ENVIRONMENTAL IMPACT ASSESSMENT PROCESS
DRAFT IMPACT ASSESSMENT REPORT

PROPOSED PROJECT BLUE WIND ENERGY FACILITY (PHASES 1-3), NORTH OF KLEINSEE

NORTHERN CAPE PROVINCE
Phase 1: 20 MW (DEA Ref: 12/12/20/2331/1)
Phase 2: 56 MW (DEA Ref: 12/12/20/2331/2)
Phase 3: 74 MW (DEA Ref: 12/12/20/2331/3)

DRAFT FOR PUBLIC REVIEW
JUNE 2012

Prepared for:

WWK Development (Pty) Ltd
P.O Box 15652,
Vlaeberg,
Cape Town

Prepared by:

Savannah Environmental Pty Ltd

Unit 606, 1410 Eglin office park
14 Eglin road, sunninghill, Gauteng
po box 148, sunninghill, 2157
Tel: +27 (0)11 234 6621
Fax: +27 (0)86 684 0547
E-mail: INFO@savannahsa.com
www.savannahsa.com

PROJECT DETAILS

DEA Reference No.	:	Phase 1: 20 MW (DEA Ref: 12/12/20/2331/1) Phase 2: 56 MW (DEA Ref: 12/12/20/2331/2) Phase 3: 74 MW (DEA Ref: 12/12/20/2331/3)
Title	:	Environmental Impact Assessment Process Draft EIA Report: Proposed Project Blue Wind Energy Facility (Phases 1-3) North of Kleinsee in the Northern Cape Province
Authors	:	Savannah Environmental (Pty) Ltd Jo-Anne Thomas & Alicia Govender
Sub-consultants	:	Simon Todd Consulting BergWind Botanical Surveys Rob Simmons Terrasoil Science MetroGIS Archaeology Contracts Office, Department of Archaeology: University of Cape Town John Pether M2 Environmental Connections cc Tony Barbour Environmental Consulting and Research Sustainable Futures ZA
Project Developer	:	WWK Development (Pty) Ltd
Report Status	:	Draft EIA Report for public review
Review Period	:	07 June 2012 – 07 July 2012

When used as a reference this report should be cited as: Savannah Environmental (2012) Draft EIA Report: Proposed Project Blue Wind Energy Facility (Phases 1-3) North of Kleinsee in the Northern Cape Province

PURPOSE OF THE ENVIRONMENTAL IMPACT ASSESSMENT REPORT

WWK Development (Pty)Ltd is currently undertaking an Environmental Impact Assessment (EIA) process to determine the environmental feasibility of a proposed wind energy facility on the West Coast, on a site north of Kleinsee, in the Northern Cape Province. WWK Development 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).

The EIA Report consists of thirteen sections:

» **Chapter 1** provides background to the proposed Project Blue Wind Energy Facility and the environmental impact assessment.
» **Chapter 2** describes the activities associated with the project (project scope).
» **Chapter 3** describes wind energy as a power option and provides insight to technologies for wind turbines.
» **Chapter 4** outlines the process which was followed during the EIA Phase of the EIA process, including the consultation programme that was undertaken and input received from interested parties.
» **Chapter 5** outlines the regulatory and legal context of the EIA study
» **Chapter 6** describes the existing biophysical and socio-economic environment that may be affected by the proposed development.
» **Chapter 7** describes the assessment of environmental impacts associated with the proposed Project Blue Phase 1.
» **Chapter 8** presents the conclusions of the impact assessment as well as impact statement for Phase 1 of the development.
» **Chapter 9** describes the assessment of environmental impacts associated with the proposed Project Blue Phase 2.
» **Chapter 10** presents the conclusions of the impact assessment as well as impact statement for Phase 2 of the development.
» **Chapter 11** describes the assessment of environmental impacts associated with the proposed Project Blue Phase 3.
» **Chapter 12** presents the conclusions of the impact assessment as well as impact statement for Phase 3 of the development.
» **Chapter 13** provides references used to compile the EIA Report.

The Scoping Phase of the EIA process identified potential issues associated with the proposed project, and defined the extent of the studies required within the EIA Phase. The EIA Phase addresses those identified potential environmental impacts and benefits associated with all phases of the project including design, construction and operation, and recommends appropriate mitigation measures for potentially significant environmental impacts. The EIA report aims to provide the environmental authorities with sufficient information to make an informed decision regarding the proposed project.

The release of a draft EIA Report provides stakeholders with an opportunity to verify that the issues they have raised to date have been captured and adequately considered within the study. The Final EIA Report will incorporate all issues and responses prior to submission to the National Department of Environmental Affairs (DEA), the decision-making authority for the project.

INVITATION TO COMMENT ON THE DRAFT EIA REPORT

Members of the public, local communities and stakeholders are invited to comment on the draft EIA Report which has been made available for public review and comment at the following locations from **07 June 2012 to 07 July 2012.**

» www.savannahSA.com
» Kleinsee Tourism centre
» Buffelsrivier office of the Nama Khoi Municipality
» Komaggas office of the Nama Khoi Municipality
» Springbok Public Library

Please submit your comments to
Shawn Johnston of **Sustainable Futures ZA** PO Box 749, Rondebosch, Cape Town, 7701 Fax: 086 510 2537 E-mail: swjohnston@mweb.co.za
The due date for comments on the draft EIA Report is 07 July 2012

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

PUBLIC FEEDBACK MEETING

In order to facilitate comments on the draft EIA Report and provide feedback on the findings of the studies undertaken, a public feedback meeting will be held during the review period for the draft Scoping Report as follows:

Date: 04 July 2012
Time: 17:00 – 18:30
Venue: Kleinsee Recreational Club

SUMMARY

Background and Project Overview

WWK Development (Pty) Ltd has identified sites north of the town of Kleinsee within the Nama Khoi Local Municipality (Northern Cape), and within a De Beers mining area for the establishment of a commercial wind energy facility. The facility is proposed to accommodate up to 75 appropriately spaced turbines over an extent of approximately 3,300 hectares for the purpose of electricity generation. The total generating capacity of the proposed wind energy facility will be up to 150 MW. This proposed facility is proposed to be established in three phases. The entire facility will be referred to as the **Project Blue Wind Energy Facility**. In addition to the wind energy facility, WWK Development are proposing the construction of a solar PV facility with a generation capacity of up to 65MW on a site adjacent to the wind energy facility. The PV facility is the subject of a separate EIA process[1].
Blue Wind Energy Facility.

Associated infrastructure proposed includes:

» **Foundations** to support the wind turbines.
» **Cabling** between the turbines, to be lain underground where practical, which will connect to an on-site substation.
» An overhead **power line** up to up to 220kV, to connect the facilities to the Gromis substation;
» **Internal roads** (approximately 6 m in width) linking the wind turbines and other infrastructure on the site. Existing roads will be used as far as possible;
» **A substation** located within the wind energy facility. A high-voltage (HV) yard footprint of approximately 80m x 90m is proposed; and
» **A workshop** area for maintenance and storage.

It is known at this time that the wind energy facility will be established in a phased approach under three separate Special Purpose Vehicles (SPVs). As such separate authorisations and permits would be required for each phase of the facility (refer to Figure 1.1). The projects were therefore registered with the National Department of Environmental Affairs as follows:

» **Phase 1:** 20 MW (DEA Ref: 12/12/20/2331/1)
» **Phase 2:** 56 MW (DEA Ref: 12/12/20/2331/2)
» **Phase 3:** 74 MW (DEA Ref: 12/12/20/2331/3)

The identified sites (as assessed in this draft EIA report) for the establishment of the proposed Project Blue Wind Energy Facility is as follows:

[1] The PV plant has been registered with the Department of Environmental Affairs under EIA Ref No 14/12/16/3/3/2/316

- **Project Blue Phase 1** on the farms Dikgat 195 Portion 07; Dikgat 195 Portion 09; Dikgat 195 Portion 02; Dikgat 195 Portion 05; Dikgat 195 Portion 04; Kleinzee 193 remaining portion; Dreyers pan 192 remaining portion; Predikant Vlei 190 portion 01; Predikant Vlei 190 portion 04; Predikant Vlei 190 portion 03.. This phase would comprise up to 10 turbines and would have a generating capacity of up to 20MW.
- **Project Blue Phase 2** on the farms Dikgat 195 Portion 07; Dikgat 195 Portion 09; Dikgat 195 Portion 02; Dikgat 195 Portion 05; Dreyers pan 192 remaining portion; Predikant Vlei 190 portion 01; Predikant Vlei 190 portion 04; Predikant Vlei 190 portion 03; Predikant Vlei 190 portion 05. This phase would comprise up to 28 turbines and would have a generating capacity of up to 56MW.
- **Project Blue Phase 3** on the farms Dikgat 195 Portion 07; Dikgat 195 Portion 09; Dikgat 195 Portion 02; Dikgat 195 Portion 05; Dikgat 195 Portion 04; Dikgat 195 remaining portion; Predikant Vlei 190 portion 01; Predikant Vlei 190 portion 04; Predikant Vlei; 190 portion 03; Predikant Vlei 190 portion 05. This phase would comprise up to 37 turbines and would have a generating capacity of up to 74MW.

The nature and extent of this facility, as well as potential environmental impacts associated with the construction of a facility of this nature is explored in more detail in this EIA Report.

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

Environmental Impact Assessment

The EIA phase for the proposed project forms part of the EIA process and has been undertaken in accordance with the EIA Regulations. 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 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

Refer to **Figures 1 to Figures 4**.

Phase 1:

- Impacts on biodiversity as a result of the construction and operation of the facility.
- Impacts on heritage resources as a result of the construction and operation of the facility.
- Visual impacts on the natural scenic resources of the region imposed by the components of the facility.
- Impacts on the social environment.
- Benefits of the proposed wind energy facility.

Phase 2:

- Impacts on biodiversity as a result of the construction and operation of the facility.
- Impacts on heritage resources as a result of the construction and operation of the facility.
- Visual impacts on the natural scenic resources of the region imposed by the components of the facility.
- Impacts on the social environment.
- Benefits of the proposed wind energy facility.

Phase 3:

- Impacts on biodiversity as a result of the construction and operation of the facility.
- Impacts on heritage resources as a result of the construction and operation of the facility.
- Visual impacts on the natural scenic resources of the region imposed by the components of the facility.
- Noise impacts as a result of the operation of the wind energy facility.

» Impacts on the social environment.
» Benefits of the proposed wind energy facility.

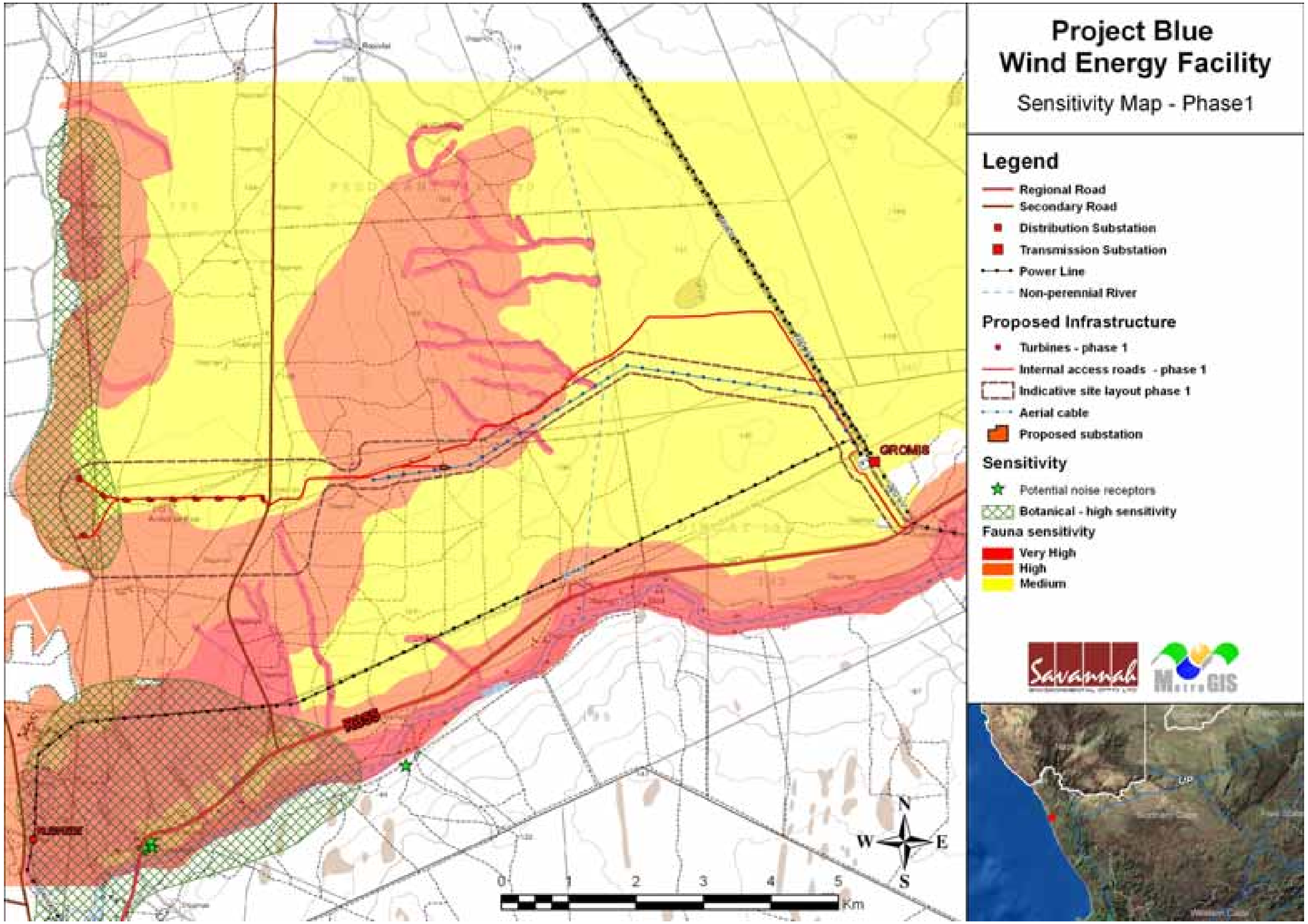

Figure 1: Environmental Sensitivity Map for Phase 1 of the proposed Project Blue Wind Farm, north of Kleinsee, in the Northern Cape (excluding heritage sensitivity).

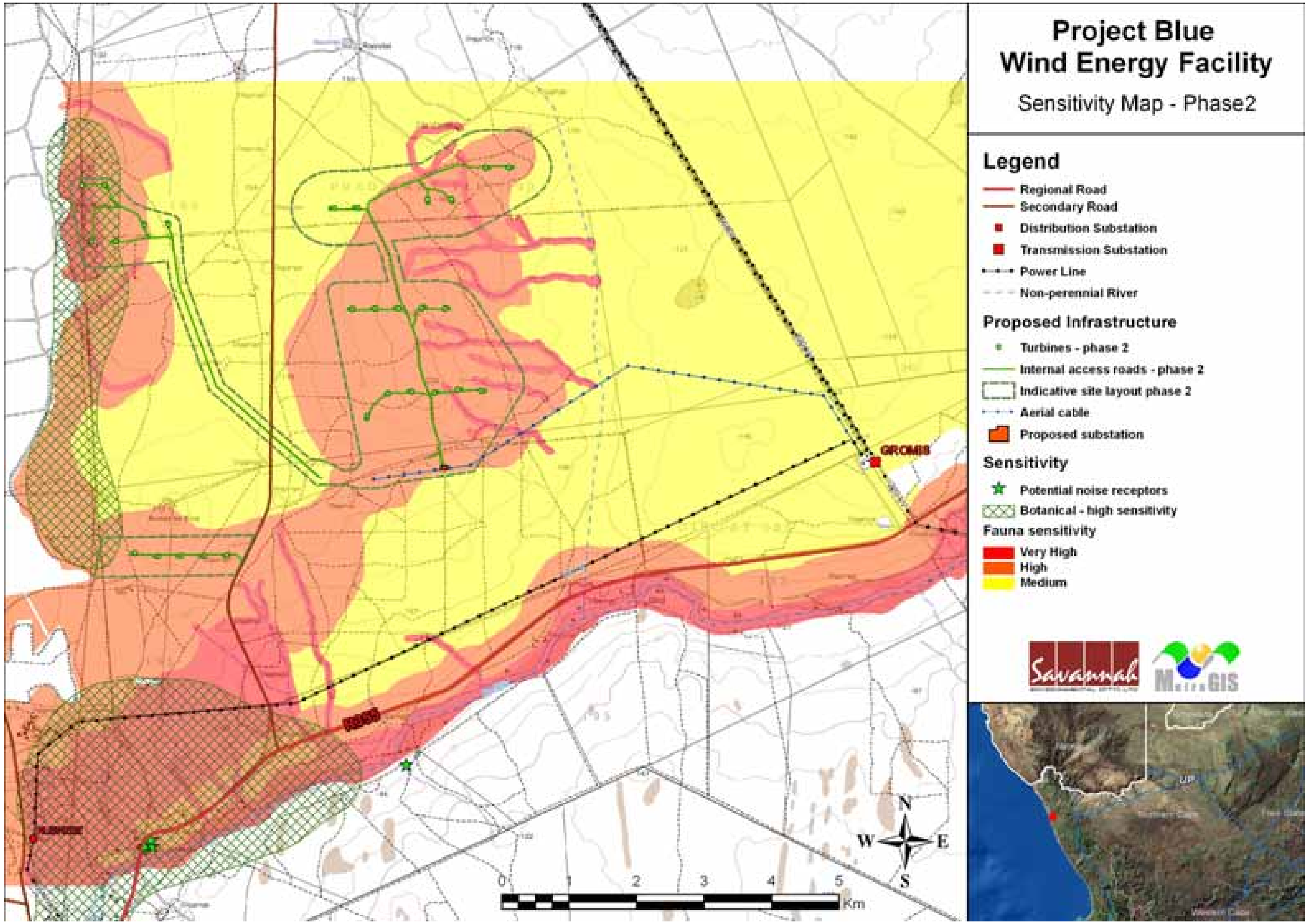

Figure 2: Environmental Sensitivity Map for Phase 2 of the proposed Project Blue Wind Farm, north of Kleinsee, in the Northern Cape (excluding heritage sensitivity).

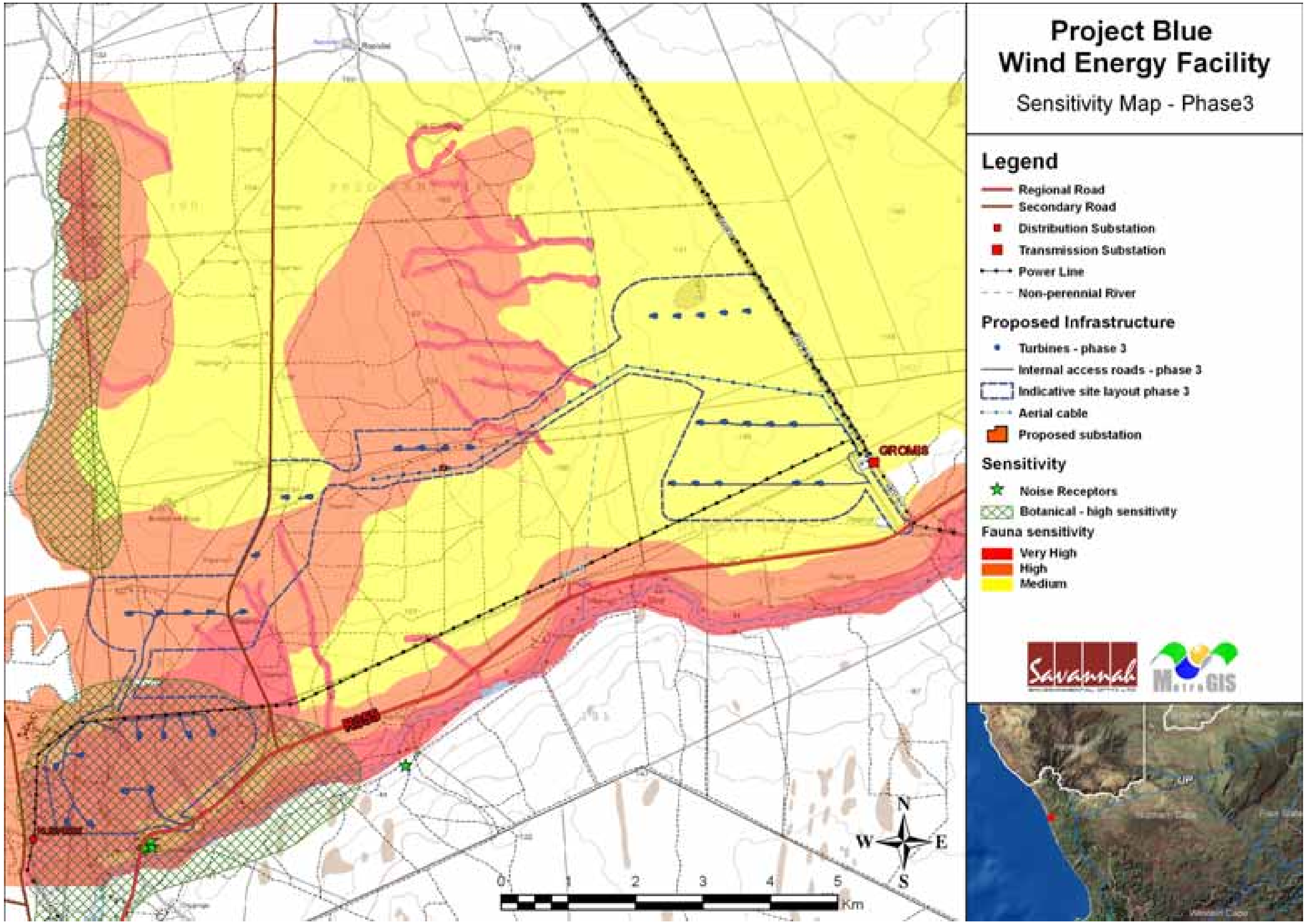

Figure 3: Environmental Sensitivity Map for Phase 3 of the proposed Project Blue Wind Farm, north of Kleinsee, in the Northern Cape (excluding heritage sensitivity).

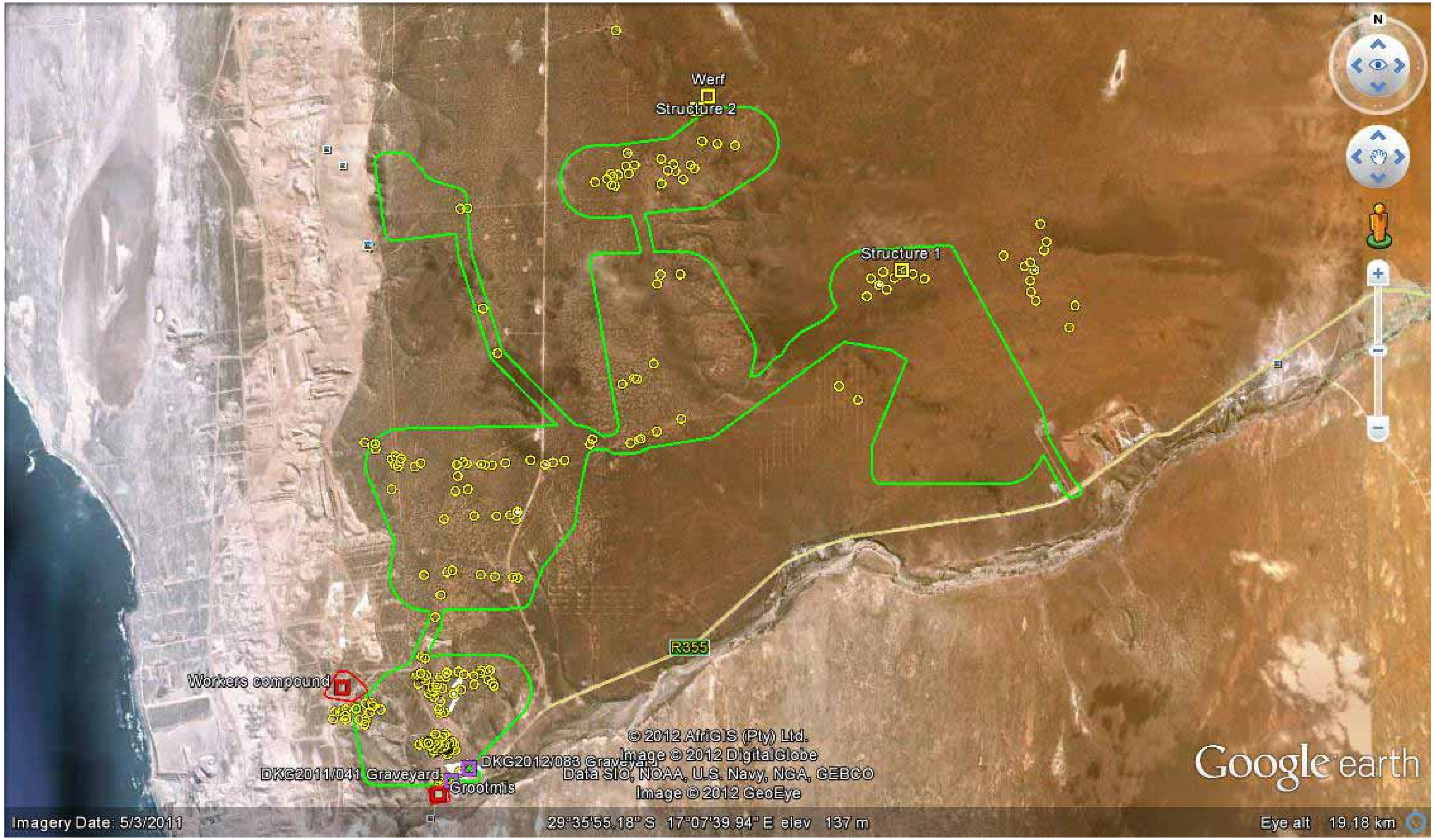

Figure 4: Environmental Sensitivity map for the project study area illustrating sensitive areas in relation to heritage

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APPENDICES

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 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 (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
CBOs	Community Based Organisations
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
EMP	Environmental Management Plan
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
LUPO	Rezoning and Subdivision in terms of Land Use Planning Ordinance, Ordinance 15 of 1985
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)
SAAO	South African Astronomical Observatory
SAHRA	South African Heritage Resources Agency
SANBI	South African National Biodiversity Institute
SANRAL	South African National Roads Agency Limited

SDF Spatial Development Framework

INTRODUCTION CHAPTER 1

WWK Development (Pty) Ltd has identified sites north of the town of Kleinsee within the Nama Khoi Local Municipality (Northern Cape), and within a De Beers mining area for the establishment of a commercial wind energy facility. The facility is proposed to accommodate up to 75 appropriately spaced turbines over an extent of approximately 3,300 hectares for the purpose of electricity generation. The total generating capacity of the proposed wind energy facility will be up to 150 MW. This proposed facility is proposed to be established in three phases. The entire facility will be referred to as the **Project Blue Wind Energy Facility**. In addition to the wind energy facility, WWK Development are proposing the construction of a solar PV facility with a generation capacity of up to 65MW on a site adjacent to the wind energy facility. The PV facility is the subject of a separate EIA process[2].

The nature and extent of all phases of the wind energy facility, as well as potential environmental impacts associated with the construction of a facility of this nature is explored in more detail in this Draft EIA Report. The purpose of this report is to assess potential environmental impacts associated with the proposed project and to recommend mitigation measures to minimise impacts on the environment. This EIA Report consists of the following sections:

» **Chapter 1** provides background to the proposed Project Blue Wind Energy Facility and the environmental impact assessment.
» **Chapter 2** describes the activities associated with the project (project scope).
» **Chapter 3** describes wind energy as a power option and provides insight to technologies for wind turbines.
» **Chapter 4** outlines the process which was followed during the EIA Phase of the EIA process, including the consultation programme that was undertaken and input received from interested parties.
» **Chapter 5** outlines the regulatory and legal context of the EIA study
» **Chapter 6** describes the existing biophysical and socio-economic environment that may be affected by the proposed development.
» **Chapter 7** describes the assessment of environmental impacts associated with the proposed Project Blue Phase 1.
» **Chapter 8** presents the conclusions of the impact assessment as well as impact statement for Phase 1 of the development.
» **Chapter 9** describes the assessment of environmental impacts associated with the proposed Project Blue Phase 2.

[2] The PV plant has been registered with the Department of Environmental Affairs under EIA Ref No 14/12/16/3/3/2/316

» **Chapter 10** presents the conclusions of the impact assessment as well as impact statement for Phase 2 of the development.
» **Chapter 11** describes the assessment of environmental impacts associated with the proposed Project Blue Phase 3.
» **Chapter 12** presents the conclusions of the impact assessment as well as impact statement for Phase 3 of the development.
» **Chapter 13** provides references used to compile the EIA Report.

1.1. Project Components

The facility is proposed to be established within an area of ~3 330 ha in extent. The facility will utilise up to 75 turbines with a generating capacity of up to 3MW each, with a hub height of up to 120m and a rotor diameter of up to 126m (i.e. each blade approximately 60m in length). The entire facility would have a capacity of up to 150 MW. The proposed wind energy facility and associated infrastructure (including proposed power line route) is proposed to be established in three phases. These phases are proposed to be developed as follows (refer to the Figure 1.1 and Table 1.1):

» Project Blue **Phase 1** - This phase would comprise up to 10 turbines and would have a generating capacity of up to **20MW**.
» Project Blue **Phase 2** - This phase would comprise up to 28 turbines and would have a generating capacity of up to **56MW**.
» Project Blue **Phase 3** - This phase would comprise up to 37 turbines and would have a generating capacity of up to **74MW**.

It is known at this time that the wind energy facility will be established in a phased approach under three separate Special Purpose Vehicles (SPVs). As such separate environmental authorisations and permits would be required for each phase of the facility. Each phase of this project has been registered with the National DEA under separate application reference numbers (refer to Table 1.1).

As the three phases are proposed to form part of a larger wind energy facility development, a consolidated EIA process has been undertaken (with a single EIA report being produced) to assess the potential environmental impacts associated with each phase of the development, as well as the potential cumulative impacts of all three phases. A single public participation process is being undertaken to provide details on and the opportunity for stakeholders to comment on all three phases of the development.

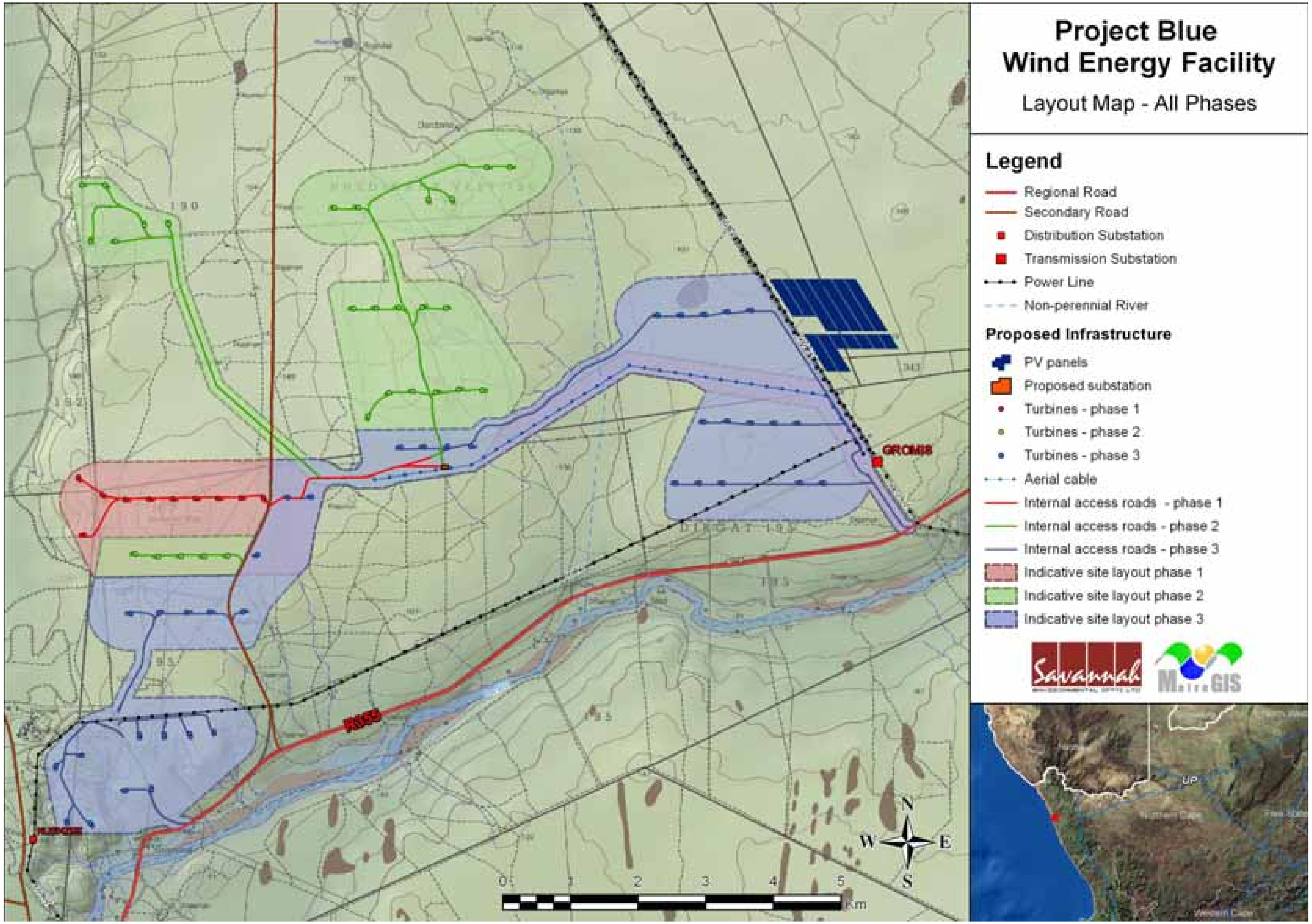

Figure 1.1: Locality map indicating the 3 different phases and areas proposed for the establishment of the Project Blue Wind Energy Facility

Table 1.1: Project Information for the three phases of the Project Blue Wind Energy Facility

Information	Phase 1	Phase 2	Phase 3
DEA Reference Number	12/12/20/2331/1	12/12/20/2331/2	12/12/20/2331/3
Descriptions of affected farm portions	» Dikgat 195 Portion 07; » Dikgat 195 Portion 09; » Dikgat 195 Portion 02; » Dikgat 195 Portion 05; » Dikgat 195 Portion 04; » Kleinzee 193 remaining portion; » Dreyers pan 192 remaining portion; » Predikant Vlei 190 portion 01; » Predikant Vlei 190 portion 04; » Predikant Vlei 190 portion 03.	» Dikgat 195 Portion 07; » Dikgat 195 Portion 09; » Dikgat 195 Portion 02; » Dikgat 195 Portion 05; » Dikgat 195 Portion 04; » Kleinzee 193 remaining portion; » Dreyers pan 192 remaining portion; » Predikant Vlei 190 portion 01; » Predikant Vlei 190 portion 04; » Predikant Vlei 190 portion 03; » Predikant Vlei 190 portion 05.	» Dikgat 195 Portion 07; » Dikgat 195 Portion 09; » Dikgat 195 Portion 02; » Dikgat 195 Portion 05; » Dikgat 195 Portion 04; » Predikant Vlei 190 portion 01; » Predikant Vlei 190 portion 04; » Predikant Vlei; 190 portion 03; » Predikant Vlei 190 portion 05.
Capacity of the facility	Up to 20MW	up to 56MW	up to 74MW
Size of the site	~860 ha	~ 1 305 ha	~ 1 875 ha
Number of turbines proposed	up to 10	up to 28 turbines	up to 37 turbines
Access road and width	Access roads will be required to the turbines and to the site (the size will be up to 6 metres wide)		

Other infrastructure associated with the wind energy facility is proposed to include:

» **Foundations** to support the wind turbines.
» **Cabling** between the turbines, to be lain underground where practical, which will connect to an on-site substation.
» An overhead **power line** up to up to 220kV, to connect the facilities to the Gromis substation;
» **Internal roads** (approximately 6 m in width) linking the wind turbines and other infrastructure on the site. Existing roads will be used as far as possible;
» **A substation** located within the wind energy facility. A high-voltage (HV) yard footprint of approximately 80m x 90m is proposed; and
» **A workshop** area for maintenance and storage.

The entire facility will be constructed in a phased approach and is proposed to take approximately 15 months to construct and commission (it is possible that phases 1 and 2 will be constructed simultaneously). The construction will require a workforce comprising low, semi-skilled and highly skilled staff. The operational phase is estimated at approximately 20 years. Each turbine is designed to operate continuously and with low maintenance.

The identified site is regarded as favourable due to the wind resource, the disturbed nature of the broader area due to mining activities, and proximity to a suitable electricity connection point. The proposed site for the wind energy facility has been determined in consultation with De Beers (the main affected landowner), and has taken cognisance of the current and proposed mining plans for the broader area in order to ensure no impacts in this regard. As a result, no feasible site alternatives have been identified for investigation for any of the project phases.

Site-specific studies and assessments are currently being undertaken through an Environmental Impact Assessment process in order to confirm the environmental feasibility of the proposed project and to delineate any areas of environmental sensitivity within the study area. Although a preliminary layout has been provided at this stage for assessment within the EIA process (as provided in Figure 1.1), the exact positioning or detailed layout of the components of this proposed wind energy facility will be finalised by taking cognisance of the wind resource on the site as well as the environmental sensitivities and mitigation measures identified through the EIA process. A final layout of the turbines within the facility would be prepared prior to construction following the completion of detailed environmental investigations and on-site wind monitoring.

1.2. The Need and Desirability for the Proposed Project Blue Wind Energy Facility

Globally there is increasing pressure on countries to increase their share of renewable energy generation due to concerns such as exploitation of non-renewable resources. 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, WWK Development (Pty) Ltd proposes the establishment of the Project Blue Wind Energy Facility to add new capacity to the national electricity grid. WWK Development 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 years) in order to build and operate the proposed wind energy facility. As part of the agreement, WWK Development will be remunerated per kWh by Eskom who will be financially backed by government. Depending on the economic conditions following the lapse of this period, the facility can either be decommissioned or the power purchase agreement may be renegotiated and extended.

1.2.1. Technical Motivation for the Project

The site was initially identified in early 2009 as an area of interest for wind development by WWK Development due to, inter alia,

» the potential wind resource (estimated from satellite derived mesocale data);
» previous disturbance of local landscape from mining activities;
» potential size of the site; and
» the proximity of high voltage electrical grid lines (at Gromis).

Initial site visits and early discussions were held with the landowner, De Beers, which subsequently engaged in a competitive process to award the land to wind developers; WWK Development was selected as part of this process.

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. A preliminary layout of the components of the wind energy facility has been developed by WWK Development and will be further assessed in the EIA phase of the project. Once environmentally constraining factors have been determined through the EIA process, and site-specific wind data is available from the wind monitoring on site, the layout of the wind turbines and associated infrastructure can be appropriately planned. 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 internal substation and access roads.

The scope of the proposed Project Blue Wind Energy Facility project, including details of all elements of the project for each of the three development phases (for the construction, operation and decommissioning phases) is discussed in more detail in Chapter 2.

1.3. Scope of the proposed Wind Energy Facility

Wind turbines use the energy from the wind to generate electricity. In essence, the blades of the turbine are turned by the wind and the energy captured is converted into electrical energy and supplied to the electricity grid for use by the consumer.

The overarching objective for the wind energy facility 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**. The development should also aim to minimise pressure on the surrounding environment, without threatening the natural area or any conservation measures, in line with national legislation.

Environmental issues are considered within **site-specific studies** and assessments through the EIA process in order to delineate areas of sensitivity within the broader area which should ideally be avoided in planning the proposed facility. A preliminary layout of the components of the wind energy facility has been developed for assessment at the EIA phase of the project. Once environmentally constraining factors have been determined through the EIA process, and site-specific wind data is available from the wind monitoring on site for an extended period (ideally more than 12 months), and the wind turbine manufacturer has been selected by WWK Development through a tendering process, the layout of the wind turbines and associated infrastructure can be appropriately finalised. The optimum position for each turbine and layout of associated infrastructure will be determined using specialist software.

1.4. 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. Three (3) separate applications for authorisation have been accepted by DEA under application reference numbers:

» Phase 1: 20 MW (DEA Ref: 12/12/20/2331/1)
» Phase 2: 56 MW (DEA Ref: 12/12/20/2331/2)
» Phase 3: 74 MW (DEA Ref: 12/12/20/2331/3)

It has been confirmed by DEA that a one EIA report can be compiled for all three projects.

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. Eskom Holdings Limited appointed Savannah Environmental (Pty) Ltd as the independent Environmental Consultant 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 R545, both Scoping and EIA processes are required as the proposed project includes the following "listed activities" in terms of GN R544 and R545 (GG No 33306 of 18 June 2010).

Relevant Notice	Activity No	Description of listed activity	Applicability to the project
Government Notice R544, 18 June 2010	9	The construction of facilities or infrastructure exceeding 1000 metres in length for the bulk transportation of water, sewage or storm water – (i) with an internal diameter of 0,36 metres or more; or (ii) with a peak throughput of 120 litres per second or more	Ablution facilities and drinking water will be required at the site office for the operational staff.
Government Notice R544, 18 June 2010	10	The construction of facilities or infrastructure for the transmission and distribution of electricity – (i) outside urban areas or industrial complexes with a capacity of more than 33 but less than 275kV;or (ii) inside urban areas or industrial complexes with a capacity of 275kV or more.	An overhead power line up to 220 kV will be used to connect the three phases of the wind energy facility to the Gromis substation.
Government Notice R544, 18 June 2010	11	The construction of: (iii) bridges; (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.	The ephemeral Buffels River runs through some of the area, particularly affecting phase 2).
Government Notice R544, 18 June 2010	22	The construction of a road, outside urban areas, (i) With a reserve wider than 13,5 metres, or (ii) Where no road reserve	External and internal access roads between turbines need to be constructed. Temporary roads during

Relevant Notice	Activity No	Description of listed activity	Applicability to the project
		exists where the road is wider than 8 metres	construction could be up to 13 m in width.
Government Notice R545, 18 June 2010	1	The construction of facilities or infrastructure for the generation of electricity where the electricity output is 20 megawatts or more.	WWK Development is proposing the establishment of a wind energy facility up to 150 MW in the following phases: » Phase 1: 20MW » Phase 2: 56MW » Phase 3: 74MW
Government Notice R545, 18 June 2010	3	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 more than 500 cubic meters.	The onsite storage of diesel and fuel in containers for construction machinery and vehicles.
Government Notice R545, 18 June 2010	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 or (ii) Agriculture or afforestation where activity 16 in this schedule will apply.	The facility is proposed to be established within an area of ~3,330 ha in extent. Phase 1: ~603 ha Phase 2: ~ 757 ha Phase 3: ~ 1 503 ha
Government Notice R546, 18 June 2010	2	The construction of reservoirs for bulk water supply with a capacity of more than 250 cubic metres.	Water will be required for the construction phase.
Government Notice R546, 18 June 2010	4	The construction of a road wider than 4 metres with a reserve less than 13,5 metres	A road to the site will be required to be constructed.
Government Notice R546, 18 June 2010	10	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	The onsite storage of diesel and fuel in containers for construction machinery and vehicles.

Relevant Notice	Activity No	Description of listed activity	Applicability to the project
		metres.	
Government Notice R546, 18 June 2010	12	The clearance of an area of 300 square metres or more of vegetation where 75% or more of the vegetative cover constitutes indigenous vegetation.	The facility is proposed to be established within an area of ~3,330 ha in extent. Vegetation around the proposed footprint of each turbine and for internal access roads will have to be removed.
Government Notice R546, 18 June 2010	13	The clearance of an area of 1 hectare or more of vegetation where 75% or more of the vegetative cover constitutes indigenous vegetation.	Most of the site falls within an area that has not been disturbed, and has indigenous vegetation.

This Draft EIA Report documents the assessment of the potential environmental impacts of the proposed construction and operation of each of the three development phases of the wind energy facility, as proposed by WWK Development. The EIA process 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).

1.5. Objectives of the Environmental Impact Assessment Process

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 was achieved through an evaluation of the proposed project in order to identify and describe potential environmental impacts. The Scoping Phase included input from the project proponent, specialists with experience in the study area as well as in EIAs for similar projects, as well as a public consultation process with key stakeholders that included both government authorities and interested and affected parties (I&APs).

The EIA Phase addresses those identified potential environmental impacts and benefits (direct, indirect and cumulative impacts) associated with all phases of the project including design, construction, operation and decommissioning, and recommends appropriate mitigation measures for potentially significant environmental impacts. This EIA report aims to provide the environmental authorities with sufficient information to make an informed decision regarding the proposed project.

The release of a draft EIA Report provides stakeholders with an opportunity to verify the issues they have raised through the EIA process have been captured and adequately considered. The final EIA Report will incorporate all issues and responses raised during the public review of the draft EIA Report prior to submission to DEA.

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

Savannah Environmental was contracted by WWK Development (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 WWK Development (Pty) Ltd. Furthermore, Savannah Environmental does not have any interests in secondary developments that may arise out of the authorisation of the proposed project.

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

The Savannah Environmental team have considerable experience in 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. Savannah Environmental is a specialist environmental consulting company providing holistic environmental management services, including environmental impact assessments 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 EAPs from Savannah Environmental who are responsible for this project are:

» Jo-Anne Thomas - a registered Professional Natural Scientist and holds a Master of Science degree. She has 14 years of consulting experience 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.

» Alicia Govender – the principle author of this report, holds an Honours Bachelor of Science degree in Environmental Management and has 4 years experience in environmental management. She is currently the responsible EAP for several renewable energy projects and other EIAs across the country.

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:

» Terrestrial Fauna study – Simon Todd Consulting
» Flora study - Bergwind Botanical Surveys & Tours cc.
» Geology, soils and agricultural potential study – Terra Soil Science cc
» Heritage study – Archaeology Contracts Office (ACO)
» Palaeontology study – John Pether
» Noise study– MENCO (M2 Environmental Connections cc)
» Visual study– MetroGIS (Pty) Ltd
» Social study– Tony Barbour Environmental Consulting and Research
» Avifauna study – Rob Simmons

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

SCOPE OF THE PROPOSED PROJECT CHAPTER 2

This chapter provides details regarding the scope of the proposed wind energy facility, including all required elements of the project and necessary steps for the project to proceed. The scope of the project includes construction, operation and decommissioning activities. This chapter also explores the alternative options pertaining to the proposed wind energy facility development, including the 'do nothing' option.

2.1. Project Site Selection - Identification of the Proposed Site as Suitable for Wind Energy Development

The northern Namaqualand coast, Northern Cape is well-known for its strong winds, prevailing mainly from the south, west and north-west. Harnessing this wind-energy can enable the generation of electrical energy that in turn can be fed into the National Electricity Grid. The northern Namaqualand coastal areas are therefore ideally suited to the establishment of sustainable energy infrastructure in the form of wind-farms. WWK Development (Pty) Ltd has identified a potential area east of the Buffels Marine Complex (De Beers Consolidated Diamond Mines) at Kleinzee, for a wind energy facility referred to as 'Project Blue'.

De Beers has awarded land to three wind developers. WWK Development (Pty) Ltd is one of the three Independent Power Producers (IPPs) that were awarded a portion of land for the development of a wind energy facility.

In the area north of Kleinsee (proposed site under investigation in this EIA report) it was concluded by de Beers that the area falls outside the current and future mining area and has sufficient land area available to construct a wind energy facility in 3 separate phases up to a total of 150 MW. This power can be fed into the electricity grid at Gromis Substation. Simulated data from satellite derived models together with CSIR data from other sites indicates that the wind resources in the area make the site attractive for a potential wind energy facility. This will however need to be confirmed through the on-site wind monitoring which will shortly start in order to confirm the feasibility of the proposed development.

2.2. Site-specific or Layout Design Alternatives

As local level issues were not assessed in detail prior to this Final scoping report, these issues are now being considered within the site-specific studies and assessments through the EIA in order to evaluate the environmental feasibility of the proposed project and to delineate areas of sensitivity within the broader development area. Although an indicative turbine layout has been provided, WWK Development has not selected the turbine model or models that will be installed on the site at this stage in the planning process. The capacity of the actual turbines to be used for the project is not certain at this point, but the units are expected to be up to 3 MW in capacity. The turbines will have a hub height of up to 120 m, and a rotor diameter of up to 125 m (i.e. each blade approximately 60 m in length). Following the outcomes of the Scoping Study, the indicative layout was revisited and a **preliminary layout** of the components of the wind energy was developed for assessment at the EIA phase of the project (refer to Figure 2.1). Once environmental constraining factors have been determined through the EIA process, and site-specific wind data is available from the wind monitoring on site, the layout of the wind turbines and associated infrastructure can be appropriately finalised. The final layout will result in a carefully achieved balance of energy production and environmental protection.

Initial studies on network integration have shown the project to be viable, but a more detailed study will be required. Network integration studies, planning and design for the distribution of the power generated by the wind energy facility are being finalised. The ability of the distribution network to absorb the generated power is one of a number of constraints on the size of the wind farm. This will be informed through understanding the local power requirements and the capacity/stability of the local electricity network. It is proposed to couple the substation at the wind energy facility to the Eskom Distribution network, via Gromis substation.

There is only one route/corridor proposed for a dedicated power line up to 220 kV that can be used for connection of the Wind Energy Facility to the Gromis substation due to the mining in the area. This route/corridor has been assessed in this EIA report.

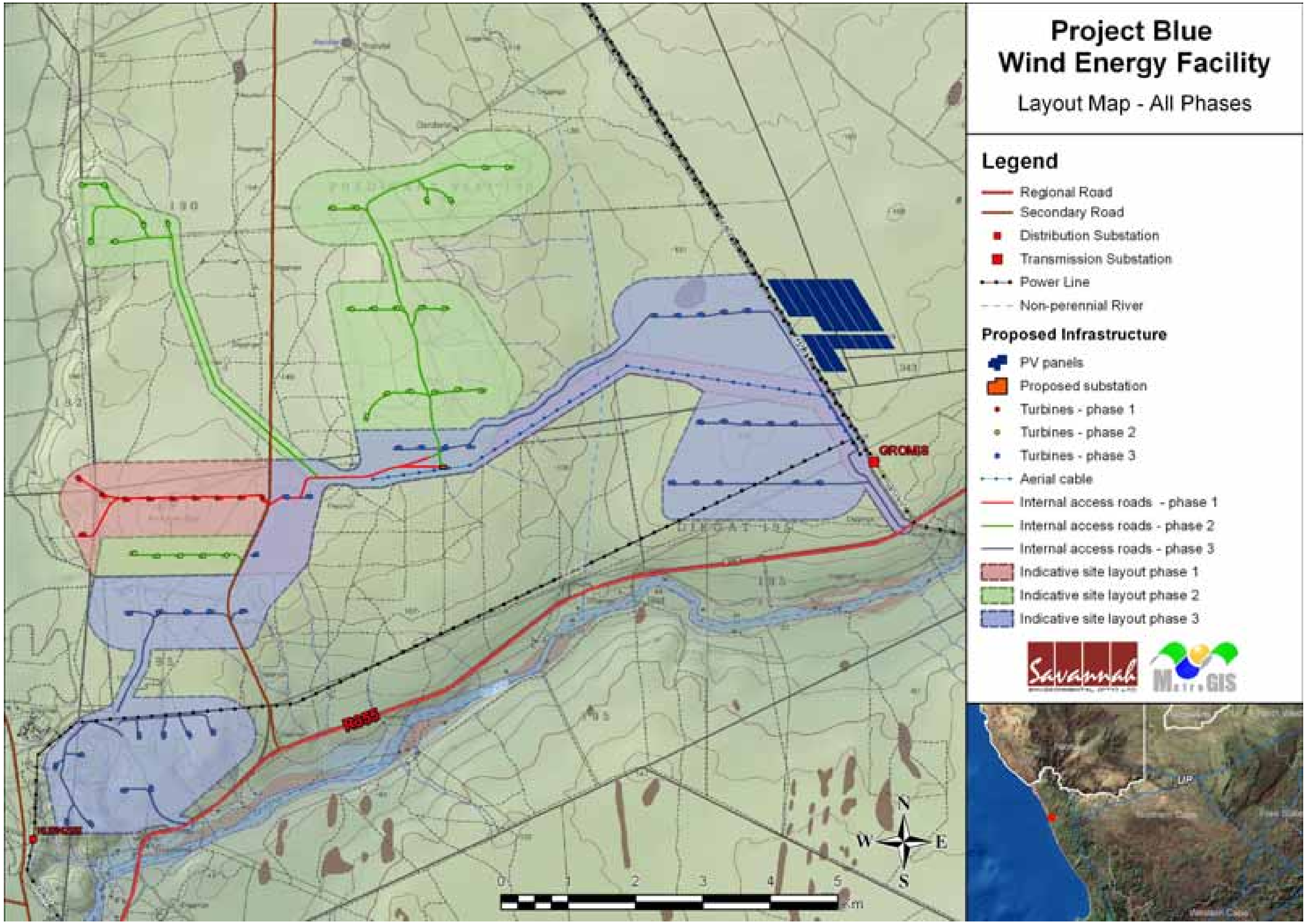

Figure 2.1: Locality map indicating the **preliminary layout** of the components of the proposed Project Blue wind energy facility

2.3. The 'do-nothing' Alternative

The 'do-nothing' alternative is the option of WWK Development not constructing the proposed Project Blue Wind Energy Facility north of Kleinsee. This would result in no impacts on the environment as a result of a wind energy facility in this area. This alternative is assessed in this EIA report.

2.4. Description of the Project Construction Phase

The construction phase of the wind energy facility is dependent on the number of turbines to be erected, but can be estimated at one week per turbine. **The entire facility will be constructed in a phased approach** and is could take approximately 15 months to construct and commission (it is possible that phases 1 and 2 would be constructed simultaneously). The construction of the proposed facility will mainly require the expertise of skilled staff, with limited opportunities for unskilled labour. In order to construct the proposed wind energy facility and associated infrastructure, a series of activities will need to be undertaken. The following construction activities have been considered to form part of the project scope.

2.4.1. 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 substation site and survey of power line servitude to determine tower locations.

2.4.2. Establishment of Access Roads to the Site

Kleinsee can be accessed from the N7 via one of three possible routes:

» "Kleinsee pad": R355, via Springbok (~97 km). This constitutes the most direct route to Kleinsee from the N7, and the only proclaimed public road to Kleinsee. The segment from Springbok to Buffelsrivier is tarred and provides sole access to the study area communities from Springbok. The segment from Bufffelsrivier to Kleinsee is untarred and the road in a relatively bad state;
» "Rooipad": Buffelsrivier-Kommagas Road off the R355, linking up with the KDBC Koiingnaas-Kleinsee road south of Kleinsee. The segment from Buffelsrivier to Kommagas is tarred; the portion from Kommagas to the De Beers Consolidated Koingnaas road is a De Beers Consolidated owned gravel

road. This Kommagas Road (“rooipad” due to red soils) is preferred by Kleinsee residents and Kleinsee farmers for accessing Springbok;

» “Hondeklipbaai pad”: Combination of (mainly gravel) roads from Garies (off the N7), via Hondelikpbaai and Koingnaas. This constitutes the most direct road link to the harbours of Cape Town and Saldanha via the N7. Garies is located approximately 176 km south-east of Kleinsee (by road). The De Beers Consolidated owned Kleinsee-Koingnaas segment is the only tarred segment at present. The remainder of the road is essentially only safely negotiable by 4x4 or truck. Tarring of the Garies-Hondeklipbaai segment is envisaged by the Kamiesberg Local Municipality SDF in the medium to long term, but no funds appear to have been allocated.

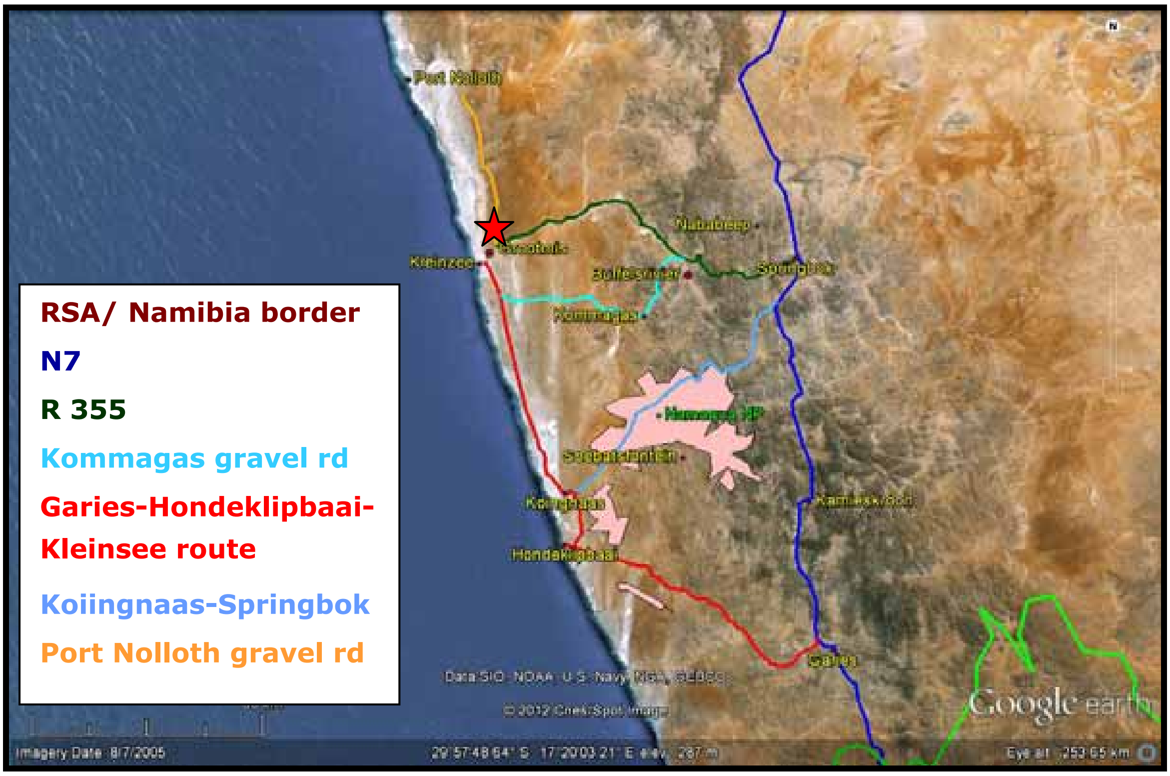

Figure 2.2: Study area road network

Two additional secondary roads provide access to the study area, namely:

- Port Nolloth gravel road, from R355 outside Kleinsee to R382 south of Port Nolloth;
- Gravel road from Koiingnaas to Springbok via the NNP.

