mooimeisiesfontein, Uitspan, Moreson, Grootfontein, Carlisle Bridge, Middleton, Rockhurst, Skelmdrif, The Echo, Willowford, Mayfair, Coniston, Kromkrans, Markwood, Kleinfontein, Die Hoek, Glen Craig, Mayfield, Hay, Cloudlands, Dikkop

Flats, Signal Kop, Boschgift (Kwandwe Nature Reserve). No mitigation of this impact is possible (i.e. the structures will be visible regardless), but general mitigation and management measures are recommended as best practice.

Shadow flicker is an impact relevant to the operation of the turbines. Shadow flicker only occurs when the sky is clear, and when the turbine rotor blades are between the sun and the receptor (i.e. when the sun is low). Most shadow impact is associated with 3-4 times the height of the object. Based on this, an 800m buffer along the edge of the outer most turbines is identified as the zone within which there is a risk of shadow flicker occurring. There are no places of residence within the 800m buffer. The significance of shadow flicker is therefore anticipated to be low to negligible.

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

Another source of glare light, albeit not as intense as flood lighting, is the aircraft warning lights mounted on top of the hub of the wind turbines. These lights are less aggravating due to the toned-down red colour, but have the potential to be visible from a great distance. This is especially true due to the strobing effect of the lights, a function specifically designed to attract the observer's attention. The Civil Aviation Authority (CAA) prescribes these warning lights and the potential to mitigate their visual impacts have traditionally been very low other than to restrict the number of lights to turbines that delineate the outer perimeter of the facility. It is the intention of the developer to make use of ground-breaking new technology in the development of strobing lights that only activate when an aircraft is detected nearby may aid in restricting light pollution at night. This will be investigated and implemented by the project proponent, if available and permissible by the CAA.

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

This anticipated lighting impact during operation is likely to be of high significance, and may be mitigated to moderate, especially within a 5 to 10km radius of the wind turbine structures.

In terms of ancillary infrastructure, the range of visual exposure will fall within that of the turbines. The anticipated visual impact resulting from this infrastructure is likely to be of low significance both before and after mitigation.

An impact on the sense of place for the area is also identified from a visual perspective. Sense of place refers to a unique experience of an environment by a user, based on his or her cognitive experience of the place. An impact on the sense of place is one that alters the visual landscape to such an extent that the user experiences the environment differently, and more specifically, in a less appealing or less positive light. The greater environment has a rural, undeveloped character and a natural appearance. These generally undeveloped landscapes are considered to have a high visual quality. The significance of the visual impacts on the sense of place within the region (i.e. beyond a 20km radius of the development and within the greater region) is expected to be of low significance. No mitigation of this impact is possible (i.e. the structures will be visible regardless), but general mitigation and management measures are recommended as best practice.

10.10.2 Impact table summarising the significance of visual impacts during construction and operation (with and without mitigation)

Construction Phase Impacts

Nature: *Visual impact of construction activities on sensitive visual receptors* Visual impact of construction activities on sensitive visual receptors in close proximity to the proposed wind farm.		
	Without mitigation	**With mitigation**
Extent	Local (2)	Local (2)
Duration	Short term (2)	Short term (2)
Magnitude	High (8)	Moderate (6)
Probability	Highly Probable (4)	Probable (3)
Significance	**Medium (48)**	**Medium (30)**
Status (positive or negative)	Negative	Negative
Reversibility	Reversible (1)	Reversible (1)
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation: Planning: » Retain and maintain natural vegetation in all areas outside of the development footprint. Construction: » Ensure that vegetation is not unnecessarily removed during the construction period. » Plan the placement of lay-down areas and temporary construction equipment camps in order to minimise vegetation clearing (i.e. in already disturbed areas) where possible. » Restrict the activities and movement of construction workers and vehicles to the immediate construction site and existing access roads. » Ensure that rubble, litter, and disused construction materials are appropriately stored (if not removed daily) and then disposed of regularly at licensed waste facilities. » Reduce and control construction dust using approved dust suppression techniques as and when required (i.e. whenever dust becomes apparent). » Restrict construction activities to daylight hours whenever possible in order to reduce lighting impacts. » Rehabilitate all disturbed areas immediately after the completion of construction works.		
Residual Impacts: None, provided that rehabilitation works are carried out as required.		

Operation Phase Impacts

Nature: *Visual impact on sensitive visual receptors (residents and visitors) located within a 5km radius of the wind turbine structures* Visual impact on observers (residents at homesteads and visitors/tourists) in close proximity (i.e. within 5km) to the wind turbine structures		
	Without mitigation	**With mitigation**
Extent	Local (2)	Local (2)
Duration	Long term (4)	Long term (4)
Magnitude	Very high (10)	Very high (10)
Probability	Highly probable (4)	Highly probable (4)
Significance	**High (64)**	**High (64)**

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

Nature: *Potential visual impact on sensitive visual receptors (observers travelling along roads) located within a 5km radius of the wind turbine structures* Visual impact on observers travelling along the roads in close proximity (i.e. within 5km) to the wind turbine structures		
	Without mitigation	**With mitigation**
Extent	Local (2)	Local (2)
Duration	Long term (4)	Long term (4)
Magnitude	Very high (10)	Very high (10)
Probability	Highly probable (4)	Highly probable (4)
Significance	**High (64)**	**High (64)**
Status (positive or negative)	Negative	Negative
Reversibility	Reversible (1)	Reversible (1)
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	No, only best practice management measures can be implemented.	
Mitigation: Planning: » Retain/re-establish and maintain natural vegetation in all areas outside of the development footprint/servitude. Operations: » Maintain the general appearance of the facility as a whole. Decommissioning: » Remove infrastructure not required for the post-decommissioning use. » Rehabilitate all areas. Consult an ecologist regarding rehabilitation specifications.		
Residual Impacts: The visual impact will be removed after decommissioning, provided the wind farm infrastructure is removed and the area rehabilitated. Failing this, the visual impact will remain.		

Nature: *Potential visual impact on sensitive visual receptors within the region (5 – 10km radius)* Visual impact on observers travelling along the roads and residents at homesteads within a 5 – 10km radius of the wind turbine structures.		
	Without mitigation	**With mitigation**
Extent	Regional (3)	Regional (3)
Duration	Long term (4)	Long term (4)

Magnitude	High (8)	High (8)
Probability	Highly probable (4)	Highly probable (4)
Significance	**High (60)**	**High (60)**
Status (positive or negative)	Negative	Negative
Reversibility	Reversible (1)	Reversible (1)
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	No, only best practise measures can be implemented	
Mitigation: Planning: » Retain/re-establish and maintain natural vegetation in all areas outside of the development footprint/servitude. Operations: » Maintain the general appearance of the facility as a whole. Decommissioning: » Remove infrastructure not required for the post-decommissioning use. » Rehabilitate all areas. Consult an ecologist regarding rehabilitation specifications.		
Residual Impacts: The visual impact will be removed after decommissioning, provided the wind farm infrastructure is removed and the area rehabilitated. Failing this, the visual impact will remain.		

Nature: *Potential visual impact on objecting sensitive visual receptors within the region (10 – 20km radius)* Visual impact on objecting sensitive visual receptors within a 10 – 20km radius of the wind turbine structures.		
	Without mitigation	**With mitigation**
Extent	Regional (3)	Regional (3)
Duration	Long term (4)	Long term (4)
Magnitude	High (8)	High (8)
Probability	Highly probable (4)	Highly probable (4)
Significance	**High (60)**	**High (60)**
Status (positive or negative)	Negative	Negative
Reversibility	Reversible (1)	Reversible (1)
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	No, only best practise measures can be implemented	
Mitigation: Planning: » Retain/re-establish and maintain natural vegetation in all areas outside of the development footprint/servitude. Operations: » Maintain the general appearance of the facility as a whole. Decommissioning: » Remove infrastructure not required for the post-decommissioning use. » Rehabilitate all areas. Consult an ecologist regarding rehabilitation specifications.		
Residual Impacts: The visual impact will be removed after decommissioning, provided the wind farm infrastructure is removed and the area rehabilitated. Failing this, the visual impact will remain.		

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

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

Nature: *<u>Shadow Flicker</u>* Visual impact of shadow flicker on sensitive visual receptors in close proximity to the wind farm.		
	Without mitigation	**With mitigation**
Extent	Local (2)	Local (2)
Duration	Long term (4)	Long term (4)
Magnitude	Low (4)	Low (4)
Probability	Improbable (2)	Improbable (2)
Significance	**Low (20)**	**Low (20)**
Status (positive or negative)	Negative	Negative
Reversibility	Reversible (1)	Reversible (1)
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	N.A. due to the low probability of occurrence	
Mitigation: » None		
Residual Impacts: None		

Nature: *<u>Visual impact of operational, safety and security lighting of the facility at night.</u>* Visual impact of lighting at night on sensitive visual receptors		
	Without mitigation	**With mitigation**
Extent	Local/Regional (3)	Local/Regional (3)
Duration	Long term (4)	Long term (4)
Magnitude	High (8)	High (8)
Probability	Highly probable (4)	Probable (3)
Significance	**High (60)**	**Medium (45)**
Status (positive or negative)	Negative	Negative
Reversibility	Reversible (1)	Reversible (1)
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	

Mitigation: Planning and operation: » Implement needs-based night lighting if considered acceptable by the CAA. » Limit aircraft warning lights to the turbines on the perimeter according to CAA requirements, thereby reducing the overall impact. » Shield the sources of light by physical barriers (walls, vegetation, or the structure itself). » Limit mounting heights of lighting fixtures, or alternatively use foot-lights or bollard level lights. » Make use of minimum lumen or wattage in fixtures. » Make use of down-lighters, or shielded fixtures. » Make use of Low Pressure Sodium lighting or other types of low impact lighting. » Make use of motion detectors on security lighting. This will allow the site to remain in relative darkness, until lighting is required for security or maintenance purposes.
Residual Impacts: The visual impact will be removed after decommissioning, provided the facility and ancillary infrastructure is removed and the area rehabilitated. Failing this, the visual impact will remain.

Nature: *Visual impact of ancillary infrastructure* Visual impact of the ancillary infrastructure on observers in close proximity to the structures.		
	Without mitigation	**With mitigation**
Extent	Local (2)	Local (2)
Duration	Long term (4)	Long term (4)
Magnitude	Low (4)	Low (4)
Probability	Improbable (2)	Improbable (2)
Significance	**Low (20)**	**Low (20)**
Status (positive or negative)	Negative	Negative
Reversibility	Reversible (1)	Reversible (1)
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	No, only best practise measures can be implemented	
Mitigation: Planning: » Retain/re-establish and maintain natural vegetation in all areas outside of the development footprint/servitude. Operations: » Maintain the general appearance of the infrastructure. Decommissioning: » Remove infrastructure not required for the post-decommissioning use. » Rehabilitate all areas. Consult an ecologist regarding rehabilitation specifications.		
Residual Impacts: The visual impact will be removed after decommissioning, provided the ancillary infrastructure is removed and the area rehabilitated. Failing this, the visual impact will remain.		

Nature: *Visual impact on the sense of place* The potential impact on the sense of place of the region. The significance of the visual impacts on the sense of place within the region (i.e. beyond a 20km radius of the development and within the greater region) is expected to be of low significance.		
	Without mitigation	**With mitigation**
Extent	Regional (3)	Regional (3)
Duration	Long term (4)	Long term (4)
Magnitude	Low (4)	Low (4)
Probability	Improbable (2)	Improbable (2)

Significance	**Low (22)**	**Low (22)**
Status (positive or negative)	Negative	Negative
Reversibility	Reversible (1)	Reversible (1)
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	No, only best practise measures can be implemented	
Mitigation: Planning: » Retain/re-establish and maintain natural vegetation in all areas outside of the development footprint/servitude. Operations: » Maintain the general appearance of the facility as a whole. Decommissioning: » Remove infrastructure not required for the post-decommissioning use. » Rehabilitate all areas. Consult an ecologist regarding rehabilitation specifications.		
Residual Impacts: The visual impact will be removed after decommissioning, provided the wind farm infrastructure is removed and the area rehabilitated. Failing this, the visual impact will remain.		

Decommissioning Phase Impacts

The visual impact will be removed after decommissioning, provided the wind farm infrastructure is removed and the area rehabilitated. Failing this, the visual impact will remain.

10.10.3 Overall Result

The primary visual impact, namely the appearance of the wind farm (the wind turbines) is not possible to mitigate. The functional design of the turbines cannot be changed in order to reduce visual impacts. Alternative colour schemes (i.e. painting the turbines sky-blue, grey or darker shades of white) are not permissible as the CAA's Marking of Obstacles expressly states, "Wind turbines shall be painted bright white to provide the maximum daytime conspicuousness". Failure to adhere to the prescribed colour specifications will result in the fitting of supplementary daytime lighting to the wind turbines, once again aggravating the visual impact.

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

Conventional mitigation (e.g. such as screening of the structures) of the potential visual impacts is highly unlikely to succeed due to the nature of the development and the receiving environment. The overall potential for mitigation is therefore generally low or non-existent.

Even though it is possible that the potential visual impacts may exceed acceptable levels within the context of the receiving environment (an area with an established tourism industry), the proposed development is not considered to be fatally flawed.

10.11. Assessment of Socio-economic Impacts

Potential social and socio-economic impacts and the relative significance of the impacts associated with the development of the Wind Garden Wind Farm are summarised below (refer to **Appendix L**).

10.11.1 Description of Socio-economic Impacts

Impacts are expected to occur with the development of the Wind Garden Wind Farm during the construction, operation and decommissioning phases. Both positive and negative impacts are identified and assessed.

Positive impacts during construction includes:
» Temporary stimulation of the national and local economy
» Temporary increase employment in the national and local economies
» Contribution to skills development in the country and local economy
» Temporary increase in household earnings
» Temporary increase in government revenue

Negative impacts during construction includes:
» Negative changes to the sense of place
» Negative impact on the local tourism, game industry and associated industries during construction
» Temporary increase in social conflicts associated with the influx of people
» Impact on economic and social infrastructure
» Impact on property and land value in the immediately affected area during construction

Positive impacts during operation includes:
» Sustainable increase in production and GDP nationally and locally
» Creation of sustainable employment positions nationally and locally
» Skills development of permanently employed workers
» Improved standards of living for benefiting households
» Sustainable increase in national and local government revenue
» Local economic and social development benefits derived from the project's operations
» Sustainable rental revenue for farms where the wind farm is located
» Sustainable increase in electricity available for the local region and South Africa

Negative impacts during operation includes:
» Negative changes to the sense of place
» Negative impact on local tourism, game farming and associated industries

10.11.2 Impact tables summarising the significance of socio-economic impacts during construction, operation and decommissioning (with and without mitigation measures)

Construction Phase Impacts

Nature: <u>*Temporary stimulation of the national and local economy*</u> The proposed Wind Garden Wind Farm will cost R 5,7 billion (2020 prices) to establish. This will equate to a total impact of R 14,6 billion (direct, indirect, and induced) on production/new business sales in the country. The localised expenditure on the project will stimulate the local and national economies albeit for a temporary period of 30 months during construction. The greatest effects on production and GDP stimulated during construction activities will be created through the multiplier effects, specifically through a combination of production and consumption induced effects. The former refers to the impact generated along backwards linkages when the project creates demand for goods and services required for construction and subsequently stimulates the business sales of the suppliers of inputs that are required to produce these goods and services. The latter refers to the effects of household spending which is derived from an increase in salaries and wages directly and indirectly stimulated by the project's expenditure		
	Without enhancement	**With enhancement**
Extent	National (4)	National (4)
Duration	Short term (2)	Short term (2)
Magnitude	High (8)	Very High (9)
Probability	Highly probable (4)	Highly probable (4)
Significance	**Medium (56)**	**High (60)**
Status (positive or negative)	Positive	Positive
Reversibility	Benefit is terminated with the end of construction	
Irreplaceable loss of resources?	No	No
Can impacts be enhanced?	Yes (enhanced)	
Enhancement: » The developer should encourage the EPC contractor to increase the local procurement practices and promote the employment of people from local communities, as far as feasible, to maximise the benefits to the local economies. » The developer should engage with local authorities and business organisations to investigate the possibility of procuring construction materials, goods and products from local suppliers were feasible.		
Residual Impacts: None foreseen at this stage		

Nature: <u>*Temporary increase employment in the national and local economies*</u> The construction of the facility will create 592 Full Time Equivalent (FTE) employment positions over the course of the development, however, 568 will be based in South Africa. Approximately 40% of the employment positions involve skilled Black South African construction workers, with the remaining being managers, professional engineers, and supervisors. Based on estimates by Wind Garden (Pty) Ltd, it is anticipated that 40% of the FTE positions will be filled by people from local communities. Beyond the direct employment opportunities that will be created by the project during the construction phase the development will also have a positive spin-off effect on the employment situation in other sectors of the national and local economies. Through the procurement of local goods (i.e., consumption induced effects) the project will support an estimated total of 732 FTE employment positions (indirect). Most of these positions will be in sectors such as construction, business services and trade. The expenditure on the project outside of the local economies will also have a positive effect on employment creation, albeit for a temporary period of 30 months. Through the production and consumption induced impacts the project is envisioned to create an estimated additional 392 FTE employment (induced) positions.		
	Without enhancement	**With enhancement**
Extent	Regional (3)	Regional (3)
Duration	Short term (2)	Short term (2)

Magnitude	High (8)	Very High (9)
Probability	Highly probable (4)	Highly probable (4)
Significance	**Medium (52)**	**Medium (56)**
Status (positive or negative)	Positive	Positive
Reversibility	Benefit is terminated with the end of construction	
Irreplaceable loss of resources?	No	No
Can impacts be enhanced?	Yes (enhanced)	

Enhancement:

» Co-ordinate with the local municipality and relevant labour unions to inform the local labour force about the project that is planned to be established and the jobs that can potentially be applied for.
» Establish a local skills desk (in Makhanda) to determine the potential skills that could be sourced in the area
» Recruit local labour as far as feasible
» Employ labour-intensive methods in construction where feasible
» Sub-contract to local construction companies particularly SMMEs and BBBEE compliant enterprises where possible
» Use local suppliers where feasible and arrange with the local SMMEs to provide transport, catering and other services to the construction crews.

Residual Impacts:

Experience gained in the construction of wind farms

Nature: *Contribution to skills development in the country and in the local economy*

The construction of the proposed Wind Garden Wind Farm is likely to have a positive impact on the skills development in South Africa. During the turbine component assembly and tower manufacturing period which is included as part of the construction phase and is planned to be conducted in the Eastern Cape, it is likely that foreign technical experts will be involved. This will present an opportunity for skills and knowledge transfer between these technical experts and local manufacturers.

It is also expected that the construction staff involved in the project will gain knowledge and experience in respect of the development of wind energy facilities. More skilled local construction staff would most likely also lower the cost of future wind pro-jects in the province. Since it is estimated that 40% of the construction workers will be from local communities, it is highly probable that these workers will be able to utilise these new skills over the long run, in other developments proposed in the local area.

In addition to the direct effects of the project on skills development in the country and the local economy, the project could contribute to the development of the local research and development (R&D) and manufacturing industries associated with wind technology.

