Environmental Impact Assessment Process
Final Scoping Report
Proposed Castle Wind Energy Facility Near De Aar, Northern Cape Province
DEA Reference Number:
14/12/16/3/3/2/278

Final Report
November 2013

Prepared for:

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PROJECT DETAILS

DEA Reference No.	:	14/12/16/3/3/2/278
Title	:	Environmental Impact Assessment Process Final Scoping Report: Proposed Castle Wind Energy Facility Near De Aar, Northern Cape Province
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Project Developer	:	Castle Wind Farm (Pty) Ltd (a juwi Renewable Energies (Pty) Ltd initiative)
Report Status	:	Final Scoping Report for submission to DEA
Submission Date	:	November 2013

When used as a reference this report should be cited as: Savannah Environmental (2013) Final Scoping Report: Proposed Castle Wind Energy Facility near De Aar, Northern Cape Province

PURPOSE OF THE FINAL SCOPING REPORT

Castle Wind Farm (Pty) Ltd commissioned an Environmental Impact Assessment (EIA) process to determine the environmental feasibility of a proposed wind farm on a site near De Aar in the Northern Cape Province. The project will be referred to as the "Castle Wind Energy Facility". The purpose of the proposed wind energy facility is to sell the electricity generated to Eskom under the Renewable Energy Independent Power Producers (IPP) Procurement Programme. The IPP Procurement Programme has been introduced by the Department of Energy (DoE) to promote the development of renewable power generation facilities (derived from) by IPPs in South Africa. Castle Wind Farm has appointed Savannah Environmental, as independent environmental consultants, to undertake the EIA. The EIA process is being undertaken in accordance with the requirements of the National Environmental Management Act (NEMA; Act No. 107 of 1998).

Scoping is an important part of the EIA process, as it helps to ensure that the impact assessment is appropriately focussed. The main objectives of the Scoping process are:

» To engage with stakeholders at an early stage of the development so that they may contribute their views with regards to the proposed project;
» To identify potential issues and impacts associated with the proposed development;
» To define the scope of the Environmental Impact Assessment (EIA);
» To define the methodology that is required for the EIA; and
» To describe the plan of study for the EIA.

In terms of NEMA, the Scoping Report is submitted to the competent authority (i.e. the National Department of Environmental Affairs (DEA)) as part of the decision-making process with regard to the proposed wind energy facility. The Scoping Report is also intended to provide sufficient background information to other Organs of State, non-statutory bodies, the general public, organisations and local communities in order to obtain their commentary and input on the proposed development. The Scoping Phase of the EIA process identifies and describes potential issues associated with the proposed project, and defines the extent of the studies required within the EIA Phase of the process. The EIA Phase will assess those identified potential environmental impacts and benefits associated with all phases of the project including design, construction, operation and decommissioning, and will recommend appropriate mitigation measures for potentially significant environmental impacts.

The Scoping Report consists of eleven sections:

» **Chapter 1** provides background to the proposed project and the environmental impact assessment
» **Chapter 2** provides the strategic context for energy planning in South Africa
» **Chapter 3** describes wind energy as a power option and provides insight to technologies for wind turbines
» **Chapter 4** provides a description of the processes followed in the determination of acceptable sites for the development of the proposed Castle Wind Energy Facility
» **Chapter 5** outlines the process which was followed during the Scoping Phase of the EIA process, including the consultation program that was undertaken and input received from interested parties
» **Chapter 6** describes the existing biophysical and socio-economic environment
» **Chapter 7** describes the activities associated with the project (project scope)
» **Chapter 8** presents the evaluation of environmental impacts
» **Chapter 9** presents the conclusions of the scoping evaluation
» **Chapter 10** describes the Plan of Study for EIA
» **Chapter 11** provides a list of references and information sources used in undertaking this Scoping Study.

The Draft Scoping Report provided the public with an opportunity to verify that all potential issues associated with the proposed project have been identified through this scoping study, and provides an opportunity for additional key issues for consideration to be raised. This Final Scoping Report incorporated all comments received prior to submission to the National Department of Environmental Affairs (DEA).

PUBLIC REVIEW PERIOD FOR THE DRAFT SCOPING REPORT

Members of the public, local communities and stakeholders were invited to comment on the Draft Scoping Report which has been made available for public review and comment for a 40-day period at the following locations from **26 September 2013 –04 November 2013:**

» De Aar Public Library – 21 Station Street, De Aar
» Phandulwazi Library – Nanzwakazi Location, Hlithani Street, De Aar
» Emthanjeni Local Municipality Offices – 45 Voortrekker Street, De Aar
» Frans Jooste Library – Bree Street, Philipstown
» Renosterberg Local Municipality – Green Street, Philipstown
» The report is available for download at www.savannahsa.com

Comments could be made as written submission via fax, post or e-mail.

SUMMARY

Background and Project Overview

Castle Wind Farm (Pty) Ltd is proposing the establishment of a wind energy facility and associated infrastructure on an identified site located near De Aar in the Northern Cape Province of South Africa. The proposed site is located within the Emthanjeni Local Municipality and Renosterberg Local Municipality, ~28 km north-east of De Aar and ~22 km south-west of Philipstown. This proposed project will be referred to as the Castle Wind Energy Facility. This development is proposed to comprise a cluster of up to 38 wind turbines (typically described as a wind energy facility or a wind farm) to be constructed within an area of approximately ~3257ha in extent.

The wind energy facility is proposed to be located on the following farm portions:

» Portion 12 of Farm 165 (Vendussie Kuil)
» Portion 13 of Farm 165 (Vendussie Kuil)
» The Remaining Extent of Portion 0 of Farm 8 (Knapdaar)

The three farm portions collectively make up a broader study area of approximately 3257ha (i.e. 32.6 km^2) which is being considered for siting of the wind energy facility.

The facility will be comprised of up to 38 wind turbines with a generating capacity of up to 3.5MW each; with a hub height of up to 100m and a rotor diameter of up to 112m (i.e. each blade is approximately 56m in length). The entire facility would have a capacity of up to 140 MW.

Infrastructure associated with the wind energy facility is proposed to include:

» Wind turbines.
» Concrete foundations to support each turbine.
» Cabling between turbines, to be laid underground where practical, which will connect to an on-site substation.
» An on-site substation to facilitate the connection between the wind energy facility and the electricity grid.
» A 132 kV overhead power line to connect into the authorised Ilanga Lethemba Substation, near De Aar[1] or Hydra Substation, based on Eskom requirements.
» Internal access roads to each turbine to link the wind turbines and other infrastructure on the site. Existing roads will be used as far as possible.
» Workshop area / office for control, maintenance and storage.

The nature and extent of the proposed facility, as well as potential environmental impacts associated with the construction, operation and decommissioning phases of a facility

[1] The Ilanga Lethemba Solar Energy Facility was awarded preferred bidder status under the REIPPP in 2012 and construction of the project commenced in 2013.

of this nature is explored in more detail in this Scoping Report.

Environmental Impact Assessment

The Scoping Study for the proposed Castle Wind Energy Facility has been undertaken in accordance with the EIA Regulations published in Government Notice 33306 of GN R543, R544, R545 and R546 (18 June 2010) (as amended), in terms of Section 24(5) of the National Environmental Management Act (NEMA; Act No 107 of 1998).

The Scoping Report aimed to identify potential issues associated with the proposed project, and define the extent of studies required within the EIA. This was achieved through an evaluation of the proposed project involving specialists with expertise relevant to the nature of the project and the study area, the project proponent, as well as a consultation process with key stakeholders that included both relevant government authorities and interested and affected parties (I&APs).

A comprehensive public participation process is being undertaken in accordance with Regulation 54 of Government Notice No R543 of 2010 during the Scoping phase of this EIA process. This public participation process comprises the following:

» Notification of the EIA Process in printed media and on site, as well as through written notification to identified stakeholders and affected and adjacent landowners.
» Identification and registration of I&APs and key stakeholders.
» Compilation and distribution of a Background Information Document (BID) to all identified I&APs and key stakeholders.
» On-going consultation with identified I&APs and stakeholders, including Telephonic communication, Focus Group Meetings and one-one-one meetings.
» Compilation and maintenance of a database containing the names and addresses of all identified I&APs and key stakeholders.
» Preparation of a Comments and Response Report detailing key issues raised by I&APs as part of the EIA Process.

Evaluation of the Proposed Project

The overarching objective for the wind farm 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. Local level environmental and planning issues will now be considered within site-specific studies to be undertaken as part of the EIA for the project. The assessments through the EIA process will assist in delineating areas of environmental sensitivity within the broader site and ultimately inform the placement of the wind turbines and associated infrastructure on the site in order to

minimise impacts on the environment.

Issues identified through this scoping study as being potentially associated with the proposed wind energy facility summarised below.

Positive potential impacts related to the construction/ Decommissioning phases of the wind energy facility include, *inter alia*:

» Positive: Social Impacts
  * Opportunistic labour in-migration
  * Skills development
  * Job creation

Negative potential impacts related to the construction/ Decommissioning phases of the wind farm include, *inter alia*:

» Visual impacts associated with the construction of the farm and associated infrastructure
» Impacts on Soils and Agricultural Potential(although anticipated to be low to negligible, it will still have to be investigated)
» Impacts on Vegetation
» Impacts on terrestrial Fauna
» Impacts on Avifauna
» Impacts on Bats
» Impacts on Heritage
» Impacts on Noise sensitive developers
» Social Impacts / nuisances

Positive potential impacts related to the operation of the wind energy facility include, *inter alia*:

» Provision of a clean, renewable energy source for the national grid
» stabilisation of power supply in Northern Cape.
» Social Impacts:
  * Creation of opportunities to local business during the operational phase, including but not limited to, provision of security, staff transport, and other services
  * Potential up and down-stream economic opportunities for the local, regional and national economy
» Assistance towards provision of secure power supply in South Africa

Negative potential impacts related to the operation of the wind farm include, *inter alia*:

» Visual impacts
  * Visual exposure of wind turbines and associated infrastructure
» Impacts on Avifauna and bats
  * Increased mortality of birds/bats due to collision with turbine blades
  * Increased mortality of birds/bats due to Electrocution with associated power lines
  * Habitat loss
» Noise impacts
» Heritage Impacts
» Social Impacts:

The majority of potential impacts identified to be associated with the construction and operation of the proposed wind energy facility are anticipated to be local to regional in extent. Although no environmental fatal flaws were identified to be

associated with the project at this stage in the process, areas of potential environmental sensitivity were identified through the scoping phase.

A sensitivity map for the proposed development site has been developed to illustrate the sensitivities identified during the scoping phase studies (refer to Figure 1). The potentially sensitive areas/environmental features that have been mapped in Figure 1 include:

» Areas of ecological sensitivity
» Areas of avifaunal sensitivity
» Areas of bat sensitivity
» Potential noise sensitive developments

This sensitivity map is a rough scale estimate of sensitivity on the site identified at a desk-top level. These areas will be subject to survey and ground-truthing during the EIA phase of the project. These potentially sensitive areas will, therefore, be further investigated and assessed through detailed specialist studies (including field surveys) during the EIA phase of the process in order to identify and confirm exclusion or no-go areas. The map will be further refined in the EIA phase on the basis of these specialist studies, in order to inform the final design of the facility.

In order to assess potential impacts within sensitive areas, the preliminary layout for the wind energy facility will be considered in the EIA phase.

In order to connect the proposed wind energy facility into the Eskom grid, a 132 kV overhead power line is required to connect into the authorised Ilanga Lethemba Substation, near De Aar or Hydra Substation. Two options are considered within this scoping report and both corridors will be assessed in the EIA report. Potential issues associated with the proposed overhead power line include impacts on flora, fauna and ecological processes, visual impacts, impacts on avifauna as a result of collisions and electrocutions, and potential impacts on heritage sites.

The power line options will be considered in detail within the EIA phase in order to assess potential impacts associated with the power line corridor and make recommendations regarding a preferred alternative alignment and appropriate mitigation measures).

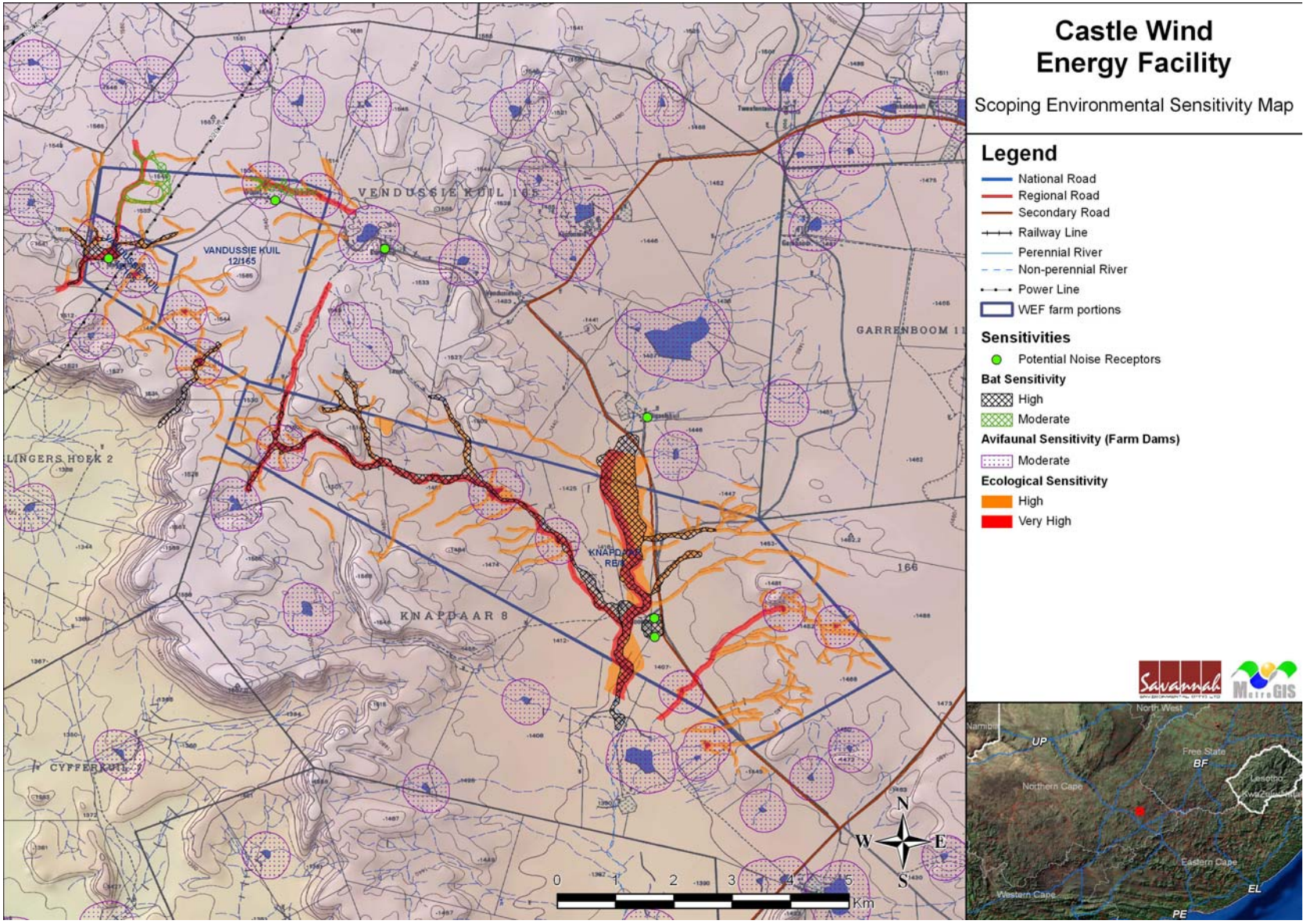

Figure 1: Desktop environmental sensitivity map for the proposed Castle Wind Energy Facility showing areas/environmental features of potentially high and medium sensitivity (as provided by specialists at scoping).

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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.

Ambient sound level: The reading on an integrating impulse sound level meter taken at a measuring point in the absence of any alleged disturbing noise at the end of a total period of at least 10 minutes after such meter was put into operation.

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

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 of time 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.

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.

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 (EIA), 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/plan: 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

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

Indirect impacts: Indirect or induced changes that may occur as a result 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 as a result 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 general public.

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

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).

Regional Methodology: The Western Cape Department of Environmental Affairs and Development Planning (DEA&DP) have developed a guideline document entitled *Strategic Initiative to Introduce Commercial Land Based Wind Energy Development to the Western Cape - Towards a Regional Methodology for Wind Energy Site Selection* (Western Cape Provincial Government, May 2006). The methodology proposed within this guideline document is intended to be a regional level planning tool to guide planners and decision-makers with regards to appropriate areas for wind energy development within the Western Cape Province (on the basis of planning, environmental, infrastructural and landscape parameters).

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 approximately 80 m 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. Larger wind turbines are usually mounted on towers ranging from 40 to 80 m tall. 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.

ABBREVIATIONS AND ACRONYMS

BID	Background Information Document
CDM	Clean Development Mechanism
CSIR	Council for Scientific and Industrial Research
CO_2	Carbon dioxide
D	Diameter of the rotor blades
DAFF	Department of Forestry and Fishery
DENC	Northern Cape Department of Environmental Affairs and Nature Conservation
DEA	National Department of Environmental Affairs
DME	Department of Minerals and Energy
DOT	Department of Transport
DWA	Department of Water Affairs
EIA	Environmental Impact Assessment
EMPr	Environmental Management Programme
GIS	Geographical Information Systems
GG	Government Gazette
GN	Government Notice
GWh	Giga Watt Hour
Ha	Hectare
I&AP	Interested and Affected Party
IDP	Integrated Development Plan
IEP	Integrated Energy Planning
km^2	Square kilometres
km/hr	Kilometres per hour
kV	Kilovolt
m^2	Square meters
m/s	Meters per second
MW	Mega Watt
NEMA	National Environmental Management Act (Act No 107 of 1998)
NERSA	National Energy Regulator of South Africa
NHRA	National Heritage Resources Act (Act No 25 of 1999)
NGOs	Non-Governmental Organisations
NIRP	National Integrated Resource Planning
NWA	National Water Act (Act No 36 of 1998)
SAHRA	South African Heritage Resources Agency
SANBI	South African National Biodiversity Institute
SANRAL	South African National Roads Agency Limited

INTRODUCTION CHAPTER 1

Castle Wind Farm (Pty) Ltd is proposing the establishment of a wind energy facility and associated infrastructure on an identified site located near De Aar in the Northern Cape Province of South Africa. The proposed site is located within the Emthanjeni Local Municipality and Renosterberg Local Municipality, ~28 km north-east of De Aar and ~22 km south-west of Philipstown. This proposed project will be referred to as the Castle Wind Energy Facility. This development is proposed to comprise a cluster of up to 38 wind turbines (typically described as a wind energy facility or a wind farm) to be constructed within an area of approximately ~3257ha in extent.

The nature and extent of the proposed facility, as well as potential environmental impacts associated with the construction, operation and decommissioning phases of a facility of this nature is explored in more detail in this Scoping Report. The Scoping Report consists of eleven sections:

» **Chapter 1** provides background to the proposed project and the environmental impact assessment
» **Chapter 2** provides the strategic context for energy planning in South Africa
» **Chapter 3** describes wind energy as a power generation option and provides insight to technologies for wind energy
» **Chapter 4** provides a description of the processes followed in the determination of acceptable sites for the development of the proposed Castle Wind Energy Facility
» **Chapter 5** outlines the process which was followed during the Scoping Phase of the EIA process, including the consultation program that was undertaken and input received from interested parties
» **Chapter 6** describes the existing biophysical and socio-economic environment
» **Chapter 7** describes the activities associated with the project (project scope)
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» **Chapter 9** presents the conclusions of the scoping evaluation
» **Chapter 10** describes the Plan of Study for EIA
» **Chapter 11** provides a list of references and information sources used in undertaking this Scoping Study

1.1. Project Overview

The proposed site was identified by Castle Wind Farm (Pty) Ltd through a Regional Assessment undertaken for a broader area in the Northern Cape. The regional site identification process included the consideration of sites/areas of special environmental importance and planning criteria, as well as issues relating to landscape character, value, sensitivity and capacity. These aspects were then balanced with technical constraining factors affecting the siting of a wind farm, including the wind resource, land availability, accessibility and existing grid infrastructure. The proposed site was confirmed by Castle Wind Farm (Pty) Limited as being potentially suitable for wind energy development. As a result, no feasible site alternatives have been identified for investigation for the proposed wind energy facility development, as the site has been screened as being potentially suitable for development of the project. This area was put forward for consideration within this EIA. The site selection process is discussed in further detail in Chapter 4 of this report.

The wind energy facility is proposed to be located on the following farm portions:
» Portion 12 of Farm 165 (Vendussie Kuil)
» Portion 13 of Farm 165 (Vendussie Kuil)
» The Remaining Extent of Portion 0 of Farm 8 (Knapdaar)

The three farm portions collectively make up a broader study area of approximately 3257ha (i.e. 32.6 km^2) which is being considered for siting of the wind energy facility (refer to Figure 1.1).

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**. As **local level environmental and planning issues** were not assessed in sufficient detail through the regional level site identification process, these issues must now be considered within **site-specific studies** and assessments through the EIA process in order to delineate areas of sensitivity within the broader site and ultimately inform the placement of the wind turbines and associated infrastructure on a site.

The facility will be comprised of up to 38 wind turbines with a generating capacity of up to 3.5MW each; with a hub height of up to 100m and a rotor diameter of up to 112m (i.e. each blade is approximately 56m in length). The entire facility would have a capacity of up to 140 MW.

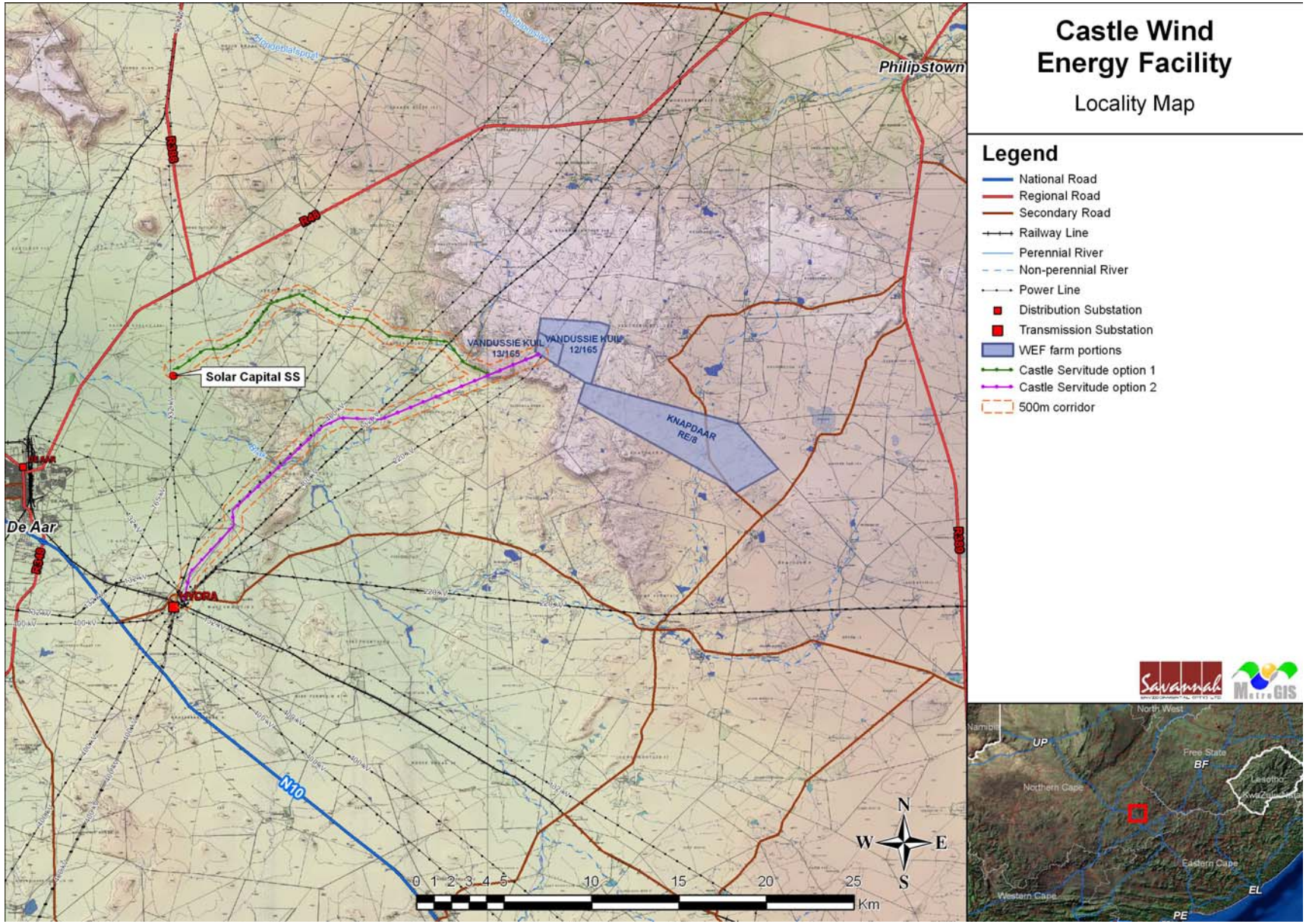


Figure 1.1: Locality map showing the study area for the establishment of the Castle Wind Energy Facility in the Northern Cape Province

Infrastructure associated with the wind energy facility is proposed to include:

» Wind turbines.
» Concrete foundations to support each turbine.
» Cabling between turbines, to be laid underground where practical, which will connect to an on-site substation.
» An on-site substation to facilitate the connection between the wind energy facility and the electricity grid.
» A 132 kV overhead power line to connect into the authorised Ilanga Lethemba Substation, near De Aar[2] or Hydra Substation, based on Eskom requirements.
» Internal access roads to each turbine to link the wind turbines and other infrastructure on the site. Existing roads will be used as far as possible.
» Workshop area / office for control, maintenance and storage.

Specialist software is available to assist developers in selecting the optimum position for each turbine before the project is constructed. This layout will then inform the positioning of other infrastructure such as the power line, access roads substation/s etc. The preliminary positioning or detailed layout of the components of this wind energy facility will be developed at the EIA phase of the project. Final placement will be informed by the outcomes of the EIA as well as from the results of the on-site wind monitoring.

1.2. The Need for the Proposed Project

The purpose of the proposed wind energy facility is to sell the electricity generated to Eskom under the Renewable Energy Independent Power Producers (IPP) Procurement Programme. The IPP Procurement Programme has been introduced by the Department of Energy (DoE) to promote the development of renewable power generation facilities (derived from) by IPPs in South Africa.

The need for harnessing renewable energy resources (such as wind energy for electricity generation) is linked to increasing pressure on countries to increase their share of renewable energy generation due to concerns such as exploitation of non-renewable resources and the rising cost of fossil fuels. In order to meet the long-term goal of a sustainable renewable energy industry and to diversify the energy-generation mix in South Africa, a goal of 17,8GW of renewables by 2030 has been set by the Department of Energy (DoE) within the Integrated Resource Plan (IRP) 2010. This energy will be produced mainly from wind, solar, biomass, and small-scale hydro (with wind and solar comprising the bulk of the power generation capacity). This amounts to a goal of ~42% of all new power generation being derived from renewable energy forms by 2030.

[2] The Ilanga Lethemba Solar Energy Facility was awarded preferred bidder status under the REIPPP in 2012 and construction of the project commenced in 2013.

In responding to the growing electricity demand within South Africa, as well as the country's targets for renewable energy, Castle Wind Farm (Pty) Limited proposes the establishment of the Castle Wind Energy Facility to add new capacity to the national electricity grid. The proposed project was identified by the developer as a highly desirable site based on a pre-feasibility assessment that was conducted for a larger area within the Northern Cape. The proposed site displays characteristics which makes it a preferred site for a Wind Energy Facility.

Local level issues are now being considered within **site-specific studies** and assessment through the EIA process in order to delineate areas of sensitivity within the broader area. Once environmentally constraining factors have been determined through the EIA process, and site-specific wind data is available from wind monitoring on site, the layout of the wind turbines and associated infrastructure can be appropriately planned. The layout will be inform the positioning of other infrastructure such as the internal substation and access roads, and other ancillary infrastructure.

The scope of the proposed Castle Wind Energy Facility (for the construction, operation and decommissioning phases) is discussed in more detail in Chapter 7.

1.3. Requirement for an Environmental Impact Assessment Process

The proposed wind energy facility is subject to the requirements of the EIA Regulations published in terms of Section 24(5) of the National Environmental Management Act (NEMA, Act No. 107 of 1998). This section provides a brief overview of the EIA Regulations and their application to this project.

NEMA is the national legislation that provides for the authorisation of "listed activities". In terms of Section 24(1) of NEMA, the potential impact on the environment associated with these activities must be considered, investigated, assessed and reported on to the competent authority that has been charged by NEMA with the responsibility of granting environmental authorisations. As this is a proposed electricity generation project and thereby considered to be of national importance, the National Department of Environmental Affairs (DEA) is the competent authority and the Northern Cape Department of Environment and Nature Conservation (DENC) will act as the commenting authority. An application for authorisation has been accepted by DEA under application reference number 14/12/16/3/3/2/278.

The need to comply with the requirements of the EIA Regulations ensures that decision-makers are provided the opportunity to consider the potential environmental impacts of a project early in the project development process and to

assess if potential environmental impacts can be avoided, minimised or mitigated to acceptable levels. Comprehensive, independent environmental studies are required in accordance with the EIA Regulations to provide the competent authority with sufficient information in order to make an informed decision. Castle Wind Farm (Pty) Ltd appointed Savannah Environmental (Pty) Ltd as the independent Environmental Consultants to conduct the EIA process for the proposed project.

An EIA is an effective planning and decision-making tool for the project developer as it allows for the identification and management of potential environmental impacts. It provides the opportunity for the developer to be forewarned of potential environmental issues, and allows for resolution of the issues reported on in the Scoping and EIA Reports as well as dialogue with Interested and Affected Parties (I&APs). In terms of sections 24 and 24D of NEMA, as read with Government Notices R543 and R546, a Scoping and EIA process is required for the proposed project (GG No 33306 of 18 June 2010). A table of the listed activities for the proposed projects in terms of GN R545, R544 and R546 (as amended in December 2010) is provided below:

Table 1.1: Listed Activities applicable to the Castle Wind Energy Facility

Relevant Notice	Activity No.	Description of listed activity	Applicability to the project
GN544	10	The construction of facilities or infrastructure for the transmission and distribution of electricity – Outside urban areas or industrial complexes with a capacity of more than 33kV but less than 275kV	Construction of power line/s, outside an urban area, with a capacity of more than 33kV.
GN544	11	The construction of: (iii) bridges (vi) bulk storm water outlet structures (x) buildings exceeding 50 square metres in size; or (xi) infrastructure or structures covering 50 square metres or more Where such construction occurs within a watercourse or within 32 metres of a watercourse, measures from the edge of a watercourse, excluding where such construction will occur behind the development setback line.	Bridges, storm water structures and buildings (such as the workshop) will occur within 32m of a watercourse.
GN544	13	The construction of facilities or infrastructure for the storage,	Facilities for storage of fuels / oils that are up to 500m^3 are required

Relevant Notice	Activity No.	Description of listed activity	Applicability to the project
		or for the storage and handling, of a dangerous good, where such storage occurs in containers with a combined capacity of 80 but not exceeding 500 cubic metres	for the wind energy facility.
GN544, 18 June 2010	18 (i)	The infilling or depositing of any material of more than 5 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock from (i) a watercourse	The wind energy facility will include the construction of infrastructure within a watercourse.
GN544	22	The construction of a road, outside urban areas, (i) with a reserve wider than 13.5 metres or, (ii) where no road reserve exists where the road is wider than 8 metres, or (iii) for which an environmental authorisation was obtained for the route determination in terms of activity 5 of Government Notice 387 of 2006 or activity 18 of Notice 545 of 2010.	The wind energy facility will require access roads to be constructed.
GN544	26	Any process or activity identified in terms of section 53(1) of the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004).	Sensitive / conservation worthy vegetation species, protected under the NEM:BA to be removed for infrastructure including wind turbines, access roads and associated infrastructure.
GN544	47	The widening of a road by more than 6 metres, or the lengthening of a road by more than 1 kilometre – (i) where the existing road reserve is wider than 13.5 metres; or (ii) where no reserve exists, where the existing road is wider than 8 metres – excluding widening or lengthening occurring inside urban areas.	Existing farm (gravel) access roads to be widened and/or lengthened.
GN545	1	The construction of facilities or infrastructure, for the generation of electricity where the output is 20 megawatts or more.	The wind energy facility will consist of wind turbines for electricity generation of more than 20MW.

Relevant Notice	Activity No.	Description of listed activity	Applicability to the project
GN545	15	Physical alteration of undeveloped, vacant or derelict land for residential, retail, commercial, recreational, industrial or institutional use where the total area to be transformed is 20 hectares or more; Except where such physical alteration takes place for: *(i)* Linear development activities. *(ii)* Agriculture or afforestation where activity 16 in this schedule will apply	The development footprint for the proposed wind energy facility will cover an area greater than 20 hectares.
GN 546, 18 June 2010	14	The clearance of an area of 5 hectares or more of vegetation where 75% or more of the vegetative cover constitutes indigenous vegetation, except where such removal of vegetation.	An area of 5 ha or more of indigenous vegetation cover to be cleared for construction of the wind energy facility and associated infrastructure.
GN 546, 18 June 2010	4 (a) (ii) (bb)	The construction of a road wider than 4 metres with a reserve less than 13,5 metres. (a) In the Northern Cape (ii) Outside urban areas, in: (bb) National Protected Area Expansion Strategy Focus areas.	New roads wider than 4 m to be constructed in a rural part of the Northern Cape within a National Protected Area Expansion Strategy Focus area.
GN 546, 18 June 2010	10(a) (ii) (bb)	The construction of facilities or infrastructure for the storage, or storage and handling of a dangerous good, where such storage occurs in containers with a combined capacity of 30 but not exceeding 80 cubic metres. (a) In the Northern Cape (ii) Outside urban areas, in: (bb) National Protected Area Expansion Strategy Focus areas.	Fuel required during construction will be stored on-site. The site occurs in a rural part of the Northern Cape within a National Protected Area Expansion Strategy Focus area.
GN 546, 18 June 2010	13 (b) & (c) ii (bb)	The clearance of an area of 1 hectare or more of vegetation where 75% or more of the vegetative cover constitutes indigenous vegetation. (b) National Protected Area	An area of 1 ha or more of indigenous vegetation cover need to be cleared in a rural part of the Northern Cape, within a National Protected Area Expansion Strategy Focus area.

Relevant Notice	Activity No.	Description of listed activity	Applicability to the project
		Expansion Strategy Focus areas. (a) In the Northern Cape (ii) Outside urban areas, in: (bb) National Protected Area Expansion Strategy Focus areas.	
GN 546, 18 June 2010	14 (a) i	The clearance of an area of 5 hectare or more of vegetation where 75% or more of the vegetative cover constitutes indigenous vegetation. (a) In the Northern Cape (ii) All areas outside urban areas	An area of 5 ha or more of indigenous vegetation cover may need to be cleared in a rural area within the Northern Cape.
GN 546, 18 June 2010	16 (iii) & (iv) (a) ii (bb)	The construction of (iii) buildings with a footprint exceeding 10 square metres in size or (iv) infrastructure covering 10 square metres or more where such construction occurs within a watercourse or within 32 metres of a watercourse, measured from the edge of a watercourse, excluding where such construction will occur behind the development setback line.	Buildings and infrastructure larger than 10 m^2 to be constructed within 32 m of a watercourse.
GN 546, 18 June 2010	19	The widening of a road by more than 4metres, or the lengthening of a road by more than 1 kilometre. (a) In the Northern Cape (ii) Outside urban areas, in: (bb) National Protected Area Expansion Strategy Focus areas.	Existing farm (gravel) access roads to be widened in a rural part of the Northern Cape, within a National Protected Area Expansion Strategy Focus area.