The route proposed for the transport of turbine components and PV panels etc. is not known at this stage, but the N7 - R355 seems the most probable route.

The proposed site is essentially only accessible from the N7 (via Garies or Springbok). Access/haul roads to the site (if required) as well as internal access roads within the site are required to be established prior to the commencement of construction. Access to the site is likely to be from the gravel roads in the study area. 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 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 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 previous condition prior to construction.

2.4.3. Undertake Site Preparation

Site preparation activities will include clearance of vegetation at the footprint of each turbine, levelling and clearance of laydown areas at each turbine position, the establishment of internal access roads and excavations for foundations. These activities will require the stripping of topsoil, which will need to be stockpiled, backfilled and/or spread on site.

2.4.4. Construct Foundation

Concrete foundations will be constructed at each turbine location. Foundation holes will be mechanically excavated to a depth of approximately 2 m to 3 m (or more depending to the sandy nature of the soil. A geotechnical investigation will give an indication of the depth of the foundation hole). A batching plant will be required to be erected on site for construction of foundations. The reinforced concrete foundation of approximately 15 m x 15 m x 2 m (varying with turbine size) will be poured and will support a mounting ring. The foundation will then be left for up to a week to cure. It should be noted that this is only a preliminary design, and the final foundation design will be determined from the results of the geotechnical survey.

2.4.5. Transport of Components and Equipment to Site

The wind turbine, including the tower, will be brought to site by the turbine supplier or a designated hauler in sections on flatbed trucks. Turbine units which must be transported to site consist of: the tower (in segments), nacelle and three rotor blades. The individual components are defined as abnormal loads in terms of Road Traffic Act (Act No 29 of 1989)[3] 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 would need to be brought to the site for the civil works (e.g. excavators, trucks, graders, compaction equipment, cement trucks, etc.).

The components required for the establishment of the substation/s (including transformers) as well as the power lines (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. (This will be further investigated in the EIA phase).

2.4.6. Establishment of Laydown Areas on Site

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

A laydown area, incorporated into the turbine component laydown area, will be required at each position where the main lifting crane will be required to erect the turbine. This area would be required to be compacted and levelled to accommodate the above-mentioned necessary equipment.

2.4.7. Construct Turbine

A 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

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

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. It will take approximately 2 days to erect a single turbine, although this will depend on the climatic conditions as a relatively wind-free day will be required for the installation of the rotor.

2.4.8. Construct Substation

A substation will be constructed within the site footprint (80 m x 90 m). The turbines will be connected to the substation via suitable switchgear, MV step-up transformers and trenched cabling. The local switchgear and transformers may be installed in the base of each tower, or may require a small concrete plinth, adjacent to each tower.

Once micro-siting/positioning of the turbines has been finalised, the position of the main substation will be chosen to optimise cable lengths and associated losses. Due to the prevailing corrosive environmental conditions an indoor substation is preferred, but a small switchyard (approx. 50 x 80m) containing the 220kV step-up transformers and O/H line feeder switchgear may be required. The construction of the substation would require a survey of the site; site clearing and levelling and construction of an access road to substation site (where required); construction of substation terrace and foundations; substation building, 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.

2.4.9. Establishment of Ancillary Infrastructure

A workshop as well as a contractor's equipment camp may also be required to be constructed. 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.

2.4.10. Connection of Wind Turbines to the Substation

Each wind turbine will be connected to an optimally positioned substation by underground electrical cables (33 kV). The installation of these cables will require the excavation of trenches, approximately 1 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.

2.4.11. Connect Substation/s to Power Grid

One overhead power line (up to 220 kV distribution line) will connect the substation to the electricity distribution network/grid from the proposed site to the Gromis substation. A route for the power line will be assessed, surveyed and pegged prior to construction.

2.4.12. Undertake Site Rehabilitation

As construction is completed in an area, and as all construction equipment is removed from the site, the site rehabilitated where practical and reasonable will begin. 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.

2.5. Project Operation Phase

The lifespan of the facility is approximated at 20 to 30 years. It is unknown at this stage how many employees would be required for the monitoring and maintenance of the facility, but in general, there should be three - five technicians for every 33 turbines installed.

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

The operations staff would be responsible for routine maintenance, long-term maintenance, and emergency work on the turbines. Routine maintenance for the turbines will include testing of lubricants for contaminants, changing of lubricants, calibrating and testing electronic systems, and tightening of bolts and components. Routine maintenance is generally completed on a scheduled basis by climbing the tower using the internal ladder and doing the work with normal hand tools and electrical testing equipment.

Long-term maintenance may include replacement/rebuilding and cleaning of larger components such as generators and gearboxes, testing of electrical components, and refurbishing blades.

Emergency work also may be required as the result of a system or component failure. Certain unplanned work such as blade repairs or repairs to other large components may require the use of a crane to complete the work.

2.6. Project Decommissioning Phase

The turbine infrastructure which will be utilised for the proposed Project Blue Wind Energy Facility north of Kleinsee 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 unless it is considered feasible to replace the existing infrastructure with more appropriate technology/infrastructure. Decommissioning activities would be required to be undertaken in accordance with the applicable legislation at the time.

The following decommissioning activities have been considered to form part of the project scope.

2.6.1. 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 construction equipment.

2.6.2. 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.

WIND ENERGY AS A POWER GENERATION TECHNOLOGY — CHAPTER 3

Wind power is the conversion of wind energy into a useful form, such as electricity, using wind turbines. The use of wind for electricity generation is a non-consumptive use of a natural resource, and produces an insignificant quantity of greenhouse gases in its lifecycle. Wind power consumes no fuel for continuing operation, and has no emissions directly related to electricity production. Operation does not produce any type of air pollution, as would be associated with fossil fuel power sources. Wind energy is firmly established as a mature technology for electricity generation and is one of the fastest growing electricity generating technologies and features in energy plans worldwide.

As part of the feasibility phase of a proposed wind energy project, a wind resource measurement and analysis programme must be conducted for the site proposed for development, as only measured data from the proposed development site will provide a robust prediction of the facility's expected energy production over its lifetime. As such, WWK Development will shortly start wind measurement monitoring on the proposed development site to measure the wind potential (wind energy) in the area. The aim of this wind measurement monitoring is to obtain reliable information about the speed, strength, direction, and frequency of the wind resource.

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. Wind turbines can start generating at wind speeds of between 10 km/hr to 15 km/hr (~3 m/s to 4 m/s), with nominal wind speeds required for full power operation varying between ~45 km/hr and 60 km/hr (~12.5 m/s to 17 m/s). Wind speed can be highly variable and is also affected by a number of factors, including surface roughness of the terrain. Typical average annual wind speeds range from 15 km/hr to 25 km/hr (4 m/s to 7 m/s) around South Africa's southern, eastern and western coastlines. This relates to an expected annual energy utilisation factor of between 15% and 30%, the value depending on the specific site selected.

Turbines are able to operate at varying wind speeds. The amount of energy a turbine can harness depends on both the wind velocity and the length of the rotor blades. Wind turbines can start generating at wind speeds of between 10 km/hr to 15 km/hr (~3 m/s to 4 m/s), with nominal wind speeds required for full power operation varying between ~45 km/hr and 60 km/hr (12.5 m/s and 17 m/s).

Wind power (strength and frequency) is a measure of the energy available in the wind and the ability to convert the wind energy into electricity using wind turbines.

Wind direction at a site is important to understand, but it is not critical in site selection as wind turbine blades automatically turn to face into the predominant wind direction at any point in time.

Although modern wind turbines are able to yaw to the direction of the wind, the design of a wind energy facility is sensitive to the predominant wind directions and wind speeds for the site, as well as to topographical features or relief affecting the flow of the wind (e.g. causing shading effects and turbulence of air flow), and the effect of adjacent turbines on wind flow and speed (specific spacing is required between turbines in order to reduce the effects of wake turbulence).

As the performance of the turbines is determined by disturbances to the wind resource, they must be appropriately spaced within the facility. Turbines would, therefore, be positioned within the study area of approximately 3 300 ha. Wind turbines typically need to be spaced approximately 2 to 3xD apart, and 5 to 7xD where a turbine is behind another (D = the diameter of the rotor blades). This is required to minimise the induced wake effect the turbines might have on each other. Considering a typical 3 MW capacity turbine whose rotors are up to approximately 125 m in diameter, each turbine would be separated by approximately 250 m to 400 m. The erection of turbines in parallel rows one behind another would require a distance between rows of up to 750 m to 1000 m.

The overall aim of the design and layout of the facility is to maximise electricity production through exposure to the wind resource, while minimising infrastructure, operation and maintenance costs, as well as social and environmental impacts. 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 micro-siting of the turbines on the site will be determined using industry standard software systems, which will automatically consider the spacing requirements. An indicative layout for each phase of the proposed Project Blue wind energy facility has been provided by WWK Development at this stage in the planning process. This will be updated and amended as more information becomes available from the on-site wind monitoring and the EIA process.

3.1. Main Components of a Wind Turbine

Generally a wind turbine consists of **three rotor blades** and a **nacelle** mounted at the top of a tapered **steel tower** (refer to Figure 3.1). The mechanical power generated by the rotation of the blades is transmitted to the generator within the nacelle via a gearbox and drive train.

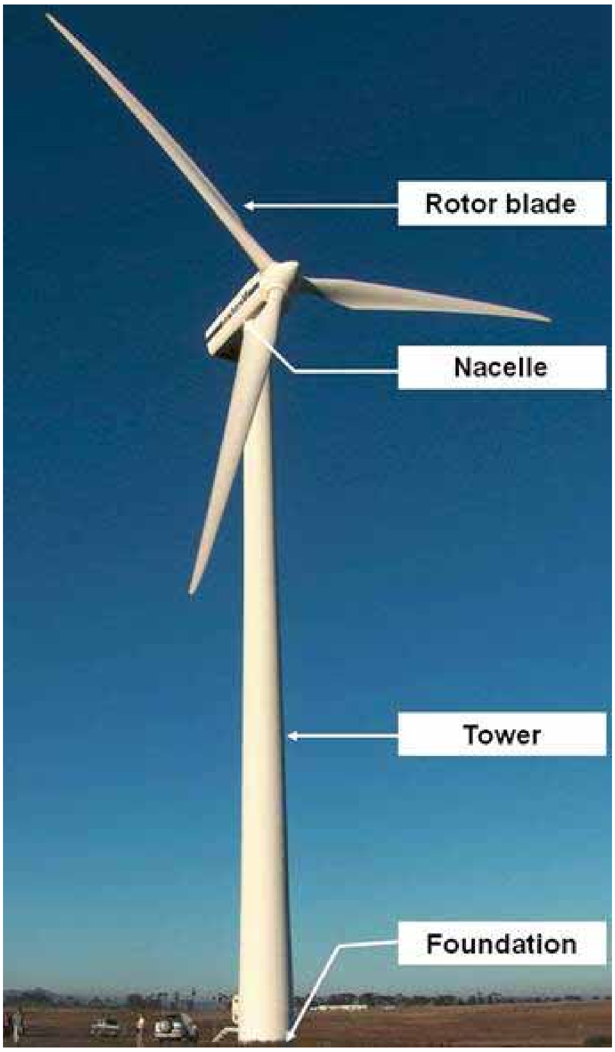

Figure 3.1: Illustration of the main components of a wind turbine

The turbines being considered for use at the proposed Project Blue Wind Energy Facility will each be up to **3 MW** in capacity. The turbines will have a **hub height of up to 120m**, and a **rotor diameter of up to 125m** (i.e. each blade approximately 60m in length).

Other infrastructure associated with the facility includes:

» **Foundations** to support the wind turbines.
» **Cabling** between the turbines, to be lain underground where practical, which will connect to an on-site substation.
» An overhead **power line** up to 220 kV, to connect the three phases of the facility to the Gromis substation.

» **Internal roads** (approximately 6 m in width) linking the wind turbines and other infrastructure on the site. Existing roads will be used as far as possible.
» **A substation** located within the wind energy facility. A high-voltage (HV) yard footprint of approximately 80m x 90m is proposed. A single substation will link all three phases of the development to the grid.
» **A workshop** area for maintenance and storage.

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 generally has three blades that rotate at a constant speed up to 24 revolutions per minute (rpm). The speed of rotation of the blades is controlled by the nacelle, which can turn, so that the blades 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 rotor blades function in a similar way to the wing of an aircraft, utilising the principles of **lift** (Bernoulli). When air flows past the blade, a wind speed and pressure differential is created between the upper and lower blade surfaces. The pressure at the lower surface is greater and thus acts to "lift" the blade. When blades are attached to a central axis, like a wind turbine rotor, the lift is translated into rotational motion. Lift-powered wind turbines are well suited for electricity generation.

The rotation of the rotor blades produces a characteristic 'swishing' sound as the blades pass in front of the tower The gearbox and generator can be heard within a short distance of the turbine. The moving parts can be heard when the nacelle is rotating to face the wind.

The tip-speed is the ratio of the rotational speed of the blade to the wind speed. The larger this ratio, the faster the rotation of the wind turbine rotor at a given wind speed. Electricity generation requires high rotational speeds.

The nacelle

The nacelle refers to the structure that houses all the generator components, i.e. control equipment, gearbox and anemometer for monitoring the wind speed and direction (as shown in Figure 3.2). The rotor is attached to the nacelle.

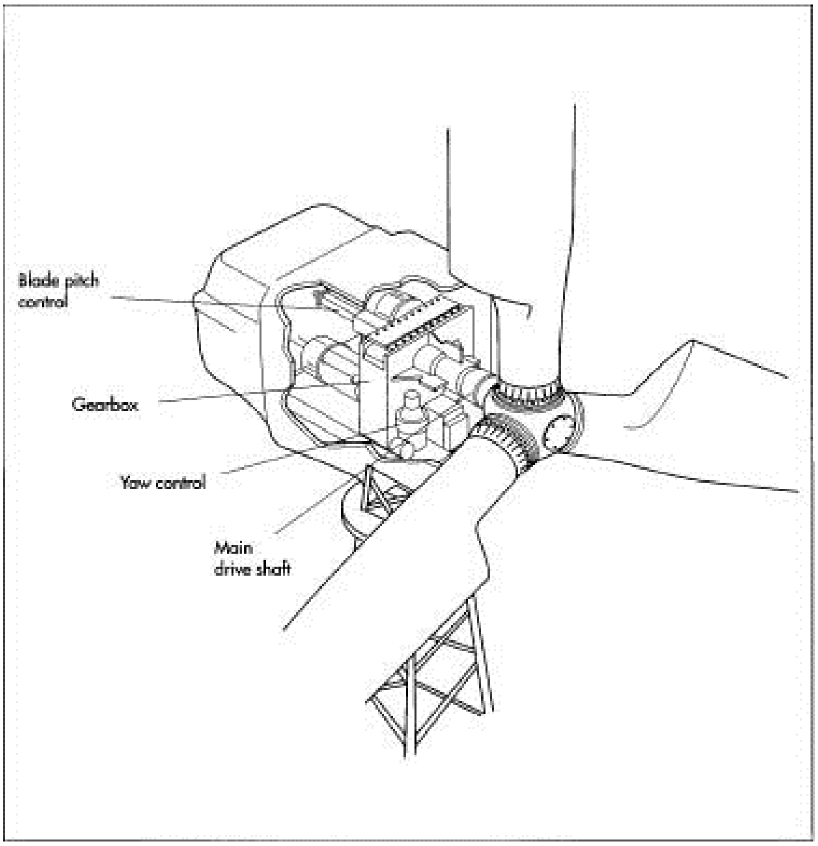

Figure 3.2: Detailed structure of a typical nacelle of a wind turbine (refer to http://www.madehow.com/images/hpm_0000_0001_0_img0219.jpg)

The generator

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

The tower

The tower, which supports the rotor, is constructed from tubular steel. The tower will be up to 120 m in height, depending on the turbine type selected for the wind energy facility. The nacelle is 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.

Foundation

A concrete **foundation** is laid into the ground at the base of the turbine to provide stability and support to the turbine.

3.2. Operating Characteristics of a Wind Turbine

With the exception of downtime for preventative maintenance and/or malfunctions, the turbines can operate 365 days a year and 24 hours a day. A turbine is designed to operate continuously, unattended and with low maintenance for 20- 30 years. The turbines will however generate electricity only during times of sufficient wind.

Once operating, a wind energy facility can be monitored and controlled remotely, with a mobile team for maintenance, when required. Downtime for preventive maintenance and/or malfunctions may reduce the operating hours.

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

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

It is the flow of air over the blades and through the rotor area that makes a wind turbine function. The wind turbine extracts energy by slowing the wind down. The theoretical maximum amount of energy in the wind that can be collected by a wind turbine's rotor is approximately 59%. This value is known as the Betz Limit. If the blades were 100% efficient, a wind turbine would not work because the air, having given up all its energy, would entirely stop. In practice, the collection efficiency of a rotor is not as high as 59%. A more typical efficiency is 35% to 45%. A wind energy system (including rotor, generator etc.) does not exhibit perfect efficiencies, and will therefore deliver between 10% and 30% of the original energy available in the wind (between 20% to 25% being typical for modern systems).

Wind turbines can be used as stand-alone applications, or they can be connected to a utility power grid. For utility-scale sources of wind energy, a large number of wind turbines are usually built close together to form a **wind energy facility** (also commonly referred to as a wind farm)

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APPROACH TO UNDERTAKING THE EIA PHASE — CHAPTER 4

An EIA Process is dictated by the EIA Regulations which involves the identification and assessment of direct, indirect, and cumulative environmental impacts associated with a proposed project. The EIA process, which comprises a **Scoping** and an **EIA Phase**, culminates in the submission of an EIA Report, including a draft Environmental Management Programme (EMP), to the competent authority for decision-making.

Figure 4.1: Phases within the EIA Process

The EIA Phase for the proposed Project Blue Wind Energy Facility has been undertaken in accordance with the EIA Regulations published in Government Notice 33306 of 18 June 2010, published in terms of Section 24(5) of NEMA (Act No. 107 of 1998). The environmental studies for this proposed project were undertaken in two phases, in accordance with the EIA Regulations.

4.1. Scoping Phase

The Scoping Report aimed at detailing the nature and extent of the proposed facility, identifying potential issues associated with the proposed project, and defining the extent of studies required within the EIA Phase. 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 I&APs. In accordance with the requirements of the EIA Regulations, feasible project-specific alternatives were investigated for consideration within the EIA process. However, no feasible and reasonable alternatives were identified for some aspects of the project. Details of alternatives considered and reasons for not considering other alternatives are detailed in Chapter 2.

The Scoping Phase also provided interested and affected parties (I&APs) with the opportunity to receive information regarding the proposed project, to participate in the process and to raise issues or concerns. To further facilitate this, the Draft Scoping Report was made available for public review. All comments, concerns, and suggestions received during the Scoping Phase and the review period were included within the Final Scoping Report, which was submitted to the National Department of Environmental Affairs (DEA) together with a Plan of Study for the EIA Phase for acceptance. The Scoping Phase concluded in February 2012 with the acceptance of the Final Scoping Report. In terms of this acceptance, an EIA was required to be undertaken for the proposed project as per the accepted plan of study. In addition, comments from the relevant Organs of State are to be requested and those received are to be submitted with the Final Environmental Impact Report (EIR). The EIA Report is to contain a construction and operational phase Environmental Management Programme (EMP).

4.2. Environmental Impact Assessment Phase

The EIA Phase aimed to achieve the following:

» Provide an overall assessment of the social and biophysical environments affected by the proposed alternatives put forward as part of the project.
» Assess potentially significant impacts (direct, indirect, and cumulative, where required) associated with the proposed facility.
» Comparatively assess any identified and feasible alternatives put forward as part of the project.
» Identify and recommend appropriate mitigation measures for potentially significant environmental impacts.
» Undertake a fully inclusive public participation process to ensure that I&APs are afforded the opportunity to participate, and that their issues and concerns are recorded.

The EIA addresses potential environmental impacts and benefits associated with all phases of the project including design, construction, operation, and decommissioning, and aims to provide the environmental authorities with sufficient information to make an informed decision regarding the proposed project.

4.3. Overview of the EIA Phase

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

» Consultation with relevant decision-making and regulating authorities (at National, Provincial and Local levels).
» Undertaking a public participation process throughout the EIA process in accordance with Regulation 54 of GN R543 of 2010 in order to identify any additional issues and concerns associated with the proposed project.
» Preparation of a Comments and Response Report detailing key issues raised by I&APs as part of the EIA Process (in accordance with Regulation 57 of GN R543 of 2010).
» Undertaking of independent specialist studies in accordance with Regulation 32 of GN R543 of 2010.
» Preparation of a Draft EIA Report in accordance with the requirements of the Regulation 31 of GN R543 of 2010.

These tasks are discussed in detail below.

4.3.1 Authority Consultation

The National DEA is the competent authority for this application. A record of all authority consultation undertaken prior to the commencement of the EIA Phase is included within the Scoping Report and this EIA report. Consultation with the regulating authorities (i.e. DEA and NC DENC) has continued throughout the EIA process. On-going consultation included the following:

» Ad hoc discussions with DEA in order to clarify the findings of the Scoping Report and the issues identified for consideration in the EIA Phase.
» Provision of an opportunity for DEA and NC DENC representatives to visit and inspect the proposed site, and the study area.

The following will also be undertaken as part of this EIA process:

» Submission of a final EIA Report following the 30-day public review period.
» Consultation with Organs of State that may have jurisdiction over the project, including:
    * Provincial and local government departments (including South African Heritage Resources Agency, Department of Water Affairs, South African National Roads Agency Limited, Department of Agriculture, etc.).
    * Government Structures (including the Department of Public Works, Roads and Transport, etc)

A record of all authority consultation undertaken prior to the commencement of the EIA Phase is included within the Scoping Report. A record of the consultation in the EIA process is included within **Appendix B**.

4.3.2 Public Involvement and Consultation

The aim of the public participation process was primarily to ensure that:

» Information containing all relevant facts in respect of the proposed project was made available to potential stakeholders and I&APs.
» Participation by potential I&APs was facilitated in such a manner that all potential stakeholders and I&APs were provided with a reasonable opportunity to comment on the proposed project.
» Comment received from stakeholders and I&APs was recorded and incorporated into the EIA process.

Below is a summary of the key public participation activities conducted thus far.

» **Identification of I&APs and establishment of a database**
Identification of I&APs was undertaken by **Sustainable Futures** (specialist public participation consultants) through existing contacts and databases, recording responses to site notices and the newspaper advertisement, as well as through the process of networking. The key stakeholder groups identified include authorities, local and district municipalities, public stakeholders, Parastatals and Non-Governmental Organisations (refer to Table 4.1 below).

Table 4.1: Key stakeholder groups identified during the EIA Process

Stakeholder Group	Department
National and Provincial Authorities	» Provincial and local government departments (including DEA, DENC, SAHRA, DWA, DAFF, SANRAL, etc.) » Government structures (including the provincial roads authority, etc.) » Namaqua National Park
Municipalities	» Nama Khoi Local Municipality » Namakwa District Municipality » Ward councillors
Public stakeholders	» Adjacent and surrounding landowners (see attached landowner map – Appendix E) » Farmers Unions » Nearby residents » De Beers Mine in Kleinsee
Parastatals & service providers	» Eskom Transmission & Distribution
NGOs/Business forums	» Wildlife Society of South Africa

Through on-going consultation with key stakeholders and I&APs, issues raised through the Scoping Phase for inclusion within the EIA Phase were confirmed. All relevant stakeholder and I&AP information has been recorded within a database of affected parties (refer to Appendix C). While I&APs were encouraged to register their interest in the project from the onset of the process, the identification and registration of I&APs has been on-going for the duration of the EIA Process and the project database has been updated on an on-going basis.

» **Newspaper Advertisements**

During the scoping phase, in order to notify and inform the public of the proposed project notices were placed in the local media (Die Burger, Die Namakwalander and Die Namakwa Kletz), on site and in public places. In addition, adverts were placed in the local media in order to notify the public on the availability of the Draft Scoping report for public review and public meeting.

During the EIA phase, a second round of newspaper adverts was placed to inform the public on the details of the availability of the Draft EIA Report for public review as well as the public meeting in the following newspapers:

- Die Burger (Friday, 8 June 2012)
- Die Namakwalander (Friday, 8 June 2012)

» **Consultation**

In order to accommodate the varying needs of stakeholders and I&APs, the following opportunities have been provided for I&AP issues to be recorded and verified through the EIA phase, including:

- Focus group meetings (stakeholders invited to attend)
- Public meeting (advertised in the local press)
- Written, faxed or e-mail correspondence

In order to further facilitate comments on the Draft EIA report and to provide feedback on the findings of the specialist scoping studies, a public feedback meeting will be held during the public review period. All interested and affected parties were invited to attend a public meeting to be on:

- **Date:** 3 July 2012
- **Time:** 17:00 – 18:30
- **Venue:** Kleinsee Recreational Club

Records of all consultation undertaken are included within **Appendix D and Appendix E**.

4.3.3 Identification and Recording of Issues and Concerns

Issues and comments raised by I&APs over the duration of the EIA process have been synthesised into Comments and Response Reports (refer to **Appendix E2** for the Comments and Response Reports compiled from the EIA Process to date).

The Comments and Response Report includes responses from members of the EIA project team and/or the project proponent. Where issues are raised that the EIA team considers beyond the scope and purpose of this EIA process, clear reasoning for this view is provided.

4.3.4 Assessment of Issues Identified through the Scoping Process

Through the Scoping Study, a number of issues requiring further study during the EIA Phase were highlighted. Issues which require further investigation within the EIA Phase, as well as the specialists involved in the assessment of these impacts are indicated below.

Table 4.2: Specialist studies undertaken within the EIA Phase

Specialist	Area of Expertise	Refer Appendix
Simon Todd of Simon Todd Consulting cc	Terrestrial Fauna	Appendix F
Dave McDonald of BergWind Botanical Surveys	Vegetation	Appendix G
Rob Simmons of UCT	Avifauna	Appendix H
Johan van der Waals of Terrasoil Science	Geology, soils and agricultural potential study)	Appendix I
Lourens du Plessis of MetroGIS	Visual	Appendix J
Jayson Orton of ACO	Heritage / Archaeology	Appendix K
John Pether	Palaeontology	Appendix L
Morne de Jager of MENCO (M2 Environmental Connections cc)	Noise	Appendix M
Tony Barbour of Tony Barbour Consulting and Research	Social Impact	Appendix N

Specialist studies considered direct, indirect, cumulative, and residual environmental impacts associated with the development of the proposed Project Blue Wind Energy Facility. Issues were assessed in terms of the following criteria:

» The **nature**, a description of what causes the effect, what will be affected, and how it will be affected

» The **extent**, wherein it is indicated whether the impact will be local (limited to the immediate area or site of development), regional, national or international. A score of between 1 and 5 is assigned as appropriate (with a score of 1 being low and a score of 5 being high)
» The **duration**, wherein it is indicated whether:
  * The lifetime of the impact will be of a very short duration (0–1 years) – assigned a score of 1
  * The lifetime of the impact will be of a short duration (2-5 years) - assigned a score of 2
  * Medium-term (5–15 years) – assigned a score of 3
  * Long term (> 15 years) - assigned a score of 4
  * Permanent - assigned a score of 5
» The **magnitude**, quantified on a scale from 0-10, where a score is assigned:
  * 0 is small and will have no effect on the environment
  * 2 is minor and will not result in an impact on processes
  * 4 is low and will cause a slight impact on processes
  * 6 is moderate and will result in processes continuing but in a modified way
  * 8 is high (processes are altered to the extent that they temporarily cease)
  * 10 is very high and results in complete destruction of patterns and permanent cessation of processes
» The **probability of occurrence**, which describes the likelihood of the impact actually occurring. Probability is estimated on a scale, and a score assigned:
  * Assigned a score of 1–5, where 1 is very improbable (probably will not happen)
  * Assigned a score of 2 is improbable (some possibility, but low likelihood)
  * Assigned a score of 3 is probable (distinct possibility)
  * Assigned a score of 4 is highly probable (most likely)
  * Assigned a score of 5 is definite (impact will occur regardless of any prevention measures)
» The **significance**, which is determined through a synthesis of the characteristics described above (refer formula below) and can be assessed as low, medium or high
» The **status**, which is described as either positive, negative or neutral
» The degree to which the impact can be reversed
» The degree to which the impact may cause irreplaceable loss of resources
» The degree to which the impact can be mitigated

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

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

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

The **significance weightings** for each potential impact are as follows:

» **< 30 points:** Low (i.e. where this impact would not have a direct influence on the decision to develop in the area)
» **30-60 points:** Medium (i.e. where the impact could influence the decision to develop in the area unless it is effectively mitigated)
» **> 60 points:** High (i.e. where the impact must have an influence on the decision process to develop in the area)

As the developer has the responsibility to avoid or minimise impacts and plan for their management (in terms of the EIA Regulations), the mitigation of significant impacts is discussed. Assessment of impacts with mitigation is made in order to demonstrate the effectiveness of the proposed mitigation measures. A separate draft EMP is included as **Appendix O – Q for each phase**.

4.3.5 Assumptions and Limitations

The following assumptions and limitations are applicable to the studies undertaken within this EIA Phase:

» All information provided by the developer and I&APs to the environmental team was correct and valid at the time it was provided.
» It is assumed that the development site identified by the developer represents a technically suitable site for the establishment of the proposed solar facility.
» It is assumed correct that the proposed connection to the National Grid is correct in terms of viability and need.
» Studies assume that any potential impacts on the environment associated with the proposed development will be avoided, mitigated, or offset.
» This report and its investigations are project-specific, and consequently the environmental team did not evaluate any other power generation alternatives.

Refer to the specialist studies in **Appendices F – N** for specialist study specific limitations.

REGULATORY AND LEGAL CONTEXT CHAPTER 5

5.1 Policy and Planning Context at a National Level

The need to expand electricity generation capacity in South Africa is based on national policy and 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 solar energy facilities is illustrated in **Figure 5.1**. These policies are discussed in more detail in the following sections, along with the provincial and local policies or plans that have relevance to the development of the proposed solar energy facility.

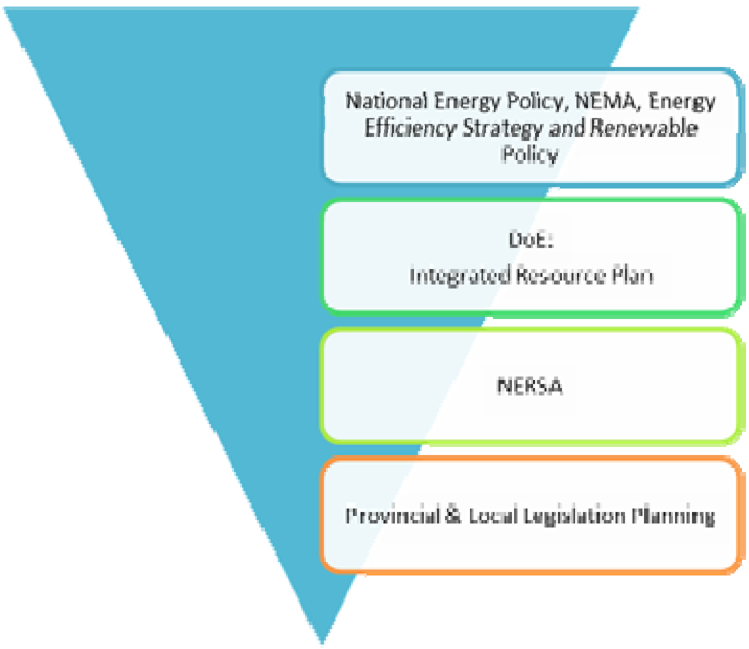


Figure 5.1: Hierarchy of electricity policy and planning documents

5.1.1 White Paper on the Energy Policy 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. 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 (and Eskom) to investigate a whole range of supply and demand side options.

5.1.2 Renewable Energy Policy in South Africa, 1998

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 meeting 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.

In order to meet the long-term goal of a sustainable renewable energy industry, the South African Government has set the following 10-year target for renewable energy: "*10 000 GWh (0.8 Mtoe) renewable energy contribution to final energy consumption by 2013 to be produced mainly from biomass, wind, solar and small-scale hydro. The renewable energy is to be utilised for power generation and non-electric technologies such as solar water heating and bio-fuels. This is approximately 4% (1 667 MW) of the estimated electricity demand (41 539 MW) by 2013*" (DME, 2003).

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*."

In order assist Government in meeting its target, Eskom is investigating potential renewable energy projects, which include a Concentrated Solar Thermal project in the Northern Cape, as well as the several wind energy facilities.

5.1.3. Final Integrated Resource Plan, 2010 - 2030

The Energy Act of 2008 obligates the Minister of Energy to develop and publish an integrated resource plan for energy. Therefore, the Department of Energy (DoE), together with the National Energy Regulator of South Africa (NERSA) has compiled the Integrated Resource Plan (IRP) for the period 2010 to 2030. The objective of the IRP is to develop a sustainable electricity investment strategy for generation capacity and transmission infrastructure for South Africa over the next twenty years. The IRP is intended to:

» Improve the long term reliability of electricity supply through meeting adequacy criteria over and above keeping pace with economic growth and development;
» Ascertain South Africa's capacity investment needs for the medium term business planning environment;
» Consider environmental and other externality impacts and the effect of renewable energy technologies; and
» Provide the framework for Ministerial determination of new generation capacity (inclusive of the required feasibility studies).

The objective of the IRP is to evaluate the security of supply, and determine the least-cost supply option by considering various demand side management and supply-side options. The IRP also aims to provide information on the opportunities for investment into new power generating projects.

The outcome of the process confirmed that coal-fired options are still required over the next 20 years and that additional base load plants will be required from 2010. The first and interim IRP was developed in 2009 by the Department of Energy. The initial four years of this plan was promulgated by the Minister of Energy on 31 December 2009, and updated on 29 January 2010. The Department of Energy released the Final IRP in March 2011, which was accepted by Parliament at the end of March. This Policy-Adjusted IRP is recommended for adoption by Cabinet and subsequent promulgation as the final IRP. 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 (including 8,4GW solar); and 8.9 GW of other generation sources.

5.1.4 Electricity Regulation Act, 2006

Under the National Energy Regulator Act, 2004 (Act No 40 of 2004), the Electricity Regulation Act, 2006 (Act No 4 of 2006) and all subsequent relevant Acts of Amendment, NERSA has the mandate to determine the prices at and conditions under which electricity may be supplied by licence to Independent Power Producers (IPPs). NERSA has recently published a request for qualification and proposals for new generation capacity under the IPP procurement programme, and is in the process of updating and developing its process in relation to the awarding of electricity generation licences.

5.2. Policy and Planning Context at a Provincial Level

5.2.1. 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; and
» 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 the proposed REF, the NCPGDS 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 NCPGDS notes "the development of (renewable) energy sources … could be some of the means by which new economic opportunity and activity is generated in the Northern Cape". The NCPGDS 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 NCPGDS 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 (BEE). 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 Province.

In this regard care will need to be taken to ensure that the proposed wind thermal plant and other renewable energy facilities do not negatively impact on the regions natural environment. In this regard the NCPGDS 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 provinces exceptional natural and cultural attributes, it has the potential to become the preferred adventure and ecotourism destination in South Africa. Care therefore needs to be taken to ensure that the development of large renewable energy projects, such as the proposed wind energy facility, do not impact on the tourism potential of the province.

5.2.2. Northern Cape Climate Change Response Strategy (in progress)

The NCPG appears to be in the process of finalising its Provincial Climate Change Response Strategy (NCPCCRS). In this regard, completion of a Draft document was announced in March 2011, and finalisation of the report anticipated after the 2011 COP17, by the end of 2011. Neither document appears to have been released by this date (i.e. April 2012).

The key aspects of the Draft PCCRS Report are however summarised in the MEC's (NCPG: Environment and Nature Conservation) 2011 budget speech: "The Provincial Climate Change Response Strategy will be underpinned by specific critical sector climate change adaptation and mitigation strategies that include the Water, Agriculture and Human Health sectors as the 3 key Adaptation Sectors, the Industry and Transport alongside the Energy sector as the 3 key Mitigation Sectors with the Disaster Management, Natural Resources and Human Society, livelihoods and Services sectors as 3 remaining key Sectors to ensure proactive long term responses to the frequency and intensity of extreme weather events such as flooding and wild fire, with heightened requirements for effective disaster management".

Key points from MEC Lucas' address include the NCPG's commitment to develop and implement policy in accord with the National Green Paper for the National Climate Change Response Strategy (2010), and an acknowledgement of the NCP's extreme vulnerability to climate-change driven desertification. The development and promotion of a provincial green economy, including green jobs, and environmental learnerships is indented as an important provincial intervention in addressing climate change. The renewable energy sector, including solar and wind energy (but also biofuels and energy from waste), is explicitly indicated as an important element of the Provincial Climate Change

Response Strategy. The MEC further indicated that the NCP was involved in the processing 7 WEF and 11 SEF EIA applications (March 2011)[4].

5.2.3. Northern Cape Provincial Spatial Development Framework (2011)

Dennis Moss Partnership is currently preparing a Provincial Spatial Development Framework (PDSF) for the Northern Cape Province (NCP). The PSDF is a legal requirement in terms of Chapter 4 of the Northern Cape Planning and Development Act 7 of 1998.

Volumes 1 and 2 were finalised in December 2011. Volumes 1 and 2 are essentially introductory, status quo reports. Volume 2 provides a situation analysis of the NCP, mainly with the view of identifying key aspects for policy focus/ intervention. Volumes 3 (Spatial Directives) and 4 (Strategies) are currently in preparation, and no Draft documents are available at this stage.

Volume 2 (Situation Analysis and Key Aspects) indicates that the envisaged Spatial Directives and Strategies reports would be closely aligned to the 2004-2014 Northern Cape Provincial Growth and Development Strategy (PGDS) (currently in Draft 4)[5]. Volume 2 includes an overview of some key relevant aspects of the PGDS Draft 4, including with regard to the roles of renewable energy and tourism in the provincial economy.

» **Renewable Energy**

The PSDF (Vol 2) notes that, at present, the Eskom Vanderkloof hydro station on the Orange River (240 MW) represents the only large energy-generating facility in the NCP. Most of the energy used in the province is generated by Eskom plants located elsewhere, mainly Mpumalanga Province. The PSDF therefore notes that the NCP's major energy challenges include securing energy supply to meet growing demand, providing everybody with access to energy services and tackling the causes and impacts of climate change (as per PGDS). In this regard, the development of large-scale renewable energy supply schemes is strategically important for increasing the diversity of domestic energy supplies for the NCP, and avoiding energy imports while minimizing the environmental impacts.

The PSDF further notes that renewable energy has been identified in the Draft 4 PGDS (2011) as a mechanism to diversify the economy and thereby promote a green economy in the province. According to the PGDS, greening the economy is characterized by substantially increased investments in

[4] (www.info.gov.za/speech/DynamicAction?pageid=461&sid=22143&tid=45200).
[5] Draft 4 (2011) of the PGDS does not appear to have been made public yet.

economic sectors (NCPG; 2011: F.1.4.1). Vol. 2 of the PSDF indicates that the promotion of job creation in the green jobs industries (e.g. manufacturing of solar water heaters, maintenance of wind generators and solar energy infrastructure) would be promoted in the forthcoming spatial directives and strategies reports (Volumes 3-4).

The PSDF notes that, according to the PGDS the NCP has considerable potential for wind energy generation, noting specifically the West Coast and certain parts of the interior of the province. The PSDF notes that a number of WEF applications are currently in progress in the NCP.

» **Tourism**

The PSDF notes that the tourism sector is identified in the Draft 4 PGDS as one of the key sectors with the capacity to 'grow, transform and diversify the provincial economy'. According to the PGDS, the vision for tourism is underpinned by a number of broad, essential and specific drivers. The 'broad drivers' consider the 'big picture' focusing on tourism's contribution to a larger development purpose, including overall economic growth, addressing social upliftment and poverty alleviation through facilitating job creation, and striving for more equitable ownership and participation in tourism through transformation.

Comparative advantages of the NCP are identified as mainly eco-tourism opportunities, including unique sectoral or nature-based routes; National parks, nature reserves and game reserves, Natural and cultural manifestations, as well as festivals and cultural events (PGNC; 2011b).

5.3. Policy and Planning Context at a Local Level

5.3.1. The Namakwa District Municipality Draft Integrated Development Plan 2012-2016

The 2012-2016 NDM Integrated Development Plan (IDP) is the third 5-year IDP of the NDM. The IDP is currently in its first year, and in Draft format. The IDP is explicitly aligned with the applicable national and provincial policy and planning frameworks, including the 12 National Outcomes (2010) and National Development Plan (2011), as well as the PGDS. Focus in presentation below is on aspects of relevance to the assessment of the Project Blue facility.

The IDP identifies a number of key socio-economic development constraints and challenges with regard to the NDM, including:

» The lack of surface and ground water resources to enable development.

- Generally poor soils, unsuited to cropping activities.
- For many of the smaller settlements, a settlements pattern largely unsupported by an adequate economic base.
- High unemployment, underemployment and economic non-participation levels, with only ~20% of the labour force permanently employed in 2010, and an increasingly larger part of the population becoming dependent on social grants.
- High poverty levels, with ~44% of households living below the poverty datum in 2010, and an overall increase in the number of poor households of 270% since 1996.
- A low growth rate in employment creation. From 1996 to 2010, only ~1 000 jobs were created in the NDM.
- A steady decline in employment provision by the NDM's traditionally key Agricultural and Mining sectors since 1996, with the former declining in 8% in relative significance in 2010, and Mining by 4.5%, resulting in a loss of ~3 100 opportunities during this period. The loss of primary sector opportunities significantly impacts on the lower skilled part of the population.
- Lack of adequate and sufficient tertiary institutions and skills training opportunities in the NCP and NDM.
- Extensive damage to the NDM's coastline and beaches by historic mining activities since the 1920s. The IDP notes that as diamond resources become fully exploited, and access to the coastline improves, the full extent of the damage, but also potential opportunities will become apparent.
- The potential impacts of climate change on the NDM. Generally hotter, drier, more fire-prone conditions, resulting in less predictable rainfall patterns, more frequent droughts, and an overall greater scarcity of water, are anticipated for the NDM.

Key identified development priorities therefore include the following:

- Employment creation, specifically including female-orientated employment opportunities, to address the current high rate of out-migration of women in the 20-34 age group.
- Skills training and reskilling opportunities, also including provision for people with low education levels.
- Economic diversification away from primary sector activities (agriculture and mining), and a greater focus on tourism as growth and employment sector.
- Realising any opportunities resulting from appropriate developments in the historically transformed coastal zone to counteract the decline of employment and other opportunities associated with a decline in the diamond mining industry.

Section 2.5 of the IDP includes a summary of a recent NDM research report on the "Possible effects and impact of climate change on human settlements and population development in the Northern Cape" (date unclear). Key findings of the report indicated that the Namakwa District, including its Atlantic fisheries, is in the direct path of extreme anticipated climate change impacts. Key recommendations include the NDM's need to mainstream climate change into planning activities and implement institutional arrangements that support integration of climate change across sectors. Renewable energy is not explicitly addressed in the document.

Projects listed under Key Performance Area (KPA) 3 (Local Economic Development), of the 2010-2011 NDM IDP indicated current NCPG support for/ involvement with two projects in which the generation of wind energy plays a major role, namely:

» Project no. LE02: *Renewable Energy Sector: the development of a synergy between the energy resources within Namakwa Region,* which, in line with NDM's objective of establishing a competitive renewable energy sector, supports projects related to a variety of renewable energy generation, including "wind farms with capacity to generate 200 MW energy within 3 Local Municipalities".
» Project LE15: *LEAP – Living Edge - Tourism and Environment Cluster* indicates current support for post-mining LED development in the Koïngnaas/ Hondeklipbaai area (Kamiesberg LM). Significantly, focus is on "post mining economic and employment opportunities with an emphasis on (green economic activities such as) mariculture, wind/other forms of green energy and tourism".

5.3.2. Nama Khoi Local Municipality 2011/2012 Revision

The 2011/ 2012 NKLM IDP Revision is the most recent IDP available, and was still compiled in terms of the 2004 NKLM 5-year IDP. Only the 2012-2013 IDP Process Plan is currently available. Review below is therefore of the 2011/ 2012 IDP. The IDP is underpinned by the national Strategic Plan for Local Government 2006-20011[6], the PGDS (see Section 5.3.1 above), the national Accelerate and Shared Growth Initiative – South Africa (2006-2014) (ASGISA), and the 2009 national Local Government Turn Around Strategy (re. service delivery challenges and financially sustainable local government).

[6] The SPLG 2006-2011 identified 5 national Key Performance Areas – or KPA – to guide reporting in the drafting of IDP documents and to monitor (and adjust, where applicable) annual municipal delivery performance against set developmetal goals in the relevant KPAs.

Socio-economic developmental planning in the NKLM is further underpinned by the objectives of national Medium-term Strategic Framework (or 12 National Outcomes by 2014), namely:

» Speeding up growth and transforming the economy to create decent work and sustainable livelihoods.
» A massive programme to build economic and social infrastructure.
» A comprehensive rural development strategy linked to land and agrarian reform and food security.
» To strengthen the skills and human resource base.
» To improve the health profile of all South Africans.
» To intensify the fight against crime and corruption.
» To build cohesive, caring and sustainable communities.
» Pursuing African advancement and enhanced international cooperation.
» Sustainable Resource Management and use.
» Building a developmental state including improvement of public services and strengthening democratic institutions.

Of specific relevance to the proposed Project Blue wind energy facility, the IDP notes that mining used to form the backbone of the economy, but that tourism is currently seen as the “new frontier” for economic development in the municipal area (NKLM Draft 2011/12 IDP). The IDP makes no mention of renewable energy projects or policy pertaining thereto.

5.4. Regulatory Hierarchy for Energy Generation Projects

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 solar 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 solar energy facility project and the related statutory environmental assessment process.

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 is responsible for forming and approving the IRP (Integrated Resource Plan for Electricity). Wind energy is considered under the White Paper for Renewable Energy (2003) and the Department undertakes research in this regard. 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 solar 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 provides legislative protection for listed or proclaimed sites, such as urban conservation areas, nature reserves and proclaimed scenic routes.
» *Department of Water Affairs (DWA):* This department is responsible for effective and efficient water resources management to ensure sustainable economic and social development.
» *Department of Agriculture, Forestry and Fishery (DAFF):* This department 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.
» *South African National Roads Agency Limited (SANRAL):* This department is responsible for all National road routes.

At **Provincial Level**, the main regulatory agency is:

» Northern Cape - Department of Environment and Nature conservation (DE&NC)
» Northern Cape - Agriculture and Land Reform
» Northern Cape - Economic Development
» Northern Cape - Roads and Public Works
» Northern Cape - Water Affairs
» South African Heritage Resources Agency
» SANRAL - Western Region
» Eskom
» SA Civil Aviation Authority

At **Local Level** the local and municipal authorities are the principal regulatory authorities responsible for planning, land use, and the environment i.e. Nama Khoi Local Municipality and Namakwa District Municipality.

» The proposed site is located in the western part of Ward 8 of the Nama-Khoi Local Municipality (NKLM), which in turn forms part of the Namakwa District Municipality (NDM) of the Northern Cape Province.
» 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.

» Spatial Development Frameworks (such as the Namakwa District Municipality's SDF).
» By-laws and policies have been formulated by local authorities to protect visual and aesthetic resources relating to urban edge lines, scenic drives, special areas, signage, communication masts, etc.

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

5.5. Legislation and Guidelines that have informed the preparation of this EIA Report

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

» National Environmental Management Act (Act No 107 of 1998)
» EIA Regulations, published under Chapter 5 of the NEMA (GN R543 - GN R546 in Government Gazette 33306 of 18 June 2010 (as amended))
» 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)
» International guidelines – the Equator Principles and the International Finance Corporation and World Bank Environmental, Health, and Safety Guidelines for Wind Energy (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 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: Relevant legislative permitting requirements applicable to the proposed wind energy facility

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
National Legislation			
National Environmental Management Act (Act No 107 of 1998)	The EIA Regulations have been promulgated in terms of Chapter 5 of the Act. Listed activities which may not commence without an environmental authorisation are identified within these Regulations. In terms of S24(1) of NEMA, the potential impact on the environment associated with these listed activities must be assessed and reported on to the competent authority charged by NEMA with granting of the relevant environmental authorisation. In terms of GNR 544 - 546 of June 2010 a Scoping and EIA Process is required to be undertaken for the proposed project.	Department of Environmental Affairs – competent authority NC DENC – commenting authority	The listed activities triggered by the proposed wind energy facility have been identified and assessed in the EIA process being undertaken (i.e. Scoping and EIA). This EIA Report will be submitted to the competent and commenting authority in support of the application for authorisation.
National Environmental Management Act (Act No 107 of 1998)	In terms of the Duty of Care Provision in S28(1) the project proponent must ensure that reasonable measures are taken throughout the life cycle of this project to ensure that any pollution or degradation of the environment associated with this project is avoided, stopped or minimised. In terms of NEMA, it has become the legal duty of a project proponent to consider a project holistically, and to consider the cumulative effect of a variety of impacts.	Department of Environmental Affairs	While no permitting or licensing requirements arise directly by virtue of the proposed project, this section has found application during the EIA Phase through the consideration of potential impacts (cumulative, direct, and indirect). It will continue to apply throughout the life cycle of the project.

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
Environment Conservation Act (Act No 73 of 1989)	National Noise Control Regulations (GN R154 dated 10 January 1992)	Department of Environmental Affairs Department of Environment and Nature Conservation Local Authorities	Noise impacts are expected to be associated with the construction phase of the project and are not likely to present a significant intrusion to the local community. Therefore is no requirement for a noise permit in terms of the legislation. On-site activities should be limited to 6:00am - 6:00pm, Monday – Saturday (excluding public holidays). Should activities need to be undertaken outside of these times, the surrounding communities will need to be notified and appropriate approval will be obtained from DEA and the Local Municipality.
National Water Act (Act No 36 of 1998)	Water uses under S21 of the Act must be licensed unless such water use falls into one of the categories listed in S22 of the Act or falls under the general authorisation.	Department of Water Affairs Provincial Department of Water Affairs	A water use license (WUL) is required to be obtained if drainage lines are impacted on and/or if water is to be abstracted from a natural resource (surface or groundwater).
National Water Act (Act No 36 of 1998)	In terms of S19, the project proponent must ensure that reasonable measures are taken throughout the life cycle of this project to prevent and remedy the effects of pollution to water resources from occurring, continuing, or recurring.	Department of Water Affairs Provincial Department of Water Affairs	This section of the Act will apply with respect to the potential impact on drainage lines, primarily during the construction phase (i.e. pollution from construction vehicles).
Minerals and Petroleum Resources Development Act	A mining permit or mining right may be required where a mineral in question is to be	Department of Mineral Resources	As no borrow pits are expected to be required for the construction of the

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
(Act No 28 of 2002)	mined (e.g. materials from a borrow pit) in accordance with the provisions of the Act. Requirements for Environmental Management Programmes and Environmental Management Plans are set out in S39 of the Act.		facility, no mining permit or right is required to be obtained.
Minerals and Petroleum Resources Development Act (Act No 28 of 2002)	In terms of subsection (2) of Section 53(1) of the Mineral and Petroleum Resources Development Act (MPRDA), 2002 (Act 28 of 2002) any person who intends to use the surface of any land in any way which may be contrary to any object of the Act or which is likely to impede any such object must apply to the Minister for approval.	Department of Mineral Resources	The developer must apply to the Minister for approval to use the surface of the property for the proposed development.
National Environmental Management: Air Quality Act (Act No 39 of 2004)	S18, S19, and S20 of the Act allow certain areas to be declared and managed as “priority areas.” Declaration of controlled emitters (Part 3 of Act) and controlled fuels (Part 4 of Act) with relevant emission standards.	Department of Environmental Affairs	No permitting or licensing requirements arise from this legislation. The Act provides that an air quality officer may require any person to submit an atmospheric impact report if there is reasonable suspicion that the person has failed to comply with the Act.
National Heritage Resources Act (Act No 25 of 1999)	S38 states that Heritage Impact Assessments (HIAs) are required for certain kinds of development including: » The construction of a road, power line, pipeline, canal or other similar linear development or barrier exceeding 300 m in length; and » Any development or other activity which	South African Heritage Resources Agency	A permit may be required should identified cultural/heritage sites on site be required to be disturbed or destroyed as a result of the proposed development. A HIA has been undertaken as part of the EIA Process to identify heritage

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	will change the character of a site exceeding 5 000 m^2 in extent. Stand alone HIAs are not required where an EIA Process is carried out as long as the EIA contains an adequate HIA component that fulfils the provisions of S38. In such cases only those components not addressed by the EIA should be covered by the heritage component.		sites. See Appendix K.
National Environmental Management: Biodiversity Act (Act No 10 of 2004)	In terms of S57, the Minister of Environmental Affairs has published a list of critically endangered, endangered, vulnerable, and protected species in GNR 151 in Government Gazette 29657 of 23 February 2007 and the regulations associated therewith in GNR 152 in GG29657 of 23 February 2007, which came into effect on 1 June 2007. In terms of GNR 152 of 23 February 2007: Regulations relating to listed threatened and protected species, the relevant specialists must be employed during the EIA Phase of the project to incorporate the legal provisions as well as the regulations associated with listed threatened and protected species (GNR 152) into specialist reports in order to identify permitting requirements at an early stage of the EIA Phase. The Act provides for listing threatened or	Department of Environmental Affairs	As the applicant will not carry out any restricted activity, as is defined in S1 of the Act, no permit is required to be obtained in this regard. Specialist flora and fauna studies have been undertaken as part of the EIA Phase. As such the potentially occurrence of critically endangered, endangered, vulnerable, and protected species and the potential for them to be affected has been considered, this report is contained in Appendix G and F.

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	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).		
Conservation of Agricultural Resources Act (Act No 43 of 1983)	» Provides for the regulation of control over the utilisation of the natural agricultural resources in order to promote the conservation of soil, water and vegetation and provides for combating weeds and invader plant species » Regulation 15 of GNR1048 provides for the declaration of weeds and invader plants, and these are set out in Table 3 of GNR1048. Weeds are described as Category 1 plants, while invader plants are described as Category 2 and Category 3 plants. These regulations provide that Category 1, 2 and 3 plants must not occur on land and that such plants must be	Department of Agriculture	This Act will find application throughout the life cycle of the project. In this regard, soil erosion prevention and soil conservation strategies must be developed and implemented. In addition, a weed control and management plan must be implemented. The permission of agricultural authorities will be required if the Project requires the draining of vleis, marshes or water sponges on land outside urban areas.

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	controlled by the methods set out in Regulation 15E.		
National Forests Act (Act No. 84 of 1998)	» In terms of S5(1) no person may cut, disturb, damage or destroy any protected tree or possess, collect, remove, transport, export, purchase, sell donate or in any other manner acquire or dispose of any protected tree or any forest product derived from a protected tree, except under a license granted by the Minister to an (applicant and subject to such period and conditions as may be stipulated". » GN 1042 provides a list of protected tree species.	National Department of Forestry	Should any protected tree species identified on the proposed development site, a permit would need to be obtained for any protected trees that are affected by the development.
National Veld and Forest Fire Act (Act 101 of 1998)	In terms of S21 the applicant would be obliged to burn firebreaks to ensure that should a veldfire occur on the property, that it does not spread to adjoining land. In terms of S12 the applicant must ensure that the firebreak is wide and long enough to have a reasonable chance of preventing the fire from spreading, not causing erosion, and is reasonably free of inflammable material. In terms of S17, the applicant must have such equipment, protective clothing, and trained personnel for extinguishing fires.	Department of Water Affairs	While no permitting or licensing requirements arise from this legislation, and this Act will find application during the construction and operational phase of the project.
Hazardous Substances Act (Act No 15 of 1973)	This Act regulates the control of substances that may cause injury, or ill health, or death due to their toxic, corrosive, irritant, strongly	Department of Health	It is necessary to identify and list all the Group I, II, III, and IV hazardous substances that may be on the site

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	sensitising or inflammable nature or the generation of pressure thereby in certain instances and for the control of certain electronic products. To provide for the rating of such substances or products in relation to the degree of danger; to provide for the prohibition and control of the importation, manufacture, sale, use, operation, modification, disposal or dumping of such substances and products. Group I and II: Any substance or mixture of a substance that might by reason of its toxic, corrosive etc., nature or because it generates pressure through decomposition, heat or other means, cause extreme risk of injury etc., can be declared as Group I or Group II substance Group IV: any electronic product; and Group V: any radioactive material. The use, conveyance, or storage of any hazardous substance (such as distillate fuel) is prohibited without an appropriate license being in force.		and in what operational context they are used, stored or handled. If applicable, a license is required to be obtained from the Department of Health.
Development Facilitation Act (Act No 67 of 1995)	Provides for the overall framework and administrative structures for planning throughout the Republic. S2 - 4 provide general principles for land development and conflict resolution.	Local Municipality District Municipality	The applicant must submit a land development application in the prescribed manner and form as provided for in the Act. A land development applicant who wishes to establish a land development area must comply with procedures set out in the Act.