	Without enhancement	**With enhancement**
Extent	Regional (3)	Regional (3)
Duration	Short term (2)	Short term (2)
Magnitude	Moderate (6)	High (8)
Probability	Probable (3)	Highly Probable (4)
Significance	**Medium (33)**	**Medium (52)**
Status (positive or negative)	Positive	Positive
Reversibility	No	
Irreplaceable loss of resources?	No	No
Can impacts be enhanced?	Yes (enhanced)	

Enhancement:

» Facilitate knowledge and skills transfer between foreign technical experts and South African professionals during the pre-establishment and construction phases
» Set up apprenticeship programmes to build onto existing skill levels or develop new skills amongst construction workers, especially those from local communities

» Facilitate broader skills development programme as part of socio-economic development commitments
Residual Impacts: » South Africa's human capital development » Improved labour productivity and employability of construction workers for similar projects » Possible development of local skills and expertise in R&D and manufacturing industries related to wind technology through partnerships with Rhodes University and NMMU

Nature: *Temporary increase in household earnings* The wind farm will create an estimated total of 1 691 South African based FTE employment positions during construction generating R 1,9 billion of revenue for the affected households in the country through direct, indirect, and induced effects. Of this figure R 754 million will be paid out in the form of salaries and wages to those individuals directly employed during the construction phase. The remaining R 1,1 billion in households' earnings will be generated through indirect and induced effects resulting from project expenditure. Although temporary, this increase in household earnings will have a positive effect on the standard of living for these households. This is especially applicable to the households bene-fitting from the project that reside in the Makana Municipality and broader Eastern Cape.		
	Without enhancement	**With enhancement**
Extent	Regional (3)	Regional (3)
Duration	Short term (2)	Short term (2)
Magnitude	Moderate (6)	High (8)
Probability	Probable (3)	Highly Probable (4)
Significance	**Medium (33)**	**Medium (52)**
Status (positive or negative)	Positive	Positive
Reversibility	Benefit is terminated with the end of construction	
Irreplaceable loss of resources?	No	No
Can impacts be enhanced?	Yes (enhanced)	
Enhancement: » Recruit local labour as far as feasible to increase the benefits to the local households » Employ labour intensive methods in construction where feasible » Sub-contract to local construction companies where possible » Use local suppliers where feasible and arrange with local SMME's and BBBEE compliant enterprises to provide transport, catering, and other services to the construction crews		
Residual Impacts: » Possible increase of households' saving accounts » Improved standard of living of the affected households		

Nature: *Temporary increase in government revenue* The investment in the Wind Garden Wind Farm will generate revenue for the government during the construction period through a combination of personal income tax, VAT, companies tax etc. Additional government revenue will be also be earned through corporate income tax, however since the gross operating surplus of the EPC contractor employed to construct the facility is not known, an estimate of the overall corporate income tax value is not possible at this stage. Government earnings will be distributed by national government to cover public spending which includes amongst others the provision and maintenance of transport infrastructure, health, and education services as well as other public goods.		
	Without enhancement	**With enhancement**
Extent	National (4)	National (4)
Duration	Short-term (2)	Short-term (2)
Magnitude	Low (4)	Low (4)

Probability	Highly probable (4)	Highly probable (4)
Significance	**Medium (40)**	**Medium (40)**
Status (positive or negative)	Positive	Positive
Reversibility	Benefit is terminated with the end of construction	
Irreplaceable loss of resources?	No	No
Can impacts be enhanced?	No	
Enhancement: » None suggested		
Residual Impacts: None envisioned		

Nature: *Impact on the sense of place experienced by the local community as a result of visual and noise effects that appear during the construction phase* The area proposed for the development as well as its surrounds does not currently have any large-scale industries or high-rise buildings. Noise and light intrusion during the night in the area is also very low. Given the above characteristics the area can be defined as being largely rural. Any rapid changes that alter the characteristics that define the area's sense of place could potentially have a negative impact to the local population's sense of place. During the construction of the proposed wind energy facility there are likely to be noise and dust impacts caused by the movement of vehicles as well as construction activities on site. These impacts are anticipated to occur primarily during the day with illumination from the site being experienced during the night. The presence of this noise is likely to alter the way the surrounding environment is experienced by households in the area. As construction activities progress and the footprint of the facility grows, the visual impact will also become more apparent and the sense of place experienced by households residing within the visually affected area will be altered further. It is anticipated that residents residing on the farms on which wind turbines are proposed to be established will experience the greatest disruption in their sense of place during the construction period. Individuals who live on the surrounding farms will, over the course of the construction phase of the project, be subjected to either visual or noise disruptions that are currently not present in the area. The sense of place at the farms located adjacent to or beyond the site of the proposed wind energy facility will also be affected to some extent. The facility will be visible from several of these farms. The visual exposure on all these farms during the construction phase will not be continuous given the proximity of some of the farms from the proposed wind energy facility. Nevertheless, the knowledge of the facility near the farm and the fact that it could be seen from some parts will still have a negative connotation and will alter the sense of place experienced by the households residing on these farms.		
	Without mitigation	**With mitigation**
Extent	Site & immediate surrounding area (2)	Site & immediate surrounding area (2)
Duration	Short term (2)	Short term (2)
Magnitude	High (8)	Moderate (6)
Probability	Highly probable (4)	Highly probable (4)
Significance	**Medium (48)**	**Medium (40)**
Status (positive or negative)	Negative	Negative
Reversibility	Possible to reverse but only with decommissioning	
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation: » The mitigation measures proposed by the visual and noise specialists should be adhered to » Natural areas that are not affected by the footprint should remain as such. Efforts should also be made to avoid		

disturbing such sites during construction » Public relations (PR) campaign prior to commencement of construction to communicate to com-munity members the construction programme, inclusive of regular updates to generate excitement in the community
Residual Impacts: » Altered characteristics of the environment » Change in the perception of tourists of the local environment

Nature: *Impact on the local tourism and game farming industry that is expected during the construction phase as a result of noise and visual effects* As construction begins at the proposed site, disturbances will likely be minimal. The presence of construction machinery, increased traffic to and from the site (transporting staff, equipment, and material) and staff on or near the site will likely be the largest disturbances. The longer construction continues, the greater the disturbances will likely be. As the towers of the wind turbines are erected there is likely to be an increased disturbance as towers and turbines become increasing visible in the surrounding area. During this period, the full negative impact may be experienced by local tourism. Once construction is completed the disturbances associated with the vehicular traffic, equipment and staff will be reduced and the remaining disturbance will be that of the wind farm itself. The examination of the wind farm impacts on tourism from literature have indicated that no lasting impacts to tourism are likely to occur. According to the literature review it was revealed that during pre-planning and planning, the negative impacts would be noticed the most, however, once operational, the impacts experienced during pre-planning and planning will most likely dissipate. This impact is further discussed under the operation phase impacts.		
	Without mitigation	**With mitigation**
Extent	Site and surrounding area (2)	Site and surrounding area (2)
Duration	Medium term (3)	Medium term (3)
Magnitude	Low (4)	Low (4)
Probability	Highly probable (4)	Probable (3)
Significance	**Medium (36)**	**Low (27)**
Status (positive or negative)	Negative	Negative
Reversibility	Possible to reverse with decommissioning	
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation: » Mitigation proposed by the visual specialist should be implemented during the beginning of the construction period to screen off visual disturbances as soon into the development phase as feasible » The mitigation measures proposed by the noise specialists should be adhered to » Heavy vehicles travelling on secondary roads should adhere to low-speed limits to minimise noise and dust pollution » If feasible, no construction activities should be carried out during weekends and outside day time working hours » Create partnerships with local tourism and game farm industry to promote the development of green energy in the community and for these establishments to communicate to their guests the benefits of green energy		
Residual Impacts: » Visual impacts cannot be eliminated due to the height of the turbines and thus the local industry could still experience some losses after construction » Perceptions of international tourists regarding the area's representation as "Wild Africa" would change		

Nature: *Temporary increase in social conflicts associated with the influx of construction workers and job seekers to the area* A significant number of the unskilled and semi-skilled workers required during the construction phase will however be

sourced locally. It is estimated that up to 40% of jobs that will be created during the construction phase could be filled by labour coming from the local municipalities and the nearby communities located outside of its boundaries. Workers from outside the immediate area will therefore comprise up to 60% of the total work force. In addition, given the scale and extent of the development, the project is likely to attract job seekers from other parts of the country, particularly from within the Eastern Cape. This would be in addition to the migrant workers contracted to work on the project.

The migration of people to the area could result in social conflicts between the local population and the migrant work force as the local population could perceive these migrant workers as "stealing" their employment opportunities. Likewise, the influx of people into the area, could potentially lead to a temporary increase in the level of crime, illicit activity and possibly a deterioration of the health of the local community through the spread of infectious diseases. Without any form of income these individuals run the risk of exacerbating the level of poverty within Makana. Aside from the broader community issues the increase in the number of people in the area is likely to have an adverse effect on crime levels, incidents of trespassing, development of informal trading and littering. There is also potentially a likelihood of increased stock theft.

The influx of job seekers and the potential social conflicts that can arise with in-migration of temporary workers to an area is difficult to mitigate.

Addressing the challenges related to potential social impacts is best done in partnership with all stakeholders in the area, specifically the affected and adjacent property owners, local communities, ward communities and municipalities. This would promote transparency; information sharing and help build good relationships between all affected parties.

The developer has indicated that staff accommodation (six hectares in extent) would be constructed to accommodate the staff who will be constructing the wind farm. Accommodation will allow the staff the remain separate from the broader community which may decrease social conflicts associated with the influx of the workers.

	Without mitigation	**With mitigation**
Extent	Regional (3)	Regional (3)
Duration	Short-term (2)	Short-term (2)
Magnitude	Low (4)	Low (4)
Probability	Highly probable (4)	Improbable (2)
Significance	**Medium (36)**	**Low (18)**
Status (positive or negative)	Negative	Negative
Reversibility	Reversibility within a short period	
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes	

Mitigation:

» Set up a recruitment office in the nearby towns (i.e. Makhanda, Riebeek East, Somerset East) and adhere to strict labour recruitment practices that would reduce the desire of potential job seekers to loiter around the properties in the hope of finding temporary employment
» Employ locals as far as feasible through the creation of a local skills database
» Establish a management forum comprising key stakeholders to monitor and identify potential problems that may arise due to the influx of job seekers to the area
» Ensure that any damages or losses to nearby affected farms that can be linked to the conduct of construction workers are adequately reimbursed
» Assign a dedicated person to deal with complaints and concerns of affected parties
» The construction of on-site accommodation will likely mitigate some social conflicts from taking place. The developer should, however, organise appropriate transport for the workers from the site to the nearest towns in order to access services or to buy goods. This will reduce the amount of time the staff spend walking to or from the site.

Residual Impacts:

Contribution towards social conflicts in the area by construction workers and job seekers who decide to stay in the area after construction is complete and who are unable to find a sustainable income

Nature: *Added pressure on economic and social infrastructure during construction as a result of increase in local traffic and in migration of construction workers*

Given that the workers will require services there is likely to be an increase in the demand for social services, access to water and electricity. According to the Makana Local Municipality's IDP (2019) there are a number of clinics and hospitals situated throughout the municipal area. There is also a clinic situated in Riebeek East. Given the proximity of the site to Makhanda, it is most likely that the health facilities in the area will experience additional demand for medical services brought about by the influx of works and job seekers.

Access to water and electricity is not a significant concern in the area, although the supply of electricity is sometimes erratic. If a construction camp is established to accommodate workers there will be a need for additional water and electrical connections for both the camp as well as the site office. These connections will, however, be minimal and it is unlikely to alter the demand significantly.

The effects of the project on road infrastructure should also be considered as it is highly likely that the development will lead to an increase in traffic volumes on surrounding roads. This could lead to a significant deterioration of local road conditions, specifically the R350, R400 and R344 regional roads which are already in a poor state of repair. The deterioration of these roads could place additional financial burdens on the municipality through additional maintenance costs. Additional traffic volumes are also likely to impact the condition of secondary roads used to access surrounding farms. The deterioration of secondary roads could add additional operating costs to farmers in the area due to delays in deliveries and damage to vehicles.

It is expected that the basic service provision, health facilities and road infrastructure will be under additional strain during the construction period. It is not expected that there will be significant impact on housing and accommodation as the developer has indicated that staff accommodation will be constructed to accommodate the workers for the duration of the construction phase of the project.

	Without mitigation	**With mitigation**
Extent	Regional (3)	Regional (3)
Duration	Short-term (2)	Short-term (2)
Magnitude	Low (4)	Minor (2)
Probability	Highly probable (4)	Probable (3)
Significance	**Medium (36)**	**Low (21)**
Status (positive or negative)	Negative	Negative
Reversibility	Reversible within a short period	
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	

Mitigation:

» Provide adequate signage along the R350, R400 & R344 to warn motorists of the construction activities taking place on the site
» Engage with local authorities and inform them of the development as well as discuss with them their ability to meet the additional demands on social and basic services created by the in migration of workers
» Where feasible, assist the municipality in ensuring that the quality of the local social and economic infrastructure does not deteriorate through the use of social responsibility allocations

Residual Impacts:

Further eroding of economic infrastructure and social services in the region which may not be suited to a large number of people utilising them at one time.

Nature: *Impact on property and land values in the immediately affected area*

The review of the property trends suggests that despite the concerns surrounding property values that often arise before the construction of wind farm there is in fact very little impact on the property and land values post-construction. The review of international literature further corroborates the absence of direct linkages between wind farm development and property prices with various studies confirming that there is no long-term impact of wind farms on property values. It can therefore be confidently stated that there will be no long-term negative impacts on prices of properties in Makana Local Municipality. However, isolated cases of property price drop particularly during the pre-construction phase cannot be ruled out altogether. From the assessment of the impact of existing wind farms on properties, the evidence indicates that there does not appear to be a risk of a reduction of property prices in the rural and farm areas of the site. There is no empirical evidence that shows that wind farms affect property prices in areas of scenic beauty. And if any properties would be impacted, such an impact would be of a temporary nature until the wind farm is developed (if it is approved).		
	Without mitigation	**With mitigation**
Extent	Site & immediate surrounding area (2)	Site & immediate surrounding area (2)
Duration	Long term (4)	Long term (4)
Magnitude	Moderate (6)	Low (4)
Probability	Improbable (2)	Improbable (2)
Significance	**Low (24)**	**Low (20)**
Status (positive or negative)	Negative	Negative
Reversibility	Reversible with decommissioning of the facility	
Irreplaceable loss of resources?	Yes	No
Can impacts be mitigated?	Yes	
Mitigation: » Meet with the affected owners and discuss their concerns over property and land values, as well as educate and inform them on the potential environmental impacts that could ensue » Mitigation measures suggested by the other specialists to be implemented		
Residual Impacts: Perceptions associated with the effect of industrial type developments on aesthetics and landscape of the natural environment cannot be entirely eliminated following completion of construction, therefore some potential buyers might still reserve themselves from buying a property in the area		

Operation Phase Impacts

Nature: *Sustainable increase in production and GDP nationally and locally* The wind farm will require an annual operational expenditure of R 35,2 million over 20 years. The total impact on production in the country as a result of the project's operations will equate to R 78,4 million per annum in 2020 prices for the 20 years. Aside from the utilities sector, industries that will experience the greatest stimulus from the project will include electrical machinery and apparatus, insurance, trade, transport service and chemical production industry. The annual spending on labour and procurement of local goods and services required in the operation of the facility (i.e., utilities, sundries, certain electrical components, etc.), will amount to R 43,1 million of new business sales on an annual basis in the local area through the multiplier effects. The rest of the annual production resulting from the project's operations will be accounted for in other parts of the country. This is under the assumption that the revenue generated by the project will not be accounted for in the Makana Local Municipality but, rather in the Province where the headquarters of the developer is located. Through indirect and induced effects, an additional R 8,7 million of GDP will be generated per annum, which means that the total impact of the project on the national GDP will equate to R 28,3 million per annum in 2020 prices. The production and consumption induced multiplier effects of the project are considered to be relatively small compared to conventional electricity generating industries. This is because the energy source used to produce electricity by the

proposed wind energy facility is free, unlike conventional power stations where raw inputs (i.e. coal) and the transport therefore comprise a significant portion of operating expenditure. It is for this reason that such a facility is a highly attractive business venture.

The contribution to the Makana Local Municipality although small relative to the combined size of the municipality's economy will nevertheless be positive and more importantly, a sustainable contribution.

	Without enhancement	**With enhancement**
Extent	National (4)	National (4)
Duration	Long term (4)	Long term (4)
Magnitude	Moderate (5)	Moderate (6)
Probability	Highly probable (4)	Highly probable (4)
Significance	Medium (52)	Medium (56)
Status (positive or negative)	Positive	Positive
Reversibility	Benefits are sustained only over project's lifespan	
Irreplaceable loss of resources?	No	No
Can impacts be enhanced?	Yes (enhanced)	

Enhancement:

» The operator of the wind farm should be encouraged to, as far as possible, procure materials, goods and products required for the operation and maintenance of the facility from local suppliers to increase the positive impact in the local economy

Residual Impacts:

None foreseen at this stage

Nature: *Creation of sustainable employment positions nationally and locally*

The wind farm will create an estimated 31 permanent employment positions across the operation phase of the development which, will be retained for approximately 20 years. Of these, an estimated 27 will be South African based positions. It is envisaged that 27% of the skilled and low skilled staff will be employed from within the local area with the remaining staff being sourced from other parts of the Eastern Cape and the country. This means that approximately 3 out of 10 positions are expected to be filled by local labour, which is a small but, positive contribution towards addressing the high unemployment rates observed in both the Makana Local Municipality and the Eastern Cape.

Aside from the direct employment opportunities, the facility will support an estimated 34 FTE employment positions created through the production and consumption induced effects. Due to the spatial allocation of procurement spending and direct employment created, most of the indirect and induced positions will also be created within the local area. The trade, agriculture and community and personal services sectors will benefit the most from these new employment opportunities.

	Without enhancement	**With enhancement**
Extent	National (4)	National (4)
Duration	Long term (4)	Long term (4)
Magnitude	Moderate (5)	Moderate (6)
Probability	Highly probable (4)	Highly probable (4)
Significance	**Medium (52)**	**Medium (56)**
Status (positive or negative)	Positive	Positive
Reversibility	Benefits are sustained only over project's lifespan	
Irreplaceable loss of resources?	No	No
Can impacts be enhanced?	Yes (enhanced)	

Enhancement:

» Where possible, local labour should be considered for employment so as to increase the positive impact on the local economy

» As far as possible, local small and medium enterprises should be approached to investigate the opportunities for supply inputs required for the maintenance and operation of the facility
Residual Impacts: Experience in operating and maintaining a wind farm

Nature: *Skills development of permanently employed workers* South Africa has a number of large-scale wind energy facilities with a large proportion located in the Eastern Cape, and thus the skills base to operate and maintain such facilities should be readily available. It is, however, likely that highly skilled personnel would need to be recruited from outside of the Makana Local Municipality as the economy would not be diversified enough to attract such specialists. These employees would include skilled "mechatronics" engineers (specialised in both electrical and mechanical engineering) likely to be recruited from the Nelson Mandela Bay Metro. Maintenance will be carried out throughout the lifetime of the turbines. A maintenance schedule usually involves an initial inspection after commissioning, semi-annual inspection, an annual inspection and two- and five-year inspections but this varies according to the turbine. Typical activities during maintenance include changing of oil, replacement of brake linings and cleaning of components.		
	Without enhancement	**With enhancement**
Extent	Regional (3)	Regional (3)
Duration	Long term (4)	Long term (4)
Magnitude	Low (4)	Low (4)
Probability	Highly probable (4)	Definite (5)
Significance	**Medium (44)**	**Medium (55)**
Status (positive or negative)	Positive	Positive
Reversibility	No	
Irreplaceable loss of resources?	No	No
Can impacts be enhanced?	Yes (enhanced)	
Enhancement: » The developer should consider establishing vocational training programmes for the local labour force to promote the development of skills required by the wind energy facility and thus provide for the opportunities for these people to be employed in other similar facilities elsewhere in the future		
Residual Impacts: Human capital development of the affected workers		

Nature: *Improved standard of living for benefitting households* The creation of an estimated 27 FTE employment positions throughout the country will generate R 21,6 million of personal income (2020 prices), which will be sustained for the entire duration of the project's lifespan. Given the average household size in affected local municipalities and nationally, this increase in household earnings will support up to 103 people. The sustainable income generated as a result of the project's operation will positively affect the standard of living of all benefitting households. This is specifically applicable to the Makana Local Municipality, as the average income per employee at the facility would far exceed the average household income within these municipalities.		
	Without enhancement	**With enhancement**
Extent	Regional (3)	Regional (3)
Duration	Long term (4)	Long term (4)
Magnitude	Moderate (5)	Moderate (6)
Probability	Probable (4)	Probable (4)
Significance	**Medium (48)**	**Medium (52)**
Status (positive or negative)	Positive	Positive
Reversibility	Benefits are sustainable only over project's lifespan	
Irreplaceable loss of resources?	No	No

Can impacts be enhanced?	Yes (enhanced)
Enhancement: » Where possible, the local labour supply should be considered for employment opportunities to increase the positive impact on the area's economy » As far as feasible, local small and medium enterprises should be approached to investigate the opportunities for supply inputs required for the maintenance and operation of the facility	
Residual Impacts: None foreseen at this stage	

Nature: Sustainable increase in national and local government revenue

The wind farm will, through property taxes and salaries and wages payments, contribute towards both local and national government revenue. At a local level, the project will contribute to local government through payments for utilities used in the operation of the facility. It will also increase its revenue through an increase in property taxes compared to the current level.

Given that the Makana Local Municipality has a relatively small economy and considering the low rates base derived by the municipality (Makana, 2019), any additional income would greatly benefit the municipality.

On a national level, the revenue derived by the project during its operations, as well as the payment of salaries and wages to permanent employees will contribute to the national fiscus. Although it is impossible to trace exactly how such revenue is allocated, any additional revenue generated means that national governments can increase its spending on public goods and services.

	Without enhancement	**With enhancement**
Extent	National (4)	National (4)
Duration	Long term (4)	Long term (4)
Magnitude	Low (4)	Low (4)
Probability	Highly probable (4)	Highly probable (4)
Significance	**Medium (48)**	**Medium (48)**
Status (positive or negative)	Positive	Positive
Reversibility	Benefits are sustained only over project's lifespan	
Irreplaceable loss of resources?	No	No
Can impacts be enhanced?	No	
Enhancement: » None suggested		
Residual Impacts: None foreseen at this stage		

Nature: Local economic and social development benefits derived from the project's operations

The Wind Garden Wind Farm will make a notable contribution to poverty and social and community development in the area. The developer has pledged that 2.5% of the gross annual revenue will be dedicated to socio-economic and economic development initiatives for the duration of operation of the wind farm. Therefore, this revenue share of the project can subsequently be utilised for local social and economic development projects.

Since the community has not yet been selected, it is not possible to quantify the number of households that will be direct beneficiaries of the project at this stage.

Furthermore, the social and economic development plan will prioritise numerous local welfare projects and community development initiatives that will be directed at uplifting local people and improving their standards of living. At this stage it is unknown how much the proposed development will contribute towards local economic

development but, it is envisioned that the revenue generated for local economic development will be significant and assist in uplifting the local communities.		
	Without enhancement	**With enhancement**
Extent	Regional (3)	Regional (3)
Duration	Long term (4)	Long term (4)
Magnitude	Moderate (6)	Moderate (6)
Probability	Highly probable (4)	Definite (5)
Significance	**Medium (52)**	**High (65)**
Status (positive or negative)	Positive	Positive
Reversibility	Benefits could stretch beyond project's lifespan	
Irreplaceable loss of resources?	No	No
Can impacts be enhanced?	Yes (enhanced)	

Enhancement:

» A social development and economic development programme should be devised by the developer and implemented throughout the project's lifespan
» The plan should be developed in consultation with local authorities and local communities to identify community projects that would result in the greatest social benefits
» These plans should be reviewed on an annual basis and, where necessary, updated
» When identifying enterprise development initiatives, the focus should be on creating sustainable and self-sufficient enterprises
» In devising the programmes to be implemented, the developer should take into account the local Integrated Development Plans (Makana, 2019)

Residual Impacts:

None foreseen at this stage

Nature: *Sustainable rental revenue for farms where the wind farm is located*

It is anticipated that farms where the wind turbines are located on will enter into a rental agreement with the developer. The owners will likely receive rental revenue as a result of hosting the turbines on their property. The revenue that the owners of the properties receive will have a positive impact on the local economies especially if spent in the local area. This revenue is also likely to assist local property owners in dealing with economic shocks to their current business activities such as drought or unfavourable economic conditions that currently prevail. The revenue generated from the rental of land for the turbines will additionally assist farmers in investing in new technologies to improve the efficiencies of their current agricultural practices and allow farmers to better compete in the open market. While these impacts are notably only for those farms who have turbines located on their properties, the impact of additional revenue is likely to be very significant to those impacted.