This report documents the scoping evaluation of the potential environmental impacts of the proposed construction and operation of the proposed Castle Wind Farm project. This scoping study forms part of the EIA process and was conducted in accordance with the requirements of the EIA Regulations in terms of Section 24(5) of the National Environmental Management Act (NEMA; Act No 107 of 1998).

1.4. Objectives of the Scoping Phase

The Scoping Phase of the EIA process refers to the process of identifying potential issues associated with the proposed project, and defining the extent of studies required within the EIA Phase. This is achieved through an evaluation of the proposed project, involving the project proponent, specialists with experience in EIAs for similar projects, and a public consultation process with key stakeholders that includes both government authorities and interested and affected parties (I&APs).

In accordance with the EIA Regulations, the main purpose of the Scoping Phase is to focus the environmental assessment in order to ensure that only potentially significant issues, and reasonable and feasible alternatives are examined in the EIA Phase. The Draft Scoping Report provided stakeholders with an opportunity to verify that the issues they have raised through the public consultation process to date have been captured and adequately considered, and provides a further opportunity for additional key issues for consideration to be raised. This Final Scoping Report incorporate all issues and responses raised during the public review of the Draft Scoping Report prior to submission to DEA.

1.5. Details of Environmental Assessment Practitioner and Expertise to conduct the Scoping and EIA

Savannah Environmental was appointed by Castle Wind Farm (Pty) Ltd as an independent consultant to undertake an Environmental Impact Assessment (EIA) for the proposed project, as required by the NEMA EIA Regulations. Neither Savannah Environmental, nor any of the specialist sub-consultants on this project are subsidiaries of or affiliated to Castle Wind Farm (Pty) Limited. 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 environmental impact 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.

The EAPs from Savannah Environmental who are responsible for this project are:

» *Karen Jodas* - the principle Environmental Assessment Practitioner (EAP) for this project, is a registered Professional Natural Scientist and holds a Master of Science degree. She has 16 years of experience consulting in the environmental field. Her key focus is on strategic environmental assessment and advice; management and co-ordination of environmental projects, which includes integration of environmental studies and environmental processes into larger engineering-based projects and ensuring compliance to legislation and guidelines; compliance reporting; the identification of environmental management solutions and mitigation/risk minimising measures; and strategy and guideline development. She is currently responsible for the project management of EIAs for several renewable energy projects across the country.
» *Ravisha Ajodhapersadh* - the principle author of this report holds an Honours Bachelor of Science degree in Environmental Management and has 6 years experience in environmental management and EIA. She is currently the responsible for EIAs for several renewable energy projects across the country.

Savannah Environmental has gained extensive knowledge and experience on potential environmental impacts associated with electricity generation projects through their involvement in related EIA Processes. Savannah Environmental has developed a valuable understanding of impacts associated with the construction and operation of renewable energy facilities.

In order to adequately identify and assess potential environmental impacts associated with the proposed project, Savannah Environmental has appointed the following specialist sub-consultants to conduct specialist impact assessments:

Specialist	Area of Expertise
Simon Todd of Simon Todd Consulting	Ecology
Jon Smallie of WildSkies Ecological Services	Avifauna
Werner Marias of Animalia	Bats
Lourens du Plessis of MetroGIS	Visual impacts and GIS mapping
Jaco van der Walt of Heritage Contracts and Archaeological Consulting CC & John Almond	Heritage & Palaeontology
Tony Barbour Environmental Consulting and Research	Social
Johann Lanz	Soils, erosion and agricultural potential
Morne de Jager of M2 Environmental Connections CC	Noise

Refer to Appendix A for the curricula vitae for Savannah Environmental and the specialist sub-consultants team.

2.1. Strategic Electricity Planning in South Africa

The need to expand electricity generation capacity in South Africa is based on national policy and is informed by on-going strategic planning undertaken by the Department of Energy (DoE). The hierarchy of policy and planning documentation that support the development of renewable energy projects such as wind energy facilities is illustrated in Figure 2.1. These policies are discussed in more detail in the following sections, along with the provincial and local policies or plans that have relevance to the development of the proposed wind energy facility.

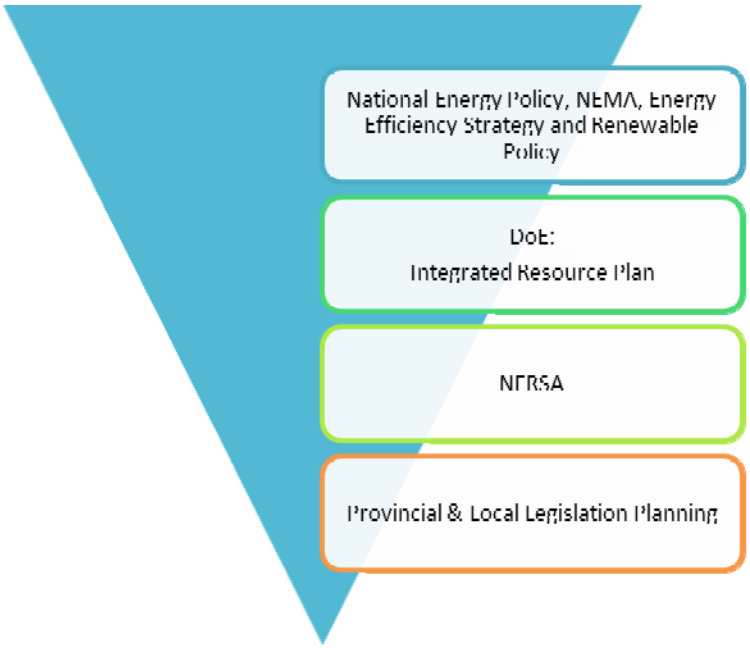


Figure 2.1: Hierarchy of electricity policy and planning documents

2.1.1 The Kyoto Protocol, 1997

South Africa's electricity is mainly generated from coal-based technologies. South Africa accounts for ~38 % of Africa's CO_2 (a greenhouse gas contributing to climate change) from burning of fossil fuels and industrial processes. The Kyoto Protocol is an international agreement linked to the United Nations Framework Convention on Climate Change. South Africa ratified the Kyoto Protocol in 2002. The Kyoto Protocol requires developing countries to reduce its greenhouse gas emissions through actively cutting down on using fossil fuels, or by utilising more renewable resources. Therefore certain guidelines and policies (discussed further in the sections below) were put in place for the Government's plans to reduce greenhouse gas emissions. The development of renewable energy projects (such as the

proposed wind energy facility) is therefore in line with South Africa's international obligations in terms of the Kyoto Protocol.

2.1.1. White Paper on the Energy Policy of the Republic of South Africa, 1998

Development within the energy sector in South Africa is governed by the White Paper on a National Energy Policy (the National Energy Policy), published by DME in 1998. This White Paper identifies five key objectives for energy supply within South Africa, i.e.:

» increasing access to affordable energy services;
» improving energy sector governance;
» stimulating economic development;
» managing energy-related environmental impacts; and
» securing supply through diversity.

Furthermore, the National Energy Policy identifies the need to undertake an Integrated Energy Planning (IEP) process and the adoption of a National Integrated Resource Planning (NIRP) approach. Through these processes, the most likely future electricity demand based on long-term southern African economic scenarios can be forecasted, and provide the framework for South Africa to investigate a whole range of supply and demand side options.

2.1.2. Renewable Energy Policy in South Africa

Internationally there is increasing development of the use of renewable technologies for the generation of electricity due to concerns such as climate change and exploitation of resources. In response, the South African government ratified the United Nations Framework Convention on Climate Change (UNFCCC) in August 1997 and acceded to the Kyoto Protocol, the enabling mechanism for the convention, in August 2002. In addition, national response strategies have been developed for both climate change and renewable energy.

Investment in renewable energy initiatives, such as the proposed wind energy facility, is supported by the National Energy Policy (DME, 1998). 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 National 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 White Paper on Renewable Energy (DME, 2003) supplements the Energy Policy, and sets out 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.

The support for the Renewable Energy Policy is guided by a rationale that South Africa has a very attractive range of renewable resources, particularly solar and wind, 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; and
» Addressing constraints on the development of the renewable industry.

The White Paper on Renewable Energy states "*It is imperative for South Africa to supplement its existing energy supply with renewable energies to combat Global Climate Change which is having profound impacts on our planet*."

2.1.3. Final Integrated Resource Plan 2010 - 2030

The current iteration of the Integrated Resource Plan (IRP) for South Africa, initiated by the Department of Energy (DoE) after a first round of public participation in June 2010, led to the Revised Balanced Scenario (RBS) that was published in October 2010. A second round of public participation was conducted in November/December 2010, which led to several changes to the IRP model assumptions

The document outlines the proposed generation new-build fleet for South Africa for the period 2010 to 2030. This scenario was derived based on the cost-optimal solution for new-build options (considering the direct costs of new build power plants), which was then "balanced" in accordance with qualitative measures such as local job creation.

The Policy-Adjusted IRP includes the same amount of coal and nuclear new builds as the RBS, while reflecting recent developments with respect to prices for renewables. In addition to all existing and committed power plants (including 10 GW committed coal), the plan includes 9,6 GW of nuclear; 6,3 GW of coal; 17,8 GW of renewables; and 8,9 GW of other generation sources. The Policy-Adjusted IRP has therefore resulted in an increase in the contribution from renewables from 11,4 GW to 17,8 GW.

The DoE has released a draft Integrated Energy Planning Report (June 2013) for public comment. The Draft Integrated Energy Planning Report gives insight on the possible implications of pursuing alternative energy policy options in South Africa. Once the implications of all the alternative options have been explored and evaluated against each of the eight (8) key objectives, final recommendations will be made in the form of the Final IEP Report.

2.1.4 Department of Energy Process for Independent Power Producers (IPP)

In order to meet the long-term goal of a sustainable renewable energy industry and to diversify the energy-generation mix in South Africa, a goal of 17,8GW of renewables by 2030 has been set by the Department of Energy (DoE) within the Integrated Resource Plan (IRP) 2010. This energy will be produced mainly from wind, solar, biomass, and small-scale hydro (with wind and solar comprising the bulk of the power generation capacity). This amounts to ~42% of all new power generation being derived from renewable energy forms by 2030.

In responding to the growing electricity demand within South Africa, as well as the country's targets for renewable energy, Castle Wind Farm (Pty) Ltd proposes the establishment of the Castle Wind Energy Facility to add new capacity to the national electricity grid. Castle Wind Farm (Pty) Ltd will be required to apply for a generation license from the National Energy Regulator of South Africa (NERSA), as well as a power purchase agreement from Eskom (i.e. typically for a period of 20 - 25 years) in order to build and operate the proposed wind energy facility. As part of the agreement, Castle Wind Farm would be remunerated per kWh by Eskom or subsequent authority/market operator. Depending on the economic conditions following the lapse of this period, the facility can either be decommissioned, or the power purchase agreement renegotiated and extended.

The IPP will undergo a bidding process in which the Department of Energy will determine preferred bidders. A Preferred Bidder will be held to compliance with the price and economic development proposals in its bid, with regular reporting to demonstrate compliance during the life of the project.

The DoE IPP Procurement Programme is currently underway. During 2012, the government signed contracts for 28 IPP projects, which include wind, solar and small hydro technologies to be developed in the Eastern Cape, Western Cape, Northern Cape and Free State provinces. The first IPP Bid submission (Round 1) occurred in November 2011. The second bid submission (Round 2) occurred in March 2012. The third Bid submission (Round 3) occurred in August 2013. Castle Wind Farm (Pty) Ltd intend bidding the project to the DoE for the bid submission in 2015. Following Round 1 and Round 2 bid submissions to the DoE, a total of 15 wind energy facility projects were awarded preferred bidders status. Construction on many of these has already commenced.

2.2. Provincial and Local Level Developmental Policy

2.2.1. Northern Cape Growth and Development Strategy (2004-2014)

The Provincial Growth and Development Strategy (PGDS) notes that the most significant challenge that the government and its partners in growth and development are confronted with is the reduction of poverty. All other societal challenges that the province faces emanate predominantly from the effects of poverty. The PGDS notes that the only effective way to reduce poverty is through long-term sustainable economic growth and development. The sectors where economic growth and development can be promoted include:

» Agriculture and agro-processing;
» Fishing and mariculture;
» Mining and mineral processing;
» Transport;
» Manufacturing;
» Tourism.

However, the PGDS also notes that economic development in these sectors also requires:

» Creating opportunities for lifelong learning;
» Improving the skills of the labour force to increase productivity;
» Increasing accessibility to knowledge and information.

The achievement of these primary development objectives depends on the achievement of a number of related objectives that, at a macro-level, describe necessary conditions for growth and development. These are:

» Developing requisite levels of human and social capital;

» Improving the efficiency and effectiveness of governance and other development institutions;
» Enhancing infrastructure for economic growth and social development.

Of specific relevance to this project, the PGDS make reference to the need to ensure the availability of inexpensive energy. The section notes that in order to promote economic growth in the Northern Cape, the availability of electricity to key industrial users at critical localities at rates that enhance the competitiveness of their industries must be ensured. At the same time, the development of new sources of energy through the promotion of the adoption of energy applications that display a synergy with the Province's natural resource endowments must be encouraged. In this regard the PGDS notes "the development of energy sources such as solar energy, the natural gas fields, bio-fuels, etc, could be some of the means by which new economic opportunity and activity is generated in the Northern Cape". The PGDS also highlights the importance of close co-operation between the public and private sectors in order for the economic development potential of the Northern Cape to be realised.

The PGDS also highlights the importance of enterprise development, and notes that the current levels of private sector development and investment in the Northern Cape are low. In addition, the Province also lags in the key policy priority areas of SMME Development and Black Economic Empowerment. The proposed wind energy facility therefore has the potential to create opportunities to promote private sector investment and the development of SMMEs in the Northern Cape.

The PGDS notes that the sustainable utilisation of the natural resource base on which agriculture depends is critical in the Northern Cape with its fragile eco-systems and vulnerability to climatic variation. The document also indicates that due to the Province's exceptional natural and cultural attributes, it has the potential to become the preferred adventure and ecotourism destination in South Africa. It is noted that attention should be paid to ensuring that the development of large renewable energy projects, such as the proposed wind energy facility, do not negatively affect the region's natural environment or the tourism potential of the Province.

2.3.2. Local & District Level Integrated Development Plans

The majority of the site falls within the Emthanjeni Local Municipality. A small section of the site falls within the Renosterberg Local Municipality. For relevance, the Emthanjeni Local Municipality's IDP and the greater Pixley ka Seme District Municipality's IDP are discussed here. The Emthanjeni Local Municipality's IDP (2012) identified a number of key performance areas (KPAs). These KPAs address the outcome of an analysis of the status quo across numerous sectors within the ELM and include the following:

» Basic Service Delivery;
» Local Economic Development;
» Environmental Management;
» Social Development;
» Good Governance and Public Participation;
» Safety and Security;
» Cross-Cutting Issues;
» Municipal Financial Viability and Management; and
» Municipal Institutional Transformation.

These KPAs aim to utilize existing economic strengths and opportunities by transferring these into workable programmes and projects. These programmes and projects tend to reduce the current threats, and strengthen the weaknesses in the local economic environment. The IDP KPAs that are relevant to the proposed energy facility include:

» Basic Service Delivery: Energy is highlighted as one of the priority issues for the ELM with respect to basic services; and,
» Local Economic Development (LED): Micro and macro-economic development and land use management are highlighted as one of the priority issues for the municipality.

The Municipality identified a number of industrial and manufacturing projects that form part of their strategy for the economic development within the area. These include amongst others:

» The development of N10 Corridor;
» Revitalization of the rail infrastructure;
» Development of industrial sites (Hanover / Britstown);
» Urban Renewal Programme (Renewal of Townships);
» A Logistics hub (De Aar); and
» A Renewable Energy hub (De Aar).

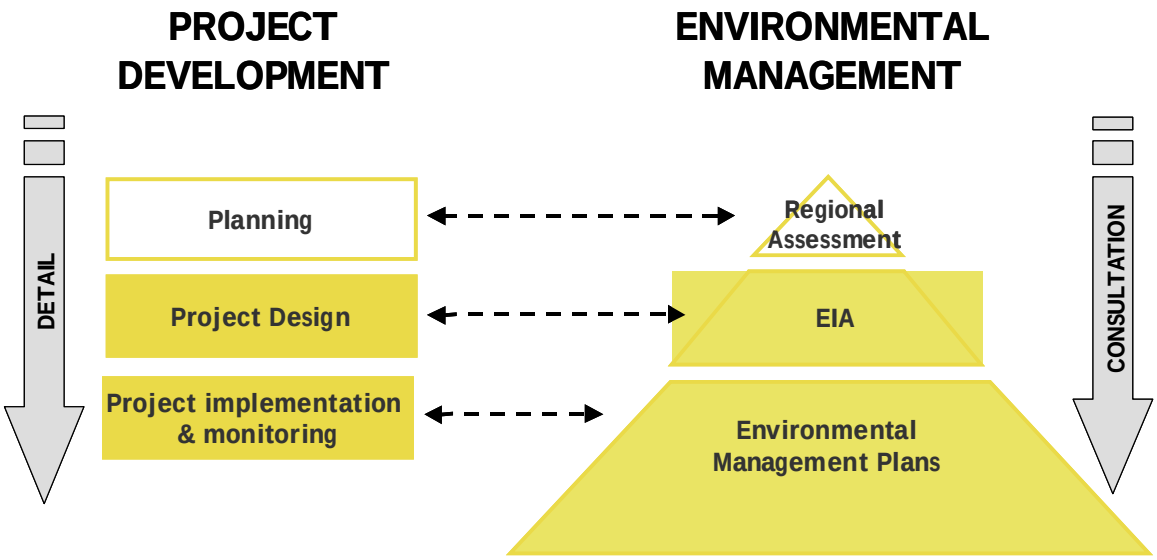
The proposed wind energy facility therefore is in line with the development of a Renewable Energy hub in the region around De Aar, as highlighted in the Emthanjeni Local Municipality's IDP (2012-2013) and the Pixley ka Seme District's IDP (2009-2012).

2.2. Project Planning and the site-specific Environmental Impact Assessment

In terms of the EIA Regulations under NEMA, a Scoping and EIA report (including an environmental management programme (EMP)) are required to be compiled for

this proposed project. The EIA is considered as an effective planning and decision-making tool in the planning process of a new power generation facility. It allows potential environmental consequences resulting from a technical facility during its establishment and its operation to be identified and appropriately managed through project design and implementation. The level of detail at a site-specific level is refined through the process, and allows for resolution of potential issue(s) through dialogue with affected parties.

The relationship between project development and the environmental assessment and management process is depicted in the figure below.



The project planning phase for the Castle Wind Energy Facility included a detailed site selection process, and the environmental suitability of the site was confirmed through an environmental screening process undertaken by Savannah Environmental. This site screening process is detailed further in Chapter 4 of this Scoping Report.

The environmental screening process considered a high-level, region for possible development. Within this region, the developer proposed a site. This entire extent of the site has been considered in this Scoping Report to determine any environmental sensitivity and/or fatal flaws and to inform the layout of the wind energy facility. A detailed layout is then considered in the EIA phase.

Compared with other renewable energy sources such as solar and bio-energy, wind turbines generate the highest energy yield while affecting the smallest land space. Wind technologies convert the energy of moving air masses at the earth's surface to mechanical power that can be directly used for mechanical needs (e.g. milling or water pumping) or converted to electric power in a generator (i.e. a wind turbine).

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 energy facility also qualifies as a Clean Development Mechanism (CDM) project (i.e. a financial mechanism developed to encourage the development of low carbon generating technologies technologies) as it meets all international requirements in this regard.

Environmental pollution and the emission of CO_2 from the combustion of fossil fuels constitute a threat to the environment. The use of fossil fuels is reportedly responsible for ~70% of greenhouse gas emissions worldwide. The climate change challenge 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 more cost-effective solution in the short-term is not necessarily the least expensive long-term solution. This holds true not only for direct project cost, but also indirect project cost 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 now is ensuring wind energy projects are able to meet all economic, social and environmental sustainability criteria.

3.1 The Importance of the Wind Resource for Energy Generation

The importance of using the wind resource for energy generation has the attractive attribute that the fuel is free. The economics of a wind energy project crucially depend on the wind resource at the 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 energy facility, as the wind resource is a critical factor to the success of the installation.

» **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 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 at wind speeds of between ~3 m/s to 4 m/s, with wind speeds greater than 6 m/s currently required for a wind energy facility 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 of the wind due to the topography. Elevation in the topography influences the flow of air, and results in turbulence within the air stream, and this has to be considered in the placement of turbines.

» **Wind power** is a measure of the energy available in the wind.

» **Wind direction** is reported by the direction from which it originates. Wind direction at a site is important to understand, but it is not typically critical in site selection as wind turbine blades automatically turn to face into the predominant wind direction at any point in time.

A wind resource measurement and analysis programme must be conducted for the site proposed for development, as only measured data will provide a robust prediction of the facility's expected energy production over its lifetime.

The placement of the individual turbines within a wind energy facility 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)
» Effect 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 the turbines might have on each other. Once a viable footprint for the establishment of the wind energy facility 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.

3.2 What is a Wind Turbine and How Does It Work

The kinetic energy of wind is used to turn a wind turbine to generate electricity. A wind turbine typically consists of **three rotor blades** and a **nacelle** mounted at the top of a tapered **tower**. The mechanical power generated by the rotation of the blades is transmitted to the generator within the nacelle via a gearbox and drive train.

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 proposed Castle Wind Farm in the Northern Cape will have a hub height of up to 100 m, and rotor diameter of 112 m. These turbines would be capable of generating in the order of up to 3.5 MW each (in optimal wind conditions).

3.2.1. Main Components of a Wind Turbine

The turbine consists of the following major components:

» The foundation
» 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 concrete and are designed for vertical loads (weight) and lateral loads (wind).

The tower
The tower, which supports the rotor, is constructed from tubular steel or concrete. It is typically 80m – 100m 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.

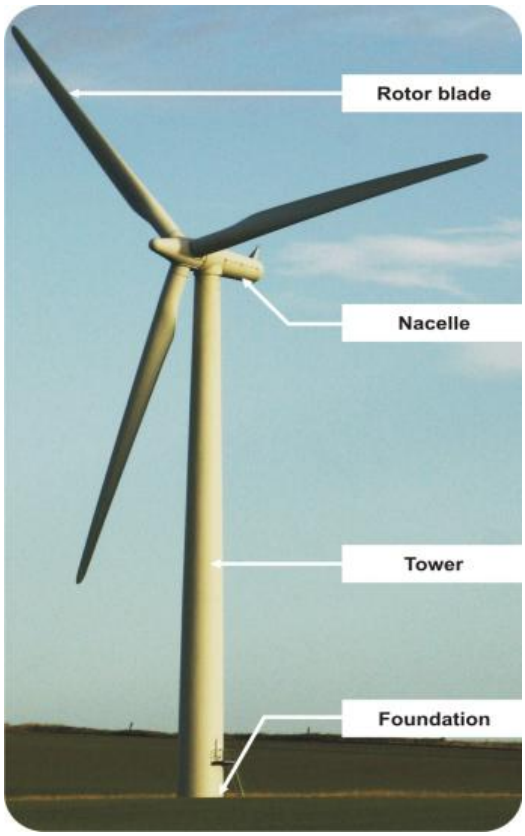


Figure 3.1: Illustration of the main components of a wind turbine

The 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, typically made from fibreglass materials or carbon fibre reinforced plastics. When a rotor blade is in contact with wind, the airflow is deflected, airflow over the top arched edge has to take a longer path than at the relatively straight underside. This results in a low pressure at the upper side and a high pressure at the lower side. The pressure differential causes the blades to start moving. The speed of rotation of the blades is controlled by the nacelle, which can turn the blades to face into the wind ('yaw control'), and change the angle of the blades ('pitch control') to make the most use of the available wind.

The nacelle (geared)

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 than a gearless turbine.

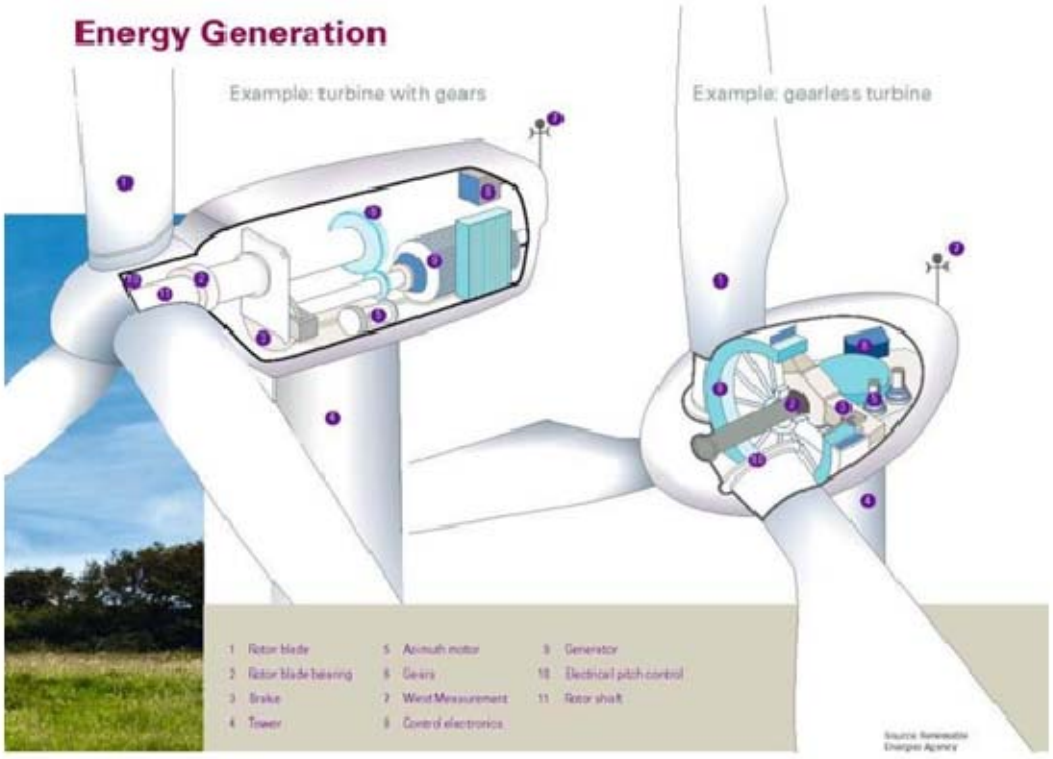


Figure 3.2: Illustration of the main components of a turbine with gears and without gears

3.2.2. 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. This wind speed is typically between 3 m/s and 4 m/s.

At very high wind speeds, typically over 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.

SUITABILITY OF THE SITE FOR THE DEVELOPMENT OF A WIND ENERGY FACILITY IN THE NORTHERN CAPE CHAPTER 4

Savannah Environmental, together with MetroGIS, undertook a regional site assessment on behalf of the developer to determine acceptable areas considered suitable for wind energy development within a broader area in the Northern Cape Province. The study area consisted of an area of approximately 36 0000 km^2 (225km x 160km). Within this study area, the Castle Wind Energy Facility site located near De Aar in the Northern Cape was considered as a possible site for development of a wind energy facility. A summary of the methodology and process applied in the evaluation of the developer's identified sites and the findings of the study are given in the sections below.

4.1. Identification of the Northern Cape Area for further Investigation

The potential to establish new wind energy facility developments on five sites near De Aar and Copperton in the Northern Cape Province was identified by juwi Renewable Energies (Pty) Ltd. The sites identified as having potential for wind energy facility development included the Castle Wind Energy Facility on Portion 12 & 13 of Farm 165, (Vendussie Kuil) and the remaining Extent of Portion 0 of Farm 8 (Knapdaar).

The five sites were identified as having potential for the installation of wind turbine generators on the basis of various technical criteria, including the wind resource, accessibility of the site, accessibility to the Eskom grid, and local site topography. As part of a pre-feasibility assessment which included site selection, a high level Regional Site Assessment was undertaken for a larger study area in the Northern Cape covering an area of approximately 36 0000 km^2 (225km x 160km) in order to inform the developer of the environmental suitability of the identified sites for the development of a wind energy facility.

This study was undertaken in accordance with the guidelines outlined in the *Strategic Initiative to Introduce Commercial Land Based Wind Energy Development to the Western Cape - Towards a Regional Methodology for Wind Energy Site Selection* (Western Cape Provincial Government, May 2006), as well as the Strategic Assessment mapping for the entire Western Cape Province (which is currently being finalised by DEA&DP). The purpose of this Regional Site Assessment was to determine areas considered suitable for development *from an environmental perspective* within the broader study area, and then to test the suitability of the five identified sites against these results. The Regional Site Assessment approach therefore served as a site risk assessment tool from an

environmental acceptability perspective – that is, a process to highlight or red-flag potential issues of concern prior to initiating a full EIA process for a proposed site.

This chapter provides the outcomes of the regional assessment and technical considerations specific to the Castle Wind Energy Facility study area, and provides results which indicate the suitability of specific area for wind energy siting and development.

4.2. Criteria for testing the environmental suitability of the site

The methodology utilised is a regional level planning tool to guide project development planners (and ultimately decision-makers) with regards to the appropriate areas for development and/or the environmental suitability of identified development sites. Local level issues are not assessed in sufficient detail at this regional level, and the intention is that identified suitable or preferred areas/sites be further considered within site-specific studies and assessments (that is, through an Environmental Impact Assessment).

The objectives for the Regional Site Assessment study were therefore to:

1. Provide support to a robust, technically sound and defendable site selection process.
2. Confirm the areas of suitability within the larger study area for wind energy development from an environmental perspective.
3. Confirm the appropriateness of the sites identified for the establishment of a wind energy facility/ies (ensuring that technical and environmental constraints are minimised as far as possible).
4. Define and understand any constraints associated with the identified sites for development (in terms of the outcome of the Regional Assessment study).
5. Provide support to an application for authorisation to DEA for the preferred site/s, using the findings as a motivation for the site/s for which application is made.

The regional site assessment involved testing the proposed development site against the environmental and planning criteria as listed in the wind regional environmental assessment of the Western Cape Province to determine the potential environmental suitability of the site, as well as highlight any red flags.

The aim of the Regional Assessment study was to undertake both a Criteria Based analysis[3] and a Landscape Based analysis[4] and to merge the results of the two

[3] The Criteria Based assessment forms the foundation of the Regional Methodology (Elements of Method 1 from DEA&DP guideline document).

[4] Landscape Assessment as a vital component, incorporating character analysis, sensitivity, value and capacity considerations (Elements of Method 2 from DEA&DP guideline document).

studies in order to identify Preferred, Negotiable and Restricted Zones for wind energy development. Detailed planning, including the use of criteria and thresholds to designate areas of suitability for development specifically with regards to the siting of wind energy facilities.

The input categories for the Criteria Based Method included, but were not limited to:

» Environmental criteria that could be negatively affected by the construction and operation of a wind energy facility (e.g. national parks, nature reserves, rivers, wetlands, etc.)
» Topographical information
» Urban and industrial planning criteria
» Infrastructure criteria that could negatively affect the placement of a wind energy facility (e.g. airports, military installations, etc.)
» Vertically disturbed landscape corridors (major transmission lines, railway lines, etc.)

The input categories for the Landscape Based Method included aspects such as:

» Major scenic drives, routes of tourism importance
» Local scenic drives or "cultural" routes
» Defined historical or heritage sites
» Scenic areas, areas of natural beauty
» Viewshed analysis/visual exposure
» Landform/land cover analysis

The combined results of the two methods were merged to highlight the site's environmental suitability for a wind energy development.

4.3. Data Sources for the Regional Assessment

Data was compiled in accordance with the data layers utilised in the Western Cape Provincial Government document: *Strategic Initiative to Introduce Commercial Land Based Wind Energy Development to the Western Cape*.

4.4. Results of the Regional Site Assessment

The input components resulted in various layers of information that were merged using GIS to form a combined dataset (various combinations of positive and negative criteria) which have defined **preferred areas/zones for development** based on environmental and planning criteria. The table below indicates the

possible combinations (based on the DEA&DP study) that resulted in the preferred areas for development index that is displayed in the map legend.

No.	Description	Preference
1	Areas with more than 1 negative criteria	Highly restricted/constrained
2	Areas with one negative criteria	Restricted/constrained
3	Neutral areas (no positive or negative criteria)	Negotiable
4	Areas with one positive criteria (and no negative criteria)	Preferred
5	Areas with more than one positive criteria (and no negative criteria)	Highly preferred

The rating system utilised within the updated DEA&DP SEA takes a more 'risk adverse approach' than that put forward by the initial DEA&DP guideline. The rating system assumes that a criteria rated as negative would always override a criteria rated as positive. Definitions of the terms used to define the level of preference are as follows:

» ***Highly Preferred / Preferred:*** Low landscape value with a high to low capacity for change. Wind energy facility development may be possible, subject to site level assessment.
» ***Negotiable:*** Low to high landscape values, but with a high capacity to absorb change. Wind energy development in these areas may be possible, subject to site level assessment.
» ***Restricted / High Restricted:*** High value landscapes combined with low capacity of landscape to adapt to change. These areas should ideally be restricted from wind energy facility development.

A Composite Map was generated to show the most favourable areas for development of a wind energy facility within the study area (indicated in dark green and pale green) from an environmental perspective (refer to Figure 4.1).

The results from the testing of the proposed development site indicated that Castle Wind Energy Facility was a site of potential for development based on the following conclusions from the regional assessment:

» The portions of the site associated with elevated relief are considered to be constrained to development.
» This site falls within a vegetation type known as Besemkaree Koppies Shrubland, which is classified as Least Threatened (Driver et al. 2005; Mucina et al., 2006) and not flagged as being of conservation concern. The condition of the vegetation will be confirmed through a botanical survey/assessment.

» Positive (inclusionary) criteria (including disturbed vertical landscapes) which overlap with this development site include the Hydra-Roodekuil 220kV power line which traverses the site.
» The entire site falls within the 35km buffer area of the De Aar military installation/aerodrome area, which is considered as a negotiable area with the South African Airforce (SAAF). The topography between the site and the military installation is considered highly important, as elevated topography could pose a barrier to shield the effects of wind turbines on radar at the SAAF facility.
» Part of the site (Portion 12 & 13 of Farm 165 (Vendussie Kuil)) occurs within an area identified as part of the National Protected Area Expansion Strategy.
» The site falls within the Important Bird Area (IBA) SA037 - Platberg-Karoo Conservancy. This is considered a negotiable area, but the species and frequency of occurrence of birds on the site will be confirmed through on-site monitoring. The bird monitoring will provide key input into the EIA process.