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
Subdivision of Agricultural Land Act (Act No 70 of 1970)	Details land subdivision requirements and procedures. Applies for subdivision of all agricultural land in the province	Local Municipality District Municipality	Subdivision will have to be in place prior to any subdivision approval in terms of S24 and S17 of the Act.
National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008)	The Minister may by notice in the *Gazette* publish a list of waste management activities that have, or are likely to have, a detrimental effect on the environment. The Minister may amend the list by – » Adding other waste management activities to the list. » Removing waste management activities from the list. » Making other changes to the particulars on the list. In terms of the Regulations published in terms of this Act (GN 718), A Basic Assessment or Environmental Impact Assessment is required to be undertaken for identified listed activities. Any person who stores waste must at least take steps, unless otherwise provided by this Act, to ensure that: » The containers in which any waste is stored, are intact and not corroded or in » any other way rendered unlit for the safe storage of waste. » Adequate measures are taken to prevent	National Department of Water and Environmental Affairs Provincial Department of Environmental Affairs (general waste)	As no waste disposal site is to be associated with the proposed project, no permit is required in this regard. Waste handling, storage and disposal during construction and operation is required to be undertaken in accordance with the requirements of the Act, as detailed in the EMP (refer to Appendix O-Q). The volumes of waste to be generated and stored on the site during construction and operation of the facility will not require a waste license (provided these remain below the prescribed thresholds).

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

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	exemptions from the requirements of the National Road Traffic Act and the relevant Regulations.		
Promotion of Access to Information Act (Act No 2 of 2000)	All requests for access to information held by state or private body are provided for in the Act under S11.	Department of Environmental Affairs	No permitting or licensing requirements.
Promotion of Administrative Justice Act (Act No 3 of 2000)	In terms of S3 the government is required to act lawfully and take procedurally fair, reasonable, and rational decisions. Interested and affected parties have right to be heard.	Department of Environmental Affairs	No permitting or licensing requirements.
Provincial Legislation			
Northern Cape Nature Conservation Act (Act No. 9 of 2009)	Provides inter alia for the sustainable utilisation of wild animals, aquatic biota and plants as well as permitting and trade regulations regarding wild fauna and flora within the province. In terms of this act the following section may be relevant with regards to any security fencing the development may require. **Manipulation of boundary fences** 19. No Person may – (a) erect, alter remove or partly remove or cause to be erected, altered removed or partly removed, any fence, whether on a common boundary or on such person's own property, in such a manner that any wild animal which as a result thereof	Northern Cape Department of Environment and Nature Conservation	A permit is required for any activities which involve species listed under schedule 1 or 2. The DENC permit office provides an integrated permit which can be used for all provincial and TOPS-related permit requirements.

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	gains access or may gain access to the property or a camp on the property, cannot escape or is likely not to be able to escape therefrom; The Act also lists protected fauna and flora under 3 schedules ranging from Endangered (Schedule 1), protected (schedule 2) to common (schedule 3). The majority of mammals, reptiles and amphibians are listed under Schedule 2, except for listed species which are under Schedule 1.		

DESCRIPTION OF THE AFFECTED ENVIRONMENT CHAPTER 6

This section of the Draft EIA Report provides a description of the environment that may be affected by all three phases of the proposed Project Blue Wind Energy Facility located north of Kleinzee 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 have been described. This information has been sourced from both existing information available for the area as well as collected field data, 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 reports contained within Appendices F - N[7].

6.1. Regional Setting

The Project Blue Wind Energy Facility site is located in the north-western portion of the Northern Cape Province of South Africa, in a region that is traditionally known as the Namaqualand. The site is located north of the small hamlet of Grootmis, approximately 3.5 km inland, just to the north of the course of the non-perennial Buffels River, and approximately 3 km north-east of the small De Beers Consolidated (DBC) mining settlement of Kleinsee. Kleinsee is located at the mouth of the Buffels River, approximately 80 km west of the town of Springbok and the N7 Cape Town–Namibia route. Large parts of the region are mine-owned, and as a result, significant mining activities are evident, especially within a 7 km band along the coast. The proposed site is not located within the restricted DBC mining area, which is located along the coastal strip to the west of the site and includes the town of Kleinsee.

The nearest settlements to the proposed development site after Kleinsee are Kommagas (~36 km) and Buffelsrivier (~42 km), which are both located inland to the south-east of the site. Kleinsee is currently in the process of being proclaimed a town. However, a number of DBC employee and other households (ca 180) continue to reside in the town.

Administratively, the proposed site is located in the western part of Ward 8 of the Nama-Khoi Local Municipality (NKLM), which in turn forms part of the Namakwa District Municipality (NDM) of the Northern Cape Province (refer to Figure 6.1). The NDM is South Africa's largest District Municipality and covers an area of ~126 000

[7] It should be noted that the specialist reports include a description and assessment of both the wind and solar energy facility components. This report only considers the wind energy facility. The solar energy facility is the subject of a separate EIA application and report.

km^2. The NDM is bounded to the west by the Atlantic Ocean, and to the north by the Gariep River (Orange River) which forms the border with Namibia.

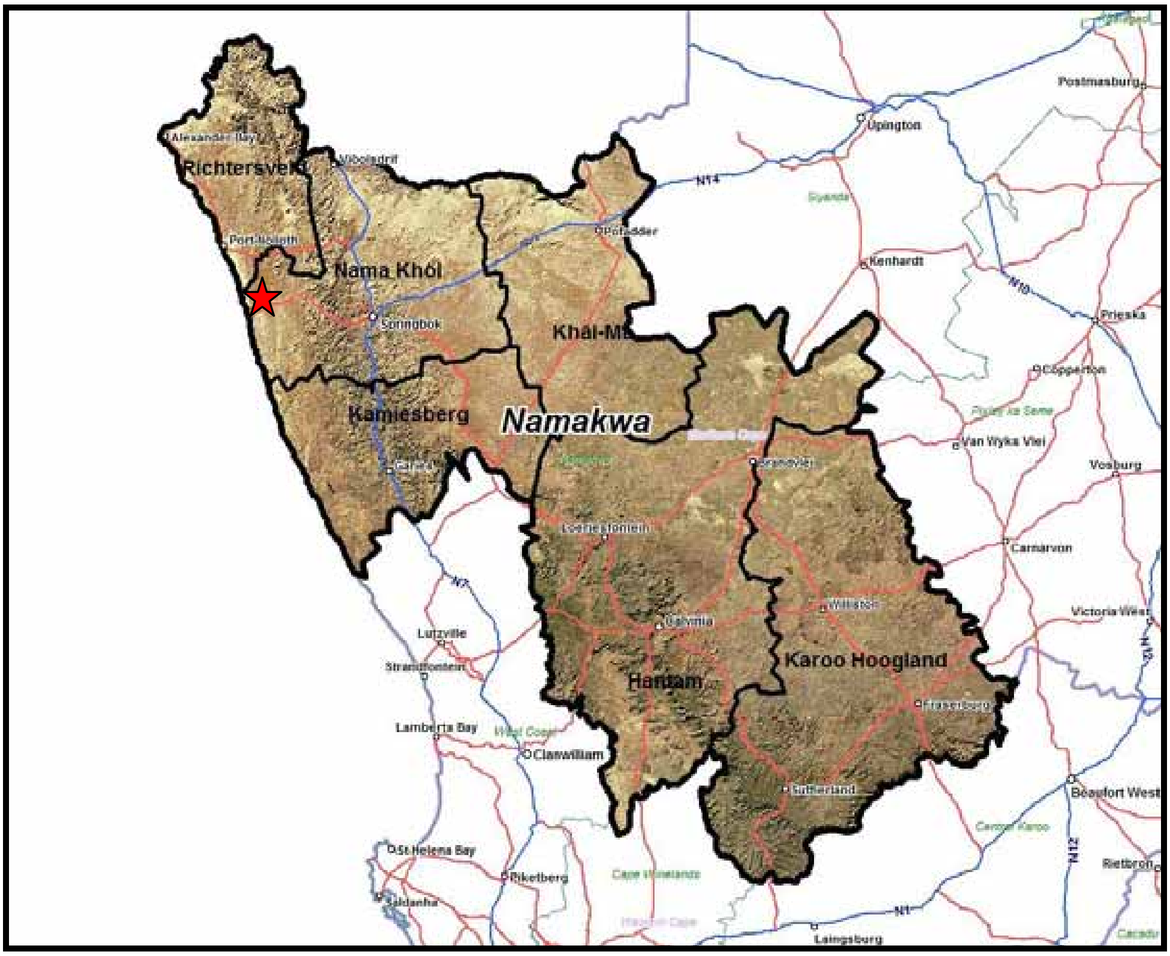


Figure 6.1: Location of the Nama Khoi Local Municipality within the NDM (*Source: NDM, 2012*).

The area falls within the Succulent Karoo Biome on the 'Coastal Plain' which also is often called the Sandveld or Namaqualand Sandveld Bioregion. The study area ranges from flat, open shrubland to steeper rocky outcrops and is generally characterised by the rolling hills that are typical of Namaqualand. Several areas of distinctive relief are however present, namely the south-western part, just north of the Buffels River and hamlet of Grootmis, is characterised by a small plateaux of silcrete that has been deeply incised and eroded to form a series of interlinking valleys. In the central western part a low hill called Arnot se Kop is present with the exposed gneiss at the edge of the palaeo-marine terrace dropping relatively steeply to its west, right at the edge of the proposed development area. A more prominent hill, known as Wolfberg, stands in the north-western corner of the study area. The ground is generally covered by low vegetation but open, deflated areas with exposed hard sediments occur in places and a few informal roads cross the study area.

The terrain surrounding the proposed site is generally flat, sloping gently westwards towards the shore. The terrain type of the region is described as *slightly undulating plains*. Hilly terrain is evident in the north of the study area. These mountains mark the beginning of the escarpment which rises to the east. Refer to Figure 6.2.

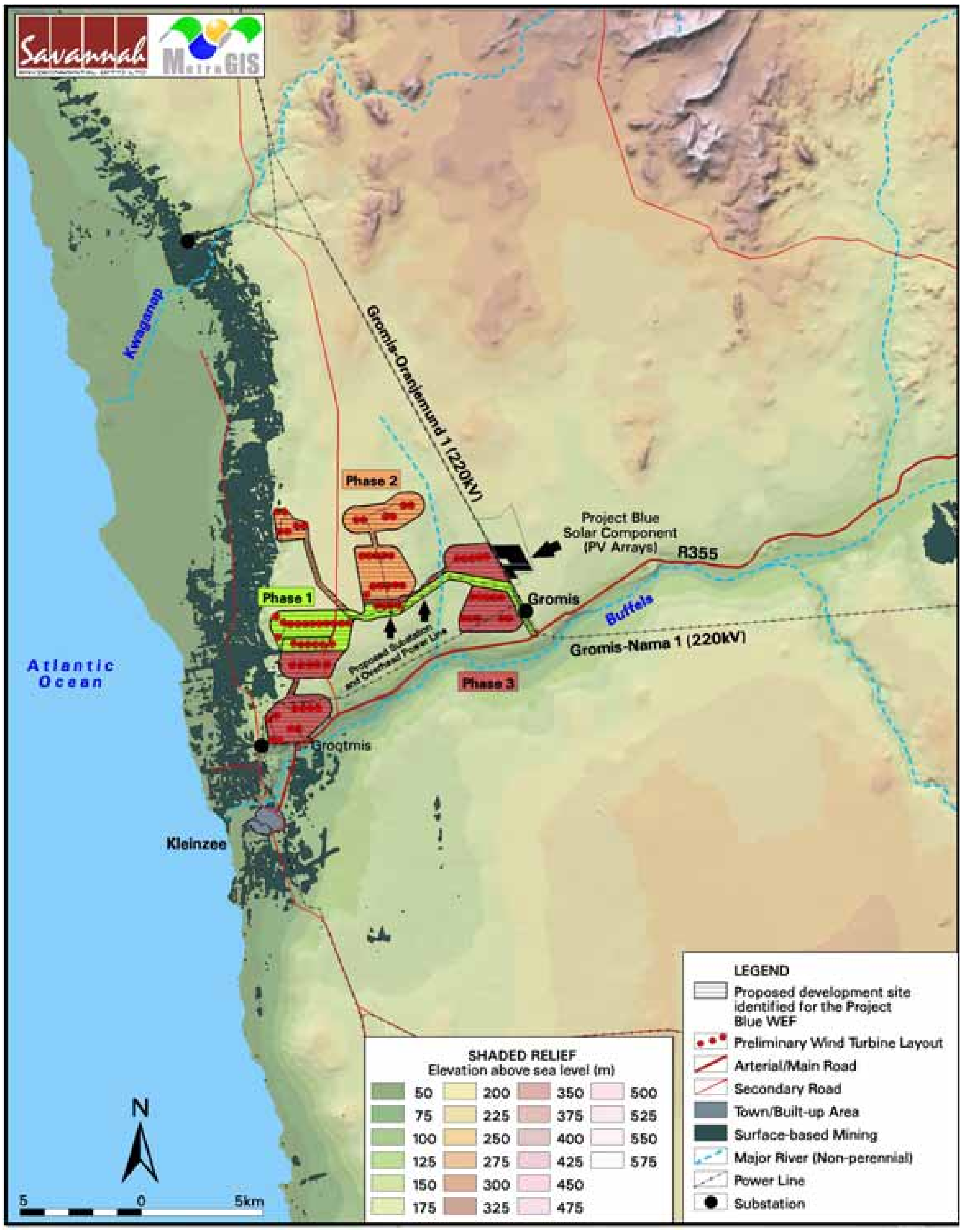


Figure 6.2: Shaded relief map (indicating the location of the proposed facility and the topography and elevation above sea level) of the study area

6.2. Land Use and Settlement Patterns

Like most arid areas in South Africa, the vast majority of the region's population is concentrated in a handful of towns and settlements, with the remainder of the population sparsely distributed over a vast rural area. Commercial farming based on raising livestock on spatially extensive properties is by far the most dominant land use in the region (refer to Figure 6.3). Very limited labour and tenure opportunities are associated with commercial farming in the region. Dwellings are typically associated with main farms, and typically include a few labourer's cottages in the general vicinity of the farmstead. Due to the multi-farm farming practice, many farms are mainly used as stock posts and not inhabited at all, or only temporarily.

The evolved regional settlement is largely associated with the N7 (Springbok, Garies, Nababeep, Kharkams, Kamieskroon) and coastal mining activities (Alexanderbaai, Port Nolloth, and Kleinsee). The few remaining small settlements are located inland, to the west of the N7, and include Kommagas, Buffelsrivier, Soebatsfontein, Spoegrivier and Lepelsfontein. Springbok is the largest town (~10 300) in the NDM, and functions as the sub-regional center for administrative, commercial and higher order social facilities. Springbok was officially proclaimed in 1862 (as Springbokfontein), mainly in order to support recently established local copper mining operations in the area. The town is located at the intersection of the N7 and N14 national roads, and is a convenient stop-over for traffic along the Windhoek-Cape Town route. The rural settlements in the municipal area are largely mono-functional rural settlement areas with a poor economic base and depend primarily on the surrounding agricultural resource base to drive the limited economy (NKLM Draft 2011/12 IDP).

The key pillars of the regional economy are mining and extensive livestock farming. Commercial farming in the Kleinsee area is essentially located south of the Buffels River, away from the Project Blue site, and to the east and south of Kleinsee. The Project Blue site and all surrounding farms are currently majority owned by DBC. Some of farms are currently leased out for grazing. On a number of commercial farms like Manelsvlei and Steenvlei DBC owns surface rights, with grazing rights and 1 ha of land belonging to other parties.

Due to the lack of water, farming in the study area is limited to stock farming, mainly small stock (sheep and goats), but also small herds of cattle. The carrying capacity of the Strandveld is very low – typically 10-15 hectares are required per sheep/ goat. Economically viable units are around 6000 ha, and most farmers rent land from De Beers or the state (e.g. Brazil south of Kleinsee). Very limited labour and tenure opportunities are associated with these extensive stock farming operations.

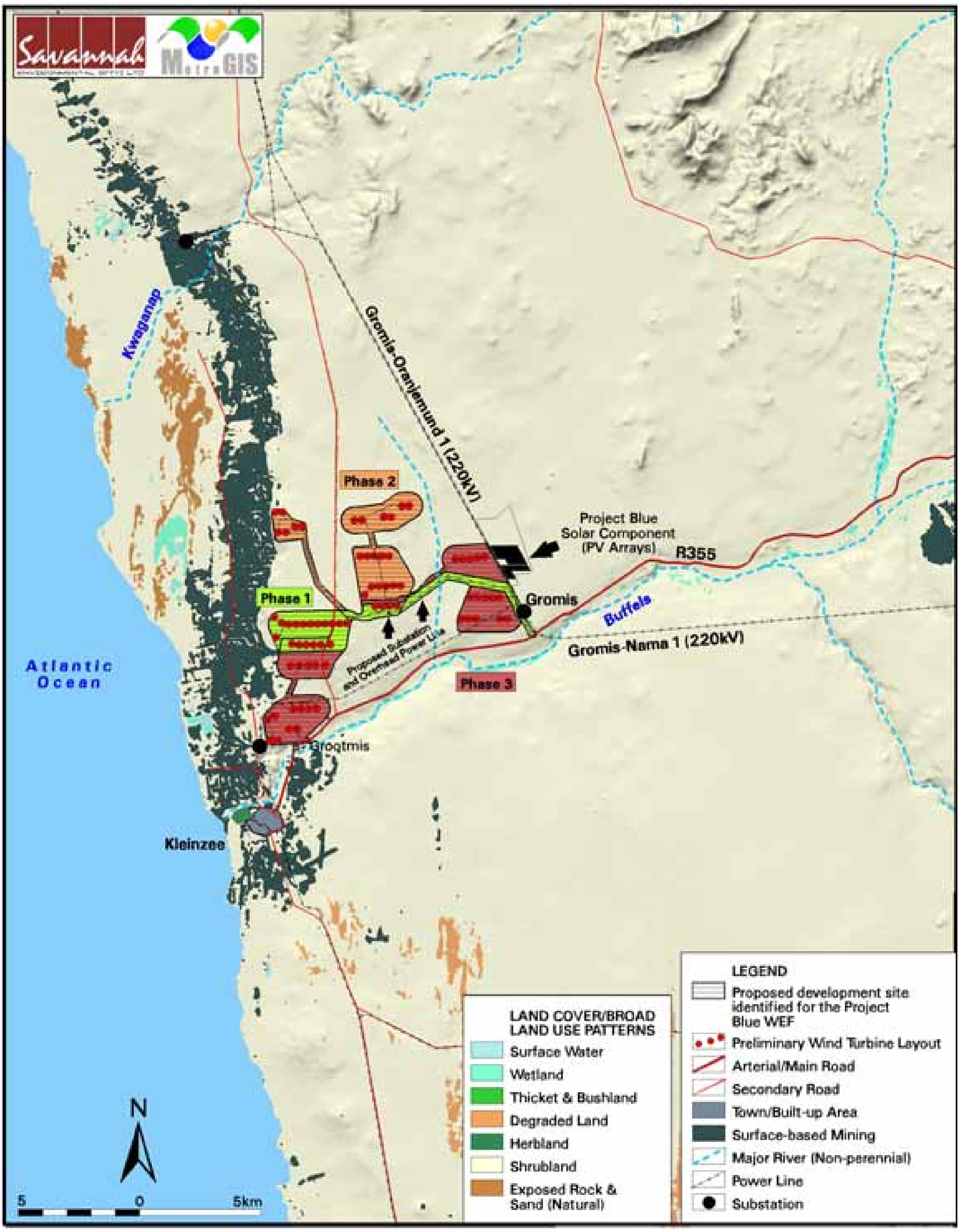


Figure 6.3: Land cover/land use map

Some farmers share labourers, other get in labour as required. The settlement pattern is also very dispersed, with farmsteads located ~7-10 km apart. The nearest inhabited farmstead to the Project Blue site, Steenvlei/ Die Houthoop, is located ~13 km from the site. Die Houthoop on Steenvlei represents the only formal diversification into agro-tourism and tourist accommodation.

Large parts of the region remain pristine and undeveloped and consist of spectacular landscapes (e.g. the Richtersveld area north of the NKLM). The region therefore has significant and growing tourism sector. The NKLM IDP 2011/12 identifies tourism as the key emerging driver of economic growth in the municipality.

6.2. Location of the Study Area

The Project Blue Wind Energy facility site consists of various adjacent cadastral portions (refer to Table 6.1 below) which are majority owned by DBC and cover an area of 2 280 ha (refer to Figure 1.1). Only a relatively small portion of the total area would be required to accommodate the wind turbines and supporting infrastructure footprints.

Table 6.1: Properties comprising the Project Blue site

Phase 1	**Phase 2**	**Phase 3**
Farm Dikgat 195 Portions 2, 4, 5, 7, 9		
Farm Predikant Vlei 190/ 1, 3, 4		Predikant Vlei 190/ 1, 3, 4, 5
Farm Dreyers Pan 192 RE		-
Farm Klein Zee 193 RE		-

The proposed site not currently used for any farming activities. No houses or structures are located on the properties. The general landscape context may be described as disturbed – both by widespread evidence of historic mining activities, as well as vertical elements such as an existing 132 kV line visible from the R355 and the Gromis substation. There are no residential communities close to the proposed development. The study area has a rural character in terms of the background sound levels.

6.3. Site access

The study area is only accessible from the N7 (via Garies or Springbok). The N7 links Cape Town in the south to Noordoewer (Namibian border) in the north. North of Noordoewer, the N7 continues north to Windhoek as the B1. The road is of crucial importance to the economies of the West Coast and Namakwaland regions, as well as that of Namibia. At Springbok the N7 links up with the N15, which provides a link with Upington to the west (and ultimately the Gauteng Province). Springbok is located approximately 558 km north of Cape Town (N7), and ~450 km north of Saldanha (port) (Figure 6.4).

Figure 6.4: Study area road network

Kleinsee can be accessed from the N7 via one of three possible routes:

» "Kleinsee pad": R355, via Springbok (~97 km). This constitutes the most direct route to Kleinsee from the N7, and the only proclaimed public road to Kleinsee. The segment from Springbok to Buffelsrivier is tarred and provides sole access to the study area communities from Springbok. The segment from Bufffelsrivier to Kleinsee is untarred and the road in a relatively bad state.
» "Rooipad": Buffelsrivier-Kommagas Road off the R355, linking up with the KDBC Koiingnaas-Kleinsee road south of Kleinsee. The segment from Buffelsrivier to Kommagas is tarred; the portion from Kommagas to the DBC Koiingnaas road is a DBC owned gravel road. This Kommagas Road ("rooipad" due to red soils) is preferred by Kleinsee residents and Kleinsee farmers for accessing Springbok.
» "Hondeklipbaai pad": Combination of (mainly gravel) roads from Garies (off the N7), via Hondelikpbaai and Koiingnaas. This constitutes the most direct road link to the harbours of Cape Town and Saldanha via the N7. Garies is located approximately 176 km south-east of Kleinsee (by road). The DBC owned Kleinsee-Koiingnaas segment is the only tarred segment at present. The remainder of the road is essentially only safely negotiable by 4x4 or truck. Tarring of the Garies-Hondeklipbaai segment is envisaged by the Kamiesberg Local Municipality Spatial Development Framework in the medium to long term, but no funds appear to have been allocated.

Two additional secondary roads provide access to the study area, namely:

» Port Nolloth gravel road, from R355 outside Kleinsee to R382 south of Port Nolloth.
» Gravel road from Koiingnaas to Springbok via the Namaqua National Park.

6.4. Geology and Topography

The study area occurs on land that ranges in elevation from 0m a.s.l. (along the coast) to about 575m a.s.l. (at the top of hills in the north). The area lies on undulating and hilly terrain with a distinct "ridge" that forms the western boundary of the site. This is not the highest part of the site and the altitude varies between 80 and 220 m above mean sea level. The geology is aeolian material overlying Tertiary and Quaternary marine sediments.

The northern Namaqualand Region is underlain by rock of the Namaqua-Natal Metamorphic Belt. The surface geology on the coast consists of deep stabilized aeolian sands (Quaternary) that are white to grey and calcareous, overlying marine sediments that are composed of calcrete or dorbank hardpans. Immediately above the high-water mark the coastline has exposed granite of the Dikgat and Brazil Formations (Goraap Suite). Further inland the soils are derived from the underlying Proterozoic rocks with variable amounts of wind-blown sand inland towards the Escarpment. Yellow, high-base, moderately deep, uniform coarse-textured sandy soils underlain by a more clayey neocutanic horizon with high pH (6.5 – 9.5) occur near the coast. These soils change to yellow-red soils and then further inland to red, high base-status (Hutton form) soils, apedal, freely drained with medium to coarse texture, weakly structured and of variable thickness.

The undulating coastal plain is about 30 km wide and separates the coast from the inland Namaqualand Klipkoppe comprising Mokolian granites and gneisses that form domes and rock sheets which weather to form yellow-brown to brown loamy sand (Mucina et al., 2006).

At places in the study area such as near Grootmis, silcrete is exposed which gives rise to a particular and isolated habitat that supports a different plant community to the more general Namaqualand Strandveld.

6.5. Climatic Conditions

The cold Benguela Current that flows northwards along the coast of Namaqualand has a marked effect on the climate with regular fog occurring over the coastal zone, adding substantially to high soil moisture levels. Similar to the coast of Namibia further north, but not as extreme, the Namaqualand coastal region is a hyper- arid area. It experiences winter rainfall ranging between 50 mm and 100 mm per annum (Le Roux, 2005). There is a rainfall gradient from the coast inland and according to a climate diagram for Namaqualand Strandveld (Figure 6.5) (Mucina et al., 2006); mean annual precipitation (MAP) exceeds 100 mm for the areas where this vegetation type occurs. All areas with less than 400 mm rainfall are considered to be arid (Refer to Figure 6.6 for graph showing average rainfall for Kleinsee).

The mean maximum temperature does not vary much throughout the year whereas there is slightly greater amplitude in mean minimum temperature (Figure 6.7). This is due to the proximity to the Atlantic Ocean and the effect of the Benguela Current. Temperatures can also be influenced by easterly berg wind conditions (off shore flow) in winter when the temperature may exceed 35 °C.

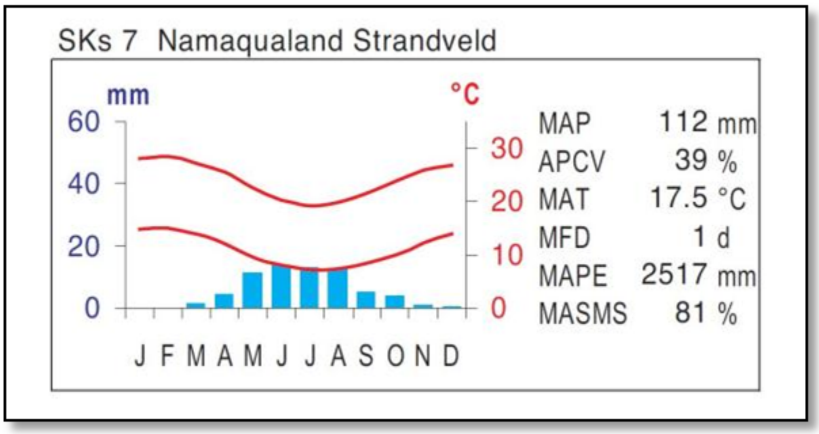


Figure 6.5: Climate diagram for Namaqualand Strandveld (from Mucina et al. 2006)

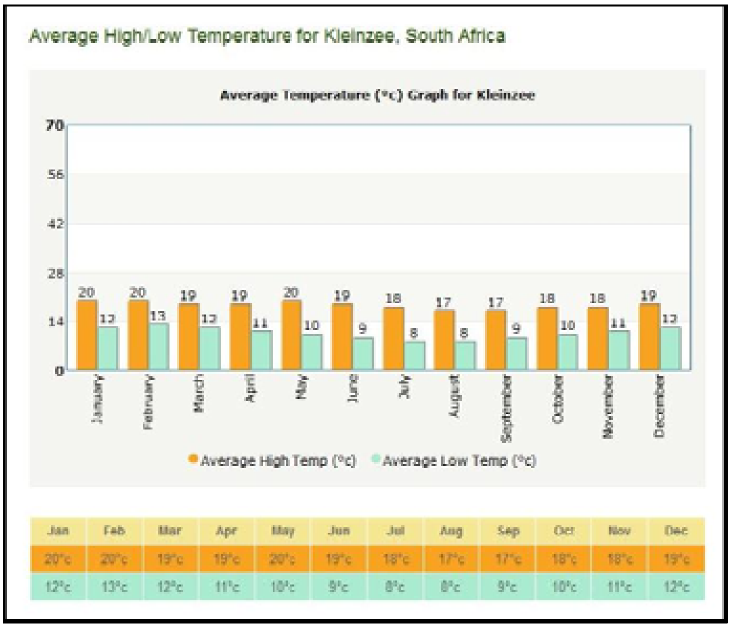


Figure 6.6: Average monthly temperatures for Kleinzee (source: http://www.worldweatheronline.com/weather-averages/South-Africa/2610093/Kleinzee/2614644/info.aspx)

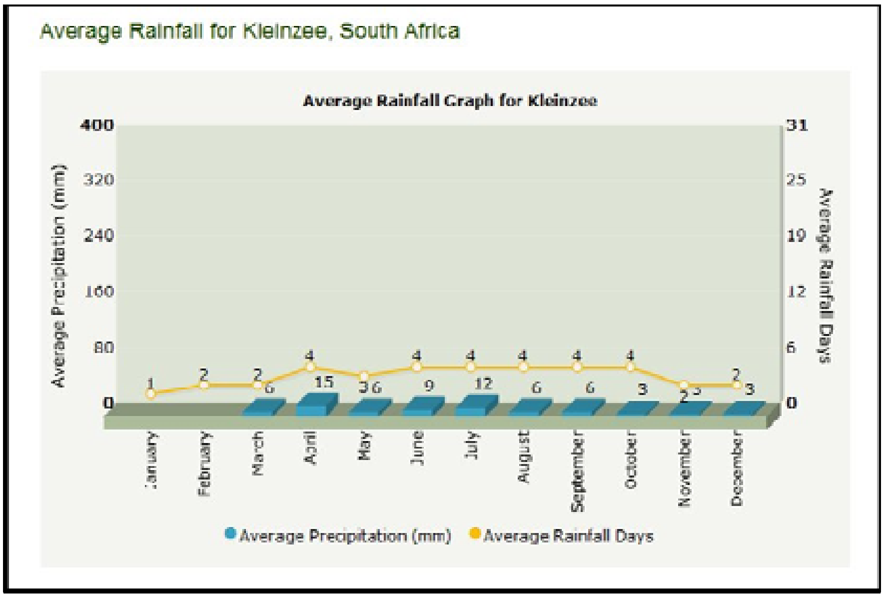


Figure 6.7: Average monthly rainfall for Kleinsee (source: http://www.worldweatheronline.com/weather-averages/South-Africa/2610093/Kleinzee/2614644/info.aspx)

The prevailing surface winds are mostly from the south and south-east in the summer when winds are strong and speeds can exceed 10 m/s. Strong winds can also occur from the west and north-west, mainly in winter.

6.6 Hydrology

The non-perennial, westward flowing Buffels and Kwaganap Rivers (and their tributaries) are the main hydrological features within the study area. The Buffels River bypasses the site to the south and the Kwaganap to the north.

6.7 Soils

The site falls into the Af17 land type (Land Type Survey Staff, 1972 - 2006) (refer to Figure 6.8 for the land type map of the area). A brief description of the land type in terms of soils, land capability, land use and agricultural potential is as follows:

Land Types Af17

Soils: Mainly eutrophic and lime containing red deep sandy soils with limited occurrences of yellow brown and bleached soils. Rock outcrops occur occasionally, especially in valley bottom positions.

Land capability and land use: Exclusively extensive grazing and wilderness area due to severe climate constraints. Soil erosion is a risk due to low vegetation cover and the occasional heavy rainfall event.

Agricultural potential: Very low potential due to the low rainfall (less than 100 mm per year).

Most of the Project Blue study area has yellow to red sand-loam soil and a particular feature of the landscape is the presence of ‘heuweltjies’. Heuweltjies are evenly spaced soil mounds that are understood to be primarily the result of termite activity with possible secondary activity of animals such as mole-rats contributing to their existence (Midgley & Musil 1990, Milton & Dean 1990; Milton & Dean 1996; Esler et al. 2006). The ‘heuweltjies’ or ‘kraaltjies’ are clearly visible in the veld as raised circular patches often with a distinct floral assemblage that differs from the surrounding vegetation (see Desmet at al. 2009 below). They are often overgrazed due to the concentration of more palatable plant species compared with ‘off-heuweltjie’ areas.

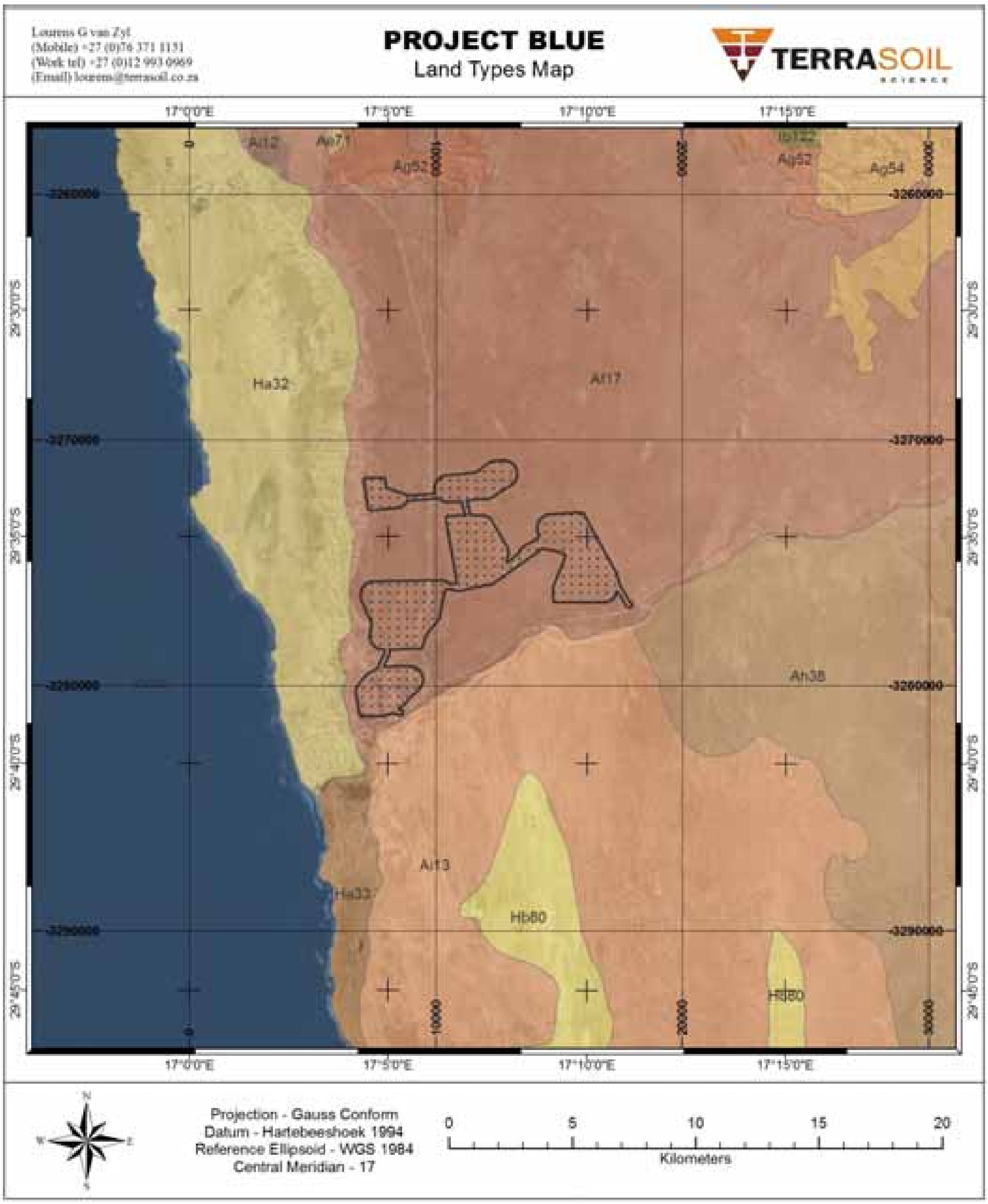


Figure 6.8: Land type map of the survey site for the proposed Project Blue Wind Energy Facility

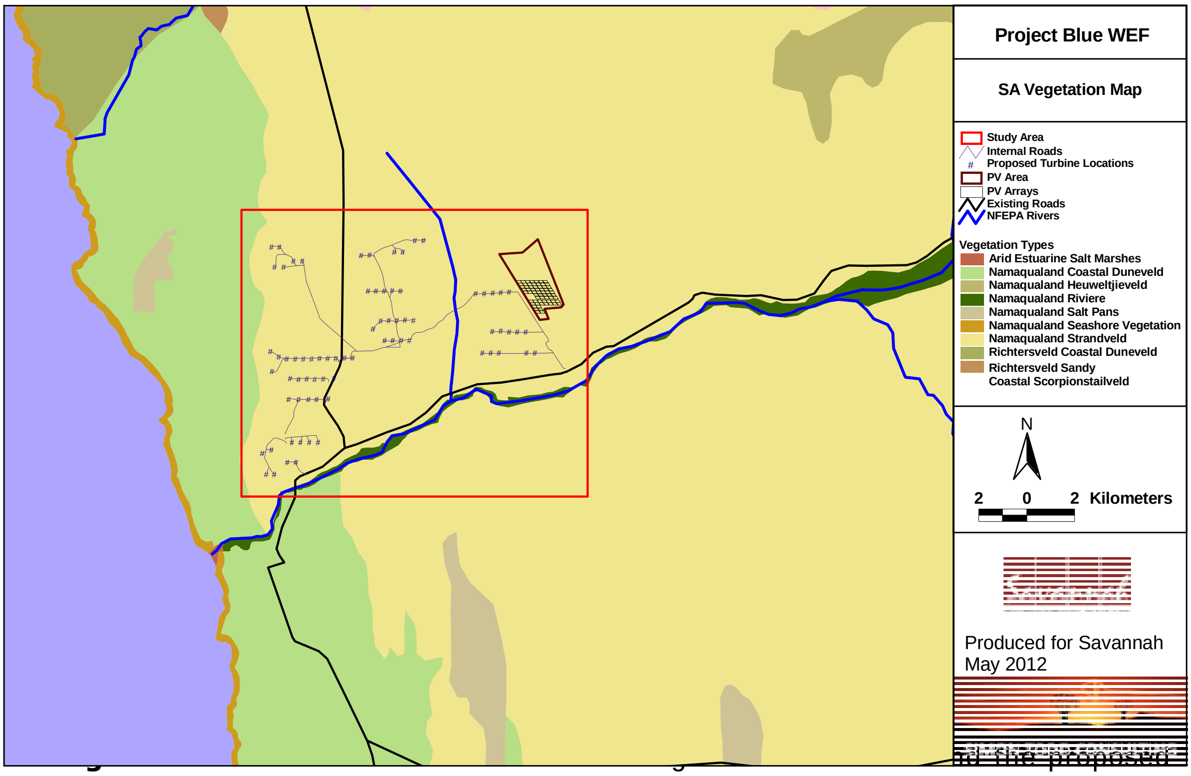
6.8. Agricultural Potential

The agricultural potential of the site is low due to soil and climatic constraints. The presence of the lime and dorbank horizons require significant physical preparation before crop production can be considered. Consequently the site is suited to extensive but managed grazing even though the carrying capacity is low due to the very low rainfall of the area. The use of the site is limited to grazing by sheep and, with the rainfall of the area, it is considered to be unsuitable for cattle grazing.

6.9. Ecological Profile of the Study Area

6.9.1 Vegetation

Namaqualand falls within the Succulent Karoo Region. This biome has high levels of plant diversity and endemism and is one of the earth's 'hotspots' of plant diversity and the only entirely arid hotspot in the world. Regionally the Project Blue study area falls with within the Namaqualand Sandveld Bioregion which lies parallel to the west coast in the western part of the Succulent Karoo Biome (Figure 6.9).



...nd the proposed Project Blue Wind Energy Facility. The vegetation map is an extract of the national vegetation map as produced by Mucina & Rutherford (2006), and also includes rivers delineated by the National Freshwater Ecosystem Priority Areas assessment (Nel et al. 2011).

In the Kleinzee area of Northern Namaqualand the coastal vegetation communities consisting of Namaqualand Coastal Duneveld and to some extent Namaqualand Inland Duneveld have been heavily impacted by open-cast diamond mining. In contrast the inland areas where there has been no diamond mining has been farmed with small livestock and apart from the effects of grazing, the vegetation has remained largely undisturbed.

The Project Blue area occurs entirely within one vegetation type, i.e. Namaqualand Strandveld. This vegetation type has a wide distribution from the Richtersveld (Northern Cape) in the north to Donkins Bay (Western Cape) in the south.

Critical Biodiversity Areas (CBAs)and Ecological Support Areas (ESAs) have been mapped for Namaqualand District Municipality. Portions of the proposed wind energy facility fall within these areas (refer to Figure 6.10).

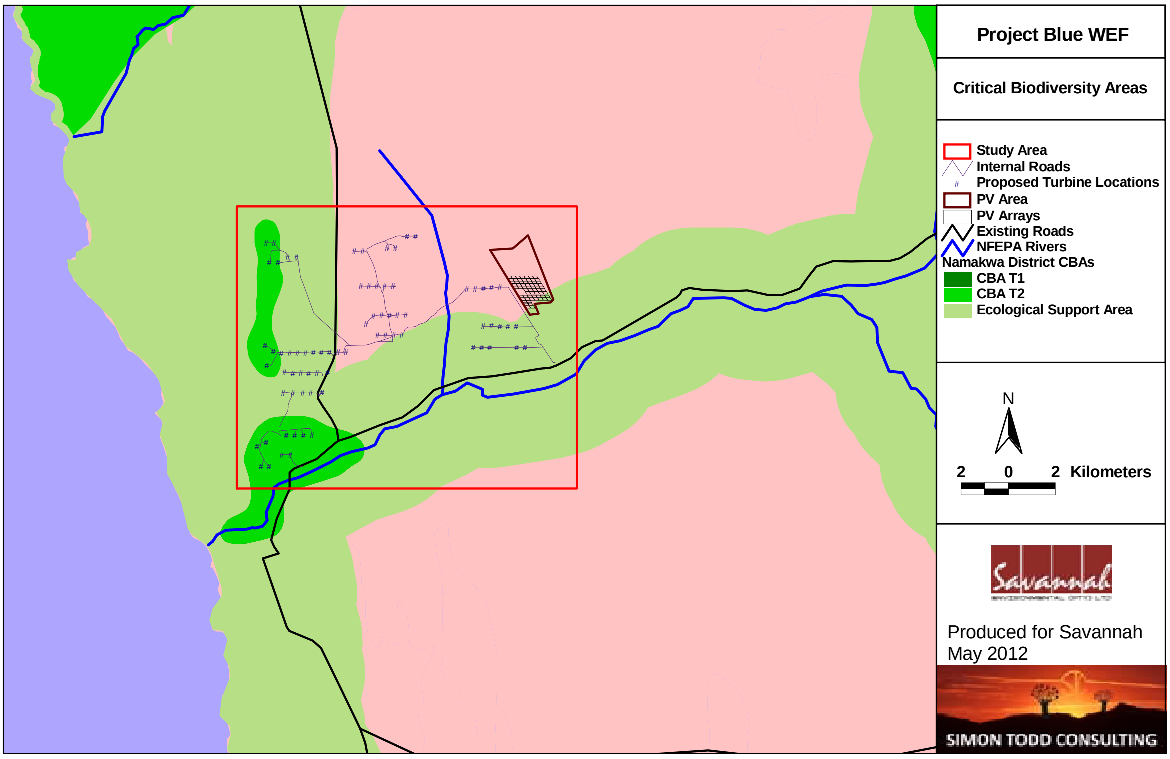


Figure 6.10: Critical Biodiversity Areas (CBA) map for the Project Blue Renewable Energy Facility site and the surrounding area. The map indicates that the development site falls partly within an Ecological Support Area, designed to function as a broad-scale ecological corridor.

<u>Condition of the vegetation and conservation status</u>

The vegetation of the Project Blue study area is impacted by grazing. No mining activities have taken place except on the extreme western boundary and these have little bearing on the proposed project. The condition of the vegetation is medium to good and no rehabilitation of vegetation is currently required or taking place in the study area.

6.9.2 Terrestrial Fauna

Habitats

In terms of broad faunal habitats available at the site, the following were identified:

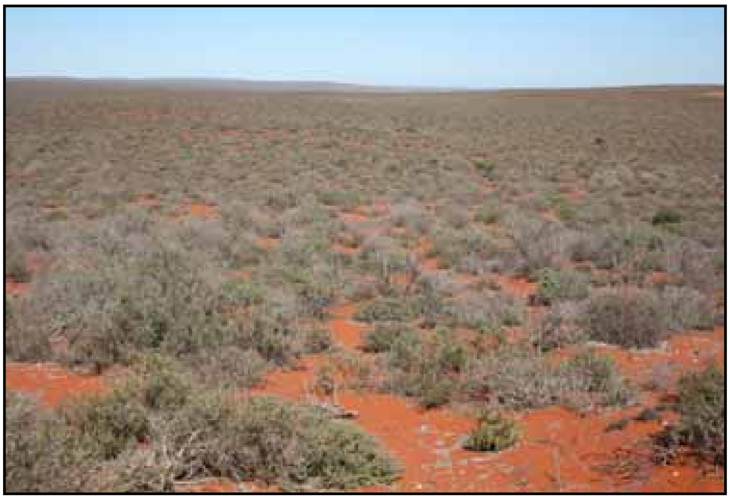
Riparian Areas & Drainage Lines

The most important drainage feature of the site is the Buffels River which forms the southern boundary of the site. Although the Buffels River itself is outside of the development footprint, the river provides habitat for certain species which are likely to forage within the affected area. Of particular importance would be bats, which may find shelter in caves and crevices in some of the low cliffs along the river. The site also contains numerous small drainage lines with taller or dense vegetation which provides important habitat for fauna such as small antelope and hares. All drainage lines and riparian areas with the site are considered very high sensitivity environments and should be avoided by the development.

Rocky outcrops

Although there were not a lot of rocky outcrops within the site, several rocky ourcrops are associated with the headlands towards the coast as well as with the central part of the site, along the slopes of the large hill which characterizes this part of the site. These areas are important habitat for reptiles such as Geckos, Skinks and Girdled Lizards. Although beyond the scope of the current study these areas are also hotspots of plant diversity and contain many endemic dwarf succulents. As these areas are rare in the landscape and provide habitat and shelter for numerous species which is not available elsewhere, they are considered high sensitivity and should not be impacted.

Red dunes



A large proportion of the eastern and southern parts of the site consist of red dunes. These areas are either relatively flat or may consist of low undulating or reasonably high dunes. The dunes are largely well vegetated and are not mobile. The reptile faunal communities of this area are dominated by psammophilous (sand-loving) species such as sand lizards and horned adders. These areas are the habitat of Grant's Golden Mole *Eremitalpa granti* which is listed as Vulnerable. This area is however broadly homogenous and is considered to be of medium sensitivity. The whole of the PV Facility lies within this habitat unit.

Heuweltjie Veld

The central and western parts of the site are characterised by fine, silty or brackish red and yellow soils. The vegetation is lower than in the red dunes and is usually characterized by the presence of scattered heuweltjies (low circular mounds of biogenic origin). Some areas of exposed silcrete or low rocky outcrop may occur within these areas. The heuweltjie veld is likely to contain a greater abundance of faunal species associated with a firm substrate. Particularly within the more saline areas, whistling rats were abundant and the high density of their burrows made the soil collapse underfoot. The majority of this habitat is considered to be of High sensitivity on account of the fact that it frequently occurred on quite steep slopes and also contained occasional rocky areas which were too small to be mapped as a separate unit.

Fauna observed or likely to occur in study area

Approximately 40 **mammal species** potentially occur at the site. Larger mammals observed or likely to occur at the site include Steenbok, Common Duiker, Jackal, Caracal, Porcupine and Aardvark.

The site contains a diverse **small mammal community** and a relatively large number of rodents, shrews, moles and mole rats occur in the area. Common species observed within the site include Brants's Whistling Rat, Namaqua Rock Mouse and the Bush Vlei Rat. Species associated with sandy habitats are likely to occur in the red dunes while those which require a firmer substrate are likely to occur in the granitic outcrops and Heuweltjie Veld. Several listed species potentially occur in the area, these include Grant's Golden Mole which is likely to occur in the dunes of the site and De Winton's Golden Mole which is a little known species recorded only from the Port Nolloth area, but could potentially occur at the site. Both of these species are listed as Vulnerable as a result of their scarcity and the impact coastal mining activities have had on their habitat.

As many as 67 **reptiles** potentially occur within the study site, including several listed species and narrow endemics. Of these 54 species have been recorded in the area by SARCA and an additional 13 potentially occur in the area according to distribution maps, but have not been recorded by SARCA. Based on the habitat requirements of the listed and narrow endemic species, particularly significant habitats within the area are likely to be the coastal dunes and the rocky outcrops. Species observed at the site include the Smith's Desert Lizard, Variable Skink, Namaqua Sand Lizard, Armadillo Girdled Lizard, Angulate Tortoise, Namib Sand Snake and Namaqua Day Gecko. The Armadillo Girdled Lizard and Namaqua Day Gecko are both listed species and several other listed species are highly likely to occur at the site. Both of these species as well as several other listed species are associated with the rocky outcrops of the site. The Armadillo Girdled Lizards were observed within a small, isolated rock outcrop, suggesting that even the smaller rocky outcrops are potentially important for reptiles.

The site lies within the known distribution range of seven **frog and toad species**. However as there is very little perennial water in the area, many of these are not likely to occur at the site or would be restricted to the vicinity of the Buffels River. Species such as the Common Platanna, Namaqua Stream Frog and to a lesser extent the Namaqua Caco are dependent to a greater or lesser degree on surface water for habitat or breeding purposes. The remaining species are either largely independent of water or well adapted to arid conditions. The Desert Rain Frog occurs in Strandveld vegetation up to 10 km from the coastline and is listed as Vulnerable.

6.9.3 Bats

The site is not likely to contain a very high diversity of bat species, largely on account of the aridity of the area. Fourteen species may occur in the area, of which 10 have a moderate to high possibility of occurring at the site. The species of conservation concern are the Cape horseshoe and Angolan wing-gland bat. The Cape horseshoe bat is endemic to the western parts of southern Africa and the likelihood that it occurs at the site would depend on the availability of suitable caves for roosting. The Angolan wing-gland bat, which is a little-known species recorded from a few widely scattered localities from western South Africa and Namibia. It is usually associated with riverine vegetation along dry river beds. Based on this information, it could potentially occur along the Buffels River. The distribution of many bat species is controlled by the availability of suitable roosting sites. The majority of species which are likely to occur in the area, roost either in caves and mine audits or in rock crevices. The presence of such potential roosting sites is therefore an important predictor of potential bat abundance at the site. There are some low cliffs along the Buffels River in the vicinity of the site which may have suitable crevices. There are also some small caves in a tributary of the Buffels River near to Grootmis, which are potentially suitable for several species. As there are many old mining pits in the area, there may also be suitable roosting sites in these as well as in many of the old or disused buildings around Kleinsee, Grootmis and scattered about the site.

The north-western parts of the site are not likely to be highly significant from a bat perspective as this rather featureless area contains few potential bat roosts or foraging areas. The areas along the Buffels River and around Kleinsee/Grootmis are potentially important for bats as this area contains potentially suitable roosting sites as well as foraging areas along the drainage lines and low ridges of the area.

6.9.4 Avifauna

Bird habitats vary across the five proposed areas: habitats east of the Kleinsee mining fence comprise intact low succulent karoo bush used mainly by small endemic bird species. The ephemeral Buffels River runs through some of the area and supports low Sarcocornia vegetation. Farther upstream (c. 8 km from the west boundary of area 3) this is used by breeding pairs of the threatened Black Harrier. Other avian microhabitats are provided by some farm dams that are scattered across the landscape (attracting wetland species), and the power poles (providing Pied and Cape Crows and Greater Kestrels with nesting opportunities).

West of the de Beers Kleinsee mining fence the habitat is drastically altered, with little to no vegetation suitable for birds in the mining area. Where open-cast mining has created deep pits (> 20 m deep) wetland birds (e.g. Coots and Blacksmith Lapwings) occur where the pits are water-filled. Cliff-nesting habitat is also provided for species such as Rock Kestrels and Familiar Chats. A large storage tank on the hill within Area 1 has attracted nesting Jackal Buzzards and Rock Kestrels.

Species of Special Concern (SSC) recorded in the study area

A total of 168 bird species has been recorded around the study area. Among the species recorded are 15 threatened or red-listed in South Africa. Bird species recorded within the study area include four species of raptor foraging and soaring through the five areas (refer to Figures 2-7 of the Avifauna Impact Assessment). These included a Secretarybird (Area 2), two kestrels (Rock and Greater in Areas 2 and 4), and the larger Jackal Buzzard (Area 1 and 5). Raptors such as this are likely to use the updrafts along the hilltops from the prevailing south-west wind to commute, or hover-hunt. Further (7.8 km) up the Buffels River is an expected breeding site of a Black Harrier.

6.10. Heritage Profile

A significant, but somewhat poor quality occurrence of stone artefacts was found at the proposed site. Despite the poor quality, the find is considered important since it is the only known occurrence of late Pleistocene (*c.* 18 000 – 10 000 years ago) LSA material in Namaqualand. This site lies at the south-western edge of the currently proposed Wind Energy Facility site (indicated as area 5 on the locality map – Refer to figure 6.4). Unmarked burials are common in coastal Namaqualand but all thus far have been uncovered in the coastal mines. However, with its good sand cover, burials could be present almost anywhere on the Namaqualand coastal plain. Only one has ever been found in an archaeological excavation, just north of Kleinsee which lies at the immediate south-western edge of the currently proposed Wind Energy Facility.

The archaeology of the coastal strip is generally quite well understood as a result of the extensive survey and mitigation work carried out there. High quality data have been extracted from these sites but further inland very little work has been carried out. Historical material is sparsely scattered in the general vicinity of the proposed development. Occasional farm houses are present but none in the immediate vicinity of the study area. Contact period archaeology has been recorded at Hondeklipbaai where coastal shell middens contained historical material likely pertaining to indigenous people being used to load copper ore onto ships in the bay in the 19th century.

The tiny settlement of Grootmis is located along the road between Kleinsee and Springbok, just 2.8 km from Kleinsee. It only has a handful of buildings, at least one of which is derelict. However, there are definitely buildings with heritage value present which include the church dated 1936 and a large stone house that is likely early 20th century. The settlement is a peculiar place with a unique character. The presence of wind turbines on the hill overlooking Grootmis **(part of Phase 3 (Area 5) of the proposed WEF**) would detract from its character.

The survey of the proposed development site revealed a large number of archaeological sites including deflated Early Stone Age (ESA) and Middle Stone Age (MSA) artefact scatters (one with bone), Late Stone Age (LSA) shell scatters and in situ shell middens, formal graveyards, and old structures. In some areas vast quantities of archaeological material was found to occur and such areas can be considered archaeological cultural landscapes. The local landscape itself also has value particularly where it forms the context for the settlement of Grootmis. Particularly significant archaeological finds were an ESA/MSA scatter with fossil bones preserved and a massive area of small shell scatters and middens in close proximity to the Buffels River near the point where fresh water was permanently available during historic (and presumably also pre-colonial) times. The ESA material included predominantly flakes, cores and hand-axes but one cleaver was also found. MSA artefacts included flakes and cores and one bifacial point that may well be from the Still Bay period. LSA material included decorated pottery, retouched stone scrapers and in situ occurrences with generally higher research value.

6.11 Social Characteristics of the Study Area and Surrounds[8]

6.11.1. Population

Despite having the largest surface area, the Northern Cape was home to only about 1 096 731 people (or 2.17% of the national population) in 2011. The population density was estimated at ~2.27 persons per km^2, while ~83% of the provincial population was estimated to live in urban areas, of which the most significant the major towns of Kimberley and Upington.

The Namakwa District Municipality was one of the less populous District Municipalities in the Northern Cape Province, and was home to an estimated 108 111 people in 2001. Census 2001 data indicates that the Coloured population group was by far the most dominant (~84%), followed by White (~12%) and Black African (~4%). Afrikaans was spoken by an overwhelming ~96% of the population as first language.