	Without enhancement	**With enhancement**
Extent	Site (1)	Site (1)
Duration	Long term (4)	Long term (4)
Magnitude	Minor (2)	Minor (2)
Probability	Definite (5)	Definite (5)
Significance	**Medium (35)**	**Medium (35)**
Status (positive or negative)	Positive	Positive
Reversibility	Benefits could stretch beyond project's lifespan	
Irreplaceable loss of resources?	No	No
Can impacts be enhanced?	No	

Enhancement:

» None suggested

Residual Impacts:

None foreseen at this stage

Nature: Sustainable increase in electricity available for the local region and South Africa The development of the wind farm will lead to a sustainable increase in the supply of electricity for the country. It is noted that the lack of electricity and loadshedding has had a notable impact on the economy of the country and is one of the reasons stated by foreign investors for the lack of investment in the country. With an improved supply of power to industry, there is likely to be an improvement in the economy as a whole. It should be noted that while this wind farm alone is unlikely to make a large impact in the shortages of electricity in the country, the cumulative impact of all the proposed wind energy products in the region will be substantial.		
	Without enhancement	**With enhancement**
Extent	National (4)	National (4)
Duration	Long term (4)	Long term (4)
Magnitude	Minor (2)	Minor (2)
Probability	Definite (5)	Definite (5)
Significance	**Medium (50)**	**Medium (50)**
Status (positive or negative)	Positive	Positive
Reversibility	Benefits during projects lifespan only	
Irreplaceable loss of resources?	No	No
Can impacts be enhanced?	No	
Enhancement: » None suggested		
Residual Impacts: None foreseen at this stage		

Nature: Impact on the sense of place experienced by the local community as a result of visual effects that appear during the operation phase The effects on the community's sense of place will initially be felt during the construction period and will continue into the operation phase. The assessment of the negative change in the sense of place that was examined in the construction phase will likely be in place during the operational phase due to the long-term duration of the development.		
	Without mitigation	**With mitigation**
Extent	Site & immediate surrounding area (2)	Site & immediate surrounding area (2)
Duration	Long term (4)	Long term (4)
Magnitude	High (8)	Moderate (6)
Probability	Highly probable (4)	Highly probable (4)
Significance	**Medium (56)**	**Medium (48)**
Status (positive or negative)	Negative	Negative
Reversibility	Possible to reverse but only with decommissioning	
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation: » Mitigation measures suggested during construction should be adhered to		
Residual Impacts: » Altered characteristics of the environment » Change in the perception of tourists of the local environment		

Nature: Impact on the local tourism, game farming and associated activities due to the altered visual and aesthetic

<u>*environment experienced during the operation phase*</u>

The broader region of Makana Local Municipality is well distinguished as a tourism area. The proposed wind farm will be located in the area where natural landscape and aesthetics are highly valued by both residents and visitors to the area.

The potential negative effects on the local tourism and game farming industry are expected to be created during the construction phase of the development. Such negative impacts are expected to ensue as a result of noise and most importantly visual disturbance, which will alter the natural and cultural landscape features of the environment and subsequently the experience of visitors to local tourism destinations and game farms. The full extent of the negative impact will, however, most probably be achieved during the operation phase of the project when the word about the proximity of the project to local game farms spread amongst potential tourists and repeat visitors and when the turbines are fully operational and visible.

The negative effects of wind farms on tourists' interest to visit the area have not been confirmed. However, based on the initial analysis of surrounding product owners, the effect of the existing Waainek Wind Farm did not impact the number of tourists visiting the area after its construction. The primary concern amongst residents was that of an ailing economy, crime and poor infrastructure.

While it is noted that there is low probability of any negative impacts occurring, there is a possibility that the development of the wind farm may decrease the number of visitors to the region.

	Without mitigation	**With mitigation**
Extent	Site & immediate surrounding area (2)	Site & immediate surrounding area (2)
Duration	Long term (4)	Long term (4)
Magnitude	Low (4)	Minor (2)
Probability	Probable (3)	Improbable (2)
Significance	**Medium (30)**	**Low (16)**
Status (positive or negative)	Negative	Negative
Reversibility	Possible to reverse with decommissioning	
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	

Mitigation:

» The mitigation measures proposed by the visual specialist should be adhered to
» The mitigation measures proposed by the noise specialist should be adhered to
» Socio-economic development commitments to further eco-tourism and conservation in the region

Residual Impacts:

Visual impacts cannot be entirely eliminated; thus, the local industry could still experience some losses

Decommissioning Phase Impacts

Upon the expiry of the Wind Garden Wind Farm lifespan, the facility would need to be disbanded, although the facility would likely be upgraded in order to maintain and prolong the lifespan of the facility.

If the wind farm is decommissioned, the land will be rehabilitated in order to return it to pre-project conditions. This also means that all impacts whether positive or negative, which take place during the operation phase will cease to exist. At the same time spending on the disassembly of the components and rehabilitation of land will increase the demand for construction services and other industries, therefore stimulating economic activity in the local area, albeit over a temporary period.

Socio-economic impacts stimulated during the decommissioning phase are expected to be similar to those that took place during the construction phase. They will also be temporary in nature, but most likely will take a much shorter time than the construction phase. They will also be associated with some expenditure, although it will be considerably less than the investment required during the development phase. Besides the positive impacts on production, employment, household income and government revenue that could ensue from the project, some negative impacts could also occur. These would largely be related to a slight increase in noise in the area surrounding the site, increase in traffic congestion on the R350 and R400 and concerns over local safety and security due to a greater number of people accessing the area.

All of the positive impacts can be enhanced to increase the benefits to the local communities, while the negative impacts could be mitigated. The impacts are expected to be of low significance due to the very short duration and, therefore, of lower magnitude. Enhancement and mitigation measures proposed for the construction phase impacts would also apply to the decommissioning phase. Overall, the impact that would ensue during the decommissioning phase will mostly be of low significance and should not affect the decision regarding the proposed development.

10.11.3 Overall Result

The net positive impacts associated with the development and operation of the Wind Garden Wind Farm are expected to outweigh the net negative effects. The project is also envisaged to have a positive stimulus on the local economy and employment creation, leading to the economy's diversification and a small reduction in the unemployment rate. The project should therefore be considered for development. It should, however, be acknowledged that the negative impacts would be largely borne by the nearby farms and households residing on them, whilst the positive impacts will be largely concentrated in the local and national economies. Due to this imbalance, it is recommended that the mitigation measures suggested be strictly adhered to. Application of these mitigation measures will ensure that the negative impacts on the nearby farms and businesses are minimised and that the distribution of the potential benefits of the project are more balanced.

10.12. Assessment of Impacts on Traffic

Potential impacts on the traffic components of the affected area and the relative significance of the impacts associated with the development of the Wind Garden Wind Farm are summarised below (refer to **Appendix M**).

10.12.1 Description of Traffic Impacts

The traffic expected to be generated by the development of the Wind Garden Wind Farm can be divided into the three phases of the project, namely:

» *Construction Phase* – The construction phase includes the transportation of people, construction materials and equipment to the project site. This phase also includes the construction of roads, excavation of turbine footings, trenching for electrical cables and other ancillary construction works that will temporarily generate the largest amount of traffic. Potential traffic congestion and delays on the surrounding road network and associated noise and dust pollution are expected to occur. Traffic generated by the construction of the facility will have a significant impact on the surrounding road network. The exact number of trips generated during construction will be determined by the contractor and the haulage company transporting the components to site, the staff requirements and where equipment is sourced from.

» *Operation Phase* – During the operation phase (including the undertaking of maintenance activities) it is expected that staff and security will periodically visit the turbines. The traffic generated during this phase will be minimal and will not have significant impact on the surrounding road network. However, the Client/Facility Manager is to ensure that regular maintenance of gravel roads occurs during operation phase to minimise/mitigate dust pollution. The maintenance and replacement of wind turbine components would require a crane and abnormal vehicles. Although abnormal load vehicles will be required, the maintenance or replacement of components can be staggered, and the transportation of the components would therefore take place over a short period of time. Traffic disruptions can be minimised by transporting the components during off-peak hours. The operation phase is expected to generate minimal traffic. Considering the above no impact table is provided for the operation phase.

» *Decommissioning Phase* – The decommissioning phase will generate construction related traffic including the transportation of people, construction materials, water and equipment (i.e. abnormal trucks transporting turbine components). It is therefore expected that the decommissioning phase will generate the same impact as that of the construction phase. Considering the above no impact table is provided for the decommissioning phase.

10.12.2 Impact tables summarising the significance of impacts on traffic during the construction and operation phases (with and without mitigation)

Construction Phase Impacts

Nature: Traffic impacts expected during the construction phase Traffic congestion due to an increase in traffic caused by the transportation of equipment, material and staff to site.		
	Without mitigation	**With mitigation**
Extent	Low (2)	Low (1)
Duration	Short term (2)	Short term (2)
Magnitude	Moderate (6)	Low (4)
Probability	Definite (5)	Probable (3)
Significance	**Medium (50)**	**Low (21)**
Status (positive or negative)	Negative	Negative
Reversibility	Completely reversible	Completely reversible
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation: » Stagger component delivery to the site. » Stagger the construction period. » The use of mobile batching plants and quarries in close proximity to the project site would decrease the impact on the surrounding road network. » Staff and general trips should occur outside of peak traffic periods. » Regular maintenance of gravel roads by the contractor during the construction phase.		
Residual Impacts: The proposed mitigation measures for the construction traffic will result in a reduction of the impact on the surrounding		

road network. Traffic will return to normal levels after construction is completed

Nature: _Dust pollution due to traffic in the construction phase_ Construction traffic on roads will generate dust. Air quality will be affected by dust pollution.		
	Without mitigation	**With mitigation**
Extent	Low (1)	Low (1)
Duration	Short term (2)	Short term (2)
Magnitude	Moderate (6)	Low (4)
Probability	Highly probable (4)	Probable (3)
Significance	**Medium (36)**	**Low (21)**
Status (positive or negative)	Negative	Negative
Reversibility	Completely reversible	Completely reversible
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation: » Dust Suppression of gravel roads during the construction phase, as required. » Regular maintenance of gravel roads by the contractor during the construction phase.		
Residual Impacts: Dust pollution during the construction phase cannot be completely mitigated but mitigation measures will significantly reduce the impact. Dust pollution is limited to the construction period.		

Nature: _Noise pollution due to traffic in the construction phase_ Construction traffic on roads will generate noise i.e. noise pollution due to increased traffic.		
	Without mitigation	**With mitigation**
Extent	Low (2)	Low (1)
Duration	Short term (2)	Short term (2)
Magnitude	Moderate (6)	Low (4)
Probability	Highly probable (4)	Probable (3)
Significance	**Medium (40)**	**Low (21)**
Status (positive or negative)	Negative	Negative
Reversibility	Completely reversible	Completely reversible
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation: » Stagger component delivery to the site. » Stagger the construction period. » The use of mobile batching plants and quarries in close proximity to the project site would decrease the impact on the surrounding road network. » Staff and general trips should occur outside of peak traffic periods. » Regular maintenance of gravel roads by the contractor during the construction phase.		
Residual Impacts: The proposed mitigation measures for the construction traffic will result in a reduction of the impact on the surrounding road network. Traffic will return to normal levels after construction is completed.		

10.12.3 Overall Result

The traffic generated during the construction phase, although significant, will be temporary and impacts are considered to be negative and of medium significance before and of low significance after mitigation. During the operation phase impact would be minimal. The traffic generated during the decommissioning phase will be similar but less than the construction phase traffic and the impact on the surrounding road network will also be considered negative and of medium significance before and of low significance after mitigation.

No impacts of high significance were identified and no fatal flaws are associated with the Wind Garden Wind Farm from a traffic perspective.

10.13. Assessment of the 'Do Nothing' Alternative

The 'do-nothing' alternative (i.e. no-go alternative) is the option of not constructing the Wind Garden Wind Farm. Should this alternative be selected, there would be no environmental impacts on the site due to the construction and operation activities of a wind farm.

a) Land use and agriculture

The land capability of the project site indicates that 92% of the land is impractical for cultivation and that the area is suitable for perennial vegetation. Based on the land capability and the land use suitability in terms of agriculture this includes grazing, veld, pastures and afforestation. The proposed development footprint of the Wind Garden Wind Farm would allow the on-going current grazing and farming activities to continue on areas of the affected properties that will not house wind farm infrastructure. The development footprint of the Wind Garden Wind Farm is less than 2% of the total extent of the project site. Therefore the current land-use will be retained, while also generating renewable energy from the wind. The impact on agricultural activities as a result of the project is, therefore, expected to be low.

The implementation of the 'do-nothing' alternative would leave the land-use restricted to the current livestock grazing and limitations experienced in terms of land capability, losing out on the opportunity to generate renewable energy from wind as additive thereto (i.e. current activities would continue). Therefore, from a land-use perspective, the 'do-nothing' alternative is not preferred as there is a perceived loss of a viable and compatible land use.

In addition, the landowner would obtain an income from the wind farm (as the developer would pay a percentage of the revenue generated to the landowner in accordance with the lease agreement for the use of the land). This would contribute towards the financial stability of the landowner which would in turn contribute to the financial viability of the farming practices on the property. The implementation of the 'do nothing' alternative would retain the current land-use, fore-going the opportunity to generate renewable energy from the wind and at the same time continue the current agricultural activities on areas that fall outside of the Wind Garden Wind Farm infrastructure.

The 'do nothing' alternative would result in a lost opportunity for the landowner (in terms of implementing a compatible land use option, while still retaining the current land use, as well as a loss in long-term revenue) and the country (in terms of renewable energy). From this perspective the no-go alternative is not preferred when considering land use and agricultural aspects of the project site. Use of the identified site for the development of the proposed wind energy facility is considered to be a preferred land use as the benefits will outweigh the impacts.

b) Socio-economic impact

Social: The impacts of pursuing the no-go alternative are both positive and negative as follows:

» The benefits would be that there is no disruption from an influx of jobseekers into the area, nuisance impacts (noise and dust during construction), visual impacts and safety and security impacts. The impact is therefore neutral.
» There would also be an opportunity lost in terms of job creation, skills development and associated economic business opportunities for the local economy, as well as a loss of the opportunity to generate energy from a renewable resource without creating detrimental effects on the environment.

Foregoing the proposed development would not necessarily compromise the development of renewable energy facilities in South Africa. However, the socio-economic benefits for local communities at this location and within the surrounding area would be forfeited. The area has experienced social challenges which has resulted in the need for socio-economic upliftment.

Therefore, from a socio-economic perspective, the 'do-nothing' alternative is not preferred as there is a perceived loss of socio-economic benefits, when considering the current socio-economic conditions of the area.

New Business: Some of the positive spin off effects that are to ensue from the project expenditure will be localised in the communities located near the site, such as the towns of Makhanda and Riebeek East. The local services sector and specifically the trade, transportation, catering and accommodation, renting services, personal services and business services are expected to benefit the most from the project activities during the construction phase. New business sales that will be stimulated as a result of the establishment of the wind farm, albeit for a temporary period, will be lost with the implementation of the 'do nothing' alternative. Therefore from a business perspective, the 'do-nothing' alternative is not preferred as there is a loss of new business opportunities.

Employment: The development of the Wind Garden Wind Farm within the Makana Local Municipality will aid in a reduction of the unemployment rate, however if the wind farm is not developed then the unemployment rate will not be positively influenced by the proposed development. The upliftment and socio-economic benefits for individuals within local communities would be forfeited with the implementation of the 'do nothing' alternative. Therefore, from an employment perspective, the 'do-nothing' alternative is not preferred as there is a perceived loss of employment opportunities.

Skills development: The establishment of the Wind Garden Wind Farm will offer numerous opportunities for skills transfer and development. This is relevant for both on-site activities and manufacturing activities. Various wind farms are proposed to be developed in the area and in the Eastern Cape Province, which means that the transfer of skills from foreign experts to the local engineers and construction workers will take place, similar to what has taken place where wind farms have been constructed and operated within the Province. The skills training and transfer benefits for individuals within local communities would be forfeited with the implementation of the 'do nothing' alternative.

Municipal goals: The opportunity to contribute to the innovative energy sourcing methods as identified by the Makana Local Municipality as per a draft policy which sets out the criteria which will enable the evaluation of renewable energy generation infrastructure to be developed in a manner that will limit the potential negative impacts thereof will not be met should the Wind Garden Wind Farm not be constructed with the implementation of the 'do nothing' alternative.

The no-go alternative will therefore result in the above economic benefits not being realised and a subsequent loss of income and opportunities to local people. From this perspective the no-go alternative is not preferred.

c) Regional scale impact

At a broader scale, the benefits of additional capacity to the electricity grid and those associated with the introduction of renewable energy would not be realised. The Eastern Cape has an ample wind resource. Although the Wind Garden Wind Farm is only proposed to contribute a contracted capacity of up to 264MW to the grid capacity, this would assist in meeting the electricity demand for the relevant private off-takers and would also assist in meeting the government's goal for renewable energy and the energy mix. The generation of electricity from renewable energy resources offers a range of potential socio-economic and environmental benefits for South Africa. These benefits include:

» Increased energy security;
» Resource saving (i.e. fossil fuels and water);
» Exploitation of South Africa's significant renewable energy resource;
» Pollution reduction;
» Climate friendly development;
» Support for international agreements;
» Employment creation;
» Acceptability to society; and
» Support to a new industry sector.

At present, South Africa is some way off from fully exploiting the diverse gains from renewable energy and from achieving a considerable market share in the renewable energy industry. South Africa's electricity supply remains heavily dominated by coal-based power generation, with the country's significant renewable energy potential largely untapped to date.

The Integrated Resource Plan (IRP) (2019) provides for the development of 17 743MW of capacity from large scale wind energy facilities by 2030, with an annual contribution of 1600MW from 2022. The IRP essentially drives the assortment of energy to be implemented for South Africa which is known as the energy mix of the country, considering various generation technologies.

The 'do-nothing' alternative will do little to influence the renewable energy targets set by government. However, as the project site experiences ample wind resource and optimal grid connection opportunities are available, not developing the Wind Garden Wind Farm would see such an opportunity being lost. As current land use activities can continue on the site once the project is operational, the loss of the land to this project during the operation phase (less than 2% of the larger project site) is not considered significant. In addition, the Eastern Cape Province will not benefit from additional generated power being evacuated directly into the Province's grid. Therefore, from a regional perspective, the 'do-nothing' alternative is not preferred as there is a perceived loss of benefits for the regional area.

From the specialist studies undertaken, no environmental fatal flaws were identified to be associated with the Wind Garden Wind Farm. All impacts associated with the project can be mitigated to acceptable levels. If the wind farm is not developed the following positive impacts will not be realised:

» Job creation from the construction and operation phases.
» Economic benefit to participating landowners due to the revenue that will be gained from leasing the land to the developer.
» Meeting of energy generation mix in a most economic and rapid manner.
» Provision of clean, renewable energy in an area where it is optimally available.

As detailed above, the 'do-nothing' alternative will result in a number of lost opportunities. The 'do nothing' alternative is therefore not preferred and not proposed to be implemented for the development of the Wind Garden Wind Farm.

CHAPTER 11: ASSESSMENT OF POTENTIAL CUMULATIVE IMPACTS

As identified and assessed in Chapter 10, a wind farm development may have effects (positive and negative) on natural resources, the social environment and on the people living in a project area. The preceding impact assessment chapter has reported on the assessment of the impacts associated with the Wind Garden Wind Farm largely in isolation (from other similar developments).

The Wind Garden Wind Farm falls within the Cookhouse REDZs which has been identified by the DEFF as an area highly suitable for wind farms given a range of factors considered. Therefore, DEFF envisages dealing with multiple applications and cumulative issues within a REDZ area. The REDZ are of strategic importance for large scale wind and solar photovoltaic development, in terms of Strategic Integrated Project (SIP) 8. These zones are considered to be areas where significant negative impacts on the environment are limited and socio-economic benefits to the country can be enhanced. Multiple projects within the area have been successfully bid under the DMRE's REIPPP programme which are operational. The Wind Garden Wind Farm will contribute to the cumulative impact experienced within the area.

This chapter assesses the potential for the impacts associated with the project to become more significant when considered in combination with the other operating or proposed wind farm projects within the area.

11.1. Legal Requirements as per the EIA Regulations, 2014 (as amended), for the undertaking of a Basic Assessment Report

This chapter of the BA report includes the following information required in terms of the EIA Regulations, 2014 - Appendix 1: Content of basic assessment reports:

Requirement	Relevant Section
3(j)(i) an assessment of each identified potentially significant impact and risk, including cumulative impacts.	The cumulative impacts associated with the development of the Wind Garden Wind Farm are included and assessed within this chapter.

11.2 Approach taken to Assess Cumulative Impacts

The cumulative impacts that have the potential to be compounded through the development of the wind farm and its associated infrastructure in proximity to other similar developments include impacts such as those listed below. The role of the cumulative assessment is to confirm if such impacts are relevant to the Wind Garden Wind Farm within the project site being considered for the development. This assessment considers whether the cumulative impact will result in:

- » Unacceptable loss of threatened or protected vegetation types or species through clearing, resulting in an impact on the conservation status of such flora or ecological functioning;
- » Unacceptable loss to sensitive aquatic features;
- » Unacceptable risk to avifauna through collision, avoidance and displacement;
- » Unacceptable risk to bats through loss of habitat, infringement on roosting or breeding areas, or risk to collision-prone species;
- » Unacceptable loss of high agricultural potential areas presenting a risk to food security and increased soil erosion;

- Complete or whole-scale change in sense of place and character of an area and unacceptable visual intrusion;
- Unacceptable loss of heritage resources;
- Unacceptable negative socio-economic impact;
- Unacceptable increase in ambient noise levels, resulting in an impact on the normal functioning of the occupants of the area;
- Unacceptable risk to the operation of the wind farm due to the potential wake loss effect and the social implications from an operational point of view; and
- Unacceptable impact to the traffic network.