4.5. Identification of a Site for Investigation in the EIA Process

Following the regional site assessment, it was juwi Renewable Energies' intention to proceed with an EIA process for the proposed Castle Wind Energy Facility under the project development company **Castle Wind Farm (Pty) Ltd**. As this Regional Site Assessment has guided juwi to site their proposed facility within an area/zone of preference (as per the regional methodology followed), no alternative locations or sites are to be considered through the EIA process. The demarcated area was an indicative area considered to be favourable/most viable for the development of a large-scale wind energy facility.

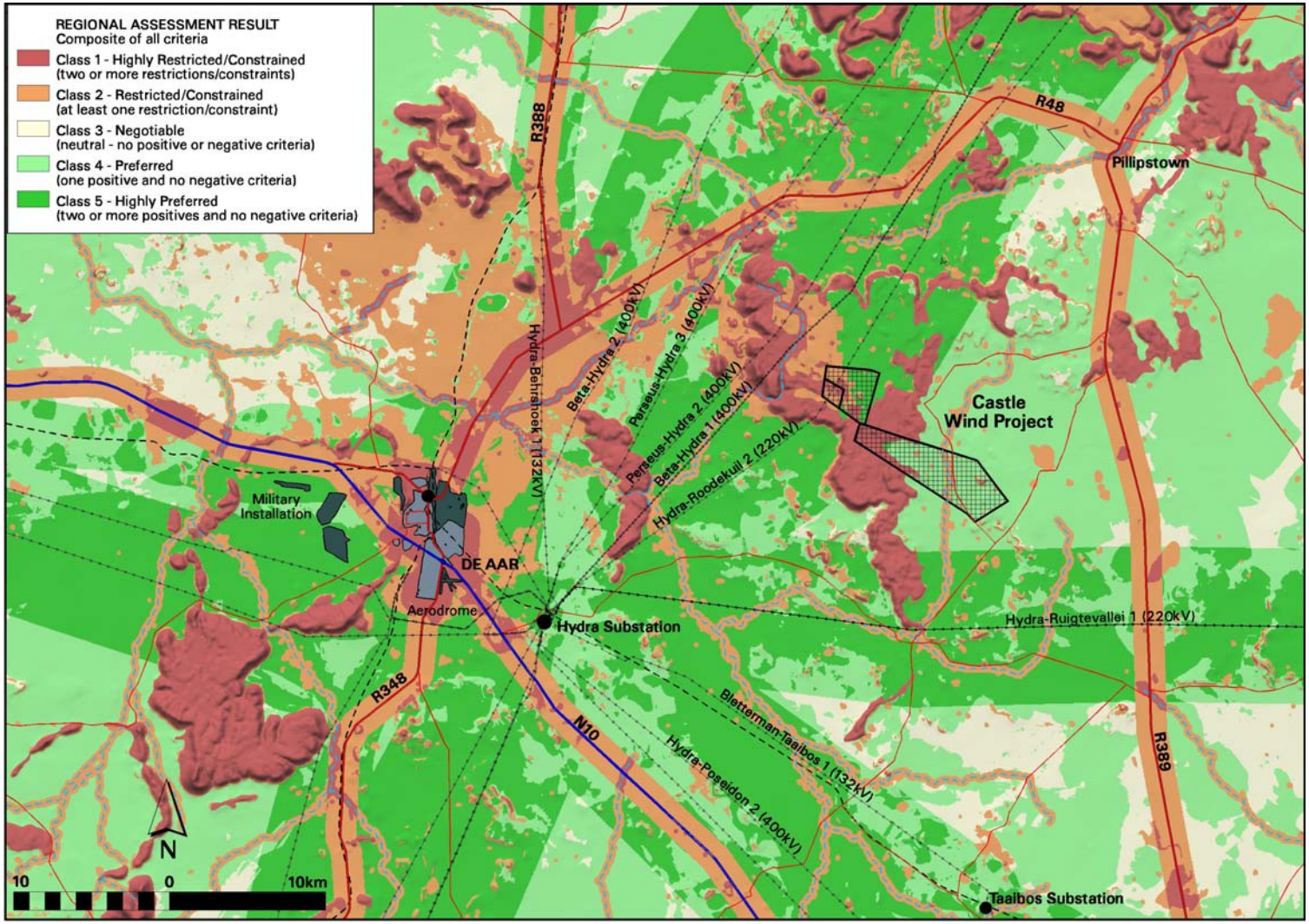


Figure 4.1: Composite map of all criteria of the Regional Assessment indicating the location of the proposed development site (indicated as the Castle Wind Project)

APPROACH TO UNDERTAKING THE SCOPING PHASE CHAPTER 5

An Environmental Impact Assessment (EIA) process refers to that process (dictated by the EIA Regulations) which involves the identification of and assessment of direct, indirect and cumulative environmental impacts associated with a proposed project. The EIA process comprises two phases: i.e. **Scoping Phase** and **EIA Phase**. The EIA process culminates in the submission of an EIA Report (including an Environmental Management Programme (EMPr)) to the competent authority for decision-making. The EIA process is illustrated below:

The Scoping Phase for the proposed Castle Wind Energy Facility has been undertaken in accordance with the EIA Regulations published in Government Notice 33306 of 18 June 2010, as amended in December 2010, in terms of Section 24(5) of the National Environmental Management Act (NEMA; Act No 107 of 1998). This scoping process is aimed at identifying potential issues associated with the proposed project, and defining the extent of studies required within the EIA. This was achieved through an evaluation of the proposed project involving specialists with expertise relevant to the nature of the project and the study area, the project proponent, as well as a consultation process with key stakeholders (including relevant government authorities) and interested and affected parties (I&APs). This chapter serves to outline the process which was followed during the Scoping Phase of the EIA process.

5.1 Objectives of the Scoping Phase

This Scoping Phase aims to:

» Identify and evaluate potential environmental (biophysical and social) impacts and benefits of all components and all phases of the proposed development (including design, construction, operation and decommissioning) within the broader study area through a desk-top review of existing baseline data and specialist studies.

» Define potentially sensitive areas from an environmental perspective within the identified farm portions in order to inform the placement of infrastructure.
» Define the scope of studies to be undertaken within the EIA process.
» Identify potentially interested and affected parties and stakeholders and involve them within the EIA process.
» Provide the authorities with sufficient information in order to make a decision regarding the scope of issues to be addressed in the EIA process, as well as regarding the scope and extent of specialist studies that will be required to be undertaken as part of the EIA Phase of the process.

Within this context, the objectives of this Scoping Phase are to:

» Detail the scope and nature of the proposed activities.
» Define the reasonable and feasible project-specific alternatives to be considered through the EIA process, including the "do nothing" option.
» Identify and evaluate key environmental issues/impacts associated with the proposed project, and through desk-top specialist studies identify environmentally sensitive areas within the site, and those issues to be addressed in more detail in the Impact Assessment Phase of the EIA process.
» Conduct an open, participatory and transparent public involvement process and facilitate the inclusion of stakeholders' concerns regarding the proposed project into the decision-making process.

5.2 Overview of the Scoping Phase

The Scoping Phase has been undertaken in accordance with the EIA Regulations published in Government Notice 33306 of 18 June 2010, in terms of NEMA. Key tasks undertaken within the scoping phase included:

» Consultation with relevant decision-making and regulating authorities (at National, Provincial and Local levels).
» Submission of a completed application form for authorisation in terms of Regulation 12 and 26 of Government Notice No R543 of 2010 to the competent authority (DEA).
» Undertaking a public involvement process throughout the Scoping process in accordance with Chapter 6 of Government Notice No R543 of 2010 in order to identify issues and concerns associated with the proposed project.
» Preparation of an Comments and Response Report detailing key issues raised by I&APs as part of the EIA Process (in accordance with Regulation 57 of Government Notice No R543 of 2010).
» Undertaking of independent specialist studies in accordance with Regulation 32 of Government Notice No R543 of 2010.

These tasks are discussed in detail below.

5.2.1 Authority Consultation and Application for Authorisation in terms of GN No R543 of 2010

As this is an electricity generation project the National Department of Environmental Affairs (DEA) is the competent authority for this application. As the project falls within the Northern Cape Province, the Northern Cape Department of Environment and Nature Conservation (Northern Cape DENC) act as a commenting authority for the project. Consultation with the Regulating authorities has been undertaken throughout the Scoping process. This consultation has included the following:

» Consultation with DEA regarding the proposed project and the EIA process to be undertaken.
» Submission of an application for authorisation to DEA. An application for authorisation has been accepted by DEA under application reference number 14/12/16/3/3/2/278.

In terms of sections 24 and 24D of NEMA, as read with the EIA Regulations of GN R543 (Regulations 26-35), R544, R545 and R546, a Scoping Study and EIA are required to be undertaken for this proposed project.

5.2.2 I&AP Identification, Registration and the Creation of a Project Database

The first step in the public involvement process was to identify relevant stakeholders and interested and affected parties (I&APs). This process was undertaken through existing contacts and databases, recording responses to site notices and newspaper advertisements, as well as through the process of networking.

Stakeholder groups identified include, amongst others:

» National, provincial and local government departments (including DEA, Northern Cape DENC, South African Heritage Resources Agency (SAHRA), Department of Water Affairs (DWA), Civil Aviation Authority (CAA), Department of Agriculture, Eskom, SKA etc.);
» Government Structures (including the Provincial Roads Authority, municipal planning departments, etc.);
» Emthanjeni Local Municipality and Renosterberg Local Municipality;
» Pixley Ka Seme District Municipality;
» Potentially affected and neighbouring landowners and tenants;
» Conservation authorities (i.e. Bird Life South Africa);
» Industry and business.

All relevant stakeholder and I&AP information has been recorded within a database of affected parties (refer to Appendix C for a listing of recorded parties). While I&APs have been encouraged to register their interest in the project from the start of the process, the identification and registration of I&APs will be on-going for the duration of the EIA process. The project database will be updated on an on-going basis throughout the project process, and will act as a record of the parties involved in the public involvement process.

5.2.3 Notification of the EIA Process

In order to notify and inform the public of the proposed project and invite members of the public to register as interested and affected parties (I&APs), the project and EIA process was advertised in the De Aar Echo and the Volksblad on 23 August 2013.

In addition, site notices were placed onsite and in public places on 21 August 2013 (farm entrance gates, the public library in De Aar and municipal office in De Aar) in accordance with the requirements of the EIA Regulations

In addition to the above advertisements and notices, key stakeholders and identified I&APs were notified in writing of the commencement of the EIA process. These parties included, inter alia:

- Relevant parties from municipalities potentially affected by the proposed project.
- The affected landowners and neighbouring landowners
- Organs of State having jurisdiction in respect of any aspect of the activity, including:
  - Department of Water Affairs (DWA)
  - Department of Mineral Resources (DMR)
  - Department of Agriculture, Forestry and Fisheries (DAFF)
  - Department of Transport and Public Works and various District Roads Departments
  - South African National Roads Agency (SANRAL)
  - Department of Rural Development and Land Reform
  - Civil Aviation Authority (CAA)
  - South African Heritage Resources Agency (SAHRA)
  - Eskom
  - SKA

Copies of all the advertisements placed and notices distributed are contained in Appendix D of this report. Copies of these letters distributed to the above

mentioned organs of state/ key stakeholders are included in Appendix E of this report.

5.2.4 Framework for Public Involvement and Consultation

The aim of the public participation process throughout the EIA process is primarily to ensure that:

» All potential stakeholders and I&APs are identified and consulted with.
» Information containing all relevant facts in respect of the application is made available to potential stakeholders and I&APs.
» Participation by potential I&APs is facilitated in such a manner that all potential stakeholders and I&APs are provided with a reasonable opportunity to comment on the application.
» Comment received from stakeholders and I&APs is recorded.

In order to provide information regarding the proposed project and the EIA process, a background information document (BID) for the project was compiled at the outset of the process (refer to Appendix E). The BID has been distributed to identified stakeholders and I&APs, and additional hard copies have been made available at public venues within the broader study area. The BID is also available on the Savannah Environmental website.

Through consultation with key stakeholders and I&APs, issues for inclusion within the issues-based scoping study are identified and confirmed. In order to accommodate the varying needs of stakeholders and I&APs within the study area, as well as capture their views, issues and concerns regarding the project, various opportunities have been and will continue to be provided for I&APs to have their issues noted, as follows:

» **Notification** of the proposed project in printed media and on site
» **Public meeting** in the study area (advertised in the local press)
» **Focus group meetings** (pre-arranged and stakeholders invited to attend)
» One-on-one **consultation meetings** (including with directly affected or surrounding landowners)
» **Telephonic consultation** sessions (consultation with various parties from the EIA project team, including the project participation consultant, lead EIA consultant as well as specialist consultants)
» Written, faxed or e-mail **correspondence.**

5.2.5 Public Involvement and Consultation Undertaken during Scoping Phase

Notification and telephonic consultations: Authorities having jurisdiction over the study area were notified of the proposed project. Landowners and adjacent landowners were identified and provided with written notice of the project and the Background Information Document, as well as an invitation to attend the public meeting. The details of the public meeting were advertised and included in a stakeholder letter to state departments, municipalities, landowners and adjacent landowners and widely in the regional newspapers (De Aar Echo and the Volksblad).

Authorities meeting: During the review period of the Draft Scoping Report meetings were held with the local municipalities and relevant organs of state. The minutes of the meetings are attached to the Final Scoping Report.

Public meeting: Public consultation and focus group meetings were held in De Aar and/ Phillips Town during the review period of the Draft Scoping Report. The minutes of the meetings are attached to the Final Scoping Report.

Focus group meetings: During the review period of the Draft Scoping Report focus group meetings were held with stakeholders such as the local Farmers Association, and affected and surrounding landowners for the facility and power line. The minutes of the meetings are attached to the Final Scoping Report.

Networking with I&APs will continue throughout the duration of the EIA process. Issues and concerns raised by I&APs were consolidated into a Comments and Response Report (refer to Appendix E).

5.2.6 Public Review of Draft Scoping Report

This is the **final stage** of the Scoping Phase. The Draft Scoping Report has been made available for public review for a 40- day period from **26 September 2013 – 04 November 2013** at the following locations:

» De Aar Public Library – 21 Station Street, De Aar
» Phandulwazi Library – Nanzwakazi Location, Hlithani Street, De Aar
» Emthanjeni Local Municipality Offices – 45 Voortrekker Street, De Aar
» Frans Jooste Library – Bree Street, Philipstown
» Renosterberg Local Municipality – Green Street, Philipstown
» The report is also available from download from www.savannahSA.com

In order to facilitate comments on the Draft Scoping Report, a public meeting was held during the review period for the Draft Scoping Report as follows:

» Date: Tuesday 15 October 2013
» Time: 18h00
» Venue: De Aar East Community Hall, De Aar (Co-ordinates: S 30° 38.970'; E 024° 01.369')

The details of the public meeting and availability of the Draft Scoping Report were advertised in the De Aar Echo on 27 September 2013) and Volksbald on the 26 September 2013. In addition, all registered I&APs and landowners were notified of the availability of the report and public meeting by letters sent via email and registered mail (refer to Appendix E).

5.2.7 Summary of Public Involvement Process undertaken to date (Scoping Phase)

Activity	Date
Placement of newspaper advert in local newspapers notifying the public and interested parties of the project.	23 August 2013
Placement of site notices on-site & in public places	21 August 2013
Distribution of a stakeholder letter, background information document to authorities, ward councillors, landowners within the study area, neighbouring landowners and stakeholder groups	August 2013 – September 2013
Placement of newspaper advert in local newspapers informing interested and affected parties of the availability of the Draft Scoping Report and Public Meeting date.	27 – 28 September 2013
40-day public review period for the Draft Scoping Report for public comment	26 September 2013 – 04 November 2013
Public Meeting	26 September 2013
Focus group meetings	26-27 September 2013
Notification to registered I&APs of submission of Final Scoping Report to DEA	November 2013

5.2.8 Evaluation of Issues Identified through the Scoping Process

Issues (both direct and indirect environmental impacts) associated with the proposed project identified within the scoping process have been evaluated through desk-top studies. In evaluating potential impacts, Savannah Environmental has been assisted by the following specialist consultants:

Specialist	Area of Expertise	Refer Appendix
Simon Todd of Simon Todd Consulting	Ecology, flora and fauna	Appendix F
Jon Smallie of WildSkies Ecological Services	Avifauna	Appendix G
Werner Marais of Animalia	Bats	Appendix H
Johann Lanz	Agricultural potential & Soils	Appendix I
Morne de Jager of Enviro Acoustic Research	Noise	Appendix J
Lourens du Plessis of MetroGIS	Visual Impact	Appendix K
Tony Barbour (Environmental Consultant and Researcher)	Social Impact	Appendix L
Jaco van der Walt of Heritage Contracts and Archaeological Consulting cc	Archaeology and Heritage	Appendix M
John Almond	Palaeontology	Appendix N

These specialist studies considered the full extent of the proposed properties and power line corridor with the aim of identifying potentially sensitive areas which should be considered in the planning of infrastructure. These studies were largely desk-top studies, with limited field work in some cases.

In order to evaluate issues and assign an order of priority, the following methodology was used to identify the characteristics of each potential issue/impact for each of the proposed project components:

» Identify the **nature** of the potential impact, which includes a description of what causes the effect, what will be affected and how it will be affected.
» Identify the **extent** of the potential impact, wherein it is indicated whether the impact will be local (limited to the immediate area or site of development) or regional,
» Identify **sensitive receptors** that may be impacted on by the proposed facility and the **types of impacts** that are most likely to occur.
» Evaluate the **significance** of potential impacts in terms of the requirements of the EIA Regulations.
» Identify the potential impacts that will be **considered further** in the EIA Phase of the process.

5.2.9 Final Scoping Report

The final stage in the Scoping Phase entailed the capturing of responses from stakeholders and I&APs on the Draft Scoping Report in order to refine this report. It is this final report upon which the decision-making environmental Authorities

provide comment, recommendations and acceptance to undertake the EIA Phase of the process.

5.3 Regulatory and Legal Context

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 renewable energy development is a multi-sectoral issue (encompassing economic, spatial, biophysical, and cultural dimensions) various statutory bodies are likely to be involved in the approval process for renewable energy facility project and the related statutory environmental assessment process.

5.3.1 Regulatory Hierarchy

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

» *Department of Energy*: This department is responsible for policy relating to all energy forms, including renewable energy, and are responsible for forming and approving the IRP (Integrated Resource Plan for Electricity). It is the controlling authority in terms of the Electricity Regulation Act (Act No 4 of 2006).
» *National Energy Regulator of South Africa (NERSA):* This body is responsible for regulating all aspects of the electricity sector, and will ultimately issue licenses for wind energy developments to generate electricity.
» *Department of Environmental Affairs (DEA):* This Department is responsible for environmental policy and is the controlling authority in terms of NEMA and the EIA Regulations. The DEA is the competent authority for this project, and charged with granting the relevant environmental authorisation.
» *The South African Heritage Resources Agency (SAHRA):* The National Heritage Resources Act (Act No 25 of 1999) and the associated provincial regulations provide legislative protection for listed or proclaimed heritage sites.
» *Department of Transport – South African Civil Aviation Authority (SACAA):* This department is responsible for aircraft movements and radar, which are aspects that influence wind energy development location and planning.
» *South African National Roads Agency Limited (SANRAL):* This department is responsible for all National road routes.
» *Department of Water Affairs (DWA):* The DWA is mandated to manage South Africa's water resources by ensuring the security and quality thereof.
» *The Department of Agriculture, Forestry and Fisheries (DAFF):* This Department is the custodian of South Africa's agriculture, fisheries and forestry resources

and is primarily responsible for the formulation and implementation of policies governing the Agriculture, Forestry and Fisheries Sector. This Department has published a guideline for the development of wind farms on agricultural land. Deals with sub-division or registration of a long term lease on agricultural land. Consent from this Department is required for the development and reckoning of the land to be utilised by the wind energy facility.

» *National Department of Water Affairs* – This Department is responsible for evaluating and issuing licenses pertaining to water use.
» *Department of Mineral Resources*: A Section 53 Application is required in terms to this Department. DMR consent required.

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

» *Provincial Government of the Northern Cape – Department of Environment and Nature Conservation (Northern Cape DENC).* This department is the commenting authority for this project.
» *Department of Transport and Public Works - Northern Cape.* This department is responsible for roads and the granting of exemption permits for the conveyance of abnormal loads on public roads.
» *Northern Cape Department of Agriculture and Rural Development* – This is the provincial authority responsible for matters affecting agricultural land.
» *Northern Cape Heritage*: provides legislative protection for listed or proclaimed heritage sites, such as urban conservation areas, nature reserves and proclaimed scenic routes.

At **Local Level** the local and municipal authorities are the principal regulatory authorities responsible for planning, land use and the environment. In the Northern Cape, the local and district municipalities (Emthanjeni Local Municipality, Renosterberg Local Municipality and Pixley Ka Seme District Municipality) play a role. In terms of the Municipal Systems Act (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.

There are also numerous non-statutory bodies such as wind energy associations and environmental lobby groups that play a role in various aspects of planning and the environment that will influence wind energy development.

5.3.2 Legislation and Guidelines that have informed the preparation of this Scoping Report

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

- National Environmental Management Act (Act No. 107 of 1998)
- EIA Regulations, published under Chapter 5 of the NEMA (GNR R543 in Government Gazette 33306 of 18 June 2010)
- Guidelines published in terms of the NEMA EIA Regulations, in particular:
  - Companion to the National Environmental Management Act (NEMA) Environmental Impact Assessment (EIA) Regulations of 2010 (Draft Guideline; DEA, 2010)
  - Public Participation in the EIA Process (DEA, 2010)
  - Integrated Environmental Management Information Series (published by DEA)
- Municipal Integrated Development Plans
- International guidelines – the Equator Principles and the International Finance Corporation and World Bank Environmental, Health, and Safety Guidelines for Wind Energy (2007).
- Astronomy Geographic Advantage Act (Act No. 21 of 2007)

Several other Acts, standards or guidelines have also informed the project process and the scope of issues evaluated in the scoping report, and to be addressed in the EIA. A listing of relevant legislation identified at this stage of the process is provided in Table 5.1. A more detailed review of legislative requirements applicable to the proposed project will be included in the EIA phase.

Table 5.1: Initial review of relevant policies, legislation, guidelines and standards applicable to the proposed Castle Wind Energy Facility EIA

Legislation	Applicable Sections
National Legislation	
Constitution of the Republic of South Africa (108 of 1996)	» Bill of Rights (S2) » Environmental Rights (S24) – i.e. the right to an environment which is not harmful to health and well-being » Rights to freedom of movement and residence (S22) » Property rights (S25) » Access to information (S32) » Right to just administrative action (S33)
National Environmental Management Act (Act No 107 of 1998)	» National environmental principles (S2), providing strategic environmental management goals and objectives of the government applicable throughout the Republic to the actions of all organs of state that may significantly affect the environment » NEMA EIA Regulations (GNR R543 of June 2010 as amended in December 2010) published in terms of Chapter 5 of the NEMA

Legislation	Applicable Sections
	» The requirement for potential impact on the environment of listed activities must be considered, investigated, assessed and reported on to the competent authority (S24 – Environmental Authorisations) » Duty of Care (S28) requiring that reasonable measures are taken to prevent pollution or degradation from occurring, continuing or recurring, or, where this is not possible, to minimise & rectify pollution or degradation of the environment » Procedures to be followed in the event of an emergency incident which may impact on the environment (S30)
Environment Conservation Act (Act No 73 of 1989)	» National Noise Control Regulations (GN R154 dated 10 January 1992)
National Heritage Resources Act (Act No 25 of 1999)	» Stipulates assessment criteria and categories of heritage resources according to their significance (S7) » Provides for the protection of all archaeological and paleontological sites, and meteorites (S35) » Provides for the conservation and care of cemeteries and graves by SAHRA where this is not the responsibility of any other authority (S36) » Lists activities which require developers any person who intends to undertake to notify the responsible heritage resources authority and furnish it with details regarding the location, nature and extent of the proposed development (S38) » 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 (S44)
National Environmental Management: Biodiversity Act (Act No 10 of 2004)	» Provides for the MEC/Minister to identify any process or activity in such a listed ecosystem as a threatening process (S53) - none have as yet been published » A list of threatened & protected species has been published in terms of S 56(1) - Government Gazette 29657. » Three government notices have been published, i.e. GN R 150 (Commencement of Threatened and Protected Species Regulations, 2007), GN R 151 (Lists of critically endangered, vulnerable and protected species) and GN R 152

Legislation	Applicable Sections
	(Threatened or Protected Species Regulations). » Provides for listing threatened or protected ecosystems, in one of four categories: critically endangered (CR), endangered (EN), 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 (National Environmental Management: Biodiversity Act: National list of ecosystems that are threatened and in need of protection, (G 34809, GoN 1002), 9 December 2011). » This Act also regulates alien and invader species. » Under this Act, a permit would be required for any activity which is of a nature that may negatively impact on the survival of a listed protected species.
Minerals and Petroleum Resources Development Act	» Regulates mining activities » Requirements for Environmental Management Programme for mining applications, including borrow pits » Section 53 requires Minister's consent to sterilise surface of land
National Environmental Management: Air Quality Act (Act No 39 of 2004)	» The Draft National Dust Control Regulations prescribe measures for the control of dust in all areas including residential and light commercial areas. » Measures to control noise (S34)
Conservation of Agricultural Resources Act (Act No 43 of 1983)	» Prohibition of the spreading of weeds (S5) » Classification of categories of weeds & invader plants (Regulation 15 of GN R1048) & restrictions in terms of where these species may occur » Requirement & methods to implement control measures for alien and invasive plant species (Regulation 15E of GN R1048) » Requirement to obtain permissions for the draining of vleis or wetlands
National Water Act (Act No 36 of 1998)	» National Government is the public trustee of the Nation's water resources (S3) » Entitlement to use water (S4) – entitles a person to use water in or from a water resource for purposes such as reasonable domestic use,

Legislation	Applicable Sections
	domestic gardening, animal watering, fire fighting and recreational use, as set out in Schedule 1 » Duty of Care to prevent and remedy the effects of pollution to water resources (S19) » Procedures to be followed in the event of an emergency incident which may impact on a water resource (S20) » Definition of water use (S21) » Requirements for registration of water use (S26 and S34) » Definition of offences in terms of the Act (S151)
Aviation Act (Act No 74 of 1962)	» 13th amendment of the Civil Aviation Regulations (CARs) 1997 » The Minister of Transport has under section 22(1) of the Aviation Act, 1962 made the regulations in the Schedule hereto. » Obstacle limitations and marking outside aerodrome or heliport - CAR Part 139.01.33
National Environmental Management: Waste Act (Act No 59 of 2008)	» The purpose of this Act is to reform the law regulating waste management in order to protect health and the environment by providing for the licensing and control of waste management activities. » The Act provides listed activities requiring a waste license. » S20 defines waste disposal practices.
National Veld and Forest Fire Act (Act No 101 of 1998)	» Formation of fire protection associations (S3) » Registration of fire protection associations (S4) » Duty to prepare and maintain firebreaks (S12) » Requirements for firebreaks (S13) » Readiness for fire fighting (S17) » Penalties (S24) and Offences (S25)
National Forests Act (Act No 84 of 1998)	» Protected trees (S12) » Forests (S19 – 21)
Astronomy Geographic Advantage Act (Act No. 21 of 2007)	» In terms of section 7(1) and 7(2) of this Act, the Minister declared core astronomy advantage areas on 20 August 2010 under Regulation No. 723 of Government Notice No. 33462. in this regard, all land within a 3 kilometres radius of the centre of the Southern African large Telescope dome falls under the Sutherland Core Astronomy Advantage Area. The declaration also applies to the core astronomy advantage area containing the MeerKAT radio telescope and the core of the planned Square Kilometre Array (SKA) radio telescope. The study area does not

Legislation	Applicable Sections
	fall within the 3 km radius of SALT or within an area which could affect the MeerKAT and SKA developments. » Under Section 22(1) of the Act the Minister has the authority to protect the radio frequency spectrum for astronomy observations within a core or central astronomy advantage area. As such, the Minister may still under section 23(1) of the Act, declare that no person may undertake certain activities within a core or central astronomy advantage area. These activities include the construction, expansion or operation of any fixed radio frequency interference source, facilities for the generation, transmission or distribution of electricity, or any activity capable of causing radio frequency interference or which may detrimentally influence the astronomy and scientific endeavour
Guideline Documents	
South African National Standard (SANS) 10328, Methods for environmental noise impact assessments in terms of NEMA No. 107 of 1998	» Prediction of impact that noise emanating from a proposed development would have on occupants of surrounding land by determining the rating level. » Noise limits are based on the acceptable rating levels of ambient noise contained in SANS 10103
Strategic Initiative to Introduce Commercial Land Based Wind Energy Development to the Western Cape - Towards a Regional Methodology for Wind Energy Site Selection	» Regional methodology for the siting of wind energy facilities within the Western Cape (Report 5) » Project level methodology for assessing wind energy facilities within the Western Cape (Report 6)
Draft Guidelines for Granting of Exemption Permits for the Conveyance of Abnormal Loads and for other Events on Public Roads	» Outlines 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
» Emthanjeni Local Municipality's IDP (2012-2013) » Renosterberg Local Municipality's IDP (2011-2013) » Pixley ka Seme District's IDP (2009-2012).	» Planning and sustainability objectives for Local and District municipalities
Department of Agriculture, Fisheries and Forestry (DAFF)	» Regulations For The Evaluation And Review Of Applications Pertaining To Wind Farming On Agricultural Land
Birdlife South Africa / Endangered	» Stipulates an integrated programme of pre-

Legislation	Applicable Sections
Wildlife Trust Best Practice Guidelines For Avian Monitoring And Impact Mitigation At Proposed Wind Energy Development Sites In Southern Africa	and post-construction monitoring for wind farm projects in order to: o Develop our understanding of the effects of wind energy facilities on southern African birds. o To develop the most effective means to mitigate the impacts on birds.
Guidelines to minimise the impact on birds of Solar Facilities and Associated Infrastructure in South Africa	» Provision of a guideline and approach to conducting avifaunal specialist studies at the desktop, EIA and post-construction monitoring stages.
South African Good Practice Guidelines for Surveying Bats in Wind Farm Developments (2011)	» Stipulates an integrated programme of pre- and post-construction monitoring for wind farm projects in order to: o develop our understanding of the effects of wind energy facilities on bats. » To develop the most effective means to mitigate the impacts on bats.
Policies and White Papers	
The White Paper on the Energy Policy of the Republic of South Africa (December 1998)	» Investment in renewable energy initiatives, such as the proposed wind energy facility, is supported by this white Paper.
The White Paper on Renewable Energy (November 2003)	» This Paper sets out Government's vision, policy principles, strategic goals and objectives for promoting and implementing renewable energy in South Africa.
Provincial Legislation	
Northern Cape Nature Conservation Act, Act No. 9 of 2009	This Act provides for the sustainable utilisation of wild animals, aquatic biota and plants; provides for the implementation of the Convention on International Trade in Endangered Species of Wild Fauna and Flora; provides for offences and penalties for contravention of the Act; provides for the appointment of nature conservators to implement the provisions of the Act; and provides for the issuing of permits and other authorisations. Amongst other regulations, the following may apply to the current project: » Boundary fences may not be altered in such a way as to prevent wild animals from freely moving onto or off of a property; » Aquatic habitats may not be destroyed or damaged; » The owner of land upon which an invasive species is found (plant or animal) must take the necessary steps to eradicate or destroy such

Legislation	Applicable Sections
	species. » The Act provides lists of protected species for the Province.

DESCRIPTION OF THE AFFECTED ENVIRONMENT CHAPTER 6

This section of the Scoping Report provides a description of the environment from a desktop perspective that may be affected by the proposed Castle Wind Energy Facility near De Aar, in the Northern Cape Province. This information is provided in order to assist the reader in understanding the possible effects of the proposed project on the environment. Aspects of the biophysical, social and economic environment that could be directly or indirectly affected by, or could affect, the proposed development and associated infrastructure such as the power line have been described. This information has been sourced from both existing information available for the area as well as collected desktop data undertaken by specialists who have a working knowledge of the area, and aims to provide the context within which this EIA is being conducted. A more detailed description of each aspect of the affected environment is included within the specialist scoping reports contained within Appendices F to N).

6.1. Regional Setting and the Study Area

The proposed Castle Wind Energy Facility site is located in the sparsely populated region of the Karoo in the Northern Cape Province. The proposed site falls within the Emthanjeni Local Municipality and the Renosterberg Local Municipality. The administrative centre of the Emthanjeni Local Municipality is De Aar, which lies approximately 300 km south east of the provincial capital of Kimberley. The site lies ~28 km north-east of De Aar and ~22 km south-west of Philipstown. The wind energy facility is proposed to be located on the following farm portions:

» Portion 12 of Farm 165 (Vendussie Kuil)
» Portion 13 of Farm 165 (Vendussie Kuil)
» The Remaining Extent of Portion 0 of Farm 8 (Knapdaar)

The three farm portions collectively make up a broader study area of approximately 3257ha (i.e. 32.6 km^2) which is being considered for siting of the wind energy facility and in this report. The site is accessible from the R389 arterial road (traversing east of the site) by means of gravel roads that intersect with this regional route.

Portions 12 and 13 of the Farm 165 (Vendussie Kuil) are traversed by the Hydra to Roodekuil 2 220kV power line. The Hydra substation is located southeast of De Aar, approximately 23km (at the closest) from the proposed Castle Wind Energy Facility site. A host of other power lines traverses further northwest of the site, which congregate at the Hydra substation. These are: Hydra to Roodekuil 1-

220kV, Beta to Hydra 1 & 2 - 400kV and Perseus to Hydra 2 & 3 - 400kV. Another set of power lines traverses south of the proposed development site. The closest of these are the Hydra to Ruigtevallei 1 & 2 - 22kV lines, located just less than 7km at the closest.

Excluding the participating landowners residential dwellings (Rooikraal) and workers houses on the site itself, there are no formal residential areas on the site. Homesteads or farm residences surrounding / in proximity to the proposed wind energy facility site include: Meyersfontein, Witput, Die Dam, Leeufontein, Slingershoek, Matjiesfontein, Pienaarskloof, Kranskop, Klipfontein, Garrenboom, Vendussiekraal, Disselskuil, Groenpan, Plessisvlakte, Rooidam, Knapdaar, etc. The average population density of the district municipality is estimated at approximately 10 people per km^2, primarily concentrated within the towns of De Aar and Philipstown.

6.2. Land Cover/ Land-Use

The most prominent land use activity within the study area is sheep farming. There are no major tourist attractions within the study area. However, the region is a popular as a stop-over for visitors travelling between Gauteng and Cape Town, although most accommodation, resorts and activities are concentrated near Colesberg (e.g. the Gariep Dam, Van Der Kloof Dam, etc.) which is located almost 70km southeast of the Castle site.

The natural vegetation or land cover types of the region are described as Shrubland, limited Thicket and Bushland and Grassland. The natural vegetation types of the study area is homogenous and are indicated as Northern Upper Karoo, in the lower lying areas, and Besemkaree Koppies Shrubland on the elevated areas, hills and low mountains. Refer to Figure 6.1 which shows the broad land cover types/land use patterns.

6.3. Climatic Conditions

The study area receives an average of less than 300mm rainfall per annum and is representative of the dry semi-desert climate associated with the Great Karoo. Rainfall for the site is low and is ~290 mm per annum according to the South African Rain Atlas (Water Research Commission, undated). In terms of the relationship between rainfall and evaporation the lower lying parts of the site fall into the classification of arid while the higher lying parts fall into the classification of semi-arid. The aridity is a significant limitation to agriculture in the region.