The Nama Khoi Local Municipality (NKLM) had a population of 44 611 (and 11 563 households) in 2001. This represented ~41% of the District Municipality's population – a fact at least part attributable to the presence of the town of Springbok (~11 000 in 2001) in the NKLM area. The most recent estimates for the NKLM indicate a population of ~54 644 (15 707 households) for 2007. No information in the population for Kleinsee could be obtained. However, it is estimated that the town has a population of 300-400. More accurate information will be obtained during the assessment phase of the EIA.

6.11.2. In-migration trends

Census 2001 data indicated net out-migration of the Northern Cape Province population, compared to 1996. Out-migration was significant in specifically the 20 – 24 cohort of the Northern Cape Province's population, probably driven by the search for better career and job opportunities, and tertiary education. Urbanisation of the rural Northern Cape Province population was observed as another significant trend (increasing from 75.2% in 1996 to 82.7% in 2001).

[8] Information presented in this section is largely at Provincial and Municipal levels, and is largely based on data compiled from Census 2001, StatsSA's Community Survey (2007) and various Census 2001-based projections.

Information contained in the Draft 2011/2012 Nama Khoi Local Municipality IDP indicates that the Nama Khoi Local Municipality's municipal population has been growing dramatically from around 1995 onwards. In this regard, it is estimated that the population has increased by 22.5% over the 12-year period 1995-2007, while the number of households had increased by 35.8%. It may be assumed that much of this growth was the result of migration into the Nama Khoi Local Municipality area, probably in large part from surrounding municipalities within the Namakwa District Municipality.

6.11.3. Education

An estimated 15.1% of the Northern Cape population had no education at all, while 71.3% had only a primary or secondary education (2001). The respective rates were 20% and 62.7% in 1996, thus indicating a significant improvement over the relevant five year period. It is assumed that these figures are broadly representative of the Nama Khoi Local Municipality and Kleinsee study areas as well.

6.11.4. Employment levels

Census 2001 data indicates that of the economically active population in the Northern Cape, 55.5% were employed while 26.1% were formally unemployed. Of significance, a third of the total population was younger than 15 years old, and approximately 45% of the potential labour force was younger than 30 years. At the same time, unemployment was the highest among the youth, with unemployment rates of 54% and 47% in the 15 - 19 and 20 – 24 year-old age groups. No statistics for the Nama Khoi Local Municipality or Kleinsee areas could be obtained.

6.11.5. Income and economic development

In terms of economic importance, the Northern Cape's share of the country's Gross Domestic Product (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%. Large scale irrigation agriculture operations are based along the Gariep, Harts and Vaal rivers.

Very limited processing and beneficiation of mining and agricultural output currently takes place in the province. This is reflected in the fact that manufacturing contributed only 4.2% towards GDPR in 2002. All the industries in the secondary sector have decreased in their contribution to the GDPR, with electricity and water sector showing the greatest decrease of 0.7% and the construction industry making the lowest contribution of 1.9% to the GDPR of the Northern Cape. At the same time the contribution to regional GDPR by industries in the tertiary sector increased, with the exception of the wholesale and retail industry, which decreased by 1.1%.

The main economic activities within the Northern Cape Province include:

» Commercial agriculture, which is the dominant land-use activity in the Northern Cape. The sector contributed 5.8% to the Northern Cape GDP per region in 2007 (~R1.3 billion), and employed approximately 19.5% of the total formally employed individuals.
» Mining. Namaqualand mining has been in decline since the 1980's, when the large copper mines in Nababeep and O'Kiep started closing down. Similarly, DBC has stopped all mining activities at Kleinsee. A subsidiary of Trans-Hex appears likely to take over a large number of DBC farms in the Kleinsee area, and Trans Hex is looking to continue mining in the area. Kleinsee Heavy Minerals is also currently proposing the mining of heavy mineral sands on a site between Kleinsee and Koiingnaas. However, the scale of the proposed mining activities is expected to be considerably smaller than the previous DBC operations.
» Tourism. The Northern Cape Province captured a mere 0.7% of South Africa's total tourism revenue in 2008. In terms of total foreign visitors, 1.3% visited the Northern Cape in 2008. The Northern Cape tourism industry is however experiencing modest growth (2.9% in 2007). The Northern Cape Province tourism sector is estimated to contribute 6% to provincial GGP. The Northern Cape has an average annual growth of 17% in national visitors and 25% annual growth in international visitors.

ASSESSMENT OF IMPACTS: PHASE 1: PROJECT BLUE WIND ENERGY FACILITY — CHAPTER 7

Project Blue Wind Energy Facility Wind: Phase 1 is proposed to comprise up to 10 turbines and have a generating capacity of up to 20MW. The proposed development site is ~860 ha in extent and located on the following farm portions: Dikgat 195 Portion 07; Dikgat 195 Portion 09; Dikgat 195 Portion 02; Dikgat 195 Portion 05; Dikgat 195 Portion 04; Kleinzee 193 remaining portion; Dreyers pan 192 remaining portion; Predikant Vlei 190 portion 01; Predikant Vlei 190 portion 04; Predikant Vlei 190 portion 03. These farm portions are majority-owned by De Beers Consolidated Mines, and lie north of the mining town of Kleinsee.

Environmental impacts associated with the proposed project are expected to be associated with the construction, operation and decommissioning of the facility. 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.

Construction activities for wind energy projects typically include:

» land clearing for site preparation and access routes;
» excavation and filling;
» transportation of supply materials and fuels;
» construction of foundations involving excavations and placement of concrete;
» construction of a substation, underground and above ground power lines
» operating mobile cranes for unloading and installation of equipment; and
» commissioning of new equipment.

Decommissioning activities will include removal of project infrastructure and site rehabilitation.

Environmental issues associated with construction and decommissioning activities may include, among others, habitat destruction, disturbance, and alteration; impacts on biodiversity; threatened fauna and flora species; protected tree species and ecological processes; soil degradation; erosion; and increased erosion potential; impacts on heritage sites; and impacts on the visual aesthetics.

Environmental issues specific to the **operation** of a wind energy facility could include visual impacts; noise produced by the spinning of rotor blades; avian/bat mortality resulting from collisions with blades; and light and illumination issues.

These and other environmental issues were originally identified through a scoping evaluation of the proposed wind energy facility. Potentially significant impacts have now been assessed during this EIA Phase. This EIA process has involved key input from specialist consultants, the project developer, and from key stakeholders and interested and affected parties. The significance of impacts associated with a facility of this nature is always project specific, and therefore impacts may vary significantly between facilities.

This chapter serves to assess the identified potentially significant environmental impacts associated with the development of the proposed facility, and to make recommendations for the management of these impacts for inclusion in the draft Environmental Management Programme (Refer to Appendix O). 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 up to 10 turbines (depending on which turbine types are ultimately chosen by the developer), access roads and a substation(s), during construction much of the approximately 860 ha of the proposed site could suffer some level of disturbance. However, once construction is complete, only a small portion of this area (estimated at approximately 10%) will be permanently impacted by infrastructure associated with the wind energy facility.

7.1. Conclusions of the Scoping Study

The majority of potential impacts identified to be associated with the construction and operation of the proposed wind energy facility are anticipated to be localised and restricted to the proposed site. No environmental fatal flaws were identified to be associated with the site. However, areas of potential sensitivity were identified through the scoping phase. These areas of sensitivity are illustrated in the sensitivity map included as Figures 8.1 and 8.2.

The potentially sensitive areas/environmental features identified include:

» Areas of visual exposure within (but not restricted to) 10 km of the proposed wind energy facility site such as homesteads and observers travelling along major and gravel roads
» Areas of high botanical sensitivity on site.
» Areas of heritage sensitivity.

7.2. Methodology for the Assessment of Potentially Significant Impacts associated with the proposed Wind Energy Facility

In order to assess the potential impacts associated with the proposed facility, it was necessary to understand the extent of the area affected by the proposed development. This affected area will include the area infrastructure (i.e. wind turbines, concrete foundations, underground cabling, internal access roads, substations, and the office workshop), as well as temporary disturbance areas (i.e. laydown areas, temporary access roads for mobile construction equipment, etc.). A wind energy facility is dissimilar to all other power generation facilities in that it does not result in the disturbance of an entire site and agricultural activities can continue undisturbed around the installed turbines.

A broader site of 860 ha was identified by the project developer for the purposes of establishing the proposed Project Blue Wind Energy Facility: Phase 1. The bulk of this effective area required for the wind energy facility footprint would not suffer any level of disturbance as a result of the required activities on site. Permanently affected areas comprise 10 turbine footprints (10 foundation areas of 20 m x 20 m in extent), access roads (6 m in width), a substation (80 m x 90 m in extent) and a workshop (~400 m^2 in extent).

The area of permanent disturbance is estimated as follows:

Permanent Component –Within the facility	Approximate extent (in m^2)
10 Turbine footprints (each 20 m x 20 m)	4 000
Permanent access roads (14.96km x 6m wide)	89 764
Substation footprints (80 m x 90 m)	7 200
Office/ Workshop area(400 m^2)	400
TOTAL (ha)	**101 364** (of a total area of 8600000 m^2) **≈1.2% of site**

Temporarily affected areas comprise laydown areas for turbines (each laydown area with a footprint of 40 m x 40 m) as well as a track of an additional 6 m in width for the crawler crane to move across the site (i.e. an additional 5 m width to the permanent road of 6 m in width – a total of 11 m in width). The 33 kV cabling to connect the turbines to the substations is to make use of the on site tracks. An approximately 1 m wide trench would be excavated, the cabling laid and the area rehabilitated. The area of temporary disturbance is as follows:

Facility Component -Temporary	Approximate area/extent (in m^2)
10 turbine laydown areas	16 000
Temporary crane travel track (5 m) plus trench for 33 kV cabling (1m) – 14.96km	89 764
TOTAL	**135 376** (of a total area of 8600000m^2) **≈1.2% of site**

Therefore, a total area of 207 127 m^2 (i.e. approximately 20.7 ha) can be anticipated to be disturbed to some extent during the construction of the wind energy facility. This amounts to **2.4%** of the total 860 ha area which will form part of the total wind energy facility site.

In order to assess the areas where impacts could occur on the site, a site layout optimisation exercise revealed the best possible positions for the turbines, substation and other infrastructure from a technical perspective (refer to Figure 7.2). This exercise considered the on-site wind resource, local topography and environmental sensitivities identified during the scoping phase of the process. This layout is expected to be approximately 80% accurate and would be refined in the final design phase of the process in terms of additional on-site wind data and any additional environmental sensitivities identified through this assessment.

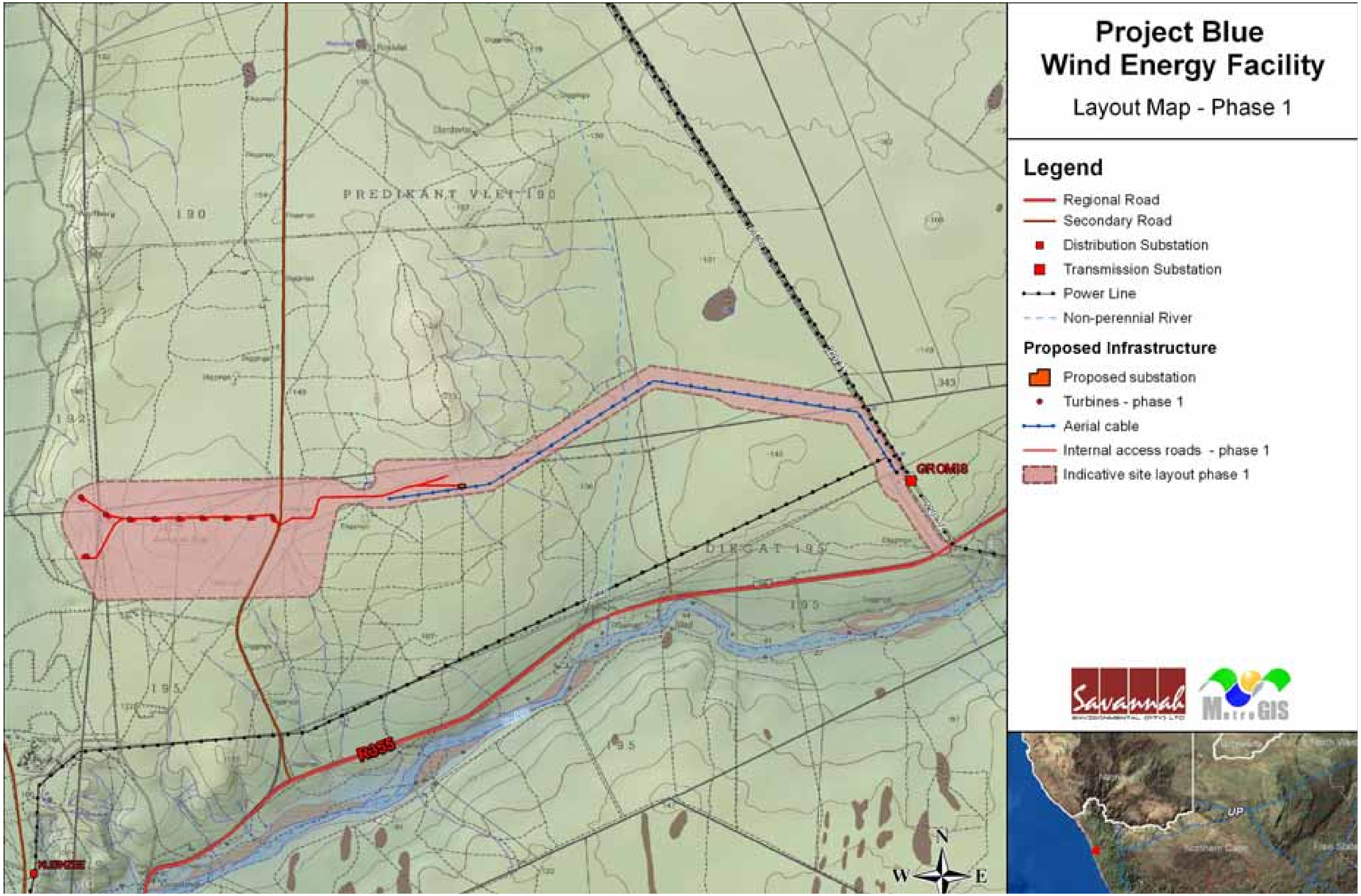


Figure 7.2: Proposed layout of Phase 1

7.3. Assessment of the Potential Impacts associated with the Construction and Operation of the Proposed Project Blue Wind Energy Facility: Phase 1

The sections which follow provide a summary of the findings of the assessment undertaken for potential impacts associated with the construction and operation of the proposed Project Blue Wind Energy Facility: Phase 1 on the identified sites. The nature of the potential impact is discussed; the significance is calculated with and without the implementation of mitigation measures. Recommendations are made regarding mitigation and management measures for potentially significant impacts and the possibility of residual and cumulative impacts are noted.

7.3.1. Potential Impacts on Vegetation

The Phase 1 indicative layout (not to be confused with Area 1) extends from west to south of Arnot se Kop in Area 1 and then eastwards through Area 2 with an over-head power-line corridor north-eastwards to Area 3, eastwards through Area 3 and then southwards to Gromis Substation. Three of the proposed ten (10) turbines of Phase 1 are located in an area designated as a Critical Biodiversity Area (CBA) and the remaining seven turbines are located in an area designated as an Ecological Support Area (ESA - Terrestrial Migration Corridor). The overhead power-line would also traverse areas designated as ESAs (Figures 7.3 and 7.4).

Impacts assessed are restricted to those impacts that would affect vegetation communities, their habitats and their constituent plant species. The impacts could also affect ecological processes and consequently ecosystem function. The impacts identified are:

» Impacts on **localized special habitats** associated with exposure of silcretes, quartzite or granite-gneiss close to the coast.
» Impact on **species of conservation concern**.
» Impact on plant communities through **fragmentation** that would lead to loss of constituent species and negatively impact the cohesiveness of the communities.
» **Loss of habitat** due to degradation of plant communities.
» **Loss of ecosystem function** due to changes in such factors as hydrological regime, increased edge effect, disturbance of successional processes, disturbance of pollination processes and possible invasion by alien plant species.

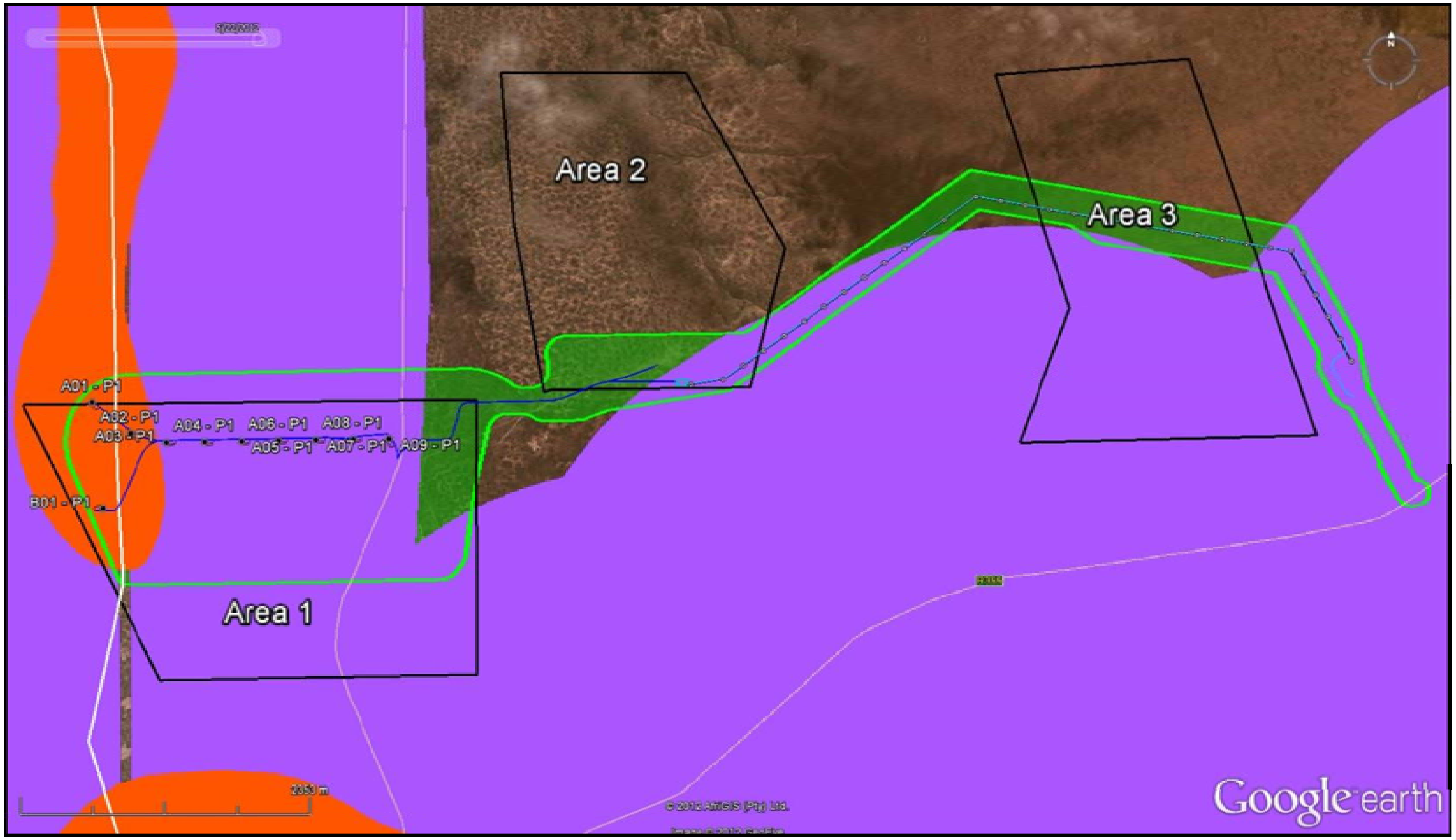


Figure 7.3: Project Blue Phase 1 layout (green) superimposed on CBA's (orange) and ESAs (purple). The dark blue lines indicate the internal roads and the light blue line shows the over-head transmission line

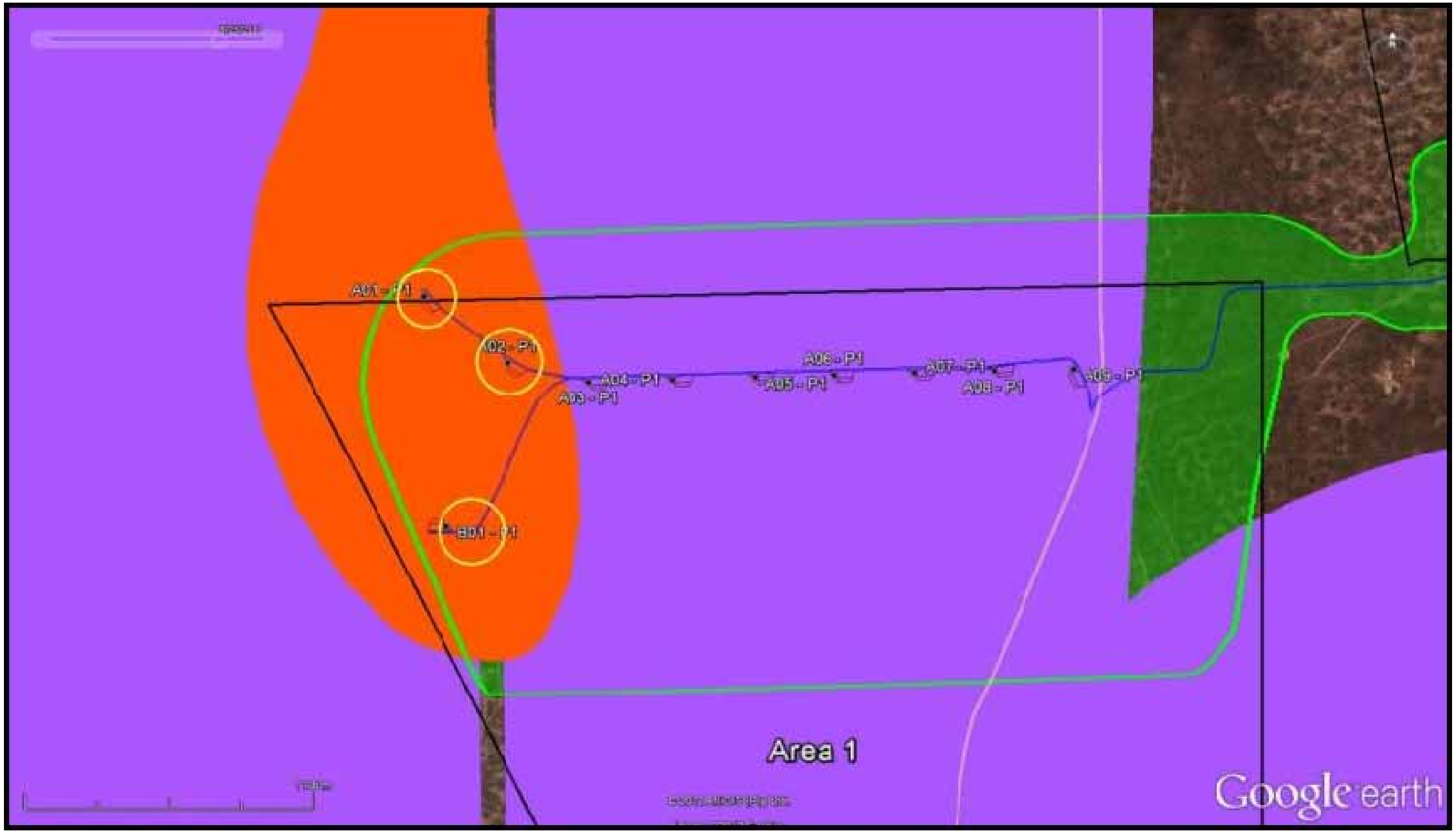


Figure 7.4: Three proposed wind turbines (indicated by yellow circles) would fall within a CBA in the Project Blue Phase 1 layout

The greatest risk to the vegetation and flora would be during the construction phase of the wind energy and solar energy facilities when the following activities would be required:

- Construction of access roads.
- Clearing of vegetation for the turbine pedestals and construction of lay-down areas and the on-site substation.
- Trenches for cables and power-lines, or if overhead, the requirement for construction of pylons.
- Operation of machinery and vehicles which could result in undesirable soil compaction.
- Possible fuel and chemical (cement) contamination.

Maintenance of the wind energy facility (operational phase) would pose lower risks to the vegetation. Only the access roads and immediate area around each turbine would need to be accessed, leaving the remaining area within the footprint relatively undisturbed.

Impact tables summarising the significance of impacts on flora associated with the wind energy facility

Nature: Loss of Namaqualand Strandveld due to construction of wind turbines, transformers and crane hard-standings: Phase 1 wind energy facility

Construction of wind-turbines (with transformers and crane hard-standings) in the Phase 1 indicative area would result in High Negative impact on the vegetation at three turbine sites that fall within a designated CBA (Refer to Figure 7.3). These sites are AO1-P1; AO2-P1 and BO1-P1. It is recommended that these sites should be completely **avoided** and that as mitigation they should either not be built or alternative locations within less sensitive Namaqualand Strandveld must be found. The remaining seven turbines proposed as part of Phase 1 would impact Namaqualand Strandveld with low botanical sensitivity and the impact is therefore rated as Medium Negative. Without mitigation the overall impact for Phase 1 would be High Negative but with mitigation would be Medium Negative.

	Without mitigation	**With mitigation**
Extent	Local (2)	Local (2)
Duration	Long-term (4)	Long-term (4)
Magnitude	High (8)	Low (4)
Probability	Definite (5)	Probable (3)
Significance	**High (70)**	**Medium (30)**
Status	Negative	Negative
Reversibility	Partially reversible	Partially reversible
Irreplaceable loss of resources?	No. Namaqualand Strandveld is wide-spread and is not threatened. Plant communities on granite koppies and quartz patches are considered important	

	and should be avoided.	
Can impacts be mitigated?	Yes, by avoiding botanically sensitive areas.	
Mitigation: » Three turbines in CBA to be removed or re-located.		
Cumulative impacts: » Will contribute to a limited extent to loss of Namaqualand Strandveld due to construction of wind energy facilities.		
Residual impacts: » Low negative.		

Nature: Loss of Namaqualand Strandveld due to construction and operation of internal roads and underground cables: Phase 1 wind energy facility The internal access roads for Phase 1 as given in the indicative layout would require that new roads of 6 m width be built. Where the road accesses the Phase 1 turbines, the underground cable could be aligned alongside the road from the on-site substation to the turbines, requiring little additional negative impact. This would have a Medium Negative impact. East of the on-site substation the internal access road will follow the route of the overhead power-lines which would be aligned to the northwest, north and east of a shallowly excavated area (visible on aerial images). The overall impact without mitigation would be Medium Negative and with mitigation Low negative.		
	Without mitigation	**With mitigation**
Extent	Local (2)	Local (2)
Duration	Long-term (4)	Long-term (4)
Magnitude	Medium (6)	Low (4)
Probability	Definite (5)	Probable (3)
Significance	**Medium (60)**	**Low (30)**
Status	Negative	Negative
Reversibility	Partially reversible	Partially reversible
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation: » Mitigation measures that should be implemented are restoration actions to promote re-vegetation of disturbed areas. A restoration specialist should be employed to ensure that the task is carried out correctly, with local species, to prevent the introduction of weeds and alien invasive plant species.		
Cumulative impacts: » Contribution to loss of Namaqualand Strandveld vegetation.		
Residual impacts: » Low negative.		

Nature: Loss of Namaqualand Strandveld due to construction and operation of overhead transmission lines for Phase 1 wind energy facility

An overhead transmission line will run from the Phase 1 on-site sub-station north-eastwards and then southwards to Gromis Sub-station. A road would be required to construct and maintain the transmission line. The impact on the Namaqualand Strandveld vegetation would be mainly associated with the road and not the transmission line itself except for limited disturbance at the sites of the poles.

The impact of construction of the proposed overhead power-line for Phase 1 would be linked to the impact of the road and is therefore Medium Negative. Mitigation would involve restoration as for the road and if successfully applied would reduce the impact to Low Negative.

	Without mitigation	**With mitigation**
Extent	Local (2)	Local (2)
Duration	Long-term (4)	Long-term (4)
Magnitude	Medium (6)	Low (4)
Probability	Definite (5)	Probable (3)
Significance	**Medium (60)**	**Low (30)**
Status	Negative	Negative
Reversibility	Partially reversible	Partially reversible
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	

Mitigation:

» Mitigation measures that should be implemented are restoration actions to promote re-vegetation of disturbed areas. A restoration specialist should be employed to ensure that the task is carried out correctly, with local species, to prevent the introduction of weeds and alien invasive plant species.

Cumulative impacts:

» Contribution to loss of Namaqualand Strandveld vegetation.

Residual impacts:

» Low negative.

Implications for project implementation

» The area within which the Project Blue Wind Energy Facility: Phase 1 is proposed is expected to be of medium to low risk in terms of impact on flora (***Loss of Namaqualand Strandveld)***.
» CBAs should be treated as 'No Go' areas for any form or development including renewable energy infrastructure. The CBAs potentially negatively impacted by Project Blue Phase 1 have been assessed as likely to have a High Negative impact. The recommended mitigation is to avoid these areas and locate the three proposed turbines located in this area elsewhere in less sensitive vegetation.
» It is recommended that the placement of wind turbines, roads, underground cables and over-head power-lines be in vegetation of low sensitivity (least threatened).

7.3.2. Potential Impacts on Terrestrial Fauna and Habitats

Potential ecological impacts resulting from the development of the wind energy facility would stem from a variety of different activities and risk factors associated with the construction and operational phases of the project including the following:

Construction Phase
» Vegetation clearing & site preparation
» Operation of heavy machinery at the site
» Human presence

Operational Phase
» Site maintenance activities
» Human presence
» Operation of the turbines

The above activities are likely to manifest themselves as the following faunal impacts:
» Loss of habitat for fauna
» Reduced landscape connectivity for fauna
» Direct faunal impacts
» Bat mortality
» Increased soil erosion risk

Impact tables summarising the significance of impacts on Terrestrial Fauna and Habitats associated with the wind energy facility

Nature: Habitat loss for fauna - Transformation and loss of habitat will have a negative effect on resident fauna.

The development of the wind energy facility will result in the loss of habitat for resident fauna. This potentially includes at least 8 listed reptiles, two listed amphibians, four listed mammals and two listed bat species. In terms of a direct loss of habitat, the development of the wind energy facility would result in the loss of approximately 70 ha of currently intact vegetation. This in itself is not viewed as being highly significant. However, some of the turbines are currently located within high sensitivity environments such as rocky outcrops or headlands and would have a significant impact on habitat availability within these restricted habitats. The only way that these impacts can be mitigated is to relocate the turbines concerned or drop them from the development.

	Without mitigation	**With mitigation**
Extent	Local (2)	Local (2)
Duration	Long-term (4)	Long-term (4)
Magnitude	Medium (6)	Low (4)
Probability	Definite (5)	Highly Probable (4)
Significance	**Medium-High (60)**	**Low (40)**
Status	Negative	Negative

Reversibility	Low	Low
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	To a small degree	

Mitigation:

» Vegetation clearing should be kept to a minimum.

» Impacts to restricted and important habitats such as the rocky outcrops should be avoided.

» The final placement of turbines must follow a micrositing procedure involving a walk-through and identification of any sensitive areas by botanical, faunal and avifaunal specialists.

Cumulative impacts:

» There is already quite a lot of transformation in the area as a result of diamond mining activities and the development would contribute to cumulative habitat loss in the area. Mining activities are however concentrated along the low coastal plain while the wind energy facility is located further inland which has been less impacted.

Residual impacts:

» Some habitat loss is an inevitable consequence of the development and cannot be fully mitigated.

Nature: Reduced landscape connectivity - Roads, turbine lay-down areas and other transformed areas will represent barriers to movement for some species. .

The extensive road network which is likely to amount to 50 km of hardened access roads are likely to have the greatest impact on landscape connectivity for fauna. Many species including snakes, tortoises, lizards, golden moles and rodents are vulnerable to predation when traversing open areas and the relatively wide nature of the roads required for wind-energy developments poses a significant threat in this regard. Although many of the species in the area are reasonable well equipped to deal with open areas, the roads and other cleared areas would have a long-term cumulative impact and slow reproducing species such as tortoises may be particularly affected. Larger mammals are likely to be less impacted due to their mobility and the presence of gaps in the areas of turbines which would remain relatively free of impact.

	Without mitigation	**With mitigation**
Extent	Local (2)	Local (2)
Duration	Long-term (4)	Long-term (4)
Magnitude	Medium (6)	Medium(5)
Probability	Highly Probable (4)	Probable (3)
Significance	**Medium (48)**	**Medium (33)**
Status	Negative	Negative
Reversibility	Moderate	Moderate
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	To some degree	

Mitigation:

» Hardened surfaces should be kept to a minimum

» Roads should be as narrow as possible and as short as possible. A natural surface such as gravel would be preferable to a tarred or concrete road, except in very steep areas where it would be difficult to prevent erosion of natural surfaces.

» Vegetation should be allowed to remain alongside or encroach on the roads as much as possible.

» Temporary lay-down areas should be in previously transformed areas or areas that will be used by the development.

Cumulative impacts:

» Although there is already some transformation in the area which contributes to reduced connectivity, the current development would add 50km of roads within a concentrated area giving rise to a significant cumulative impact from roads.

Residual impacts:

» Due to the soft sands at the site, hardened roads will in all likelihood be necessary to access the site and so there is little that can be done to fully mitigate this impact.

Nature: Direct Faunal Impacts - Fauna will be directly impacted by the development as a result of construction activities and human presence at the site.

Some smaller animals would not be able to move away from construction activity sufficiently quickly during construction and would be killed by vehicles and earth-moving machinery. In addition, the presence of a large work force on the site would pose a risk to species such as snakes, tortoises and mammals which would be vulnerable to poaching for food, trade or killed out of fear and superstition.

	Without mitigation	**With mitigation**
Extent	Local (2)	Local (1)
Duration	Short-term (4)	Short-term (4)
Magnitude	Medium (5)	Medium-Low (3)
Probability	Highly Probable (4)	Probable (3)
Significance	**Medium (44)**	**Low (24)**
Status	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	To some extent	

Mitigation:

» Any fauna directly threatened by the construction activities should be removed to a safe location by the ECO or other suitably qualified person.

» The collection, hunting or harvesting of any plants or animals at the site should be strictly forbidden. Personnel should not be allowed to wander off the construction site.

» Fires should only be allowed within fire-safe demarcated areas.

» No fuel wood collection should be allowed on-site.

» No dogs should be allowed on site.

» If the site must be lit at night for security purposes, this should be done with low-UV type lights (such as most LEDs), which do not attract insects.

» All hazardous materials should be stored in the appropriate manner to prevent contamination of the site. Any accidental chemical, fuel and oil spills that occur at the site should be cleaned up in the appropriate manner as related to the nature of the spill.
» No unauthorized persons should be allowed onto the site.
» All construction vehicles should adhere to a low speed limit to avoid collisions with susceptible species such as snakes and tortoises.

Cumulative impacts:

» The potential for cumulative impacts is relatively low as there are few other developments currently underway in the area and mining activity in the area is on the decline.

Residual impacts:

» Residual impacts for fauna can be mitigated to a large degree, although some mortality of a few immobile species can be expected.

Nature: Bat Mortality due to Turbines - The presence of the turbines poses a high risk to bats foraging or moving through the area.

The presence of turbines within bat foraging, movement or migration areas would pose a significant threat to bat species. This is likely to be those turbines along the coastal bluff as well as the cluster of turbines near Grootmis. As the threat would persist for as long as the turbines were operational, this represents a long-term threat that may have a significant cumulative impact on the local bat populations. Bats are particularly vulnerable to impact from turbines for several reasons. They may be attracted to the vicinity of the turbines and secondly although they may or may not collide with the turbine blades, they are vulnerable to barotrauma in which they suffer fatal internal haemorrhage as a result of passing through the low-air pressure vortices behind the turbine blades. It is difficult to establish the extent or significance of this impact without long-term bat monitoring as per the South African Good Practice Guidelines for Surveying Bats in Wind Farm Developments (Sowler & Stoffberg 2011). Potential mitigation measures include curtailment in which the turbines are kept stationary at certain times of the day or year as well as relocating turbines outside of areas of high bat activity.

	Without mitigation	**With mitigation**
Extent	Local (3)	Local (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Medium-High (7)	Low (4)
Probability	Highly Probable (4)	Probable (3)
Significance	**Medium-High (56)**	**Low (27)**
Status	Negative	Negative
Reversibility	Low	High
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes, to a large degree	

Mitigation:

» Bat monitoring according to the South African Good Practice Guidelines for Surveying Bats in Wind Farm Developments (Sowler & Stoffberg 2011), should be initiated as soon as possible.
» Final turbine placement must reflect the findings and recommendations emerging from the above studies.

Cumulative impacts:

» There are some other planned wind farm developments in the area which could result in a

large cumulative impact on the local bat populations.
Residual impacts: » Despite mitigation and avoidance measures which are not entirely effective, some impacts on bats are likely to occur.

Nature: Increased erosion risk - Increased erosion risk as a result of soil disturbance and loss of vegetation cover. (Associated with the development as well as access roads) The development of the site would create a lot of soil disturbance, which would leave the site highly susceptible to wind erosion. Along the coastal headlands and the large hill in the central part of the site, the substrate is firmer and water rather than wind erosion would be the primary risk. In these areas standard erosion control measures such as water diversion and dispersing structures should be built along roads and other cleared areas. Within the sandy areas, the strong winds which characterize the area will tend to mobilize any loose sand. Such sand movement can result in degradation of the affected areas as it smothers established plants and once initiated can become self-sustaining. Measures to reduce sand movement should therefore be implemented at the site wherever bare soil is exposed. The extreme measures required for rehabilitation of previously mined areas in the area serve as evidence of the potential significance of wind erosion		
	Without mitigation	**With mitigation**
Extent	Local (2)	Local (1)
Duration	Long-term (4)	Short-term (2)
Magnitude	Medium (5)	Low (3)
Probability	Highly Probable (4)	Probable (3)
Significance	**Medium (44)**	**Low (18)**
Status	Negative	Negative
Reversibility	Low	High
Irreplaceable loss of resources?	Yes	No
Can impacts be mitigated?	Yes	
Mitigation: » Regular monitoring for erosion after construction to ensure that no erosion problems have developed as result of the disturbance. » All erosion problems observed should be rectified as soon as possible, using the appropriate erosion control structures and revegetation techniques.		
Cumulative impacts: » Higher sediment loads in rivers and streams will affect in-stream vegetation and biota		
Residual impacts: » If erosion at the site is controlled, then there will be no residual impact		

Implications for project implementation

- » The Wind Energy Facility occurs across a range of different sensitivities, with those turbines along the north- and south- west falling within high sensitivity areas.
- » The placement of the turbines within these areas should be reviewed as it may not be possible to appropriately mitigate the likely impacts associated with development in these areas.
- » There are a large number of listed reptiles known from the area, many of which are associated with rocky outcrops. Turbines which impact this habitat are likely to have a significant impact on local reptile populations as the rocky outcrops are a restricted habitat that was not widely available at the site.
- » The potential impact of the development and particularly the wind turbines on Golden Moles is identified as a potential concern which is highlighted as a significant unknown associated with the development.
- » Although large parts of the site are not likely to be important for bats, certain areas, largely those identified as being important for reptiles are also identified as being potentially important for bats. As little is known about bat composition or activity patterns in the area, it is recommended that long-term bat monitoring be initiated to inform the final placement of turbines at the site.

7.3.3. Potential Impacts on Avifauna

The region is likely to support at least 168 bird species, including 15 threatened (red-listed) species, and 44 endemic species. The avian groups of greatest conservation significance likely to be impacted by the turbines include the (i) bustards that move in with good rainfall; (ii) flocking waterbirds such as red-listed cormorants and flamingos, and (iii) fifteen raptor species. Many have a low likelihood of occurrence but (breeding) Ludwig’s Bustards, Secretarybirds, (breeding) Jackal Buzzards (recorded close to Phase 1 – see Figure 7.5), Greater Kestrel, White Pelicans and Namaqua Sandgrouse were all confirmed collision-prone species and the threatened Black Harriers occur at low frequency in the area and breeding in the nearby Buffels River.

Impacts may occur in terms of both collision and disturbance from the facility itself. Two brief surveys revealed a rich vein of endemic passerines (26% of the total number of species) which could be affected by disturbance impacts. From the results of the avifauna impact assessment (refer to Appendix H), the area within which the Project Blue Wind Energy Facility: Phase 1 is proposed is expected to be of low risk in terms of collision.

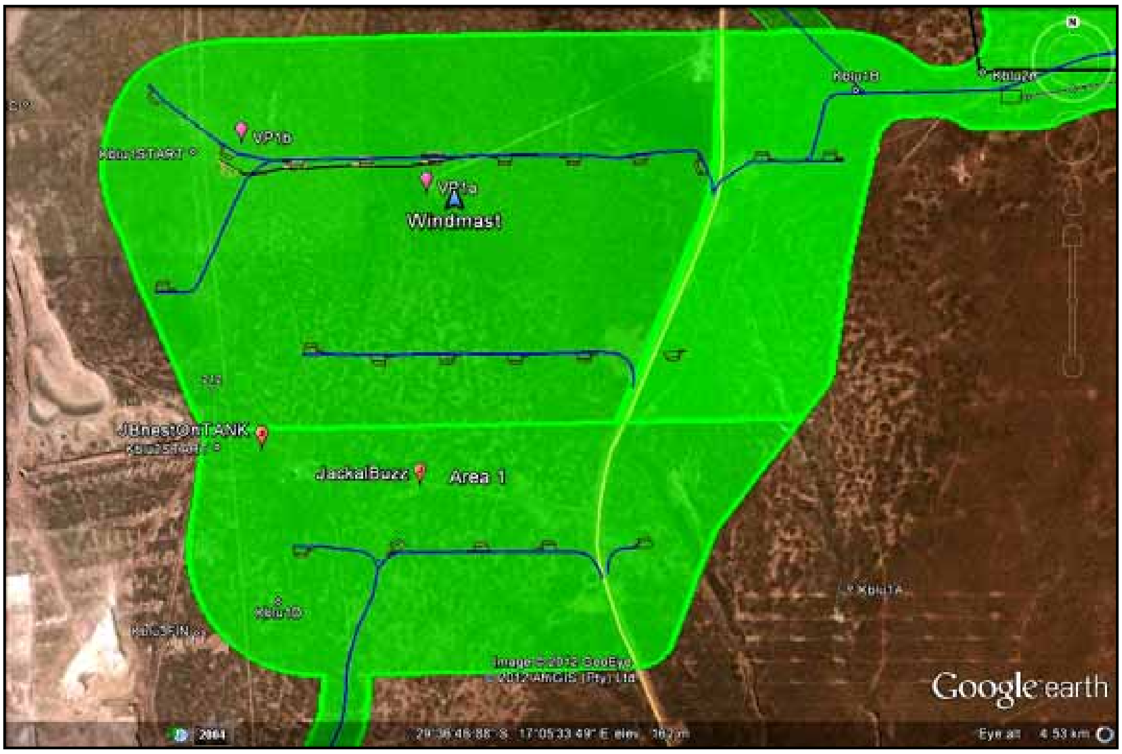


Figure 7.5: Collision-prone birds present in the vicinity of Phase 1.

Impact tables summarising the significance of impacts on avifauna associated with the wind energy facility

Nature: Direct mortality or avoidance of area around the wind farm for the bird groups identified as at risk, due to noise, or impacts with turbine blades (Flamingos = GLF, Pelican = P, Raptors = R, Shelduck = SD, Ludwig's Bustard = LB, Southern Black Korhaan = SBK)		
	Without mitigation	**With mitigation**
Extent	**0**(GLF, P, SD) **1**(R) **3** (LB,SBK)	**0**(GLF,P, SD) **1**(R) **3** (LB,SBK)
Duration	**5** (GLF, P, R, SD, LB, SBK)	**5** (GLF, P, R, SD, LB, SBK)
Magnitude	**4** (GLF, P, R, SD) **6**(LB, SBK)	**3** (GLF, P, R, SD) **5**(LB, SBK)
Probability	**4** (GLF, P, LB, SBK), **3** (R) **1**(SD)	**3**(GLF, P, LB, SBK), **2** (R) **1**(SD)
Significance (E+D+M)P	**36**(GLF, P, R)**,** **9**(SD) **56** (LB,SBK)	**24**(GLF, R)**, 8**(SD) **39** (LB,SBK)
Status (+ve or –ve)	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of species?	Yes (particularly the bustards)	Reduced
Can impacts be mitigated?	Partially	
Mitigation: » As far as possible, orientate the turbine strings north-south so they do not present a barrier to north-south commuting birds. » Do not place turbines on the very top of ridges but on the east side where orographic lift is		

less pronounced for soaring raptors » Paint one turbine blade with ultra-violet paint, readily seen by birds day and night. » Undertake pre-construction monitoring to confirm flight paths and foraging areas. » Continue monitoring into operational phase to confirm impacts (if any) of the wind energy facility on avifauna.
Cumulative impacts: Cumulative impacts (Masden et al. 2010) are those that may affect a species in a small area (e.g. a wind farm) yet have a wide-scale influence. If resident territorial birds are killed by turbines for example, then other individuals will be pulled in to take up the vacant territory. Thus for bustards that may reside in the area, the impact may be greater than just around the immediate vicinity of the wind farm. On the other hand migratory species killed in one area such as flamingos migrating through the area to their breeding grounds, may be affected far from that breeding area. A wide-spread population reduction may occur as a result. Last, if several wind farms are developed in one area and result in widespread displacement or collisions of a range-restricted species, then they may have a wide spread influence cumulatively even if the individual wind farms do not have a major impact. Furthermore, if the wind farm is enlarged, or taken closer to the ocean, then bird movements may be influenced negatively. Cumulative impacts for raptors such as the buzzards and Secretarybirds may be present if the mortality brings other territorial birds in. Wind farms are proposed for an area south of Kleinsee too and this may have a cumulative impact on the species detailed above. The present study assumes that the land use here will remain stable and no further mine excavations will be placed near the wind farm, that may attract wetland species.
Residual impacts: After mitigation, direct mortality or area avoidance by the species identified above may still occur and further mitigation (e.g. micro-siting) will be needed.

Implications for project implementation

» The area within which the Project Blue Wind Energy Facility: Phase 1 is proposed is expected to be of low risk in terms of collision.

» There are three classes of mitigation for birds around wind farms:
  - (i) re-position the turbines to avoid intersecting the movements of the birds
  - (ii) redesign the turbines to alter the present pattern/shape/size of the turbines so birds see them more readily and avoid contact or
  - (iii) close down turbines when these birds approach.

» It is recommended that further research (in the form of pre-construction and operational monitoring) be undertaken to determine flight paths of flamingos and where the raptors and bustards forage. On present (limited) evidence the wind energy facility area is considered to be far enough from the coastal flyways (1.9 km) that it will avoid impacting flamingo flyways. However, passage rates will need to be assessed with the presence of bustards, korhaans and the raptors in the area.

» The effects of power lines across the wind farm may have a high impact on the birds of the area because bustards and other collision-prone species are well known to suffer mortality (Martin and Shaw 2010). However, wherever possible all overhead lines should be marked with bird flappers or, where possible, buried underground.

7.3.4. Potential Impacts on Geology, Soils and Agricultural Potential

Due to the low agricultural potential of the site as well as the low rainfall the impacts on soils and agriculture is expected to be low – provided that adequate storm water management and erosion prevention measures are implemented. These measures should be included in the layout and engineering designs of the development. The erodibility of the soils on the site is associated with the low sparse vegetation cover, sandy topsoils and restricting subsoil layers. In the mining areas the erodibility is a major challenge due to the presence of excessive NaCl in the newly established soils and storm water emanating from the site should be mitigated and controlled.

Impact tables summarising the significance of impacts on geology, soils and agricultural potential associated with the wind energy facility

Nature: Construction of turbine foundations and laydown areas		
	Without mitigation	**With mitigation**
Extent	Local (1)	N/A
Duration	Permanent (5)	N/A
Magnitude	Minor (2)	N/A
Probability	Probable (4)	N/A
Significance	**Moderate (32)**	N/A
Status	Negative	N/A
Reversibility	Irreversible	
Irreplaceable loss of resources?	Yes	
Can impacts be mitigated?	No	
Mitigation: » Limit footprint to the immediate development area.		
Cumulative impacts: » Soil erosion may arise owing to increased surface water runoff. Adequate management and erosion control measures should be implemented.		
Residual impacts: » Limited is activity is managed.		

Nature: Construction of buildings and other infrastructure with the associated disturbance of soils and existing land use		
	Without mitigation	**With mitigation**
Extent	Local (1)	N/A
Duration	Permanent (5)	N/A
Magnitude	Minor (2)	N/A
Probability	Probable (4)	N/A
Significance	**Moderate (32)**	N/A
Status	Negative	N/A

Reversibility	Irreversible	
Irreplaceable loss of resources?	Yes	
Can impacts be mitigated?	No	
Mitigation: » Limit footprint to the immediate development area.		
Cumulative impacts: » The cumulative impact of this activity will be small as it is constructed on land with low agricultural potential.		
Residual impacts: » Limited due to low agricultural potential		

Nature: construction of roads with the associated disturbance of soils and existing land use		
	Without mitigation	**With mitigation**
Extent	Local (1)	N/A
Duration	Permanent (5)	N/A
Magnitude	Minor (2)	N/A
Probability	Probable (4)	N/A
Significance	**Moderate (32)**	N/A
Status	Negative	N/A
Reversibility	Irreversible	
Irreplaceable loss of resources?	Yes	
Can impacts be mitigated?	No	
Mitigation: » Limit footprint to the immediate development area and keep to existing roads as far as possible.		
Cumulative impacts: » The cumulative impact of this activity will be small as it is constructed on land with low agricultural potential.		
Residual impacts: » Limited due to low agricultural potential		

Nature: Impact of vehicle operation on site
Vehicle movement will be restricted to the construction site and established roads. Vehicle impacts in this sense are restricted to spillages of lubricants and petroleum products.

	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Short-term (2)	Short-term (2)
Magnitude	Minor (2)	Minor (2)
Probability	Probable (4)	Improbable (2)
Significance	**Low (20)**	**Low (10)**
Status	Negative	Negative
Reversibility	Reversible	
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	Yes	
Mitigation: » Limit footprint to the immediate development area. » Maintain vehicles in designated areas only. » Prevent and address spillages.		
Cumulative impacts: » The cumulative impact of this activity will be small if managed.		
Residual impacts: » Limited if activity is managed.		

Nature: Impact of dust generation on site This activity entails the operation of vehicles on site and their associated dust generation. Generated dust can impact large areas depending on environmental and climatic conditions.		
	Without mitigation	**With mitigation**
Extent	Local (2)	Local (1)
Duration	Short-term (2)	Short-term (2)
Magnitude	Minor (2)	Minor (2)
Probability	Probable (4)	Improbable (2)
Significance	**Low (24)**	**Low (12)**
Status	Negative	Negative
Reversibility	Reversible	
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	Yes	
Mitigation: » Limit vehicle movement to absolute minimum. » Construct proper roads for access. » Implement appropriate dust control measures.		
Cumulative impacts: » The cumulative impact of this activity will be small if managed but can have widespread impacts if ignored.		

Residual impacts: » Limited if activity is managed.

Nature: Loss of agricultural potential and land capability owing to the development		
	Without mitigation	**With mitigation**
Extent	Site (1)	N/A
Duration	Permanent (5)	N/A
Magnitude	Low (2)	N/A
Probability	Highly probable (4)	N/A
Significance	**32 (Low)**	N/A
Status	Negative	N/A
Reversibility	Medium	
Irreplaceable loss of resources?	Yes	
Can impacts be mitigated?	No. The loss of agricultural land is a long term loss and there are no mitigation measures that can be put in place to combat this loss.	
Mitigation: » N/A		
Cumulative impacts: » The cumulative impact of this activity will be small as it is constructed on land with low agricultural potential.		
Residual impacts: » The loss of agricultural land is a long term loss. This loss extends to the post-construction phase. The agricultural potential is very low though.		

Implications for project implementation

» The impacts on soils are small in comparison to historical mining impacts in the study area.
» The impacts should be limited to the immediate construction sites and rehabilitation measures should be implemented in line with those to be implemented by the diamond mine.
» Regarding the construction of turbines and associated infrastructure the following recommendations are made:
  * Limit physical impacts to as small a footprint as possible.
  * Site management has to be implemented with the appointment of a suitable environmental control officer (ECO) to oversee the process, address problems and recommend and implement corrective measures.
  * Implement site specific erosion and water control measures to prevent excessive surface runoff from the site (turbines and roads).

  * Plan the road and site layout in such a way as to make maximal use of existing roads to keep natural units as intact as possible.
  * Prevent dust generation and vehicle associated pollution and spillages.
- With effective implementation of mitigating measures (as outlined in the **EMP** in **Appendix O**) the impacts identified can be reduced to a low level.

7.3.5. Potential Visual Impacts

The combined results of the visual exposure, viewer incidence / perception and visual distance of the proposed wind energy facility is displayed in Figure 7.6. Here the weighted impact and the likely areas of impact have been indicated as a visual impact index. Values have been assigned for each potential visual impact per data category and merged in order to calculate the visual impact index.

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

The visual impact index for the WEF is further described as follows.

- The visual impact index map indicates a core zone of moderate to high visual impact within a 5 km radius of the proposed facility. Affected areas include Kleinzee and long stretches of road, especially the R355 that passes the proposed development area at close proximity in places.
- The extent of potential visual impact remains high between the 5 km and
- 10 km radii, becoming moderate towards the outer edge of this zone. Affected areas include only a few stretches of road. Visual impacts within this zone are likely to be low to moderate.
- Between 10 km and 20 km, the extent of potential visual impact is reduced. Visual impacts within this zone are likely to be very low to low, with only stretches of road being affected.
- Remaining impacts beyond the 20 km radius are expected to be negligible to very low.

It is evident from the above that visual impacts are likely to occur primarily on roads. It must be noted that all roads converge onto Kleinzee and that the duration of visual impact is likely to be high, particularly as one travels towards Kleinzee. The impact intensifies as the distance to the wind energy facility becomes closer.

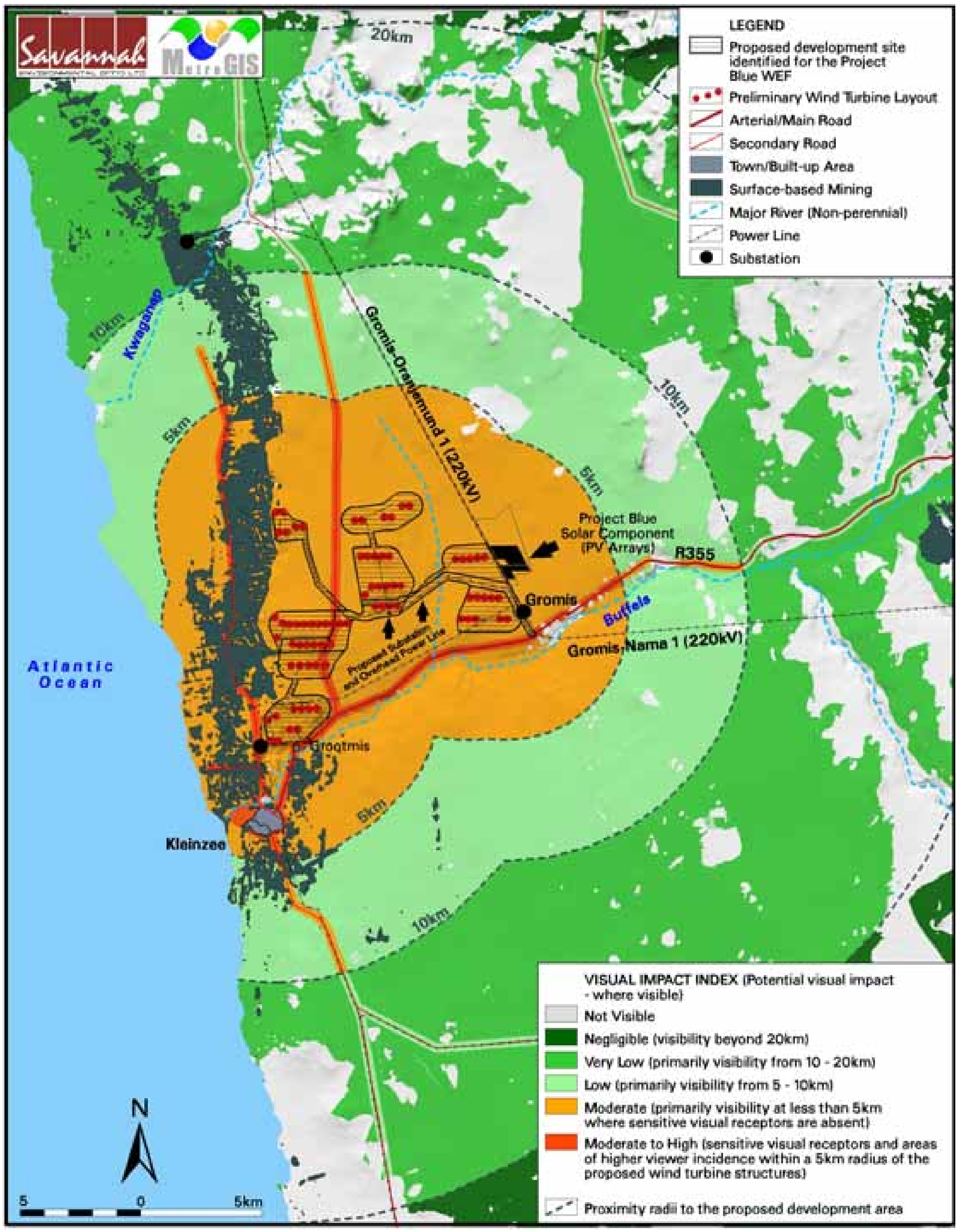


Figure 7.6: Visual impact index of the proposed Wind Energy Facility.