Further to the above, positive cumulative impacts are also expected and will be associated with socio-economic aspects and benefits.

Figure 11.1 indicates the location of the Wind Garden Wind Farm in relation to all other operating and proposed wind farms located within the surrounding area of the project site. These projects were identified using the Department of Environment, Forestry and Fisheries Renewable Energy Database and current knowledge of projects operating and being proposed in the area. For the assessment of cumulative impacts only developments within a 30km radius from the Wind Garden Wind Farm were considered (**Figure 11.2**), which is in line with the Department of Environment, Forestry and Fisheries requirements.

In the case of the Wind Garden Wind Farm, there are three (3) wind farms located within a 30km radius of the project site (refer to **Figure 11.1** and **Table 11.1**). At the time of writing this BA report two facilities are still in process of obtaining Environmental Authorisation[19] and one facility is already operational. The potential for cumulative impacts is summarised in the sections which follow and have been considered within the specialist studies (refer to **Appendices D – M**).

Table 11.1: Wind farms located within the broader area (within a 30km radius) of the Wind Garden Wind Farm project site

Project Name	Capacity	Location from the Wind Garden Wind Farm project site	Project Status
Waainek Wind Energy Facility	24MW	16km to the south-east	Operational
Albany Wind Energy Facility	297MW	32km to the east	In process
Fronteer Wind Farm	213MW	Directly adjacent to the east	In process

It must be noted that the Wind Garden Wind Farm and the Fronteer Wind Farm are proposed by the same umbrella company but are assessed under separate special purpose vehicles known as Wind Garden (Pty) Ltd and Fronteer (Pty) Ltd. Therefore, technical consideration of the two planned facilities adjacent to one another have been considered by the developer holistically.

[19] Applications for Environmental authorisation for numerous wind farms have been undertaken within the area, however some of these applications have lapsed and are no longer considered to be valid and are therefore not considered as part of the cumulative impact assessment.

It should be noted that not all the wind farms presently under consideration by various wind farm developers will be built for operation. Not all proposed developments will be granted the relevant permits by the relevant authorities (DEFF, DMRE, NERSA and Eskom) and this is because of the following reasons:

» There may be limitations to the capacity of the existing or future Eskom grid;
» Not all applications will receive a positive environmental authorisation;
» There are stringent requirements to be met by applicants in terms of the REIPPP Programme and a highly competitive process that only selects the best projects;
» Not all proposed wind farms will be viable because of lower wind resources on some sites, and the best wind resource areas should be utilised first;
» Not all proposed wind farms will be able to reduce the associated negative impacts to acceptable levels or be able to mitigate the impacts to acceptable levels (fatally flawed);
» Not all proposed facilities will eventually be granted a generation license by NERSA and sign a Power Purchase Agreement with Eskom; and
» Not all developers will be successful in securing financial support to advance their projects further.

As there is uncertainty whether all the above-mentioned wind farms will be implemented, it is also difficult to quantitatively assess the potential cumulative impacts. The cumulative impacts of other known wind farms in the broader area and the Wind Garden Wind Farm are therefore qualitatively assessed in this Chapter.

It is important to explore the potential for cumulative impacts on a quantitative basis as this will lead to a better understanding of these impacts and the potential for mitigation that may be required. The scale at which the cumulative impacts are assessed is important. For example, the significance of the cumulative impact on the regional or national economy will be influenced by wind farm developments throughout South Africa, while the significance of the cumulative impact on visual amenity may only be influenced by wind farm developments that are in closer proximity to each other, e.g., up to 30 km to 50 km apart. For practical purposes a sub-regional scale of 30km has been selected for this cumulative impact evaluation.

In the sections below a summary of the potential for a cumulative impact resulting from several wind farms within a 30km radius of the Wind Garden Wind Farm are explored (refer also to the specialist reports contained in **Appendix D** to **M**). Impacts are assessed accordingly in terms of the proposed project in isolation and the impact considering other projects within the area or the cumulative impact with and without mitigation, as was deemed relevant by the specialist. The approach taken by the various specialists in assessing cumulative impacts is informed by the scale at which the impact is likely to occur.

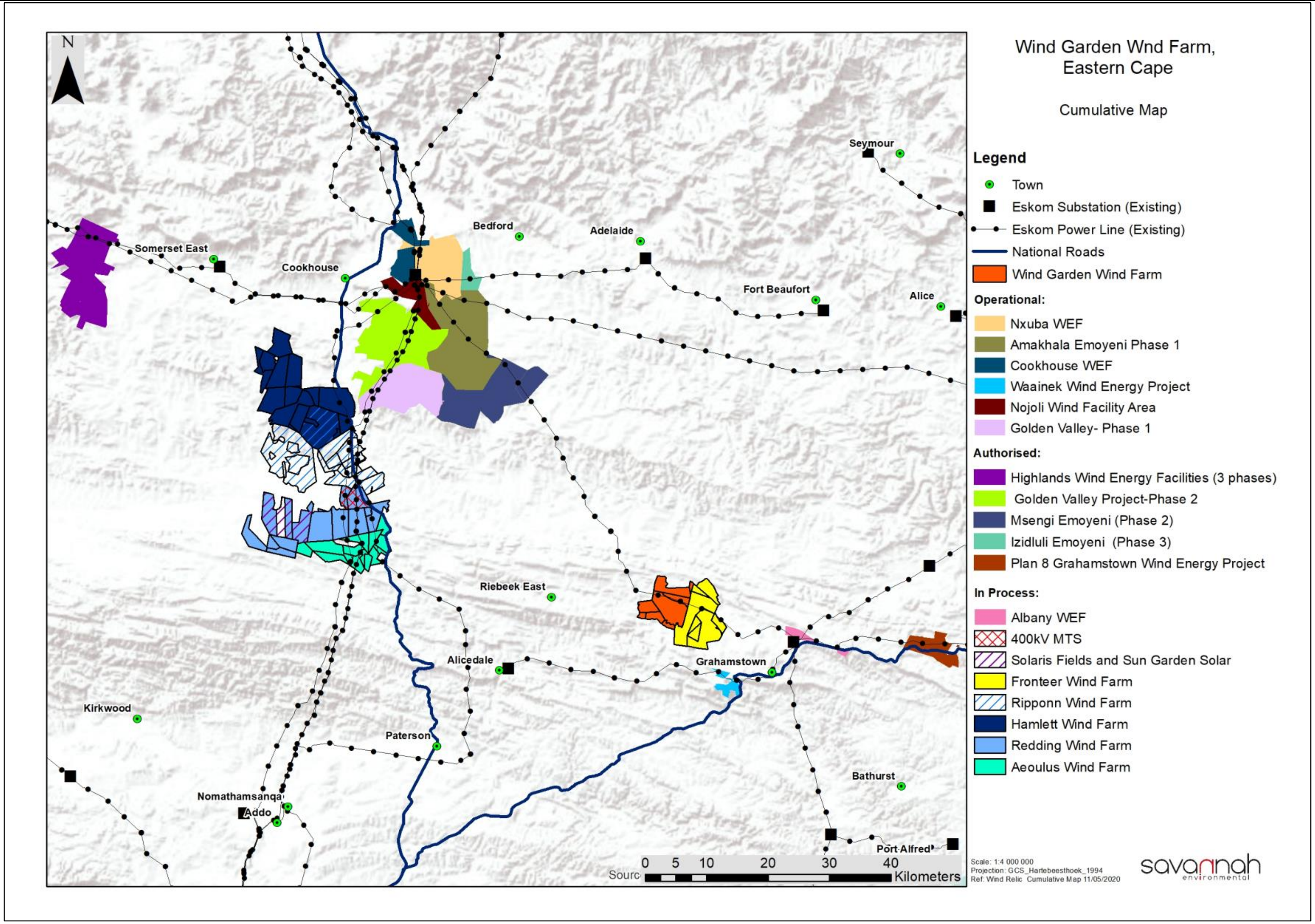


Figure 11.1: Wind farm projects located within the surrounding area of the Wind Garden Wind Farm project site that are considered as part of the cumulative impact assessment

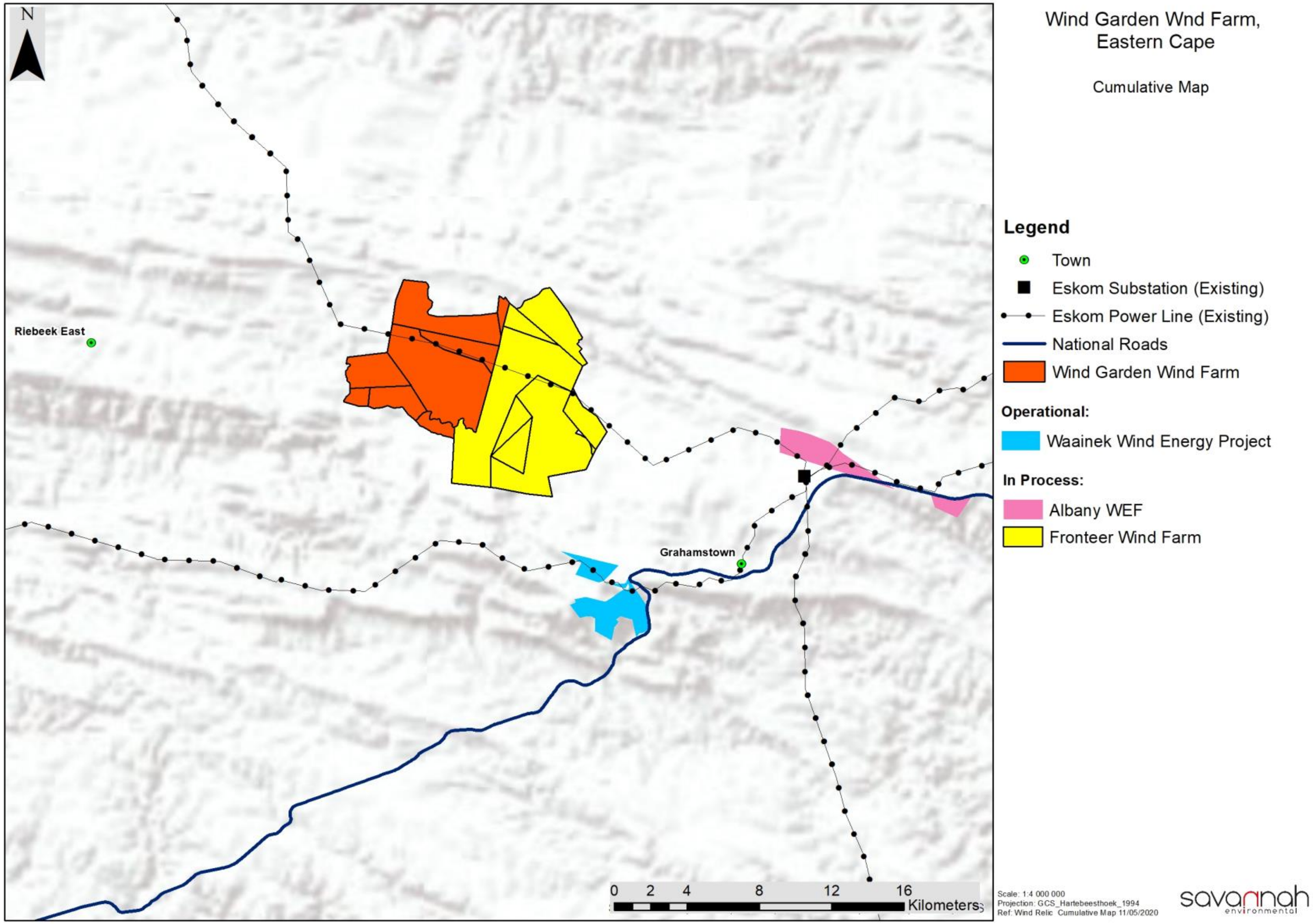


Figure 11.2: Wind farm projects located within a 30km radius of the Wind Garden Wind Farm project site that are considered as part of the cumulative impact assessment

11.3 Cumulative Impacts on Ecological Processes

From an ecological perspective the development will contribute to cumulative impacts on CBAs, habitat loss in the area and potentially the ability to meet future conservation targets. In addition, the presence of the wind turbines and daily operational activities at the site may deter certain species from the area, resulting in a loss in broad-scale landscape connectivity. This impact would persist for the life of the facility and is therefore assessed for the operational phase of the wind farm.

In terms of existing impacts in the area, there is currently only the existing Waainek Wind Energy Facility near Makhanda (Grahamstown) and then the various operational facilities north of the site near Cookhouse. Apart from some impact on Albany Broken Veld, these other developments are located within different habitats and vegetation types to the Wind Garden Wind Farm project site and as a result, cumulative impacts from these other developments do not contribute directly to the same habitats and plant communities as the Wind Garden project site. Therefore, in terms of cumulative impacts, it is really only the proposed Fronteer Wind Farm that would contribute directly to cumulative impact in the same area and habitats as the Wind Garden Wind Farm project. The footprint of each project is less than 80ha each, with the result that the total expected footprint in the area from wind energy development would be less than 160ha. This is not considered highly significant in the context of the receiving environment which is still largely intact with all affected vegetation types being classified as Least Concern and each being still more than 80% intact.

Nature: *Cumulative ecological impacts due to wind energy development in the area* Wind energy development in the wider area around the site will generate cumulative impacts on habitat loss and fragmentation for fauna and flora.		
	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Local (1)	Local (2)
Duration	Long-term (4)	Long-term (4)
Magnitude	Low (3)	Moderate (4)
Probability	Probable (3)	Probable (3)
Significance	**Low (24)**	**Medium (30)**
Status (positive or negative)	Negative	Negative
Reversibility	Moderate	Low
Irreplaceable loss of resources?	No	Yes
Can impacts be mitigated?	Yes	
Mitigation: » Minimise habitat loss and degradation within high-value faunal habitats such as drainage lines. » Promote sustainable land use practices in the area and especially on wind farm properties to improve the quality of the habitat for fauna and flora. » Ensure that alien species of flora as well as fauna are managed to ensure that they do not have a broadly negative impact.		

11.4 Cumulative Impacts on Aquatic Ecology

In terms of aquatic ecology cumulative impacts are expected to occur. The cumulative impact assessment considers the combined impact of the surrounding wind farms on the natural environment. Although the current state of the surrounding landscape is largely natural the cumulative impact would be negligible, coupled to the fact that the aquatic systems are largely ephemeral.

Nature: *Cumulative impacts on Aquatic Ecology* In the assessment of this project, a number of projects have been assessed by the specialist within the area and or other sites were accessed during the course of travelling between the various projects. Of these potential projects, the specialist has been involved in the initial EIA aquatic assessments or has managed / assisted with the water use license (WUL) process and or Plant and Animal Search and Rescue for several of these projects. All of the projects have indicated that their intention with regard to mitigation, i.e. selecting the best possible sites to minimise the local and regional impacts, or improving the drainage or hydrological conditions within these rivers, and therefore the cumulative impact could be seen as a net benefit. However, the worst-case scenario has been assessed below, i.e. only the minimum of mitigation be implemented by the other projects such as stormwater management, and that flows within these systems are sporadic.		
	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Local (1)	Local (1)
Duration	Long term (4)	Long term (4)
Magnitude	Low (1)	Low (2)
Probability	Probable (3)	Definite (5)
Significance	**Low (18)**	**Medium (35)**
Status (positive or negative)	Negative	Negative
Reversibility	Medium	Medium
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation: » Improve the current stormwater and energy dissipation features not currently found along the tracks and roads within the region by local landowners / public works entities where possible. » Install properly sized culverts with erosion protection measures at the present road / track crossings where already installed by local landowners / public works entities.		

11.5 Cumulative Impacts on Avifauna

The cumulative effect of the Wind Garden Wind Farm along with the actual and predicted impacts of the operational Waainek Wind Energy Facility, the Albany Wind Energy Facility and future impacts of the proposed Fronteer Wind Farm, has the potential to affect various bird species at a higher significance than the impacts of the Wind Garden Wind Farm alone. **Table 11.2** list the key species that may possibly be impacted upon cumulatively. Of these, Blue Crane, Martial eagle and Verreaux's eagle are of primary concern, as they might suffer from turbine collisions.

Table 11.2: Key species that may possibly be impacted upon cumulatively

	Key Species										
	Martial Eagle	Verreaux's Eagle	Cape Vulture	Blue Crane	Secretarybird	Lanner Falcon	Ludwig's Bustard	Southern Black Bustard	Black Stork	Caspian Tern	African Marsh-harrier
Avoidance Rate	99%	99%	95%	98%	98%	98%	98%	98%	98%	98%	99%
Wind Garden	0.04	0.11	0	0.22	0	0	0.04	0.03	0	0	0
Fronteer	0.15	0.005	0	0.30	0	0.08	0.01	0.02	0	0	0
Total	0.19	0.12	0	0.52	0	0.08	0.05	0.05	0	0	0

In the case of the predicted collision risks from the Wind Garden Wind Farm, it is clear that the predicted levels of additional mortality are very low numerically, and as such it can be reasonably concluded without any detailed population analysis that these effects would not be significant, at either the regional or the national scale. Notwithstanding this, it is still recommended that mitigation measures should be implemented to minimise the risk of collision to Martial Eagle and Verreaux's Eagle in particular, so that the Wind Garden Wind Farm makes as small as possible a contribution to the overall cumulative risk.

In conclusion, if all operational and proposed facilities are considered and all appropriate and effective mitigation as outlined by their respective specialists, and if all mitigation measures recommended for the Wind Garden Wind Farm are implemented, the cumulative impact after mitigation is likely to have a medium significance. With the contribution of the Wind Garden Wind Farm being low.

From a residual impact perspective, the impact should be less severe at a regional and national level, due to the large distribution ranges of the species, but should nonetheless be carefully monitored. Although the calculated significance is on the low border of medium, if all the mitigation measures proposed for the various renewable projects are strictly implemented, the cumulative impacts of these developments, including the proposed Wind Garden Wind Farm, should be reduced to low.

Nature: *Cumulative impacts on avifauna* Cumulative impact of all impacts on avifauna at all operational and proposed wind farms in the region.		
	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Local (2)	High (4)
Duration	Permanent (5)	Permanent (5)
Magnitude	Medium (2)	Medium (3)
Probability	Probable (3)	Probable (3)
Significance	**Low (27)**	**Medium (36)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes	
Mitigation: » All mitigation measures listed for the Wind Garden Wind Farm and recommended for other projects must be adhered to. » The applicant and operational neighbouring projects should proactively collaborate in turbine collision research and mitigation if incidents on Priority species occur. Data must be shared, and research efforts co-ordinated to reduce mortalities in the region of the species above, and where applicable and agreed, effort must be made to assist in funding of such research. » Mitigation for cumulative impacts warrant a cumulative approach to mitigation to achieve maximum effectiveness. In this area, an opportunity exists to initiate a Stewardship programme by the local environmental groups. It is recommended that the companies/wind farm owners should collaborate for the purpose of further research and mitigation into the impacts of wind farms on priority species in the Makhanda area.		

11.6 Cumulative Impacts on Bats

Cumulative impacts on bats were assessed as the incremental impact of the proposed activity on the baseline, when added to the impacts of other past, present or reasonably foreseeable future activities within a 50km radius. A 50km radius is used because of the migratory behaviour of the Natal long-fingered bat found on site. This species can travel up to hundreds of kilometres and more than 50 km a day.

It is important to consider cumulative impacts across the entire scale that potentially affected animals are likely to move, especially mobile animals like bats. Impacts at a local scale could have negative consequences at larger scales if the movement between distant populations is impacted. The cumulative impacts could be lower for species that do not migrate over such large distances or resident species that are not known to migrate.

All species recorded during the pre-construction monitoring (except for the Natal long-fingered bat) do not migrate over such large distances. The sphere of the cumulative impact would then likely be restricted to the home ranges and foraging distances of different species, which can range from 1km to at least 15km for some insectivorous bats and up to at least 24 km for some fruit bats.

Cumulative impacts on bats could increase as new facilities are constructed but are difficult to accurately predict or assess without baseline data on bat population size and demographics and these data are lacking for many South African bat species. It is possible that cumulative impacts could be mitigated with the appropriate measures applied to wind farm design and operation at each respective facility.

Cumulative impacts could result in declines in populations of even those species of bats currently listed as Least Concern, if they happen to be more susceptible to mortality from wind turbines (e.g. high-flying open air foragers such as free-tailed and fruit bats) even if the appropriate mitigation measures are applied. Further research into the populations and behaviour of South African bats, both in areas with and without wind turbines, is needed to better inform future assessments of the cumulative effects of wind energy facilities on bats.

In terms of residual risk, changes in inter-annual activity (especially for migratory bats) could increase mortalities at multiple wind farms despite curtailment regimes that may be implemented. Constant monitoring and carcass searching would increase the knowledge of inter-annual activity variation and would help to refine mitigation options (such as curtailment plans) to reduce this residual risk.

Nature: *Cumulative bat mortality impacts*

Cumulative indirect impacts to bats, such as those relating to changes to physical environment (e.g., roost and habitat destruction) are likely to be low to medium across the cumulative impact regions. Cumulative direct impacts to bats, specifically related to bat mortality, are likely to be higher.

For non-migratory species, cumulative direct impacts could have a high significance before mitigation but could reduce to medium or low with appropriate turbine siting and operational mitigation if determined as being necessary based on operational monitoring. Direct impacts on migratory species (i.e., the Natal long-fingered bat) may be high before mitigation but could also reduce to low or medium with appropriate turbine siting and operational mitigation. However, these ratings would be dependent on all other surrounding wind energy facilities also adopting similar mitigation strategies to reduce impacts to bats.

At this time, impacts to bats would increase when more wind energy facilities are constructed.