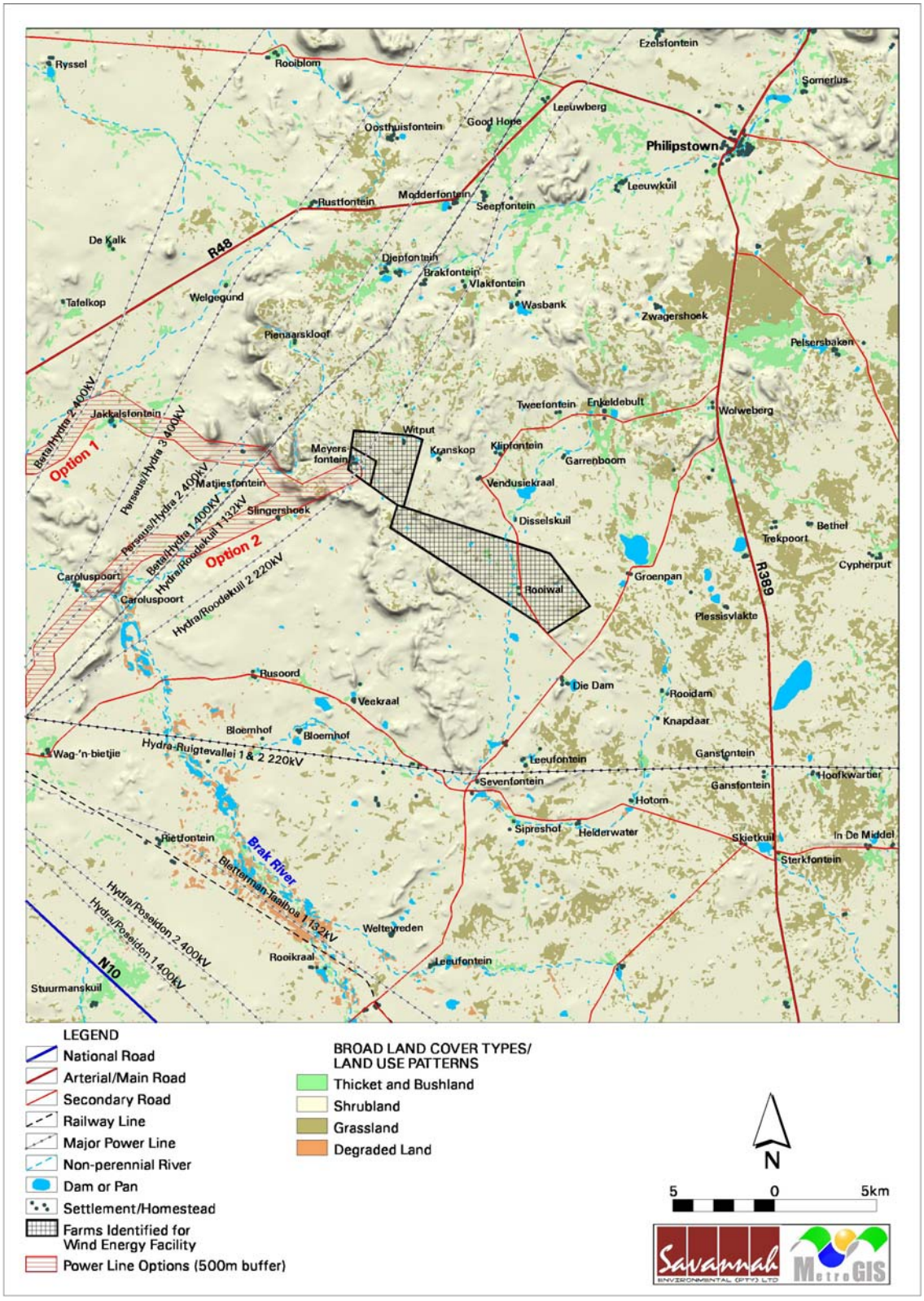


Figure 6.1: Land cover/land use map of Portion 5 of the Farm Nelspoortje No. 103, as well as the broader study area

6.4. Critical Biodiversity Areas & Conservation Planning Areas

No fine-scale conservation planning has been conducted in the area and so no Critical Biodiversity Areas have been defined for the region. However, the western part of Portion 12 and 13 of the Farm 165 (Vendussie Kuil) lies within a National Protected Areas Expansion Strategy focus area (Refer to Figure 6.4). NPAES focus areas are areas that are considered important for the expansion of the land-based protected area network as they contribute towards meeting biodiversity thresholds for terrestrial or freshwater ecosystems, maintaining ecological processes or climate change resilience. The affected NPAES focus area is a part of the Senqu Caledon focus area, but at 6400ha it a relatively small part of the broader 345 913ha Senqu Caledon focus area. Approximately 450ha of the NPAES focus area is actually within the site. In addition, the proposed wind energy facility is situated within the Platberg Karoo Conservancy Important Bird Area (IBA – Barnes 1998), this IBA is discussed further under Section 6.3.7 (Avifauna).

6.5. Biophysical Characteristics of the Study Site and Surrounds

6.3.1. Topography

The topography or terrain morphology of the region is broadly described as Lowlands with Hills of the Interior Plain. The elevation above sea level ranges from 1687m at the top of the northern section of the escarpment (near Pienaarskloof), to 1238m along the Brak River floodplain (where it leaves the study area in the west). The site itself has an undulating slope elevation with some low hills or ridges occurring in places. A shaded Relief map is shown in Figure 6.2. The proposed wind energy facility site is predominantly on an elevated, mountainous plateau within the Karoo. There is a drainage valley that runs through the eastern part of the site. Elevation ranges between 1400 meters in the valley to 1550 meters on the highest parts of the plateau. Average slope across the site is around 3%, but the terrain is broken and there are short slopes that are much steeper (up to 25%).

6.3.2. Hydrology

The non-perennial Brak River is the only major hydrological feature, traversing the study area from the south-east to the west. Other non-perennial rivers or streams are located throughout the region, one of which traverses the proposed development site. A number of farm dams are found throughout the study area

and there is a high occurrence of non-perennial pans to the east. The broader study area is drained by a network of small intermittent streams that flow eastwards into an unnamed north-south flowing tributary of the Brakrivier.

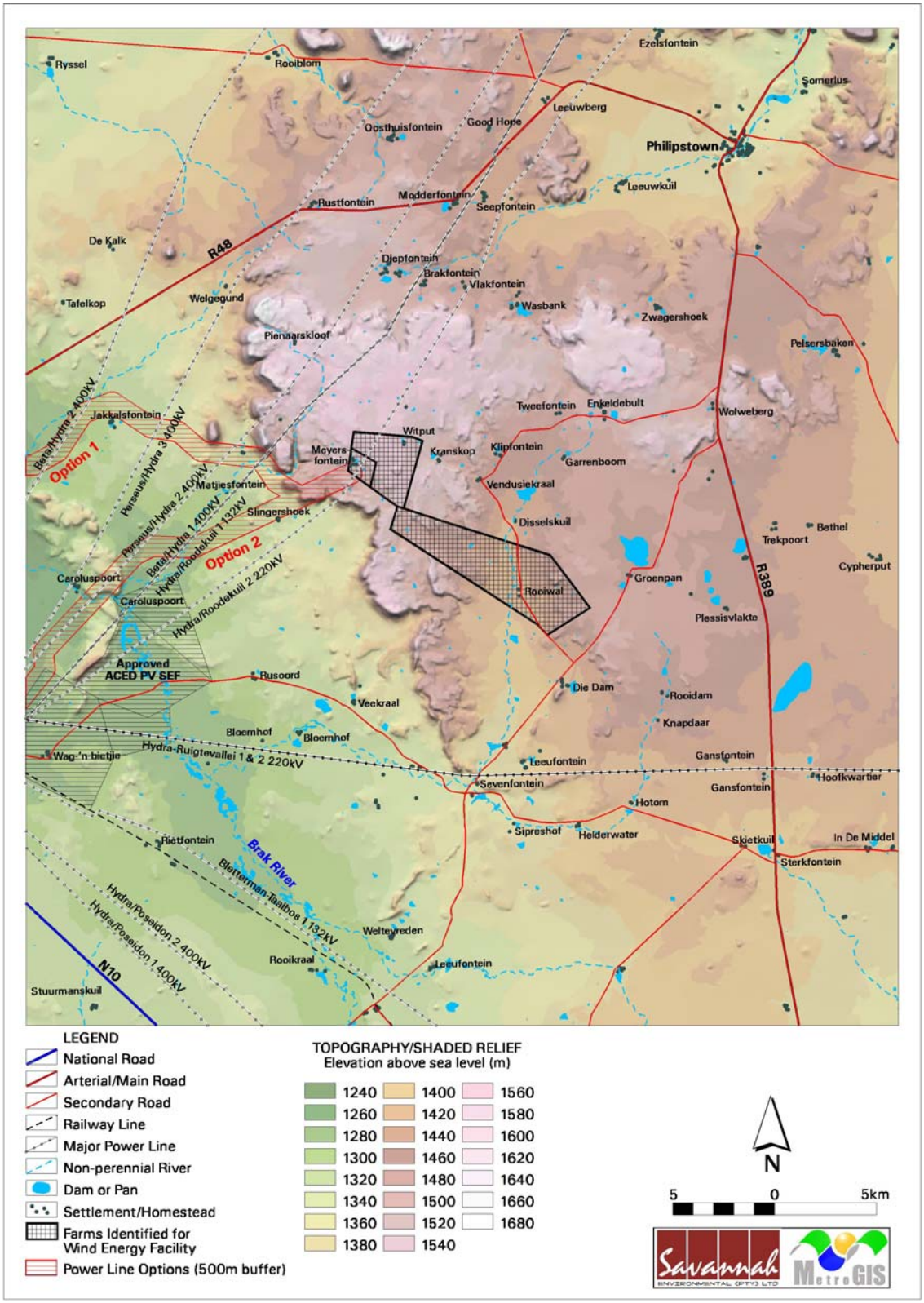


Figure 6.2: Shaded relief map indicating the location of the proposed facility and the topography and elevation above sea level

6.3.3. Geology, Soils and Agricultural Potential

The geology is shale and sandstone of the Beaufort and Ecca groups of the Karoo Supergroup, with dolerite intrusions, commonly forming the crests. Soils and geology consist of shales of the Volksrust formation and the Prince Albert Formation, as well as Dwyka Group diamictites, while there are also dolerite sills and sheets in places. Large areas are also covered by superficial deposits of calcrete from the Kalahari Group. Soils are variable and may be deeper sandy soils or shallow soils of the Glenrosa and Mispah forms.

The land type classification is a nation-wide survey that groups areas of similar soil and terrain conditions into different land types. There are four land types across the site (refer to Figure 6.3) described as follows:

» *Land type Ae142* - occupies the valley area with slightly deeper soils, while the other land types occupy the plateau areas. Almost all soils have a reasonably high clay content and are limited in depth by fairly shallow bedrock in the subsoil.
» Land type Ae142 and Ag11 have a low susceptibility to water erosion (class 1) while the other two types have higher susceptibility (class 5 and 6).

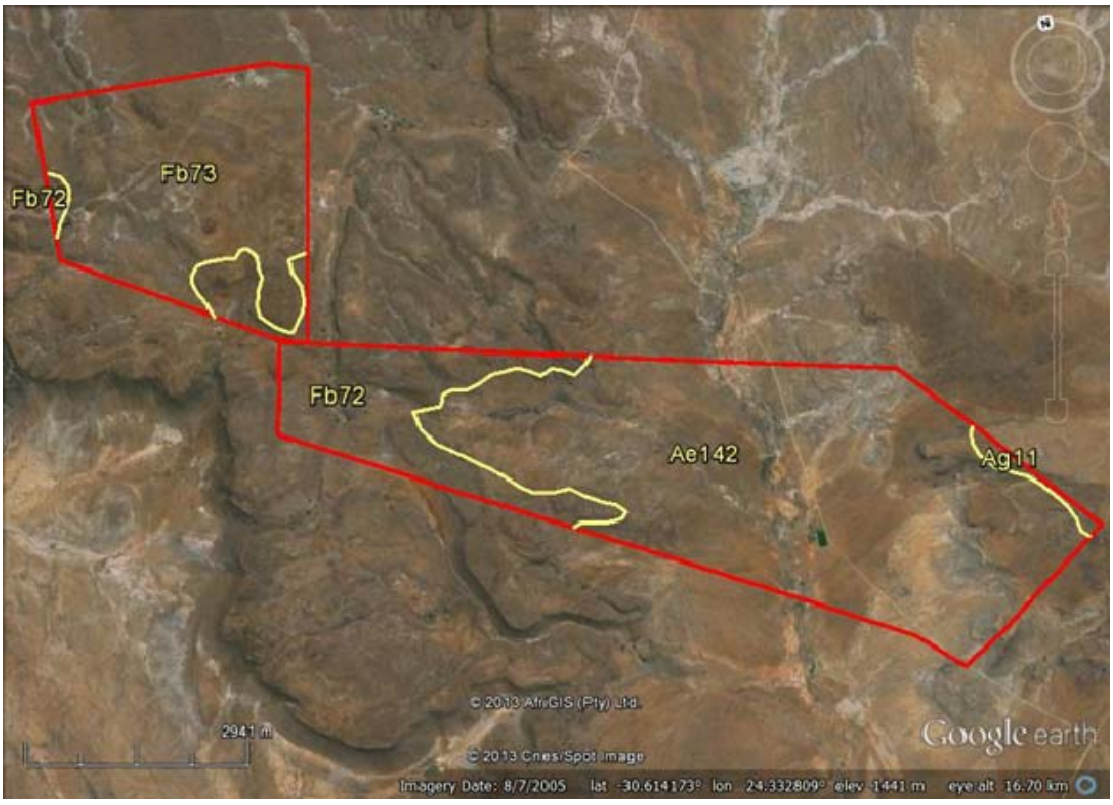


Figure 6.3: The Distribution of the different land types within the Castle Wind Energy Facility site (with yellow boundaries between land types).

A summary detailing soil data for the different land types is provided in Table 6.1.

Table 6.1: Land type data for site. Erosion indicates the severity of the water erosion hazard on an 8 class system, with 8 being most severe

Land type	Land capability class	Dominant soil forms	Depth (cm)	Clay % A horizon	Clay % B horizon	Depth limiting layer	Erosion	% of land type
Ae142	VII	Hutton	30-50	15-25	25-40	R	1	40
		Swartland	3-20	15-30	35-45	so		22
		Valsrivier	6-30	15-30	35-45	vr, vp		15
		Oakleaf	60-120	15-25	35-45	ne		6
		Mispah	2-10	10-20		R, ca		5
		Glenrosa	5-15	10-25		R		5
		Oakleaf	60-120	15-20	20-35	ne		4
Fb73	VII	Mispah	5-10	15-25		R	5	36
		Glenrosa	10-20	15-25		R		18
		Hutton	20-30	15-25	15-25	R		16
		rock outcrop	0	0		R		15
		Swartland	2-10	15-30	30-45	so		12
Fb72	VII	Mispah	5-15	10-25		R	6	56
		rock outcrop	0	0		R		20
		Glenrosa	10-20	10-25		R		16
		Swartland	2-10	15-30	30-45	so		5
Ag11	VII	Hutton	10-35	6-20	6-25	R	1	31
		Swartland	2-20	15-35	30-45	so		22
		Hutton	20-40	25-30	35-45	R		12
		Mispah	3-10	10-20		R		5
		rock outcrop	0	0		R		5
		Valsrivier	6-30	20-30	35-45	vr, vp		5

Land capability classes: VII - non-arable, low potential grazing land
Depth limiting layers: vr = structured clay horizon (red); vp = structured clay horizon (pedocutanic); R = hard rock; so = partially weathered rock; ca = hardpan carbonate; ne = weakly structured B horizon.

Land capability is the combination of soil suitability and climate factors. The entire site has a land capability classification, on the 8 Category scale, of Class 7 (i.e non-arable, low potential grazing land). Land capability is limited by the mountainous, rocky terrain, the shallow soils and the aridity of the region. The site is used for sheep farming. The natural grazing capacity is low and varies between 18 - 30 hectares per large stock unit across the site. There is a very small area of cultivated, irrigated land surrounding the farm house (Rooi Kraal) which is located on the Farm Knapdaar.

6.3.4. Flora & Broad Scale Vegetation Patterns

According to the national vegetation map (Mucina & Rutherford 2006) (refer to Figure 6.3), two vegetation types (Northern Upper Karoo and Besemkaree

Koppies Shrubland) occur within the site itself and the same two vegetation types will most likely occupy the power line route to Hydra substation near De Aar. The eastern part of the site consists of Northern Upper Karoo and the western part of the site consists of Besemkaree Koppies Shrubland. Both vegetation types are classified as Least Threatened and have not been significantly transformed. These vegetation types are described below & in more detail in the ecological report (Appendix F):

» *Northern Upper Karoo* is usually an open shrubland dominated by low karoo shrubs and grasses with larger elements such as Acacia mellifera more prominent in the north. Known endemic plant species found in this vegetation type include: Lithops hookeriana, Stomatium pluridens, Atriplex spongiosa, Galenia exigua and Manulea deserticola.

» *Besemkaree Koppies Shrubland* is associated with the slopes of koppies, butts, and tafelbergs within the dry grasslands of the southern and central Free State and the adjacent parts of the Northern and Eastern Cape. This vegetation type consists of an upper layer of tall shrubs, such as Searsia erosa, S.burchellii, S.ciliata, Euclea crispa, Diospyros austro-africana and Olea europea subsp africana, with an understorey of low shrubs and grasses. This vegetation type is associated with dolerite koppies and sills embedded within Karoo supergroup elements. Four vegetation-type endemics have been recorded including Euphorbia crassipes, Neohenrica sibettii, N.spicata as well as an undescribed species of Cussonia.

Although these two vegetation types are clearly differentiated on the SA Vegmap, in reality, they are likely to form a much more complex mosaic with Besemkaree Koppies Shrubland on the rocky hillsides and outcrops, and Northern Upper Karoo on the plains, flat areas and lowlands.

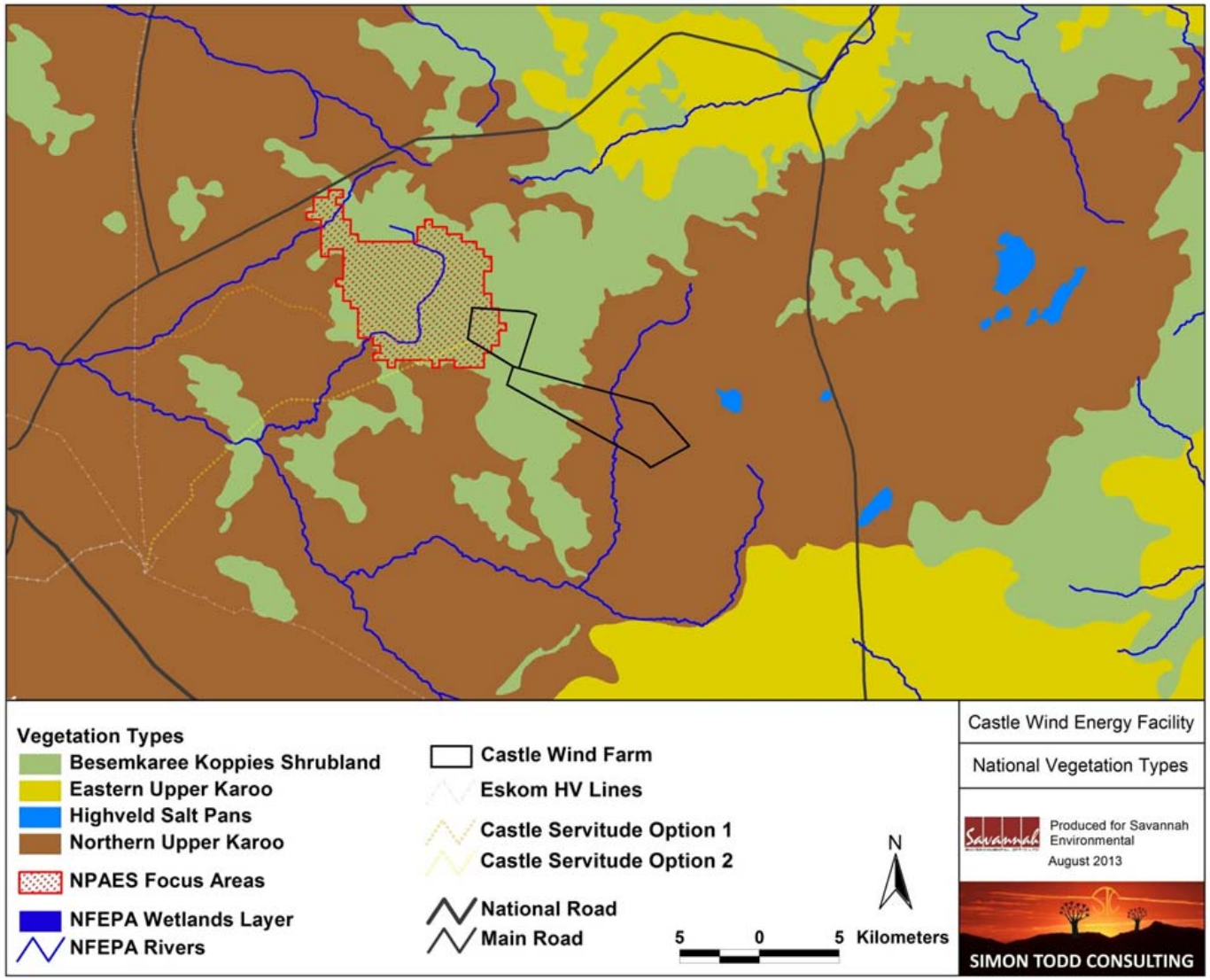


Figure 6.4: Map showing vegetation types (Mucina & Rutherford (2006) as well as National Freshwater Ecosystem Priority Areas assessment (Nel et al. 2011), as well as NPAES focus areas.

6.3.5. Listed and Protected Plant Species

According to the SANBI SIBIS database, 270 plant species have been recorded from the quarter degree squares 3024 CA, AD, CA, CB. This includes 5 species of conservation concern. However, one of the listed species *Asparagus stipulaceus* is an error resulting from changes in taxonomy since the data was collected. This species is restricted to the coast and does not occur in the area. Consequently, there are four species of conservation concern known from the area, three of which are classified as Data Deficient, indicating that little is known about these species. The low number of species recorded in the area and the Data Deficient status of the listed species, suggests that the area has not been well sampled in the past. The fourth species, *Rapanea melanophloeos* is a forest species that is not likely to occur at the site as there do not appear to be any sheltered kloofs or forest patches at the site. Overall, these results suggest that although the area has not been well investigated in the past, it is not likely to be highly diverse and while some listed species may be present, these are likely to be present as scattered and localised populations within specialised habitats and will have to be further investigated during the EIA phase.

6.3.6. Fauna

Mammals

The Castle Wind Energy Facility site lies within the range of 51 terrestrial mammals, including three listed mammal species. The three listed species are the Brown Hyaena Hyaena brunnea (NT), Black-footed cat Felis nigripes (VU) and Honey Badger Mellivora capensis (SA RDB EN). While the Black-footed Cat and Honey Badger may occur at the site, the Brown Hyaena is less likely to be present. All of these species have relatively wide ranges across South Africa. The south-facing slopes with dense vegetation, riparian areas and rocky outcrops are likely to provide habitat for mammalian species.

Reptiles

According to the distribution maps available in the literature, as many as 44 reptiles could occur in the study area. However, according to the records within the SARCA database, only 32 have been recorded in the region, which is a more representative estimate of the species richness likely to be encountered at the site. The site represents a relatively rich habitat for reptiles as it contains various types of rocky outcrops, koppies and slopes as well as more densely vegetated

areas, riparian areas and flats of varying texture. Despite the likely richness of the site for reptiles, no listed reptile species are known from the area.

Amphibians

Eleven frog species are known from the broad area around the site, including the Giant Bullfrog (*Pyxicephalus adpersus)* which is listed as Near Threatened. The Giant Bullfrog breeds in ephemeral pans and as there do not appear to be any suitable pans at the site, it is unlikely that the area is very important for this species. As there does not appear much natural, perennial water on the site, those species which require perennial water are likely to associated with farm dams and similar artificial water supplies. There are however a number of species which are relatively independent of perennial water and which would be more widespread at the site. Given the aridity of the site, the most important parts of the site for amphibians are likely to be the vicinity of the drainage lines.

6.3.7. Bats

In terms of habitat, the table below described the potential of the vegetation units of the site to serve as suitable roosting and foraging spaces for bats.

Vegetation Unit	Roosting Potential	Foraging Potential	Comments
Besemkaree Koppies Shrubland	Moderate - High	Moderate	The koppies and tafelbergs of this unit may provide adequate roosting space for bats. The shrubs and grasses may attract insects and thus bats for foraging, may be very weather dependent.
Northern Upper Karoo	Moderate	Moderate - Low	The dwarf shrubs and grasses may attract insects which in turn will attract foraging bats.

The ecology of three common South African insectivorous bat species are described below, these species could occur on the site and will be verified during the bat monitoring programme.

» *Miniopterusnatalensis: Miniopterusnatalens*is, commonly called the Natal - clinging bat, occurs widely across the country but mostly within the southern and eastern regions. It is listed as a Near Threatened conservation category. It is a cave-dependent species, such that the presence of suitable roosting sites in an area may be more important in predicting its presence than the vegetation. However, personal observations have proved this species to also utilize culverts as roosts, either singly or in very low numbers. This species assembles in large numbers to roost within caves. It utilizes separate caves

for winter hibernating activities and summer maternity behaviour. Winter hibernacula generally occur in more temperate areas of the country and at higher altitudes, while summer maternity roosts are warmer and lower altitudes (Monadjemet al., 2010). For this particular site, if a suitable roosting cave is located near to the site it would most likely be used as a summer maternity roost. But no locations of any caves are known within the area of the site.

» *Miniopterusnatalensis:* undertake short migratory journeys between hibernacula and maternity roosts. The problem lies in that very little is known about bat migratory behaviour and paths in South Africa for this species and such migrations can be up to 150 kilometers in distance. If the site is located within a migratory path the bat detecting system should detect high *Miniopterusnatalensis* numbers and activity during the remainder of the bat monitoring survey. So far no signs of mass migrations are detected. Sowler & Stoffberg (2012) advise the likelihood of risk of fatality affecting *Miniopterusnatalensis*, is that of Medium – High risk. Their evaluation was of the risk was based on broad ecological features, excluding migratory tendencies.

» *Neoromiciacapensis:* Commonly called the Cape Serotine, *Neoromiciacapensis* has a Least Concern conservation category as it is widespread over much of sub-Saharan Africa in high numbers. It roosts individually or in small groups of two or three bats in a variety of shelters, such as under the bark of trees, at the base of aloe leaves, and under the roofs of houses. They will utilize most man-made structures as day roosts (Monadjemet al., 2010). These types of roosting sites on the farms must be considered as sensitive. They do not undertake migrations and thus are considered residents of the site. They are tolerant of a wide range of environmental conditions as they survive and prosper within arid semi-desert areas to montane grasslands, forests, and savannas; inferring that they may occupy several habitat types across the site, and are adaptable towards habitat changes. They are thought to have a Medium – High likelihood of risk of fatality due to wind turbines (Sowler&Stoffberg, 2012).

» *Tadaridaaegyptiaca:* The Egyptian Free-tailed Bat, *Tadaridaaegyptiaca*, is a Least Concern species as it has a wide distribution and high abundance throughout South Africa. It occurs from the Western Cape of South Africa, north through to Namibia and southern Angola; and through Zimbabwe to central and northern Mozambique (Monadjemet al., 2010). This species is protected by national legislation in South Africa (ACR, 2010). They roost communally in small (dozens) to medium-sized (hundreds) groups in caves, rock crevices, under exfoliating rocks, in hollow trees and behind the bark of dead trees. *Tadaridaaegyptiaca* has also adapted to roosting in buildings, in particular roofs of houses (Monadjemet al., 2010). Thus man-made structure and large trees on the site would be important roosts for this species. Its presence is strongly associated with permanent water bodies due to

concentrated densities of insect prey (Monadjemet al., 2010). The Egyptian Free-tailed bat is considered to have a high likelihood of risk of fatality due to wind turbines (Sowler & Stoffberg, 2012). Due to the high abundance and widespread distribution of this species, high mortality rates due to wind turbines would be a cause of concern as these species have more significant ecological roles than the rarer bat species.

6.3.8. Avifauna

The Castle site is situated within the Platberg Karoo Conservancy Important Bird Area (IBA – Barnes 1998) as the area supports populations of two Globally Threatened species, the Lesser Kestrel and the Blue Crane. The Important Bird Areas (IBA) Programme is one of BirdLife International's conservation initiatives. The site also falls within a high sensitivity area as classified in the "Avian Wind Farm Sensitivity Map for South Africa" (Retief *et al*, 2011).

Target Species

A list of 'target species' has been compiled for this site. Target species are those species for which there is most conservation concern, and therefore the focus of this study. The species are as follows: African Marsh Harrier *Circus ranivorus*; Black Harrier *Circus maurus*; Martial Eagle *Polemaetus bellicosus*; Verreaux's Eagle *Aquila verreaux*; Lesser Kestrel *Falco naumanni*; Blue Crane *Anthropoides paradiseus*; Ludwig's Bustard *Neotis ludwigii*; Secretarybird *Sagittarius serpentarius*; Lanner Falcon *Falco biarmicus*; Cape Long-billed Lark *Certhilauda brevirostris*; White Stork *Ciconia ciconia*; Jackal Buzzard *Buteo rufofuscus*; Rock Kestrel *Falco rupicolus*; Southern Pale Chanting Goshawk *Melierax canorus*; and Blue Korhaan *Eupodotis caerulescens*. Data on birds is currently being collected thorough the pre-construction bird monitoring programme, which will be considered in the EIA.

Bird Micro Habitats

The habitats available to birds at a small spatial scale are known as micro habitats. These micro habitats are formed by a combination of factors such as vegetation, land use, anthropogenic factors, topography and others. The micro habitats identified as available to birds on site are as follows:

» Karoo flats: Hardly any of the Castle site could be called Karoo flats as it is almost on the edge of the escarpment. This means it is less likely that large terrestrial species will use the site at high densities.

» Drainage lines: Drainage lines bisect this site. These areas are typically covered with broken Karoo veld, typically more shrubby than grassy. Whilst these areas probably hold relatively high bird species diversity, this is probably mostly comprised of small bird species, which are in general considered to be less at risk of impact from wind turbines. However, large terrestrial species will utilize these areas in the right conditions, and various bird species will also utilize these drainage lines as flight paths, even if not selecting the habitat on the ground.
» Dams: There are small dams on and near this site. Although empty, these dams may still be important for avifauna. When holding water, these dams will attract a range of water dependent bird species. When empty, they still represent a greener, more lush area with different plant species and will probably still attract certain bird species, particular the Blue Crane. This species is known to roost communally (in flocks) in the shallows of dams, to escape predators.
» Rocky kopjes: Although no true kopjes exist on site, the site is almost on the edge of quite a major escarpment to the south-west. This area presents different (and favourable) air currents which are typically utilized by raptors in particular. In addition these areas hold different vegetation (often more woody species) to the flats and as such attract a slightly different set of bird species. Where large ridges and cliff lines are present, the likelihood of large eagles such as Verreaux's Eagle nesting would need to be considered. During the site visit it was not possible to fully examine the escarpment for nesting eagles. However it was suspected that Verreaux's Eagle in particular would nest somewhere in that area. That is confirmed by Harebottle (2012) who found a nest on the cliffs approximately 1.5kms south-west of the Castle site's boundary.

6.6. Social Characteristics

The proposed site occurs within the Emthanjeni Local Municipality and the Renosterberg Local Municipality, which both fall within the greater Pixley ke Seme District Municipality. The social and economic characteristics of the region are described below.

6.6.1. Economy

In terms of economic importance, the Northern Cape's share of the country's GDP in 2002 was 2%, the lowest contribution of the nine provinces. However, although the Northern Cape Province has the smallest economy of the nine provinces, Gross Domestic Product of the Region (GDPR) per capita is higher than

the national average. In terms of economic activities, the economy of Northern Cape is heavily dependent on the primary sectors of the economy, which in 2002 made up 31.0% of GDPR. The largest sector is mining which has declined in contribution to the GDPR from 25.8% in 1996 to 23.7% in 2002. Agriculture, on the other hand, increased in its contribution from 6.2% to 7.3%. A limited amount of processing of primary commodity output in mining and agriculture takes place in the Northern Cape. This is reflected in the fact that manufacturing contributes only 4.2% towards GDPR.

6.6.2. Population

The total population of the Pixley ka Seme District Municipality is ~165 000 (Census 2001). Of the total population Coloureds make up ~62% of the total, followed by Black Africans (~27%) and Whites (~10%). For the Siyathemba Local Municipality, the figures are ~64% Coloured, 26% Black African and 8% Whites. The Siyathemba Local Municipality makes up ~22% (36 000) of the total, making it the most populated local municipality in the district municipality. The demographic makeup of the Siyathemba Local Municipality is similar to that of the region. The population density for the region is 2.1 people per square kilometre. In terms of future growth projections, a negative growth rate is forecast for the rural population and by 2015 the towns are also expected to show a negative growth rate 0f 1.29% (Pixley ka Seme District Municipality IDP).

6.6.3. Education

Based on Census 2001 data, ~25% of the Pixley ka Seme District Municipality population had no education, while 35% only had primary level of qualifications. The figures are essentially the same for the Siyathemba Local Municipality. The education levels in the region are low and can be attributed to the rural nature of the area together with the substantial number of previously disadvantaged population groups who did not have equal access to education in the past era.

According to the Municipal Profiles of 2002, the primary school population represented 46.3% of the total population of the district. There are 49 primary schools and 18 secondary schools and combined schools in the district. While the actual number of schools is generally satisfactory there is an acute shortage of schools in the remote areas of the district. As a result children often have to walk long distances to reach schools (Pixley ka Seme District Municipality IDP 2008/2009).

6.6.4. Employment levels

According to the Census 2001 data the unemployment rate in the Pixley ka Seme District Municipality was 21%[5]. The rate for the Siyathemba Local Municipality was 14%. In terms of employment the agricultural sector was the most important economic sector in the Pixley ka Seme District Municipality accounting for ~39% of the total working population. The commercial services sector accounted for ~23% of the employment opportunities. These two sectors combined therefore accounted for ~62% of all the employment opportunities in the area.

6.7. Heritage and Palaeontological Profile

The desktop information presented below, will be supplemented by a heritage survey during the EIA phase, to determine if any heritage sites of significance occur on the site for the proposed wind energy facility.

Human Settlement in the De Aar Region

Evidence has been found that the predecessors of today's Khoi-San Bushmen lived in the area thousands of years ago. According to the source of Hocking, the Khoikhoi, nomadic cattle herders, had their forbears in East Africa and lived in the Northern Cape for at least 3000 years and dominated the region until the eighteenth century when the Tswana tribe arrived from the west. The Tswana tribe settled around the present day Kuruman. Evidence of the Khoikhoi's existence in the Cape can for instance be seen in the form of Bushmen drawings at the Damfontein and Brandfontein sites in the Karoo. (Hocking 1983: 2; Marais 1977: 1). It was in the early nineteenth century that the Griqua frontiersmen of the old Cape Colony crossed the Orange River from the south. The Griquas were half white and half Khoikhoi. These people dressed like Europeans and lived aboard wagons, much like the *Trekboere* who migrated northward from the Cape Colony. (Hocking 1983: 2). De Aar was a very important town during the time of the Anglo-Boer war. Due to its strategic position it was very well suited for a distribution and reception depot of military provisions and animals. Another milestone for the area was when the railway reached De Aar in 1881. The town of De Aar developed around the De Aar railway station. The town was officially proclaimed on 23 December 1903. (Marais 1977: 1-2, 6).