Impact tables summarising the significance of visual impacts associated with the wind energy facility

Nature of Impact: Potential visual impact of construction on visual receptors in close proximity to the proposed facility. During construction, there will be a noticeable increase in heavy vehicles utilising the roads to the development site that may cause, at the very least, a visual nuisance to other road users in the area. The clearing of vegetation during construction is unavoidable. Given the large footprint of development, it is likely that large tracks of land will be affected. The rehabilitation of vegetation in this region is difficult, given the hot, dry climatic conditions of this region.		
	No mitigation	***Mitigation considered***
Extent	Local **(4)**	Local **(4)**
Duration	Long term **(4)**	Short term **(2)**
Magnitude	Moderate **(6)**	Low **(4)**
Probability	Highly Probable **(4)**	Probable **(3)**
Significance	Moderate **(56)**	Low **(30)**
Status	Negative	Negative
Reversibility	Recoverable	Recoverable
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation: » Ensure that vegetation is not unnecessarily cleared or removed during the construction period. » Reduce the construction period through careful logistical planning and productive implementation of resources. » Plan the placement of lay-down areas and temporary construction equipment camps in order to minimise vegetation clearing (i.e. in already disturbed areas) wherever possible. » Restrict the activities and movement of construction workers and vehicles to the immediate construction site and existing access roads. » Ensure that rubble, litter, and disused construction materials are appropriately stored (if not removed daily) and then disposed regularly at licensed waste facilities. » Reduce and control construction dust through the use of approved dust suppression techniques as and when required (i.e. whenever dust becomes apparent). » Restrict construction activities to daylight hours in order to negate or reduce the visual impacts associated with lighting. » Rehabilitate all disturbed areas, construction areas, roads, slopes etc immediately after the completion of construction works.		
Cumulative impacts: In context of the existing rural character and relative low activity rate, the construction phase of the WEF will contribute to a regional increase in heavy vehicles on the roads in the region, with constructions activity distinctly noticeable.		
Residual impacts: None.		

Nature of Impact: Potential visual impact on users of arterial and secondary roads in close proximity to the proposed facility

Visual impacts on the R355 arterial road, being the major access route to Kleinzee, as well as the secondary road from the north, are expected to be of moderate significance within a radius of 5 km from the facility. The duration of visual impact within this zone, at an average speed of 90km/h, will be about 10 minutes.

	No mitigation	***Mitigation considered***
Extent	Local **(4)**	N/a
Duration	Long term **(4)**	N/a
Magnitude	High **(8)**	N/a
Probability	Probable **(3)**	N/a
Significance	Moderate **(48)**	N/a
Status	Negative	N/a
Reversibility	Recoverable	N/a
Irreplaceable loss of resources?	No	N/a
Can impacts be mitigated?	No	

Mitigation / Management:

Planning:

» Retain / re-establish and maintain natural vegetation in all areas outside of the development footprint.

Operations:

» Maintain the general appearance of the facility as a whole.

Decommissioning:

» Remove infrastructure not required for the post-decommissioning use of the site.
» Rehabilitate all areas. Consult an ecologist regarding rehabilitation specifications.
» Monitor rehabilitated areas post-decommissioning and implement remedial actions.

Cumulative impacts:

The construction of wind turbines together with the associated infrastructure will increase the cumulative visual impact of industrial type infrastructure within the region. This is relevant in light of the power line infrastructure already present in the area.

Residual impacts:

The visual impact will be removed after decommissioning, provided the facility and ancillary infrastructure is removed. Failing this, the visual impact will remain.

Nature of Impact: Potential visual impact on residents of Kleinzee

Kleinzee is situated less than 5 km from the nearest boundary of the proposed facility. The potential for visual exposure is high, but due to the existence of buildings and other structures, typically of a built up area, the visual absorption capacity is expected to be high, therefore limiting full exposure of the wind energy facility.

	No mitigation	***Mitigation considered***
Extent	Local **(4)**	N/a
Duration	Long term **(4)**	N/a
Magnitude	Moderate **(6)**	N/a
Probability	Probable **(3)**	N/a

Significance	Moderate **(42)**	N/a
Status (positive or negative)	Negative	N/a
Reversibility	Recoverable **(3)**	N/a
Irreplaceable loss of resources?	No	N/a
Can impacts be mitigated?	No	

Mitigation / Management:

Planning:

» Retain / re-establish and maintain natural vegetation in all areas outside of the development footprint.

Operations:

» Maintain the general appearance of the facility as a whole.

Decommissioning:

» Remove infrastructure not required for the post-decommissioning use of the site.
» Rehabilitate all areas. Consult an ecologist regarding rehabilitation specifications.
» Monitor rehabilitated areas post-decommissioning and implement remedial actions.

Cumulative impacts:

The construction of wind turbines together with the associated infrastructure will increase the cumulative visual impact of industrial type infrastructure within the region. This is relevant in light of the power line infrastructure already present in the area.

Residual impacts:

The visual impact will be removed after decommissioning, provided the facility and ancillary infrastructure is removed. Failing this, the visual impact will remain.

Nature of Impact: Potential visual impact of ancillary infrastructure (i.e. the substation, the overhead power line, the internal access roads and the office / workshop) on observers in close proximity to the facility

Ancillary infrastructure associated with the wind energy facility includes the substations, the overhead power line, the internal access roads, administration buildings and workshop, which may be visible to observers in close proximity to the facility. These will be located within the facility footprint. The roads have the potential of manifesting as landscape scarring. Other infrastructure has the potential of creating visual clutter, contributing to cumulative impacts, therefore having the potential of visual impact within the viewshed areas. No dedicated viewsheds have been generated for the ancillary infrastructure, as the range of visual exposure will fall within that of the turbines, as indicated on Figure 7.6.

	No mitigation	***Mitigation considered***
Extent	Local **(4)**	Local **(4)**
Duration	Long term **(4)**	Long term **(4)**
Magnitude	Low **(4)**	Low **(4)**
Probability	Improbable **(2)**	V Improbable **(1)**
Significance	Low **(24)**	Low **(12)**
Status	Negative	Negative
Reversibility	Recoverable	Recoverable
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	

Mitigation / Management:

Planning: » Plan internal roads in such a way and in such a location that clearing of vegetation is minimised. Consolidate existing infrastructure as much as possible, and make use of already disturbed areas rather than pristine sites wherever possible. » Retain / re-establish and maintain natural vegetation in all areas outside of the development footprint. Construction: » Rehabilitation of all construction areas. » Ensure that vegetation is not cleared unnecessarily to make way for access roads and ancillary buildings. Operation: » Maintenance of roads to avoid erosion and suppress dust. Decommissioning: » Removal of infrastructure and roads not required for post decommissioning use and rehabilitation of the footprint areas. » Monitor rehabilitated areas post-decommissioning and implement remedial actions.
Cumulative impacts: The construction of the substation, overhead power line, internal roads and buildings, will increase the cumulative visual impact of industrial type infrastructure within the region. This is relevant in light of existing roads and power lines already present in the area.
Residual impacts: The visual impact will be removed after decommissioning, provided the access roads are removed and rehabilitated. Failing this, the visual impact will remain.

Nature of Impact: Potential visual impact of shadow flicker on observers in close proximity thereto. Shadow flicker (as a result of the turbines) only occurs when the sky is clear, and when the rotor blades are between the sun and the receptor (i.e. when the sun is low). De Gryse in Scenic Landscape Architecture (2006) found that "most shadow impact is associated with 3-4 times the height of the object". Based on this research, a 320m buffer along the edge of the facility is submitted as the zone within which there is a risk of shadow flicker occurring. There are no roads or places of residence within the 320 m buffer. The significance of shadow flicker is therefore anticipated to be low.		
	No mitigation	***Mitigation considered***
Extent	Local **(4)**	N/a
Duration	Long term **(4)**	N/a
Magnitude	Low **(4)**	N/a
Probability	Very Improbable **(1)**	N/a
Significance	Low **(12)**	N/a
Status	Negative	N/a
Reversibility	Recoverable	N/a
Irreplaceable loss of resources?	No	N/a
Can impacts be mitigated?	No	
Mitigation / Management: Decommissioning:		

Removal of infrastructure not required for post decommissioning use and rehabilitation of the footprint areas.
Cumulative impacts: The construction of wind turbines together with the associated infrastructure will increase the cumulative visual impact of industrial type infrastructure within the region.
Residual impacts: The visual impact will be removed after decommissioning, provided the facility and ancillary infrastructure is removed. Failing this, the visual impact will remain.

Nature of Impact: Potential visual impact of lighting on visual receptors in close proximity of the proposed facility.

Lighting impacts relate to the effects of glare and sky glow. The source of glare light, although not as intense as direct lighting, is the aircraft warning lights mounted on top of the hub of the wind turbines. These lights are less aggravating due to the toned-down red colour, but have the potential to be visible from a great distance. There is no mitigation for this impact.

Sky glow is the condition where the night sky is illuminated when light reflects off particles in the atmosphere such as moisture, dust or smog. The sky glow intensifies with the increase in the amount of light sources. Each new light source, especially upwardly directed lighting, contribute to the increase in sky glow. The wind energy facility may contribute to the effect of sky glow within this environment. The area surrounding the facility is primarily demarcated as conservation areas, which are highly sensitive to lighting impacts.

	No mitigation	***Mitigation considered***
Extent	Local **(4)**	Local **(4)**
Duration	Long term **(4)**	Long term **(4)**
Magnitude	High **(8)**	Moderate **(6)**
Probability	Probable **(3)**	Improbable **(2)**
Significance	Moderate **(48)**	Low **(28)**
Status	Negative	Negative
Reversibility	Recoverable	Recoverable
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	

Mitigation:

Planning & operation:

» Shielding the sources of light by physical barriers (walls, vegetation, or the structure itself);
» Limiting mounting heights of lighting fixtures, or alternatively using foot-lights or bollard level lights;
» Making use of minimum lumen or wattage in fixtures;
» Making use of down-lighters, or shielded fixtures;
» Making use of Low Pressure Sodium lighting or other types of low impact lighting.
» Making use of motion detectors on security lighting. This will allow the site to remain in relative darkness, until lighting is required for security or maintenance purposes.

Cumulative impacts: The existing town of Kleinzee already generates lighting impacts at night. The impact of the proposed WEF will contribute to a regional increase in lighting impact.
Residual impacts: The visual impact will be removed after decommissioning, provided the facility and ancillary infrastructure is removed. Failing this, the visual impact will remain.

Nature of Impact: Potential visual impact of the proposed facility on visual character and sense of place of the region		
Sense of place refers to a unique experience of an environment by a user, based on his or her cognitive experience of the place. Visual criteria, specifically the visual character of an area (informed by a combination of aspects such as topography, level of development, vegetation, noteworthy features, cultural / historical features, etc.), play a significant role. An impact on the sense of place is one that alters the visual landscape to such an extent that the user experiences the environment differently, and more specifically, in a less appealing or less positive light. Specific aspects contributing to the sense of place of this region include the rural and undeveloped character of the area. A sense of remoteness is evident when travelling through the area. Approaching Kleinzee and the mined areas, this sense of place is altered. The location of the proposed wind energy facility close to Kleinzee can be regarded as a transition zone between a built-up and rural area, within which changes to the sense of place may be more acceptable to sensitive viewers. Given the vastness of this region, where this particular sense of place is experienced widely, any change to it close to a disturbed area is likely to be of low significance.		
	No mitigation	***Mitigation considered***
Extent	Regional **(3)**	N/a
Duration	Long term **(4)**	N/a
Magnitude	Low **(4)**	N/a
Probability	Improbable **(2)**	N/a
Significance	Low **(22)**	N/a
Status	Negative	N/a
Reversibility	Recoverable	N/a
Irreplaceable loss of resources?	No	N/a
Can impacts be mitigated?	No	

Mitigation / Management: <u>Planning:</u> » Retain / re-establish and maintain natural vegetation in all areas outside of the development footprint. <u>Operations:</u> » Maintain the general appearance of the facility as a whole. <u>Decommissioning:</u> » Remove infrastructure not required for the post-decommissioning use of the site. » Rehabilitate all areas. Consult an ecologist regarding rehabilitation specifications. » Monitor rehabilitated areas post-decommissioning and implement remedial actions.
Cumulative impacts: The construction of wind turbines together with the associated infrastructure will increase the cumulative visual impact of industrial type infrastructure within the region. This is relevant in light of the power line infrastructure already present in the area.
Residual impacts: The visual impact will be removed after decommissioning, provided the facility and ancillary infrastructure is removed. Failing this, the visual impact will remain.

Implications for project implementation

» The construction and operation of the proposed Project Blue Wind Energy Facility and its associated infrastructure, will have a visual impact on the study area, specifically within 5km of the proposed facility.
» The anticipated visual impacts listed above (i.e. post mitigation impacts) range from moderate to low, and none are considered to be fatal flaws for the proposed wind energy facility.
» Mitigation measures as proposed must be implemented.

7.3.6. Potential Heritage Impacts

The assessment of Phase 1 impacts is limited to archaeology since impacts to the landscape are considered to be insignificant. However, one very large archaeological site will be impacted by the access road. Mitigation would be easy to accomplish, though should the present road alignment be retained then it will be a time-consuming exercise.

Impact tables summarising the significance of impacts on heritage sites associated with the wind energy facility

Nature: Impacts to heritage resources for Phase 1 including the access road through identified archaeological site (DKG2012/048)		
	Without mitigation	**With mitigation**
Extent	Local (2)	Local (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	Moderate (6)	Small (0)

Probability	Definite (5)	Probable (3) [Improbable (2) with avoidance]
Significance	**High (65)**	**Low (18) [Low (12) with avoidance]**
Status	Negative	Negative
Reversibility	No	
Irreplaceable loss of resources?	Yes	
Can impacts be mitigated?	Yes through avoidance or sampling.	
Mitigation: » Avoid heritage site through realignment of access road. » If it is not possible to avoid impact, undertake archaeological excavation and sampling.		
Cumulative impacts: » There are probably hundreds of thousands of archaeological sites in the Namaqualand Sandveld and loss (with mitigation) of some will thus not be significant.		
Residual impacts: » Loss of heritage sites.		

Implications for project implementation

» Phase 1 is relatively small and there will not be great impacts from the turbines. Just four hours of archaeological mitigation are required if the current layout is implemented. However, the access road that bisects the two graveyards at Grootmis will result in extensive impacts to numerous shell scatters spread over a wide area and this is estimated to require about 50 to 60 hours of work to mitigate should this alignment be used. An alternative alignment is strongly favoured here.

» Impacts to archaeological resources can generally be easily mitigated, although in some cases this would be time-consuming due to the extensive numbers of sites or occurrences to be impacted.

» In general, high to medium significance impacts for archaeology will be reduced to low through mitigation

» It is concluded that the proposed Project Blue Wind Energy Facility: Phase 1 should be allowed to proceed.

» Prior to construction a final walk-down survey must be carried out in order to examine any areas not yet checked and any turbine positions that have been changed or added subsequent to the Phase 1 survey. Archaeological mitigation as required must then be carried out.

» If any unmarked pre-colonial burials are intersected during the construction phase of the project then these should be reported to SAHRA or an archaeologist so that appropriate action can be taken.

7.3.7. Potential Noise Impacts

The Scoping-level noise impact assessment indicated that Phase 1 of the development would pose no risk to any potential noise-sensitive development (NSD). Therefore, no impact is expected and this impact is not assessed further here.

This phase of the development will however add to the cumulative noise impacts on NSDs located in close proximity to Phase 3 (refer to Chapter 11).

7.3.8. Potential Social Impacts

Impacts associated with the Construction Phase

The key social issues associated with the construction phase are the following:

Potential positive impacts

» Creation of employment and business opportunities, and opportunity for skills development and on-site training.

Potential negative impacts

» Impacts associated with the presence of construction workers on local communities;
» Increased risks to stock, crops, grazing and farming infrastructure associated with the presence of construction workers;
» Impact of heavy vehicles on local roads;
» Loss of agricultural land associated with construction related activities.

Impact tables summarising the significance of social impacts associated with the construction of the wind energy facility

Nature: ***Creation of local employment and business opportunities during the construction phase associated with proposed wind energy facility***   Based on the information from other WEFs the capital expenditure associated with the construction of Phase 1 (20 MW) would be ~ R320 million (with Phases 2 and 3 being R900 million and R1.2 billion respectively). The total capital expenditure associated with the full 150MW (Phase 1, 2 and 3) facility would be region of R2.4 billion (2012 Rands).   The establishment of a 150 MW wind energy facility would take ~ 24 months and create approximately 300 construction related jobs. Of this total approximately 25 % (75) will be available to skilled personnel (engineers, technicians, management and supervisory), ~ 15 % (45) to semi-skilled personnel (drivers, equipment operators), and ~ 60% (180) to low skilled personnel (construction labourers, security staff). The employment opportunities associated with each phase would be ~ 48 for Phase 1 (20MW), ~ 112 for Phase 2 (56 MW) and ~ 148 for Phase 3 (74MW).

The total wage bill with the construction of a 150MW facility (300 employees X 24 months) is estimated to be in the region of R89 million. This is based on the assumption that the average monthly salary for low, semi and skilled workers is R5 000, R12 000 and R30 000 respectively. The capital expenditure is anticipated to be in the region of R2.4 billion for a 150 MW wind energy facility.

Members from the local community are likely to be in a position to qualify for the majority of the low skilled and some of the semi-skilled employment opportunities. The majority of these employment opportunities are also likely to accrue to Historically Disadvantaged (HD) members from the local community. Given the high unemployment levels and limited job opportunities in the area this will represent a significant social benefit. The remainder of the semi-skilled and majority of the skilled employment opportunities are likely to be associated with the contactors appointed to construct the wind energy facility and associated infrastructure. In terms of accessibility the majority of the construction workers from outside the area are likely to be accommodated in Kleinsee. The findings of the SIA indicate that old De Beers mining hostels could be used to accommodate construction workers.

In terms of training, the contractors are likely to provide on-site training and skills development opportunities. However, the majority of benefits are likely to accrue to personnel employed by the relevant contractors. In the absence of specific commitments from the developer to employ local contractors the potential for meaningful skills development and training for members from the local communities are likely to be limited.

A percentage of the wage bill will be spent in the local economy and will create opportunities for local businesses in Kleinsee and Springbok. The sector of the local economy that is most likely to benefit from the proposed development is the local service industry. The potential opportunities for the local service sector would be linked to accommodation, catering, cleaning, transport and security, etc. associated with the construction workers on the site. The injection of income into the area in the form of wages and rental for accommodation will also create opportunities for local businesses in the Kleinsee and Springbok. The sector of the local economy that is most likely to benefit from the proposed development is the local service industry. The benefits to the local economy will be confined to the construction period (24 months).

In addition to the employment benefits, the expenditure of R2.4 billion during the construction phase will create business opportunities for the local and regional economy. However, given the technical nature of the project and the high import content associated with wind turbines the opportunities for the local economy is likely to be limited. However, some of the required civil engineering and construction skills may be able to be sourced from Springbok.

The local hospitality industry will also benefit from the accommodation and meals for professionals (engineers, quantity surveyors, project managers, product representatives etc.) and other personnel involved on the project. Experience from other construction projects indicates that the potential opportunities are not limited to onsite construction workers but also to consultants and product representatives associated with the project.

	Without Mitigation	**With Enhancement**
Extent	Local – Regional (2) (Rated as 2 due to potential opportunities for local communities and businesses)	Local – Regional (3) (Rated as 3 due to potential opportunities for local communities and businesses)
Duration	Short term (2)	Short term (2)
Magnitude	Low (4)	Low (4)
Probability	Highly probable (4)	Highly probable (4)
Significance	Medium (32)	Medium (36)
Status	Positive	Positive
Reversibility	N/A	N/A
Irreplaceable loss of resources?	N/A	N/A
Can impact be enhanced?	Yes	

Enhancement measures:

Employment

» Where reasonable and practical, WWK should appoint local contractors and implement a 'locals first' policy, especially for semi and low-skilled job categories.
» Prior to commencement of the construction phase, WWK should meet with representatives from the NKLM to establish the existence of skills and unemployment databases for the relevant municipal areas. If such databases exists, they should be made available to the appointed contractors.
» The local authorities, community representatives and organisations on the interested and affected party database should be informed of the final decision regarding the project and the potential job opportunities for locals and the employment procedures which WWK intends to implement during the construction phase.
» Where feasible, training and skills development programmes for locals should be initiated prior to the initiation of the construction phase.

Business

» WWK should develop a database of local companies, specifically companies that qualify as BBBEE companies, which qualify as potential service providers (e.g. construction companies, catering companies, waste collection companies, security companies etc.) prior to the commencement of the tender process for construction contractors. These companies should be notified of the tender process and invited to bid for project-related work;
» Where possible, WWK should assist local BBBEE companies to complete and submit the required tender forms and associated information;
» The NKLM, in conjunction with representatives from the local hospitality and retail industries, should identify strategies aimed at maximising the potential benefits associated with the project.

Note that while preference to local employees and companies is recommended, it is recognised that a competitive tender process may not guarantee the employment of local labour for the construction phase.

Cumulative impacts:

Opportunity to up-grade and improve skills levels in the area. However, due to relatively small

number of local employment opportunities and limited skills range, this benefit is likely to be limited.
Residual impacts: Improved pool of skills and experience in the local area. However, due to relatively small number of local employment and skills-transfer opportunities this benefit is likely to be limited.

Nature: ***Potential impacts on family structures and social networks associated with the presence of construction workers during construction the wind energy facility***

The presence of construction workers poses a potential risk to family structures and social networks. While the presence of construction workers does not in itself constitute a social impact, the manner in which construction workers conduct themselves can impact on local communities. The most significant negative impact is associated with the disruption of existing family structures and social networks. This risk is linked to potentially risky behaviour of male construction workers, including:

» An increase in alcohol and drug use;
» An increase in crime levels;
» The loss of girlfriends and or wives to construction workers;
» An increase in teenage and unwanted pregnancies;
» An increase in prostitution;
» An increase in sexually transmitted diseases (STDs).

The findings of the SIA indicate that the potential impact of outside construction workers on the local community is an issue of concern. In this regard problems were experienced with construction workers housed in or near Kommagas/ Buffelsrivier during the tarring of R355 from Springbok to Buffelsrivier and the construction of the Eskom substation near Kommagas.

The potential risk to local residents in the area could potentially be mitigated by implementing a local employment policy, specifically for the low and semi-skilled employment opportunities associated with the construction phase. Employing members from the local community to fill the low-skilled job categories would reduce the risk and mitigate the potential impacts on the local communities. These workers will be from the local community and form part of the local family and social network and, as such, the potential impact will be low. However, due to the potential mismatch of skills and low education levels, the potential employment opportunities for the members from these local communities may be low.

WWK has indicated that construction workers will not be accommodated on site and will be transported to and from the site on a daily basis. The findings of the SIA indicate that non local workers can be accommodated in the DBC hostels in Kleinsee which are currently vacant. There are a total of 384 rooms and DBC is keen on seeing these facilities used. This issue would need to be discussed with the NKLM who are currently in the process of taking over the running of these and other services from DBC.

The potential risks posed by construction workers to the local community can be reduced to low by employing members from the local community. While the risks associated with construction workers at a community level will be low, at an individual and family level they may be significant, especially in the case of contracting a sexually transmitted disease or an unplanned pregnancy. However, given the nature of construction projects it is not possible to totally avoid these potential impacts at an individual or family level.

	Without Mitigation	**With Mitigation**
Extent	Local (3) (Rated as 3 due to potential severity of impact on local communities)	Local (1) (Rated as 1 due to potential severity of impact on local communities)
Duration	Short term for community as a whole (2) Long term-permanent for individuals who may be affected by STDs etc. (5)	Short term for community as a whole (2) Long term-permanent for individuals who may be affected by STDs etc. (5)
Magnitude	Low for the community as a whole (4) High-Very High for specific individuals who may be affected by STDs etc. (10)	Low for community as a whole (4) High-Very High for specific individuals who may be affected by STDs etc. (10)
Probability	Probable (3)	Probable (3)
Significance	Low for the community as a whole (27) Moderate-High for specific individuals who may be affected by STDs etc. (54)	Low for the community as a whole (21) Moderate-High for specific individuals who may be affected by STDs etc. (48)
Status	Negative	Negative
Reversibility	No in case of HIV	No in case of HIV
Irreplaceable loss of resources?	Yes, if people contract HIV/AIDS. Human capital plays a critical role in communities that rely on farming for their livelihoods	
Can impact be mitigated?	Yes, to some degree. However, the risk cannot be eliminated	

Mitigation:

- Where reasonable and practical, WWK should appoint local contractors and implement a 'locals first' policy, especially for semi and low-skilled job categories.
- WWK should liaise with the NKLM to ensure that that recommended mitigation measures are implemented.
- WWK and the contractor(s) should, in consultation with representatives from the MF, develop a code of conduct for the construction phase. The code should identify which types of behaviour and activities are not acceptable. Construction workers in breach of the code should be dismissed. All dismissals must comply with the South African labour legislation.
- WWK and the contractor should implement an HIV/AIDS awareness programme for all construction workers at the outset of the construction phase.
- The movement of construction workers on and off the site should be closely managed and monitored by the contractors. In this regard the contractors should be responsible for making the necessary arrangements for transporting workers to and from site over weekends or after hours.

» The contractors should make the necessary arrangements for allowing workers from outside the area to return home over weekends and/ or on a regular basis. This would reduce the risk posed to local family structures and social networks. » With the exception of security personnel, no construction workers should be accommodated on the site overnight.
Cumulative impacts: Impacts on family and community relations that may, in some cases, persist for a long period of time. Where unplanned / unwanted pregnancies occur, or members of the community are infected by an STD, specifically HIV, the impacts may be permanent and have long term to permanent cumulative impacts on the affected individuals and/or their families and the community.
Residual impacts: Impacts on family and community relations that may, in some cases, persist for a long period of time. Where unplanned / unwanted pregnancies occur, or members of the community are infected by an STD, specifically HIV, the impacts may be permanent and have long term to permanent cumulative impacts on the affected individuals and/or their families and the community.

Nature: ***Potential loss of livestock, poaching and damage to farm infrastructure associated with the presence of construction workers on site*** The movement of construction workers on and off the site poses a potential threat to farm infrastructure, such as fences and gates, which may be damaged. Stock losses may also result from gates along access roads being left open and/or fences being damaged. The issue of trespassing, stock theft and illegal hunting were raised as concerns by commercial farmers and Kleinsee Farmers Union. It should however be noted that the majority of commercial farms are located to the south of the proposed site, across Buffels River, near the proposed Eskom wind energy facility site. The local farmers interviewed indicated that stock theft was increasingly becoming an issue on commercial farms, especially since DBC had closed down Kleinsee its operations. Illegal hunting of small antelope, etc. (mainly with dogs, but also small calibre rifles) and removal of tortoises was also reported as a growing problem in area. The area is also rich in rare succulents which have a high value on the black market. DBC currently owns the majority of the proposed development site and surrounding properties, but is in process of selling off, mainly to subsidiary of Trans-Hex (which may potentially lease out grazing. Portions of the site adjacent to DBC land is rented out for grazing; on others (e.g. Manelsvlei across R355 and Buffels River) DBC only has surface rights, and these are also used for grazing by "owners" of grazing rights. While the overall stock numbers are low the area vulnerable due to large size of properties and low population densities. All of the parties interviewed indicated that no construction workers should be accommodated on the site.		
	Without Mitigation	**With Mitigation**
Extent	Local (4) (Rated as 4 due to potential severity of impact on local farmers)	Local (2)
Duration	Medium term (3)	Medium term (3)
Magnitude	Moderate (6) (Due to reliance on agriculture and	Low (4)

	livestock for maintaining livelihoods)	
Probability	Probable (3)	Probable (3)
Significance	Medium (39)	Low (27)
Status	Negative	Negative
Reversibility	Yes, compensation paid for stock losses etc.	Yes, compensation paid for stock losses etc.
Irreplaceable loss of resources?	No	No
Can impact be mitigated?	Yes	

Mitigation:

- WWK in consultation with the NKLM and local farmers should develop a Code of Conduct for construction workers. The Code of Conduct should be signed by WWK and all relevant contractors prior to the commencement of any on-site construction activities.
- WWK should hold contractors liable for compensating farmers and communities in full for any stock losses and/or damage to farm infrastructure that can be linked to construction workers. This should be contained in the Code of Conduct, to be signed between WWK, the contractors and neighbouring landowners. The agreement should also cover loses and costs associated with any fires caused by construction workers or construction related activities (see below).
- A designated Environmental Control Officer (ECO) should be appointed to monitor the conduct of staff. Affected landowners should have on-going access to the ECO.
- The EMP must outline procedures for managing and storing waste (including arrangements for plastic waste etc.) on site.
- Contractors must ensure that all workers are informed of the conditions contained on the Code of Conduct at the outset of the construction phase. The consequences of stock theft, poaching and trespassing on adjacent farms should be emphasised.
- Contractors must ensure that workers who are found guilty of stealing livestock, poaching and/or damaging farm infrastructure are dismissed and formally charged. This should be contained in the Code of Conduct. All dismissals must be in accordance with South African labour legislation.
- WWK should enter into legally binding arrangements with regard to compensation with all relevant property owners prior to the start of construction.

Cumulative impacts:
None, provided that losses are adequately compensated for.

Residual impacts:
None, provided that losses are adequately compensated for.

Nature: ***Potential loss of livestock, crops and houses, damage to farm infrastructure and threat to human life associated with increased incidence of veld fires***

The presence of construction workers and construction-related activities on the site can poses an increased risk of veld fires that in turn pose a threat to the natural vegetation, farmsteads, livestock and wildlife in the area. In the process, farm and tourism infrastructure may also be damaged or destroyed and human lives threatened. The issue of fire has been raised as a key concern by most farmers in the area. In the case of the proposed Project Blue wind energy facility the sparse, succulent vegetation on the site is not prone to veld fires. In addition, none of the famers interviewed indicated that this was an issue of concern.

	Without Mitigation	**With Mitigation**
Extent	Local (2)	Local (1)
Duration	Short term (2)	Short term (2)
Magnitude	Low (4)	Low (4)
Probability	Probable (3)	Probable (3)
Significance	Low (24)	Low (21)
Status	Negative	Negative
Reversibility	Yes, compensation paid for stock losses etc.	Yes, compensation paid for stock losses etc.
Irreplaceable loss of resources?	No	No
Can impact be mitigated?	Yes	

Mitigation:

Despite the low risk of veld fires, WWK should enter into an agreement with the affected landowners whereby the company will compensate for damages proven to be attributed to activities associated with the wijd energy facility. This includes losses associated veld fires. In addition, the potential increased risk of veld fires can be mitigated. The detailed mitigation measures are outlined in the EMP for the construction and operation phases. The aspects that should be covered include:

» Contractor to ensure that open fires on the site for cooking or heating are not allowed except in designated areas.
» Contractor to ensure that construction related activities that pose a potential fire risk, such as welding, are properly managed and are confined to areas where the risk of fires has been reduced. Measures to reduce the risk of fires include clearing working areas and avoiding working in high wind conditions when the risk of fires is greater. In this regard special care should be taken during the high risk dry, windy summer months.
» Contractor to provide adequate fire fighting equipment on-site.
» Contractor to provide fire-fighting training to selected construction staff.
» As per the conditions of the Code of Conduct, in the advent of a fire being caused by construction workers and or construction activities, the appointed contractors must compensate farmers for any damage caused to their farms. The contractor should also compensate the fire fighting costs borne by farmers and local authorities.

In addition the landowner should also ensure that they join the local fire protection agency.

Cumulative impacts:

No, provided losses are compensated for.

Residual impacts:

No, provided losses are compensated for.

Nature: ***Potential impacts to road surfaces and road safety associated with the movement of construction related traffic to and from the site***

The establishment of a wind energy facility requires abnormal loads associated with the transport of turbine components onto site. These will include abnormally long loads associated with ~ 60 m rigid turbine blades, as well as abnormally heavy loads associated with ~ 80 tonne nacelles. In addition, a crawler crane (~ 750 t) and assembly cranes will also need to be transported onto and off the sites. Other heavy equipment will include normal civil engineering construction equipment such as graders, excavators, cement trucks, etc.

Access to the site is likely to be via the R355 Springbok-Buffelsrivier Road. This road provides access to small scale mines along road, De Beers land, and communal grazing areas around Kommagas and Buffelsrivier. Potential delays associated with abnormal loads may develop along the road due to the mountainous terrain and at the Spektakel Pass. These delays would impact on other road users, including tourists. The local traffic authorities should therefore be informed of the dates and times of abnormal load trips. In addition, trips during peak tourism season periods, namely the Easter weekend, flower season (August-September) and December holidays should be carefully planned to minimize the impact on tourist related traffic.

	Without Mitigation	**With Mitigation**
Extent	Local (3) (Rated as 3 due to potential severity of impact on local farmers)	Local (2)
Duration	Short term (2)	Short term (2)
Magnitude	Low (4)	Low (4)
Probability	Probable (3)	Probable (3)
Significance	Low (27)	Low (24)
Status	Negative	Negative
Reversibility	Yes	
Irreplaceable loss of resources?	No	No
Can impact be mitigated?	Yes	

Mitigation:

» Movement of heavy vehicle traffic should, where possible, be carefully planned to minimize the impact on tourist related traffic during the peak tourist season periods (Easter weekend, flower season (August-September) and December holidays).

» Movement of construction traffic should be limited to weekdays. In addition, the movement of heavy vehicles on the local roads, specifically the R355 and Kommagas gravel road should not be permitted after 13h00 on Friday afternoons and before 09h00 on Monday mornings as these are times that are likely to impact on weekend visitors to the area.

» The contractor should inform local farmers and representatives from the NKLM and Tourism Sector of dates and times when abnormal loads will be undertaken.

» The contractor should ensure that damage caused to roads by construction related activities, including heavy vehicles, is repaired before the completion of the construction phase. The costs associated with the repair must be borne by the developer.

» All vehicles must be road-worthy and drivers must be qualified and made aware of the potential road safety issues and need for strict speed limits.

Cumulative impacts:

If damage to roads is not repaired then this will impact on the farming activities in the area and also result in higher maintenance costs for vehicles of local farmers and other road users. The costs will be borne by road users who were not responsible for the damage.

Residual impacts: If damage to roads is not repaired then this will impact on the farming activities in the area and also result in higher maintenance costs for vehicles of local farmers and other road users.

Nature: ***Loss of farmland and natural vegetation*** The activities associated with the construction phase, such as establishment of access/haul roads, the movement of heavy vehicles, the establishment of lay-down areas and foundations for the wind turbines, substations and power lines will potentially damage topsoil and vegetation and result in losses of the grazing resource.		
	Without Mitigation	**With Mitigation**
Extent	Local (2)	Local (1)
Duration	Long term-permanent if disturbed areas are not rehabilitated (5)	Short term if damaged areas are rehabilitated (1)
Magnitude	Low (4)	Low (4)
Probability	Probable (3)	Probable (3)
Significance	Medium (33)	Low (18)
Status	Negative	Negative
Reversibility	Yes, but long period required	Yes, but long period required
Irreplaceable loss of resources?	No. Affected land can be restored, provided appropriate rehabilitation is implemented. Due to the aridity of the area, effective rehabilitation may however take long to achieve, and may prove costly.	
Can impact be mitigated?	Yes, provided efficient site rehabilitation is carried out.	

Mitigation:

» The footprint associated with the construction related activities (access roads, turning circles, construction platforms, workshop etc.) should be minimised.
» An Environmental Control Officer (ECO) should be appointed to monitor the entire duration of the construction phase.
» All areas disturbed by construction related activities, such as access roads, construction platforms, workshop area etc., should be rehabilitated at the end of the construction phase.
» The implementation of a rehabilitation programme should be included in the terms of reference for the contractor/s appointed to establish the wind energy facility. The specifications for the rehabilitation programme should be drawn up by a suitably qualified specialist.
» The implementation of the Rehabilitation Programme should be monitored by the ECO;
» • Compensation should be paid to any farmers that suffer a permanent loss of land due to the establishment of the wind energy facility. Compensation should be paid by WWK and based on accepted land values for the area;
» WWK should investigate the option of establishing an Environmental Rehabilitation Trust Fund to cover the costs of decommissioning and rehabilitation of disturbed areas. The Trust Fund should be funded by a percentage of the revenue generated from the sale of energy to the national grid over the 2 year operational life of the facility. The rationale for the establishment of a Rehabilitation Trust Fund is linked to the experiences with the mining sector in South Africa and failure of many mining companies to allocate sufficient funds during the operational phase to cover the costs of rehabilitation and closure.

» WWK should consult with the affected property owner/s with regard to the timing of the construction phase in order to enable them to plan his farming activities.
Cumulative impacts: Overall loss of farmland could impact on the livelihoods of the affected farmers, their families and the workers on the farms and their families. However, disturbed areas can be rehabilitated. In addition, carrying capacity of the area is low.
Residual impacts: Overall loss of farmland could impact on the livelihoods of the affected farmers, their families and the workers on the farms and their families.

Impacts associated with the Operation Phase

The following key social issues are of relevance to the operational phase:

<u>Potential positive impacts</u>

» Creation of employment and business opportunities. The operational phase will also create opportunities for skills development and training;
» Benefits associated with the establishment of a Community Trust;
» The establishment of renewable energy infrastructure.

<u>Potential negative impacts</u>

» The visual impacts and associated impact on sense of place and the character of the landscape (as discussed in Section 7.3.5);
» Potential impact on tourism.

Impact tables summarising the significance of social impacts associated with the operation of the wind energy facility

Nature: ***Creation of employment and business opportunities associated with the operational phase of the wind energy facility*** Based on information from other WEFs the establishment of Phase 1-3 (150MW) will create approximately 50 permanent employment opportunities over the operational phase is expected to last 20 years. Of these totals approximately 20% will be available to skilled personnel and 80% to semi and low skilled personnel. This represents a significant benefit for an area that has been negatively affected by the closure of DBC Kleinsee operations. Members from the local community are likely to be in a position to qualify for the majority of the low skilled and some of the semi-skilled employment opportunities associated with the proposed Project Blue wind energy facility. The majority of these employment opportunities are also likely to accrue to Historically Disadvantaged (HD) members from the local community. Given the high unemployment levels and limited job opportunities in the area this will represent a significant social benefit. The remainder of the semi-skilled and majority of the skilled employment opportunities are likely to be associated with people from outside the area. Due to the need for specialised skills it may be necessary to import the required operational and maintenance skills from other parts of South Africa or even overseas. However, it will be possible

to increase the number of local employment opportunities through the implementation of a skills development and training programme linked to the operational phase. Such a programme would support the strategic goals of promoting local employment and skills development contained in the NDM and NKLM IDP. The NDM and NKLM IDP Managers and Ward 8 councillor all indicated that Kommagas and Buffelsrivier should benefit from employment and meaningful skills development and training associated with the proposed wind energy facility. In this regard WWK has indicated that they are committed to local employment and the implementation of a training and skills development programme for members from the local community.

Given the location of the proposed WEF the majority of permanent staff is likely to reside Kleinsee. In terms of accommodation options, a percentage of the new permanent employees may purchase houses in Kleinsee while others may decide to rent. Both options would represent a positive economic benefit for the region. In addition, a percentage of the annual wage bill earned by permanent staff would be spent in the regional and local economy. This will benefit local businesses in the local towns in the area. The benefits to the local economy will extend over the 20-year operational lifespan of the project. The local hospitality industry is also likely to benefit from the operational phase. These benefits are associated with site visits by company staff members and other professionals (engineers, technicians etc.) who are involved in the company and the project but who are not linked to the day-to-day operations.

The establishment of a Community Trust as required in terms of the Request for Proposal Document prepared by the Department of Energy will also create potential benefits for the local community (see below).

	Without Mitigation	**With Enhancement**
Extent	Local (1)	Local (2)
Duration	Long term (4)	Long term (4)
Magnitude	Minor (2)	Minor (2)
Probability	Probable (3)	Probable (3)
Significance	Low (21)	Low (24)
Status	Positive	Positive
Reversibility	N/A	
Irreplaceable loss of resources?	No	
Can impact be enhanced?	Yes	

Enhancement:

The enhancement measures listed above to enhance local employment and business opportunities during the construction phase, also apply to the operational phase. In addition:

» WWK should implement a training and skills development programme for locals during the first 5 years of the operational phase. The aim of the programme should be to maximise the number of people from local communities and the broader NDM and NKLM area employed during the operational phase of the project.

Cumulative impacts:

Creation of permanent employment and skills and development opportunities for members from the local community and creation of additional business and economic opportunities in the area

Residual impacts:

Creation of permanent employment and skills and development opportunities for members from the local community and creation of additional business and economic opportunities in the area

<table>
<tr><td colspan="3">Nature: Benefits associated with establishment of a community trust
In terms of the Request for Proposal document prepared by the Department of Energy all bidders for operating licences for renewable energy projects must demonstrate how the proposed development will benefit the local community. This can be achieved by establishing a Community Trust which is funded by revenue generated from the sale for energy. WWK has indicated that they are committed to establishment of a community trust. Community Trusts provide an opportunity to generate a steady revenue stream that is guaranteed for a 20 year period. This revenue can be used to fund development initiatives in the area and support the local community. The long term duration of the revenue stream also allows local municipalities and communities to undertake long term planning for the area. The revenue from the proposed facility can be used to support a number of social and economic initiatives in the area, including:
» Education;
» School feeding schemes;
» Training and skills development;
» Infrastructure development;
» Support for SMMEs.

In addition, the establishment of the proposed wind energy facility is unlikely to have a significantly impact on the agricultural land uses that underpin the local economic activities in the area. The loss of this relatively small area is therefore unlikely to impact on the current and future farming activities. Experience has however also shown that Community Trusts can be mismanaged. This issue will need to be addressed in order to maximise the potential benefits associated with the establishment of a community trust.

The benefits associated with Community Trusts are linked size of the facility. The larger the facility the greater the potential revenue stream generated for the Trust.</td></tr>
<tr><td></td><td>Without Mitigation</td><td>With Enhancement[9]</td></tr>
<tr><td>Extent</td><td>Local (2)</td><td>Local and Regional (4)</td></tr>
<tr><td>Duration</td><td>Long term (4)</td><td>Long term (4)</td></tr>
<tr><td>Magnitude</td><td>Low (4)</td><td>Moderate (6)</td></tr>
<tr><td>Probability</td><td>Probable (3)</td><td>Definite (5)</td></tr>
<tr><td>Significance</td><td>Medium (30)</td><td>High (70)</td></tr>
<tr><td>Status</td><td>Positive</td><td>Positive</td></tr>
<tr><td>Reversibility</td><td>N/A</td><td></td></tr>
<tr><td>Irreplaceable loss of resources?</td><td>No</td><td></td></tr>
<tr><td>Can impact be enhanced?</td><td>Yes</td><td></td></tr>
<tr><td colspan="3">Enhancement:
In order to maximise the benefits and minimise the potential for corruption and misappropriation of funds the following measures should be implemented:
» Clear criteria for identifying and funding community projects and initiatives in the area should be identified. The criteria should be aimed at maximising the benefits for the community as a whole and not individuals within the community.</td></tr>
</table>

[9] Enhancement assumes effective management of the community trust

» Strict financial management controls, including annual audits, should be instituted to manage the funds generated for the Community Trust from the proposed wind energy facility.
Cumulative impacts: Promotion of social and economic development and improvement in the overall well-being of the community
Residual impacts: Promotion of social and economic development and improvement in the overall well-being of the community

Nature: *Development of infrastructure to generate clean, renewable energy* South Africa currently relies on coal-powered energy to meet more than 90% of its energy needs. The majority of the coal used to generate energy in South Africa is low grade coal with a high sulphur content. As a result South Africa is the nineteenth largest per capita producer of carbon emissions in the world, and Eskom, as an energy utility, has been identified as the world's second largest producer of carbon emissions. The promotion of renewable energy sources is supported at national and provincial levels. The fit with national and provincial energy policies should be viewed within the context of the site's location the potential impact on the areas sense of place and surrounding tourist related land uses. In addition, the current application is not unique. In this regard, a significant number of wind and solar energy facility developments are currently proposed in the northern Cape Province and other parts of South Africa. The potential contribution of the proposed Project Blue wind energy facility should therefore be regarded as valuable, but should not be overestimated.		
	Without Mitigation	**With Enhancement**
Extent	Local, Regional and National (4)	Local, Regional and National (4)
Duration	Long term (4)	Long term (4)
Magnitude	Moderate (6)	Moderate (6)
Probability	Highly Probable (4)	Highly Probable (4)
Significance	Medium (56)	Medium (56)
Status	Positive	Positive
Reversibility	Yes	
Irreplaceable loss of resources?	Yes, impact of climate change on ecosystems	
Can impact be mitigated?	Yes	
Enhancement: The establishment of the wind energy facility is a mitigation measure in itself. In order to maximize the benefits of the proposed project WWK should: » Use the project to promote and increase the contribution of renewable energy to the national energy supply; » Implement a skills development and training programme aimed at maximizing the number of employment opportunities for local community members; » Investigate the opportunities for establishing a Community Trust that would benefit local, disadvantaged and vulnerable communities.		

Cumulative impacts:
Reduce carbon emissions via the use of renewable energy and associated benefits in terms of global warming and climate change.

Residual impacts:
Reduce carbon emissions via the use of renewable energy and associated benefits in terms of global warming and climate change.

Nature: ***Potential negative impact of the wind energy facility on local tourism***

The impact on tourism is linked to the visual impact on the areas sense of place and landscape character. In this regard the overall visual impacts associated with the full 150MW wind energy facility are likely to be greater than the visual impacts associated with only Phase 1, 2 or 3.

The findings of the SIA indicate that the Garies-Kleinsee route (and then either R355 or Kommagas Road to Springbok) has been identified as a potential tourism development corridor/ scenic circular route in Kamiesberg SDF. However, no decision has been taken by the NKLM on this matter as yet. In addition, the project would require tarring large sections of the route and no budget has been earmarked for this purpose. The development of the route is therefore unlikely in the medium term. The findings of the SIA also indicate that the local tourism sector and I&APs in the area did not believe that wind turbines would impact negatively on the tourism potential of the area. Wind turbines were not viewed as being incompatible with local landscape and the areas sense of place. Representatives from the local authority also indicated that the promotion of the local "green" tourism growth strategy may benefit, and tie-in with other "greening" projects in the area, such as the DBCs dune veld rehabilitation south of Kleinsee).

In addition, the area has been disturbed by mining, and mining in the area to west of the site is likely to continue. This area is likely to remain a restricted area for foreseeable future, and effectively inaccessible to tourism. The relevant area is also severely disturbed. The potential negative impact on the tourism potential of the area is therefore likely to be limited.

The findings of the VIA (MetroGIS, May 2012) indicate that the Potential visual impact of the proposed facility on the visual character and sense of place of the region will be low. This is due to the vastness of this region, where this particular sense of place is experienced widely.

	Without Mitigation	**With Mitigation/Enhancement**
Extent	Local–Regional (1)	Local–Regional (1)
Duration	Long term (4)	Long term (4)
Magnitude	Low (4)	Low (4)
Probability	Probable (3)	Probable (3)
Significance	Low (27)	Low (27)
Status	Negative Positive	Negative Positive
Reversibility	Yes, turbines can be removed	Yes, turbines can be removed
Irreplaceable loss of resources?	No, turbines can be removed	No, turbines can be removed
Can impact be mitigated or enhanced?	No	

Enhancement: » The recommendations contained in the VIA should be implemented.
Cumulative impacts: The wind energy facility has the potential to impact on the experience of tourist and the tourism potential of the area in general in both a negative and positive manner
Residual impacts: The wind energy facility has the potential to impact on the experience of tourist and the tourism potential of the area in general in both a negative and positive manner.

Implications for project implementation

- From a policy and planning perspective, the proposed wind energy facility is strongly supported at a national and local level. The development of a green economy is supported at provincial, District municipality and local municipality levels. This includes local energy generation from renewable sources, as well as eco/ conservation tourism development. Transformation of the Kleinsee economy away from historic mining activities has been identified as a key development priority for Kleinsee. The rehabilitation/ utilisation of disturbed coastal areas have been identified as a further challenge. The proposed Project Blue wind energy facility has the potential to contribute to meeting both of these policy objectives.
- All phases (Phase 1, 2, and 3) of the wind energy facility will create employment and business opportunities for locals during both the construction and operational phase of the project.
- The establishment of a Community Trust creates an opportunity to support local economic development in the area.
- The proposed development represents an investment in clean, renewable energy infrastructure, which, given the challenges created by climate change, represents a positive social benefit for society as a whole.
- The potential benefits will increase if all three Phases are developed.

7.4. Assessment of Cumulative Impacts Associated with the Proposed Wind Energy Facility

Cumulative impact, in relation to an activity, refers to the impact of an activity that in itself may not be significant but may become significant when added to the existing and potential impacts eventuating from similar or diverse activities or undertakings in the area[10]. To some extent a cumulative impact is a regional impact, rather than the local site scale impact, i.e. if something has a regional impact it also has a cumulative impact. Cumulative impacts for this assessment will include any approved renewable energy facilities in the area. The cumulative impact of the Project Blue Wind Energy Facility: Phase 1 has been considered at various levels as follows:

[10] Definition as provided by DEA in the EIA regulations.

1. Impacts of Phase 1 of the wind energy facility plus the other two development phases of the Project Blue Wind Energy Facility (i.e. Phase 2 and Phase 3).
2. Impacts of the wind energy facility and the solar energy facility (proposed by WWK as Phase 4 of the Project Blue Renewable Energy Facility).
3. The additive impact of this project and other approved renewable energy projects within a 10 – 20 km radius of the site. Based on the information available at the time of undertaking this EIA, one other wind energy facility occurs in close proximity to the Project Blue site namely:
   * The proposed Eskom Kleinzee Wind Energy Facility which is located approximately 11km south of the proposed Project Blue site.

The potential *direct* cumulative impacts as a result of the proposed project are expected to be associated predominantly with:

» *Visual impact* on the surrounding area – at a local level and driven primarily by the number of turbines and associated substations proposed within the facility.
» Potential impacts associated with numerous wind energy facilities in the area. One wind energy facility has been authorised (near Koingnaas) and EIA processes for other wind energy facilities are currently being undertaken within the area. Should more than one facility be authorised and constructed, cumulative impacts in terms of visual impacts, impacts on avifauna, ecology and heritage resources (in particular the cultural landscape) could be expected.

The potential *indirect* cumulative impacts as a result of the proposed project are expected to be associated predominantly with:

» Flora, fauna and ecological processes – at a regional level and driven primarily by the on-going negative effects of agricultural activities in the area.
» Increased pressure on road and other infrastructure.

Cumulative effects have been considered within the detailed specialist studies, where applicable (refer to Appendices F -N) and are listed in the tables in section 7.3 above.

7.5. Assessment of the No Go Alternative

South Africa currently relies on coal-powered energy to meet more than 90% of its energy needs. As a result South Africa is one of the highest per capita producers of carbon emissions in the world and Eskom, as an energy utility, has been identified as the world's second largest producer carbon emissions. The national government has set targets for renewables substitution. The No-Development option would represent a lost opportunity for South Africa to supplement its current energy needs with clean, renewable energy. Given South Africa's position as one of the highest per capita producer of carbon emissions in the world, this would represent a negative social cost.

The proposed Project Blue wind energy facility: Phase 1 would contribute 20MW to South Africa's energy needs, with the full facility (Phases 1, 2 and 3) contributing up to 150MW. The proposal is however not unique. A significant number of renewable energy projects have been proposed in other parts of South Africa. Foregoing the proposed Project Blue wind energy facility development is therefore unlikely to impact negatively on South Africa's ability to achieve its stated renewable energy targets.

However, at a local level, the No-Development option would also result in a loss in employment opportunities associated with both the construction and operational phase. In addition, the benefits associated with the establishment of a Community Trust funded by revenue generated from the sale of energy from the wind energy facility would be forfeited. The revenue from the proposed wind energy facility can be used to support a number of social and economic initiatives in the area. These local benefits would be forgone if the proposed wind energy facility is not developed in the proposed area. Given the closure of the Kleinsee mine and the limited economic opportunities in the area this would represent a negative social cost for the local community.

Nature: ***Implementation of the no development option***		
The no-development option would result in the lost opportunity for South Africa to supplement is current energy needs with clean, renewable energy. The No-Development option would also result in the loss of the benefits to the local community and economy associated with the creation of employment opportunities and the establishment of a Community Trust.		
	Without Mitigation	**With Mitigation**
Extent	Local, Regional and National (3)	Local, Regional and National (4)
Duration	Long term (4)	Long term (4)
Magnitude	Low (4)	Medium (6)
Probability	Probable (3)	Highly Probable (4)
Significance	Moderate (33)	Moderate (56)
Status	Negative	Positive
Reversibility	Yes	
Irreplaceable loss of resources?	Yes, impact of climate change on ecosystems	
Can impact be mitigated?	Yes	
Enhancement:		
The proposed wind energy facility should be developed and the mitigation and enhancement measures identified in the EIA should be implemented.		
Cumulative impacts:		
Reduce carbon emissions via the use of renewable energy and associated benefits in terms of global warming and climate change.		
Residual impacts:		
Reduce carbon emissions via the use of renewable energy and associated benefits in terms of global warming and climate change.		

CONCLUSIONS: PHASE 1: PROJECT BLUE WIND ENERGY FACILITY CHAPTER 8

This chapter of the EIA Report provides the conclusions drawn from the assessment of potential impacts associated with the development of the proposed Project Blue Wind Energy facility: Phase 1. This environmental impact assessment (EIA) has been undertaken in accordance with the EIA Regulations published in Government Notice 33306 of June 2010, in terms of Section 24(5) of the National Environmental Management Act (NEMA; Act No 107 of 1998). The scope of the proposed wind energy facility assessed through this EIA included:

» up to 10 wind turbine generator units, appropriately spaced to make use of the wind resource on a study area of approximately 860 ha
» a substation of approximately 80m x 90m in extent
» underground electrical cabling between turbines and the substation
» internal access roads
» a workshop on the facility site

The generating capacity of the facility is expected to be up to 20MW but will be dictated by the choice of turbine, which will be determined by the on-site conditions and the local wind regime following extensive on-site monitoring which is currently underway.

The EIA Phase aimed to achieve the following:

» Provide an overall assessment of the social and biophysical environments affected by the proposed alternatives put forward as part of the project.
» Assess potentially significant impacts (direct, indirect and cumulative, where required) associated with the proposed wind energy facility.
» Evaluate the an on-site substation site, associated power line and underground cabling, and access roads, for consideration by the decision-making authorities.
» Identify and recommend appropriate mitigation measures for potentially significant environmental impacts.
» Undertake a fully inclusive public involvement process to ensure that I&APs are afforded the opportunity to participate, and that their issues and concerns are recorded.

The preceding chapters of this report together with the specialist studies contained within Appendices F - N provide a detailed assessment of the environmental impacts on the social and biophysical environment as a result of the proposed project. This chapter concludes the Draft EIA Report by providing a summary of the conclusions of the assessment of the proposed site for the wind energy facility and associated infrastructure. In so doing, it draws on the information gathered as part of the EIA process and the knowledge gained by the environmental consultants during the course of the EIA and presents an informed opinion of the environmental impacts associated with the proposed project. The conclusions and recommendations of this EIA are the result of assessment of identified impacts by specialists, and the parallel process of public participation. The public consultation process has been extensive and every effort has been made to include representatives of all stakeholders in the study area.

8.1. Evaluation of the Proposed Project

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. It must be noted that there are a number of unavoidable impacts on environmental resources as a result of the development of a facility of this nature, e.g. visual impacts due to the size of the wind turbine structures. Generally, however, the unavoidable adverse environmental impacts likely to result from the development of a wind energy facility are balanced by the long-term benefits to be provided through the production of renewable energy.

Through the assessment of impacts associated with the proposed wind energy facility, both potentially positive and negative impacts have been identified. The most significant environmental impacts associated with the proposed project include:

» Impacts on biodiversity as a result of the construction and operation of the facility.
» Impacts on heritage resources as a result of the construction and operation of the facility.
» Visual impacts on the natural scenic resources of the region imposed by the components of the facility.
» Impacts on the social environment.
» Benefits of the proposed wind energy facility.

8.1.1. Impacts on Biodiversity as a result of the Construction and Operation of the Wind Energy Facility

Potential impacts on biodiversity as a result of the proposed construction and operation of the wind energy facility include impacts on natural vegetation, terrestrial fauna, habitats, bats and avifauna.

Critical Biodiversity Areas (CBAs) as identified within the Namakwa Biodiversity Sector Plan are located in the vicinity of the proposed wind energy facility. Two proposed turbines within the Phase 1 wind energy facility fall within an identified CBA. This area is considered to be an area of high sensitivity from both a flora and fauna perspective (refer to Figures 8.1 and 8.2), and should ideally be avoided and these proposed turbines relocated to less sensitive vegetation. Due to the limited development footprint planned within this area, it may be possible to mitigate impacts through careful micro-siting of the turbines, laydown areas and access roads. This will however require confirmation and extensive input from a suitably qualified ecologist during the final design phase of the proposed project.