	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Low Local (2)	Regional (5)
Duration	Long-term (3)	Long-term (3)
Magnitude	Low (5)	High (10)
Probability	Distinct Possibility (3)	Distinct Possibility (3)
Significance	**Medium (30)**	**Medium (54)**

Status (positive or negative)	Negative	Negative
Reversibility	No	No
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes	

Mitigation:

» At operational wind energy facilities where impacts to bats exceed threshold values, mitigation strategies such as curtailment or deterrents must be used.
» The operation of lights at substations should be limited to avoid attracting bats to the area. Where lights need to be used such as at the substation and switching station and elsewhere, these should have low attractiveness for insects such as low-pressure sodium and warm white LED lights. High pressure sodium and white mercury lighting is attractive to insects and should not be used as far as possible.
» Lighting should be fitted with movement sensors to limit illumination and light spill, and the overall lit time. In addition, the upward spread of light near to and above the horizontal plane should be restricted and directed to minimise light trespass and sky glow.
» Increasing the spacing between lights, and the height of light units can reduce the intensity and volume of the light to minimise the area illuminated and give bats an opportunity to fly in relatively dark areas between and over lights.
» Siting of new wind energy facilities and the layouts thereof should take cognisance of sensitivity and no-go areas enforced by the DEFF through the EIA process.

11.7 Cumulative Impacts on Land Use, Soil and Agricultural Potential

The general condition of the soil resources in the study area is predominantly natural. Aside from isolated areas of erosion, limited developments and accompanying anthropogenic activities, no significant degradation of the area is notable. Additionally, considering the low sensitivity of the soil resources in the area, it is the specialist's opinion that no significant impacts are expected. Loss of land capability has been determined as a cumulative impact.

Nature: *Loss of land capability*
A loss of land capability could occur with the development of various renewable energy facilities.

	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Low (2)	Low (2)
Duration	Permanent (5)	Permanent (5)
Magnitude	Minor (2)	Minor (2)
Probability	Improbable (2)	Improbable (2)
Significance	**Low (18)**	**Low (18)**
Status (positive or negative)	Negative	Negative
Reversibility	Moderate	Moderate
Irreplaceable loss of resources?	No	Low (2)
Can impacts be mitigated?	Not applicable	

Mitigation:

» Areas of higher land capability must be considered in terms of avoidance of infrastructure, as relevant.

11.8 Cumulative Impacts on Heritage (including archaeology, palaeontology and cultural landscape)

Considering the area within which the Wind Garden Wind Farm is proposed, the cumulative unmitigated impacts on historical structures, burial grounds and graves, as well as palaeontological resources consist of a medium negative impact mostly confined to the construction phase of the project. This could potentially result in an unacceptable loss of heritage resources. However, by implementing the mitigation measures as listed in this report the cumulative impacts can be managed to low negative.

The cumulative heritage impacts assessed include cumulative impacts of historical structures of a low significance, impacts historical structures of a high significance, cumulative impacts on graves and burial grounds and cumulative impacts on palaeontological resources.

The residual impacts from a cumulative perspective will be moderate and relate to the loss of resources.

Nature: *Cumulative heritage impacts on historical structure of a low significance*
Historical Structures (EWF1-07) have been identified on the Wind Garden Wind Farm site during the survey, including the ruins of houses. These sites were rated as having a low heritage significance and heritage rating of IIIC.

Cumulative impacts to historical resources would occur during the construction and operation phase when the ground surface is cleared and when turbine, substation foundations and roads are excavated.

	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Low (1)	Low (1)
Duration	Short term (2)	Long term (4)
Magnitude	Minor (2)	Minor (2)
Probability	Unlikely (2)	Unlikely (2)
Significance	**Low (10)**	**Low (14)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes	

Mitigation:
» Mitigation measures as proposed in the HIA's, and approved by the ECPHRA for the proposed facilities that reduce negative impacts on graves and burial grounds must be implemented in line with the NHRA 25 of 1999 and National Health Act regulations.

Nature: *Cumulative heritage impacts on historical structure of a high significance*
Historical Structures (EWF1-04)) have been identified on the Wind Garden Wind Farm site during the survey, including a farmhouse. This site was rated as having a medium heritage significance and heritage rating of IIIB.

Cumulative impacts to historical resources would occur during the construction and operation phase when the ground surface is cleared and when turbine, substation foundations and roads are excavated.

	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Low (1)	Low (1)
Duration	Long Term (4)	Long Term (4)
Magnitude	Low (2)	Low (3)
Probability	Unlikely (2)	Unlikely (2)
Significance	**Low (14)**	**Low (16)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes	

Mitigation:

» Mitigation measures as proposed in the HIA's, and approved by the ECPHRA for the proposed facilities that reduce negative impacts on graves and burial grounds must be implemented in line with the NHRA 25 of 1999 and National Health Act regulations.

Nature: *Cumulative heritage impacts on graves and burial grounds* Graves and Burial Grounds (EWF1-10, EWF1-11, and EWF1-12) have been identified on the Wind Garden Wind Farm site during the survey. These sites are of high significance and rated as IIIA. Cumulative impacts to Burial Grounds and graves resources would occur during the construction and operation phase when the ground surface is cleared and when turbine, substation foundations and roads are excavated.		
	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Low (1)	Low (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Low (2)	Low (3)
Probability	Unlikely (2)	Unlikely (2)
Significance	**Low (14)**	**Low (16)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes	
Mitigation: » Mitigation measures as proposed in the HIA's, and approved by the ECPHRA for the proposed facilities that reduce negative impacts on graves and burial grounds must be implemented in line with the NHRA 25 of 1999 and National Health Act regulations.		

Nature: *Cumulative heritage impacts on palaeontological resources* Cumulative impacts on fossil remains preserved at or beneath the ground surface.		
	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Local (1)	Local (1)
Duration	Permanent (5)	Medium-term (5)
Magnitude	Minor (2)	Minor (2)
Probability	Highly Probable (1)	Improbable (1)
Significance	**Low (8)**	**Low (8)**
Status (positive or negative)	Negative	Neutral
Reversibility	Irreversible	
Can impacts be mitigated?	Not required	
Mitigation: Not required		

Nature: *Cumulative impacts on cultural heritage* extent that the addition of this project will have on the overall impact of developments in the region on the cultural landscape and associated heritage resources (tangible and intangible)		
	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Regional (3)	Regional (3)

Duration	Long Term (4)	Long Term (4)
Magnitude	Low (4)	Moderate (6)
Probability	Improbable (2)	Unlikely (2)
Significance	**Low (22)**	**Low (26)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	Low
Can impacts be mitigated?	Yes	

Mitigation:

» Mitigation measures as proposed in the HIA for the proposed development that reduces negative impacts to perceptual qualities, land use patterns and living heritage will reduce the impact of this facility on the overall load.
» Mitigation measures proposed for heritage resources will reduce the negative cumulative impact on the cultural landscape and should be implemented as recommended.
» According to the VIA by Du Plessis (2021) no mitigation of the impact on the sense of place of the region is possible as the structures will be visible regardless. However, the following general mitigation measures are proposed:
    * The natural vegetation in all areas outside of the development footprint/servitude must be maintained/re-established during the planning phase.
    * Maintain the general appearance of the facility as a whole during the operational phase
    * Remove the infrastructure not required for the post-decommissioning use and rehabilitate all areas.

11.9 Cumulative Noise Impacts

The noise specialist has considered the cumulative noise impact with the development of the Wind Garden Wind Farm and the directly adjacent proposed Fronteer Wind Farm. Considering the contribution of the Wind Garden Wind Farm on the total cumulative noises (if the Fronteer Wind Farm is also developed) will be less than 3dBA and total noise levels will be less than 45dBA. The cumulative noise impact will be of a low significance.

Nature: *Cumulative noise impacts*
Wind turbines from various wind energy facilities operating simultaneously at night could have a cumulative impact. Increases in ambient sound levels due to air-borne noise from wind turbines are considered.

	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Regional (3)	Regional (3)
Duration	Long term (4)	Long term (4)
Magnitude	Low-medium (4)	ow-medium (4)
Probability	Probable (2)	Probable (2)
Significance	**Low (22)**	**Low (22)**
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	Medium	Medium
Can impacts be mitigated?	No mitigation required	

Mitigation:
No mitigation required as the significance of the noise impact is low.

11.10 Cumulative Visual Impacts

The potential cumulative visual impact of the Wind Garden Wind Farm (incl. associated infrastructure) considers the impact in context of the operational Waainek Wind Energy Facility, and the proposed Fronteer and Albany wind energy facilities located within the area, or potential consolidation of visual impacts, with specific reference to the location of the Wind Garden Wind Farm within the Cookhouse REDZ.

Visibility analyses of the Wind Garden, Fronteer, Waainek and Albany wind energy facilities were undertaken individually from each of the wind turbine positions, respectively 47, 38, 8 and 43 turbines at an offset of 200m above ground level (the approximate blade-tip height). The results of these viewshed analyses were overlain in order to determine areas where all four facilities may be visible, areas where three may be visible, areas where two may be visible, or areas where only turbines from a single facility may be visible.

The cumulative viewshed analysis is displayed on **Figure 11.2**. The areas of visual exposure are displayed as an index ranging from one (green), two (yellow), three (orange) and four (red). This implies that areas that are red or orange have a higher cumulative visual exposure than yellow or green areas.

The location of the Waainek and Albany wind energy facilities on ridges to the south and to the north of the plateau has as an effect that the wind turbines are visible over larger areas to the south and to the north. The overall combined areas of higher cumulative visual exposure over shorter distances are primarily located on the plateau. Longer distance cumulative visual exposure may occur further north along the south facing slopes of the Fish River Rand.

The areas of higher cumulative visual exposure contain sensitive visual receptors in the form of residents of homesteads and observers travelling along the arterial or regional roads traversing the plateau. Even though the Waainek Wind Energy Facility only consists of eight wind turbines, the combined number of wind turbines within a 30km radius (should all be constructed) may be up to 136, potentially resulting in cumulative visual impacts ranging from moderate to high significance.

The combined visual impact or cumulative impact of up to four wind energy facilities is expected to increase the area of potential visual impact within the region. The intensity of visual impact (number of turbines visible) to exposed receptors, especially those located within a 5-10km radius of the proposed Wind Garden Wind Farm is expected to increase when considered in conjunction with the other existing or proposed wind energy facilities. The fact that these facilities are located within a REDZ is not likely to mitigate the potential visual impact on affected sensitive visual receptors.

Nature: *Potential cumulative visual impacts* The potential cumulative visual impact of wind farms on the visual quality of the landscape.		
	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Regional (3)	Regional (3)
Duration	Long term (4)	Long term (4)
Magnitude	High (8)	High (8)
Probability	Highly probable (4)	Highly probable (4)
Significance	**High (60)**	**High (60)**
Status (positive or negative)	Negative	Negative
Reversibility	Reversible (1)	Reversible (1)
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	No	
Mitigation: » N/A		

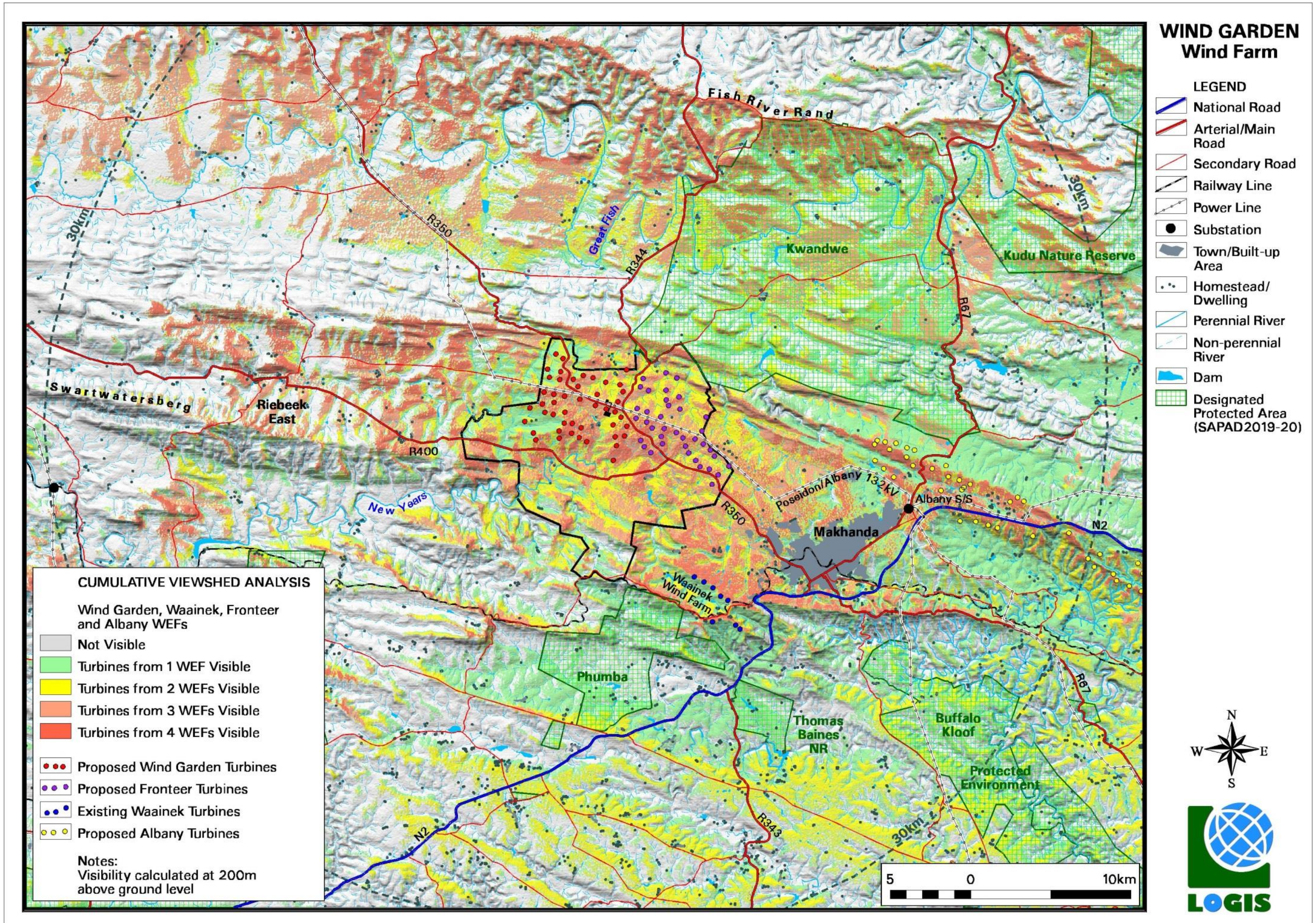


Figure 11.2: Cumulative viewshed analysis of the proposed Wind Garden, Fronteer, Albany and Waainek wind energy facility turbines

11.11 Cumulative Socio-Economic Impacts

From a socio-economic perspective cumulative impacts have been identified for both the construction and operation phases, and within each phase positive and negative impacts have been identified.

During the construction phase the following cumulative impacts are relevant:

- Temporary stimulation of the national and local economy
- Temporary increase employment in the national and local economies
- Contribution to skills development in the country and local economy
- Temporary increase in household earnings
- Temporary increase in government revenue
- Negative changes to the sense of place
- Negative impact on the local tourism, game industry and associated industries during construction
- Temporary increase in social conflicts associated with the influx of people
- Impact on economic and social infrastructure

During the construction phase the following cumulative impacts are relevant:

- Sustainable increase in production and GDP nationally and locally
- Creation of sustainable employment positions nationally and locally
- Skills development of permanently employed workers
- Improved standards of living for benefiting households
- Local economic and social development benefits
- Sustainable rental revenue for farms where wind farms are located
- Sustainable increase in electricity available for the local region and South Africa
- Negative changes to the sense of place
- Negative impact on local tourism, game farming and associated industries

Further to the above operational impacts considered, the impact of the wake-loss effect in terms of socio-economic aspects is identified from a cumulative perspective. Wake loss is defined as production losses due to the mutual interaction of wind turbines caused by the wind energy deficit downstream of the wind turbine rotors. Where wake losses are experienced by a wind energy facility energy production occurs which in-turn effects the revenue of the operational facility and thereby implicates the socio-economic development commitments and obligations of the affected wind project.

With the location of the proposed Fronteer Wind Farm directly adjacent, and to the east, of the Wind Garden Wind Farm project site, consideration of the wake loss effect must be provided. In this regard it must be noted that the Wind Garden Wind Farm and the Fronteer Wind Farm are proposed by the same umbrella company but are assessed under separate special purpose vehicles known as Wind Garden (Pty) Ltd and Fronteer (Pty) Ltd. Therefore, technical consideration of the two planned facilities adjacent to one another has been undertaken by the developer holistically.

The developer has indicated that the development footprints (i.e. turbine layouts) of the Wind Garden Wind Farm and the Fronteer Wind Farms have been optimised by a team of Technical and Advisory Consultants. An holistic approach was undertaken by modelling an Annual Energy Production for the collective project proposed in the area to ascertain the total yield for the Wind Garden Wind and Fronteer Wind Farm and their cumulative wake effects. This has been considered in the proposed development footprints assessed and has ensured the reduction of wake loss effects. Therefore, considering the approach taken in this regard, the impact of the wake loss effect is not considered further with the development footprints of the Wind Garden Wind Farm and the Fronteer Wind Farm confirmed as acceptable in this regard.

Socio-economic cumulative impacts during the construction phase

Nature: *Temporary increase in the GDP and production of the national and local economies during construction* It is highly likely that if the projects are approved by government the demand for goods and services required for the construction of similar facilities would grow especially if they were constructed simultaneously. This could provide sufficient economies of scale and thus open opportunities for the establishment of new industries in the country and new businesses in the local area, specifically in the sectors that are not well represented in the economy. This would have a significant positive impact on the regional economies and a notable impact on the national economy.		
	Overall impact of the proposed project considered in isolation	***Cumulative impact of the project and other projects in the area***
Extent	National (4)	National (4)
Duration	Short term (2)	Medium-term (3)
Magnitude	Very High (9)	Very High (9)
Probability	Highly probable (4)	Highly probable (4)
Significance	**High (60)**	**High (64)**
Reversibility	Benefit is terminated with the end of construction	
Status (positive or negative)	Positive	Positive
Irreplaceable loss of resources?	No	No
Can impacts be enhanced?	No	
Enhancement: » None beyond enhancement at an individual project level		
Residual Impacts: » None foreseen at this stage		

Nature: *Temporary increase employment in the national and local economies* With the number of wind farms that are proposed for the region, it is highly likely that if the projects are approved by authorities the number of people employed from the local area would be significant. It would likely result in a significant temporary reduction in the unemployment rate in the area and increase the number of employed in the area during the construction phase of the development. This would be particularly significant if all proposed developments were constructed simultaneously.		
	Overall impact of the proposed project considered in isolation	***Cumulative impact of the project and other projects in the area***
Extent	Regional (3)	Regional (3)
Duration	Short term (2)	Medium-term (3)
Magnitude	Very High (9)	Very High (9)
Probability	Highly probable (4)	Highly probable (4)
Significance	**Medium (56)**	**High (60)**
Reversibility	Benefit is terminated with the end of construction	
Status (positive or negative)	Positive	Positive
Irreplaceable loss of resources?	No	No
Can impacts be enhanced?	No	
Enhancement: » None beyond enhancement at an individual project level		

Residual Impacts:
» None foreseen at this stage

Nature: *Temporary increase employment in the national and local economies* The potential construction of numerous renewable energy projects will have a notable impact on the skills development in the region especially in the field of renewable energy. This will have a positive impact on an area that has notably been lacking skills development and employment opportunities.		
	Overall impact of the proposed project considered in isolation	***Cumulative impact of the project and other projects in the area***
Extent	Regional (3)	Regional (3)
Duration	Short term (2)	Medium-term (3)
Magnitude	High (8)	Very High (9)
Probability	Highly Probable (4)	Highly probable (4)
Significance	**Medium (52)**	**High (60)**
Reversibility	No	
Status (positive or negative)	Positive	Positive
Irreplaceable loss of resources?	No	No
Can impacts be enhanced?	No	
Enhancement: » None beyond enhancement at an individual project level		
Residual Impacts: » South Africa's human capital development » Improved labour productivity and employability of construction workers for similar projects		

Nature: *Temporary improvement of the standard of living of the positively affected households* The living standards in the region will likely increase for the affected households as earnings increase in the region. If construction of all proposed projects occurs simultaneously then it is likely that the cumulative impact will be notable for the region. The injection of earnings at a household level will have induced and indirect impacts on the local and regional economy as spending increases.		
	Overall impact of the proposed project considered in isolation	***Cumulative impact of the project and other projects in the area***
Extent	Regional (3)	Regional (3)
Duration	Short term (2)	Medium-term (3)
Magnitude	High (8)	Very High (9)
Probability	Highly Probable (4)	Highly probable (4)
Significance	**Medium (52)**	**High (60)**
Reversibility	Benefit is terminated with the end of construction	
Status (positive or negative)	Positive	Positive
Irreplaceable loss of resources?	No	No
Can impacts be enhanced?	No	
Enhancement: » None beyond enhancement at an individual project level		
Residual Impacts: » Possible increase of households' saving accounts » Improved standard of living of the affected households		

Nature: *Temporary improvement of the standard of living of the positively affected households* The development of the proposed projects will likely increase government revenue through VAT, companies' tax, PAYE and income tax and property taxes. The impact of increased revenues for the local economies will be notable. At a national level this will result in lower government debt and servicing costs as revenue increases.		
	Overall impact of the proposed project considered in isolation	***Cumulative impact of the project and other projects in the area***
Extent	National (4)	National (3)
Duration	Short-term (2)	Medium-term (3)
Magnitude	Low (4)	Moderate (6)
Probability	Highly probable (4)	Highly probable (4)
Significance	**Medium (40)**	**Medium (48)**
Reversibility	Benefit is terminated with the end of construction	
Status (positive or negative)	Positive	Positive
Irreplaceable loss of resources?	No	No
Can impacts be enhanced?	No	
Enhancement: » None beyond enhancement at an individual project level		
Residual Impacts: » None envisaged		

Nature: *Impact on the sense of place experienced by the local community as a result of visual and noise effects that appear during the construction phase* The development of the proposed renewable energy facilities may have a notable impact on the change to the sense of place of the area. The area is currently perceived by residents and visitors as rural and "wild". This perception may change with the construction of the proposed renewable energy structures. This could be particularly evident if construction occurs simultaneously.		
	Overall impact of the proposed project considered in isolation	***Cumulative impact of the project and other projects in the area***
Extent	Site & immediate surrounding area (2)	Regional (3)
Duration	Short term (2)	Medium-term (3)
Magnitude	Moderate (6)	High (8)
Probability	Highly probable (4)	Highly probable (4)
Significance	**Medium (40)**	**Medium (56)**
Reversibility	Possible to reverse but only with decommissioning	
Status (positive or negative)	Negative	Negative
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	No	
Mitigation: » None beyond mitigation at an individual project level		
Residual Impacts: » Altered characteristics of the environment » Change in the perception of tourists of the local environment		

Nature: *Impact on the local tourism and game farming industry that is expected during the construction phase as a result of noise and visual effects* It is unlikely that the area will experience a notable loss of visitors to the area from the development of Wind Garden

Wind Farm but, there may be a small reduction of visitors during construction owing to the perceptions associated with wind turbines in areas of natural beauty. A similar phenomenon may be experienced during construction of the other renewable energy facilities. As per international literature, this will only be a short-term or temporary effect and will not persist during operation of the wind farms.