Archaeology

[5] A more recent estimate indicated an unemployment rate of 37% (Pixley ka Seme District Municipality IDP 2010/ 2011).

Occupation by early humans would probably date to at least the Middle Stone Age although Earlier Stone Age sites are known in the wider region (Morris 2011b). Sites consist of open sites near stream beds or hills and outcrops (van der Walt 2011). Raw material sources would have attracted Stone Age people who later on occupied rock shelters where available, as well as open sites. During the Late Stone Age (LSA) they also produced rock engravings, of which some are known to occur on the farm Tafelkop north of the study area, as well as rock paintings, some of which occur on the farm Veekraal east of the study area and others on Jakkalsfontein north of the study area (van Schalkwyk 2011). Dolerite koppies in the region are known to have rock engravings (Fock & Fock 1989; Morris 1988.

Palaeontology

A desktop assessment of the palaeontology of the area found that the Castle Wind Energy Facility site is underlain by Middle Permian fluvial sediments of the Lower Beaufort Group (Karoo Supergroup) as well as Early Jurassic igneous intrusions of the Karoo Dolerite Suite. The Lower Beaufort rocks in this area contain a sparse fossil biota of mammal-like reptiles, true reptiles, vertebrate and invertebrate trace fossils (*e.g.* scratch burrows), petrified wood and other plant fossils that are assigned to the *Pristerognathus* Assemblage Zone. Several important new vertebrate fossil sites just to the west and east of the Castle site, were recorded in a recent palaeontological field assessment for a large wind energy project (Almond 2012a). Further Palaeozoic fossil remains are unlikely to be encountered in the western portions of the study area on Vendussie Kuil 165 and the western half of Knapdaar 8 since the bedrocks here are largely unfossiliferous dolerite and the Beaufort Group country rocks have been intensely baked. In the central, and especially the eastern, parts of Knapdaar 8, however, valuable vertebrate and other fossil heritage may be present both at surface and beneath the ground. Fossiliferous exposures of the Beaufort Group sediments here are likely to be limited by the cover of Late Caenozoic superficial sediments (colluvium, alluvium *etc*) that are generally of low palaeontological sensitivity.

This chapter provides details regarding the scope of the proposed Castle Wind Energy Facility, including all required elements of the project and necessary steps for the project to be developed. The scope of the project includes construction, operation and decommissioning activities. This chapter also describes alternative options with regards to the proposed wind energy facility development, including the "do nothing" alternative.

7.1 Project Alternatives

7.1.1 Site Alternatives

The proposed site for the Castle Wind Energy Facility was identified as having potential for the installation of wind turbine generators on the basis of various technical criteria, including the wind resource, accessibility of the site, accessibility to the Eskom grid, and local site topography. The regional site assessment (described in detail in Chapter 4) involved testing the site against environmental and planning criteria, and the approach served as a site risk assessment tool from an environmental acceptability perspective – that is, a process to highlight or red-flag potential issues of concern prior to initiating a full EIA process for a proposed site. This site identification process is considered acceptable and therefore no location or site alternatives have been considered further.

7.1.2 Site-specific alternatives

Once sufficient information is available from an environmental and planning perspective for the broader 3 257ha site, a detailed micro-siting exercise will be undertaken to effectively 'design' the wind energy facility within the available site. As local level issues were not assessed in sufficient detail at the regional level, these issues are now being considered within the site-specific studies and assessments through the EIA in order to delineate areas of sensitivity within the broader area. Through the process of determining environmental constraining factors, the layout of the wind turbines and infrastructure can be appropriately planned. The overall aim of the planning process would be to maximise electricity production through exposure to the wind resource, while minimising infrastructure, operation and maintenance costs, and social and environmental impacts. Specialist software is available to assist developers in selecting the optimum position for each turbine. This micro-siting information will then be provided, and will inform the specialist impact assessments at the EIA phase. The planning process will also include the positioning of other ancillary infrastructure, including access roads,

laydown areas, power line corridors and the on-site substation site. Feasible alternatives in this regard will be assessed in detail in the EIA phase. Two power line options have been included at this stage:

» Option 1 to the approved Ilanga Lethemba substation
» Option 2 to the existing Hydra Substation

7.1.3 Technology alternatives

This refers to alternative technologies for use in the establishment of the wind facility. There is a limited range of alternative technologies (turbines) for commercial-scale wind energy facilities. In addition, the technology is constantly evolving. Table 7.1 summarises the types of variables associated with existing wind turbine technologies. There are no significant differences from an environmental perspective between technologies. The technology provider has not yet been confirmed and will be decided after further wind analysis and a tender process. The developer would utilise the same make and model (and size) of turbine across the whole site.

Table 7.1: 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 3.5MW range.
Foundation	The foundation is usually poured concrete. Its size and shape is dictated by the size of the wind turbine and local geotechnical considerations.
Tower	Towers are typically constructed from steel and/or concrete. The height of towers generally varies between 80 m and 100 m.
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).
Other variables	Yaw gears, brakes, control systems, lubrication systems and all other turbine components are similar on modern wind turbines.

7.1.4 The 'do nothing' alternative

The 'do-nothing' alternative is the option of not constructing the Castle Wind Energy Facility on the proposed site. This alternative would result in no environmental impacts on the site or surrounding area.

The electricity demand in South Africa is placing increasing pressure on the country's existing power generation capacity. There is therefore a need for additional electricity generation options to be developed throughout the country. The decision to expand South Africa's electricity generation capacity, and the mix of generation technologies is based on **national policy** and informed by on-going strategic planning undertaken by the national Department of Energy (DoE). The support for renewable energy policy is guided by a rationale that South Africa has a very attractive range of renewable resources, particularly solar and wind and that renewable applications are in fact the least-cost energy service in many cases and more so when social and environmental costs are taken into account.

The generation of electricity from renewable energy in South Africa offers a number of socio-economic and environmental benefits:

» **Increased energy security:** The current electricity crisis in South Africa highlights the significant role that renewable energy can play in terms of supplementing the power available. In addition, given that renewables can often be deployed in a decentralised manner close to consumers, they offer the opportunity for improving grid strength and supply quality, while reducing expensive transmission and distribution losses.
» **Resource saving:** Conventional coal fired plants are major consumers of water during their requisite cooling processes. 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, where compared with wet cooled conventional power stations. This translates into revenue saving of R26.6 million. As an already water stressed nation, it is critical that South Africa engages in a variety of water conservation measures, particularly as the detrimental effects of climate change on water availability are experienced in the future.
» **Exploitation of our significant renewable energy resource:** At present, valuable national resources (including biomass by-products, solar insulation and wind) remain largely unexploited. The use of these energy sources will strengthen energy security through the development of a diverse energy portfolio.
» **Pollution reduction:** The releases of by-products of fossil fuel burning for electricity generation have a particularly hazardous impact on human health, and contribute to ecosystem degradation.
» **Climate friendly development:** The uptake of renewable energy offers the opportunity to address energy needs in an environmentally responsible manner, contributing to the mitigation of climate change through the reduction of greenhouse gas emissions. South Africa as a nation is estimated to be responsible for 1% of global GHG emissions and is currently ranked 9th worldwide in terms of per capita CO_2 emissions.

- **Support for international agreements and enhanced status within the international community:** 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 for cementing its status as a leading player within the international community.
- **Employment creation:** The sale, development, installation, maintenance and management of renewable energy facilities has significant potential for job creation in South Africa.
- **Acceptability to society:** Renewable energy offers a number of tangible benefits to society including reduced pollution concerns, improved human and ecosystem health and climate friendly development.
- **Support to a new industry sector:** The development of renewable energy offers an opportunity to establish a new industry within the South African economy.
- **Protecting the natural foundations of life for future generations:** Actions to reduce our disproportionate carbon footprint can play an important part in ensuring our role in preventing dangerous anthropogenic climate change; thereby securing the natural foundations of life for generations to come.

At present, South Africa is some way off from 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.

In order to meet the long-term goal of a sustainable renewable energy industry and to diversify the energy-generation mix in South Africa, a goal of 17,8GW of renewables by 2030 has been set by the Department of Energy (DoE) within the Integrated Resource Plan (IRP) 2010. This energy will be produced mainly from wind, solar, biomass, and small-scale hydro (with wind and solar comprising the bulk of the power generation capacity). This amounts to ~42% of all new power generation being derived from renewable energy forms by 2030.

Through research, the viability of the Castle Wind Energy Facility has been established, and Castle Wind Farm (Pty) Ltd proposes that up to 38 turbines can be established as part of the facility. The 'do nothing' alternative will not assist the South African government in reaching the set targets for renewable energy. In addition the Northern Cape's power supply will not be strengthened by the additional generated power being evacuated directly into the Province's electricity grid.

The current land use of the site would not be lost with the implementation of a wind energy facility. There would therefore not be any significant impact on current land

use associated with the project being developed, or not. The 'do nothing' alternative will be assessed in further detail during the EIA Phase.

7.2 Components / Infrastructure

The wind energy facility will comprise of up to 38 wind turbines with a generating capacity of up to 3.5MW each, with a hub height of up to 100m and a rotor diameter of up to 112m (i.e. each blade is approximately 56m in length). The entire facility would have a generating capacity of up to 140 MW. The infrastructure associated with the wind energy facility is proposed to include:

» Turbine foundation/footprint: 26m$^{2.}$
» Cabling between turbines to be laid underground (1-2 m deep) where practical. This will connect to an on-site substation.
» Laydown area (footprint is shown in Figure 7.1 below).
» On-site sub-station (with an approximate compound size of 100 m x 100 m).
» A 132 kV overhead power line to connect into the authorised Ilanga Lethemba Substation, near De Aar[11] or Hydra Substation. The power line will have a 31m servitude and will be approximately 20-25 kilometres in length.
» Internal access roads up to 7m wide.
» Workshop area / office for control, maintenance and storage.

Figure 7.1 illustrates the approximate extent of the wind turbine construction area.

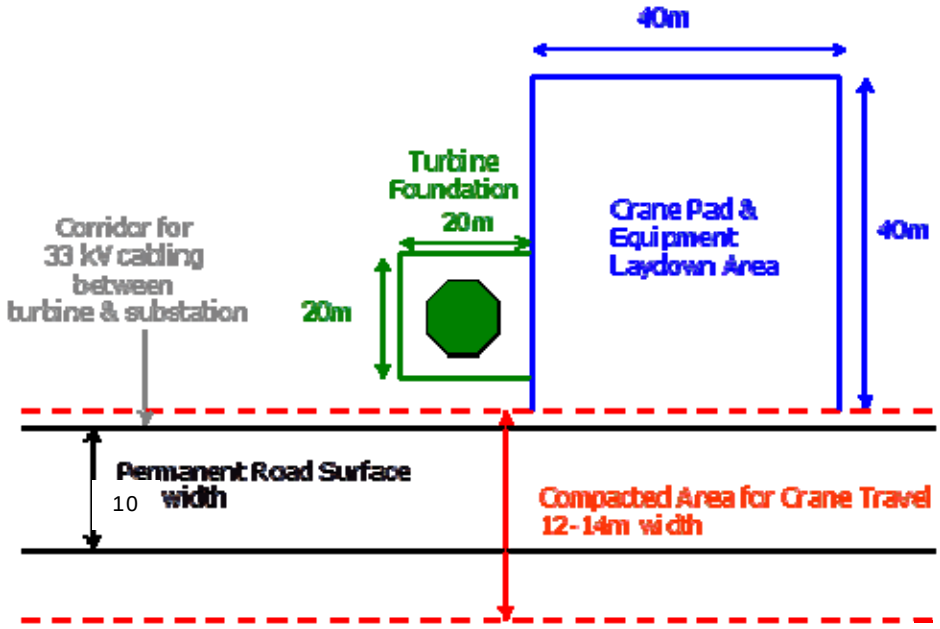


Figure 7.1: Diagrammatic representation of a typical layout of components.

[11] The Ilanga Lethemba Solar Energy Facility was awarded preferred bidder status under the REIPPP in 2012 and construction of the project commenced in 2013.

Temporary infrastructure required during the construction phase includes:

» Construction camps
» Construction yard and offices
» Laydown area and storage areas
» Temporary access roads

7.3 Project Construction Phase

The construction phase in anticipated to take between 12 – 18 months. In order to construct the proposed wind energy facility and associated infrastructure, a series of activities will need to be undertaken. The number of people in a construction crew will be determined during the EIA phase. There may be more than one crew operating on the site at any one time. Construction crews will constitute mainly skilled and semi-skilled workers. No contractors (other than security personnel) will reside on the site at any time during the construction or operational phases.

7.3.1. Conduct Surveys

Prior to initiating construction, a number of surveys will be required including, but not limited to, geotechnical survey, site survey and confirmation of the turbine micro-siting footprint, survey of on-site-substation site/s and survey of power line servitude/s to determine tower locations.

7.3.2. Establishment of Access Roads to the Site

The proposed site is accessible from the R389 between Philipstown and Hanover, via existing gravel farm roads. Access/haul roads to the site as well as internal access roads within the site are required to be established prior to the commencement of construction. As far as possible, existing access roads would be utilised, and upgraded where required. Within the site itself, access will be required between the turbines for construction purposes (and later limited access for maintenance). Special haul roads of up to 7m in width may need to be constructed to and within the site to accommodate abnormally loaded vehicle access and circulation. The internal service road alignment will be informed by the final micro-siting/positioning of the wind turbines.

These access roads will have to be constructed in advance of any components being delivered to site, and will remain in place after completion for future access and possibly access for replacement of parts if necessary. It is proposed that in preparing the access road, a portion of it (up to 7m in width) will be constructed as a permanent access road and the remainder as a temporary access road that can be de-compacted and returned to its pre-construction condition through rehabilitation.

7.3.3. Undertake Site Preparation

Site preparation activities will include clearance of vegetation at the footprint of each turbine, the establishment of internal access roads (as discussed in 7.2.2 above) and excavations for foundations (refer to 7.2.4 below). These activities will require the stripping of topsoil, which will need to be stockpiled, backfilled and/or spread on site.

Site preparation will be undertaken in a systematic manner to reduce the risk of the open ground to erosion. In addition, site preparation will include search and rescue of floral species of concern (where required), as well as identification and excavation of any sites of cultural/heritage value (where required).

7.3.4. Construct Foundation

Concrete foundations will be constructed at each turbine location. The dimension of a turbine foundation is approximately 26m^2. Foundation holes will be mechanically excavated to a depth of approximately 4 m, depending on the local geology. Concrete may to be brought to site as ready-mix or batched on site if no suitable concrete suppliers are available in the vicinity. The reinforced concrete foundation will be poured and will support a mounting ring. The foundation will then be left up to a week to cure.

Figure 7.2: Photograph illustrating the construction of the foundation for a wind turbine (photo sourced from www.blm.gov)

7.3.5. Transport of Components and Equipment to Site

The wind turbine, including the tower, will be brought to the site by the turbine supplier in sections on flatbed trucks. Turbine units which must be transported to site consist of: the tower (in segments), hub, nacelle, and three rotor blades. The individual components are defined as abnormal loads in terms of Road Traffic Act (Act No 29 of 1989)[12] by virtue of the dimensional limitations (abnormal length of the blades) and load limitations (i.e. the nacelle). In addition, components of various specialised construction and lifting equipment are required on site to erect the wind turbines and need to be transported to site. In addition to the specialised lifting equipment/cranes, the normal civil engineering construction equipment will need to be brought to the site for the civil works (e.g. excavators, trucks, graders, compaction equipment, cement trucks, site offices etc.).

The components required for the establishment of the substation/s (including transformers) as well as the power line (including towers and cabling) will also be transported to site as required.

The dimensional requirements of the load during the construction phase (length/height) may require alterations to the existing road infrastructure (e.g. widening on corners), accommodation of street furniture (e.g. street lighting, traffic signals, telephone lines etc) and protection of road-related structures (i.e. bridges, culverts, portal culverts, retaining walls etc) as a result of abnormal loading.

The equipment will be transported to the site using appropriate National and Provincial roads, and the dedicated access/haul road to the site itself

7.3.6. Establishment of Lay Down Areas on Site

Laydown areas will need to be established at each turbine position for the storage and assembly of wind turbine components. The laydown area will need to accommodate the cranes required in tower/turbine assembly. Laydown and storage areas will be required to be established for the normal civil engineering construction equipment which will be required on site.

In addition a number of construction compound areas will need to be established around the site. These will be temporary structures for site offices, storage and safe refuelling areas.

[12] A permit will be required for the transportation of these abnormal loads on public roads.

7.3.7. Construct Turbine

A large lifting crane will be brought on site. It will lift the tower sections into place. The nacelle, which contains the gearbox, generator and yawing mechanism, will then be placed onto the top of the assembled tower. The next step will be to assemble or partially assemble the rotor (i.e. the blades of the turbine) on the ground. It will then be lifted to the nacelle and bolted in place. A small crane will likely be needed for the assembly of the rotor while a large crane will be needed to put it in place.

7.3.8. Construct Substation/s

One or more on-site substations will be constructed within the site. The turbines will be connected to the substation via underground cabling wherever possible. The position of the substation/s will be informed by the final micro-siting/positioning of the wind turbines. The layout of the turbines will determine the optimum position for the construction of a substation.

The construction of the substation would require a survey of the site; site clearing and levelling and construction of access road/s to the substation site (where required); construction of substation terrace and foundations; assembly, erection and installation of equipment (including transformers); connection of conductors to equipment; and rehabilitation of any disturbed areas and protection of erosion sensitive areas.

7.3.9. Establishment of Ancillary Infrastructure

A workshop as well as a contractor's equipment camp will also be required to be constructed. Temporary storage areas and a construction compound (sizes and numbers to be confirmed later in process) will also be established. Service building(s) (number, size and location to be confirmed later in process) are also required.

The establishment of these facilities/buildings will require the clearing of vegetation and levelling of the development site and the excavation of foundations prior to construction. A laydown area for building materials and equipment associated with these buildings will also be required.

7.3.10. Connection of Wind Turbines to the Substation

Each wind turbine will be connected to an optimally positioned on-site substation by underground electrical cables wherever possible. The installation of these cables will require the excavation of trenches, approximately 1-2 m in depth within which

these cables can then be laid. The underground cables will be planned to follow the internal access roads, where possible.

7.3.11. Connect Substation/s to Power Grid

A 132 kV power line will connect the substation/s to the electricity distribution network/grid. Based on discussions with Eskom, the 132 kV overhead power line is proposed to connect into the authorised Ilanga Lethemba Substation, near De Aar or Hydra Substation. The connection point to the Eskom power grid will however be confirmed through a network planning exercise. A route for the power line will be assessed during the EIA phase and surveyed and pegged prior to construction. A 500m corridor has been considered in this scoping report.

7.3.12. Commissioning

Prior to the start-up of a wind turbine, a series of checks and tests will be carried out. This will include both static and dynamic tests to make sure the turbine is working within appropriate limits. Grid interconnection and unit synchronisation will be undertaken to confirm the turbine and unit performance. Physical adjustments may be needed such as changing the pitch of the blades. The schedule for this activity will be subject to site and weather conditions.

7.3.13. Undertake Site Rehabilitation

As construction is completed in an area, and as all construction equipment is removed from the site, the site will be rehabilitated where practical and reasonable. On full commissioning of the facility, any access points to the site which are not required during the operation phase will be closed and prepared for rehabilitation.

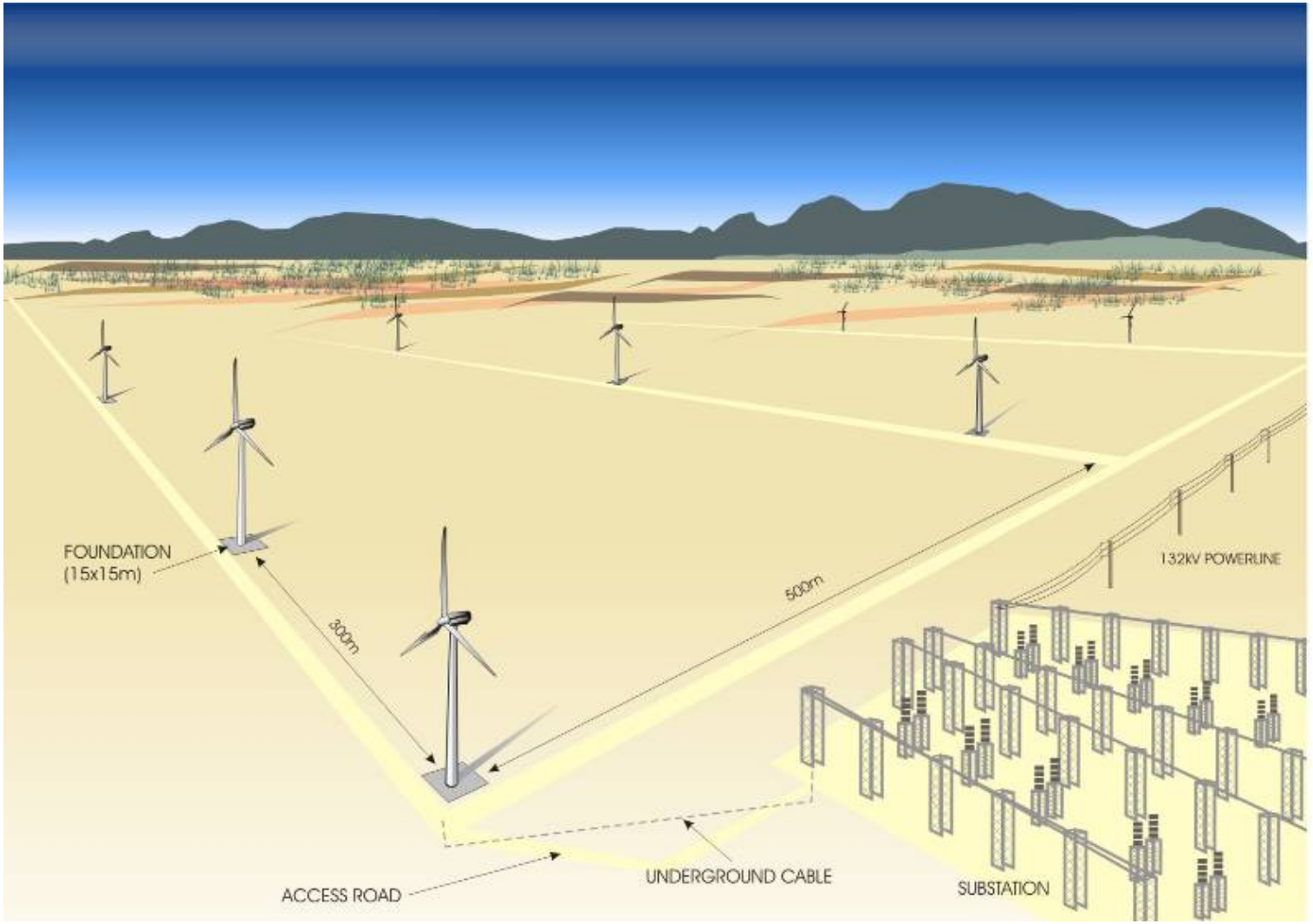


Figure 7.3: Artists impression of a portion of a wind energy facility, illustrating the various components and associated infrastructure. Note that distances shown are indicative only

7.4 Project Operation Phase

It is not known at this stage exactly how many people will be responsible for monitoring and maintenance of the facility. It is anticipated that there could be security and maintenance staff required on site.

Each turbine within the wind energy facility will be operational except under circumstances of mechanical breakdown, inclement weather conditions or maintenance activities.

7.4.1. Maintenance

The wind turbine will be subject to periodic maintenance and inspection. Periodic oil changes will be required. Any waste products (e.g. oil) will be disposed of in accordance with relevant waste management legislation.

7.5 Decommissioning

The turbine infrastructure which will be utilised for the proposed wind energy facility is expected to have a lifespan of approximately 20 - 30 years (with maintenance). Equipment associated with this facility would only be decommissioned once it has reached the end of its economic life. It is possible that refurbishment of the infrastructure of the facility discussed in this EIA would comprise the disassembly and replacement of the turbines with more appropriate technology/infrastructure available at that time.

The following decommissioning activities have been considered to form part of the project scope of the proposed wind energy facility.

7.5.1. Site Preparation

Site preparation activities will include confirming the integrity of the access to the site to accommodate required equipment and lifting cranes, preparation of the site (e.g. lay down areas, construction platform) and the mobilisation of decommissioning equipment.

7.5.2. Disassemble Existing Turbine

A large crane will be brought on site. It will be used to disassemble the turbine and tower sections. These components will 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.

SCOPING OF ISSUES ASSOCIATED WITH THE PROPOSED CASTLE WIND ENERGY FACILITY CHAPTER 8

Chapter 8 presents the potential environmental and social impacts identified for the Castle Wind Energy Facility and associated infrastructure such as the power line and substation. These chapters serve to describe the identified potential environmental impacts associated with the proposed project and to make recommendations for further studies required to be undertaken in the EIA phase, and/or recommendations for the management of these impacts for inclusion in the Environmental Management Programme (EMPr) to be prepared as part of the EIA Phase.

From a technical perspective, certain parts of the study area are more suitable for the siting of wind turbines than others (in order to exploit the wind resource). The issues that have been scoped for Castle Wind Energy Facility include the entire extent of Portions 12 and 13 of Farm 165 (Vendussie Kuil) and the Remaining Extent of Portion 0 of Farm 8 (Knapdaar). Specialist scoping reports are included within **Appendix F to N** wherein the potential issues relating to the whole project (i.e. wind turbines, access roads, grid connection components, etc.) are identified. A discussion of the potential cumulative impacts associated with the proposed project at this stage of the process is presented in Section 8.6.

8.1 Construction phase

An understanding of the activities to be undertaken during the construction process is necessary to predict the potential impacts of the facilities on the environment. These have been explained in detail in Chapter 7 of this report and include:

» Land clearing for site preparation and access routes.
» Transportation of project components, supply materials and fuels.
» Construction of foundations involving excavations and placement of concrete.
» Construction of the on-site substation(s), and underground and/ above ground power lines.
» Operating cranes for unloading and installation of wind turbines.
» Excavation of foundations for wind turbines.
» Commissioning of new installations.
» Waste removal and rehabilitation of disturbed sites.

Environmental issues associated with construction activities may include, amongst others, alteration of land use, soil erosion, visual impacts, noise impacts, threats to biodiversity and ecological processes, including habitat alteration and impacts to fauna, and social impacts (these are discussed in Section 8.3 below).

8.2 Operational phase

Operational activities will include regular maintenance of the wind turbines and associated site infrastructure.

Environmental issues specific to the operation of a wind energy facility could include visual impacts, noise impacts produced by the spinning of rotor blades and operation of the generator, bird or bat injury or mortality resulting from collisions with blades, disturbance, injury or mortality to other faunal species, lighting and illumination issues, and change in land use.

The significance of impacts associated with a particular wind energy facility is dependent on site-specific factors, and therefore impacts can be expected to vary significantly from site to site. The extent of the study area allows for significant variations in impacts within the site.

8.3 Scoping of Issues

The text and tables below provide an indication of the potential direct and indirect environmental issues and impacts which have been identified during the Scoping phase of the EIA and which may be relevant during the construction and operational phases of the proposed Castle Wind Energy Facility and associated infrastructure.

8.3.1 Potential Impacts on Land Use, Soil and Agricultural Potential

Land capability is the combination of soil suitability and climate factors. The entire site has a land capability classification, on the 8 category scale, of Class 7 – non-arable, low potential grazing land. Land capability is limited by the mountainous, rocky terrain, the shallow soils and the aridity. The site is utilised for sheep farming. Given the severe soil and aridity constraints, this is the only viable agricultural land use. The natural grazing capacity is low and varies between 18 and 30 hectares per large stock unit across the site.

There is a very small area of cultivated, irrigated land surrounding the farm house (Rooi Kraal) which is located on the Farm Knapdaar. From an agricultural impact point of view, this is the only agriculturally sensitive area on the site that should be avoided for inclusion in the development. The significance of agricultural impacts is influenced by the limited agricultural capability of the study area and that the footprint of disturbance will only impact on a small proportion of the available land surface.

Table 8.1: Potential Impacts on Soil, Land Use and Agriculture

Issue	Nature of Impact	Extent of Impact	'No go' areas
Construction Phase			
Physical soil disturbance due to construction activities	» Soil erosion due to alteration of the land surface run-off characteristics. Alteration of run-off characteristics may be caused by construction related land surface disturbance, vegetation removal, the establishment of hard standing areas and roads. Erosion will cause loss and deterioration of soil resources and may occur during all phases of the project. » Loss of topsoil due to poor topsoil management (burial, erosion, etc.) during construction-related soil profile disturbance (levelling, excavations, road surfacing etc.) and resultant decrease in that soil's agricultural suitability.	Local	To be confirmed during the soil survey
Impacts on current land use and agricultural potential due to construction activities	» Loss of agricultural land use due to direct occupation by turbines and associated infrastructure, including roads for the duration of the project. » Placement of spoil material generated from construction related excavations which can cover agricultural land and thereby render it unsuitable for future agriculture. » Temporary disturbance to livestock management due to disruptions to fences and stock watering infrastructure during the construction phase.	Local	Small area of cultivated, irrigated land surrounding the farm house (Rooi Kraal) which is located on the Farm Knapdaar.
Operational Phase			
Potential social impacts	» Loss of agricultural land use due to direct occupation by turbines and other infrastructure, including roads, for the duration of the project. This will take affected portions of land out of agricultural production. » Generation of additional land use income makes a positive contribution to farming cash flow, and thereby improves the financial sustainability of agricultural activity.	Local	None due to low agricultural potential
Cumulative impacts	» Cumulative impacts due to the regional loss of agricultural resources and production as a result of other	Regional	None due to low agricultural

Issue	Nature of Impact	Extent of Impact	'No go' areas
	developments on agricultural land in the region.		potential

Gaps in knowledge and recommendations for further study:

Currently there is no evidence to suggest that the wind energy facility cannot be supported on the proposed site from an agricultural perspective. However, the extent and significance of the risk posed to agricultural resources and risk of soil erosion at a low level is not yet fully understood. Field work will be conducted as part of the EIA level investigation which will consider the following parameters:

» More detailed assessment of local soil conditions
» Assessment of erosion and erosion potential on study area
» Assessment of specific on-site agricultural activities
» Assessment of the impacts of specific construction activities and layout on soil conditions.

Detail regarding the above further study required is provided in Chapter 10 (Plan of Study for the EIA phase).

8.3.2 Potential Ecological Impacts

The eastern part of the site consists of Northern Upper Karoo and the western part of the site consists of Besemkaree Koppies Shrubland. Both vegetation types are classified as Least Threatened and have not been significantly transformed. Although the area has not been well investigated in the past, it is not likely to be highly diverse and while some listed species may be present, these are likely to be present as scattered and localised populations within specialised habitats and will have to be further investigated during the EIA phase. The south-facing slopes with dense vegetation, riparian areas and rocky outcrops are likely to provide habitat for fauna (mammalian species). In terms of conservation planning areas, the western part of Portion 12 and 13 of the Farm 165 (Vendussie Kuil) lies within a National Protected Areas Expansion Strategy (NPAES) focus area. The NPAES focus area is a part of the Senqu Caledon focus area which is 345 913ha in extent, of which only 450ha occurs within the Castle site.

The preliminary ecological sensitivity assessment of the site identifies at a high (regional) level those parts of the study area that have high conservation value or that may be sensitive to disturbance. The ecological sensitivity map for the Castle Wind Energy Facility site is illustrated below in Figure 8.1.

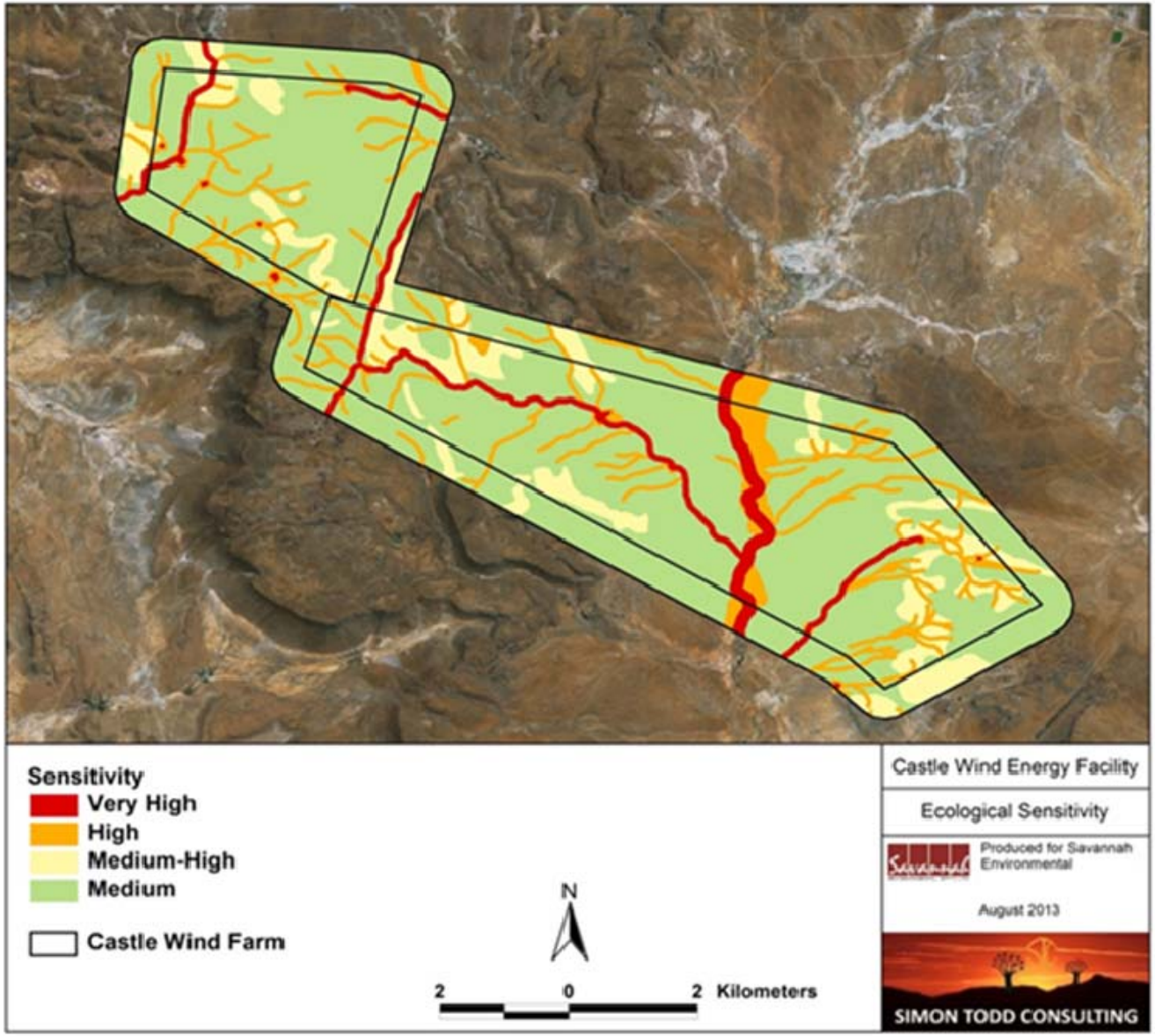


Figure 8.1: Preliminary Ecological Sensitivity Map of the study area proposed for the proposed Castle Wind Energy Facility

A fine-scale habitat types map (refer to Figure 8.2) was derived for the site by considering topography, soils, drainage features and observable colour and textural patterns on the satellite imagery of the site. The habitat types map drived for the site is illustrated below in Figure 8.2 and are described based on previous experience in the area. The habitat types correspond to areas with similar physical and ecological characteristics and do not necessarily correspond to single plant community types. The habitat map suggests that there is a preponderance of dolerite soils at the site, with exposed shale and shale-clay soils only in the eastern parts of the site. The dominant communities at the site are briefly descibed as follows:

» *Dolerite Hills and Slopes* – These are rocky outcrops, usually characterised by the presence of low trees such as *Searsia erosa*, *S.ciliata*, *Euclea crispa*, *Diospyros austro-africana* and *Olea europea* subsp *africana.* Although the plant communities may be fairly similar, the steep slopes are differentiated from the low hills for the purposes of sensitivity mapping.