Impacts on birds and bats relate mainly to impacts associated with habitat disturbance during construction, and displacement and collisions during operation. The site is not likely to contain a very high diversity of bat species, largely on account of the aridity of the area. The area within which Phase 1 is proposed is not likely to be highly significant from a bat perspective as this rather featureless area contains few potential bat roosts or foraging areas. From the results of the avifauna impact assessment, the area within which the Project Blue Wind Energy Facility: Phase 1 is proposed is expected to be of low risk in terms of collision. However, in order to confirm the presence of species of concern and the risk of impact a comprehensive programme to fully monitor the actual impacts of the facility on the bats and avifauna of the area is recommended, from pre-construction and into the operational phase of the project. Clarity on the environmental impact of this and other facilities proposed for the same general area can only be reached once pre-construction monitoring has been completed. It is imperative that the impacts of this project be viewed in the context of cumulative effects generated by multiple wind energy facility proposals for this general area, and that mitigation of these cumulative impacts be managed accordingly.

8.1.2. Impacts on heritage resources as a result of the construction and operation of the facility

The area proposed for the establishment of the Project Blue Wind Energy Facility: Phase 1 is not considered to be sensitive from a cultural landscape perspective. Only one archaeological site of potential significance was identified for this proposed development. This site would be affected by the proposed access road to the site. It is considered possible to mitigate this impact through avoidance (i.e. rerouting of the access road around the site) or through the undertaking of archaeological excavation and sampling. A permit will be required to be obtained from SAHRA for this latter form of mitigation.

8.1.3. Visual Impacts associated with the Wind Energy Facility and associated Infrastructure

The proposed wind energy facility is likely to be visible for up to 20km from the site. The majority of potentially significant impacts are restricted to the 0 – 5 km zone. The visual impact is expected to be low beyond the 10km radius. Visual sensitive receptors within this zone include users of major and secondary roads (including the R355), residents of towns (including Kleinsee), and settlements and homesteads within the region (very limited). The anticipated visual impacts listed above (i.e. post mitigation impacts) range from moderate to low, and none are considered to be fatal flaws for the proposed wind energy and photovoltaic facility.

The primary visual impact, namely the appearance and dimensions of the wind energy facility (mainly the wind turbines) is not possible to mitigate to any significant extent within this landscape. The functional design of the structures and the dimensions of the facility cannot be changed in order to reduce visual impacts. Alternative colour schemes (i.e. painting the turbines sky-blue, grey or darker shades of white) are not permissible as the CAA's Marking of Obstacles expressly states, "*Wind turbines shall be painted bright white to provide the maximum daytime conspicuousness*". Failure to adhere to the prescribed colour specifications will result in the fitting of supplementary daytime lighting to the wind turbines, once again aggravating the visual impact. The potential for mitigation is therefore low or non-existent.

The mitigation of secondary visual impacts, such as security and functional lighting, construction activities, etc. may be possible and should be implemented and maintained on an on-going basis.

8.1.4. Impacts on the Social Environment

The proposed wind energy facility is located within a region which has historically been characterised by mining activities. The main residential area within the vicinity of the proposed development is the town of Kleinsee, which is associated with the De Beers Consolidated mine (and in the process of being proclaimed a formal town). The proposed development site is majority owned by De Beers, but falls outside of the mining area. The location of the wind energy facility has been planned in consultation with De Beers, taking the mineral resource and future mining plans into consideration.

The proposed development is strongly supported at a national, provincial and local level from a policy and planning perspective. In addition, when considered within the context of the socio-economic impact associated with the decline in mining in the area and the associated loss of jobs etc., the proposed wind energy facility is expected to have a positive impact as it provides an opportunity for investment in the area and the creation of new employment and business opportunities during both the construction and operational phase of the project. The establishment of a Community Trust, as required by the Department of Energy, creates an opportunity to support local economic development in the area. In order to enhance the local employment and business opportunities, WWK Development should implement a training and skills development programme for locals. The aim of the programme should be to maximise the number of people from local communities employed during the construction and operational phase of the project.

Impacts on the social environment are expected during both the construction phase and the operational phase of the wind energy facility. Impacts are expected at both a local and regional scale. Impacts on the social environment as a result of the construction of the wind energy facility can be mitigated to impacts of low significance or can be enhanced to be of positive significance to the region.

Impacts associated with the operational phase of the wind energy facility relate mainly to visual impacts (refer to 7.1.3 above). As no potentially sensitive noise receptors are located in close proximity of the proposed wind turbines within the Phase 1 development area, no noise impacts are expected.

8.1.5. Benefits of the Proposed Project

Internationally there is increasing pressure on countries to increase their share of renewable energy generation due to concerns such as climate change and exploitation of resources. 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 pre-feasibility assessments and research, the viability of establishing a wind energy facility in the Northern Cape Province has been established by WWK Development. The positive implications of establishing a wind energy facility on the demarcated sites include:

» The project would assist the South African government in reaching their set targets for renewable energy.
» The National electricity grid in the Northern Cape would benefit to some extent from the additional generated power.
» Promotion of clean, renewable energy in South Africa.
» Creation of local employment and business opportunities for the area.

The proposed development represents an investment in clean, renewable energy infrastructure, which, given the challenges created by climate change, represents a positive social benefit for society as a whole. The proposed project will not consume energy, but will instead provide a new source of clean, renewable electricity to the South African power grid. This generation of renewable power will aid in reducing the dependency on other power generation fuels and enhancing the reliability of the regional energy supply.

8.2. Overall Conclusion (Impact Statement)

The findings of the specialist studies undertaken within this EIA to assess both the benefits and potential negative impacts anticipated as a result of the proposed project conclude that:

» The majority of impacts associated with the establishment of the wind energy facility are of **moderate to low significance** and are restricted to the site itself. These impacts can be avoided or reduced in significance through the implementation of recommended mitigation measures.
» Two wind turbine locations impact on an area of high ecological sensitivity (within a CBA). Impacts are potentially of **high significance** within this area. Due to the limited development footprint planned within this area, it may be possible to mitigate impacts through careful micro-siting of the turbines, laydown areas and access roads. This will however require confirmation and extensive input from a suitably qualified ecologist during the final design phase of the proposed project.
» There is a **low risk** of impacts on birds and bats during construction and operation within the Phase 1 development area.
» Due to the low agricultural potential of the site as well as the low rainfall the impacts on soils and agriculture is expected to be **low**, provided that adequate storm water management and erosion prevention measures are implemented.
» The main unavoidable impact associated with the establishment of the wind energy facility on the identified sites is the visual impact associated with the wind turbines and associated infrastructure. The visual impact is expected to be restricted to within a distance of 10 km of the site within which limited numbers of sensitive visual receptors are located. Mitigation of the visual impact associated with the wind turbines is not possible to mitigate. Impacts associated with secondary impacts can, however, be mitigated.
» There are **no environmental fatal flaws** that should prevent the proposed wind energy facility and associated infrastructure from proceeding on the identified sites, provided that the recommended mitigation, monitoring and management measures are implemented, and given due consideration during the process of finalising the wind energy facility layout.
» In order to enhance the positive impacts associated with the proposed facility, the mitigation measures listed in the report should be implemented.
» The proposed development also represents an investment in clean, renewable energy, which, given the challenges created by climate change, represents a positive social benefit for society as a whole.

The significance levels of the majority of identified negative impacts can generally be reduced by implementing the recommended mitigation measures. With reference to the information available at this planning approval stage in the project cycle, the **confidence** in the environmental assessment undertaken is regarded as **acceptable**.

8.3. Overall Recommendation

Based on the nature and extent of the proposed project, the local level of disturbance predicted as a result of the construction and operation of the facility and associated substations, the findings of the EIA, and the understanding of the significance level of potential environmental impacts, it is the opinion of the EIA project team that the application for the proposed Project Blue Wind Energy Facility: Phase 1 and associated infrastructure be authorised by DEA. The following conditions must be required to be included within an authorisation issued for the project:

» All feasible mitigation measures detailed within this report and the specialist reports contained within Appendices F to N must be implemented.
» The draft Environmental Management Programme (EMP) as contained within Appendix O of this report should form part of the contract with the Contractors appointed to construct and maintain the proposed wind energy facility, and will be used to ensure compliance with environmental specifications and management measures. The implementation of this EMP for all life cycle phases of the proposed project is considered to be key in achieving the appropriate environmental management standards as detailed for this project.
» As far as possible, access roads and cable trenches which could potentially impact on sensitive areas should be shifted in order to avoid these areas of high sensitivity (i.e. best practice is impact avoidance). Where this is not possible, alternative mitigation measures as detailed in this report must be implemented.
» The final location of the wind turbines and associated infrastructure must be informed by surveys undertaken by an ecological, avifaunal and heritage specialist. The EMP for construction must be updated to include site-specific information and specifications resulting from the final walk-though surveys. This EMP must be submitted to DEA for approval prior to the commencement of construction.
» During construction, unnecessary disturbance to habitats should be strictly controlled and the footprint of the impact should be kept to a minimum.
» Disturbed areas should be kept to a minimum and rehabilitated as soon as possible once construction is complete in an area.
» An on-going monitoring programme should be established to detect and quantify any alien species.
» A comprehensive stormwater management plan should be compiled for the development site prior to construction.
» A monitoring programme should be initiated prior to construction and continued throughout construction and operation in order to collect data on the numbers of birds and/or bats affected by wind energy facilities in South African conditions.
» Applications for all other relevant and required permits required to be obtained by WWK Development must be submitted to the relevant regulating authorities. This includes permits for the transporting of all components (abnormal loads) to site,

disturbance to heritage sites, disturbance of protected vegetation, and disturbance to any riparian vegetation or wetlands.

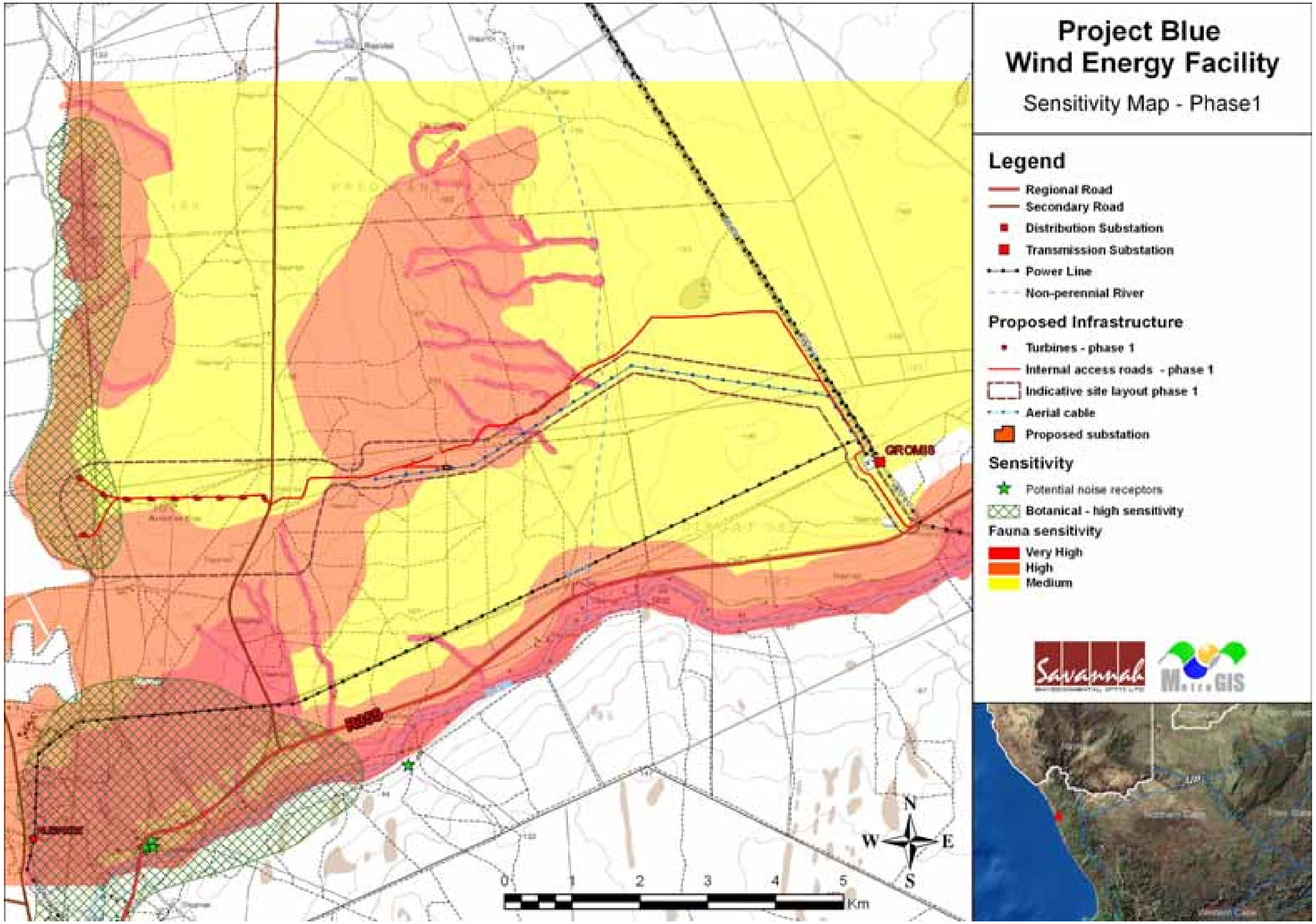


Figure 8. 1: Environmental Sensitivity Map for Phase 1 of the proposed Project Blue Wind Farm, north of Kleinsee, in the Northern Cape (excluding heritage sensitivity).

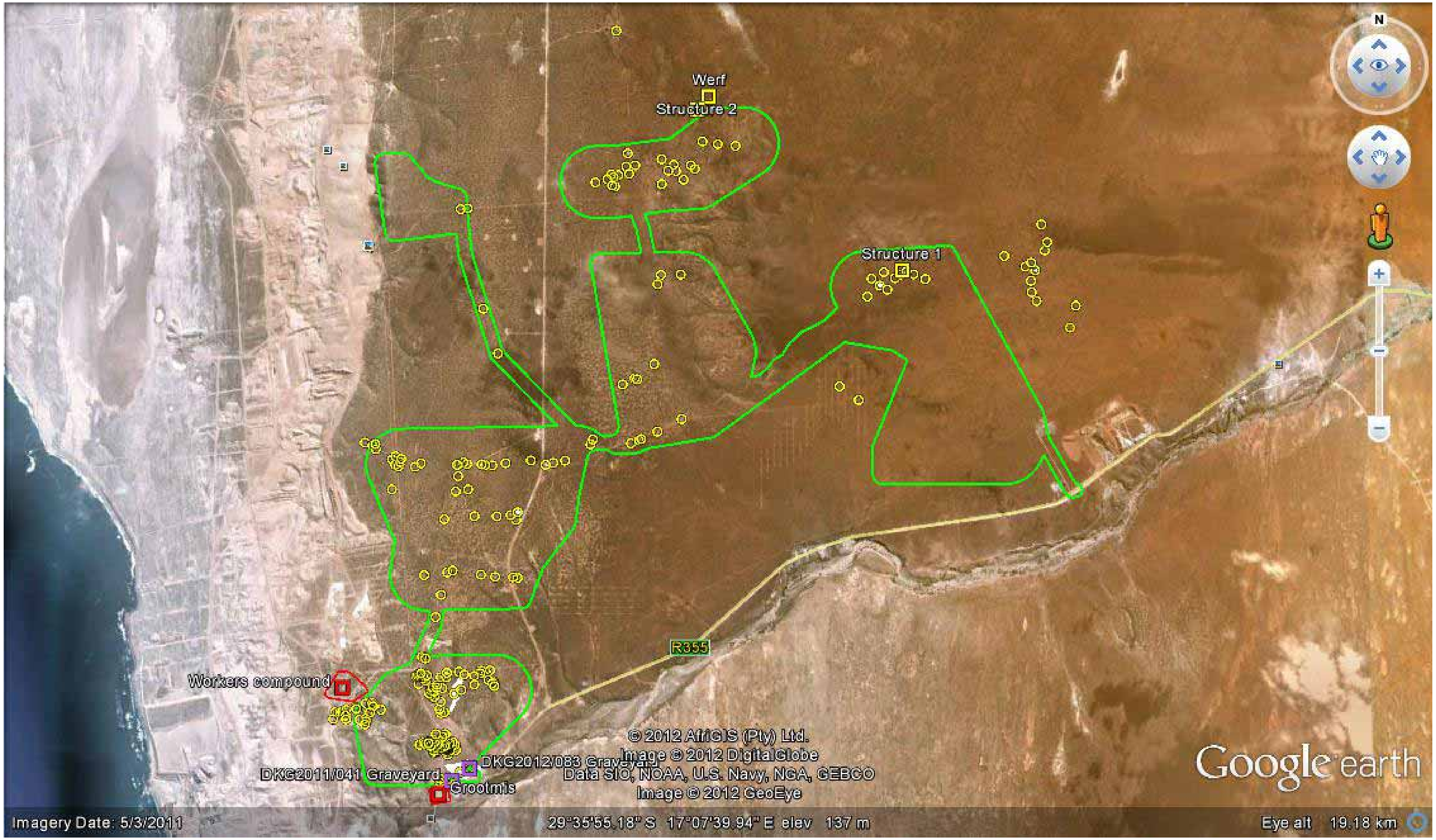


Figure 8.2: Environmental Sensitivity map for the project study area illustrating sensitive areas in relation to heritage

ASSESSMENT OF IMPACTS: PHASE 2: PROJECT BLUE WIND ENERGY FACILITY CHAPTER 9

Project Blue Wind Energy Facility Wind: Phase 2 is proposed to comprise up to 28 turbines and have a generating capacity of up to 56 MW. The proposed development site is ~1 305 ha in extent and located on the following farm portions: Dikgat 195 Portion 07; Dikgat 195 Portion 09; Dikgat 195 Portion 02; Dikgat 195 Portion 05; Dreyers pan 192 remaining portion; Predikant Vlei 190 portion 01; Predikant Vlei 190 portion 04; Predikant Vlei 190 portion 03; Predikant Vlei 190 portion 05. These farm portions are majority-owned by De Beers Consolidated Mines, and lie north of the mining town of Kleinsee.

Environmental impacts associated with the proposed project are expected to be associated with the construction, operation and decommissioning of the facility. 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.

Construction activities for wind energy projects typically include:

» land clearing for site preparation and access routes;
» excavation and filling;
» transportation of supply materials and fuels;
» construction of foundations involving excavations and placement of concrete;
» construction of a substation, underground and above ground power lines
» operating mobile cranes for unloading and installation of equipment; and
» commissioning of new equipment.

Decommissioning activities will include removal of project infrastructure and site rehabilitation.

Environmental issues associated with construction and decommissioning activities may include, among others, habitat destruction, disturbance, and alteration; impacts on biodiversity; threatened fauna and flora species; protected tree species and ecological processes; soil degradation; erosion; and increased erosion potential; impacts on heritage sites; and impacts on the visual aesthetics.

Environmental issues specific to the **operation** of a wind energy facility could include visual impacts; noise produced by the spinning of rotor blades; avian/bat mortality resulting from collisions with blades; and light and illumination issues.

These and other environmental issues were originally identified through a scoping evaluation of the proposed wind energy facility. Potentially significant impacts have now been assessed during this EIA Phase. This EIA process has involved key input from specialist consultants, the project developer, and from key stakeholders and interested and affected parties. The significance of impacts associated with a facility of this nature is always project specific, and therefore impacts may vary significantly between facilities.

This chapter serves to assess the identified potentially significant environmental impacts associated with the development of the proposed facility, and to make recommendations for the management of these impacts for inclusion in the draft Environmental Management Programme (Refer to Appendix P). 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 up to 28 turbines (depending on which turbine types are ultimately chosen by the developer), access roads and a substation(s), during construction much of the approximately 1 305 ha of the proposed site could suffer some level of disturbance. However, once construction is complete, only a small portion of this area (estimated at approximately 10%) will be permanently impacted by infrastructure associated with the wind energy facility.

9.1. Conclusions of the Scoping Study

The majority of potential impacts identified to be associated with the construction and operation of the proposed wind energy facility are anticipated to be localised and restricted to the proposed site. No environmental fatal flaws were identified to be associated with the site. However, areas of potential sensitivity were identified through the scoping phase. These areas of sensitivity are illustrated in the sensitivity map included as Figures 10.1 and 10.2.

The potentially sensitive areas/environmental features identified include:

» Areas of visual exposure within (but not restricted to) 10 km of the proposed wind energy facility site such as homesteads and observers travelling along major and gravel roads
» Areas of high botanical sensitivity on site.
» Areas of heritage sensitivity.

9.2. Methodology for the Assessment of Potentially Significant Impacts associated with the proposed Wind Energy Facility

In order to assess the potential impacts associated with the proposed facility, it was necessary to understand the extent of the area affected by the proposed development. This affected area will include the area infrastructure (i.e. wind turbines, concrete foundations, underground cabling, internal access roads, substations, and the office workshop), as well as temporary disturbance areas (i.e. laydown areas, temporary access roads for mobile construction equipment, etc.). A wind energy facility is dissimilar to all other power generation facilities in that it does not result in the disturbance of an entire site and agricultural activities can continue undisturbed around the installed turbines.

A broader site of 1 305 ha was identified by the project developer for the purposes of establishing the proposed Project Blue Wind Energy Facility: Phase 2. The bulk of this effective area required for the wind energy facility footprint would not suffer any level of disturbance as a result of the required activities on site. Permanently affected areas comprise 28 turbine footprints (28 foundation areas of 20 m x 20 m in extent), access roads (6 m in width), a substation (80 m x 90 m in extent) and a workshop (~400 m^2 in extent).

The area of permanent disturbance is estimated as follows:

Permanent Component –Within the facility	Approximate extent (in m^2)
28 Turbine footprints (each 20 m x 20 m)	11 200
Permanent access roads (19.9km x 6m wide)	119 376
Substation footprints (80 m x 90 m)	7 200
Office/ Workshop area(400 m^2)	400
TOTAL (ha)	**138 176** (of a total area of 13050000 m^2) **≈ 1.1% of site**

Temporarily affected areas comprise laydown areas for turbines (each laydown area with a footprint of 40 m x 40 m) as well as a track of an additional 6 m in width for the crawler crane to move across the site (i.e. an additional 5 m width to the permanent road of 6 m in width – a total of 11 m in width). The 33 kV cabling to connect the turbines to the substations is to make use of the on site tracks. An approximately 1 m wide trench would be excavated, the cabling laid and the area rehabilitated. The area of temporary disturbance is as follows:

Facility Component -Temporary	Approximate area/extent (in m^2)
28 turbine laydown areas	44 800
Temporary crane travel track (5 m) plus trench for 33 kV cabling (1m) – 19.9km	119 376
TOTAL	**164 176** (of a total area of 13050000 m^2) **≈1.3% of site**

Therefore, a total area of 302 352 m^2 (i.e. approximately 30.2 ha) can be anticipated to be disturbed to some extent during the construction of the wind energy facility. This amounts to **2.3%** of the total 1305 ha area which will form part of the total wind energy facility site.

In order to assess the areas where impacts could occur on the site, a site layout optimisation exercise revealed the best possible positions for the turbines, substation and other infrastructure from a technical perspective (refer to Figure 9.2). This exercise considered the on-site wind resource, local topography and environmental sensitivities identified during the scoping phase of the process. This layout is expected to be approximately 80% accurate and would be refined in the final design phase of the process in terms of additional on-site wind data and any additional environmental sensitivities identified through this assessment.

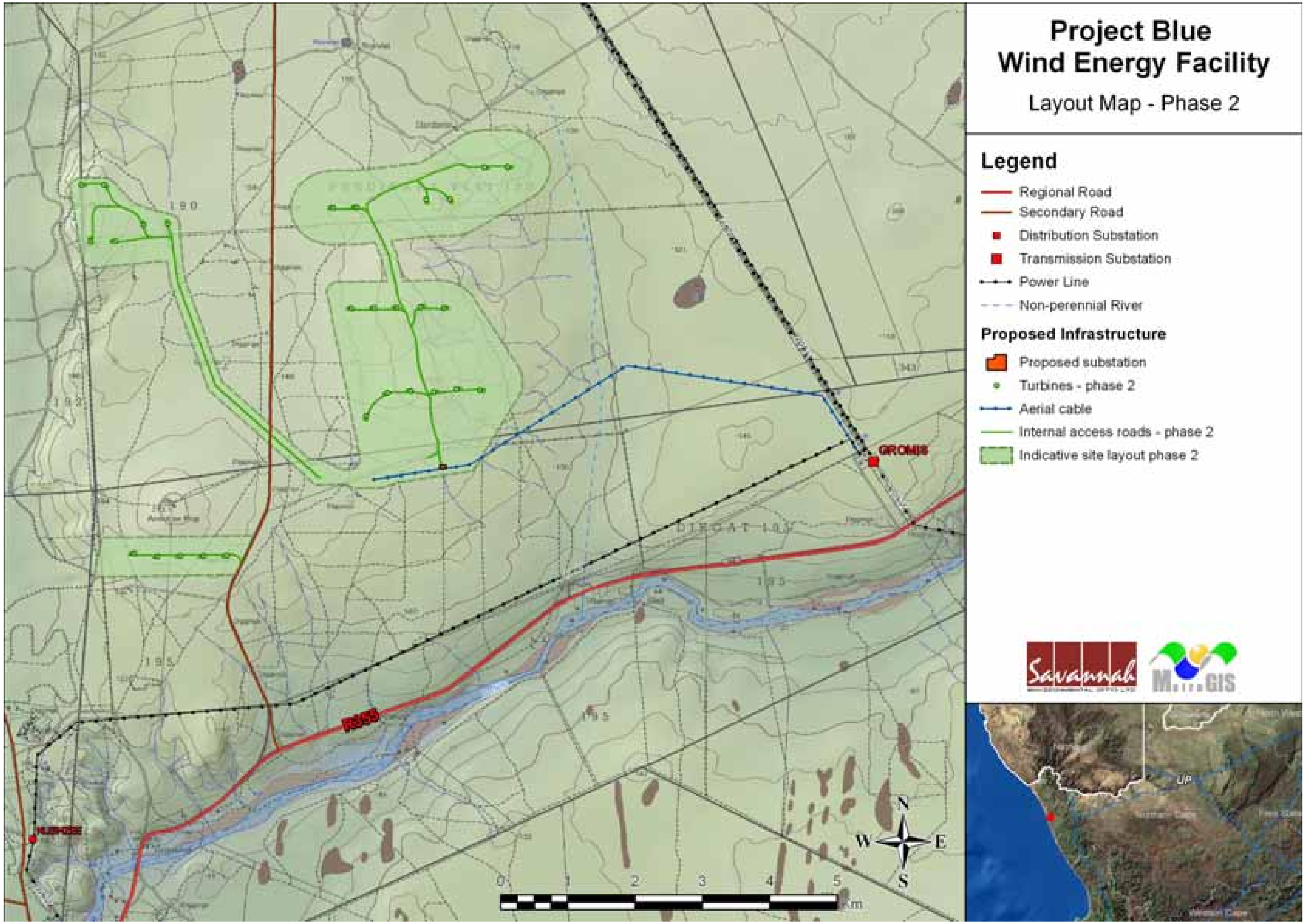


Figure 9.2: Proposed layout of Phase 2

9.3. Assessment of the Potential Impacts associated with the Construction and Operation of the Proposed Project Blue Wind Energy Facility: Phase 2

The sections which follow provide a summary of the findings of the assessment undertaken for potential impacts associated with the construction and operation of the proposed Project Blue Wind Energy Facility: Phase 2 on the identified sites. The nature of the potential impact is discussed; the significance is calculated with and without the implementation of mitigation measures. Recommendations are made regarding mitigation and management measures for potentially significant impacts and the possibility of residual and cumulative impacts are noted.

9.3.1. Potential Impacts on Vegetation

Phase 2 of Project Blue covers the north part of Area 1, the whole of Area 2 and most of Area 4 (east and west extremes). Twenty-eight turbines are proposed for Phase 2; of these, four are located in a CBA and seven are located in ESAs (Terrestrial Migration Corridor). The overhead power-line as described for Phase 1 would be common to all phases (refer to Figures 9.3 – 9.4).

Impacts assessed are restricted to those impacts that would affect vegetation communities, their habitats and their constituent plant species. The impacts could also affect ecological processes and consequently ecosystem function. The impacts identified are:

» Impacts on **localised special habitats** associated with exposure of silcretes, quartzite or granite-gneiss close to the coast.
» Impact on **species of conservation concern**.
» Impact on plant communities through **fragmentation** that would lead to loss of constituent species and negatively impact the cohesiveness of the communities.
» **Loss of habitat** due to degradation of plant communities.
» **Loss of ecosystem function** due to changes in such factors as hydrological regime, increased edge effect, disturbance of successional processes, disturbance of pollination processes and possible invasion by alien plant species.

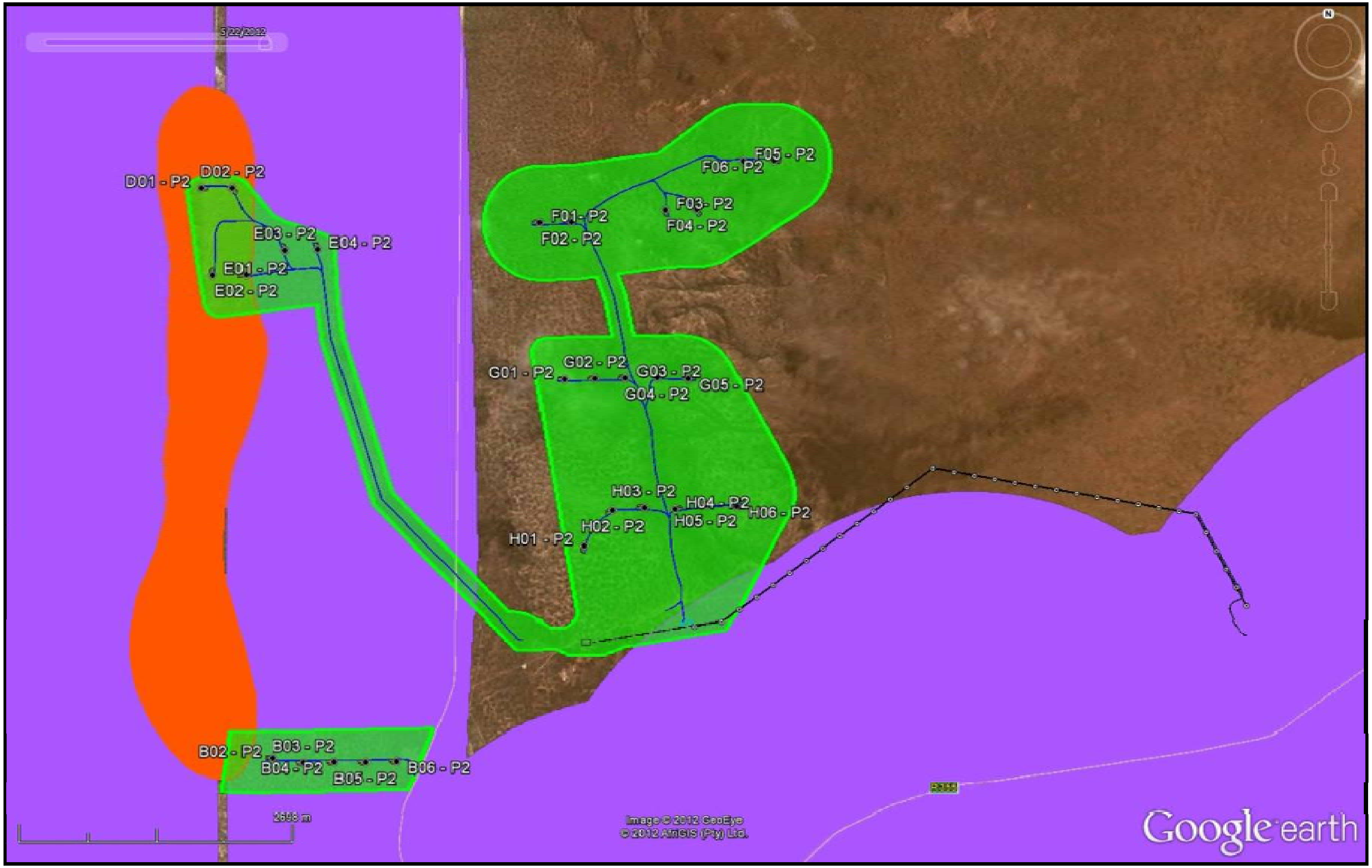


Figure 9.3: The layout for Project Blue Phase 2 (green areas) superimposed on CBAs (orange) and ESAs (purple)

Figure 9.4: Part of the Project Blue Phase 2 which would impact on a Critical Biodiversity Area (CBA). Four turbines (indicated by yellow circles) would be located in the CBA

The greatest risk to the vegetation and flora would be during the construction phase of the wind energy and solar energy facilities when the following activities would be required:

» Construction of access roads.
» Clearing of vegetation for the turbine pedestals and construction of lay-down areas and the on-site substation.
» Trenches for cables and power-lines, or if overhead, the requirement for construction of pylons.
» Operation of machinery and vehicles which could result in undesirable soil compaction.
» Possible fuel and chemical (cement) contamination.

Maintenance of the wind energy facility (operational phase) would pose lower risks to the vegetation. Only the access roads and immediate area around each turbine would need to be accessed, leaving the remaining area within the footprint relatively undisturbed.

Impact tables summarising the significance of impacts on flora associated with the wind energy facility

Nature: Loss of Namaqualand Strandveld due to construction of wind turbines, transformers and crane hard-standings: Phase2 wind energy facility Construction of wind-turbines (with transformers and crane hard-standings) in the Phase 2 indicative area would result in High Negative impact on the vegetation at four turbine sites that fall within a designated CBA (Refer to Figure 9.3). These sites are DO1-P2; DO2-P2; EO1-P2 and EO2-P2. It is recommended that, as best practice, these sites should be completely **avoided** and that as mitigation they should either not be built or alternative locations within less sensitive Namaqualand Strandveld must be found. The remaining eighteen (18) Phase 2 turbines would impact Namaqualand Strandveld with low botanical sensitivity and the impact is therefore rated as Medium Negative. Without mitigation the overall impact for Phase 2 would be High Negative but with mitigation would be Medium Negative.		
	Without mitigation	**With mitigation**
Extent	Local (2)	Local (2)
Duration	Long-term (4)	Long-term (4)
Magnitude	High (8)	Low (4)
Probability	Definite (5)	Probable (3)
Significance	**High (70)**	**Medium (30)**
Status	Negative	Negative
Reversibility	Partially reversible	Partially reversible
Irreplaceable loss of resources?	No. Namaqualand Strandveld is wide-spread and is not threatened. Plant communities on granite koppies and quartz patches are considered important and should be avoided.	

Can impacts be mitigated?	Yes, by avoiding botanically sensitive areas.

Mitigation:

» Four turbines in CBA to be removed or re-located.

» If it is not possible to avoid the CBA area, undertake detailed micro-siting with an ecologist during final design. Permits will be required to be obtained to impact on any protected or threatened species.

Cumulative impacts:

» Will contribute to a limited extent to loss of Namaqualand Strandveld due to construction of wind energy facilities.

Residual impacts:

» Low negative.

Nature: Loss of Namaqualand Strandveld due to construction and operation of internal roads and underground cables: Phase 2 wind energy facility

New internal roads 6 m wide would be required to access all the turbine sites in Phase 2. From the internal road layout it is clear that very few existing roads, or only limited parts of existing roads, would be used. As for Phase 1, the underground cables from the turbines to the on-site sub-station will be aligned alongside the roads resulting in limited additional loss of vegetation. The result of road-building in Phase 2 would be a significant loss of Namaqualand Strandveld. The amount is difficult to quantify but since this vegetation type is widespread and the roads would not have an extreme fragmentary effect, the impact is rated as Medium Negative as opposed to High Negative. Mitigation could reduce the impact to Low negative.

	Without mitigation	**With mitigation**
Extent	Local (2)	Local (2)
Duration	Long-term (4)	Long-term (4)
Magnitude	Medium (6)	Low (4)
Probability	Definite (5)	Probable (3)
Significance	**Medium (60)**	**Low (30)**
Status	Negative	Negative
Reversibility	Partially reversible	Partially reversible
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	

Mitigation:

» To mitigate the impact of the internal roads, road construction must be limited to the footprint of the roads i.e. no vehicles should leave the road footprint and no equipment should be stored in area alongside the roads.

» Properly demarcated and approved areas for parking construction vehicles and / or stockpiling and storing materials must be determined.

» Since the roads would be used for turbine maintenance, mitigation measures such as restoration measures would be impractical in the medium to long term. However, it would be important to ensure that the roads are correctly drained and maintained to avoid erosion from runoff.

Cumulative impacts:

» Contribution to loss of Namaqualand Strandveld vegetation.

Residual impacts:

» Low negative.

Nature: Loss of Namaqualand Strandveld due to construction and operation of overhead transmission lines for Phase 2 wind energy facility

The overhead transmission line from the on-site substation will be common for all phases. Therefore the impacts as described for Phase 1 apply (refer to Chapter 7). No additional impact in terms of overhead transmission lines would result from Phase 2.

An overhead transmission line will run from the Phase 1 on-site substation north-eastwards and then southwards to Gromis Substation. A road would be required to be constructed to maintain the transmission line. The impact on the Namaqualand Strandveld vegetation would be mainly associated with the road and not the transmission line itself except for limited disturbance at the sites of the poles.

The impact of construction of the proposed overhead power-line would be linked to the impact of the road and is therefore Medium Negative. Mitigation would involve restoration as for the road and if successfully applied would reduce the impact to Low Negative.

	Without mitigation	**With mitigation**
Extent	Local (2)	Local (2)
Duration	Long-term (4)	Long-term (4)
Magnitude	Medium (6)	Low (4)
Probability	Definite (5)	Probable (3)
Significance	**Medium (60)**	**Low (30)**
Status	Negative	Negative
Reversibility	Partially reversible	Partially reversible
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	

Mitigation:

» Mitigation measures that should be implemented are restoration actions to promote re-vegetation of disturbed areas. A restoration specialist should be employed to ensure that the task is carried out correctly, with local species, to prevent the introduction of weeds and alien invasive plant species.

Cumulative impacts:

» Contribution to loss of Namaqualand Strandveld vegetation.

Residual impacts:

» Low negative.

Implications for project implementation

- The area within which the Project Blue Wind Energy Facility: Phase 2 is proposed is expected to be of medium to low risk in terms of impact on flora (***Loss of Namaqualand Strandveld)***.
- CBAs should be treated as 'No Go' areas for any form or development including renewable energy infrastructure. The CBAs potentially negatively impacted by Project Blue Phase 2 have been assessed as likely to have a High Negative impact. The recommended mitigation is to avoid these areas and locate the four proposed turbines located in this area elsewhere in less sensitive vegetation.
- If it is not possible to avoid impacting on these areas, it will be necessary to undertake detailed micro-siting with an ecologist during final design. Permits will be required to be obtained to impact on any protected or threatened species.
- It is recommended that the placement of wind turbines, roads, underground cables and over-head powerlines be in vegetation of low sensitivity (least threatened).

9.3.2. Potential Impacts on Terrestrial Fauna and Habitats

Potential ecological impacts resulting from the development of the wind energy facility would stem from a variety of different activities and risk factors associated with the construction and operational phases of the project including the following:

Construction Phase

- Vegetation clearing & site preparation
- Operation of heavy machinery at the site
- Human presence

Operational Phase

- Site maintenance activities
- Human presence
- Operation of the turbines

The above activities are likely to manifest themselves as the following faunal impacts:

- Loss of habitat for fauna
- Reduced landscape connectivity for fauna
- Direct faunal impacts
- Bat mortality
- Increased soil erosion risk

Impact tables summarising the significance of impacts on Terrestrial Fauna and Habitats associated with the wind energy facility

Nature: Habitat loss for fauna - Transformation and loss of habitat will have a negative effect on resident fauna.

The development of the wind energy facility will result in the loss of habitat for resident fauna. This potentially includes at least 8 listed reptiles, two listed amphibians, four listed mammals and two listed bat species. In terms of a direct loss of habitat, the development of the wind energy facility would result in the loss of approximately 70 ha of currently intact vegetation. This in itself is not viewed as being highly significant. However, some of the turbines are currently located within high sensitivity environments such as rocky outcrops or headlands and would have a significant impact on habitat availability within these restricted habitats. The only way that these impacts can be mitigated is to relocate the turbines concerned or drop them from the development.		
	Without mitigation	**With mitigation**
Extent	Local (2)	Local (2)
Duration	Long-term (4)	Long-term (4)
Magnitude	Medium (6)	Low (4)
Probability	Definite (5)	Highly Probable (4)
Significance	**Medium-High (60)**	**Low (40)**
Status	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	To a small degree	
Mitigation: » Vegetation clearing should be kept to a minimum. » Impacts to restricted and important habitats such as the rocky outcrops should be avoided. » The final placement of turbines must follow a micro-siting procedure involving a walk-through and identification of any sensitive areas by botanical, faunal and avifaunal specialists.		
Cumulative impacts: » There is already quite a lot of transformation in the larger area as a result of diamond mining activities and the development would contribute to cumulative habitat loss in the area. Mining activities are however concentrated along the low coastal plain while the wind energy facility is located further inland which has been less impacted.		
Residual impacts: » Some habitat loss is an inevitable consequence of the development and cannot be fully mitigated.		

Nature: Reduced landscape connectivity - Roads, turbine lay-down areas and other transformed areas will represent barriers to movement for some species. . The extensive road network which is likely to amount to 50 km of hardened access roads are likely to have the greatest impact on landscape connectivity for fauna. Many species including snakes, tortoises, lizards, golden moles and rodents are vulnerable to predation when traversing open areas and the relatively wide nature of the roads required for wind-energy developments poses a significant threat in this regard. Although many of the species in the area are reasonable well equipped to deal with open areas, the roads and other cleared areas would have a long-term cumulative impact and slow reproducing species such as tortoises may be particularly affected. Larger mammals are likely to be less impacted due to their mobility and the presence of gaps in the areas of turbines which would remain relatively free of impact.		
	Without mitigation	**With mitigation**
Extent	Local (2)	Local (2)

Duration	Long-term (4)	Long-term (4)
Magnitude	Medium (6)	Medium(5)
Probability	Highly Probable (4)	Probable (3)
Significance	**Medium (48)**	**Medium (33)**
Status	Negative	Negative
Reversibility	Moderate	Moderate
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	To some degree	

Mitigation:

» Hardened surfaces should be kept to a minimum

» Roads should be as narrow as possible and as short as possible. A natural surface such as gravel would be preferable to a tarred or concrete road, except in very steep areas where it would be difficult to prevent erosion of natural surfaces.

» Vegetation should be allowed to remain alongside or encroach on the roads as much as possible.

» Temporary lay-down areas should be in previously transformed areas or areas that will be used by the development.

Cumulative impacts:

» Although there is already some transformation in the area which contributes to reduced connectivity, the current development would add 50km of roads within a concentrated area giving rise to a significant cumulative impact from roads.

Residual impacts:

» Due to the soft sands at the site, hardened roads will in all likelihood be necessary to access the site and so there is little that can be done to fully mitigate this impact.

Nature: Direct Faunal Impacts - Fauna will be directly impacted by the development as a result of construction activities and human presence at the site.

Some smaller animals would not be able to move away from construction activity sufficiently quickly during construction and would be killed by vehicles and earth-moving machinery. In addition, the presence of a large work force on the site would pose a risk to species such as snakes, tortoises and mammals which would be vulnerable to poaching for food, trade or killed out of fear and superstition.

	Without mitigation	**With mitigation**
Extent	Local (2)	Local (1)
Duration	Short-term (4)	Short-term (4)
Magnitude	Medium (5)	Medium-Low (3)
Probability	Highly Probable (4)	Probable (3)
Significance	**Medium (44)**	**Low (24)**
Status	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	To some extent	

Mitigation:

» Any fauna directly threatened by the construction activities should be removed to a safe location by the ECO or other suitably qualified person.

» The collection, hunting or harvesting of any plants or animals at the site should be strictly forbidden. Personnel should not be allowed to wander off the construction site.
» Fires should only be allowed within fire-safe demarcated areas.
» No fuel wood collection should be allowed on-site.
» No dogs should be allowed on site.
» If the site must be lit at night for security purposes, this should be done with low-UV type lights (such as most LEDs), which do not attract insects.
» All hazardous materials should be stored in the appropriate manner to prevent contamination of the site. Any accidental chemical, fuel and oil spills that occur at the site should be cleaned up in the appropriate manner as related to the nature of the spill.
» No unauthorized persons should be allowed onto the site.
» All construction vehicles should adhere to a low speed limit to avoid collisions with susceptible species such as snakes and tortoises.

Cumulative impacts:

» The potential for cumulative impacts is relatively low as there are few other developments currently underway in the area and mining activity in the area is on the decline.

Residual impacts:

» Residual impacts for fauna can be mitigated to a large degree, although some mortality of a few immobile species can be expected.

Nature: Bat Mortality due to Turbines - The presence of the turbines poses a high risk to bats foraging or moving through the area.

The presence of turbines within bat foraging, movement or migration areas would pose a significant threat to bat species. This is likely to be those turbines along the coastal bluff as well as the cluster of turbines near Grootmis. As the threat would persist for as long as the turbines were operational, this represents a long-term threat that may have a significant cumulative impact on the local bat populations. Bats are particularly vulnerable to impact from turbines for several reasons. They may be attracted to the vicinity of the turbines and secondly although they may or may not collide with the turbine blades, they are vulnerable to barotrauma in which they suffer fatal internal haemorrhage as a result of passing through the low-air pressure vortices behind the turbine blades. It is difficult to establish the extent or significance of this impact without long-term bat monitoring as per the South African Good Practice Guidelines for Surveying Bats in Wind Farm Developments (Sowler & Stoffberg 2011). Potential mitigation measures include curtailment in which the turbines are kept stationary at certain times of the day or year as well as relocating turbines outside of areas of high bat activity.

	Without mitigation	**With mitigation**
Extent	Local (3)	Local (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Medium-High (7)	Low (4)
Probability	Highly Probable (4)	Probable (3)
Significance	**Medium-High (56)**	**Low (27)**
Status	Negative	Negative
Reversibility	Low	High
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes, to a large degree	
Mitigation:		

» Bat monitoring according to the South African Good Practice Guidelines for Surveying Bats in Wind Farm Developments (Sowler & Stoffberg 2011), should be initiated as soon as possible. » Final turbine placement must reflect the findings and recommendations emerging from the above studies.
Cumulative impacts: » There are some other planned wind farm developments in the area which could result in a large cumulative impact on the local bat populations.
Residual impacts: » Despite mitigation and avoidance measures which are not entirely effective, some impacts on bats are likely to occur.

Nature: Increased erosion risk - Increased erosion risk as a result of soil disturbance and loss of vegetation cover. (Associated with the development as well as access roads) The development of the site would create a lot of soil disturbance, which would leave the site highly susceptible to wind erosion. Along the coastal headlands and the large hill in the central part of the site, the substrate is firmer and water rather than wind erosion would be the primary risk. In these areas standard erosion control measures such as water diversion and dispersing structures should be built along roads and other cleared areas. Within the sandy areas, the strong winds which characterize the area will tend to mobilize any loose sand. Such sand movement can result in degradation of the affected areas as it smothers established plants and once initiated can become self-sustaining. Measures to reduce sand movement should therefore be implemented at the site wherever bare soil is exposed. The extreme measures required for rehabilitation of previously mined areas in the area serve as evidence of the potential significance of wind erosion		
	Without mitigation	**With mitigation**
Extent	Local (2)	Local (1)
Duration	Long-term (4)	Short-term (2)
Magnitude	Medium (5)	Low (3)
Probability	Highly Probable (4)	Probable (3)
Significance	**Medium (44)**	**Low (18)**
Status	Negative	Negative
Reversibility	Low	High
Irreplaceable loss of resources?	Yes	No
Can impacts be mitigated?	Yes	
Mitigation: » Regular monitoring for erosion after construction to ensure that no erosion problems have developed as result of the disturbance. » All erosion problems observed should be rectified as soon as possible, using the appropriate erosion control structures and revegetation techniques.		
Cumulative impacts: » Higher sediment loads in rivers and streams will affect in-stream vegetation and biota		
Residual impacts: » If erosion at the site is controlled, then there will be no residual impact		

Implications for project implementation

» The Wind Energy Facility occurs across a range of different sensitivities, with those turbines along the north- and south- west falling within high sensitivity areas.
» The placement of the turbines within areas of high sensitivity should be reviewed during the final micro-siting of the facility, as it may not be possible to appropriately mitigate the likely impacts associated with development in these areas.
» There are a large number of listed reptiles known from the area, many of which are associated with rocky outcrops. Turbines which impact this habitat are likely to have a significant impact on local reptile populations as the rocky outcrops are a restricted habitat that was not widely available at the site.
» The potential impact of the development and particularly the wind turbines on Golden Moles is identified as a potential concern which is highlighted as a significant unknown associated with the development.
» Although large parts of the site are not likely to be important for bats, certain areas, largely those identified as being important for reptiles are also identified as being potentially important for bats. As little is known about bat composition or activity patterns in the area, it is recommended that long-term bat monitoring be initiated to inform the final placement of turbines at the site.

9.3.3. Potential Impacts on Avifauna

The region is likely to support at least 168 bird species, including 15 threatened (red-listed) species, and 44 endemic species. The avian groups of greatest conservation significance likely to be impacted by the turbines include the (i) bustards that move in with good rainfall; (ii) flocking waterbirds such as red-listed cormorants and flamingos, and (iii) fifteen raptor species. Many have a low likelihood of occurrence but (breeding) Ludwig's Bustards, Secretarybirds, (breeding) Jackal Buzzards, Greater Kestrel, White Pelicans and Namaqua Sandgrouse were all confirmed collision-prone species and the threatened Black Harriers occur at low frequency in the area and breeding in the nearby Buffels River (Refer to figures 9.5 – 9.7).

Impacts may occur in terms of both collision and disturbance from the facility itself. Two brief surveys revealed a rich vein of endemic passerines (26% of the total number of species) which could be affected by disturbance impacts. From the results of the avifauna impact assessment (refer to Appendix H), the area within which the Project Blue Wind Energy Facility: Phase 2 is proposed is expected to be of low risk in terms of collision.

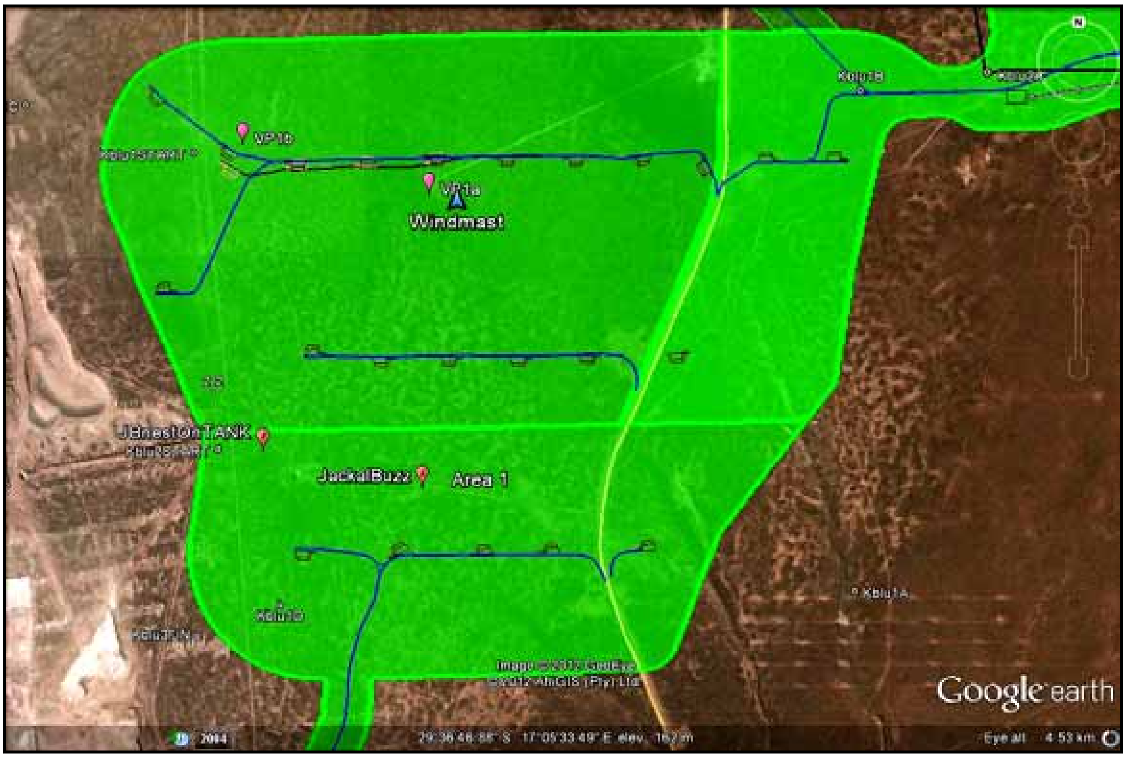


Figure 9.5: Collision-prone birds present in the vicinity of Area 1 of Phase 2.

Figure 9.6: Collision-prone species found in Area 2 of Phase 2, including red-listed bustards and Secretarybirds. The latter was found eating Pied Crows from their nests in May 2012. This area is a high risk one for birds as a result of the occurrence and breeding of these two species.

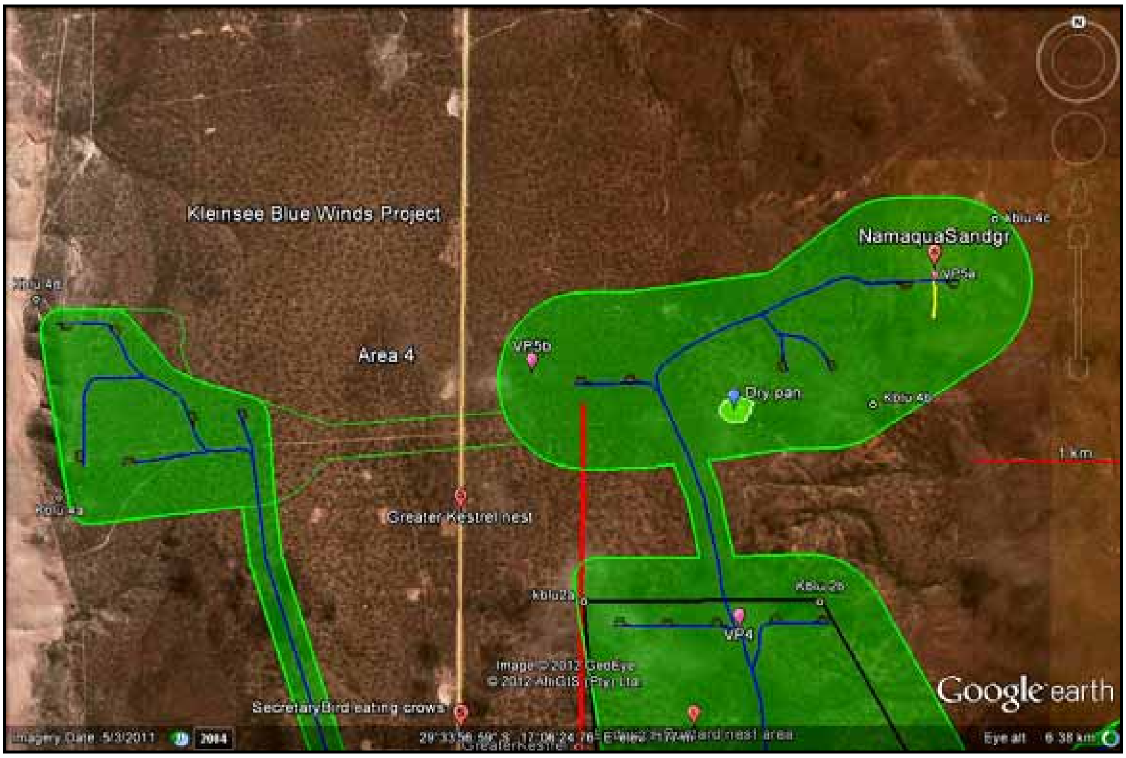


Figure 9.7: Collision-prone species recorded in Area 4 in May 2012. Only Namaqua Sandgrouse (top right) were recorded here.

From the avifauna assessment undertaken, it is concluded areas 2 and 5 (which form part of Phase 2) are rated as being of moderate to high risk in terms of collisions. This is due to the presence of pelicans, raptors and bustards. Of these, area 2 is the highest risk area due to the breeding of a Ludwig's Bustard and the presence of the Secretarybird in the area. Both are red-listed and collision-prone species.