	Overall impact of the proposed project considered in isolation	***Cumulative impact of the project and other projects in the area***
Extent	Site and surrounding area (2)	Regional (3)
Duration	Medium term (3)	Medium-term (3)
Magnitude	Low (4)	Low (4)
Probability	Probable (3)	Probable (3)
Significance	**Low (27)**	**Medium (30)**
Reversibility	Possible to reverse with decommissioning	
Status (positive or negative)	Negative	Negative
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	No	

Mitigation:

» None beyond mitigation at an individual project level

Residual Impacts:

» Visual impacts cannot be eliminated due to the height of the turbines and thus the local industry could still experience some losses after construction.

» Perceptions of international tourists regarding the area's representation as "Wild Africa" would change due to the development as well as similar developments proposed for other parts of the Makana Local Municipality

Nature: *Temporary increase in social conflicts associated with the influx of construction workers and job seekers to the area*

The number of projects planned for the area may entice job seekers from outside the region to move to the area in search of employment. The increase in job seekers to an area with already low levels of employment may lead to increased conflicts in the area. Such conflicts will need to be managed by engaging the communities, local authorities and local labour unions. Managing expectations of the community is important to avoiding such conflicts at a project-by-project level.

The simultaneous construction of all the planned projects in the region will drastically increase the number of workers present in the area. This will be mitigated somewhat by the presence of staff accommodation for those developments but the presence of additional workers in the area may be a cause for conflict for local community members. It is therefore vitally important that local community members are employed for the development of projects in the region.

	Overall impact of the proposed project considered in isolation	***Cumulative impact of the project and other projects in the area***
Extent	Regional (3)	Regional (3)
Duration	Short-term (2)	Medium-term (3)
Magnitude	Low (4)	Low (4)
Probability	Improbable (2)	Probable (3)
Significance	**Low (18)**	**Medium (30)**
Reversibility	Reversibility within a short period	
Status (positive or negative)	Negative	Negative
Irreplaceable loss of resources?	Yes	No
Can impacts be mitigated?	No	

Mitigation:

» None beyond mitigation at an individual project level

Residual Impacts:

» Contribution towards social conflicts in the area by construction workers and job seekers who decide to stay in the area after construction is complete and who are unable to find a sustainable income

Nature: *<u>Added pressure on economic and social infrastructure during construction as a result of increase in local traffic and in migration of construction workers</u>* The number of projects planned for the area will increase the number of workers and job seekers in the area. This may drastically increase pressure on economic infrastructure and social services for the area. Despite the provision of accommodation, the additional staff may cause strain on the already delicate social and economic infrastructure in the area. It is therefore important to employ local community members to reduce the influx of people to the area. This should be managed at a project-by-project level.		
	Overall impact of the proposed project considered in isolation	***Cumulative impact of the project and other projects in the area***
Extent	Regional (3)	Regional (3)
Duration	Short-term (2)	Medium-term (3)
Magnitude	Minor (2)	Low (4)
Probability	Probable (3)	Probable (3)
Significance	**Low (21)**	**Medium (30)**
Reversibility	Reversible within a short period	
Status (positive or negative)	Negative	Negative
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	No	
Mitigation: » None beyond mitigation at an individual project level		
Residual Impacts: » Contribution towards social conflicts in the area by construction workers and job seekers who decide to stay in the area after construction is complete and who are unable to find a sustainable income		

Socio-economic cumulative impacts during the operation phase

Nature: *<u>Sustainable increase in production and GDP nationally and locally</u>* If other renewable energy facilities that have been proposed are approved in the Eastern Cape, together with the Wind Garden Wind Farm project, sufficient economies of scale could be created to establish new businesses in the local economies. These businesses could then supply the goods and services required for the operation and maintenance of the facility that cannot currently be procured in the area. This would contribute to the local economies' growth and development. Additional impacts would be the improved energy supply in the country as well as the reduced carbon emissions in generation of electricity.		
	Overall impact of the proposed project considered in isolation	***Cumulative impact of the project and other projects in the area***
Extent	National (4)	National (4)
Duration	Long-term (4)	Long-term (4)
Magnitude	Moderate (6)	High (8)
Probability	Highly probable (4)	Highly probable (4)
Significance	**Medium (56)**	**High (64)**
Reversibility	Benefits are sustained only over project's lifespan	
Status (positive or negative)	Positive	Positive
Irreplaceable loss of resources?	No	No
Can impacts be enhanced?	No	
Enhancement: » None beyond mitigation at an individual project level		

Residual Impacts:
» None foreseen at this stage

Nature: *Creation of sustainable employment positions nationally and locally* The development of the proposed projects will create a notable number of sustainable employment positions for the region. The development of the Wind Garden Wind Farm will create 27 direct employment positions alone. The development of other renewable projects will be notable in the region as they will likely create a similar number of sustainable positions for the duration of the operation of the facilities.		
	Overall impact of the proposed project considered in isolation	***Cumulative impact of the project and other projects in the area***
Extent	National (4)	National (4)
Duration	Long-term (4)	Long-term (4)
Magnitude	Moderate (6)	High (8)
Probability	Highly probable (4)	Highly probable (4)
Significance	**Medium (56)**	**High (64)**
Reversibility	Benefits are sustained only over project's lifespan	
Status (positive or negative)	Positive	Positive
Irreplaceable loss of resources?	No	No
Can impacts be enhanced?	No	
Enhancement: » None beyond mitigation at an individual project level		
Residual Impacts: » None foreseen at this stage		

Nature: *Skills development of permanently employed workers* The development of the proposed projects is likely to further develop the skills of those employed by the renewable energy projects in the region. This will further increase the skills base in the area.		
	Overall impact of the proposed project considered in isolation	***Cumulative impact of the project and other projects in the area***
Extent	Regional (3)	Regional (3)
Duration	Long-term (4)	Long-term (4)
Magnitude	Low (4)	Moderate (6)
Probability	Definite (5)	Definite (5)
Significance	**Medium (55)**	**High (65)**
Reversibility	No	
Status (positive or negative)	Positive	Positive
Irreplaceable loss of resources?	No	No
Can impacts be enhanced?	No	
Enhancement: » None beyond mitigation at an individual project level		
Residual Impacts: » None foreseen at this stage		

Nature: *Improved standard of living for benefitting households*
Those workers who are employed by the renewable energy facilities are likely to experience improved standards of living. This will be fairly notable in the region which has low levels employment, high levels of poverty and limited access to resources. It is likely that the development of the proposed renewable energy facilities will support

between 3,8 and 3,9 members per household.		
	Overall impact of the proposed project considered in isolation	***Cumulative impact of the project and other projects in the area***
Extent	Regional (3)	Regional (3)
Duration	Long term (4)	Long-term (4)
Magnitude	Moderate (6)	High (8)
Probability	Probable (4)	Probable (4)
Significance	**Medium (52)**	**High (60)**
Reversibility	Benefits are sustainable only over project's lifespan	
Status (positive or negative)	Positive	Positive
Irreplaceable loss of resources?	No	No
Can impacts be enhanced?	No	
Enhancement: » None beyond mitigation at an individual project level		
Residual Impacts: » None foreseen at this stage		

Nature: <u>*Local economic and social development benefits*</u> The benefits of the economic and socio-economic development initiatives that are to be developed as a result of the establishment and operation of the renewable energy facilities will be very notable in the region. The cumulative financial resources provided by the renewable energy projects will assist in reducing the levels of poverty in the Blue Makana Local Municipality and surrounds as a result of multiple socio-economic development projects that would be run concurrently in the area. This will lead to improved standards of living for the members of the community that benefit from these programmes. Additionally, it is possible that improvements in access to services will be felt by the local communities such as access to healthcare and municipal services. Local infrastructure will also be improved through the social and economic programmes planned which will be a benefit to the local economy and community. Finally, local SMEs and organisations will greatly benefit for the economic support provided by the established socio-economic and economic development plans.		
	Overall impact of the proposed project considered in isolation	***Cumulative impact of the project and other projects in the area***
Extent	Regional (3)	Regional (3)
Duration	Long term (4)	Long-term (4)
Magnitude	Moderate (6)	High (8)
Probability	Definite (5)	Definite (5)
Significance	**High (65)**	**High (75)**
Reversibility	Benefits could stretch beyond project's lifespan	
Status (positive or negative)	Positive	Positive
Irreplaceable loss of resources?	No	No
Can impacts be enhanced?	No	
Enhancement: » None beyond mitigation at an individual project level		
Residual Impacts: » None foreseen at this stage		

Nature: <u>*Sustainable rental revenue for farms where wind farms are located*</u> As with the development of the Wind Garden Wind Farm, there will likely be increased household incomes for

households who have renewable energy infrastructure situated on their properties. This increased infrastructure may potentially lead to improved buying power in the local economy and an ability to improve their current farming practices. This in itself will lead to increase in employment on the participating properties and may further increase the employment rate in the area.

	Overall impact of the proposed project considered in isolation	***Cumulative impact of the project and other projects in the area***
Extent	Site (1)	Local (2)
Duration	Long term (4)	Long-term (4)
Magnitude	Minor (2)	Low (4)
Probability	Definite (5)	Definite (5)
Significance	**Medium (35)**	**Medium (50)**
Reversibility	Benefits could stretch beyond project's lifespan	
Status (positive or negative)	Positive	Positive
Irreplaceable loss of resources?	No	No
Can impacts be enhanced?	No	

Enhancement:

» None beyond mitigation at an individual project level

Residual Impacts:

» None foreseen at this stage

Nature: _Sustainable increase in national and local government revenue_

While the development of a single wind farm is unlikely to dramatically improve the levels of electricity provision in the country, the development of the proposed renewable energy projects will provide a notable injection of electricity supply to a system that is under significant pressure. The increased levels of electricity provision throughout the country will be welcomed by industry as well as the wider society and will be a boon to an economy under stress.

	Overall impact of the proposed project considered in isolation	***Cumulative impact of the project and other projects in the area***
Extent	National (4)	National (4)
Duration	Long term (4)	Long-term (4)
Magnitude	Minor (2)	Low (4)
Probability	Definite (5)	Definite (5)
Significance	**Medium (50)**	**High (60)**
Reversibility	Benefits during projects lifespan only	
Status (positive or negative)	Positive	Positive
Irreplaceable loss of resources?	No	No
Can impacts be enhanced?	No	

Enhancement:

» None beyond mitigation at an individual project level

Residual Impacts:

» None foreseen at this stage

Nature: *Impact on the sense of place experienced by the local community as a result of visual effects that appear during the operation phase of the renewable energy facilities* The effects on the community's sense of place will initially be felt during the construction period and will continue into the operation phase of the various renewable energy facilities. This change in sense of place may be fairly notable in an area that has limited development in terms of pre-existing renewable energy facilities. There may be an overall change in perception of the area due to the presence of other wind farms in the surrounding area and may distress members of the community.		
	Overall impact of the proposed project considered in isolation	***Cumulative impact of the project and other projects in the area***
Extent	Site & immediate surrounding area (2)	Regional (3)
Duration	Long term (4)	Long-term (4)
Magnitude	Moderate (6)	Moderate (6)
Probability	Highly probable (4)	Highly probable (4)
Significance	**Medium (48)**	**Medium (52)**
Reversibility	Possible to reverse but only with decommissioning	
Status (positive or negative)	Negative	Negative
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	No	
Mitigation: » None beyond mitigation at an individual project level		
Residual Impacts: » None foreseen at this stage		

Nature: *Impact on the sense of place experienced by the local community as a result of visual effects that appear during the operation phase* The broader region of the Makana Local Municipality is well distinguished as a tourism area. The proposed developments will be located in the area where natural landscape and aesthetics are highly valued by both residents and visitors to the area. Such developments may change the perception of the area as "Wild Africa" for visitors. The impact probability will likely be low as international literature has indicated that development of wind farms in areas of tourism has had limited impacts on tourism in their respective regions. In some cases, it has been welcomed by tourists who see the benefit of green energy while a limited number of tourists have noted the intrusion caused by wind farms. The majority of tourists however are not impacted by the presence of wind farms in an area.		
	Overall impact of the proposed project considered in isolation	***Cumulative impact of the project and other projects in the area***
Extent	Site & immediate surrounding area (2)	Regional (3)
Duration	Long term (4)	Long-term (4)
Magnitude	Minor (2)	Low (4)
Probability	Improbable (2)	Improbable (2)
Significance	**Low (16)**	**Low (22)**
Reversibility	Possible to reverse with decommissioning	
Status (positive or negative)	Negative	Negative
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	No	
Mitigation: » None beyond mitigation at an individual project level		
Residual Impacts: » None foreseen at this stage		

11.12 Cumulative Traffic Impacts

For the assessment of cumulative traffic impacts associated with the Wind Garden Wind Farm it was assumed that all projects would be constructed at the same time. This is the precautionary approach as in reality, some of these projects would be subject to a highly competitive bidding process and not all the projects may be successful. Even if all the facilities are constructed and decommissioned at the same time, the roads authority will consider all applications for abnormal loads and work with all project companies to ensure that loads on the public roads are staggered and staged to ensure that the impact will be acceptable.

The construction and decommissioning phases of a wind farm are the only significant traffic generators. The duration of these phases is short term i.e. the potential impact of the traffic generated during the construction and decommissioning phases of the proposed Wind Garden Wind Farm on the surrounding road network is temporary. When operational, wind farms do not add any significant traffic to the road network. The cumulative impacts (i.e. impacts of all projects under construction at the same time) were assessed to be of medium significance before mitigation and low significance after mitigation.

Nature: *Cumulative traffic impacts* Traffic congestion and the associated noise and dust pollution		
	Without mitigation	**Without mitigation**
Extent	Low (2)	Medium (3)
Duration	Short-term (2)	Short-term (2)
Magnitude	Moderate (6)	High (8)
Probability	Definite (5)	Improbable (2)
Significance	**Medium (50)**	**Low (26)**
Status (positive or negative)	Negative	Negative
Reversibility	Reversible	Reversible
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation: » Stagger component delivery to the site. » Dust suppression » Reduce the construction period » The use of mobile batching plants in close proximity to the site would decrease the impact on the surrounding road network. » Staff and general trips should occur outside of peak traffic periods.		

11.13 Conclusion regarding Cumulative Impacts

Cumulative impacts are expected to occur with the development of the Wind Garden Wind Farm throughout all phases of the project life cycle and within all areas of study considered as part of this BA report. The main aim for the assessment of cumulative impacts considering the Wind Garden Wind Farm is to test and determine whether the development will be acceptable within the landscape proposed for the development, and whether the loss, from an environmental and social perspective, will be acceptable without whole-scale change.

The following conclusions can be drawn regarding the cumulative impacts associated with the project:

- There will be no unacceptable loss or impact on ecological aspects (vegetation types, species and ecological processes) due to the development of the Wind Garden Wind Farm and other wind farms within the surrounding area, provided recommended mitigation measures are implemented. The cumulative impact is therefore acceptable.
- There will be no significant loss of sensitive and significant aquatic features, provided recommended mitigation measures are implemented. The cumulative impact is therefore acceptable.
- There will be no unacceptable risk to avifauna with the development of the Wind Garden Wind Farm and other wind farms within the surrounding area, provided recommended mitigation measures are implemented. The cumulative impact is therefore acceptable.
- There will be no unacceptable risk to bats in terms of mortality with the development of the Wind Garden Wind Farm and other wind farms within the surrounding area, provided recommended mitigation measures are implemented. The cumulative impact is therefore acceptable.
- There will be no unacceptable loss of land capability due to the development of the Wind Garden Wind Farm and other wind farms within the surrounding areas, provided recommended mitigation measures are implemented. The cumulative impact is therefore acceptable.
- Change to the sense of place and character of the area is expected with the development of wind energy facilities. However, the change is not considered to be a fatal flaw.
- There will be no unacceptable loss of heritage resources associated with the development of the Wind Garden Wind Farm and other wind farms within the surrounding areas. The cumulative impact is therefore acceptable.
- No unacceptable socio-economic impacts are expected to occur. The cumulative impact is therefore acceptable.
- No unacceptable increase in ambient noise levels is expected to occur with the development of the Wind Garden Wind Farm and other wind farms within the surrounding areas. The cumulative impact is therefore acceptable.
- No unacceptable impacts to the traffic network are expected to occur with the development of the Wind Garden Wind Farm and other wind farms within the surrounding areas. The cumulative impact is therefore acceptable.

Positive cumulative impacts are expected to occur from a socio-economic perspective. These impacts will range from a medium to high significance depending on the impact being considered.

All cumulative impacts associated with the Wind Garden Wind Farm will be of a medium or low significance, with impacts of a high significance associated with positive socio-economic cumulative impacts and visual impacts. A summary of the cumulative impacts is included in **Table 11.3** below.

Table 11.3: Summary of the cumulative impact significance for the Wind Garden Wind Farm within the project site

Specialist assessment	Overall significance of impact of the proposed project considered in isolation	Cumulative significance of impact of the project and other projects in the area
Ecology	Low	Medium
Aquatic Ecology	Low	Medium
Avifauna	Low	Medium
Bats	Medium	Medium
Land use, soil and agricultural potential	Low	Low
Heritage (archaeology, palaeontology and cultural landscape)	Low	Low
Noise	Low	Low
Visual	High	High
Socio-Economic	*Positive impacts:* High or Medium (depending on the impact being considered) *Negative impacts:* Medium or Low (depending on the impact being considered)	*Positive impacts:* High or Medium (depending on the impact being considered) *Negative impacts:* Medium or Low (depending on the impact being considered)
Traffic	*Without mitigation:* Medium	With mitigation Low

The location of the Wind Garden Wind Farm project site and the surrounding wind farms being considered as part of this cumulative impact assessment within a REDZ is considered to assist with the concentration of the negative impacts within an area, as well as the focussing of positive impacts and benefits. The REDZ are considered to be areas within which significant negative impacts on the natural environment are limited and socio-economic benefits are enhanced. Therefore, the development of wind farms within a REDZ reduces the negative impacts in areas located outside of the REDZ and concentrates the positive impacts within the REDZ thereby creating a positive contribution to the communities present. This supports and contributes the need and desirability of the Wind Garden Wind Farm within the project site.

Based on the specialist cumulative assessment and findings, the development of the Wind Garden Wind Farm and its contribution to the overall impact of all wind energy facilities to be developed within a 30km radius, it can be concluded that the Wind Garden Wind Farm cumulative impacts will be of a medium to low significance, with impacts of a high significance mainly relating to positive socio-economic impacts and visual impacts on the landscape. Therefore, the development of the Wind Garden Wind Farm will not result in unacceptable, high cumulative impacts and will not result in a whole-scale change of the environment.

CHAPTER 12: CONCLUSIONS AND RECOMMENDATIONS

Wind Garden (Pty) Ltd is proposing the development of a commercial wind farm and associated infrastructure on a site located approximately 17km north-west of Makhanda (previously known as Grahamstown) (measured from the centre of the site) within the Makana Local Municipality and the Sarah Baartman District Municipality in the Eastern Cape Province. The entire extent of the site falls within the Cookhouse Renewable Energy Development Zone (REDZ) and within the Eastern Corridor of the Strategic Transmission Corridors.

A preferred project site with an extent of ~4336ha has been identified by Wind Garden (Pty) Ltd as a technically suitable area for the development of the Wind Garden Wind Farm. The project site consists of five affected properties which make up the project site (**Figure 1.2** and **Table 1.1**). The affected properties include:

» Remaining Extent of Farm Brackkloof No 183
» Portion 5 of Farm Hilton No 182
» Portion 8 of Farm Hilton No 182
» Portion 4 of Farm Vandermerweskraal No 132
» Portion 1 of Farm Thursford No183

A development envelope for the placement of the wind farm infrastructure (i.e. development footprint) has been identified within the project site and assessed as part of the BA process. The development envelope is ~3400ha in extent and the much smaller development footprint of ~66.6ha will be placed and sited within the development envelope. The development footprint will contain the following infrastructure to enable the wind farm to generate up to 264MW:

» Up to 47 wind turbines with a maximum hub height of up to 120m. The tip height of the turbines will be up to 200m.
» A 132kV switching station and a 132/33kV on-site collector substation to be connected via a 132kV overhead power line (twin turn dual circuit). The wind farm will be connected to the national grid through a connection from the 132/33kV collector substation via the 132kV power line which will connect to the 132kV switching station that will loop in and loop out of the existing Poseidon – Albany 132kV power line which will be located inside of the project site.
» Concrete turbine foundations and turbine hardstands.
» Temporary laydown areas which will accommodate the boom erection, storage and assembly area.
» Cabling between the turbines, to be laid underground where practical.
» Access roads to the site and between project components with a width of approximately 4,5m. The main access points will be 8m wide.
» A temporary concrete batching plant.
» Staff accommodation (temporary).
» Operation and Maintenance buildings including a gate house, security building, control centre, offices, warehouses, a workshop and visitor's centre.