» *Rocky Dolerite Plains* - compose a large proportion of the western section of the site and consist of relatively flat open vegetation with significant rock cover and are usually dominated by low shrubs such as *Ruschia intricata*, *Gnidia polycephala* and *Hertia pallens* with scattered grasses. These areas are likely to be of moderate sensitivity, but species of conservation concern if present are likely to be localised.

» *Open Dolerite Plains* – Open plains on deeper soils with little rock cover and invariably dominated by perennial bunchgrasses such as *Stipagrostis*. There are not likely to be many plant species of concern within this habitat type and it is not considered sensitive.

» *Shale Slopes* – Some part of the slopes of the eastern part of the site, are on shale and are considered relatively high sensitivity on account of their slope as well as the possible presence of species of conservation concern such as species of *Stomatium* which often favour areas of shale gravel.

» *Shale Flats* – Some of the plains of the eastern part of the site are on shale and consist of open shrubland dominated by species such as *Rosenia humilis*, *Eriocephalus ericoides*, *Pentzia* spp. and *Pteronia* spp.. It is unlikely that there are many species of conservation concern within this habitat type and it is considered of generally low sensitivity.

» *Plains Wash* – There are some extensive broad washes in the vicinity of the larger drainage lines. These are gently sloping plains that receive water from upslope and consist of alternating bare and vegetated areas. Typical species are likely to include species adapted to disturbance including various *Asparagus*,

Psilocaulon and *Salsola* species. Erosion risk in these areas is high on account the occasional water movement through these areas.

» Drainage Lines - For the purposes of the sensitivity mapping, this category was broken down into various subcategories relating to their ecological significance, but are likely to contain a similar suite of species. This community is likely to be dominated by species such as *Salsola calluna*, *Salsola glabrescens*, *Lycium oxycarpum*, *Rhigozum trichotomum* and occasional trees including *Acacia mellifera* and *Boscia albitrunca*.

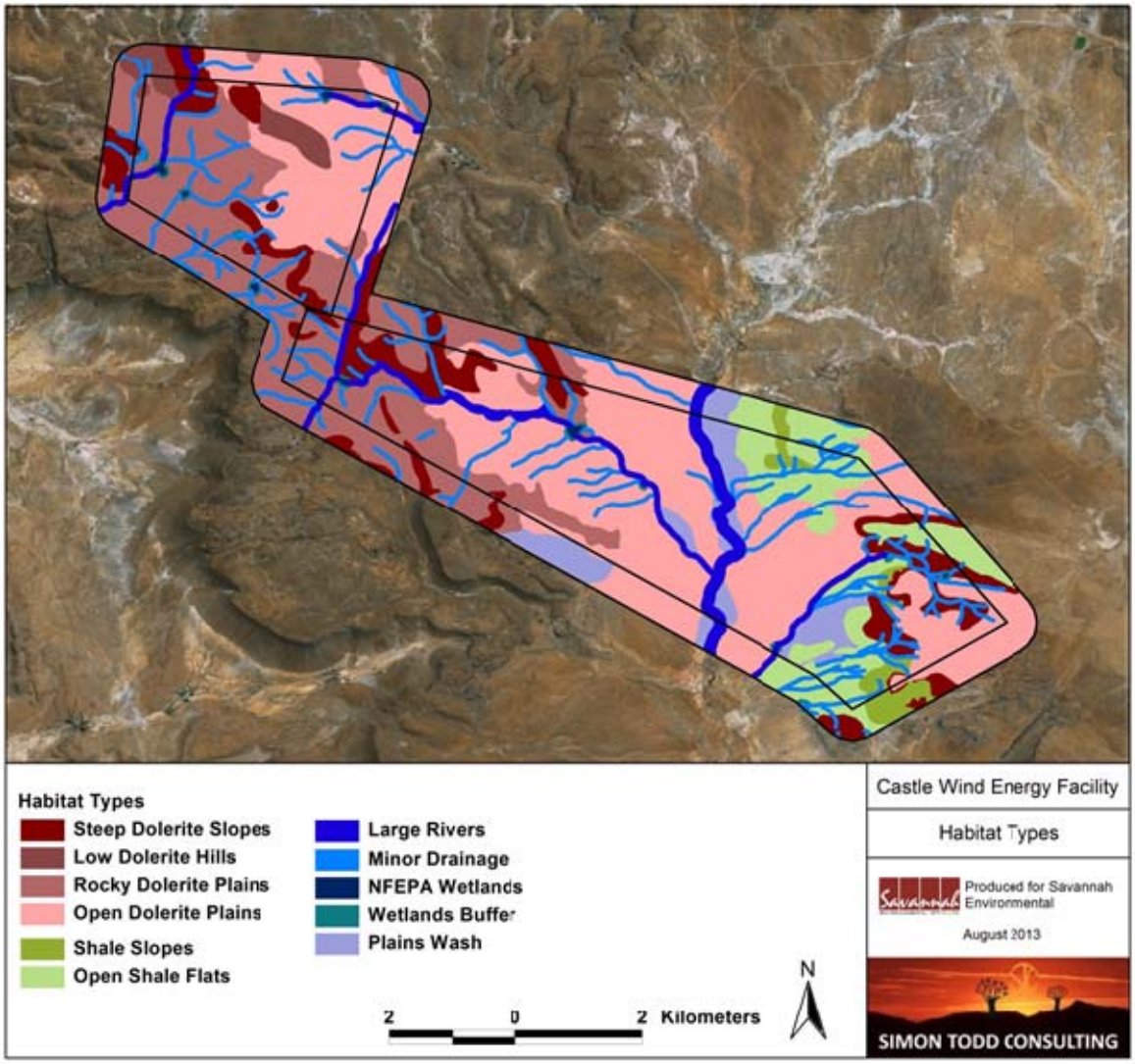


Figure 8.2: Habitat types at the Castle site. Each habitat type corresponds to an area with similar physical and ecological characteristics, and forms the basis for the ecological sensitivity map derived for the site.

These areas are identified as potentially sensitive at this stage in the process, but the actual sensitivity and plant communities present will be verified during the EIA phase. In general, the majority of the site does not appear to be highly ecologically

sensitive, as the abundance of listed plant and animal species is likely to be low and the sensitive habitats are relatively confined and can probably be avoided in the layout of the wind energy facility. These sensitive features should be considered in the design of the wind energy facility.

Direct loss of vegetation associated with the construction phase of the proposed development is likely to have a Low to Medium impact on a regional scale, depending on the final extent and position of the actual infrastructure footprints and the management of the land following construction. Indirect (mainly operational phase) impacts (disruption of ecological processes, etc.) are likely to be of low significance due to the nature of the facility.

Table 8.2: Potential impacts on ecology

Issue	Nature of Impact	Extent of Impact	'No go' areas
Impacts on vegetation and conservation listed plant species	Site preparation and construction will result in disturbance which would impact on indigenous vegetation and possibly plant species listed as being of conservation concern.	Local	To be determined during the ecological survey
Degradation of ecosystems	» The large amount of disturbance created during construction will leave the site vulnerable to alien plant invasion and soil erosion. » Erosion would also impact biodiversity through possible topsoil loss as well as through possible siltation of drainage lines and water bodies.	Local	To be determined during the ecological survey
Direct impacts on fauna	» Increased levels of noise, pollution, disturbance and human presence 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. » Some mammals and reptiles such as tortoises 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.	Local	To be determined during the ecological survey
Impacts on Critical Biodiversity Areas (CBA) and	» Parts of the development area lie within areas classified as Critical Biodiversity Areas. » Development would also result in	Local and regional	To be determined during the ecological survey

Issue	Nature of Impact	Extent of Impact	'No go' areas
Loss of Landscape Connectivity	landscape fragmentation and the loss of landscape connectivity for fauna and flora particularly along the escarpment which is vulnerable to cumulative impacts.		

Gaps in knowledge and recommendations for further study:

The extent and significance of the risk posed to flora and fauna is not fully understood as the study area has not been surveyed in detail. Fieldwork during the EIA phase will be undertaken in order to inform the assessment of potential impacts and the definition of any no go areas. More detail regarding the above further study required is provided in Chapter 10 (Plan of Study for the EIA phase).

8.3.3 Potential Impacts on Birds

In addition to the desktop assessment undertaken, the avifaunal scoping study was supplemented with a visit to the study area by the avifaunal specialist. The avifaunal assessment will be supplemented by a pre-construction bird monitoring programme currently underway on the site. The Castle site is situated within the Platberg Karoo Conservancy Important Bird Area (IBA – Barnes 1998). This means that at a national scale it is in an area of high avifaunal sensitivity. On a regional scale, the Castle site also falls within a high sensitivity area as classified by the recent "Avian Wind Farm Sensitivity Map for South Africa" (Retief *et al*, 2011). However on a local scale and based on the site characteristics, the site has medium and low sensitivity areas based on micro habitat factors. The ability and extent to which the site supports bird life will be determined and verified during the pre-construction bird monitoring programme.

A list of 'target species' has been compiled for this site. Target species are those species for which there is most conservation concern, and therefore the focus of this study. The target species are as follows: African Marsh Harrier *Circus ranivorus*; Black Harrier *Circus maurus*; Martial Eagle *Polemaetus bellicosus*; Verreaux's Eagle *Aquila verreaux*; Lesser Kestrel *Falco naumanni*; Blue Crane *Anthropoides paradiseus*; Ludwig's Bustard *Neotis ludwigii*; Secretarybird *Sagittarius serpentarius*; Lanner Falcon *Falco biarmicus*; Cape Long-billed Lark *Certhilauda brevirostris*; White Stork *Ciconia ciconia*; Jackal Buzzard *Buteo rufofuscus*; Rock Kestrel *Falco rupicolus*; Southern Pale Chanting Goshawk *Melierax canorus*; and Blue Korhaan *Eupodotis caerulescens*. At this stage this list is preliminary and will be refined based on the pre-construction bird monitoring.

The expected interactions between these birds and the proposed facility are:

- disturbance of birds during construction and maintenance;

- habitat destruction during construction and maintenance of the facility and associated infrastructure;
- displacement of birds from the area, or from flying over the area;
- collision of birds with turbine blades during operation; and
- collision and electrocution of birds on associated electrical infrastructure.

These impacts will be assessed in more detail during the EIA Phase, considering the pre-construction bird monitoring data.

Micro-siting of turbines and other infrastructure within the proposed site remains the foremost means of mitigating the above described impacts on birds. The avifaunal specialist has identified preliminary medium avifaunal sensitivity areas on the site based on micro habitats which are shown in Figure 8.3. Avifaunal sensitivity areas, including surface water sources (farm dams) evident at a desktop level, have been mapped and buffered by 300 metres. Ideally infrastructure should not be constructed within these areas. Although it is clear that numerous drainage lines exist on site, these will be clearly mapped in the EIA phase. These areas can be avoided during final turbine micro sighting. Construction of infrastructure should not take place within these areas or their buffers, which will be refined based on monitoring data. These areas are preliminary sensitive areas and will be modified, over ruled or added to during the EIA phase, as necessary.

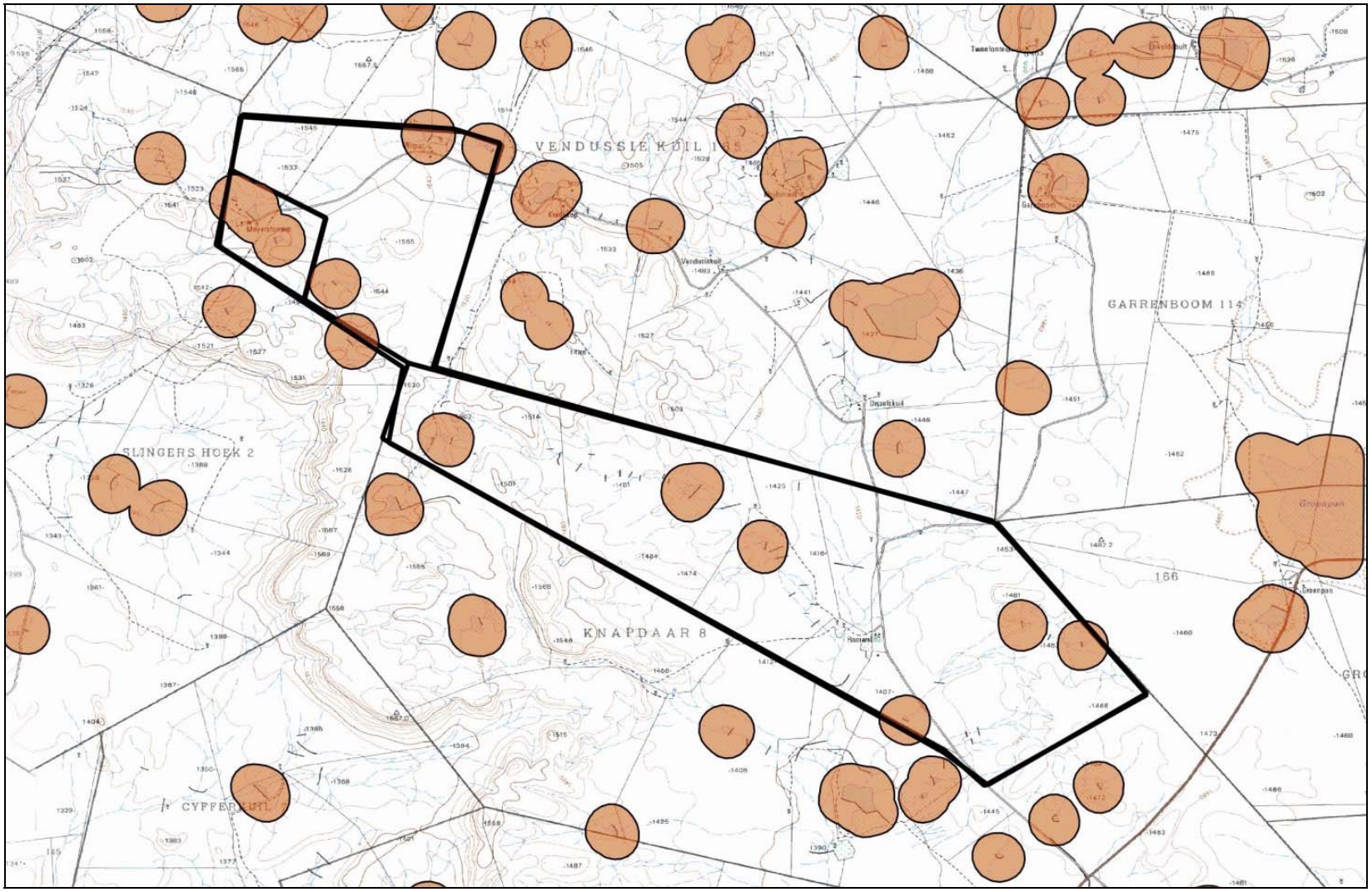


Figure 8.3: Preliminary bird sensitivity map of the study area

Table 8.3: Potential impacts on avifauna

Issue	Nature of Impact	Extent of Impact	'No go' areas
Construction phase			
Destruction of bird habitat & disturbance of birds	Avifauna species currently in the study area will be affected as their habitat will be destroyed. The habitat within the study area is not considered to be unique for birds with few if any red listed species resident on site (to be confirmed).	Local	Medium sensitivity areas in Figure 8.3 are exclusion areas. Suitability of development in areas of medium sensitivity to be confirmed in the EIA phase.
Displacement of birds from the site and barrier effects	With avifauna habitat disturbed, this could result in displacement of avifauna from their site and breeding species would be affected.	Local and regional	
Operational phase			
Collision of birds with turbine blades	This impact is likely to affect large terrestrial birds, raptors etc.	Local and regional	Medium sensitivity areas (dams) in Figure 8.3 - to be confirmed through bird monitoring

Gaps in knowledge and recommendations for further study:

The proposed development is likely to impact on birds predominantly through collision with turbines. The extent to which collision risk can be assessed is limited without data on bird flight behaviour on site. This data should be collected through a pre-construction bird monitoring programme. Currently there is no evidence to suggest that the proposed Castle Wind Energy Facility on the proposed site cannot be supported from an avifaunal perspective. More baseline information concerning the impact of construction on bird habitat and the significance of the risk of collision of the target species with the wind energy facility within the various parts of the study area during operation is required to be collected before a final conclusion can be made in this regard.

EIA Phase

» A full pre-construction bird monitoring programme will be conducted on site.
» Based on data collected through the more detailed investigations, the sensitivity map for the site will be developed further.

» The impacts identified in this scoping phase study will be assessed formally, and based on data collected through the monitoring programme.
» Recommendations will be made for the management of identified impacts.

Pre-construction monitoring

It is difficult at this stage to judge the likelihood of collision of birds with turbines as no baseline data on bird movement on the site or surrounds is available. This will be collected through a pre-construction bird monitoring programme which is currently underway on the site. The aims and methods of this pre-construction monitoring programme have been detailed in Chapter 10. This baseline data will enable an informed decision on the potential risk of displacement, collision and mortality of the target species.

Detail regarding the above further study required is provided in Chapter 10 (Plan of Study for the EIA phase).

8.3.4 Potential Impacts on Bats

The Scoping process has identified the potential impacts on bats associated with the construction of the proposed wind energy facility as habitat destruction and disturbance of bats. The potential impact on bats will predominantly occur during the operational phase of the wind energy facility and are anticipated to include, most significantly, collision of bats with turbine blades and barotrauma, which is the sudden drop in air pressure around turbines causing a bat's lungs to rapidly expand resulting in mortality. The table below provides an indication of species that may be roosting or foraging on the study area, the possible site specific roosts, and their probability of occurrence is based on literature. A total of nine bat species may occur on the site, four of which have a high probability of being encountered on site. Four species have a Medium-High risk of being impacted by turbines and a further one species has a High risk of being impacted by wind turbines. Bat mortalities during foraging on the site is most likely to be of higher significance, should turbines be placed in areas of high bat sensitivity.

Species	Common name	Probability of occurrence	Conservation status	Possible habitat to be utilised in study area	Likely Risk of Impact (Sowler & Stoffberg, 2012)
1. *Eidolon helvum*	African straw-coloured fruit bat	None - Low	Least Concern (LC)	Non breeding migrant in South Africa. Lack of fruiting trees.	Moderate - High
2. *Eptesicush ottentotus*	Long-tailed serotine	**High**	LC	Crevice dweller and in buildings. Rock crevices in rocky outcrops.	Moderate
3. *Miniopterus natalensis*	Natal long-fingered bat	**High**	Near Threatened (NC)	Roosts gregariously in caves, no known caves close to the study site.	Moderate - High

Species	Common name	Probability of occurrence	Conservation status	Possible habitat to be utilised in study area	Likely Risk of Impact (Sowler & Stoffberg, 2012)
4. *Myotistricolor*	Temmink'smyotis	Moderate	LC	On edge of distribution.	Moderate - High
5. *Neoromicia capensis*	Cape serotine	**High**	LC	Roofs of buildings and crevices. Very common species.	Moderate - High
6. *Nycteristhebaica*	Egyptian slit-faced bat	Low	LC	Cavities, hollow tree trunks, and culverts under roads. Any suitable hollows. May prefer cluttered habitats more. On edge of distribution.	Low
7. *Rhinolophusclivosus*	Geoffroy's horseshoe bat	Moderate	LC	Roosts gregariously in caves, no known caves close to the study site. But may also utilise any other cavities.	Low
8. *Rhinolophusdarlingi*	Darling's Horseshoe bat	Low	LC	On edge of distribution. Roost in caves and any suitable hollows.	Low
9. *Tadaridaaegyptiaca*	Egyptian free-tailed bat	**High**	LC	Crevices, buildings, very common bat.	High

Figure 8.4 depicts the potentially bat sensitive areas on the site (drainage lines), based on features identified to be important for foraging and roosting of the species that are most probable to occur on site. Thus the bat scoping sensitivity map is based on bat species ecology and habitat preferences. This map can be used as a pre-construction mitigation in terms of improving turbine placement with regards to bat preferred habitats on site. The California Guidelines for Reducing Impacts to Birds and Bats from Wind Energy Development (2007) states that wind turbines within or near to sites of water and/or riparian habitat could increase the number of bat and bird collisions and that construction within and near to water bodies on a site should not be encouraged.

This was considered when compiling the sensitivity map.

» Areas classified as having moderate sensitivity include foraging habitat or potential roosting sites.
» Areas classified as having high sensitivity include habitat for resident bat populations, capable of elevated levels of bat activity and support greater bat diversity than the rest of the site. These areas are 'no-go' areas and turbines must not be placed in these areas.

Figure 8.4 Preliminary bat sensitivity map of the Castle Wind Energy Facility site

Areas not depicted as having a Moderate or High Bat Sensitivity are considered of a Low Bat Sensitivity category. The wind farm development can proceed within these areas with minimal negative bat impact. It is important to note that this Scoping Phase assessment sensitivity map is not intended to govern the ideal locations of wind turbines with regards to bat sensitivity, but rather to highlight areas that will require special attention during bat monitoring and impact assessment. There are no buffer distances indicated on the Moderate and High sensitivities, since buffers will be determined during the preconstruction monitoring. Similarly this map may be altered significantly during the preconstruction monitoring as insight into bat activity on the site increases with analysed data.

Table 8.4: Potential impacts on bats

Issue	Nature of Impact	Extent of Impact	'No go' areas
Construction Phase			
Loss of bat foraging habitat	» Habitat destruction due to the construction of the concrete foundation of the turbines, access roads and associated infrastructure. » Increase in the movement of bats across the area due to removal or destruction of vegetation.	Local	High sensitivity areas shown in Figure 8.4
Operational Phase			
Collisions with turbines, associated infrastructure and barotrauma	» Attraction of insects to lights used at the facility, resulting in an increased incidence of bats in that area for feeding purposes.	Local and regional	High sensitivity areas shown in Figure 8.4
	» Movement of bats between food sources into open areas where turbines may be located is likely to increase the risk of collisions with turbine blades and bat mortality.	Local and regional	High sensitivity areas shown in Figure 8.4
	» Exposure of bats to rapid decreases in external air pressure near the blade tips could result in barotrauma and bat mortality.	Local and regional	High sensitivity areas shown in Figure 8.4
Disturbance of bats and interaction with infrastructure	» The construction of wind energy facilities has the potential to disrupt the natural migration routes of migratory bat species in the area by being placed in their flight path. » Wind turbines may disrupt bats that commute nightly from roost sites to feeding areas. » If a wind energy facility results in the	Local	High sensitivity areas shown in Figure 8.4

Issue	Nature of Impact	Extent of Impact	'No go' areas
	death of many individual bats, breeding patterns and population growth and maintenance could be severely disturbed. » There is a likelihood that bats could roost in the substation/s and workshop areas and/or office or associated infrastructures.		

Gaps in knowledge and recommendations for further study:

Currently there is no baseline information to confirm whether the wind energy facility will have a negative impact on bats occurring in the study area. More baseline data is required to determine the occurrence of habitat and roosts and the relationship of bats to the proposed infrastructure. This can be obtained through data collection from a pre-construction bat monitoring programme.

EIA Phase

» The micro habitats on site will be assessed for their suitability for the key bat species likely to occur on the site.
» The sensitivity zones will be confirmed and mapped.
» The impacts identified in this scoping phase study will be assessed in the EIA phase.
» A site visit must be conducted for the EIA phase of this project to more accurately determine bat presence and to provide more guidance regarding the appropriate positioning of the turbines, and associated infrastructure.
» Baseline data collected during the pre-construction monitoring being undertaken on the site will be considered in the final bat impact assessment report.

Pre-construction Bat Monitoring

» A bat monitoring program is critical in extending the specialist's knowledge of wind energy and bat interactions. A 12-month pre-construction monitoring program which is underway must be planned to collect data on local environmental factors and bat communities. This programme will conform to the South African Good Practice Guidelines for Surveying Bats in Wind Farm Developments.

Detail regarding the above further study required is provided in Chapter 10 (Plan of Study for the EIA phase).

8.3.5 Potential impacts on Archaeological, Heritage and Paleontological Resources

The heritage scoping study revealed that the following heritage sites, features and objects can be expected within the study area.

» There is a high likelihood of finding fossil remains on the eastern portion of the study area (Portion 0 of Farm 8 (Knapdaar)).
» In terms of archaeology there is a high likelihood of finding Middle Stone Age (MSA) sites scattered on the site. Based on other studies in the study area, these sites will consist mostly of open sites near stream beds or hills and outcrops (van der Walt, 2011).
» Later Stone Age (LSA) sites were also recorded in the larger area (e.g. Kaplan, 2010) and especially shelters with archaeological deposit could be of high significance.
» Rock art is also expected in the area as recorded in the wider study area (erg Fock & Fock, 1989; Morris, 1988 and van Jaarsveld, 2006).
» Historical finds include middens, structural remains and cultural landscape. The study area has been used for farming in the past and features dating to this period associated with farming can occur and can include houses and other structures older than 60 years, farming infrastructure such as wind mills, etc. Remains dating to the Anglo-Boer War were also recorded in the wider region (van der Walt, 2011; Orton, 2012) and remains dating to this period could occur in the study area.
» Graves and informal cemeteries can be expected anywhere on the landscape.

The construction phase of the project could directly impact on surface and subsurface archaeological sites. The construction of the project can directly impact on both the visual context and sense of place of historical sites. The construction and operation of the proposed project could directly impact on marked and unmarked graves.

Based on the current information obtained for the area at a desktop level it is anticipated that any heritage sites that occur within the proposed development area will have a Generally Protected B (GP.B) field rating and no red flags were identified at this stage of the EIA process. Every site is relevant to the Heritage Landscape, but it is anticipated that few sites in the study area could have conservation value.

The following conclusions are applicable in terms of sensitivity of the expected heritage sites on the site:

» Palaeontology
  There is a high likelihood of finding fossil remains on the eastern portion of the study area (Portion 0f Farm 8 (Knapdaar) and if possible no wind turbines should be located on this portion. If this is not possible any fossil remains in

this area could be mitigated either in the form of conservation of the sites within the development or by a Phase 2 study where the sites will be recorded and sampled before the developer can apply for a destruction permit for these sites prior to development.

» Archaeological sites
All sites could be mitigated either in the form of conservation of the sites within the development or by a Phase 2 study where the sites will be recorded and sampled before the developer can apply for a destruction permit for these sites prior to development.

» Historical finds and Cultural landscape
It is not anticipated that the built environment will be severely impacted upon as few structures occur within the study area (based on Google Earth). This assumption will however have to be verified in the field. If any sites dating to the Anglo Boer War occur in the study area, it is recommended that these sites are conserved.

» Burials and cemeteries
Formal and informal cemeteries as well as pre-colonial graves occur widely across Southern Africa. It is generally recommended that these sites are preserved within a development. These sites can however be relocated if conservation is not possible, but this option must be seen as a last resort and is not advisable. The presence of any grave sites must be confirmed during the field survey and the public consultation process.

Table 5.5: Potential heritage and paleontological impacts

Issue	Nature of Impact	Extent of Impact	'No go' areas
Construction Phase			
Potential impacts on heritage resources	Construction of wind turbines and associated infrastructure impacting on heritage resources including graves, rock art sites and Stone Age sites.	Local	None identified at this stage subject to confirmation during EIA phase)
Potential movement, damage, or destruction of fossil material	Potential damage or destruction of fossil materials during the construction of project infrastructural elements	Local	None identified
	Movement of fossil materials during the construction phase such that they are no longer in situ when discovered.	Local	None identified
	The loss of access for scientific study to any fossil materials present beneath infrastructural elements.	Local	None identified
Operational Phase			
Potential impact on	The proposed wind energy facility could directly impact on both the	Local and regional	None identified

Issue	Nature of Impact	Extent of Impact	'No go' areas
sense of place	visual context and sense of place of historical sites.		

Gaps in knowledge and recommendations for further study

The status and significance of the heritage and archaeological sites identified at a desktop level was not confirmed at Scoping. Verification of the desktop information collected regarding the position and status of the heritage and archaeological sites identified is required to determine the significance of the impacts on the heritage environment.

In order to comply with the requirements of the National Heritage Resources Act (Act 25 of 1999), a Phase 1 Archaeological Impact Assessment will be undertaken during the EIA phase. The possibility of any negative impact on the palaeontological heritage of the project area could be minimised by a thorough site investigation by a palaeontologist as part of a full EIA study prior to commencement of the project. Detail regarding the above further study required is provided in Chapter 10 (Plan of Study for the EIA phase). Similarly, a thorough and on-going examination should be made of all excavations as they are being performed. Should any fossil materials be identified, the excavations should be halted and SAHRA informed of the discovery.

8.3.6 Potential Visual Impacts

The proposed Castle Wind Energy Facility site is located in the sparsely populated region of the Karoo in the Northern Cape Province. Portions 12 and 13 of the Farm 165 (Vendussie Kuil) are traversed by the Hydra to Roodekuil No.2 220kV power line. Excluding the participating landowners' residential dwellings (Rooikraal) and workers houses on the site itself, there are no formal residential areas on the site or in the surrounding area. Homesteads or farm residences surrounding / in proximity to the proposed wind energy facility site include: Meyersfontein, Witput, Die Dam, Leeufontein, Slingershoek, Matjiesfontein, Pienaarskloof, Kranskop, Klipfontein, Garrenboom, Vendusiekraal, Disselskuil, Groenpan, Plessisvlakte, Rooidam, Knapdaar, etc. De Aar and Philipstown are the main towns relevant to the Castle site.

Due to the height of the wind turbines (a hub-height of up to 100m) and the site's location within a rural landscape, visual impacts of the wind turbines and other infrastructure such as the power line can be expected. The result of the preliminary viewshed analyses for the proposed facility is shown on the map below (Figure 8.5). It must be noted that the viewshed analyses indicate theoretical visibility of the proposed development and do not include the effect of vegetation cover or existing

structures on the exposure of the proposed facility, therefore signifying a worst-case scenario.

The viewshed analyses will be refined once a preliminary and/or final layout of the facility is completed and will be regenerated for the actual position of the infrastructure on the site, and per structure position (and actual proposed technology) during the EIA phase of the project.

It is evident from the preliminary viewshed analyses that the proposed facility would have a very large area of potential visual exposure within the central to southern sections of the study area. This is attributed to the sizable wind turbine structures, the location of the structures on top of the plateau and the generally flat topography to the south. The visual exposure to the north is effectively interrupted by the northern escarpment due to the relative setback distance of the wind turbines from this escarpment. The visually exposed terrain, for the most part, falls within vacant natural land, although some sensitive visual receptors may be encountered at farm residences and along major roads.

Within a **5km radius** from the proposed facility, the wind turbines would likely be exposed to a number of farm residences and sections of secondary roads traversing near or over the development site. Affected farmsteads, excluding the ones located within the development site, may include: *Kranskop, Klipfontein, Garrenboom, Vendusiekraal, Disselskuil, Groenpan, Die Dam* and *Slingershoek*.

Visibility within the **5-10km** radius from the development site becomes scattered due to the shielding effect of the escarpment surrounding the site. This is quite evident to the north and some sections to the south, where the wind turbines are not expected to be visible at all. Sections of the R389 arterial road may experience views of the facility, as well as sections of the secondary roads traversing within this zone. Affected homesteads, from where the turbine structures may be visible, includes: *Tweefontein, Enkeldebult, Tierpoort, Plessisvlakte, Rooidam, Knapdaar, Hotom, Sipreshof, Rusoord, Matjiesfontein* and *Pienaarskloof*.

The intensity of visual exposure is expected to subside beyond a **10km** radius. This zone contains large tracts of natural land, limited sections of the R389 and other secondary roads, and a number of farm residences. These include: *Leeuwkuil, Bethel, Cypherput, Hoofkwartier, Gansfontein, Skietkuil, Bloemhof,Rietfontein, Wag-'n-Bietjie, Caroluspoor* and *Jakkalsfontein.*

Visibility beyond a **radius of 20km** from the facility is deemed to be negligible, as the structures are unlikely to be visible with the naked eye, or totally absorbed within the landscape. It is envisaged that the structures (where visible from shorter distances) may constitute a high visual prominence, potentially resulting in a high visual impact. .