Impact tables summarising the significance of impacts on avifauna associated with the wind energy facility

Nature: Direct mortality or avoidance of area around the wind farm for the bird groups identified as at risk, due to noise, or impacts with turbine blades (Flamingos = GLF, Pelican = P, Raptors = R, Shelduck = SD, Ludwig's Bustard = LB, Southern Black Korhaan = SBK)		
	Without mitigation	**With mitigation**
Extent	**0**(GLF, P, SD) **1**(R) **3** (LB,SBK)	**0**(GLF,P, SD) **1**(R) **3** (LB,SBK)
Duration	**5** (GLF, P, R, SD, LB, SBK)	**5** (GLF, P, R, SD, LB, SBK)
Magnitude	**4** (GLF, P, R, SD) **6**(LB, SBK)	**3** (GLF, P, R, SD) **5**(LB, SBK)
Probability	**4** (GLF, P, LB, SBK), **3** (R) **1**(SD)	**3**(GLF, P, LB, SBK), **2** (R) **1**(SD)
Significance (E+D+M)P	**36**(GLF, P, R), **9**(SD) **56** (LB,SBK)	**24**(GLF, R), **8**(SD) **39** (LB,SBK)
Status (+ve or –ve)	Negative	Negative
Reversibility	Low	Low

<table>
<tr><td>Irreplaceable loss of species?</td><td>Yes (particularly the bustards)</td><td>Reduced</td></tr>
<tr><td>Can impacts be mitigated?</td><td>Partially</td><td></td></tr>
<tr><td colspan="3">Mitigation:
» As far as technically feasible, orientate the turbine strings north-south so they do not present a barrier to north-south commuting birds.
» Do not place turbines on the very top of ridges but on the east side where orographic lift is less pronounced for soaring raptors
» Paint one turbine blade with ultra-violet paint, readily seen by birds day and night.
» Undertake pre-construction monitoring to confirm flight paths and foraging areas.
» Continue monitoring into operational phase to confirm impacts (if any) of the wind energy facility on avifauna.</td></tr>
<tr><td colspan="3">Cumulative impacts:
Cumulative impacts (Masden et al. 2010) are those that may affect a species in a small area (e.g. a wind farm) yet have a wide-scale influence. If resident territorial birds are killed by turbines for example, then other individuals will be pulled in to take up the vacant territory. Thus for bustards that may reside in the area, the impact may be greater than just around the immediate vicinity of the wind farm. On the other hand migratory species killed in one area such as flamingos migrating through the area to their breeding grounds, may be affected far from that breeding area. A wide-spread population reduction may occur as a result. Last, if several wind farms are developed in one area and result in widespread displacement or collisions of a range-restricted species, then they may have a wide spread influence cumulatively even if the individual wind farms do not have a major impact. Furthermore, if the wind farm is enlarged, or taken closer to the ocean, then bird movements may be influenced negatively. Cumulative impacts for raptors such as the buzzards and Secretarybirds may be present if the mortality brings other territorial birds in. Wind farms are proposed for an area south of Kleinsee too and this may have a cumulative impact on the species detailed above. The present study assumes that the land use here will remain stable and no further mine excavations will be placed near the wind farm, that may attract wetland species.</td></tr>
<tr><td colspan="3">Residual impacts:
After mitigation, direct mortality or area avoidance by the species identified above may still occur and further mitigation (e.g. micro-siting) will be needed.</td></tr>
</table>

Implications for project implementation

- From the avifauna assessment undertaken, it is concluded areas 2 and 5 (which form part of Phase 2) are rated as being of moderate to high risk in terms of collisions. This is due to the presence of pelicans, raptors and bustards. Of these, area 2 is the highest risk area due to the breeding of a Ludwig's Bustard and the presence of the Secretarybird in the area. Both are red-listed and collision-prone species.
- There are three classes of mitigation for birds around wind farms:
  - (iv) re-position the turbines to avoid intersecting the movements of the birds
  - (v) redesign the turbines to alter the present pattern/shape/size of the turbines so birds see them more readily and avoid contact or

(vi) close down turbines when these birds approach.

» It is recommended that further research (in the form of pre-construction and operational monitoring) be undertaken to determine flight paths of flamingos and where the raptors and bustards forage. On present (limited) evidence the wind energy facility area is considered to be far enough from the coastal flyways (1.9 km) that it will avoid impacting flamingo flyways. However, passage rates will need to be assessed with the presence of bustards, korhaans and the raptors in the area.
» The effects of power lines across the wind farm may have a high impact on the birds of the area because bustards and other collision-prone species are well known to suffer mortality (Martin and Shaw 2010). However, wherever possible all overhead lines should be marked with bird flappers or, where possible, buried underground.

9.3.4. Potential Impacts on Geology, Soils and Agricultural Potential

Due to the low agricultural potential of the site as well as the low rainfall the impacts on soils and agriculture is expected to be low – provided that adequate storm water management and erosion prevention measures are implemented. These measures should be included in the layout and engineering designs of the development. The erodibility of the soils on the site is associated with the low sparse vegetation cover, sandy topsoils and restricting subsoil layers. In the mining areas the erodibility is a major challenge due to the presence of excessive NaCl in the newly established soils and storm water emanating from the site should be mitigated and controlled.

Impact tables summarising the significance of impacts on geology, soils and agricultural potential associated with the wind energy facility

Nature: Construction of turbine foundations and laydown areas		
	Without mitigation	**With mitigation**
Extent	Local (1)	N/A
Duration	Permanent (5)	N/A
Magnitude	Minor (2)	N/A
Probability	Probable (4)	N/A
Significance	**Moderate (32)**	N/A
Status	Negative	N/A
Reversibility	Irreversible	
Irreplaceable loss of resources?	Yes	
Can impacts be mitigated?	No	
Mitigation: » Limit footprint to the immediate development area.		
Cumulative impacts: » Soil erosion may arise owing to increased surface water runoff. Adequate management and erosion control measures should be implemented.		
Residual impacts:		

» Limited is activity is managed.

Nature: Construction of buildings and other infrastructure with the associated disturbance of soils and existing land use		
	Without mitigation	**With mitigation**
Extent	Local (1)	N/A
Duration	Permanent (5)	N/A
Magnitude	Minor (2)	N/A
Probability	Probable (4)	N/A
Significance	**Moderate (32)**	N/A
Status	Negative	N/A
Reversibility	Irreversible	
Irreplaceable loss of resources?	Yes	
Can impacts be mitigated?	No	
Mitigation: » Limit footprint to the immediate development area.		
Cumulative impacts: » The cumulative impact of this activity will be small as it is constructed on land with low agricultural potential.		
Residual impacts: » Limited due to low agricultural potential		

Nature: construction of roads with the associated disturbance of soils and existing land use		
	Without mitigation	**With mitigation**
Extent	Local (1)	N/A
Duration	Permanent (5)	N/A
Magnitude	Minor (2)	N/A
Probability	Probable (4)	N/A
Significance	**Moderate (32)**	N/A
Status	Negative	N/A
Reversibility	Irreversible	
Irreplaceable loss of resources?	Yes	
Can impacts be mitigated?	No	
Mitigation: » Limit footprint to the immediate development area and keep to existing roads as far as possible.		
Cumulative impacts: » The cumulative impact of this activity will be small as it is constructed on land with low agricultural potential.		
Residual impacts:		

» Limited due to low agricultural potential

Nature: Impact of vehicle operation on site Vehicle movement will be restricted to the construction site and established roads. Vehicle impacts in this sense are restricted to spillages of lubricants and petroleum products.		
	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Short-term (2)	Short-term (2)
Magnitude	Minor (2)	Minor (2)
Probability	Probable (4)	Improbable (2)
Significance	**Low (20)**	**Low (10)**
Status	Negative	Negative
Reversibility	Reversible	
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	Yes	
Mitigation: » Limit footprint to the immediate development area. » Maintain vehicles in designated areas only. » Prevent and address spillages.		
Cumulative impacts: » The cumulative impact of this activity will be small if managed.		
Residual impacts: » Limited if activity is managed.		

Nature: Impact of dust generation on site This activity entails the operation of vehicles on site and their associated dust generation. Generated dust can impact large areas depending on environmental and climatic conditions.		
	Without mitigation	**With mitigation**
Extent	Local (2)	Local (1)
Duration	Short-term (2)	Short-term (2)
Magnitude	Minor (2)	Minor (2)
Probability	Probable (4)	Improbable (2)
Significance	**Low (24)**	**Low (12)**
Status	Negative	Negative
Reversibility	Reversible	
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	Yes	
Mitigation: » Limit vehicle movement to absolute minimum. » Construct proper roads for access. » Implement appropriate dust control measures.		

Cumulative impacts: » The cumulative impact of this activity will be small if managed but can have widespread impacts if ignored.
Residual impacts: » Limited if activity is managed.

Nature: Loss of agricultural potential and land capability owing to the development		
	Without mitigation	**With mitigation**
Extent	Site (1)	N/A
Duration	Permanent (5)	N/A
Magnitude	Low (2)	N/A
Probability	Highly probable (4)	N/A
Significance	**32 (Low)**	N/A
Status	Negative	N/A
Reversibility	Medium	
Irreplaceable loss of resources?	Yes	
Can impacts be mitigated?	No. The loss of agricultural land is a long term loss and there are no mitigation measures that can be put in place to combat this loss.	
Mitigation: » N/A		
Cumulative impacts: » The cumulative impact of this activity will be small as it is constructed on land with low agricultural potential.		
Residual impacts: » The loss of agricultural land is a long term loss. This loss extends to the post-construction phase. The agricultural potential is very low though.		

Implications for project implementation

» The impacts on soils are small in comparison to historical mining impacts in the study area.

» The impacts should be limited to the immediate construction sites and rehabilitation measures should be implemented in line with those to be implemented by the diamond mine.

» Regarding the construction of turbines and associated infrastructure the following recommendations are made:
  - Limit physical impacts to as small a footprint as possible.
  - Site management has to be implemented with the appointment of a suitable environmental control officer (ECO) to oversee the process, address problems and recommend and implement corrective measures.
  - Implement site specific erosion and water control measures to prevent excessive surface runoff from the site (turbines and roads).

- * Plan the road and site layout in such a way as to make maximal use of existing roads to keep natural units as intact as possible.
- * Prevent dust generation and vehicle associated pollution and spillages.

» With effective implementation of mitigating measures (as outlined in the **EMP** in **Appendix P**) the impacts identified can be reduced to a low level.

9.3.5. Potential Visual Impacts

The combined results of the visual exposure, viewer incidence / perception and visual distance of the proposed wind energy facility is displayed in Figure 9.8. Here the weighted impact and the likely areas of impact have been indicated as a visual impact index. Values have been assigned for each potential visual impact per data category and merged in order to calculate the visual impact index.

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

The visual impact index for the wind energy facility is further described as follows.

» The visual impact index map indicates a core zone of moderate to high visual impact within a 5 km radius of the proposed facility. Affected areas include Kleinsee and long stretches of road, especially the R355 that passes the proposed development area at close proximity in places.

» The extent of potential visual impact remains high between the 5 km and

» 10 km radii, becoming moderate towards the outer edge of this zone. Affected areas include only a few stretches of road. Visual impacts within this zone are likely to be low to moderate.

» Between 10 km and 20 km, the extent of potential visual impact is reduced. Visual impacts within this zone are likely to be very low to low, with only stretches of road being affected.

» Remaining impacts beyond the 20 km radius are expected to be negligible to very low.

It is evident from the above that visual impacts are likely to occur primarily on roads. It must be noted that all roads converge onto Kleinzee and that the duration of visual impact is likely to be high, particularly as one travels towards Kleinsee. The impact intensifies as the distance to the wind energy facility becomes closer.

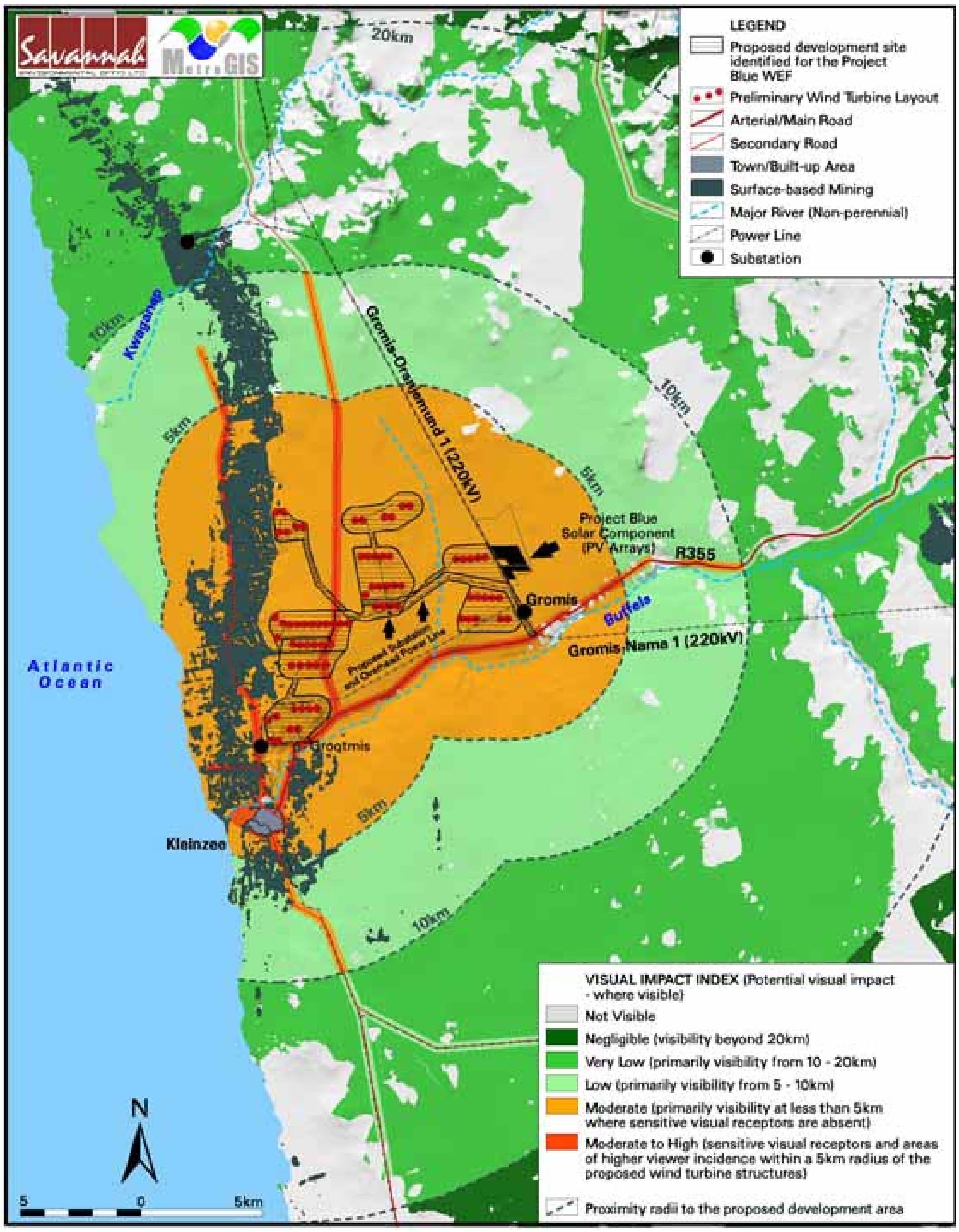


Figure 9.8: Visual impact index of the proposed Wind Energy Facility

Impact tables summarising the significance of visual impacts associated with the wind energy facility

Nature of Impact: Potential visual impact of construction on visual receptors in close proximity to the proposed facility. During construction, there will be a noticeable increase in heavy vehicles utilising the roads to the development site that may cause, at the very least, a visual nuisance to other road users in the area. The clearing of vegetation during construction is unavoidable. Given the large footprint of development, it is likely that large tracks of land will be affected. The rehabilitation of vegetation in this region is difficult, given the hot, dry climatic conditions of this region.		
	No mitigation	***Mitigation considered***
Extent	Local **(4)**	Local **(4)**
Duration	Long term **(4)**	Short term **(2)**
Magnitude	Moderate **(6)**	Low **(4)**
Probability	Highly Probable **(4)**	Probable **(3)**
Significance	Moderate **(56)**	Low **(30)**
Status	Negative	Negative
Reversibility	Recoverable	Recoverable
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation: » Ensure that vegetation is not unnecessarily cleared or removed during the construction period. » Reduce the construction period through careful logistical planning and productive implementation of resources. » Plan the placement of lay-down areas and temporary construction equipment camps in order to minimise vegetation clearing (i.e. in already disturbed areas) wherever possible. » Restrict the activities and movement of construction workers and vehicles to the immediate construction site and existing access roads. » Ensure that rubble, litter, and disused construction materials are appropriately stored (if not removed daily) and then disposed regularly at licensed waste facilities. » Reduce and control construction dust through the use of approved dust suppression techniques as and when required (i.e. whenever dust becomes apparent). » Restrict construction activities to daylight hours in order to negate or reduce the visual impacts associated with lighting. » Rehabilitate all disturbed areas, construction areas, roads, slopes etc immediately after the completion of construction works.		
Cumulative impacts: In context of the existing rural character and relative low activity rate, the construction phase of the WEF will contribute to a regional increase in heavy vehicles on the roads in the region, with constructions activity distinctly noticeable.		
Residual impacts: None.		

Nature of Impact: Potential visual impact on users of arterial and secondary roads in close proximity to the proposed facility Visual impacts on the R355 arterial road, being the major access route to Kleinzee, as well as the secondary road from the north, are expected to be of moderate significance within a radius of 5 km from the facility. The duration of visual impact within this zone, at an average speed of 90km/h, will be about 10 minutes.		
	No mitigation	***Mitigation considered***
Extent	Local **(4)**	N/a
Duration	Long term **(4)**	N/a
Magnitude	High **(8)**	N/a
Probability	Probable **(3)**	N/a
Significance	Moderate **(48)**	N/a
Status	Negative	N/a
Reversibility	Recoverable	N/a
Irreplaceable loss of resources?	No	N/a
Can impacts be mitigated?	No	
Mitigation / Management: Planning: » Retain / re-establish and maintain natural vegetation in all areas outside of the development footprint. Operations: » Maintain the general appearance of the facility as a whole. Decommissioning: » Remove infrastructure not required for the post-decommissioning use of the site. » Rehabilitate all areas. Consult an ecologist regarding rehabilitation specifications. » Monitor rehabilitated areas post-decommissioning and implement remedial actions.		
Cumulative impacts: The construction of wind turbines together with the associated infrastructure will increase the cumulative visual impact of industrial type infrastructure within the region. This is relevant in light of the power line infrastructure already present in the area.		
Residual impacts: The visual impact will be removed after decommissioning, provided the facility and ancillary infrastructure is removed. Failing this, the visual impact will remain.		

Nature of Impact: Potential visual impact on residents of Kleinzee Kleinzee is situated less than 5 km from the nearest boundary of the proposed facility. The potential for visual exposure is high, but due to the existence of buildings and other structures, typically of a built up area, the visual absorption capacity is expected to be high, therefore limiting full exposure of the wind energy facility.		
	No mitigation	***Mitigation considered***
Extent	Local **(4)**	N/a
Duration	Long term **(4)**	N/a
Magnitude	Moderate **(6)**	N/a
Probability	Probable **(3)**	N/a

Significance	Moderate **(42)**	N/a
Status (positive or negative)	Negative	N/a
Reversibility	Recoverable **(3)**	N/a
Irreplaceable loss of resources?	No	N/a
Can impacts be mitigated?	No	

Mitigation / Management:

Planning:

» Retain / re-establish and maintain natural vegetation in all areas outside of the development footprint.

Operations:

» Maintain the general appearance of the facility as a whole.

Decommissioning:

» Remove infrastructure not required for the post-decommissioning use of the site.
» Rehabilitate all areas. Consult an ecologist regarding rehabilitation specifications.
» Monitor rehabilitated areas post-decommissioning and implement remedial actions.

Cumulative impacts:

The construction of wind turbines together with the associated infrastructure will increase the cumulative visual impact of industrial type infrastructure within the region. This is relevant in light of the power line infrastructure already present in the area.

Residual impacts:

The visual impact will be removed after decommissioning, provided the facility and ancillary infrastructure is removed. Failing this, the visual impact will remain.

Nature of Impact: Potential visual impact of ancillary infrastructure (i.e. the substation, the overhead power line, the internal access roads and the office / workshop) on observers in close proximity to the facility

Ancillary infrastructure associated with the wind energy facility includes the substations, the overhead power line, the internal access roads, administration buildings and workshop, which may be visible to observers in close proximity to the facility. These will be located within the facility footprint. The roads have the potential of manifesting as landscape scarring. Other infrastructure has the potential of creating visual clutter, contributing to cumulative impacts, therefore having the potential of visual impact within the viewshed areas. No dedicated viewsheds have been generated for the ancillary infrastructure, as the range of visual exposure will fall within that of the turbines, as indicated on Figure 7.6.

	No mitigation	***Mitigation considered***
Extent	Local **(4)**	Local **(4)**
Duration	Long term **(4)**	Long term **(4)**
Magnitude	Low **(4)**	Low **(4)**
Probability	Improbable **(2)**	V Improbable **(1)**
Significance	Low **(24)**	Low **(12)**
Status	Negative	Negative
Reversibility	Recoverable	Recoverable
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	

Mitigation / Management:

Planning:

» Plan internal roads in such a way and in such a location that clearing of vegetation is minimised. Consolidate existing infrastructure as much as possible, and make use of already disturbed areas rather than pristine sites wherever possible.
» Retain / re-establish and maintain natural vegetation in all areas outside of the development footprint.

Construction:
» Rehabilitation of all construction areas.
» Ensure that vegetation is not cleared unnecessarily to make way for access roads and ancillary buildings.

Operation:
» Maintenance of roads to avoid erosion and suppress dust.

Decommissioning:
» Removal of infrastructure and roads not required for post decommissioning use and rehabilitation of the footprint areas.
» Monitor rehabilitated areas post-decommissioning and implement remedial actions.

Cumulative impacts:
The construction of the substation, overhead power line, internal roads and buildings, will increase the cumulative visual impact of industrial type infrastructure within the region. This is relevant in light of existing roads and power lines already present in the area.

Residual impacts:
The visual impact will be removed after decommissioning, provided the access roads are removed and rehabilitated. Failing this, the visual impact will remain.

Nature of Impact: Potential visual impact of shadow flicker on observers in close proximity thereto.

Shadow flicker (as a result of the turbines) only occurs when the sky is clear, and when the rotor blades are between the sun and the receptor (i.e. when the sun is low). De Gryse in Scenic Landscape Architecture (2006) found that “most shadow impact is associated with 3-4 times the height of the object”. Based on this research, a 320m buffer along the edge of the facility is submitted as the zone within which there is a risk of shadow flicker occurring. There are no roads or places of residence within the 320 m buffer. The significance of shadow flicker is therefore anticipated to be low.

	No mitigation	***Mitigation considered***
Extent	Local **(4)**	N/a
Duration	Long term **(4)**	N/a
Magnitude	Low **(4)**	N/a
Probability	Very Improbable **(1)**	N/a
Significance	Low **(12)**	N/a
Status	Negative	N/a
Reversibility	Recoverable	N/a
Irreplaceable loss of resources?	No	N/a
Can impacts be mitigated?	No	

Mitigation / Management:
Decommissioning:
Removal of infrastructure not required for post decommissioning use and rehabilitation of the footprint areas.

Cumulative impacts:
The construction of wind turbines together with the associated infrastructure will increase the cumulative visual impact of industrial type infrastructure within the region.

Residual impacts:
The visual impact will be removed after decommissioning, provided the facility and ancillary infrastructure is removed. Failing this, the visual impact will remain.

Nature of Impact: Potential visual impact of lighting on visual receptors in close proximity of the proposed facility.

Lighting impacts relate to the effects of glare and sky glow. The source of glare light, although not as intense as direct lighting, is the aircraft warning lights mounted on top of the hub of the wind turbines. These lights are less aggravating due to the toned-down red colour, but have the potential to be visible from a great distance. There is no mitigation for this impact.

Sky glow is the condition where the night sky is illuminated when light reflects off particles in the atmosphere such as moisture, dust or smog. The sky glow intensifies with the increase in the amount of light sources. Each new light source, especially upwardly directed lighting, contribute to the increase in sky glow. The wind energy facility may contribute to the effect of sky glow within this environment. The area surrounding the facility is primarily demarcated as conservation areas, which are highly sensitive to lighting impacts.

	No mitigation	***Mitigation considered***
Extent	Local **(4)**	Local **(4)**
Duration	Long term **(4)**	Long term **(4)**
Magnitude	High **(8)**	Moderate **(6)**
Probability	Probable **(3)**	Improbable **(2)**
Significance	Moderate **(48)**	Low **(28)**
Status	Negative	Negative
Reversibility	Recoverable	Recoverable
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	

Mitigation:
Planning & operation:
» Shielding the sources of light by physical barriers (walls, vegetation, or the structure itself);
» Limiting mounting heights of lighting fixtures, or alternatively using foot-lights or bollard level lights;
» Making use of minimum lumen or wattage in fixtures;
» Making use of down-lighters, or shielded fixtures;
» Making use of Low Pressure Sodium lighting or other types of low impact lighting.
» Making use of motion detectors on security lighting. This will allow the site to remain in relative darkness, until lighting is required for security or maintenance purposes.

Cumulative impacts:
The existing town of Kleinzee already generates lighting impacts at night. The impact of the proposed WEF will contribute to a regional increase in lighting impact.

Residual impacts:
The visual impact will be removed after decommissioning, provided the facility and ancillary infrastructure is removed. Failing this, the visual impact will remain.

Nature of Impact: Potential visual impact of the proposed facility on visual character and sense of place of the region

Sense of place refers to a unique experience of an environment by a user, based on his or her cognitive experience of the place. Visual criteria, specifically the visual character of an area (informed by a combination of aspects such as topography, level of development, vegetation, noteworthy features, cultural / historical features, etc.), play a significant role. An impact on the sense of place is one that alters the visual landscape to such an extent that the user experiences the environment differently, and more specifically, in a less appealing or less positive light.

Specific aspects contributing to the sense of place of this region include the rural and undeveloped character of the area. A sense of remoteness is evident when travelling through the area. Approaching Kleinzee and the mined areas, this sense of place is altered. The location of the proposed wind energy facility close to Kleinzee can be regarded as a transition zone between a built-up and rural area, within which changes to the sense of place may be more acceptable to sensitive viewers.

Given the vastness of this region, where this particular sense of place is experienced widely, any change to it close to a disturbed area is likely to be of low significance.

	No mitigation	**Mitigation considered**
Extent	Regional **(3)**	N/a
Duration	Long term **(4)**	N/a
Magnitude	Low **(4)**	N/a
Probability	Improbable **(2)**	N/a
Significance	Low **(22)**	N/a
Status	Negative	N/a
Reversibility	Recoverable	N/a
Irreplaceable loss of resources?	No	N/a
Can impacts be mitigated?	No	

Mitigation / Management:

Planning:
» Retain / re-establish and maintain natural vegetation in all areas outside of the development footprint.

Operations:
» Maintain the general appearance of the facility as a whole.

Decommissioning:
» Remove infrastructure not required for the post-decommissioning use of the site.
» Rehabilitate all areas. Consult an ecologist regarding rehabilitation specifications.
» Monitor rehabilitated areas post-decommissioning and implement remedial actions.

Cumulative impacts: The construction of wind turbines together with the associated infrastructure will increase the cumulative visual impact of industrial type infrastructure within the region. This is relevant in light of the power line infrastructure already present in the area.
Residual impacts: The visual impact will be removed after decommissioning, provided the facility and ancillary infrastructure is removed. Failing this, the visual impact will remain.

Implications for project implementation

» The construction and operation of the proposed Project Blue Wind Energy Facility and its associated infrastructure, will have a visual impact on the study area, specifically within 5km of the proposed facility.
» The anticipated visual impacts listed above (i.e. post mitigation impacts) range from moderate to low, and none are considered to be fatal flaws for the proposed wind energy facility.
» Mitigation measures as proposed must be implemented.

9.3.6. Potential Heritage Impacts

Phase 2 will not have impacts of high significance on the heritage of the area. However, some archaeological mitigation will be required, particularly in the far north where the cluster of small shell scatters on heuweltjies was located.

Impact tables summarising the significance of impacts on heritage sites associated with the wind energy facility

Nature: Assessment of impacts to heritage resources for Phase 2.		
	Without mitigation	**With mitigation**
Extent	Local (2)	Local (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	Minor (2)	Small (0)
Probability	Definite (5)	Improbable (2)
Significance	**Medium (45)**	**Low (12)**
Status	Negative	Negative
Reversibility	No	
Irreplaceable loss of resources?	Yes	
Can impacts be mitigated?	Yes through avoidance or sampling.	
Mitigation: » If it is not possible to avoid impact, undertake archaeological excavation and sampling.		
Cumulative impacts: » There are probably hundreds of thousands of archaeological sites in the Namaqualand Sandveld and loss (with mitigation) of some will thus not be significant.		
Residual impacts: » Loss of heritage sites.		

Implications for project implementation

- Phase 2, though larger than phase 1, will not have impacts of high significance on the heritage of the area. However, some archaeological mitigation will be required, particularly in the far north where the cluster of small shell scatters on heuweltjies was located. Construction of turbines would necessitate five hours' of mitigation of the impacted sites, although due to the need to treat the cluster of shell scatters as one larger site three further hours would need to be allocated there.
- Impacts to archaeological resources can generally be easily mitigated, although in some cases this would be time-consuming due to the extensive numbers of sites or occurrences to be impacted.
- In general, high to medium significance impacts for archaeology will be reduced to low through mitigation
- It is concluded that the proposed Project Blue Wind Energy Facility: Phase 2 should be allowed to proceed.
- Prior to construction a final walk-down survey must be carried out in order to examine any areas not yet checked and any turbine positions that have been changed or added subsequent to the Phase 2 survey. Archaeological mitigation as required must then be carried out.
- If any unmarked pre-colonial burials are intersected during the construction phase of the project then these should be reported to SAHRA or an archaeologist so that appropriate action can be taken.

9.3.7. Potential Noise Impacts

The Scoping-level noise impact assessment indicated that Phase 2 of the development would pose no risk to any potential noise-sensitive development (NSD). Therefore, no impact is expected and this impact is not assessed further here.

This phase of the development will however add to the cumulative noise impacts on NSDs located in close proximity to Phase 3 (refer to Chapter 11).

9.3.8. Potential Social Impacts

Impacts associated with the Construction Phase

The key social issues associated with the construction phase are the following:

Potential positive impacts

- Creation of employment and business opportunities, and opportunity for skills development and on-site training.

Potential negative impacts

- Impacts associated with the presence of construction workers on local communities;
- Increased risks to stock, crops, grazing and farming infrastructure associated with the presence of construction workers;
- Impact of heavy vehicles on local roads;
- Loss of agricultural land associated with construction related activities.

Impact tables summarising the significance of social impacts associated with the construction of the wind energy facility

Nature: ***Creation of local employment and business opportunities during the construction phase associated with proposed wind energy facility***

Based on the information from other WEFs the capital expenditure associated with the construction of Phase 1 (20 MW) would be ~ R320 million, with Phases 2 and 3 being R900 million and R1.2 billion respectively. The total capital expenditure associated with the full 150MW (Phase 1, 2 and 3) facility would be region of R2.4 billion (2012 Rands).

The establishment of a 150 MW wind energy facility would take ~ 24 months and create approximately 300 construction related jobs. Of this total approximately 25 % (75) will be available to skilled personnel (engineers, technicians, management and supervisory), ~ 15 % (45) to semi-skilled personnel (drivers, equipment operators), and ~ 60% (180) to low skilled personnel (construction labourers, security staff). The employment opportunities associated with each phase would be ~ 48 for Phase 1 (20MW), ~ 112 for Phase 2 (56 MW) and ~ 148 for Phase 3 (74MW).

The total wage bill with the construction of a 150MW facility (300 employees X 24 months) is estimated to be in the region of R89 million. This is based on the assumption that the average monthly salary for low, semi and skilled workers is R5 000, R12 000 and R30 000 respectively. The capital expenditure is anticipated to be in the region of R2.4 billion for a 150 MW wind energy facility.

Members from the local community are likely to be in a position to qualify for the majority of the low skilled and some of the semi-skilled employment opportunities. The majority of these employment opportunities are also likely to accrue to Historically Disadvantaged (HD) members from the local community. Given the high unemployment levels and limited job opportunities in the area this will represent a significant social benefit. The remainder of the semi-skilled and majority of the skilled employment opportunities are likely to be associated with the contactors appointed to construct the wind energy facility and associated infrastructure. In terms of accessibility the majority of the construction workers from outside the area are likely to be accommodated in Kleinsee. The findings of the SIA indicate that old De Beers mining hostels could be used to accommodate construction workers.

In terms of training, the contractors are likely to provide on-site training and skills development opportunities. However, the majority of benefits are likely to accrue to personnel employed by the relevant contractors. In the absence of specific commitments from the developer to employ local contractors the potential for meaningful skills development and training for members from the local communities are likely to be limited.

A percentage of the wage bill will be spent in the local economy and will create opportunities for local businesses in Kleinsee and Springbok. The sector of the local economy that is most likely to benefit from the proposed development is the local service industry. The potential opportunities for the local service sector would be linked to accommodation, catering, cleaning, transport and security, etc. associated with the construction workers on the site. The injection of income into the area in the form of wages and rental for accommodation will also create opportunities for local businesses in the Kleinsee and Springbok. The sector of the local economy that is most likely to benefit from the proposed development is the local service industry. The benefits to the local economy will be confined to the construction period (24 months).

In addition to the employment benefits, the expenditure of R2.4 billion during the construction phase will create business opportunities for the local and regional economy. However, given the technical nature of the project and the high import content associated with wind turbines the opportunities for the local economy is likely to be limited. However, some of the required civil engineering and construction skills may be able to be sourced from Springbok.

The local hospitality industry will also benefit from the accommodation and meals for professionals (engineers, quantity surveyors, project managers, product representatives etc.) and other personnel involved on the project. Experience from other construction projects indicates that the potential opportunities are not limited to onsite construction workers but also to consultants and product representatives associated with the project.

	Without Mitigation	**With Enhancement**
Extent	Local – Regional (2) (Rated as 2 due to potential opportunities for local communities and businesses)	Local – Regional (3) (Rated as 3 due to potential opportunities for local communities and businesses)
Duration	Short term (2)	Short term (2)
Magnitude	Low (4)	Low (4)
Probability	Highly probable (4)	Highly probable (4)
Significance	Medium (32)	Medium (36)
Status	Positive	Positive
Reversibility	N/A	N/A
Irreplaceable loss of resources?	N/A	N/A
Can impact be enhanced?	Yes	

Enhancement measures:

Employment

» Where reasonable and practical, WWK should appoint local contractors and implement a ‘locals first’ policy, especially for semi and low-skilled job categories.

» Prior to commencement of the construction phase, WWK should meet with representatives from the NKLM to establish the existence of skills and unemployment databases for the relevant municipal areas. If such databases exists, they should be made available to the appointed contractors.

» The local authorities, community representatives and organisations on the interested and affected party database should be informed of the final decision regarding the project and the potential job opportunities for locals and the employment procedures which WWK intends to implement during the construction phase.

» Where feasible, training and skills development programmes for locals should be initiated

prior to the initiation of the construction phase. **<u>Business</u>** » WWK should develop a database of local companies, specifically companies that qualify as BBBEE companies, which qualify as potential service providers (e.g. construction companies, catering companies, waste collection companies, security companies etc.) prior to the commencement of the tender process for construction contractors. These companies should be notified of the tender process and invited to bid for project-related work; » Where possible, WWK should assist local BBBEE companies to complete and submit the required tender forms and associated information; » The NKLM, in conjunction with representatives from the local hospitality and retail industries, should identify strategies aimed at maximising the potential benefits associated with the project. Note that while preference to local employees and companies is recommended, it is recognised that a competitive tender process may not guarantee the employment of local labour for the construction phase.
Cumulative impacts: Opportunity to up-grade and improve skills levels in the area. However, due to relatively small number of local employment opportunities and limited skills range, this benefit is likely to be limited.
Residual impacts: Improved pool of skills and experience in the local area. However, due to relatively small number of local employment and skills-transfer opportunities this benefit is likely to be limited.

Nature: ***Potential impacts on family structures and social networks associated with the presence of construction workers during construction the wind energy facility*** The presence of construction workers poses a potential risk to family structures and social networks. While the presence of construction workers does not in itself constitute a social impact, the manner in which construction workers conduct themselves can impact on local communities. The most significant negative impact is associated with the disruption of existing family structures and social networks. This risk is linked to potentially risky behaviour of male construction workers, including: » An increase in alcohol and drug use; » An increase in crime levels; » The loss of girlfriends and or wives to construction workers; » An increase in teenage and unwanted pregnancies; » An increase in prostitution; » An increase in sexually transmitted diseases (STDs). The findings of the SIA indicate that the potential impact of outside construction workers on the local community is an issue of concern. In this regard problems were experienced with construction workers housed in or near Kommagas/ Buffelsrivier during the tarring of R355 from Springbok to Buffelsrivier and the construction of the Eskom substation near Kommagas. The potential risk to local residents in the area could potentially be mitigated by implementing a

local employment policy, specifically for the low and semi-skilled employment opportunities associated with the construction phase. Employing members from the local community to fill the low-skilled job categories would reduce the risk and mitigate the potential impacts on the local communities. These workers will be from the local community and form part of the local family and social network and, as such, the potential impact will be low. However, due to the potential mismatch of skills and low education levels, the potential employment opportunities for the members from these local communities may be low.

WWK has indicated that construction workers will not be accommodated on site and will be transported to and from the site on a daily basis. The findings of the SIA indicate that non local workers can be accommodated in the DBC hostels in Kleinsee which are currently vacant. There are a total of 384 rooms and DBC is keen on seeing these facilities used. This issue would need to be discussed with the NKLM who are currently in the process of taking over the running of these and other services from DBC.

The potential risks posed by construction workers to the local community can be reduced to low by employing members from the local community. While the risks associated with construction workers at a community level will be low, at an individual and family level they may be significant, especially in the case of contracting a sexually transmitted disease or an unplanned pregnancy. However, given the nature of construction projects it is not possible to totally avoid these potential impacts at an individual or family level.

	Without Mitigation	**With Mitigation**
Extent	Local (3) (Rated as 3 due to potential severity of impact on local communities)	Local (1) (Rated as 1 due to potential severity of impact on local communities)
Duration	Short term for community as a whole (2) Long term-permanent for individuals who may be affected by STDs etc. (5)	Short term for community as a whole (2) Long term-permanent for individuals who may be affected by STDs etc. (5)
Magnitude	Low for the community as a whole (4) High-Very High for specific individuals who may be affected by STDs etc. (10)	Low for community as a whole (4) High-Very High for specific individuals who may be affected by STDs etc. (10)
Probability	Probable (3)	Probable (3)
Significance	Low for the community as a whole (27) Moderate-High for specific individuals who may be affected by STDs etc. (54)	Low for the community as a whole (21) Moderate-High for specific individuals who may be affected by STDs etc. (48)
Status	Negative	Negative
Reversibility	No in case of HIV	No in case of HIV
Irreplaceable loss of resources?	Yes, if people contract HIV/AIDS. Human capital plays a critical role in communities that rely on farming for their livelihoods	

Can impact be mitigated?	Yes, to some degree. However, the risk cannot be eliminated

Mitigation:

» Where reasonable and practical, WWK should appoint local contractors and implement a 'locals first' policy, especially for semi and low-skilled job categories.
» WWK should liaise with the NKLM to ensure that that recommended mitigation measures are implemented.
» WWK and the contractor(s) should, in consultation with representatives from the MF, develop a code of conduct for the construction phase. The code should identify which types of behaviour and activities are not acceptable. Construction workers in breach of the code should be dismissed. All dismissals must comply with the South African labour legislation.
» WWK and the contractor should implement an HIV/AIDS awareness programme for all construction workers at the outset of the construction phase.
» The movement of construction workers on and off the site should be closely managed and monitored by the contractors. In this regard the contractors should be responsible for making the necessary arrangements for transporting workers to and from site over weekends or after hours.
» The contractors should make the necessary arrangements for allowing workers from outside the area to return home over weekends and/ or on a regular basis. This would reduce the risk posed to local family structures and social networks.
» With the exception of security personnel, no construction workers should be accommodated on the site overnight.

Cumulative impacts:

Impacts on family and community relations that may, in some cases, persist for a long period of time. Where unplanned / unwanted pregnancies occur, or members of the community are infected by an STD, specifically HIV, the impacts may be permanent and have long term to permanent cumulative impacts on the affected individuals and/or their families and the community.

Residual impacts:

Impacts on family and community relations that may, in some cases, persist for a long period of time. Where unplanned / unwanted pregnancies occur, or members of the community are infected by an STD, specifically HIV, the impacts may be permanent and have long term to permanent cumulative impacts on the affected individuals and/or their families and the community.

Nature: ***Potential loss of livestock, poaching and damage to farm infrastructure associated with the presence of construction workers on site***

The movement of construction workers on and off the site poses a potential threat to farm infrastructure, such as fences and gates, which may be damaged. Stock losses may also result from gates along access roads being left open and/or fences being damaged. The issue of trespassing, stock theft and illegal hunting were raised as concerns by commercial farmers and Kleinsee Farmers Union. It should however be noted that the majority of commercial farms are located to the south of the proposed site, across Buffels River, near the proposed Eskom wind energy facility site. The local farmers interviewed indicated that stock theft was increasingly becoming an issue on commercial farms, especially since DBC had closed down Kleinsee its operations. Illegal hunting of small antelope, etc. (mainly with dogs, but also small calibre rifles) and removal of tortoises was also reported as a growing problem in area. The area is also rich in rare succulents which have a high value on the black market.

DBC currently owns the majority of the proposed development site and surrounding properties, but is in process of selling off, mainly to subsidiary of Trans-Hex (which may potentially lease out grazing. Portions of the site adjacent to DBC land is rented out for grazing; on others (e.g. Manelsvlei across R355 and Buffels River) DBC only has surface rights, and these are also used for grazing by "owners" of grazing rights. While the overall stock numbers are low the area vulnerable due to large size of properties and low population densities. All of the parties interviewed indicated that no construction workers should be accommodated on the site.

	Without Mitigation	**With Mitigation**
Extent	Local (4) (Rated as 4 due to potential severity of impact on local farmers)	Local (2)
Duration	Medium term (3)	Medium term (3)
Magnitude	Moderate (6) (Due to reliance on agriculture and livestock for maintaining livelihoods)	Low (4)
Probability	Probable (3)	Probable (3)
Significance	Medium (39)	Low (27)
Status	Negative	Negative
Reversibility	Yes, compensation paid for stock losses etc.	Yes, compensation paid for stock losses etc.
Irreplaceable loss of resources?	No	No
Can impact be mitigated?	Yes	

Mitigation:

» WWK in consultation with the NKLM and local farmers should develop a Code of Conduct for construction workers. The Code of Conduct should be signed by WWK and all relevant contractors prior to the commencement of any on-site construction activities.
» WWK should hold contractors liable for compensating farmers and communities in full for any stock losses and/or damage to farm infrastructure that can be linked to construction workers. This should be contained in the Code of Conduct, to be signed between WWK, the contractors and neighbouring landowners. The agreement should also cover loses and costs associated with any fires caused by construction workers or construction related activities (see below).
» A designated Environmental Control Officer (ECO) should be appointed to monitor the conduct of staff. Affected landowners should have on-going access to the ECO.
» The EMP must outline procedures for managing and storing waste (including arrangements for plastic waste etc.) on site.
» Contractors must ensure that all workers are informed of the conditions contained on the Code of Conduct at the outset of the construction phase. The consequences of stock theft, poaching and trespassing on adjacent farms should be emphasised.
» Contractors must ensure that workers who are found guilty of stealing livestock, poaching and/or damaging farm infrastructure are dismissed and formally charged. This should be contained in the Code of Conduct. All dismissals must be in accordance with South African labour legislation.
» WWK should enter into legally binding arrangements with regard to compensation with all

relevant property owners prior to the start of construction.
Cumulative impacts: None, provided that losses are adequately compensated for.
Residual impacts: None, provided that losses are adequately compensated for.

Nature: ***Potential loss of livestock, crops and houses, damage to farm infrastructure and threat to human life associated with increased incidence of veld fires*** The presence of construction workers and construction-related activities on the site can poses an increased risk of veld fires that in turn pose a threat to the natural vegetation, farmsteads, livestock and wildlife in the area. In the process, farm and tourism infrastructure may also be damaged or destroyed and human lives threatened. The issue of fire has been raised as a key concern by most farmers in the area. In the case of the proposed Project Blue wind energy facility the sparse, succulent vegetation on the site is not prone to veld fires. In addition, none of the famers interviewed indicated that this was an issue of concern.		
	Without Mitigation	**With Mitigation**
Extent	Local (2)	Local (1)
Duration	Short term (2)	Short term (2)
Magnitude	Low (4)	Low (4)
Probability	Probable (3)	Probable (3)
Significance	Low (24)	Low (21)
Status	Negative	Negative
Reversibility	Yes, compensation paid for stock losses etc.	Yes, compensation paid for stock losses etc.
Irreplaceable loss of resources?	No	No
Can impact be mitigated?	Yes	
Mitigation: Despite the low risk of veld fires, WWK should enter into an agreement with the affected landowners whereby the company will compensate for damages proven to be attributed to activities associated with the wijd energy facility. This includes losses associated veld fires. In addition, the potential increased risk of veld fires can be mitigated. The detailed mitigation measures are outlined in the EMP for the construction and operation phases. The aspects that should be covered include: » Contractor to ensure that open fires on the site for cooking or heating are not allowed except in designated areas. » Contractor to ensure that construction related activities that pose a potential fire risk, such as welding, are properly managed and are confined to areas where the risk of fires has been reduced. Measures to reduce the risk of fires include clearing working areas and avoiding working in high wind conditions when the risk of fires is greater. In this regard special care should be taken during the high risk dry, windy summer months. » Contractor to provide adequate fire fighting equipment on-site. » Contractor to provide fire-fighting training to selected construction staff. » As per the conditions of the Code of Conduct, in the advent of a fire being caused by		

construction workers and or construction activities, the appointed contractors must compensate farmers for any damage caused to their farms. The contractor should also compensate the fire fighting costs borne by farmers and local authorities.

In addition the landowner should also ensure that they join the local fire protection agency.

Cumulative impacts:
No, provided losses are compensated for.

Residual impacts:
No, provided losses are compensated for.

Nature: ***Potential impacts to road surfaces and road safety associated with the movement of construction related traffic to and from the site***

The establishment of a wind energy facility requires abnormal loads associated with the transport of turbine components onto site. These will include abnormally long loads associated with ~ 60 m rigid turbine blades, as well as abnormally heavy loads associated with ~ 80 tonne nacelles. In addition, a crawler crane (~ 750 t) and assembly cranes will also need to be transported onto and off the sites. Other heavy equipment will include normal civil engineering construction equipment such as graders, excavators, cement trucks, etc.

Access to the site is likely to be via the R355 Springbok-Buffelsrivier Road. This road provides access to small scale mines along road, De Beers land, and communal grazing areas around Kommagas and Buffelsrivier. Potential delays associated with abnormal loads may develop along the road due to the mountainous terrain and at the Spektakel Pass. These delays would impact on other road users, including tourists. The local traffic authorities should therefore be informed of the dates and times of abnormal load trips. In addition, trips during peak tourism season periods, namely the Easter weekend, flower season (August-September) and December holidays should be carefully planned to minimize the impact on tourist related traffic.

	Without Mitigation	**With Mitigation**
Extent	Local (3) (Rated as 3 due to potential severity of impact on local farmers)	Local (2)
Duration	Short term (2)	Short term (2)
Magnitude	Low (4)	Low (4)
Probability	Probable (3)	Probable (3)
Significance	Low (27)	Low (24)
Status	Negative	Negative
Reversibility	Yes	
Irreplaceable loss of resources?	No	No
Can impact be mitigated?	Yes	

Mitigation:

» Movement of heavy vehicle traffic should, where possible, be carefully planned to minimize the impact on tourist related traffic during the peak tourist season periods (Easter weekend, flower season (August-September) and December holidays).

» Movement of construction traffic should be limited to weekdays. In addition, the movement of heavy vehicles on the local roads, specifically the R355 and Kommagas gravel road should

not be permitted after 13h00 on Friday afternoons and before 09h00 on Monday mornings as these are times that are likely to impact on weekend visitors to the area. » The contractor should inform local farmers and representatives from the NKLM and Tourism Sector of dates and times when abnormal loads will be undertaken. » The contractor should ensure that damage caused to roads by construction related activities, including heavy vehicles, is repaired before the completion of the construction phase. The costs associated with the repair must be borne by the developer. » All vehicles must be road-worthy and drivers must be qualified and made aware of the potential road safety issues and need for strict speed limits.
Cumulative impacts: If damage to roads is not repaired then this will impact on the farming activities in the area and also result in higher maintenance costs for vehicles of local farmers and other road users. The costs will be borne by road users who were not responsible for the damage.
Residual impacts: If damage to roads is not repaired then this will impact on the farming activities in the area and also result in higher maintenance costs for vehicles of local farmers and other road users.

Nature: ***Loss of farmland and natural vegetation*** The activities associated with the construction phase, such as establishment of access/haul roads, the movement of heavy vehicles, the establishment of lay-down areas and foundations for the wind turbines, substations and power lines will potentially damage topsoil and vegetation and result in losses of the grazing resource.		
	Without Mitigation	**With Mitigation**
Extent	Local (2)	Local (1)
Duration	Long term-permanent if disturbed areas are not rehabilitated (5)	Short term if damaged areas are rehabilitated (1)
Magnitude	Low (4)	Low (4)
Probability	Probable (3)	Probable (3)
Significance	Medium (33)	Low (18)
Status	Negative	Negative
Reversibility	Yes, but long period required	Yes, but long period required
Irreplaceable loss of resources?	No. Affected land can be restored, provided appropriate rehabilitation is implemented. Due to the aridity of the area, effective rehabilitation may however take long to achieve, and may prove costly.	
Can impact be mitigated?	Yes, provided efficient site rehabilitation is carried out.	
Mitigation: » The footprint associated with the construction related activities (access roads, turning circles, construction platforms, workshop etc.) should be minimised. » An Environmental Control Officer (ECO) should be appointed to monitor the entire duration of the construction phase. » All areas disturbed by construction related activities, such as access roads, construction platforms, workshop area etc., should be rehabilitated at the end of the construction phase. » The implementation of a rehabilitation programme should be included in the terms of reference for the contractor/s appointed to establish the wind energy facility. The specifications for the rehabilitation programme should be drawn up by a suitably qualified		

specialist. » The implementation of the Rehabilitation Programme should be monitored by the ECO; » • Compensation should be paid to any farmers that suffer a permanent loss of land due to the establishment of the wind energy facility. Compensation should be paid by WWK and based on accepted land values for the area; » WWK should investigate the option of establishing an Environmental Rehabilitation Trust Fund to cover the costs of decommissioning and rehabilitation of disturbed areas. The Trust Fund should be funded by a percentage of the revenue generated from the sale of energy to the national grid over the 2 year operational life of the facility. The rationale for the establishment of a Rehabilitation Trust Fund is linked to the experiences with the mining sector in South Africa and failure of many mining companies to allocate sufficient funds during the operational phase to cover the costs of rehabilitation and closure. » WWK should consult with the affected property owner/s with regard to the timing of the construction phase in order to enable them to plan his farming activities.
Cumulative impacts: Overall loss of farmland could impact on the livelihoods of the affected farmers, their families and the workers on the farms and their families. However, disturbed areas can be rehabilitated. In addition, carrying capacity of the area is low.
Residual impacts: Overall loss of farmland could impact on the livelihoods of the affected farmers, their families and the workers on the farms and their families.

Impacts associated with the Operation Phase

The following key social issues are of relevance to the operational phase:

<u>Potential positive impacts</u>

» Creation of employment and business opportunities. The operational phase will also create opportunities for skills development and training;
» Benefits associated with the establishment of a Community Trust;
» The establishment of renewable energy infrastructure.

<u>Potential negative impacts</u>

» The visual impacts and associated impact on sense of place and the character of the landscape (as discussed in Section 7.3.5);
» Potential impact on tourism.

Impact tables summarising the significance of social impacts associated with the operation of the wind energy facility

Nature: ***Creation of employment and business opportunities associated with the operational phase of the wind energy facility*** Based on information from other WEFs the establishment of Phase 1-3 (150MW) will create approximately 50 permanent employment opportunities over the operational phase is expected to last 20 years. Of these totals approximately 20% will be available to skilled personnel and 80% to semi and low skilled personnel. This represents a significant benefit for an area that has been

negatively affected by the closure of DBC Kleinsee operations.

Members from the local community are likely to be in a position to qualify for the majority of the low skilled and some of the semi-skilled employment opportunities associated with the proposed Project Blue wind energy facility. The majority of these employment opportunities are also likely to accrue to Historically Disadvantaged (HD) members from the local community. Given the high unemployment levels and limited job opportunities in the area this will represent a significant social benefit. The remainder of the semi-skilled and majority of the skilled employment opportunities are likely to be associated with people from outside the area.

Due to the need for specialised skills it may be necessary to import the required operational and maintenance skills from other parts of South Africa or even overseas. However, it will be possible to increase the number of local employment opportunities through the implementation of a skills development and training programme linked to the operational phase. Such a programme would support the strategic goals of promoting local employment and skills development contained in the NDM and NKLM IDP. The NDM and NKLM IDP Managers and Ward 8 councillor all indicated that Kommagas and Buffelsrivier should benefit from employment and meaningful skills development and training associated with the proposed wind energy facility. In this regard WWK has indicated that they are committed to local employment and the implementation of a training and skills development programme for members from the local community.

Given the location of the proposed WEF the majority of permanent staff is likely to reside Kleinsee. In terms of accommodation options, a percentage of the new permanent employees may purchase houses in Kleinsee while others may decide to rent. Both options would represent a positive economic benefit for the region. In addition, a percentage of the annual wage bill earned by permanent staff would be spent in the regional and local economy. This will benefit local businesses in the local towns in the area. The benefits to the local economy will extend over the 20-year operational lifespan of the project. The local hospitality industry is also likely to benefit from the operational phase. These benefits are associated with site visits by company staff members and other professionals (engineers, technicians etc.) who are involved in the company and the project but who are not linked to the day-to-day operations.

The establishment of a Community Trust as required in terms of the Request for Proposal Document prepared by the Department of Energy will also create potential benefits for the local community (see below).

	Without Mitigation	**With Enhancement**
Extent	Local (1)	Local (2)
Duration	Long term (4)	Long term (4)
Magnitude	Minor (2)	Minor (2)
Probability	Probable (3)	Probable (3)
Significance	Low (21)	Low (24)
Status	Positive	Positive
Reversibility	N/A	
Irreplaceable loss of resources?	No	
Can impact be enhanced?	Yes	

Enhancement:

The enhancement measures listed above to enhance local employment and business opportunities during the construction phase, also apply to the operational phase. In addition:

» WWK should implement a training and skills development programme for locals during the first 5 years of the operational phase. The aim of the programme should be to maximise the number of people from local communities and the broader NDM and NKLM area employed during the operational phase of the project.
Cumulative impacts: Creation of permanent employment and skills and development opportunities for members from the local community and creation of additional business and economic opportunities in the area
Residual impacts: Creation of permanent employment and skills and development opportunities for members from the local community and creation of additional business and economic opportunities in the area

Nature: *Benefits associated with establishment of a community trust*

In terms of the Request for Proposal document prepared by the Department of Energy all bidders for operating licences for renewable energy projects must demonstrate how the proposed development will benefit the local community. This can be achieved by establishing a Community Trust which is funded by revenue generated from the sale for energy. WWK has indicated that they are committed to establishment of a community trust. Community Trusts provide an opportunity to generate a steady revenue stream that is guaranteed for a 20 year period. This revenue can be used to fund development initiatives in the area and support the local community. The long term duration of the revenue stream also allows local municipalities and communities to undertake long term planning for the area. The revenue from the proposed facility can be used to support a number of social and economic initiatives in the area, including:

» Education;
» School feeding schemes;
» Training and skills development;
» Infrastructure development;
» Support for SMMEs.

In addition, the establishment of the proposed wind energy facility is unlikely to have a significantly impact on the agricultural land uses that underpin the local economic activities in the area. The loss of this relatively small area is therefore unlikely to impact on the current and future farming activities. Experience has however also shown that Community Trusts can be mismanaged. This issue will need to be addressed in order to maximise the potential benefits associated with the establishment of a community trust.

The benefits associated with Community Trusts are linked size of the facility. The larger the facility the greater the potential revenue stream generated for the Trust.

	Without Mitigation	**With Enhancement**[11]
Extent	Local (2)	Local and Regional (4)
Duration	Long term (4)	Long term (4)
Magnitude	Low (4)	Moderate (6)
Probability	Probable (3)	Definite (5)
Significance	Medium (30)	High (70)
Status	Positive	Positive

[11] Enhancement assumes effective management of the community trust

Reversibility	N/A	
Irreplaceable loss of resources?	No	
Can impact be enhanced?	Yes	

Enhancement:

In order to maximise the benefits and minimise the potential for corruption and misappropriation of funds the following measures should be implemented:

» Clear criteria for identifying and funding community projects and initiatives in the area should be identified. The criteria should be aimed at maximising the benefits for the community as a whole and not individuals within the community.

» Strict financial management controls, including annual audits, should be instituted to manage the funds generated for the Community Trust from the proposed wind energy facility.

Cumulative impacts:

Promotion of social and economic development and improvement in the overall well-being of the community

Residual impacts:

Promotion of social and economic development and improvement in the overall well-being of the community

Nature: *Development of infrastructure to generate clean, renewable energy*

South Africa currently relies on coal-powered energy to meet more than 90% of its energy needs. The majority of the coal used to generate energy in South Africa is low grade coal with a high sulphur content. As a result South Africa is the nineteenth largest per capita producer of carbon emissions in the world, and Eskom, as an energy utility, has been identified as the world's second largest producer of carbon emissions.