Wind Garden (Pty) Ltd has confirmed that the project site is particularly suitable for wind energy development from a technical perspective due to the strength of the prevailing wind resources, access to the electricity grid, compatibility with the current land use and land availability. The wind resource of the project site has been confirmed through data collected by wind masts deployed on site since 2011.

A summary of the recommendations and conclusions for the proposed project is provided in this Chapter.

12.1. Legal Requirements as per the EIA Regulations, 2014 (as amended), for the undertaking of a Basic Assessment Report

This chapter of the BA report includes the following information required in terms of the EIA Regulations, 2014 - Appendix 1: Content of basic assessment reports:

Requirement	Relevant Section
3(k) where applicable, a summary of the findings and impact management measures identified in any specialist report complying with Appendix 6 to these Regulations and an indication as to how these findings and recommendations have been included in the final report	A summary of the findings of the specialist studies undertaken for the Wind Garden Wind Farm has been included in section 12.2.
3(l) an environmental impact statement which contains (i) a summary of the key findings of the environmental impact assessment, (ii) a map at an appropriate scale which superimposes the proposed activity and its associated structures and infrastructure on the environmental sensitivities of the preferred site indicating any areas that should be avoided, including buffers and (iii) a summary of the positive and negative impacts and risks of the proposed activity and identified alternatives.	An environmental impact statement containing the key findings of the environmental impacts of the Wind Garden Wind Farm has been included as section 12.5. An Environmental Sensitivity and Layout map of the Wind Garden Wind Farm has been included as **Figure 12.1** which overlays the development footprint (as assessed within the BA) of the wind farm with the environmental sensitive features located within the project site. An optimised layout which adheres to the avoidance measures based on the sensitivity analysis (Chapter 9) has been provided by the developer and has been overlain with the environmental sensitivities (**Figure 12.2**). A summary of the positive and negative impacts associated with the Wind Garden Wind Farm has been included in section 12.2.
3(n) any aspects which were conditional to the findings of the assessment either by the EAP or specialist which are to be included as conditions of authorisation.	All conditions required to be included in the Environmental Authorisation of the Wind Garden Wind Farm has been included in section 12.6.
3(p) a reasoned opinion as to whether the proposed activity should or should not be authorised, and if the opinion is that it should be authorised, any conditions that should be made in respect of that authorisation.	A reasoned opinion as to whether the Wind Garden Wind Farm should be authorised has been included in section 12.5.

12.2 Evaluation of the Wind Garden Wind Farm

The preceding chapters of this report together with the specialist studies contained within **Appendices D-M** provide a detailed assessment of the potential impacts that may result from the development of the Wind Garden Wind Farm. This chapter concludes the environmental assessment of the wind farm by providing a summary of the results and conclusions of the assessment of both the project site and development footprint for the Wind Garden Wind Farm. In so doing, it draws on the information gathered as part of the BA process, the knowledge gained by the environmental specialists and the EAP, and presents a combined and informed opinion of the environmental impacts associated with the project.

No environmental fatal flaws or unacceptable impacts were identified in the detailed specialist studies conducted, provided that the recommended mitigation measures are implemented. These measures include, amongst others, the avoidance of sensitive features within the development footprint and the undertaking of the construction and operational bird and bat monitoring, as specified by the specialists.

The potential environmental impacts associated with the Wind Garden Wind Farm identified and assessed through the BA process include:

» Impacts on ecology, flora and fauna.
» Impacts on aquatic ecology.
» Impacts on avifauna.
» Impacts on bats.
» Impacts on land use, soils and agricultural potential.
» Impacts on heritage resources, including archaeology, palaeontology and the cultural landscape.
» Noise impacts due to the construction and operation of the wind farm.
» Visual impacts on the area imposed by the components of the facility.
» Positive and negative socio- economic impacts.
» Traffic impacts, including increased pressure on the existing road network.

The development footprint, as assessed, has been overlain with the relevant environmental sensitivities in **Figure 12.1**.

12.2.1 Impacts on Ecology

Based on the nature and significance of the post-mitigation ecological impacts, the Wind Garden Wind Farm development envelope and the development footprint is considered as a broadly suitable environment and placement of infrastructure for wind farm development from an ecological perspective.

Overall, there are no specific long-term impacts likely to be associated with the development of the Wind Garden Wind Farm that cannot be reduced to a low significance. As such, there are no fatal flaws associated with the development and no terrestrial ecological considerations that should prevent it from proceeding.

The ecological features of the area include Least Concern vegetation types on a broad-scale, with some areas of high sensitivity in terms of the fine-scale vegetation confirmed. Listed plant species are present within the development envelop. In terms of CBAs, there is a single turbine within a CBA 1 and seven turbines within CBA 2 areas, with the majority of the remainder of the site being an ESA. The CBAs within the site are based largely on broad-scale ecological patterns and processes such as transitions between vegetation types. The development of the wind farm would add to transformation in the area and increase fragmentation of the landscape to some degree. However, the total footprint is however low and very unlikely to compromise the overall ecological functioning of the affected CBAs and the receiving landscape in general. Since, the CBAs are not based on the known presence of specific biodiversity features of high value, the wind farm is considered largely compatible with biodiversity maintenance in the area and as such, the potential impact on the affected CBAs and ESAs is considered acceptable.

The Ecological Impact Assessment identified impacts within the construction, operation and decommissioning phases of the project.

The Ecological Impact Assessment has identified impacts of medium significance to be associated with the development of the Wind Garden Wind Farm prior to the implementation of appropriate recommendation and mitigation measures. With the implementation of the mitigation measures majority of impacts would be reduced to a low significance, with only one impact of a medium significance. All impacts are considered to be acceptable. No impacts of a high significance or fatal flaws are expected to occur after implementation of the recommended mitigation measures.

There are no impacts associated with the Wind Garden Wind Farm that cannot be mitigated to an acceptable level and as such, the assessed layout is considered acceptable. With the application of relatively simple mitigation and avoidance measures, the impact of the Wind Garden Wind Farm on the local environment can be reduced to an acceptable level.

12.2.2 Impacts on Aquatic Ecology

From the results of the aquatic assessment it is confirmed that the Wind Garden Wind Farm will not have direct impact on any very high sensitivity areas, mainstem riparian systems (outside of the development footprint) and pans that contain functioning aquatic environmental of a high sensitivity with the implementation of the limited adjustments of the development footprint recommended by the specialist.

The impacts from an aquatic ecological perspective will be of a low significance following mitigation. The impacts have been identified and assessed for the life-cycle of the facility, with all impacts being of a low significance following the implementation of mitigation. Potential impacts identified include disturbance and the loss of pans, impact on watercourses through physical disturbance, increase in surface water runoff that could lead to hydrological changes, an increase in sedimentation and erosion and impact on localised surface water quality.

From the results of the aquatic assessment, it is confirmed that the Wind Garden Wind Farm will not have direct impact on any very high sensitivity areas, mainstem riparian systems (outside of the development footprint) or pans that contain functioning aquatic environmental features of a high sensitivity with the implementation of the limited adjustments of the development footprint recommended by the specialist. The specialist indicates that the project can be authorised, subject to the implementation of the recommended mitigation measures.

Furthermore, a Water Use License (or General Authorisation) for water uses identified in Section 21 c and 21 i of the National Water Act (Act 36 of 1998) would be required where activities are undertaken within 500m of watercourses and pans.

12.2.3 Impacts on Avifauna

The avifauna described to be associated with Wind Garden Wind Farm project site and the impacts identified and assessed are based on the results of the four seasons of pre-construction monitoring which was conducted from June 2019 to August 2020 in accordance with the best practice guidelines.

The Avifauna Impact Assessment identified that all impacts associated with the development of the Wind Garden Wind Farm development footprint will be of a medium significance before mitigation and can be mitigated to an acceptable level of impact (i.e. medium or low significance, depending on the impact being considered). No impacts of a high significance or fatal flaws are expected to occur with the implementation of the recommended mitigation measures.

Considering the avifauna features identified within the project site and surrounding areas, specific buffers have been recommended by the specialist for the placement of infrastructure, as well as buffers where turbine placement must be avoided and mitigation increased. The implementation of buffers from known eagle nest sites were put in place primarily to reduce collision risk, but also removes the possibility of disturbance to these eagle nest sites. As these buffers have been considered in the layout, the main residual disturbance issue would therefore be the loss of foraging habitat around the wind farm as a result of displacement. From experience at existing wind farms by the specialist, birds are likely to avoid the close proximity of the wind turbines.

Considering the placement of turbines within the development area, there are thirteen (13) turbines located within cautionary buffers which require the minimisation of turbine placement within these areas. The specialist has indicated that the development as proposed would be acceptable for authorisation, subject to the implementation of the recommended appropriate mitigation measures. Considering this, the specialist is not requiring further minimisation of turbines within the cautionary buffers of 3km and 5km, respectively. However, the specialist does recommend that all turbines located within the cautionary buffers have a single blade painted black during construction. Given this is a novel mitigation, which has been proven to be effective internationally, a post-construction monitoring scheme should be implemented to determine its effectiveness.

12.2.4 Impacts on Bats

Pre-construction bat monitoring was undertaken within the Wind Garden Wind Farm project site in accordance with the best practice guidelines. The monitoring was designed to monitor bat activity across the area for the Wind Garden Wind Farm. The baseline environment was investigated by using acoustic monitoring to document bat activity between 13 March 2019 and 16 June 2020 (459 sample nights).

Key habitat features have been identified for bats within the development envelope. These habitat features present specific uses and opportunities for bats including roosts, foraging resources and commuting resources. All features, except for drainage lines and some specific roosts, were buffered by 260m to turbine base (i.e. 200m to blade tip based on turbines with a hub height of 120m (the lowest being considered)) and blade lengths of 80m (the longest being considered). Drainage lines were buffered by 100m to blade tip. A tunnel roost entrance was buffered by 2.5km, even though only 100 least concern, low risk bats are currently present in the roost (which would require a 1km buffer), the roost has been used in the past by Natal long-fingered bats and it is a regionally important roost, and is an active site for bat research for a number of local and international universities. No turbines are allowed to be placed within these buffers (i.e. no-go areas), including the blades. Construction of associated infrastructure is permitted in the no-go areas (except roost buffers, where no construction can take place), but should be avoided as much as possible. Adherence to these buffers is the primary mitigation measure to avoid impacts.

Based on the bat activity recorded at the Wind Garden Wind Farm, the significance ratings for the majority of the impacts to bats posed by the development are predicted to be medium or high before mitigation.

After mitigation, all impacts are predicted to be low. Based on the opportunity for reduction of the impacts through appropriate mitigation measures from a high or medium significance to a low acceptable significance no fatal flaws are expected to occur.

The development footprint proposed and assessed adheres to the no-go areas (buffers) and is in accordance with current knowledge on how to promote bat conservation with respect to wind energy by minimizing risk. All buffers are to blade tip.

12.2.5 Impacts on Land Use, Soil and Agricultural Potential

The development envelope is considered to be mainly of a low and very low agricultural sensitivity, with some medium sensitivity patches and high sensitivity patches present within the central section of the development envelope.

No areas of high sensitivity were identified within proximity to any of the proposed activities associated with the Wind Garden Wind Farm. Considering the lack of sensitivity and the measures put in place in regard to stormwater management and erosion control, it is the specialist's opinion that all activities will have an acceptable impact on agricultural productivity. Also, no adjustment of infrastructure placement is required.

All aspects considered during the impact assessment has been determined to have low or moderate post-mitigation significance. The worst-case impact scenario includes Moderate final significance ratings associated with Moderate sensitivity resources. It is considered that erosion from increased overland flows following the development of various components is of most concern, given the fact that erosion could result in a direct loss of soil resources. Various mitigation measures and monitoring activities have been prescribed, which will remedy the potential effects that erosion might have on land capability. All impacts identified to be associated with the development of the Wind Garden Wind Farm are considered to be acceptable with the implementation of the recommendations and mitigation measures as provided by the specialist. No fatal flaws have been identified.

12.2.6 Impacts on Heritage Resources (archaeology, palaeontology and cultural landscape)

During the site survey 12 heritage sites were identified within the project site. Three (3) labourer houses (EWF1-01, EWF1-05, EWF1-06), two (2) sheds (EWF1-02 and EWF1-09), one (1) farmhouse (EWF1-03) and one (1) reservoir (EWF1-08) were identified and were rated as not conservation worthy and of no heritage significance. The ruins of one (1) house (EWF1-07) was also identified and has a low heritage significance and heritage rating of IIIC. A farmstead (EWF1-04) was also identified. This site has a heritage rating of IIIB and is of a medium heritage significance. Further to the above, a total of three (3) burial grounds (EWF1-10 – EWF1-12) were identified. Graves have heritage rating of IIIA and is of a high heritage significance.

The Wind Garden Wind Farm is underlain by the Dwyka Group, the Witpoort Formation, the Weltevrede Formation, which are part of the Witteberg Group of the Cape Supergroup. As such, there is a moderate to high chance of finding fossils in this area. No visible evidence of fossiliferous outcrops was found during the site survey.

The Cultural Landscape of the area between and surrounding Makhanda and Somerset East is sparsely populated with several farmsteads and their associated structures located on the valley floors of this hilly and mountainous region. The farmsteads are connected through several farm roads and old historic ox-wagon routes that link the local communities to the busy towns of Makhanda and Somerset East. Many of the old farm buildings, stone houses and the churches in the area contain architectural elements greater than 60 years of age and fall with the general protection of the National Heritage Resources Act (25 of 1999) (NHRA). The area comprises of both Local and Provincial heritage sites, consisting of palaeontological sites, rock art, burial grounds and graves, monuments and memorials, stonewalling, as well as historical structures. The grading of the cultural landscape elements ranged from IIIC to II. The area proposed for the Wind Garden Wind Farm, has a medium to high heritage significance.

Specific buffers for the avoidance of impacts on the heritage resources were identified. These are listed below:

» Historical Structures (EWF1-04) that were rated as high heritage significance must include a no-go-buffer-zone of at least 500m from the outer perimeter of the farmstead (which is currently occupied) from the closest infrastructure (including substation, turbines, facilities and roads). No infrastructure proposed as part of the development footprint is located within this buffer area.
» Graves and Burial grounds (EWF1-10 to EWF1-12) must be demarcated with a 30-meter no-go-buffer-zone and the graves should be avoided and left *in situ*. No infrastructure proposed as part of the development footprint is located within the buffer areas.

Majority of impacts identified on the heritage resources were either of a medium or low significance prior to the implementation of mitigation measures (except for the impact on historical structures of a high significance and graves and burial grounds). With the implementation of the mitigation measures the impact significance will be reduced to a low acceptable impact. No impacts of a high significance are expected to occur with mitigation.

Considering the development footprint, the specialist indicates that the placement of infrastructure is considered to be acceptable based on the avoidance of heritage resources. The overall impact of the Wind Garden Wind Farm on heritage resources are identified to be acceptably low with the implementation of the recommended mitigation measures.

12.2.7 Noise Impacts

Considering the ambient sound levels and character of the area, ambient sound levels are generally low and typical of a rural noise district during low wind conditions. Ambient sound levels will likely increase as wind speeds increase. Potential Noise Sensitive Developments (NSDs) were identified within the projects site and ambient noise levels were measured in specific locations.

Based on the results of the Noise Impact Assessment no adjustments in terms of the proposed development footprint are required.

Noise impacts will be of low significance for daytime construction activities, of medium significance for night-time construction activities (with mitigation proposed to reduce the significance to low) and of low significance for both day- and night-time operation activities. No impacts of a high significance or fatal flaws were identified.

The specialist has indicated that a noise monitoring programme must be undertaken before the development of the wind farm as well as noise monitoring after the first year of operation of the wind farm. The acoustic consultant will need to recommend whether future noise monitoring is required following this initial monitoring.

12.2.8 Visual Impacts

A visibility analysis was undertaken for the project. The result of the viewshed analysis displays the potential areas of visual exposure, as well as the potential frequency of exposure, and potential visual sensitive receptors. Negative impacts on visual receptors will occur during the undertaking of construction activities and the operation of the Wind Garden Wind Farm.

During the construction phase of the Wind Garden Wind Farm a noticeable increase in heavy vehicles utilising the roads will occur. This will result in a visual nuisance to other road users and landowners within the surrounding area.

The operation of the Wind Garden Wind Farm will have a high visual impact on observers/visitors residing at homesteads within a 5km radius of the proposed wind turbine structures, on observers travelling along the roads within a 5km radius of the wind turbines, on residents of (or visitors to) homesteads within a 5 - 10km radius of the wind turbine structures, on objecting landowners and residents of (or visitors to) homesteads and tourist facilities within a 10 - 20km radius of the wind turbine structures. No mitigation of this impact is possible (i.e. the structures will be visible regardless), but general mitigation and management measures are recommended as best practice.

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

Shadow flicker is an impact relevant to the operation of the turbines. Shadow flicker only occurs when the sky is clear, and when the turbine rotor blades are between the sun and the receptor (i.e. when the sun is low). Most shadow impact is associated with 3-4 times the height of the object. Based on this, an 800m buffer along the edge of the outer most turbines is identified as the zone within which there is a risk of shadow flicker occurring. There are no places of residence within the 800m buffer. The significance of shadow flicker is therefore anticipated to be low to negligible.

In terms of lighting impacts, the area immediately surrounding the proposed facility has a relatively low incidence of receptors and light sources, and therefore light trespass and glare from the security and after-hours operational lighting for the facility will have some significance for visual receptors in close proximity. Further lighting impacts include the potential for sky glow. Sky glow is the condition where the night sky is illuminated when light reflects off particles in the atmosphere such as moisture, dust or smog. The sky glow intensifies with the increase in the amount of light sources. Each new light source, especially upwardly directed lighting, contribute to the increase in sky glow. This anticipated lighting impact during operation is likely to be of high significance, and may be mitigated to moderate, especially within a 5 to 10km radius of the wind turbine structures.

Another source of glare light, albeit not as intense as flood lighting, is the aircraft warning lights mounted on top of the hub of the wind turbines. These lights are less aggravating due to the toned-down red colour, but have the potential to be visible from a great distance. This is especially true due to the strobing effect of the lights, a function specifically designed to attract the observer's attention. The Civil Aviation Authority (CAA) prescribes these warning lights and the potential to mitigate their visual impacts have traditionally been very low other than to restrict the number of lights to turbines that delineate the outer perimeter of the facility. It is the intention of the developer to make use of ground-breaking new technology in the development of strobing lights that only activate when an aircraft is detected nearby. This may aid in restricting light pollution at night. This will be investigated and implemented by the project proponent, if available and permissible by the CAA.

In terms of ancillary infrastructure, the range of visual exposure will fall within that of the turbines. The anticipated visual impact resulting from this infrastructure is likely to be of low significance both before and after mitigation.

The greater environment has a rural, undeveloped character and a natural appearance. These generally undeveloped landscapes are considered to have a high visual quality. The significance of the visual impacts on the sense of place within the region (i.e. beyond a 20km radius of the development and within the greater region) is expected to be of low significance. No mitigation of this impact is possible (i.e. the structures will be visible regardless), but general mitigation and management measures are recommended as best practice.

It is likely that the Wind Garden Wind Farm will be met with concern and potential opposition from affected landowners and tour operators within the region from a visual perspective. The fact that the visual impact is expected to be of high significance is undisputed, however this is not considered to be a fatal flaw.

12.2.9 Socio-economic Impacts

Impacts are expected to occur with the development of the Wind Garden Wind Farm during the construction, operation and decommissioning phases. Both positive and negative impacts are identified and assessed.

Positive impacts during construction includes:
» Temporary stimulation of the national and local economy
» Temporary increase employment in the national and local economies
» Contribution to skills development in the country and local economy
» Temporary increase in household earnings
» Temporary increase in government revenue

Negative impacts during construction includes:
» Negative changes to the sense of place
» Negative impact on the local tourism, game industry and associated industries during construction
» Temporary increase in social conflicts associated with the influx of people
» Impact on economic and social infrastructure
» Impact on property and land value in the immediately affected area during construction

Positive impacts during operation includes:
» Sustainable increase in production and GDP nationally and locally

» Creation of sustainable employment positions nationally and locally
» Skills development of permanently employed workers
» Improved standards of living for benefiting households
» Sustainable increase in national and local government revenue
» Local economic and social development benefits derived from the project's operations
» Sustainable rental revenue for farms where the wind farm is located
» Sustainable increase in electricity available for the local region and South Africa

Negative impacts during operation includes:
» Negative changes to the sense of place
» Negative impact on local tourism, game farming and associated industries

The net positive impacts associated with the development and operation of the Wind Garden Wind Farm are expected to outweigh the net negative effects. The project is also envisaged to have a positive stimulus on the local economy and employment creation, leading to the economy's diversification and a small reduction in the unemployment rate. The project should therefore be considered for development. It should, however, be acknowledged that the negative impacts would be largely borne by the nearby farms and households residing on them, whilst the positive impacts will be largely concentrated in the local and national economies. Due to this imbalance, it is recommended that the mitigation measures suggested be strictly adhered to. Application of these mitigation measures will ensure that the negative impacts on the nearby farms and businesses are minimised and that the distribution of the potential benefits of the project are more balanced.

12.2.10 Impacts on Traffic

Traffic impacts have been identified for the construction, operation and decommissioning phases, with the most significant impact expected to occur during the construction phase.

The traffic generated during the construction phase, although significant, will be temporary and impacts are considered to be negative and of medium significance before and of low significance after mitigation. During the operation phase impact would be minimal. The traffic generated during the decommissioning phase will be similar but less than the construction phase traffic and the impact on the surrounding road network will also be considered negative and of medium significance before and of low significance after mitigation.

No impacts of high significance were identified and no fatal flaws are associated with the Wind Garden Wind Farm from a traffic perspective.

12.2.11 Assessment of Cumulative Impacts

Cumulative impacts and benefits on various environmental and social receptors will occur to varying degrees with the development of several renewable energy facilities in South Africa. The degree of significance of these cumulative impacts is difficult to predict without detailed studies based on more comprehensive data/information on each of the receptors and the site-specific developments. The alignment of renewable energy developments with South Africa's National Energy Response Plan and the global drive to move away from the use of non-renewable energy resources and to reduce greenhouse gas emissions is undoubtedly positive. The economic benefits of renewable energy developments at a local, regional and national level have the potential to be significant.