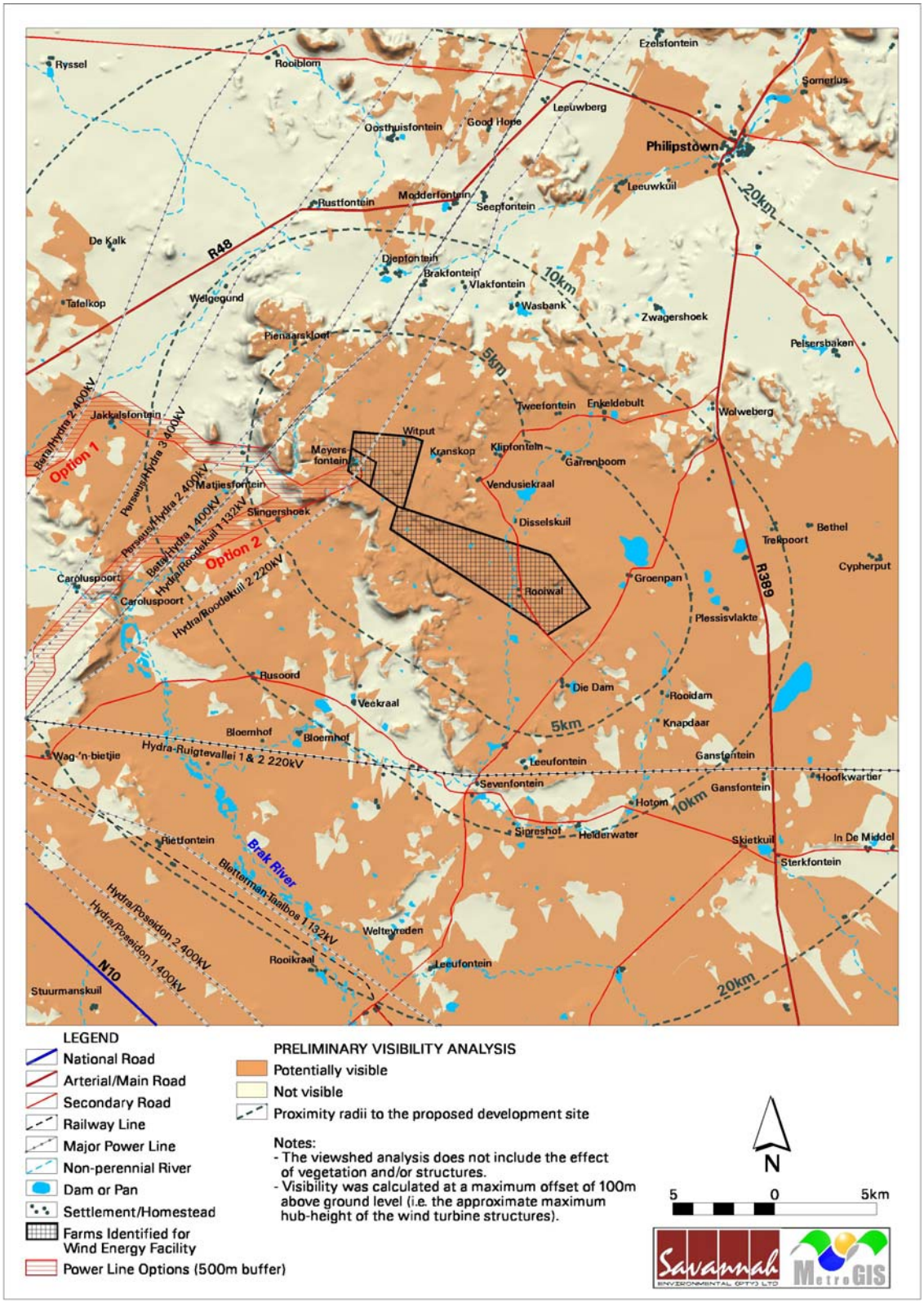


Figure 8.5: Preliminary Visibility Analysis (Wind Turbine Infrastructure only)

Table 8.6: Potential visual impacts

Issue	Nature of Impact	Extent of Impact	'No go' areas
Construction Phase			
Potential visual impacts associated with the construction phase	Impacts on sensitive visual receptors'	Local and regional	None identified
Secondary visual impacts	Construction of new access roads within areas with steep slopes and elevated topography.	Local and regional	None identified
Operational Phase			
Visibility to observers and residences	The visibility of the facility to, and potential visual impact on, observers travelling along the R389 arterial road and the local roads traversing near the proposed facility. The visibility of the facility to, and potential visual impact on observers residing at homesteads (farm residences) located within close proximity of the site.	Local and regional	None identified
Impact on scenic resources	The potential visual impact on the scenic resources, landscape and topography of the region brought about by the construction of wind turbines within sensitive topographic units (i.e. hills, mountains and steep slopes).	Local and regional	None identified
Cumulative impacts	Potential cumulative visual impacts (or alternately, consolidation of visual impacts) with specific reference to the authorised Mulilo wind energy facility which adjoins the site.	Regional	None identified

Gaps in knowledge and recommendations for further study:

The severity of the visual impact and the extent of visual exposure were not determined during Scoping. It is recommended that sensitive visual receptors within (but not restricted to) a 10km buffer zone from the wind energy facility be identified and the severity of the visual impact assessed within the EIA phase of the project.

Additional spatial analyses must be undertaken in order to:

» Determine Visual Distance/Observer Proximity to the facility
» Determine Viewer Incidence/Viewer Perception
» Determine the Visual Absorption Capacity of the landscape
» Determine the Visual Impact Index

Specific spatial criteria need to be applied to the visual exposure of the proposed facilities in order to successfully determine visual impact and ultimately the significance of the visual impact. Detail regarding the above further study required is provided in Chapter 10.

8.3.7 Potential Noise Impacts

Besides existing roads, no other significant ambient soundscape contributors exist in the study area. Six (6) potential noise-sensitive developments were identified in the noise specialist scoping study, two (2) of which are located inside the study area boundary / site and four (4) of which are located outside the site for the proposed wind energy facility (refer to Figure 8.6). The main noise sources associated with the proposed project include:

» Construction activities, although temporary in nature.
» Noise generated from the wind turbines.

Refer to the table below and the scoping noise impact assessment for more detailed explanations on potential noise sources as a result of the wind energy facility and associated infrastructure and activities.

Figure 8.6: Location of potential noise sensitive developments

Table 8.7: Potential noise impacts

Issue	Nature of Impact	Extent of Impact	'No go' areas
Construction Phase			
Noise impact on identified noise sensitive developments (NSD)	Potential sources of noise from construction and operation activities which could impact on the noise-sensitive developments include: » construction of access roads, » establishment of turbine tower foundations and electrical substation(s), » the possible establishment, operation and removal of concrete batching plants, » the construction of any buildings, » digging of trenches to accommodate underground power cables, » the erection of turbine towers and assembly of wind turbines, » Construction equipment e.g. excavator/grader, bulldozer, dump trucks, vibratory roller, bucket loader, rock breaker, (potentially) drill rig, flat bed trucks, concrete truck(s), cranes, fork lift and various 4WD and service vehicles, » Concrete batching plants and use of borrow pits (if required) » Blasting (if required), and » Construction related traffic.	Local	None
Operational Phase			
Wind turbine noise: aerodynamic sources	» Interaction of the turbulent boundary layer with the blade trailing edge. » Noise due to inflow turbulence (turbulence in the wind interacting with the blades). » Discrete frequency noise due to trailing edge thickness. » Discrete frequency noise due to laminar boundary layer instabilities (unstable flow close to the surface of the blade).	Local	Noise sensitive developments indicated in Figure 8.6 are potential areas which should be avoided.

Issue	Nature of Impact	Extent of Impact	'No go' areas
	» Noise generated by the rotor tips.		
Wind turbine noise: mechanical sources	Potential sources of noise include: » the gearbox and the tooth mesh frequencies of the step up stages; » generator noise caused by coil flexure of the generator windings which is associated with power regulation and control; » generator noise caused by cooling fans; » control equipment noise caused by hydraulic compressors for pitch regulation and yaw control.	Local	Noise sensitive developments indicated in Figure 8.6 are potential areas which should be avoided.

Gaps in knowledge and recommendations for further study:

The potential noise impact from the wind energy facility will be investigated in more detail in the EIA Phase. The purpose of an environmental noise impact investigation and assessment will be to determine and quantify the acoustical impact of, or on a proposed development. The following information is considered critical:

» The prevailing night-time background ambient noise levels,
» The available meteorological data,
» The exact locations of the various wind turbine generators within the wind farm development footprint,
» The confirmation of the noise-sensitive developments, and;
» An overview of the equipment, processes and schedules for the construction phase.

Detail regarding the above further study required is provided in Chapter 10.

8.3.8 Potential Impacts on the Social Environment

The potential positive social impacts during the construction phase are largely linked to the creation of employment and skills development opportunities. The potential negative impacts are linked to the impact on local road surfaces associated with the transport of heavy components and the impact on local communities and current farming activities associated with the presence of construction workers on the site and social nuisances (such as construction traffic,

dust and noise). During the operational phase, social impacts may occur, however to a limited extent. A number of key social issues are potentially associated with the construction and operation of the wind energy facility as detailed in the table below.

Table 8.8: Potential social impacts

Issue	Nature of Impact	Extent of Impact	'No go' areas
Construction phase			
Impact on rural sense of place	Impact on sense of place closely linked to the visual impacts from the wind energy facility	Local and regional	N/A
Impact on farming activities	» Safety and security impacts, stock losses, damage to farm infrastructure and damage to farm roads. » Potential impact on farming operations and loss of productive land (during the construction and operational phase).	Local and regional	None
Impact on existing infrastructure	Potential damage to roads by heavy equipment and increased traffic volumes (during the construction and operational phase)	Local and regional	N/A
Influx of job seekers into the area	» The influx of job seekers may result in an increase in sexually transmitted diseases, including HIV/AIDS; increase in prostitution; increase in alcohol and drug related incidents; increase in crime; and creation of tension and conflict in the community. » Potential threat to farm safety due to increased number of people in the area and construction workers.	Local and Regional	N/A
Creation of employment and business opportunities	Positive impact associated with indirect business opportunities created as a result of the proposed project.	Local and regional	N/A
Creation of potential training and skills development opportunities for local communities and businesses	Positive impact associated with potential for skills development and business opportunities.	Local and Regional	N/A

Issue	Nature of Impact	Extent of Impact	'No go' areas
Potential up and down-stream economic opportunities for the local, regional and national economy	Maximising opportunities to local and regional SMMEs and other businesses to provide a range of services, which may include, but not limited to, catering, laundry, transport (limited positive impact)	Local, Regional and National	N/A
Operational phase			
Impact on property prices	» Generation of additional land use income makes a positive contribution to farming cash flow, and thereby improves the financial sustainability of agricultural activity. » Decrease in value of property due to reduced grazing capability.	Local and regional	N/A
Impact on tourism	Positive or negative impact on tourism potential due to viewer perception of the wind energy facility.	Local and Regional	None
Creation of potential training and skills development opportunities	Positive impact associated with potential for skills development and business opportunities.	Local and Regional	N/A
Renewable energy	Provision of clean, renewable energy source for the national grid	Local and Regional	N/A
Local content	Benefits associated with the establishment of a Community Trust	Local and Regional	N/A

Gaps in knowledge and recommendations for further study:

The proposed wind energy facility is in line with the development of a Renewable Energy hub in the region around De Aar, as highlighted in the Emthanjeni Local Municipality's IDP (2012-2013) and the Pixley ka Seme District's IDP (2009-2012). The extent and significance of the social impacts at a local level will be determined in the EIA phase.

The following typical, generic project information is required to be considered in order to address the gaps in information at a local level:

» Comments received from I&APs during the public participation process, including comments reflected in the Final Scoping Report;

- A plan of the proposed lay-out(s) of the facilities (including an indication of the phasing sequence on the site), supporting structures and infrastructure;
- Duration of the construction phase (months);
- Number of people employed during the construction phase;
- Breakdown of number of people employed in terms of skills categories (low skilled, semi-skilled and skilled);
- Estimate of the total wage bill for the construction phase and breakdown in % as per skills categories;
- Estimate of total capital expenditure for the construction phase;
- Indication of where construction workers will be housed;
- Opportunities for on-site skills development and training;
- Description of the typical activities associated with the construction phase, specifically on-site construction activities. This includes a description of how the components associated with a wind energy facility will be transported to and assembled on site;
- The size of the vehicles needed to transport the components and the routes that will be used to transport the large components to the site, and an estimate of the number of vehicle trips required; and
- Information on the nature of the agreements with the affected landowners and or communities, specifically with regard to compensation for damage to land, infrastructure etc.

Detail regarding the above further study required is provided in Chapter 10.

8.4 Decommissioning phase

Decommissioning activities may include removal of project infrastructure and site rehabilitation. The turbine infrastructure which will be utilised for the proposed wind energy facility is expected to have a lifespan of approximately 20 - 30 years (with maintenance). It is possible that upgrade and refurbishment of the infrastructure of the facility discussed in this EIA would comprise the disassembly and replacement of the turbines with more appropriate technology/infrastructure available at that time.

Similar to the construction phase, environmental issues associated with decommissioning activities may include, among others, noise impacts, soil erosion, and threats to biodiversity and ecological processes, including habitat alteration and impacts to fauna. Issues and impacts associated with decommissioning of the project(s) are expected to be similar to those associated with the construction phase as detailed in Section 8.3.

8.5 Potential Impacts of the Power Line and Substation

Based on the information available at this stage, a 132 kV overhead power line is required to connect into the authorised Ilanga Lethemba Substation, near De Aar or Hydra Substation. The two power line options / corridors are shown in Figure 8.7. A 500m corridor is being considered within the EIA process. The power line will have a 31m servitude and will be approximately 20-25 kilometres in length. A broader study area between the Castle site and the Ilanga Lethemba Substation and Hydra Substation has been considered in this Scoping report. An on-site sub-station/s (with an approximate compound size of 100 m x 100 m) will also be required. The text and tables below provide details of potential impacts associated with the construction and operation phases of a proposed 132kV power line and on site substations. Impacts associated with decommissioning are expected to be similar to those associated with construction.

Specialist scoping reports are included within **Appendix F to M** wherein issues relating to all components of the project (i.e. wind turbines, power lines and substation components) are identified. The assessment of impacts relating to the power line and on-site substations will be undertaken in the EIA phase. A discussion of the potential cumulative impacts associated with the power line and substations is presented in Section 8.6.

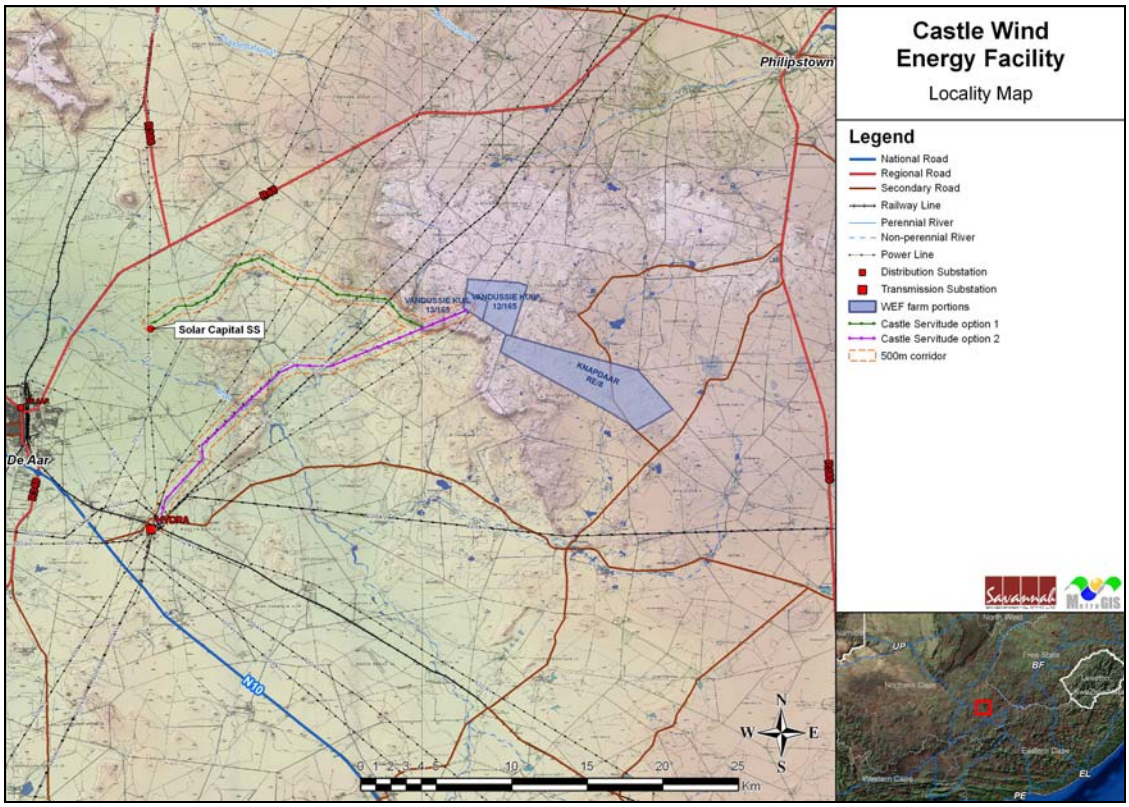


Figure 8.7: Map showing the power line corridors considered in this scoping report for the Castle Wind Energy Facility

8.5.1 Construction phase

An understanding of the activities to be undertaken during the construction process is necessary to predict the potential impacts of the proposed power line on the environment. Construction activities for the proposed 132 kV power line are anticipated to include surveys, vegetation clearance and construction of access roads, pegging of power line route, construction of foundations, stringing of conductors and rehabilitation of disturbed areas.

Environmental issues associated with linear construction activities may include, amongst others, alteration of land use, soil erosion, visual impacts, noise impacts, impacts on vegetation, impacts on fauna and social impacts.

An understanding of the activities to be undertaken during the construction process for the substation is necessary to predict the potential impacts of the proposed substations on the environment. One or more on-site substation will be constructed within the site. The position of the substation/s will be informed by the final micro-siting/positioning of the wind turbines. The construction of the substation would require a survey of the site; site clearing and levelling and construction of access road/s to the substation site (where required); construction of substation terrace and foundations; assembly, erection and installation of equipment (including transformers); connection of conductors to equipment; and rehabilitation of any disturbed areas and protection of erosion sensitive areas.

8.5.2 Operational phase

Operational activities include regular maintenance of the 132kV power line and associated 31m wide servitude. The operational or economic life of the power line is anticipated to be in the region of 40 years (including maintenance).

Environmental issues specific to the operation of the power line could include visual impacts, bird injury or mortality resulting from collisions with power lines and electrocution of larger bird species, and impacts on biodiversity, land-use and the social environment.

The proposed substation/s will require routine maintenance work throughout the operational period. The site will be accessed using the access roads established during the construction phase. The substation is expected to have a lifespan of more than 40 years (with maintenance) and the infrastructure would only be decommissioned once it has reached the end of its economic life.

Environmental issues specific to the operation of the substations could include visual impacts, electrocution of birds and increase in runoff and erosion.

8.5.3 Decommissioning phase

Decommissioning activities will include removal of project infrastructure and site rehabilitation. The operational or economic life of the power line and substation is anticipated to be in the region of 40 years (with maintenance).

Similar to the construction phase, environmental issues associated with decommissioning activities may include, among others, noise impacts, soil erosion, and threats to biodiversity and ecological processes, including habitat alteration and impacts to fauna. Impacts are expected to be similar to those identified for the construction phase of the project.

8.5.4 Scoping of Issues Associated With the Power Line & Substation

As the majority of the 132kV power line will be located outside of the Castle wind energy facility site, most of the impacts relating to the construction and operation thereof will be registered outside of the site, and will remain localised (i.e. within the servitude) apart from those on avifauna and visual impacts. A variation of the significance of the impacts along the alternative corridors is expected based on their capacity to be aligned with existing linear infrastructure.

Potentially significant impacts associated with the power line and substation development include:

» During construction disturbance to soil, vegetation and nearby residents due to excavations for the support structure for the 132kV power line.
» During operation, the power line could cause bird mortality (electrocution / collision) with the power line, and could result in visual impacts on the surrounding area.

The areas likely to be impacted by the power lines are similar to those within the site and due to the low terrestrial footprint of the power line; these impacts are likely to be local in nature and of low significance. In terms of the power line routes, the SA Vegmap indicates that Option 2 would traverse a higher proportion of Besemkaree Koppies Shrubland than Option 1, which is largely restricted to the Northern Upper Karoo vegetation type. This suggests that species of conservation concern are more likely to be encountered along Option 2 than Option 1, which is a contributing factor to Option 1 being identified as the preferred power line option route.

Table 8.9: Potential Impacts associated with the power line and substation/s

Issue	Nature of Impact	Extent of Impact	'No go' areas
Negative impact on vegetation and soil structure during construction of the power line and associated access roads.	Excavations of foundations and stringing of the power line may disturb vegetation and sensitive species (plants and animals)	Local	Not possible to identify at this stage
Disturbance (intrusion impacts) to residents / farmers living in close proximity to where the power line is being constructed.	Construction noise due to vehicles / staff building the power line may disturb residents / landowners.	Local	Not possible to identify at this stage
Operational impact: Bird mortality due to the power line and substation	Electrocution / collision of certain bird species with the power line, due to overhead cables. Electrocution on substation infrastructure may occur. Cumulative impacts due to extensive power line infrastructure in the area.	Local – Regional	Not possible to identify at this stage
Operational impact: Visual impact on surrounding area	Visual impact on potentially sensitive visual receptors in the study area. Cumulative visual impact due to extensive power line infrastructure in the area.	Local – Regional	Not possible to identify at this stage

Gaps in knowledge & recommendations for further study:

Each specialist study will consider the impact of the power line on the different environmental elements. The different power line alternatives and substation sites will need to be investigated in the field to ensure that there are no significant environmental features along the routes that would be impacted and to ensure that the most favourable power line route from an environmental perspective can be identified. This will be undertaken during the EIA phase.

The occurrence of potentially sensitive environments and species within the identified power line corridors and substation sites will require identification and classification. The following activities will be undertaken during the EIA phase in order to assess potential impacts on the ecological receiving environment by the proposed power line and substation:

- Develop and verify the ecological sensitivity map of the power line corridors and substation sites.
- Characterise the vegetation and plant communities present within the corridors and at the substation site.
- Identify and map the presence of any unique and special habitats.
- Locate, identify and map the location of significant populations of species of conservation concern, so that suitable mitigation measures may be put in place.
- Determine any social impacts and issues related to the power line.
- Determine the visual impact of the power line.
- Determine if any heritage sites occurs within the power line.
- Evaluate what the most applicable mitigation measures to reduce the impact of the development of the power line and substations would be and if there are any areas where specific precautions or mitigation measures should be implemented.
- Assess the impacts identified above in light of the site-specific findings and the final power line route and substation site to be provided by the developer.
- Alternatives powerlines routes will be assessed in the EIA phase.

The EIA Phase activities to be undertaken are detailed in Chapter 10.

8.6 Cumulative impacts

The local and regional cumulative impacts associated with the wind energy facility and associated infrastructure is discussed in further detail below.

Local perspective: In identifying and evaluating impacts associated with the proposed wind energy facility, it has been assumed that although during the operational phase the area affected will comprise of the wind turbines and associated infrastructure, during construction a larger area between the site and Ilanga Lethemba Substation, Hydra Substation, De Aar and Phillipstown would be affected.

The cumulative impacts associated with the proposed wind energy facility are expected to be associated with the scale of the project (i.e. that up to 38 wind turbines and associated infrastructure will be located on the proposed site). The site could suffer some level of disturbance as a result of the activities required to be undertaken. However, once construction is complete, it is anticipated that only a small portion of this area (typically less than 10% of the affected farm portions) will be permanently impacted by infrastructure associated with the project.

The anticipated cumulative impacts on agricultural resources, soils, flora and fauna and environmental and social receptors are not considered to be of high significance at this Scoping stage of the process if identified environmental constraints and

sensitivities are taken into consideration. Currently most of the site is not environmentally constrained due to potential no-go areas. The potential direct cumulative impacts associated with the operation phase of the project are expected to be of most significance for bird and bat species which may make use of the study area.

In addition to the proposed Castle Wind Energy facility, several other renewable energy facilities are proposed in the area. Each facility will include associated grid integration infrastructure (i.e. power lines and substations). This would add to the potential cumulative impact in the region.

The potential direct cumulative impacts associated with the power line and substations are expected to be associated predominantly with the potential visual impact, impacts on ecology (mainly associated with habitat loss) and potential impacts on avifauna and bats during operation. The significance of the cumulative impacts will be adequately assessed and considered in the detailed specialist studies to be undertaken in the EIA phase of the process.

Regional perspective: An area of potential concern is the large number of other proposed renewable energy developments in the area between De Aar and Phillipstown, and the resulting potential for cumulative impacts. The proposed wind energy facility is located in close proximity to the following projects located within the region (refer to **Figure 8.8**):

Project	Applicant	DEA Ref. No	Status
1. Proposed Mulilo Wind Energy facility situated on the Eastern Plateau near De Aar	Mulilo Renewable Energy (Pty) Ltd	12/12/20/2463/2	Authorised
2. Oasis wind energy facility	Oasis Wind Farm (Pty) Ltd	14/12/16/3/3/2/311	EIA in process
3. Naumanni Wind Energy Facility	Naumanni Wind Farm (Pty) Ltd	14/12/16/3/3/2/310	EIA in process
4. Proposed Inyanga Solar Energy Project 3, on the farm Riet Fountain	Islandsite Investment 519 (Pty) Ltd	12/12/20/2497	EIA in process
5. Proposed ACED solar energy facility (Phase 1-5) on a site east of	ACED Renewables De Aar,	12/12/20/2250/	Authorised

Project	Applicant	DEA Ref. No	Status
De Aar			
6. Development of a solar CSP energy facility in De Aar	South Africa Mainstream Renewable Power Development	12/12/20/2025/2/A	Authorised
7. Proposed Solar Power Generation Facility in the remaining extent of the farm Vetlaagte 4	Inqwaba Energy (Pty) Ltd	4/12/16/3/3/2/382/6	EIA in process
8. Proposed Photovoltaic solar Energy Facility on a site southeast of De Aar, Northern Cape	Inca De Aar Solar (Pty) Ltd	12/12/20/2177	Authorised,
9. Proposed solar energy facility and associated infrastructure on site north East of De Aar	Solar Capital (Pty) Ltd	12/12/20/2048/4	Authorised, preferred bidder (2 phases) & project under Construction
10. Proposed photovoltaic (solar) energy plant on Du Plessis Dam Farm near De Aar,	Mulilo Renewable Energy (Pty) Ltd	12/12/20/2498	Authorised and preferred bidder
11. Proposed photovoltaic (solar) energy plant on Paarde Valley Farm near De Aar	Mulilo Renewable Energy (Pty) Ltd	12/12/20/2500	EIA in process
12. Renosterberg Wind Farm	Renosterberg Wind Energy Company (Pty) Ltd (RWEC) in partnership with the Industrial	14/12/16/3/3/2/404	Project on hold

Project	Applicant	DEA Ref. No	Status
	Development Corporation of South Africa (IDC).		
13. Renosterberg PV Project	Renosterberg Wind Energy Company (Pty) Ltd (RWEC) in partnership with the Industrial Development Corporation of South Africa (IDC).	14/12/16/3/3/2/403	EIA in process

(These projects were identified using the Department of Environmental Affairs Geographic Information System digital data developed by the CSIR. It must be noted that this secondary product has not yet been verified by DEA).

As can be seen from Figure 8.8, there are proposed developments to the north, south and southwest of the current site. While some of the proposed developments have been approved and are likely to proceed, and two solar projects are under construction (near De Aar), the majority have yet to be approved by the Department of Energy and so it is difficult to assess at this point, which facilities are likely to be built and which are not. Regardless, in the long term, the development of a large number of facilities in the area is likely to occur on account of the presence of a large amount of Eskom transmission infrastructure which can be used to evacuate the power. Therefore, cumulative impacts are a concern in the area and will need to be considered in greater detail during the EIA phase.

Cumulative effects within approximately 20km from the study area (accounting primarily for avifauna, noise, bats, soil, visual, palaeontology, heritage and ecological impacts) will be addressed during the EIA phase and can only be adequately assessed once a preliminary layout is available. The significance of the cumulative impact will be directly influenced by the proximity of authorised Mulilo wind energy facility to the proposed development site.

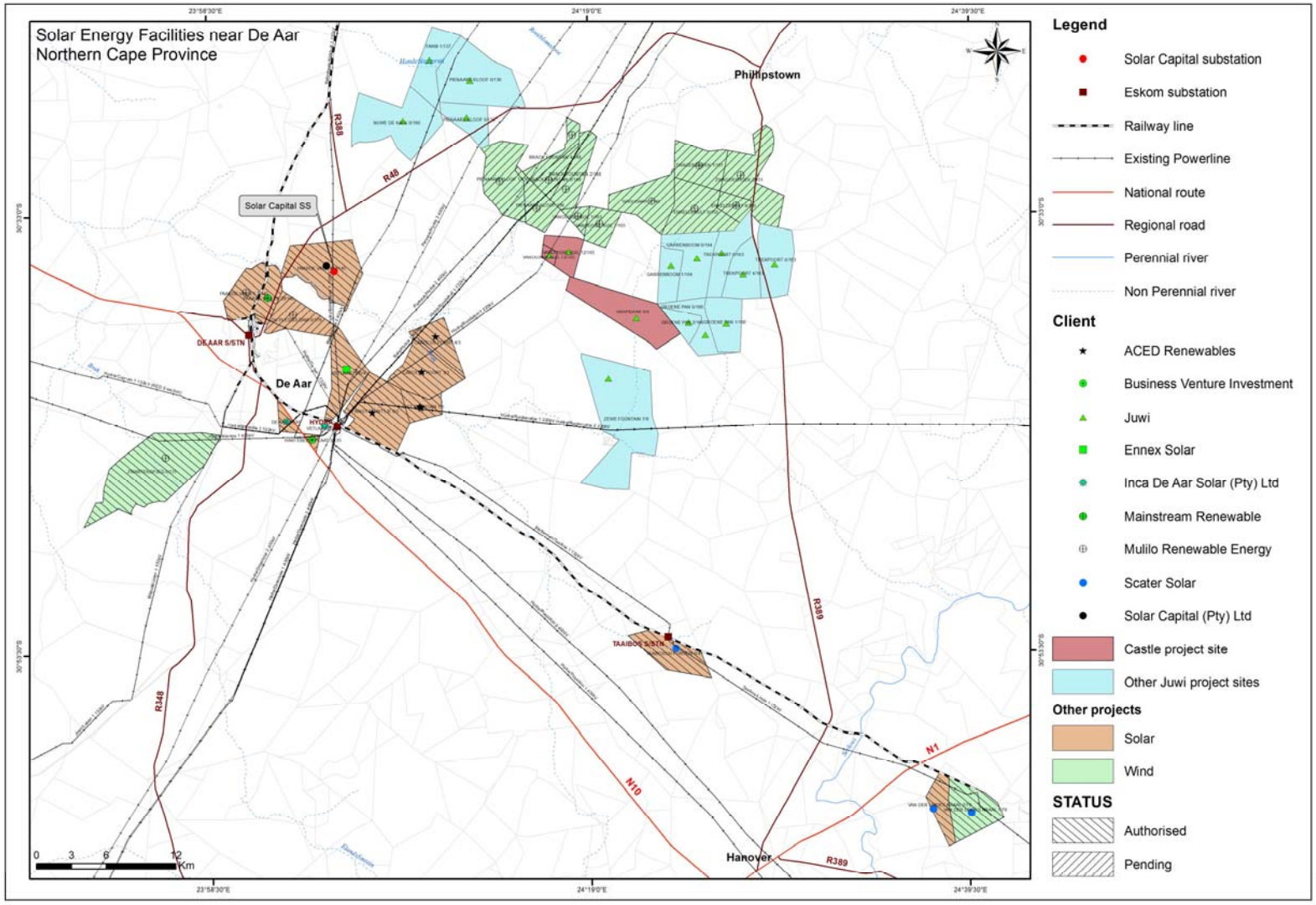


Figure 8.8: Other wind and solar energy projects surrounding the Castle Energy Facility (These projects were identified using the Department of Environmental Affairs Geographic Information System digital data developed by the CSIR. It must be noted that this secondary product has not yet been verified by DEA)

CONCLUSIONS CHAPTER 9

Castle Wind Farm (Pty) Ltd is proposing the establishment of a wind energy facility and associated infrastructure on an identified site located near De Aar in the Northern Cape Province of South Africa. The proposed site is located within the Emthanjeni Local Municipality and Renosterberg Local Municipality, ~28 km north-east of De Aar and ~22 km south-west of Philipstown. This proposed project will be referred to as the Castle Wind Energy Facility. This development is proposed to comprise a cluster of up to 38 wind turbines (typically described as a wind energy facility or a wind farm) to be constructed within an area of approximately ~3257ha in extent.

The wind energy facility is proposed to be located on the following farm portions:

» Portion 12 of Farm 165 (Vendussie Kuil)
» Pportion 13 of Farm 165 (Vendussie Kuil)
» The Remaining Extent of Portion 0 of Farm 8 (Knapdaar)

Infrastructure associated with the wind energy facility is proposed to include:

» Wind turbines
» Concrete foundations to support each turbine
» Cabling between turbines, to be laid underground where practical, which will connect to an on-site substation
» An on-site substation to facilitate the connection between the wind energy facility and the electricity grid
» A 132 kV overhead power line to connect into the authorised Ilanga Lethemba Substation, near De Aar[8] or Hydra Substation, based on Eskom requirements
» Internal access roads to each turbine to link the wind turbines and other infrastructure on the site. Existing roads will be used as far as possible,
» Workshop area / office for control, maintenance and storage.

The Scoping Study for the proposed Castle Wind Energy Facility has been undertaken in accordance with the EIA Regulations published in Government Notice 33306 of GN R543, R544, R545 and R546 (18 June 2010) (as amended), in terms of Section 24(5) of the National Environmental Management Act (NEMA; Act No 107 of 1998). This project was registered with the National Department of Environmental Affairs under application reference number **14/12/16/3/3/2/278.**

[8] The Ilanga Lethemba Solar Energy Facility was awarded preferred bidder status under the REIPPP in 2012 and construction of the project commenced in 2013.

This Scoping Report is aimed at detailing the nature and extent of this facility, identifying potential issues associated the proposed project, and defining the extent of studies required within the EIA. This was achieved through an evaluation of the proposed project, involving the project proponent, specialist consultants, and a consultation process with key stakeholders that included both relevant government authorities and interested and affected parties (I&APs). In accordance with the requirements of the EIA Regulations, feasible project-specific alternatives (including the "do nothing" option) have been identified for consideration within the EIA process.

The conclusions and recommendations of this Scoping Report are the result of on-site inspections, desktop evaluations of impacts identified by specialists, and the parallel process of public participation.

A summary of the conclusions of the evaluation of the potential impacts identified to be associated the proposed wind farm and associated power line is provided below. Recommendations regarding investigations required to be undertaken within the EIA are provided within the Plan of Study for EIA, contained within Chapter 10 of this report.

9.1. Conclusions drawn from the Evaluation of the Proposed Site for Development of the Wind Energy Facility

In identifying and evaluating impacts associated with the proposed wind energy facility, it has been assumed that although during operation, the area affected will comprise of up to 38 turbines (depending on which turbine types are ultimately chosen by the developer), access roads and a substation(s), during construction much of the approximately 3257 ha of the proposed site could suffer some level of disturbance. However, once construction is complete, only a small portion of this area (less than 10%) will be permanently impacted by infrastructure associated with the wind energy facility.

General potential issues identified through this scoping study associated with Castle Wind Energy facility are summarised in Tables 9.1 and 9.2. The majority of potential impacts identified to be associated with the construction and operation of the proposed wind energy facility are anticipated to be local to regional in extent. No environmental fatal flaws were identified to be associated with the site. However, areas of potential sensitivity such as potential noise sensitive receptors, bird and bat sensitive areas, drainage lines and potential habitats for protected flora and fauna were identified through the scoping phase. These areas of sensitivity are illustrated in the sensitivity map included as Figure 9.1.