The Wind Garden Wind Farm falls within the Cookhouse REDZ which has been identified by the DEFF as an area highly suitable for wind farms given a range of factors considered. Therefore, DEFF envisages dealing with multiple applications and cumulative issues within a REDZ area. The REDZs are of strategic importance for large scale wind and solar photovoltaic development, in terms of Strategic Integrated Project (SIP) 8. These zones are considered to be areas where significant negative impacts on the environment are limited and socio-economic benefits to the country can be enhanced. Multiple projects within the area have been successfully bid under the DMRE's REIPPP programme and are currently operational. The Wind Garden Wind Farm will contribute to the cumulative impact experienced within the area. The cumulative impacts associated with the Wind Garden Wind Farm have been assessed to be acceptable, with no unacceptable loss or risk expected (refer to **Table 12.1** and Chapter 11).

Table 12.1: Summary of the cumulative impact significance for the Wind Garden Wind Farm

Specialist assessment	**Overall significance of impact of the proposed project considered in isolation**	**Cumulative significance of impact of the project and other projects in the area**
Ecology	Low	Medium
Aquatic Ecology	Low	Medium
Avifauna	Low	Medium
Bats	Medium	Medium
Land use, soil and agricultural potential	Low	Low
Heritage (archaeology, palaeontology and cultural landscape)	Low	Low
Noise	Low	Low
Visual	High	High
Socio-Economic	*Positive impacts:* High or Medium (depending on the impact being considered) *Negative impacts:* Medium or Low (depending on the impact being considered)	*Positive impacts:* High or Medium (depending on the impact being considered) *Negative impacts:* Medium or Low (depending on the impact being considered)
Traffic	*Without mitigation:* Medium	With mitigation Low

Based on the specialist cumulative assessment and findings, the development of the Wind Garden Wind Farm and its contribution to the overall impact of all wind energy facilities to be developed within a 30km radius, it can be concluded that the Wind Garden Wind Farm cumulative impacts will be of a medium to low significance, with impacts of a high significance mainly relating to positive socio-economic impacts and visual impacts on the landscape. It was concluded that the development of the Wind Garden Wind Farm will not result in unacceptable, high cumulative impacts and will not result in a whole-scale change of the environment.

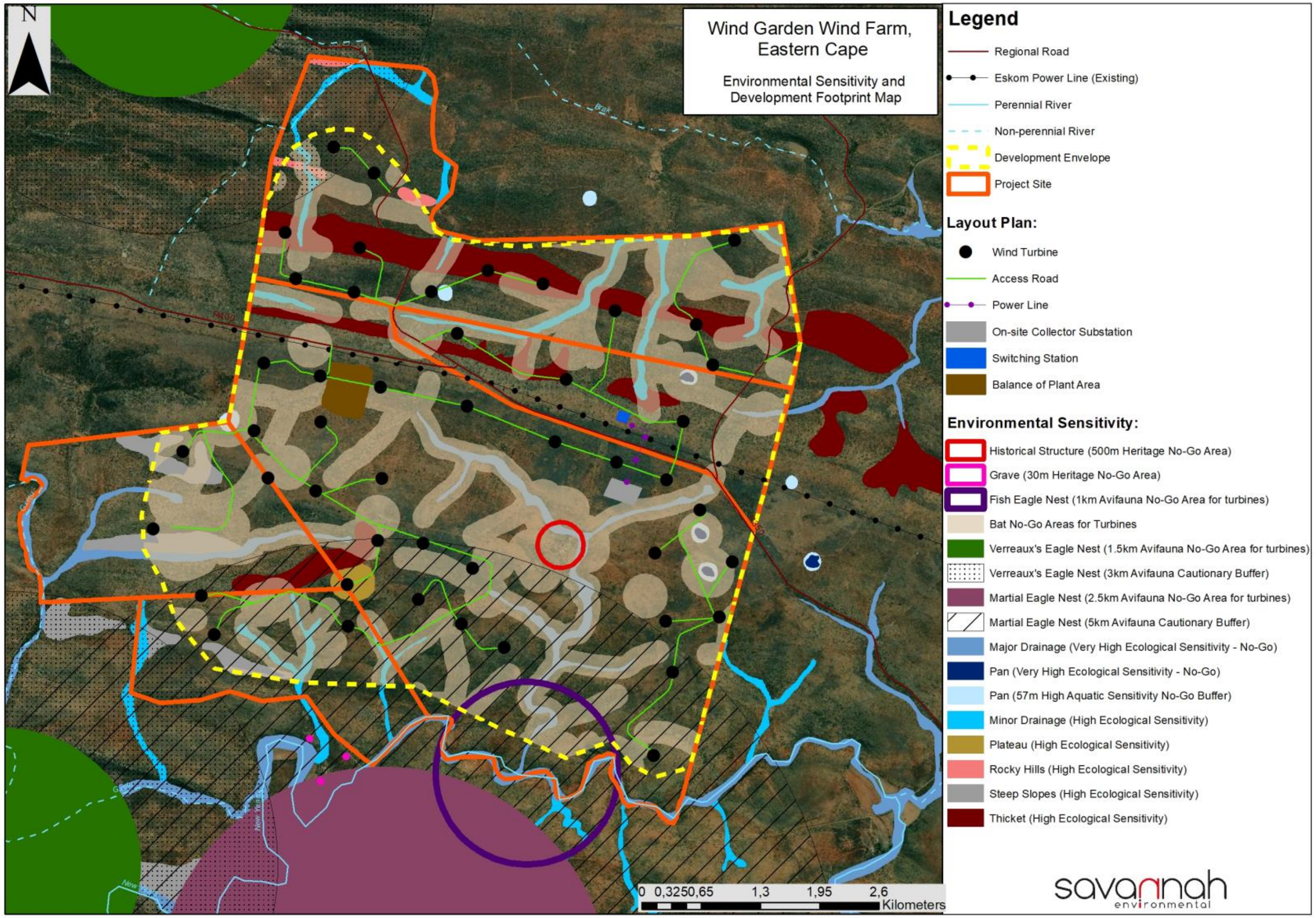


Figure 12.1: The development footprint (~66.6ha) of the Wind Garden Wind Farm, as assessed within this BA Report, overlain on the identified environmental sensitive features (**Appendix O**)

12.3. Optimisation of the Layout

The development footprint was designed by the project developer in order to respond to and avoid the sensitive environmental and social features located within the development envelope. This approach ensured the application of the mitigation hierarchy (i.e. avoid, minimise, mitigate and offset) to the Wind Garden Wind Farm project, which ultimately ensures that the development is appropriate from an environmental perspective and is suitable for development within the development envelope (located within the project site). The application of the mitigation hierarchy was undertaken by the developer prior to the commencement of the BA process for Environmental Authorisation, as detailed in Chapter 3, and further considered based on specialist study findings, as concluded in this chapter. With the implementation of the optimised layout, the development footprint is considered to be suitable and appropriate from an environmental perspective for the wind farm, as it ensures the avoidance, reduction and/or mitigation of all identified detrimental or adverse impacts on sensitive features as far as possible. The optimised layout is recommended as the preferred layout for implementation (**Figure 12.2** and **Figure 12.3**).

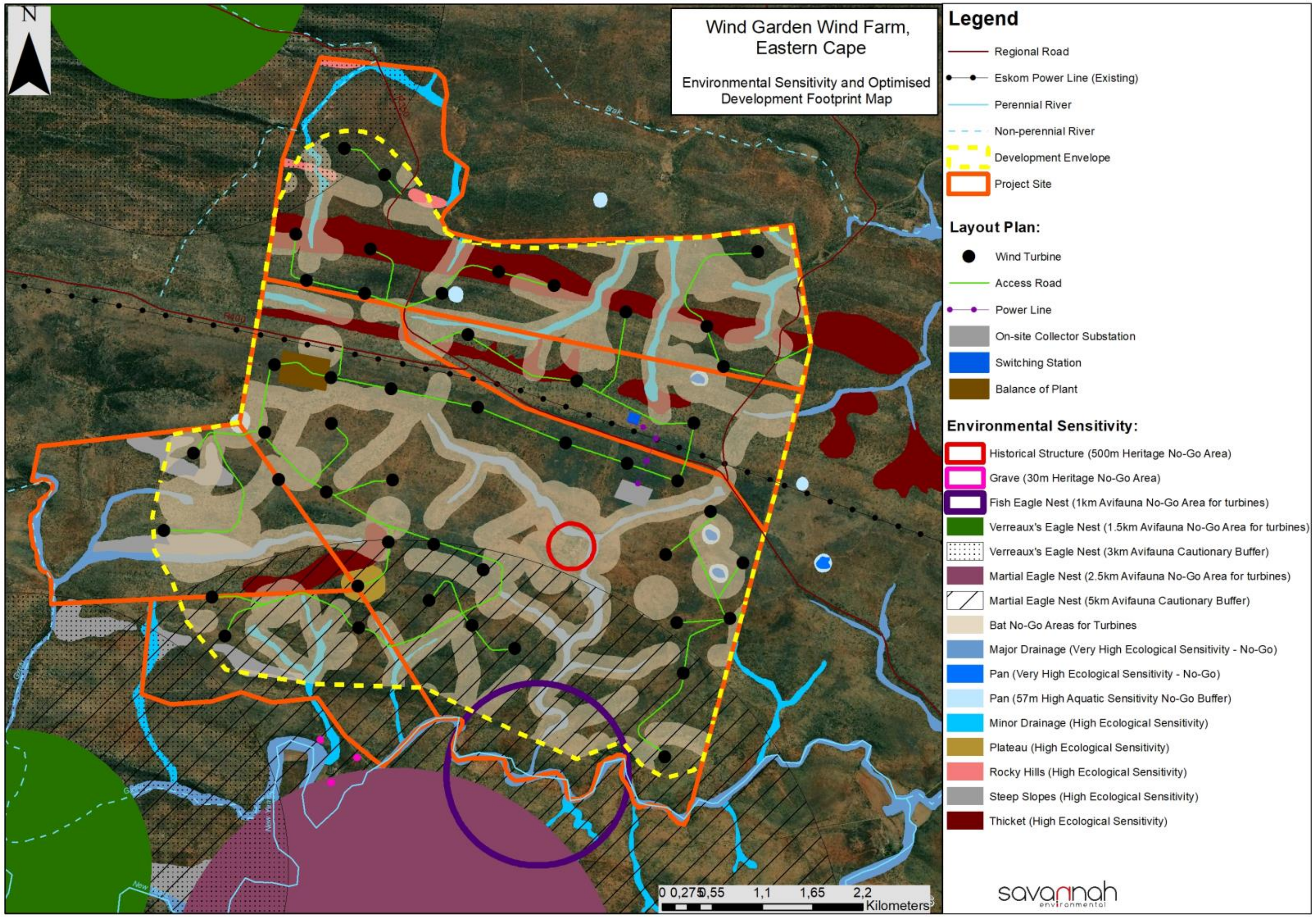


Figure 12.2: Final preferred (optimised) development footprint for the Wind Garden Wind Farm, overlain with the identified environmental sensitivities (A3 map included in **Appendix O**)

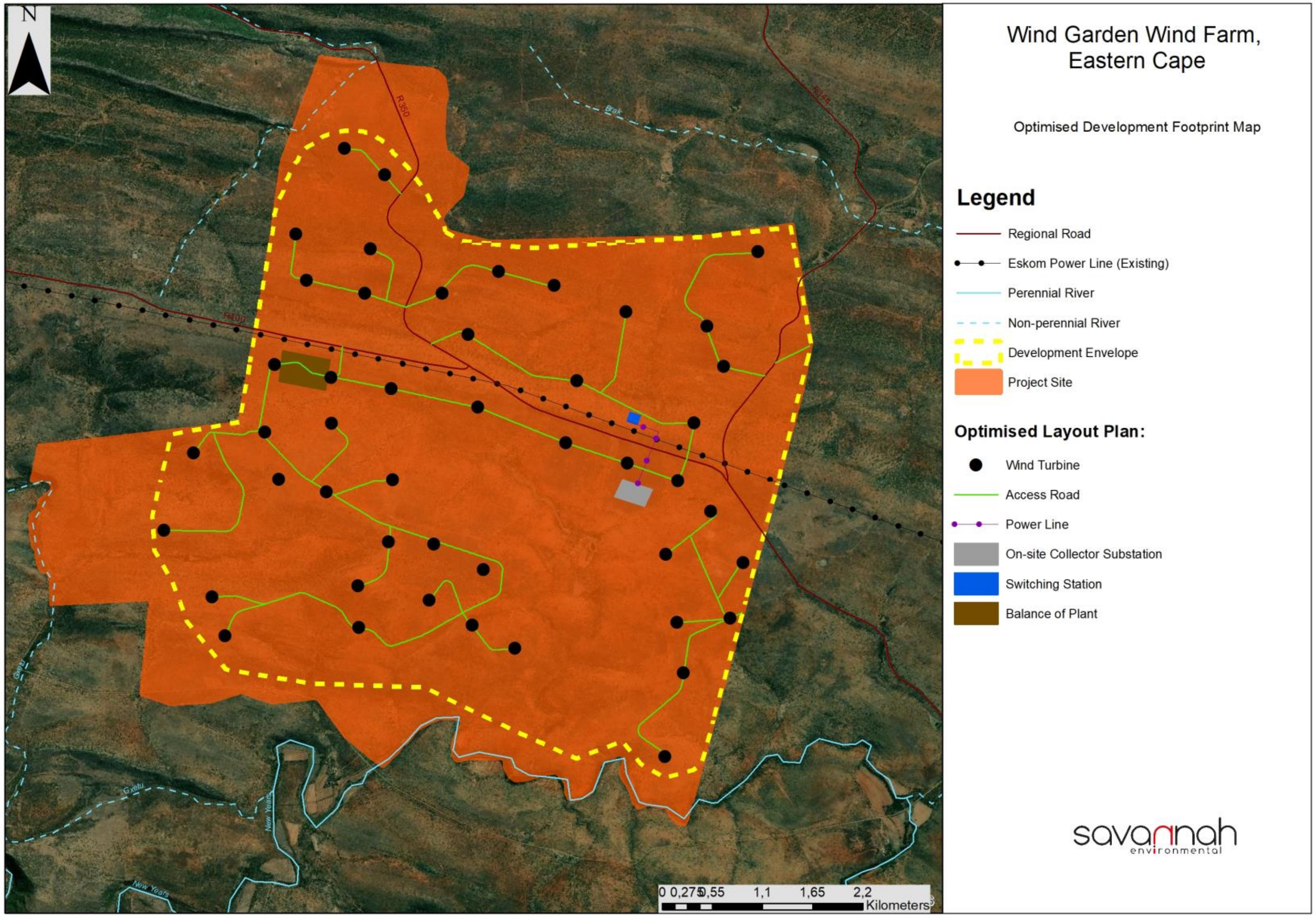


Figure 12.3: Final preferred (optimised) development footprint for the Wind Garden Wind Farm considered to be acceptable for development (A3 map included in **Appendix O**)

12.4. Environmental Costs of the Wind Farm versus Benefits of the Wind Farm

Environmental costs (including those to the natural environment, economic and social environment) can be anticipated at a local and site-specific level, and are considered acceptable provided the mitigation measures as outlined in the BA report and the EMPr are implemented and adhered to. No fatal flaws have been identified. These environmental costs could include:

» *A loss of biodiversity, flora and fauna due to the clearing of land for the construction and utilisation of land for the wind farm* - The cost of loss of biodiversity has been minimised/avoided through the limited placement of project components and infrastructure within the fine-scale vegetation types considered to be of high sensitivity.
» *An increase in traffic* - The Wind Garden Wind Farm construction will create an increase in traffic. This impact will however be short-term in extent and is not considered to be significant.
» *Visual impacts associated with the wind farm* - The Wind Garden Wind Farm will be visible and mainly of a high significance. No mitigation of this impact is possible (i.e. the structures will be visible in the landscape), but general mitigation and management are required as best practise to minimise secondary visual impacts which may arise from mismanagement of the site.
» *Loss of land for agriculture* – The development will remove areas available for agricultural activities, however based on the small development footprint of the wind farm, this will be limited and not significant.
» *Impacts on birds and bats* – loss of birds and bats species due to collision. The impact is however considered to be acceptable without any impact of high significance.

Benefits of the Wind Garden Wind Farm include the following:
» The project will result in important economic benefits at the local and regional scale through job creation, income and other associated downstream economic development. These will persist during the preconstruction, construction, operation and decommissioning phases of the project.
» The project provides an opportunity for a new land use on the affected properties which is considered as a more efficient use of the land and provides an opportunity for financial benefits to the current land use.
» The project contributes towards the Provincial and Local goals for the development of renewable energy as outlined in the respective IDPs.
» The project serves to diversify the economy and electricity generation mix of South Africa through the addition of wind energy.
» The water requirement for a wind farm is negligible compared to the levels of water used by coal-based technologies. This generation technology is therefore supported in dry climatic areas.
» South Africa's per capita greenhouse gas emissions are amongst the highest in the world due to the reliance on fossil fuels. The Wind Garden Wind Farm will contribute to achieving goals for implementation of renewable energy and sustaining a 'green' economy within South Africa.

The benefits of the Wind Garden Wind Farm are expected to occur at a national, regional and local level. As the costs to the environment at a site-specific level have been largely limited through the appropriate placement of infrastructure on the project site within lower sensitive areas through the avoidance of features and areas considered to be sensitive, the benefits of the project are expected to partially offset the localised environmental costs of the wind farm.

12.5. Overall Conclusion (Impact Statement)

A technically viable development footprint was proposed by the developer and assessed as part of the BA process. The assessment of the development footprint within the development envelope was undertaken by independent specialists and their findings have informed the results of this BA report.

The specialist findings have indicated that there are no identified fatal flaws associated with the implementation of the development footprint within the project site. The developer has designed a project development footprint in response to the identified sensitive environmental features and areas present within the project site. This approach is in line with the application of the mitigation hierarchy, where all the sensitive areas which could be impacted by the development have been avoided (i.e. tier 1 of the mitigation hierarchy). Feedback from the aquatic specialist has indicated the limited adjustment is needed to ensure a low acceptable impact. This recommendation has been adhered to by the developer which has designed an optimised layout which is in-line with these requirements to ensure environmental acceptability (**Figure 12.2** and **Figure 12.3**).

The impacts that are expected to remain after the avoidance of the sensitive areas have been reduced through the recommendation of specific mitigation measures by the specialists. The minimisation of the significance of the impacts is in line with tier 2 of the mitigation hierarchy.

Therefore, impacts can be mitigated to acceptable levels or enhanced through the implementation of the recommended mitigation or enhancement measures. This is however not relevant for the visual impact of the wind farm as the turbines will be visible regardless of the mitigation applied. This high significance rating is, however, not considered as a fatal flaw by the specialist.

Through the assessment of the development footprint within the project site, and the optimisation thereof, it can be concluded that the development of the Wind Garden Wind Farm is environmentally acceptable (subject to the implementation of the recommended mitigation measures).

12.6. Overall Recommendation

Considering the findings of the independent specialist studies, the impacts identified, the development footprint proposed by the developer within the development envelope, the avoidance of the sensitive environmental features within the project site, as well as the potential to further minimise the impacts to acceptable levels through mitigation, it is the reasoned opinion of the EAP that the Wind Garden Wind Farm is acceptable within the landscape and can reasonably be authorised (**Figure 12.3**).

The following infrastructure would be included within an authorisation issued for the project:

» Up to 47 wind turbines with a maximum hub height of up to 120m. The tip height of the turbines will be up to 200m.
» A 132kV switching station and a 132/33kV on-site collector substation to be connected via a 132kV overhead power line (twin turn dual circuit). The wind farm will be connected to the national grid through

a connection from the 132/33kV collector substation via the 132kV power line which will connect to the 132kV switching station that will loop in and loop out of the existing Poseidon – Albany 132kV power line which will be located inside of the project site.

» Concrete turbine foundations and turbine hardstands.
» Temporary laydown areas which will accommodate the boom erection, storage and assembly area.
» Cabling between the turbines, to be laid underground where practical.
» Access roads to the site and between project components with a width of approximately 4,5m. The main access points will be 8m wide.
» A temporary concrete batching plant.
» Staff accommodation (temporary).
» Operation and Maintenance buildings including a gate house, security building, control centre, offices, warehouses, a workshop and visitor's centre.

The following key conditions would be required to be included within an authorisation issued for the Wind Garden Wind Farm:

» All mitigation measures detailed within this BA report, as well as the specialist reports contained within **Appendices D to M**, are to be implemented.
» The EMPr as contained within **Appendix N** of this BA report should form part of the contract with the Contractors appointed to construct and maintain the wind farm in order to ensure compliance with environmental specifications and management measures. The implementation of this EMPr for all life cycle phases of the Wind Garden Wind Farm is considered key in achieving the appropriate environmental management standards as detailed for this project.
» Following the final design of the Wind Garden Wind Farm, a revised layout must be submitted to DEFF for review and approval prior to commencing with construction. No development is permitted within the identified no-go areas as detailed in **Figure 12.1.**
» A pre-construction walk-through of the final layout, including roads and underground cables, should be undertaken before construction commences and adjusted where required to reduce impacts on species of conservation concern and habitats of concern.
» Erosion management at the site should take place according to the Erosion Management Plan and Rehabilitation Plan.
» Implement a chance finds procedure for the rescuing of any fossils or heritage resources discovered during construction.
» If any archaeological material or human burials are uncovered during construction activities, work in the immediate area should be halted, the find reported to the heritage authorities and inspected by an archaeologist. Such heritage is the property of the State and may require excavation and curation in an approved institution.
» Maintain vegetation cover (i.e. either natural or cultivated) immediately adjacent to the actual development footprint, both during construction and operation of the proposed facility.
» Monitor all rehabilitated areas for one year following decommissioning, and implement remedial actions as and when required.

A validity period of 15 years of the Environmental Authorisation is requested, should the project obtain approval from DEFF.

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