Table 9.1 Potential impacts associated with the construction phase

Potential Positive Impacts	Social Impacts » Generation of additional land use income makes a positive contribution to farming cash flow, and thereby improves the financial sustainability of agricultural activity » Skills development » Job and direct and indirect business opportunities » Improvement in opportunities for local and regional SMMEs
Potential Negative Impacts	Soil and agricultural impacts » Physical soil disturbance, erosion and disruption to current agricultural or grazing practices due to construction activities Ecological impacts » Impacts on a Critical Biodiversity Areas, Ecological support areas and loss of landscape connectivity » Degradation of ecosystems » Direct impacts on fauna, their habitat and movement » Impact on listed plant species occurring within the study area. Impact on birds » Destruction of bird habitat and disturbance of birds » Displacement of birds from the site and barrier effects Impacts on bats » The destruction of habitats resulting in a reduced prey-base and/or the destruction of roost sites Heritage and palaeontology » Impacts on heritage resources. » Impacts on paleontological resources » Visual impacts associated with the construction of the facility and associated infrastructure Noise impacts » Noise impacts due to movement of construction machinery and vehicles, traffic and blasting (if required) Social impacts » Impacts on farming activities » Influx of job seekers and associated social issues » Loss of sense of place » Impacts on property prices » Increased traffic » Increase crime in the study area » Impacts on existing infrastructure

Table 9.2: Potential impacts associated with the operation phase

Potential Positive Impacts	Clean energy » Provision of a clean, renewable energy source for the national grid Social Impacts » Generation of additional land use income makes a positive contribution to farming cash flow, and thereby improves the financial sustainability of agricultural activity. » Creation of opportunities to local business during the operational phase, including but not limited to, provision of security, staff transport, and other services » Potential up and down-stream economic opportunities for the local, regional and national economy » Potential positive impacts on existing tourism potential due to visitors from other areas wanting to view the facility » Potential positive impacts on local farmers due to upgrade of roads and other infrastructure thereby improving efficiencies » Assistance towards provision of secure power supply in South Africa
Potential Negative Impacts	Soil and agricultural impacts » Soil erosion due to alteration of the land surface run-off characteristics Ecological impacts » Change in runoff and drainage patterns » Establishment of alien plant species » Loss of listed vegetation species Impacts on birds » Collision of birds and increased mortality of target species identified due to collision with turbine blades » Mortality of target species identified due to collision with wind turbines.Impacts on bats » Increased mortality of bats as a result of collision with turbine blades and barotrauma » Disturbance of bats and interaction with infrastructure Heritage Impacts » Indirect impact on heritage sites and impact on cultural landscape and sense of place Visual impacts » Visual exposure of wind turbines (due to scale of the structures) and associated infrastructure on observers from roads, built-up areas, homesteads and farmsteads » Visual impact on affecting perception of sensitive topographic features and sense of place Noise impacts » Wind turbine noise: aerodynamic sources » Wind turbine noise: mechanical sources

	Social impacts » Potential localised negative impacts on farming activities and land use » Visual and sense of place impacts on existing receptors, including nearby rural and urban residences

Although no environmental fatal flaws were identified to be associated with the project at this stage in the process, areas of potential environmental sensitivity were identified through the scoping phase.

A sensitivity map for the proposed development site has been developed to illustrate the sensitivities identified during the scoping phase studies (refer to Figure 9.1). This sensitivity map is a rough scale estimate of sensitivity on the site identified at a desk-top level. These areas will be subject to survey and ground-truthing during the EIA phase of the project. These potentially sensitive areas will, therefore, be further investigated and assessed through detailed specialist studies (including field surveys) during the EIA phase of the process in order to identify and confirm exclusion or no-go areas (refer to Chapter 9 for more details). The map will be further refined in the EIA phase on the basis of these specialist studies, in order to inform the final design of the facility. In order to assess potential impacts within sensitive areas, the preliminary layout for the wind energy facility will be considered in the EIA phase.

The potentially sensitive areas/environmental features that have been mapped in Figure 9.1 include:

» Areas of ecological sensitivity
» Areas of avifaunal sensitivity
» Areas of bat sensitivity
» Potential noise sensitive developments

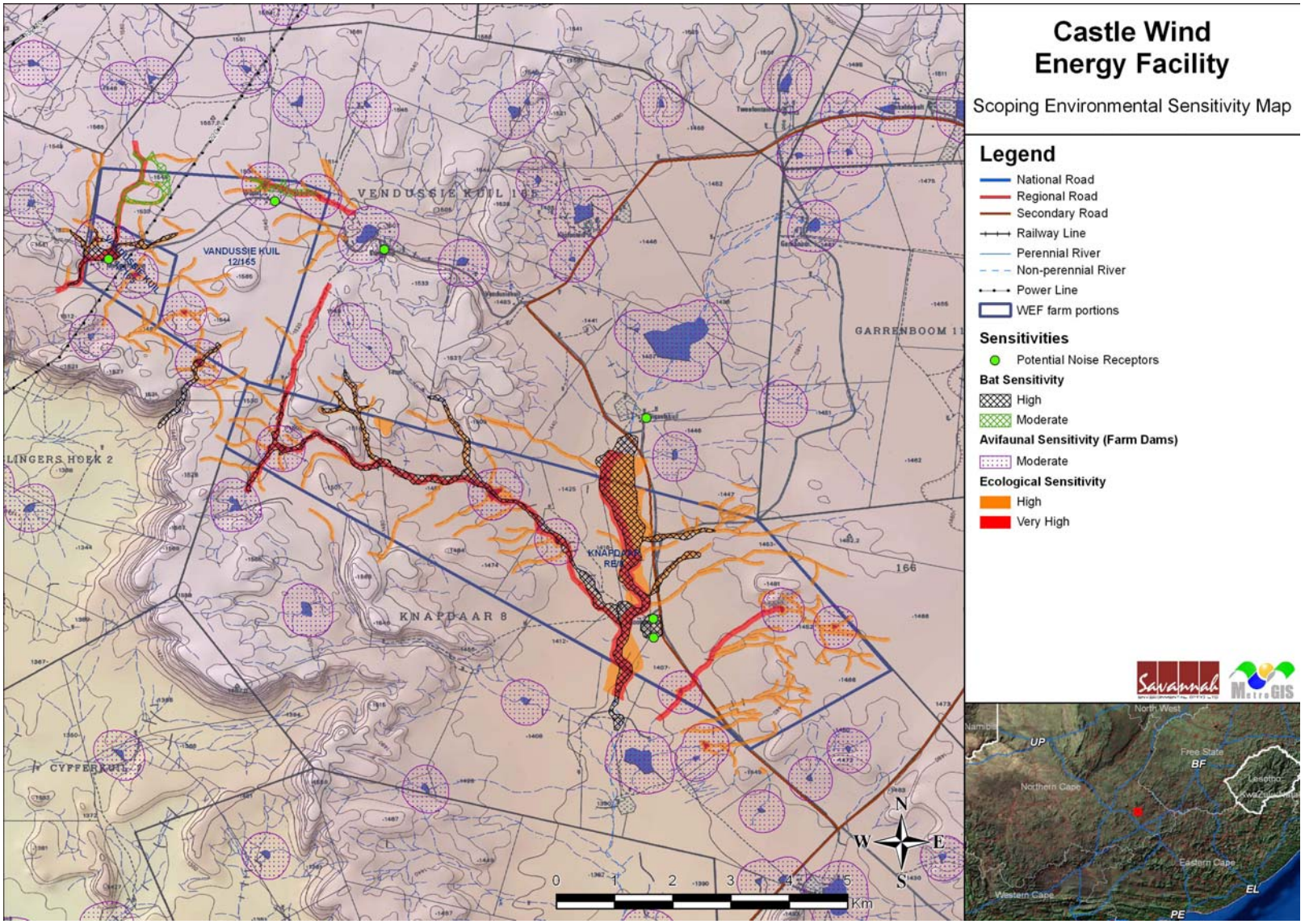


Figure 9.1: Preliminary Scoping Environmental Sensitivity Map of the Castle Wind Energy Facility

Areas where high to very-high sensitivity classes overlap (i.e. medium Bird Sensitivity Areas (farm dams) overlapping with Very High Ecologically sensitive areas) in Figure 9.1 and are areas which could potentially pose the most constraints to the proposed siting of wind energy facility.

The following is evident from the preliminary sensitivity map:

- Six noise sensitive developments (residential dwellings) are identified within the study area.
- In terms of conservation planning areas, the western part of Portions 12 and 13 of the Farm 165 (Vendussie Kuil) lies within a National Protected Areas Expansion Strategy (NPAES) focus area (the Senqu Caledon focus area). This has been considered as sensitive, until explored in the EIA phase in more detail.
- The major ecological features of the site include:
  - Larger drainage lines which are fairly well developed, with different soils and vegetation from the surrounding areas. This includes a tributary of the the non-perennial Brak River which is the only major hydrological feature, traversing Portion 0 of Farm 8 (Knapdaar).
  - The steeper, south-facing slopes are also potentially sensitive. South-facing slopes represent mesic habitats that may contain forest patches or other plant communities associated with wetter environments.
- Avifaunal sensitivity areas include surface water sources (farm dams) evident at a desktop level which have a 300 metre buffer. Ideally infrastructure should not be constructed within these areas.
- Drainage lines considered as being sensitive habitat and foraging areas for bats and are recommended as no-go areas for placement of wind turbines.
- Although not shown on the map, there is a high likelihood of finding fossil remains on the eastern portion of the study area (Portion 0 of Farm 8 (Knapdaar)) compared to the rest of the site, which will require field verification during the EIA phase.
- Although not shown on the map, there is a very small area of cultivated, irrigated land surrounding the farm house (Rooi Kraal) which is located on the Farm Knapdaar. From an agricultural impact point of view, this is the only agriculturally sensitive area on the site that should be avoided for inclusion in the development.

In order to assess potential impacts within sensitive areas, a preliminary layout for the wind energy facility is required to be compiled by the applicant.

Cumulative effects: The proposed Castle Wind Energy Facility is proposed to be located in an identified Renewable Energy hub in the Northern Cape Province. Subsequently, there are currently more than 10 proposed/ authorised renewable

energy projects between De Aar and Phillipstown, with 2 currently under construction. These projects are listed and more details are provided in Chapter 8.

Cumulative effects within approximately 20km from the study area (accounting primarily for avifauna, noise, bats, soil, visual, palaeontology, heritage and ecological impacts) will be addressed during the EIA phase and can only be adequately assessed once a preliminary layout is available.

Environmental fatal flaws: No environmental fatal flaws were identified to be associated with the proposed Castle Wind Energy facility at this stage in the process. However, areas of potential high sensitivity were identified at a desk-top level through the scoping phase, as illustrated in the sensitivity map (refer to Figure 9.1).

9.2. Evaluation of the Potential Issues associated with the Overhead Power Line

In order to connect the proposed wind energy facility into the Eskom grid, a 132 kV overhead power line is required to connect into the authorised Ilanga Lethemba Substation, near De Aar or Hydra Substation. Two options are considered within this scoping report and both corridors will be assessed in the EIA report. The power line will have a 31m servitude and will be approximately 20-25 kilometres in length. Potential issues associated with the proposed overhead power line include impacts on flora, fauna and ecological processes, visual impacts, impacts on avifauna as a result of collisions and electrocutions, and potential impacts on heritage sites.

The power line options will be considered in detail within the EIA phase in order to assess potential impacts associated with the power line corridor and make recommendations regarding a preferred alternative alignment and appropriate mitigation measures).

PLAN OF STUDY FOR ENVIRONMENTAL IMPACT ASSESSMENT CHAPTER 10

A detailed description of the nature and extent of the proposed Castle Wind Energy Facility and associated infrastructure, details regarding the Scoping process followed, as well as the issues identified and evaluated through the Scoping Phase (to date) have been included in this Scoping Report. This Chapter of the report provides the Plan of Study for Environmental Impact Assessment (EIA) for all of the proposed project development components (i.e. wind energy facility, grid connection an associated infrastructure).

The Plan of Study describes how the EIA Phase for the proposed Castle Wind Energy Facility will proceed. The EIA Phase of the study includes detailed specialist studies for those impacts recorded to be of potential significance, as well as on-going public consultation. The key findings of the Scoping Phase (which includes inputs from authorities, Organs of State, stakeholders, the public, the proponent and the EIA specialist team), together with the requirements of the NEMA EIA Regulations and applicable guidelines, are used to inform the Plan of Study for EIA.

10.1 Aims of the EIA Phase

The EIA Phase will aim to achieve the following:

» Provide an overall assessment of the social and biophysical environments affected by the proposed project.
» Assess potentially significant impacts (direct, indirect and cumulative, where required) associated with the proposed wind energy facility and associated infrastructure.
» Identify and recommend appropriate mitigation measures for potentially significant environmental impacts.
» Undertake a fully inclusive public involvement process to ensure that I&AP are afforded the opportunity to participate, and that their issues and concerns are recorded.

The EIA will address potential environmental impacts and benefits (direct, indirect and cumulative impacts) associated with all components of the project including design, construction, operation and decommissioning, and will aim to provide the environmental authorities with sufficient information to make an informed decision regarding the proposed project. All feasible alternatives (including the 'do nothing' alternative) will be assessed.

10.2 Project components to be assessed under the EIA Phase

A number of anticipated impacts for the wind energy facility and associated infrastructure is anticipated due to the variability in the extent (and ultimately significance) of their impacts during construction and operation. The components of the proposed wind energy facility as presented in this Scoping Report will be assessed in the EIA Report in order for the DEA to make an informed decision regarding each particular component.

10.3 Authority Consultation

Consultation with the regulating authorities (i.e. DEA and Northern Cape DENC) will continue throughout the EIA process. The draft scoping report was submitted to DEA & DENC. On-going consultation will include the following:

» Submission of a Final Scoping Report to DEA following a 40-day public review period.
» Submission of a Draft EIA Report to Northern Cape DENC for review and comment.
» Submission of a Draft EIA Report to DEA for review.
» Submission of a Final EIA Report following a 40-day public review period.
» An opportunity for authorities to visit and inspect the site.

10.4 Consideration of Alternatives

The following project alternatives will be investigated in the EIA:

» **The 'do nothing' alternative:** The applicant does not establish the proposed Castle Wind Energy Facility or associated infrastructure (maintain status quo).
» **Site-specific alternatives:** in terms of the siting or positioning of the following in response the identified environmental sensitivities:
    - the wind turbines (including associated infrastructure) on the site.
    - power line located inside and outside of the site for development.
    - on-site substation/s.
» **Alternative corridors for power line routing:** In order to connect the wind energy facility to the power grid, different power line options will be considered. These options will be investigated in the EIA phase of the process and a preferred option nominated for consideration by the regulating authorities.

» **Site alternatives:** The applicant has determined the quality of the wind resource over the farm portions included in this report. In addition, the siting of the facility was informed by a regional assessment. The proposed site is

considered to be feasible for the proposed development. No feasible site alternatives are currently proposed.

10.5 Assessment of Potential Impacts and Recommendations regarding Mitigation Measures

A summary of the issues which require further investigation within the EIA phase, as well as the proposed activities to be undertaken in order to assess the significance of these potential impacts is provided in Table 10.1. The specialists which have been involved in the Scoping Phase and are to be involved in the EIA Phase are also reflected in this table. These specialist studies will consider the study area proposed for the development of the project components and will assess all project components and feasible alternatives.

Table 10.1: Summary of the issues which require further investigation within the EIA phase and activities to be undertaken in order to assess the significance of these potential impacts across the full extent of the site development footprint (including power line routes)

Issue	Activities to be undertaken in order to assess significance of impacts	Specialist
Impacts on Soils and Agricultural Potential	The following assessments will be undertaken in the EIA phase: • **More detailed assessment of soil conditions:** The EIA phase assessment will include a field investigation of soils and agricultural conditions across the site, power line corridors and proposed substation site. This field investigation will be aimed at ground truthing the existing land type information and understanding the specific soil conditions on site. this field survey will however not be based on a grid spacing of test pits but will comprise a reconnaissance type soil mapping exercise based on an assessment of surface conditions, topography, and hand augered samples in strategic places, if necessary. Such a soil investigation is considered adequate for the purposes of this study. • **Assessment of erosion and erosion potential on site:** The field investigation will involve a visual assessment of erosion and erosion potential on site, taking into account the proposed development layout. • **Assessment of the impacts of specific construction activities and layout on soil conditions:** The EIA phase will include an assessment of the specifics of construction activities and the proposed development layout on potential loss of topsoil and generation of spoil material. • **Assessment of specific on-site agricultural activities:** The EIA phase will gather more detail on agricultural activity on the site and identify any locally important soil and agricultural issues. This will be done through interviews with farmers and agricultural role players in the area. • **Terms of reference for EIA study:** The terms of reference for the EIA study will include the requirements for an agricultural study as described under point 4 of section C of the National Department of Agriculture, Forestry and Fisheries document: *Regulations for the evaluation and review of applications pertaining to renewable energy on agricultural land***,** dated	Johann Lanz

Issue	Activities to be undertaken in order to assess significance of impacts	Specialist
	September 2011. The above requirements may be summarised as: » Identify and assess all potential impacts (direct, indirect and cumulative) and economic consequences of the proposed development on soils and agricultural potential. » Describe and map soil types (soil forms) and characteristics (soil depth, soil colour, limiting factors, and clay content of the top and sub soil layers). » Map soil survey points. » Describe the topography of the site. » Do basic climate analysis and identify suitable crops and their water requirements. » Summarise available water sources for agriculture. » Describe historical and current land use, agricultural infrastructure, as well as possible alternative land use options. » Describe the erosion, vegetation and degradation status of the land. » Determine and map, if there is variation, the agricultural potential across the site. » Provide recommended mitigation measures, monitoring requirements, and rehabilitation guidelines for all identified impacts.	
Impacts on Ecology, Flora and Fauna	The EIA Phase will include the following activities: » Ground-truth and refine the ecological sensitivity map of the site, power line routes and proposed substation site. Particular attention will be paid to the wetlands within the northern high-lying parts of the site as well as the steep areas and other localised specialised habitats which are likely to occur across the site. » Characterise the vegetation and plant communities present at the site. The SA vegetation map only provides a coarse picture of the vegetation present and on-site surveys will be conducted to generate a species list for the site as well as identify and where necessary map different plant communities present at the site. This is likely to be particularly relevant in the central part of the site where the steep slopes are likely to generate a variety of different habitats with associated plant communities.	Simon Todd of Simon Todd Consulting

Issue	Activities to be undertaken in order to assess significance of impacts	Specialist
	» Identify and map the presence of any unique and special habitats at the site such as gravel patches, rock fields and other localised habitats. » Locate, identify and map the location of significant populations of species of conservation concern, so that the final development footprint can be adjusted so as to avoid and reduce the impact on such species. Some species of concern may be widespread and others localised and the distribution of such species will be established during the site visit. » Evaluate the likely presence of listed faunal species at the site such as the Riverine Rabbit, and identify associated habitats that should be avoided to prevent impact to such species. » Evaluate, based on the site attributes, what the most applicable mitigation measures to reduce the impact of the development on the site would be and if there are any areas where specific precautions or mitigation measures should be implemented. » Assess the impacts identified above in light of the site-specific findings and the final layout to be provided by the developer. » Recommend appropriate mitigation measures and provide inputs to the Environmental Management Programme.	
Impacts on Birds	The EIA Phase will include the following activities: » A full pre-construction bird monitoring programme will be conducted in order to establish the baseline species utilising the wind energy facility site and surroundings. » Based on the findings of the pre-construction monitoring, the sensitivity zones and suitable buffer zones will be confirmed and mapped for the site. » The identified impacts will be assessed and final recommendations will be made regarding the significance of each identified impact as well as the layout to be provided by the developer. » Where necessary and possible, recommended mitigation measures for the management of the identified impacts will be developed and described. Pre-construction bird and bat monitoring for the proposed wind energy facility will be required to	Jon Smallie of WildSkies Ecological Services

Issue	Activities to be undertaken in order to assess significance of impacts	Specialist
	be undertaken (refer to Section 10.9) and over a 12 month period and the results thereof integrated into the draft EIA Report prior to release of the report for public review. The Draft EIA report will therefore only be submitted to the DEA following the completion of the 12 month pre-construction monitoring campaigns.	
Impact on Bats	Before making any recommendations as to whether or not this development could proceed, with respect to bat conservation, a bat EIA study must be conducted which includes site visits. The EIA report will be treated as a draft until such time as results of the 12 months pre-construction monitoring can be incorporated into the EIA findings. These data will describe risk levels and inform specific mitigation actions based on real, long-team scientific data. A site visit will be conducted by the bat specialist to more accurately determine bat presence, and to provide more guidance regarding the appropriate positioning of the turbines as well as the associated infrastructure. Information for the EIA phase will include the following fieldwork techniques: » Species presence estimates determined through the use of a bat detector system operated whilst driving transect lines across the farm » Surveys to assess and identify potential key areas for roosting such as (but not limited to) buildings, underground sites and trees » Further roost investigation will be conducted if any areas adjacent to the site are identified and having a high chance of having suitable roost sites » Roost surveys will be conducted during day-light hours as well as at dusk and dawn at all infrastructure currently present on the farm; Pre-construction bird and bat monitoring for the proposed wind energy facility will be required to be undertaken (refer to Section 10.9) and over a 12 month period and the results thereof integrated into the draft EIA Report prior to release of the report for public review. The Draft EIA	Werner Marias of Animalia cc

Issue	Activities to be undertaken in order to assess significance of impacts	Specialist
	report will therefore only be submitted to the DEA following the completion of the 12 month pre-construction monitoring campaigns.	
Noise Impacts	The EIA Phase will include the following activities: » A site visit to obtain information regarding background noise levels, the prevailing meteorological conditions during this background noise level survey, as well as confirming and identifying Noise Sensitive Developments (NSDs), » Currently identified (potential) NSDs will be investigated during the EIA phase, and any additional NSDs will be identified. Their relative sensitivity to noise impacts will be determined. This will be based on the SANS 10103 guideline, as well as current land uses on the properties (residential vs business/industrial). » Using the data (proposed processes, noise characteristics of the selected equipment, locations of the WTG) as provided by the project developer, the predicted impact of the Wind Energy Facility on NSDs will be predicted using the CONCAWE method as recommended by SANS 10357:2004 for both the construction and operational phases, as well as the ISO 9613-2 model for the operational phase. » Using the calculated noise levels at the identified NSDs, the projected significance of the facility (whether construction or operational phase) will be determined using the criteria as proposed (subject to possible changes after any stakeholder input). Further recommendations on the most suitable buffer zone can be made after more information is available for the proposed facility. The following information is considered critical in the assessment of the potential noise impact through the EIA Phase study: » A site visit and the measurement of ambient sound levels; » Data as received from the developer (layout and equipment to be used) will be used to model the potential noise impact. » The potential impact will be evaluated (where possible) in terms of the nature (description of what causes the effect, what/who might be affected and how it/they might be affected)	Morné de Jager of Enviro Acoustic Research

Issue	Activities to be undertaken in order to assess significance of impacts	Specialist
	as well as the extent of the impact; » The potential significance of the identified issues will be calculated based on the evaluation of the issues/impacts; » The development of an Environmental Management Plan and a proposal of potential mitigation measures (if required); and » Recommendations.	
Impacts on Heritage Resources and Paleontological Resources	The EIA Phase will include the following activities: **Heritage Resources** In order to comply with the National Heritage Resources Act (Act 25 of 1999) a Phase 1 Archaeological and Heritage Impact Assessment must be undertaken. During this study sites of archaeological, historical or places of cultural interest must be located, identified, recorded, photographed and described. During this study the levels of significance of recorded heritage resources must be determined and mitigation proposed should any significant sites be impacted upon, ensuring that all the requirements of SAHRA are met. When the final power line route and tower positions are determined, this alignment must be subjected to a heritage walk down, where each proposed pylon will be assessed. If any sites are identified during this walk down micro adjustments to the pylon position should suffice to ensure heritage compliance. **Paleontological Resources** A field investigation by a palaeontologist as part of a full EIA study will be undertaken, focusing mainly on the eastern portion of the study area (farm Knapdaar The field study will: » Document and map fossil remains observed. » Delineate any areas of high palaeontological sensitivity.	**Heritage** Jaco van der Walt of Heritage Contracts and Archaeological Consulting **Palaeontology** Dr John Almond

Issue	Activities to be undertaken in order to assess significance of impacts	Specialist
	If required, the report will make specific recommendations for any necessary monitoring or mitigation measures for the pre-construction and construction phases of the Castle Wind Energy Facility development.	
Visual Impacts	The exercise below should be undertaken for the wind energy facility as well as the power line corridor and substation site. • **Determine Visual Distance/Observer Proximity to the facility:** In order to refine the visual exposure of the facility on surrounding areas/receptors, the principle of reduced impact over distance is applied in order to determine the core area of visual influence for the wind turbines. Proximity radii for the proposed development site are created in order to indicate the scale and viewing distance of the facility and to determine the prominence of the structures in relation to their environment. MetroGIS determined the proximity radii based on the anticipated visual experience of the observer over varying distances. The distances are adjusted upwards for larger facilities and downwards for smaller facilities (i.e. depending on the size and nature of the proposed infrastructure). MetroGIS developed this methodology in the absence of any known and/or acceptable standards for South African wind energy facilities. The proximity radii (calculated from the boundary lines of the **Wind Energy Facility**) are as follows: » 0 – 5km. Short distance view where the facility would dominate the frame of vision and constitute a very high visual prominence. » 5 - 10km. Medium distance view where the structures would be easily and comfortably visible and constitute a high visual prominence. » 10 - 20km. Longer distance view where the facility would become part of the visual environment, but would still be visible and recognisable. This zone constitutes a medium visual prominence. » Greater than 20km. Very long distance view of the facility where the facility could	Lourens du Plessis of MetroGIS

Issue	Activities to be undertaken in order to assess significance of impacts	Specialist
	potentially still be visible, though not as easily recognisable. This zone constitutes a low visual prominence for the facility. Note: These distances may be revised once provisional layouts of the proposed facility become available. • **Determine Viewer Incidence/Viewer Perception:** The number of observers and their perception of a structure determine the concept of visual impact. If there are no observers, there would be no visual impact. If the visual perception of the structure is favourable to all the observers, then the visual impact would be positive. It is therefore necessary to identify areas of high viewer incidence and to classify certain areas according to the observer's visual sensitivity towards the proposed facility and its related infrastructure. It would be impossible not to generalise the viewer incidence and sensitivity to some degree, as there are many variables when trying to determine the perception of the observer; regularity of sighting, cultural background, state of mind, and purpose of sighting which would create a myriad of options. • **Determine the Visual Absorption Capacity of the landscape:** This is the capacity of the receiving environment to absorb or screen 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 discernable detail in visual characteristics of both environment and structure decreases. The digital terrain model utilised in the calculation of the visual exposure of the facility does not	

Issue	Activities to be undertaken in order to assess significance of impacts	Specialist
	incorporate the potential visual absorption capacity (VAC) of the region. It is therefore necessary to determine the VAC by means of the interpretation of the natural visual characteristics, supplemented with field observations. • **Determine the Visual Impact Index:** The results of the above analyses are merged in order to determine where the areas of likely visual impact would occur. These areas are further analysed in terms of the previously mentioned issues (related to the visual impact) and in order to judge the severity of each impact. Cumulative Impacts of approved renewable energy facilities will also be considered.	
Social Impact Assessment	The identification and assessment of social impacts will be guided by the Guidelines for specialist The EIA approach will include: » Review of existing project information, including the Planning and Scoping Documents; » Collection and review of reports and baseline socio-economic data on the area (IDPs, Spatial Development Frameworks etc.); » Site visit and interviews with key stakeholders in the area including local land owners and authorities, local community leaders and councillors, local resident associations and residents, local businesses, community workers etc.; » Identification and assessment of the key social issues and opportunities; » Preparation of Social Impact Assessment (SIA) Report, including identification of mitigation/optimization and management measures to be implemented. » Finalisation SIA Report.	Tony Barbour (Environmental Consultant and Researcher)

10.6 Methodology for the Assessment of Potential Impacts

Direct, indirect and cumulative impacts of the above issues, as well as all other issues identified will be assessed in terms of the following criteria:

- The **nature**, which shall include a description of what causes the effect, what will be affected and how it will be affected.
- The **extent**, wherein it will be indicated whether the impact will be local (limited to the immediate area or site of development) or regional:
  - local extending only as far as the development site area – assigned a score of 1;
  - limited to the site and its immediate surroundings (up to 10 km) – assigned a score of 2;
  - will have an impact on the region – assigned a score of 3;
  - will have an impact on a national scale – assigned a score of 4; or
  - will have an impact across international borders – assigned a score of 5.
- The **duration**, wherein it will be 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; or
  - 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); and
  - 10 is very high and results in complete destruction of patterns and permanent cessation of processes.
- The **probability** *of occurrence*, which shall describe the likelihood of the impact actually occurring. Probability will be 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); and
  - Assigned a score of 5 is definite (impact will occur regardless of any prevention measures).

» the **significance**, which shall be determined through a synthesis of the characteristics described above (refer formula below) and can be assessed as low, medium or high.
» the **status**, which will be 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).

As the applicant has the responsibility to avoid or minimise impacts, and plan for their management (in terms of the EIA Regulations), the mitigation of significant impacts will be discussed and appropriate recommendations made. Assessment of impacts with mitigation will be made in order to demonstrate the effectiveness of the proposed mitigation measures.

The results of the specialist studies and other available information will be integrated and synthesised by the Savannah Environmental project team. An EIA report will be compiled, and will include:

» **detailed description** of the proposed activity
» a description of the property(ies) on which the activity is to be undertaken and the location of the activity on the property(ies)
» a description of the **environment that may be affected by the activity** and the manner in which the physical, biological, social, economic and cultural aspects of the environment may be affected by the proposed activity
» details of the **public participation process** conducted, including:

  - steps undertaken in accordance with the plan of study for EIA;
  - a list of persons, organisations and organs of state that were registered as interested and affected parties;
  - a summary of comments received from, and a summary of issues raised by registered interested and affected parties, the date of receipt of these comments and the response to those comments; and
  - copies of any representations, objections and comments received from registered interested and affected parties
- a description of the **need and desirability** of the proposed project and identified potential alternatives to the proposed activity, including advantages and disadvantages that the proposed activity or alternatives may have on the environment and the community that may be affected by the activity
- an indication of the methodology used in determining the **significance** of potential environmental impacts
- a description and comparative **assessment of all alternatives** identified during the environmental impact assessment process
- a summary of the findings and recommendations of **specialist reports**
- a description of all environmental issues that were identified during the environmental impact assessment process, an assessment of the significance of each issue and an indication of the extent to which the issue could be addressed by the adoption of mitigation measures
- an assessment of each identified potentially significant impact
- an assessment of cumulative impacts
- a description of any assumptions, uncertainties and gaps in knowledge
- an environmental **impact statement** which contains:
  - a summary of the key findings of the environmental impact assessment; and
  - a comparative assessment of the positive and negative implications of the proposed activity and identified alternatives
- a draft **environmental management programme (EMPr)**
- copies of specialist reports undertaken for the EIA.

The draft EIA Report will be released for a 40-day public review period. The comments received from I&APs will be captured within a Comments and Response Report, which will be included within the final EIA Report, for submission to the authorities for decision-making.

10.7 Public Participation Process

A public participation process will be undertaken by Savannah Environmental in accordance with the requirements of the EIA Regulations. Consultation with key stakeholders and I&APs will be on-going throughout the EIA process. Through this consultation process, stakeholders and I&APs will be encouraged to provide input to the project, and to comment on the findings of the EIA process.

In order to accommodate the varying needs of stakeholders and I&APs within the study area and within the power line corridors (routes to be determined), as well as capture their inputs regarding the project, various opportunities will be provided for stakeholders and I&APs to be involved in the EIA phase of the process, as follows:

» Public meeting (advertised meeting for registered I&APs and members of the general public).
» Focus group meetings (pre-arranged and stakeholders invited to attend).
» One-on-one consultation meetings (for example on request by stakeholders or I&APs).
» Telephonic consultation sessions (consultation with various parties from the EIA project team, including the project participation consultant, lead EIA consultant as well as specialist consultants).
» Written, faxed or e-mail correspondence.

The draft EIA report will be made available for public review for a 40-day period prior to finalisation and submission to the DEA for review and decision-making. In order to provide an overview of the findings of the EIA process and facilitate comments, meetings suitable to accommodating the needs of the I&APs and stakeholders as described above will be held during this public review period.

10.8 *Public Involvement Process for the Power Line corridors (linear* **development)**

The following actions will be undertaken as part of the EIA Phase with regards to the Public Involvement Process of the power line component of the proposed project:

» Identify sensitive receptors along the route(s) and alternatives

Areas of potential environmental and social sensitivity within the power line corridor(s) will be mapped during the EIA Phase. The potential impacts associated with the proposed power line(s) will be considered in detail within the EIA phase. Recommendations regarding a preferred alignment and appropriate mitigation measures will be made.

10.9 Pre-construction monitoring for birds and bats

Pre-construction bird and bat monitoring data collection and reporting will be undertaken in accordance with the respective bird[9] and bat[10] monitoring guidelines for wind farms in order to inform the bird and bat specialist assessments, and be presented to DEA for consideration to assist the decision making process. The monitoring programmes will facilitate the collection of baseline data. The results will be analysed and interpreted, and included within the final bird and bat specialist assessments in order to inform the decisions regarding the project feasibility, the final facility design, construction, and ultimately the management strategy of the development.

10.9.1 Birds

The primary aims of pre-construction monitoring (undertaken by Wild Skies Consulting) for the Castle Wind Energy facility site are:

» To estimate the number/density of birds regularly present or resident within the broader impact area of the facility before its construction.
» To document patterns of bird movements in the vicinity of the proposed facility before its construction (e.g. Erickson et al. 1999).
» To estimate predicted collision risk (the frequency with which individuals or flocks fly through the future rotor swept area of the proposed facility – Morrison 1998, Band et al. 2007) for key species.
» To establish a pre-impact baseline of bird numbers, distributions and movements so as to assess the importance of the site for key species.
» To assess the quality and importance of the habitat available to the key species on site.
» To inform the decision of whether the project should proceed or not and to mitigate impacts by informing the final design, construction and management strategy of the development.

The following methodology will be employed during the programme (more detail provided in specialist report in Appendix H):
» Definition of the 'inclusive impact zone' (monitoring study area)
» Description of the study area and bird micro habitat delineation
» Development of a target species list
» Determination of monitoring effort
» Sampling activities

[9] BirdLife South Africa / Endangered Wildlife Trust best practice guidelines for avian monitoring and impact mitigation at proposed wind energy development sites in southern Africa, 2012
[10] Endangered wildlife Trust South African Good Practice Guidelines for Surveying Bats in Wind Farm Developments, May 2012

- » Sample counts of small terrestrial species
- » Counts of large terrestrial species and raptors
- » Focal site surveys and monitoring
- » Incidental observations
- » Direct observation of bird movements

10.9.2 Bats

The 12 months of pre-construction monitoring (undertaken by Animaila cc) will include the following:

- » Species presence estimates determined through the use of a bat detector system operated whilst driving transect lines across the site development area, as well as through the placement of static bat detectors on the site.
- » Determination of bat movement within the study area from data collected through the use of a bat detector system.
- » Surveys to assess and identify potential key areas for roosting such as (but not limited to) buildings, underground sites and trees
- » Further roost investigation will be conducted if any areas adjacent to the site are identified and having a high chance of having suitable roost sites.
- » Roost surveys will be conducted during daylight hours as well as at dusk and dawn at all infrastructure currently present on the farm.

10.10 Key Milestones of the programme for the EIA

The envisaged key milestones of the programme for the EIA phase of the project are outlined in Table 10.2.

Table 10.2: Envisaged key milestones of the programme for the EIA phase of the project

Key Milestone Activities	Proposed completion date[11]
Authority acceptance of the Scoping Report and Plan of Study to undertake the EIA	45-days after DEA receiving the Final Scoping report – expected in December 2013
Commencement of EIA phase studies, including a 12-month bird and bat monitoring programme	November 2013- September 2014
Public review period of draft EIA Report	October 2014[12]
Finalisation of draft EIA Report	November 2014
Make final EIA Report and draft EMPr available to the public, stakeholders and authorities	November 2014
Final EIA Report to DEA for review and decision-making, and issue of an Environmental Authorisation	Within 105 days after DEA receiving the Final EIA report.

[11] Indicative dates only

[12] Makes provision for results of 12 month monitoring programme to be included in the draft EIA report

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