The promotion of renewable energy sources is supported at national and provincial levels. The fit with national and provincial energy policies should be viewed within the context of the site's location the potential impact on the areas sense of place and surrounding tourist related land uses. In addition, the current application is not unique. In this regard, a significant number of wind and solar energy facility developments are currently proposed in the northern Cape Province and other parts of South Africa. The potential contribution of the proposed Project Blue wind energy facility should therefore be regarded as valuable, but should not be overestimated.

	Without Mitigation	**With Enhancement**
Extent	Local, Regional and National (4)	Local, Regional and National (4)
Duration	Long term (4)	Long term (4)
Magnitude	Moderate (6)	Moderate (6)
Probability	Highly Probable (4)	Highly Probable (4)
Significance	Medium (56)	Medium (56)
Status	Positive	Positive
Reversibility	Yes	
Irreplaceable loss of resources?	Yes, impact of climate change on ecosystems	
Can impact be mitigated?	Yes	

Enhancement:

The establishment of the wind energy facility is a mitigation measure in itself. In order to maximize the benefits of the proposed project WWK should: » Use the project to promote and increase the contribution of renewable energy to the national energy supply; » Implement a skills development and training programme aimed at maximizing the number of employment opportunities for local community members; » Investigate the opportunities for establishing a Community Trust that would benefit local, disadvantaged and vulnerable communities.
Cumulative impacts: Reduce carbon emissions via the use of renewable energy and associated benefits in terms of global warming and climate change.
Residual impacts: Reduce carbon emissions via the use of renewable energy and associated benefits in terms of global warming and climate change.

Nature: *Potential negative impact of the wind energy facility on local tourism*

The impact on tourism is linked to the visual impact on the areas sense of place and landscape character. In this regard the overall visual impacts associated with the full 150MW wind energy facility are likely to be greater than the visual impacts associated with only Phase 1, 2 or 3.

The findings of the SIA indicate that the Garies-Kleinsee route (and then either R355 or Kommagas Road to Springbok) has been identified as a potential tourism development corridor/ scenic circular route in Kamiesberg SDF. However, no decision has been taken by the NKLM on this matter as yet. In addition, the project would require tarring large sections of the route and no budget has been earmarked for this purpose. The development of the route is therefore unlikely in the medium term. The findings of the SIA also indicate that the local tourism sector and I&APs in the area did not believe that wind turbines would impact negatively on the tourism potential of the area. Wind turbines were not viewed as being incompatible with local landscape and the areas sense of place. Representatives from the local authority also indicated that the promotion of the local “green” tourism growth strategy may benefit, and tie-in with other “greening” projects in the area, such as the DBCs dune veld rehabilitation south of Kleinsee).

In addition, the area has been disturbed by mining, and mining in the area to west of the site is likely to continue. This area is likely to remain a restricted area for foreseeable future, and effectively inaccessible to tourism. The relevant area is also severely disturbed. The potential negative impact on the tourism potential of the area is therefore likely to be limited.

The findings of the VIA (MetroGIS, May 2012) indicate that the Potential visual impact of the proposed facility on the visual character and sense of place of the region will be low. This is due to the vastness of this region, where this particular sense of place is experienced widely.

	Without Mitigation	**With Mitigation/Enhancement**
Extent	Local–Regional (1)	Local–Regional (1)
Duration	Long term (4)	Long term (4)
Magnitude	Low (4)	Low (4)
Probability	Probable (3)	Probable (3)

Significance	Low (27)	Low (27)
Status	Negative Positive	Negative Positive
Reversibility	Yes, turbines can be removed	Yes, turbines can be removed
Irreplaceable loss of resources?	No, turbines can be removed	No, turbines can be removed
Can impact be mitigated or enhanced?	No	
Enhancement: » The recommendations contained in the VIA should be implemented.		
Cumulative impacts: The wind energy facility has the potential to impact on the experience of tourist and the tourism potential of the area in general in both a negative and positive manner		
Residual impacts: The wind energy facility has the potential to impact on the experience of tourist and the tourism potential of the area in general in both a negative and positive manner.		

Implications for project implementation

» From a policy and planning perspective, the proposed wind energy facility is strongly supported at a national and local level. The development of a green economy is supported at provincial, District municipality and local municipality levels. This includes local energy generation from renewable sources, as well as eco/ conservation tourism development. Transformation of the Kleinsee economy away from historic mining activities has been identified as a key development priority for Kleinsee. The rehabilitation/ utilisation of disturbed coastal areas have been identified as a further challenge. The proposed Project Blue wind energy facility has the potential to contribute to meeting both of these policy objectives.
» All phases (Phase 1, 2, and 3) of the wind energy facility will create employment and business opportunities for locals during both the construction and operational phase of the project.
» The establishment of a Community Trust creates an opportunity to support local economic development in the area.
» The proposed development represents an investment in clean, renewable energy infrastructure, which, given the challenges created by climate change, represents a positive social benefit for society as a whole.
» The potential benefits will increase if all three Phases are developed.

9.4. Assessment of Cumulative Impacts Associated with the Proposed Wind Energy Facility

Cumulative impact, in relation to an activity, refers to the impact of an activity that in itself may not be significant but may become significant when added to the existing and potential impacts eventuating from similar or diverse activities or undertakings in the area[12]. To some extent a cumulative impact is a regional impact, rather than the local site scale impact, i.e. if something has a regional impact it also has a cumulative impact. Cumulative impacts for this assessment will include any approved renewable energy facilities in the area. The cumulative impact of the Project Blue Wind Energy Facility: Phase 2 has been considered at various levels as follows:

4. Impacts of Phase 2 of the wind energy facility plus the other two development phases of the Project Blue Wind Energy Facility (i.e. Phase 1 and Phase 3).
5. Impacts of the wind energy facility and the solar energy facility (proposed by WWK as Phase 4 of the Project Blue Renewable Energy Facility).
6. The additive impact of this project and other approved renewable energy projects within a 10 – 20 km radius of the site. Based on the information available at the time of undertaking this EIA, one other wind energy facility occurs in close proximity to the Project Blue site namely:
   * The proposed Eskom Kleinzee Wind Energy Facility which is located approximately 11km south of the proposed Project Blue site.

The potential *direct* cumulative impacts as a result of the proposed project are expected to be associated predominantly with:

» *Visual impact* on the surrounding area – at a local level and driven primarily by the number of turbines and associated substations proposed within the facility.
» Potential impacts associated with numerous wind energy facilities in the area. One wind energy facility has been authorised (near Koingnaas) and EIA processes for other wind energy facilities are currently being undertaken within the area. Should more than one facility be authorised and constructed, cumulative impacts in terms of visual impacts, impacts on avifauna, ecology and heritage resources (in particular the cultural landscape) could be expected.

The potential *indirect* cumulative impacts as a result of the proposed project are expected to be associated predominantly with:

» Flora, fauna and ecological processes – at a regional level and driven primarily by the on-going negative effects of agricultural activities in the area.
» Increased pressure on road and other infrastructure.

Cumulative effects have been considered within the detailed specialist studies, where applicable (refer to Appendices F -N) and are listed in the tables in section 9.3 above.

9.5. Assessment of the No Go Alternative

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[12] Definition as provided by DEA in the EIA regulations.

South Africa currently relies on coal-powered energy to meet more than 90% of its energy needs. As a result South Africa is one of the highest per capita producers of carbon emissions in the world and Eskom, as an energy utility, has been identified as the world's second largest producer carbon emissions. The national government has set targets for renewables substitution. The No-Development option would represent a lost opportunity for South Africa to supplement its current energy needs with clean, renewable energy. Given South Africa's position as one of the highest per capita producer of carbon emissions in the world, this would represent a negative social cost. The proposed Project Blue wind energy facility: Phase 2 would contribute 56 MW to South Africa's energy needs, with the full facility (Phases 1, 2 and 3) contributing up to 150MW. The proposal is however not unique. A significant number of renewable energy projects have been proposed in other parts of South Africa. Foregoing the proposed Project Blue wind energy facility development is therefore unlikely to impact negatively on South Africa's ability to achieve its stated renewable energy targets.

However, at a local level, the No-Development option would also result in a loss in employment opportunities associated with both the construction and operational phase. In addition, the benefits associated with the establishment of a Community Trust funded by revenue generated from the sale of energy from the wind energy facility would be forfeited. The revenue from the proposed wind energy facility can be used to support a number of social and economic initiatives in the area. These local benefits would be forgone if the proposed wind energy facility is not developed in the proposed area. Given the closure of the Kleinsee mine and the limited economic opportunities in the area this would represent a negative social cost for the local community.

Nature: ***Implementation of the no development option*** The no-development option would result in the lost opportunity for South Africa to supplement is current energy needs with clean, renewable energy. The No-Development option would also result in the loss of the benefits to the local community and economy associated with the creation of employment opportunities and the establishment of a Community Trust.		
	Without Mitigation	**With Mitigation**
Extent	Local, Regional and National (3)	Local, Regional and National (4)
Duration	Long term (4)	Long term (4)
Magnitude	Low (4)	Medium (6)
Probability	Probable (3)	Highly Probable (4)
Significance	Moderate (33)	Moderate (56)
Status	Negative	Positive
Reversibility	Yes	
Irreplaceable loss of resources?	Yes, impact of climate change on ecosystems	
Can impact be mitigated?	Yes	
Enhancement: The proposed wind energy facility should be developed and the mitigation and		

enhancement measures identified in the EIA should be implemented.
Cumulative impacts: Reduce carbon emissions via the use of renewable energy and associated benefits in terms of global warming and climate change.
Residual impacts: Reduce carbon emissions via the use of renewable energy and associated benefits in terms of global warming and climate change.

CONCLUSIONS: PHASE 2: PROJECT BLUE WIND ENERGY FACILITY — CHAPTER 10

This chapter of the EIA Report provides the conclusions drawn from the assessment of potential impacts associated with the development of the proposed Project Blue Wind Energy facility: Phase 2. This environmental impact assessment (EIA) has been undertaken in accordance with the EIA Regulations published in Government Notice 33306 of June 2010, in terms of Section 24(5) of the National Environmental Management Act (NEMA; Act No 107 of 1998). The scope of the proposed wind energy facility assessed through this EIA included:

» up to 28 wind turbine generator units, appropriately spaced to make use of the wind resource on a study area of approximately 1 305 ha
» a substation of approximately 80m x 90m in extent
» underground electrical cabling between turbines and the substation
» internal access roads
» a workshop on the facility site

The generating capacity of the facility is expected to be up to 56MW but will be dictated by the choice of turbine, which will be determined by the on-site conditions and the local wind regime following extensive on-site monitoring which is currently underway.

The EIA Phase aimed to achieve the following:

» Provide an overall assessment of the social and biophysical environments affected by the proposed alternatives put forward as part of the project.
» Assess potentially significant impacts (direct, indirect and cumulative, where required) associated with the proposed wind energy facility.
» Evaluate the an on-site substation site, associated power line and underground cabling, and access roads, for consideration by the decision-making authorities.
» Identify and recommend appropriate mitigation measures for potentially significant environmental impacts.
» Undertake a fully inclusive public involvement process to ensure that I&APs are afforded the opportunity to participate, and that their issues and concerns are recorded.

The preceding chapters of this report together with the specialist studies contained within Appendices F - N provide a detailed assessment of the environmental impacts on the social and biophysical environment as a result of the proposed project. This chapter concludes the Draft EIA Report by providing a summary of the conclusions of the assessment of the proposed site for the wind energy facility and associated infrastructure. In so doing, it draws on the information gathered as part of the EIA process and the knowledge gained by the environmental consultants during the course of the EIA and presents an informed opinion of the environmental impacts associated with the proposed project. The conclusions and recommendations of this EIA are the result of assessment of identified impacts by specialists, and the parallel process of public participation. The public consultation process has been extensive and every effort has been made to include representatives of all stakeholders in the study area.

10.1. Evaluation of the Proposed Project

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. It must be noted that there are a number of unavoidable impacts on environmental resources as a result of the development of a facility of this nature, e.g. visual impacts due to the size of the wind turbine structures. Generally, however, the unavoidable adverse environmental impacts likely to result from the development of a wind energy facility are balanced by the long-term benefits to be provided through the production of renewable energy.

Through the assessment of impacts associated with the proposed wind energy facility, both potentially positive and negative impacts have been identified. The most significant environmental impacts associated with the proposed project include:

» Impacts on biodiversity as a result of the construction and operation of the facility.
» Impacts on heritage resources as a result of the construction and operation of the facility.
» Visual impacts on the natural scenic resources of the region imposed by the components of the facility.
» Impacts on the social environment.
» Benefits of the proposed wind energy facility.

10.1.1. Impacts on Biodiversity as a result of the Construction and Operation of the Wind Energy Facility

Potential impacts on biodiversity as a result of the proposed construction and operation of the wind energy facility include impacts on natural vegetation, terrestrial fauna, habitats, bats and avifauna.

Critical Biodiversity Areas (CBAs) as identified within the Namakwa Biodiversity Sector Plan are located in the vicinity of the proposed wind energy facility. Four proposed turbines within the Phase 2 wind energy facility fall within an identified CBA. This area is considered to be an area of high sensitivity from both a flora and fauna perspective (refer to Figures 10.1 and 10.2), and should ideally be avoided and these proposed turbines relocated to less sensitive vegetation. Due to the limited development footprint planned within this area, it may be possible to mitigate impacts through careful micro-siting of the turbines, laydown areas and access roads. This will however require confirmation and extensive input from a suitably qualified ecologist during the final design phase of the proposed project.

Impacts on birds and bats relate mainly to impacts associated with habitat disturbance during construction, and displacement and collisions during operation. The site is not likely to contain a very high diversity of bat species, largely on account of the aridity of the area. The area within which Phase 2 is proposed is not likely to be highly significant from a bat perspective as this rather featureless area contains few potential bat roosts or foraging areas. From the avifauna assessment undertaken, it is concluded areas 2 and 5 (which form part of Phase 2) are rated as being of moderate to high risk in terms of collisions. This is due to the presence of pelicans, raptors and bustards. Of these, area 2 is the highest risk area due to the breeding of a Ludwig's Bustard and the presence of the Secretarybird in the area. Both are red-listed and collision-prone species. In order to confirm the presence of species of concern and the risk of impact a comprehensive programme to fully monitor the actual impacts of the facility on the bats and avifauna of the area is recommended, from pre-construction and into the operational phase of the project. Clarity on the environmental impact of this and other facilities proposed for the same general area can only be reached once pre-construction monitoring has been completed. It is imperative that the impacts of this project be viewed in the context of cumulative effects generated by multiple wind energy facility proposals for this general area, and that mitigation of these cumulative impacts be managed accordingly.

10.1.2. Impacts on heritage resources as a result of the construction and operation of the facility

The area proposed for the establishment of the Project Blue Wind Energy Facility: Phase 1 is not considered to be sensitive from a cultural landscape perspective. Phase 2, though larger than phase 1, will not have impacts of high significance on the heritage of the area. However, some archaeological mitigation will be required, particularly in the far north where the cluster of small shell scatters on heuweltjies was located. Construction of turbines would necessitate five hours' of mitigation of the impacted sites, although due to the need to treat the cluster of shell scatters as one larger site three further hours would need to be allocated there. A permit will be required to be obtained from SAHRA for this mitigation.

10.1.3. Visual Impacts associated with the Wind Energy Facility and associated Infrastructure

The proposed wind energy facility is likely to be visible for up to 20km from the site. The majority of potentially significant impacts are restricted to the 0 – 5 km zone. The visual impact is expected to be low beyond the 10km radius. Visual sensitive receptors within this zone include users of major and secondary roads (including the R355), residents of towns (including Kleinsee), and settlements and homesteads within the region (very limited). The anticipated visual impacts listed above (i.e. post mitigation impacts) range from moderate to low, and none are considered to be fatal flaws for the proposed wind energy and photovoltaic facility.

The primary visual impact, namely the appearance and dimensions of the wind energy facility (mainly the wind turbines) is not possible to mitigate to any significant extent within this landscape. The functional design of the structures and the dimensions of the facility cannot be changed in order to reduce visual impacts. Alternative colour schemes (i.e. painting the turbines sky-blue, grey or darker shades of white) are not permissible as the CAA's Marking of Obstacles expressly states, "*Wind turbines shall be painted bright white to provide the maximum daytime conspicuousness*". Failure to adhere to the prescribed colour specifications will result in the fitting of supplementary daytime lighting to the wind turbines, once again aggravating the visual impact. The potential for mitigation is therefore low or non-existent.

The mitigation of secondary visual impacts, such as security and functional lighting, construction activities, etc. may be possible and should be implemented and maintained on an on-going basis.

10.1.4. Impacts on the Social Environment

The proposed wind energy facility is located within a region which has historically been characterised by mining activities. The main residential area within the vicinity of the proposed development is the town of Kleinsee, which is associated with the De Beers Consolidated mine (and in the process of being proclaimed a formal town). The proposed development site is majority owned by De Beers, but falls outside of the mining area. The location of the wind energy facility has been planned in consultation with De Beers, taking the mineral resource and future mining plans into consideration.

The proposed development is strongly supported at a national, provincial and local level from a policy and planning perspective. In addition, when considered within the context of the socio-economic impact associated with the decline in mining in the area and the associated loss of jobs etc., the proposed wind energy facility is expected to have a positive impact as it provides an opportunity for investment in the area and the creation of new employment and business opportunities during both the construction and operational phase of the project. The establishment of a Community Trust, as required by the Department of Energy, creates an opportunity to support local economic development in the area. In order to enhance the local employment and business opportunities, WWK Development should implement a training and skills development programme for locals. The aim of the programme should be to maximise the number of people from local communities employed during the construction and operational phase of the project.

Impacts on the social environment are expected during both the construction phase and the operational phase of the wind energy facility. Impacts are expected at both a local and regional scale. Impacts on the social environment as a result of the construction of the wind energy facility can be mitigated to impacts of low significance or can be enhanced to be of positive significance to the region.

Impacts associated with the operational phase of the wind energy facility relate mainly to visual impacts (refer to 10.1.3 above). As no potentially sensitive noise receptors are located in close proximity of the proposed wind turbines within the Phase 1 development area, no noise impacts are expected.

10.1.5. Benefits of the Proposed Project

Internationally there is increasing pressure on countries to increase their share of renewable energy generation due to concerns such as climate change and exploitation of resources. 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 pre-feasibility assessments and research, the viability of establishing a wind energy facility in the Northern Cape Province has been established by WWK Development. The positive implications of establishing a wind energy facility on the demarcated sites include:

» The project would assist the South African government in reaching their set targets for renewable energy.
» The National electricity grid in the Northern Cape would benefit to some extent from the additional generated power.
» Promotion of clean, renewable energy in South Africa.
» Creation of local employment and business opportunities for the area.

The proposed development represents an investment in clean, renewable energy infrastructure, which, given the challenges created by climate change, represents a positive social benefit for society as a whole. The proposed project will not consume energy, but will instead provide a new source of clean, renewable electricity to the South African power grid. This generation of renewable power will aid in reducing the dependency on other power generation fuels and enhancing the reliability of the regional energy supply.

10.2. Overall Conclusion (Impact Statement)

The findings of the specialist studies undertaken within this EIA to assess both the benefits and potential negative impacts anticipated as a result of the proposed project conclude that:

» The majority of impacts associated with the establishment of the wind energy facility are of **moderate to low significance** and are restricted to the site itself. These impacts can be avoided or reduced in significance through the implementation of recommended mitigation measures.
» Four wind turbine locations impact on an area of high ecological sensitivity (within a CBA). Impacts are potentially of **high significance** within this area. Due to the limited development footprint planned within this area, it may be possible to mitigate impacts through careful micro-siting of the turbines, laydown areas and access roads. This will however require confirmation and extensive input from a suitably qualified ecologist during the final design phase of the proposed project.
» There is a **moderate to high risk** of impacts on birds and bats during construction and operation within Areas 2 and 5 which form part of the Phase 2 development area.
» Due to the low agricultural potential of the site as well as the low rainfall the impacts on soils and agriculture is expected to be **low**, provided that adequate storm water management and erosion prevention measures are implemented.
» The main unavoidable impact associated with the establishment of the wind energy facility on the identified sites is the visual impact associated with the wind turbines and associated infrastructure. The visual impact is expected to be restricted to within a distance of 10 km of the site within which limited numbers of sensitive visual receptors are located. Mitigation of the visual impact associated with the wind turbines is not possible to mitigate. Impacts associated with secondary impacts can, however, be mitigated.
» There are **no environmental fatal flaws** that should prevent the proposed wind energy facility and associated infrastructure from proceeding on the identified sites, provided that the recommended mitigation, monitoring and management measures are implemented, and given due consideration during the process of finalising the wind energy facility layout.
» In order to enhance the positive impacts associated with the proposed facility, the mitigation measures listed in the report should be implemented.
» The proposed development also represents an investment in clean, renewable energy, which, given the challenges created by climate change, represents a positive social benefit for society as a whole.

The significance levels of the majority of identified negative impacts can generally be reduced by implementing the recommended mitigation measures. With reference to the information available at this planning approval stage in the project cycle, the **confidence** in the environmental assessment undertaken is regarded as **acceptable**.

10.3. Overall Recommendation

Based on the nature and extent of the proposed project, the local level of disturbance predicted as a result of the construction and operation of the facility and associated substations, the findings of the EIA, and the understanding of the significance level of potential environmental impacts, it is the opinion of the EIA project team that the application for the proposed Project Blue Wind Energy Facility: Phase 2 and associated infrastructure be authorised by DEA. The following conditions must be required to be included within an authorisation issued for the project:

» All feasible mitigation measures detailed within this report and the specialist reports contained within Appendices F to N must be implemented.
» The draft Environmental Management Programme (EMP) as contained within Appendix P of this report should form part of the contract with the Contractors appointed to construct and maintain the proposed wind energy facility, and will be used to ensure compliance with environmental specifications and management measures. The implementation of this EMP for all life cycle phases of the proposed project is considered to be key in achieving the appropriate environmental management standards as detailed for this project.
» As far as possible, access roads and cable trenches which could potentially impact on sensitive areas should be shifted in order to avoid these areas of high sensitivity (i.e. best practice is impact avoidance). Where this is not possible, alternative mitigation measures as detailed in this report must be implemented.
» The final location of the wind turbines and associated infrastructure must be informed by surveys undertaken by an ecological, avifaunal and heritage specialist. The EMP for construction must be updated to include site-specific information and specifications resulting from the final walk-though surveys. This EMP must be submitted to DEA for approval prior to the commencement of construction.
» During construction, unnecessary disturbance to habitats should be strictly controlled and the footprint of the impact should be kept to a minimum.
» Disturbed areas should be kept to a minimum and rehabilitated as soon as possible once construction is complete in an area.
» An on-going monitoring programme should be established to detect and quantify any alien species.
» A comprehensive stormwater management plan should be compiled for the development site prior to construction.
» A monitoring programme should be initiated prior to construction and continued throughout construction and operation in order to collect data on the numbers of birds and/or bats affected by wind energy facilities in South African conditions.
» Applications for all other relevant and required permits required to be obtained by WWK Development must be submitted to the relevant regulating authorities. This includes permits for the transporting of all components (abnormal loads) to site,

disturbance to heritage sites, disturbance of protected vegetation, and disturbance to any riparian vegetation or wetlands.

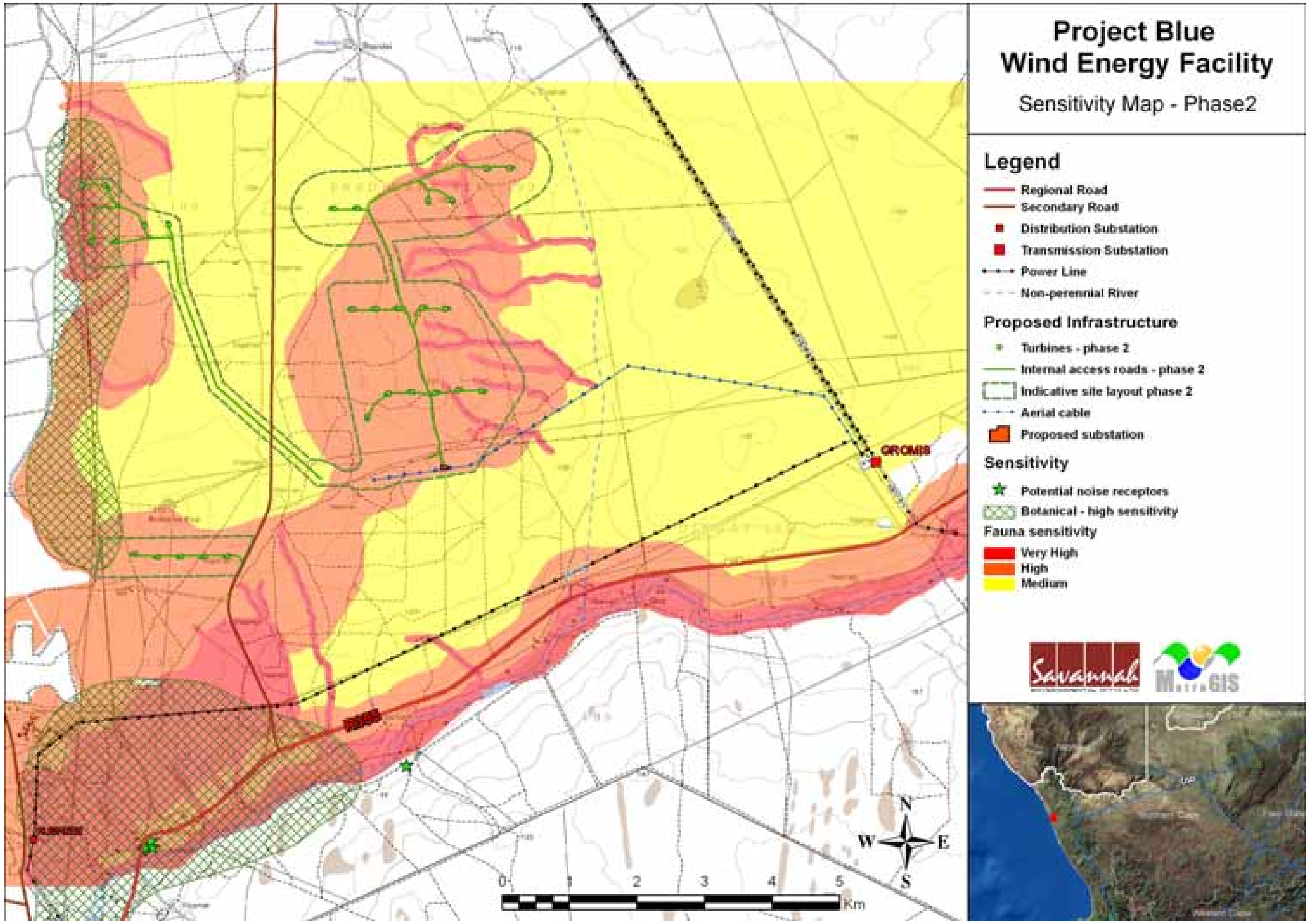

Figure 10. 1:Environmental Sensitivity Map for Phase 2 of the proposed Project Blue Wind Farm, north of Kleinsee, in the Northern Cape (excluding heritage sensitivity).

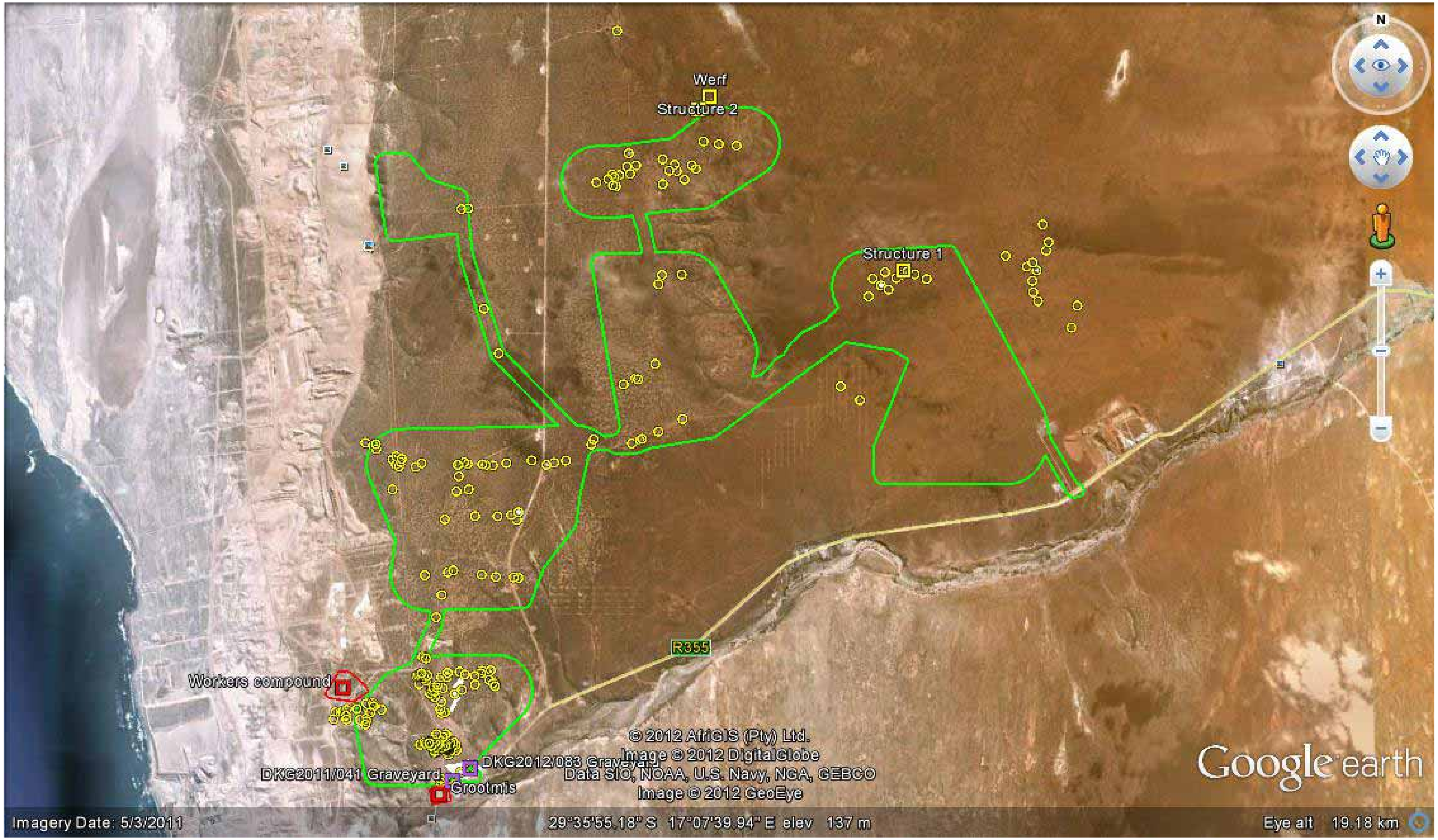

Figure 10.2: Environmental Sensitivity map for the project study area illustrating sensitive areas in relation to heritage

ASSESSMENT OF IMPACTS: PHASE 3: PROJECT BLUE WIND ENERGY FACILITY CHAPTER 11

Project Blue Wind Energy Facility Wind: Phase 3 is proposed to comprise up to 37 turbines and have a generating capacity of up to 74 MW. The proposed development site is ~1 875 ha in extent and located on the following farm portions: Dikgat 195 Portion 07; Dikgat 195 Portion 09; Dikgat 195 Portion 02; Dikgat 195 Portion 05; Dikgat 195 Portion 04; Dikgat 195 remaining portion; Predikant Vlei 190 portion 01; Predikant Vlei 190 portion 04; Predikant Vlei; 190 portion 03; Predikant Vlei 190 portion 05. These farm portions are majority-owned by De Beers Consolidated Mines, and lie north of the mining town of Kleinsee.

Environmental impacts associated with the proposed project are expected to be associated with the construction, operation and decommissioning of the facility. 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.

Construction activities for wind energy projects typically include:

» land clearing for site preparation and access routes;
» excavation and filling;
» transportation of supply materials and fuels;
» construction of foundations involving excavations and placement of concrete;
» construction of a substation, underground and above ground power lines
» operating mobile cranes for unloading and installation of equipment; and
» commissioning of new equipment.

Decommissioning activities will include removal of project infrastructure and site rehabilitation.

Environmental issues associated with construction and decommissioning activities may include, among others, habitat destruction, disturbance, and alteration; impacts on biodiversity; threatened fauna and flora species; protected tree species and ecological processes; soil degradation; erosion; and increased erosion potential; impacts on heritage sites; and impacts on the visual aesthetics.

Environmental issues specific to the **operation** of a wind energy facility could include visual impacts; noise produced by the spinning of rotor blades; avian/bat mortality resulting from collisions with blades; and light and illumination issues.

These and other environmental issues were originally identified through a scoping evaluation of the proposed wind energy facility. Potentially significant impacts have now been assessed during this EIA Phase. This EIA process has involved key input from specialist consultants, the project developer, and from key stakeholders and interested and affected parties. The significance of impacts associated with a facility of this nature is always project specific, and therefore impacts may vary significantly between facilities.

This chapter serves to assess the identified potentially significant environmental impacts associated with the development of the proposed facility, and to make recommendations for the management of these impacts for inclusion in the draft Environmental Management Programme (Refer to Appendix Q). 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 up to 37 turbines (depending on which turbine types are ultimately chosen by the developer), access roads and a substation(s), during construction much of the approximately 1 875 ha of the proposed site could suffer some level of disturbance. However, once construction is complete, only a small portion of this area (estimated at approximately 10%) will be permanently impacted by infrastructure associated with the wind energy facility.

11.1. Conclusions of the Scoping Study

The majority of potential impacts identified to be associated with the construction and operation of the proposed wind energy facility are anticipated to be localised and restricted to the proposed site. No environmental fatal flaws were identified to be associated with the site. However, areas of potential sensitivity were identified through the scoping phase. These areas of sensitivity are illustrated in the sensitivity map included as Figures 12.1 and 12.2.

The potentially sensitive areas/environmental features identified include:

» Areas of visual exposure within (but not restricted to) 10 km of the proposed wind energy facility site such as homesteads and observers travelling along major and gravel roads
» Areas of high botanical sensitivity on site.
» Areas of heritage sensitivity
» Areas of noise sensitivity.

11.2. Methodology for the Assessment of Potentially Significant Impacts associated with the proposed Wind Energy Facility

In order to assess the potential impacts associated with the proposed facility, it was necessary to understand the extent of the area affected by the proposed development. This affected area will include the area infrastructure (i.e. wind turbines, concrete foundations, underground cabling, internal access roads, substations, and the office workshop), as well as temporary disturbance areas (i.e. laydown areas, temporary access roads for mobile construction equipment, etc.). A wind energy facility is dissimilar to all other power generation facilities in that it does not result in the disturbance of an entire site and agricultural activities can continue undisturbed around the installed turbines.

A broader site of 1 875 ha was identified by the project developer for the purposes of establishing the proposed Project Blue Wind Energy Facility: Phase 3. The bulk of this effective area required for the wind energy facility footprint would not suffer any level of disturbance as a result of the required activities on site. Permanently affected areas comprise 37 turbine footprints (37 foundation areas of 20 m x 20 m in extent), access roads (6 m in width), a substation (80 m x 90 m in extent) and a workshop (~400 m^2 in extent).

The area of permanent disturbance is estimated as follows:

Permanent Component –Within the facility	Approximate extent (in m^2)
37 Turbine footprints (each 20 m x 20 m)	14 800
Permanent access roads (15 662m x 6m wide)	93 971
Substation footprints (80 m x 90 m)	7 200
Office/ Workshop area(400 m^2)	400
TOTAL (ha)	**116 371** (of a total area of 18750000 m^2) **≈ 0.6% of site**

Temporarily affected areas comprise laydown areas for turbines (each laydown area with a footprint of 40 m x 40 m) as well as a track of an additional 6 m in width for the crawler crane to move across the site (i.e. an additional 5 m width to the permanent road of 6 m in width – a total of 11 m in width). The 33 kV cabling to connect the turbines to the substations is to make use of the on site tracks. An approximately 1 m wide trench would be excavated, the cabling laid and the area rehabilitated. The area of temporary disturbance is as follows:

Facility Component -Temporary	Approximate area/extent (in m^2)
37 turbine laydown areas	59 200
Temporary crane travel track (5 m) plus trench for 33 kV cabling (1m) – 24.16km	93971
TOTAL	**153 171** (of a total area of 18750000 m^2) **≈0 .8% of site**

Therefore, a total area of 269 543 m^2 (i.e. approximately 27 ha) can be anticipated to be disturbed to some extent during the construction of the wind energy facility. This amounts to **1.4%** of the total 1 875 ha area which will form part of the total wind energy facility site.

In order to assess the areas where impacts could occur on the site, a site layout optimisation exercise revealed the best possible positions for the turbines, substation and other infrastructure from a technical perspective (refer to Figure 11.2). This exercise considered the on-site wind resource, local topography and environmental sensitivities identified during the scoping phase of the process. This layout is expected to be approximately 80% accurate and would be refined in the final design phase of the process in terms of additional on-site wind data and any additional environmental sensitivities identified through this assessment.

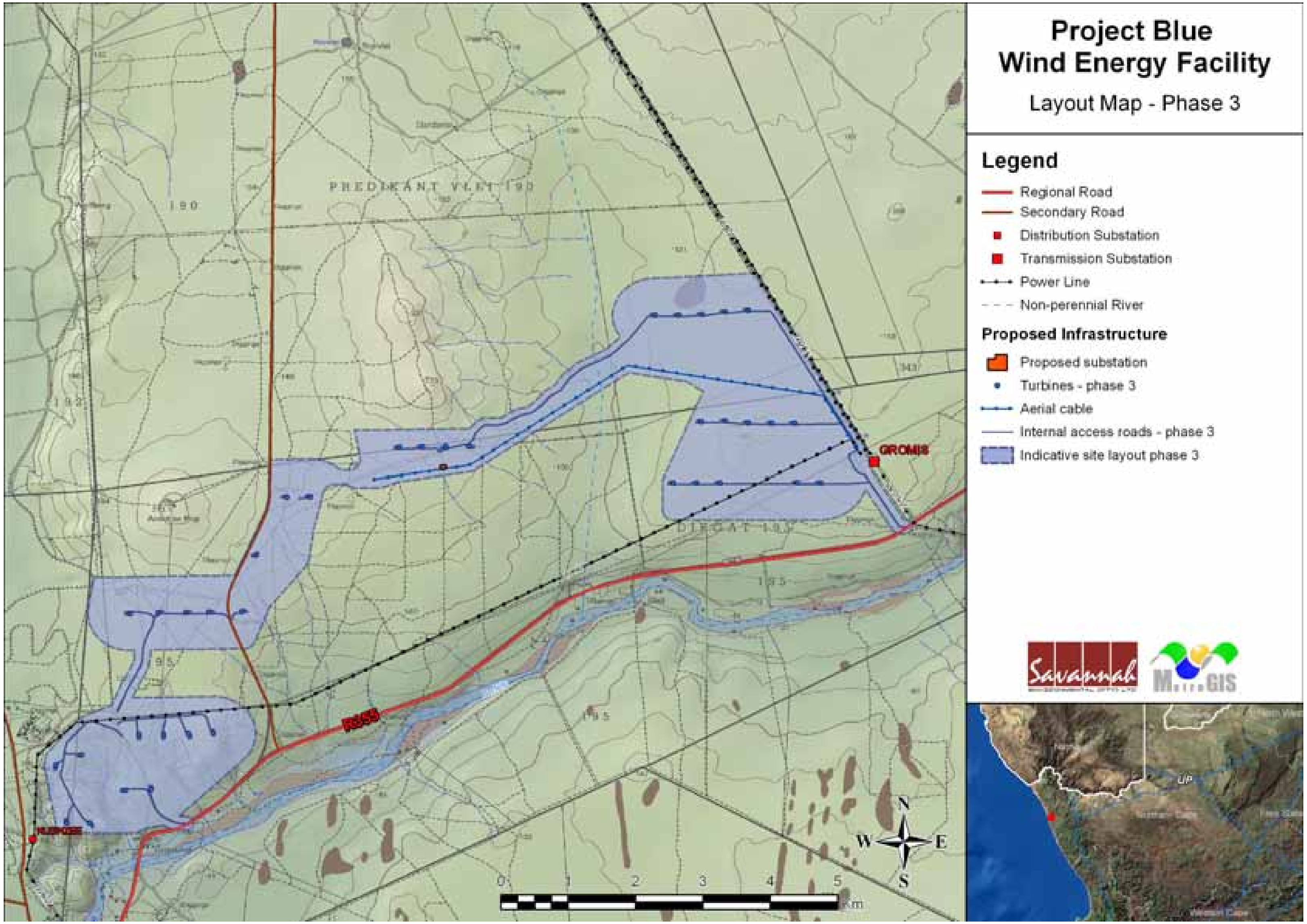

Figure 11.2: Proposed layout of Phase 3

11.3. Assessment of the Potential Impacts associated with the Construction and Operation of the Proposed Project Blue Wind Energy Facility: Phase 3

The sections which follow provide a summary of the findings of the assessment undertaken for potential impacts associated with the construction and operation of the proposed Project Blue Wind Energy Facility: Phase 3 on the identified sites. The nature of the potential impact is discussed; the significance is calculated with and without the implementation of mitigation measures. Recommendations are made regarding mitigation and management measures for potentially significant impacts and the possibility of residual and cumulative impacts are noted.

11.3.1. Potential Impacts on Vegetation

The proposed Project Blue Phase 3 would affect parts of Area 1 and 2 and almost the whole of Areas 3 and 5. During the Scoping Phase, it was clearly indicated that Area 5 falls within a designated CBA. Eighteen wind turbines are proposed for Phase 3 and of those, ten (10) fall within the designated CBA north of Grootmis (refer to Figures 11.3 – 11.4).

Impacts assessed are restricted to those impacts that would affect vegetation communities, their habitats and their constituent plant species. The impacts could also affect ecological processes and consequently ecosystem function. The impacts identified are:

- Impacts on **localized special habitats** associated with exposure of silcretes, quartzite or granite-gneiss close to the coast.
- Impact on **species of conservation concern**.
- Impact on plant communities through **fragmentation** that would lead to loss of constituent species and negatively impact the cohesiveness of the communities.
- **Loss of habitat** due to degradation of plant communities.
- **Loss of ecosystem function** due to changes in such factors as hydrological regime, increased edge effect, disturbance of successional processes, disturbance of pollination processes and possible invasion by alien plant species.

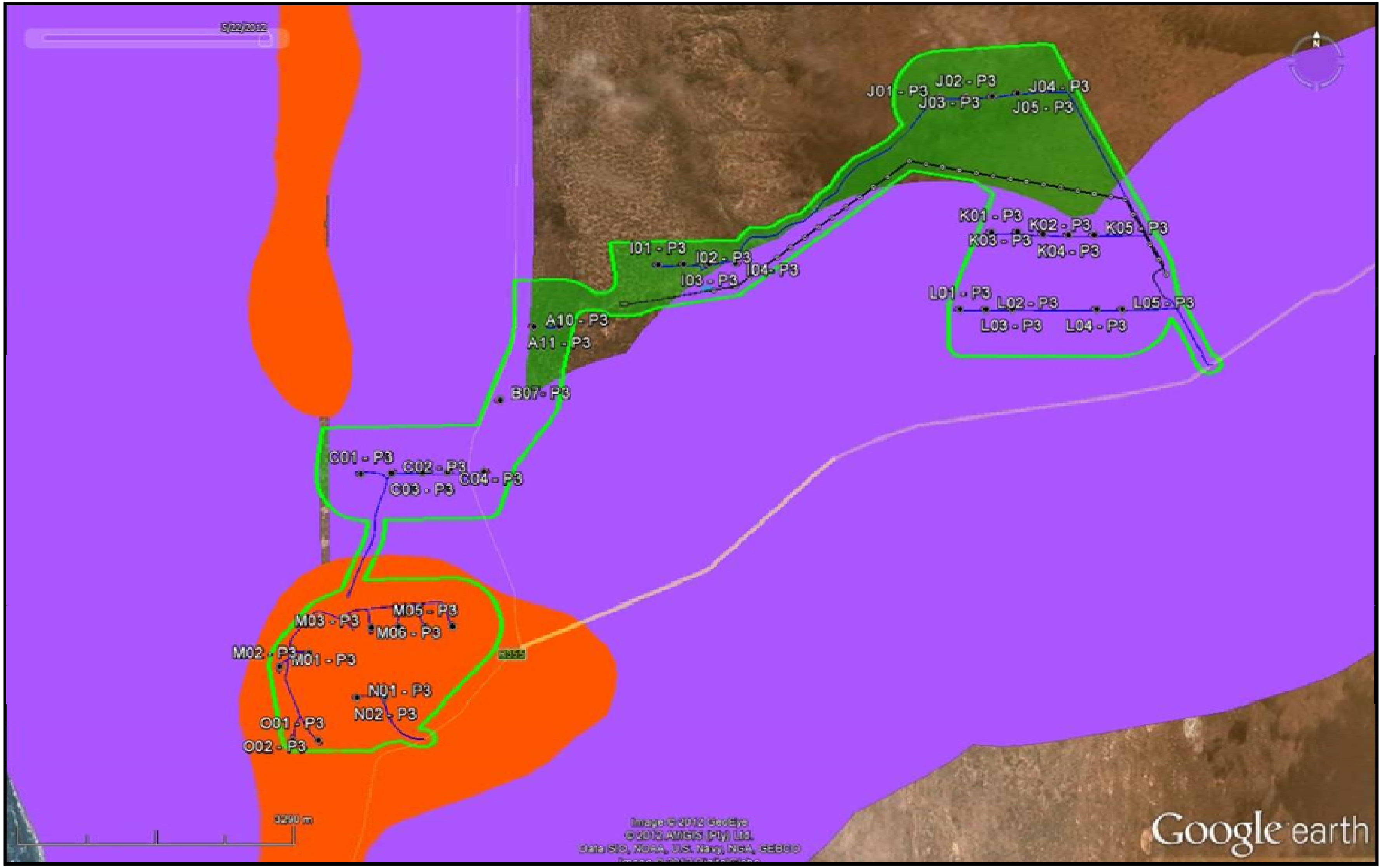

Figure 11.3: Project Blue Phase 3 area (green outline) which falls partly within a CBA (orange) and partly within an ESA (purple)

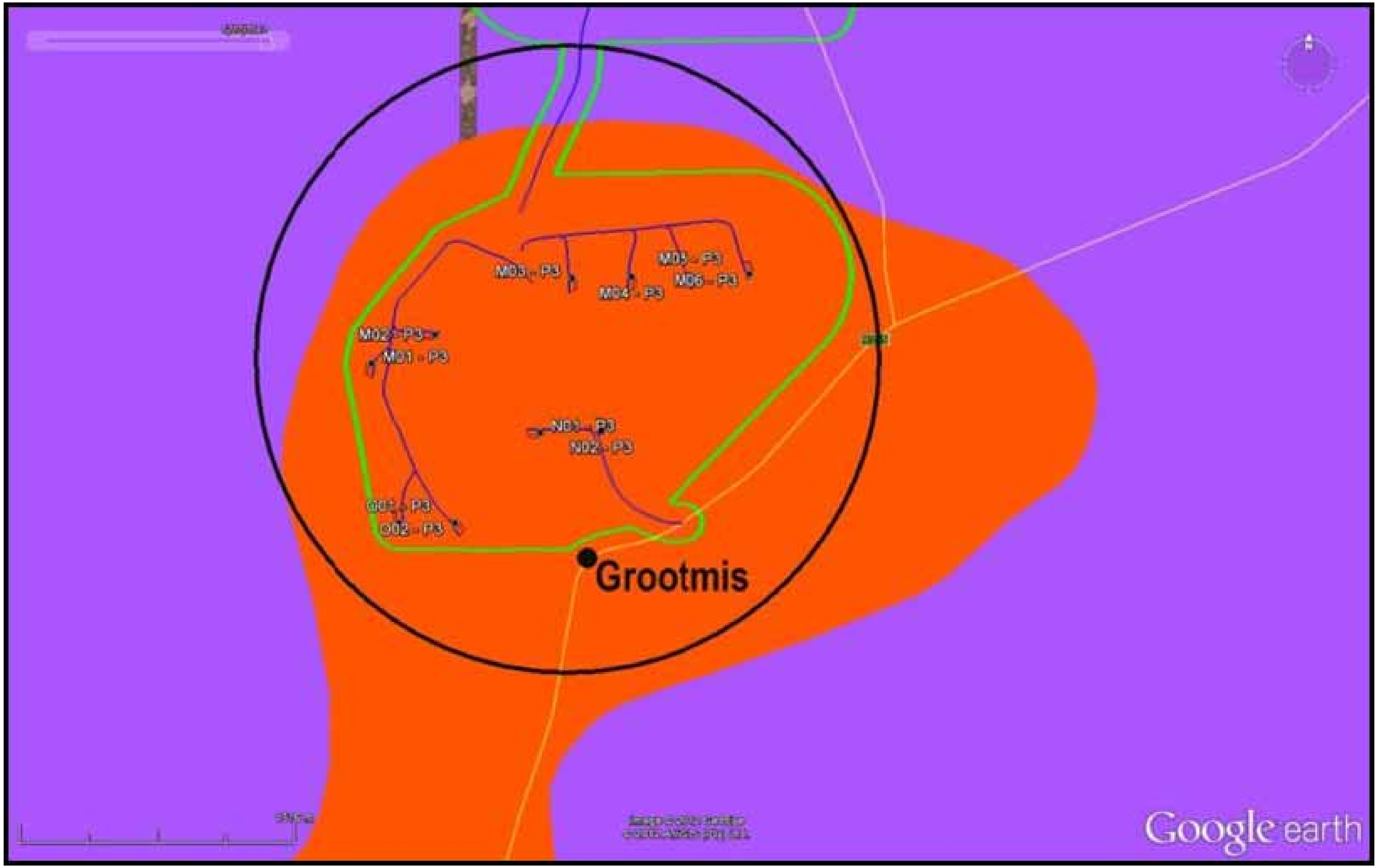

Figure 11.4: Enlargement of the area north of Grootmis with part of the Project Blue Phase 3 occurring within a CBA. The area circled in black is considered as a no go area and should be excluded from consideration for wind turbines since the impacts would be High Negative.

The greatest risk to the vegetation and flora would be during the construction phase of the wind energy and solar energy facilities when the following activities would be required:

» Construction of access roads.
» Clearing of vegetation for the turbine pedestals and construction of lay-down areas and the on-site substation.
» Trenches for cables and power-lines, or if overhead, the requirement for construction of pylons.
» Operation of machinery and vehicles which could result in undesirable soil compaction.
» Possible fuel and chemical (cement) contamination.

Maintenance of the wind energy facility (operational phase) would pose lower risks to the vegetation. Only the access roads and immediate area around each turbine would need to be accessed, leaving the remaining area within the footprint relatively undisturbed.

Impact tables summarising the significance of impacts on flora associated with the wind energy facility

Nature: Loss of Namaqualand Strandveld due to construction of wind turbines, transformers and crane hard-standings: Phase 3 wind energy facility

The wind turbines proposed for Area 5 N01-P3; N01-P3; M01-p3; M02-P3; M03-P3; M04-P3; M05-P3; M06-P3; O01-P3 and O02-P3 should be relocated (Refer to figures 11.3 & 11.4) are located within a CBA, which is considered to be of high sensitivity. Construction of these ten turbines at the proposed sites would result in High Negative impact on the vegetation. Therefore, it is strongly recommended that construction of turbines at these sites should be completely **avoided**. As mitigation they should either not be built or alternative locations within less sensitive Namaqualand Strandveld must be found. The remaining 27 Phase 3 turbines would impact Namaqualand Strandveld with low botanical sensitivity and the impact is therefore rated as Medium Negative. Without mitigation the overall impact for Phase 3 would be High Negative but with mitigation would be Medium Negative.

The principal mitigation in this case would be to **avoid** construction of the ten turbines in Area 5 near Grootmis. These turbines should be re-located. Mitigation for the other turbines would require restoration of disturbed areas related to construction e.g. restoration of vegetation of the crane hard-standing areas.

	Without mitigation	**With mitigation**
Extent	Local (2)	Local (2)
Duration	Long-term (4)	Long-term (4)
Magnitude	High (8)	Medium (6)
Probability	Definite (5)	Probable (3)
Significance	**High (70)**	**Medium (36)**

Status	Negative	Negative
Reversibility	Partially reversible	Partially reversible
Irreplaceable loss of resources?	Yes, in Area 5 (special habitat). Elsewhere, no, Namaqualand Strandveld is wide-spread and is not threatened. Plant communities on granite koppies and quartz patches are considered important and should be avoided.	
Can impacts be mitigated?	» Yes, by implementing restoration measures. » Yes, by completely avoiding construction in Area 5	
Mitigation: » Ten turbines in CBA (Area 5) to be removed or re-located. » Areas affected by construction to be appropriately rehabilitated.		
Cumulative impacts: » If construction takes place in Area 5 it would contribute significantly to loss of special habitat (CBA). Elsewhere the construction of turbines would contribute to a limited extent to loss of Namaqualand Strandveld.		
Residual impacts: » Low negative.		

Nature: Loss of Namaqualand Strandveld due to construction and operation of internal roads and underground cables: Phase 3 wind energy facility

Phase 3 would require a new network of roads (6 m wide) to reach all the proposed turbine sites for construction and operation. Few existing roads, or only limited parts of existing roads, would be used. As for Phases 1 and 2, the underground cables from the turbines to the on-site sub-station would be aligned alongside the roads resulting in limited additional loss of vegetation. The result of road-building in Phase 3 would be a significant loss of Namaqualand Strandveld. Similar to the case for Phases 1 and 2 (as detailed in Chapters 7 and 9), the amount of vegetation loss is difficult to quantify but since this vegetation type is widespread and the roads would not have an extreme fragmentary effect, the impact is rated as Medium Negative as opposed to High Negative.

	Without mitigation	**With mitigation**
Extent	Local (2)	Local (2)
Duration	Long-term (4)	Long-term (4)
Magnitude	Medium (6)	Low (4)
Probability	Definite (5)	Probable (3)
Significance	**Medium (60)**	**Low (30)**
Status	Negative	Negative
Reversibility	Partially reversible	Partially reversible
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation: » To mitigate the impact of the internal roads, road construction must be limited to the footprint of the roads i.e. no vehicles should leave the road footprint and no equipment		

should be stored in area alongside the roads.

» Properly demarcated and approved areas for parking construction vehicles and / or stockpiling and storing materials must be determined.
» Since the roads would be used for turbine maintenance, mitigation measures such as restoration measures would be impractical in the medium to long term. However, it would be important to ensure that the roads are correctly drained and maintained to avoid erosion from runoff.
» A high level of maintenance of the roads during the operational phase to prevent negative effects such as soil erosion.

Cumulative impacts:

» Contribution to loss of Namaqualand Strandveld vegetation.

Residual impacts:

» Low negative.

Nature: Loss of Namaqualand Strandveld due to construction and operation of overhead transmission lines for Phase 3 wind energy facility

The overhead transmission line from the on-site substation will be common for all phases. Therefore the impacts as described for Phases 1 apply (refer to Chapter 7). No additional impact in terms of overhead transmission lines would result from Phase 3.

An overhead transmission line will run from the Phase 1 on-site substation north-eastwards and then southwards to Gromis Substation. A road would be required to construct and maintain the transmission line. The impact on the Namaqualand Strandveld vegetation would be mainly associated with the road and not the transmission line itself except for limited disturbance at the sites of the poles.

The impact of construction of the proposed overhead power-line for Phase 1 would be linked to the impact of the road and is therefore Medium Negative. Mitigation would involve restoration as for the road and if successfully applied would reduce the impact to Low Negative.

	Without mitigation	**With mitigation**
Extent	Local (2)	Local (2)
Duration	Long-term (4)	Long-term (4)
Magnitude	Medium (6)	Low (4)
Probability	Definite (5)	Probable (3)
Significance	**Medium (60)**	**Low (30)**
Status	Negative	Negative
Reversibility	Partially reversible	Partially reversible
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	

Mitigation:

» Mitigation measures that should be implemented are restoration actions to promote re-vegetation of disturbed areas. A restoration specialist should be employed to ensure that the task is carried out correctly, with local species, to prevent the introduction of

weeds and alien invasive plant species.
Cumulative impacts:
» Contribution to loss of Namaqualand Strandveld vegetation.
Residual impacts:
» Low negative.

Implications for project implementation

- » CBAs should be treated as 'No Go' areas for any form or development including renewable energy infrastructure. The CBAs potentially negatively impacted by Project Blue Phase 3 have been assessed as likely to have a High Negative impact. The recommended mitigation is to avoid these areas and locate the ten proposed turbines located in this area elsewhere in less sensitive vegetation.
- » Apart from Area 5, the area within which the Project Blue Wind Energy Facility: Phase 3 is proposed is expected to be of medium to low risk in terms of impact on flora (***Loss of Namaqualand Strandveld)***.
- » It is recommended that the placement of wind turbines, roads, underground cables and over-head power-lines be in vegetation of low sensitivity (least threatened).

11.3.2. Potential Impacts on Terrestrial Fauna and Habitats

Potential ecological impacts resulting from the development of the wind energy facility would stem from a variety of different activities and risk factors associated with the construction and operational phases of the project including the following:

Construction Phase

- » Vegetation clearing & site preparation
- » Operation of heavy machinery at the site
- » Human presence

Operational Phase

- » Site maintenance activities
- » Human presence
- » Operation of the turbines

The above activities are likely to manifest themselves as the following faunal impacts:

- » Loss of habitat for fauna
- » Reduced landscape connectivity for fauna
- » Direct faunal impacts
- » Bat mortality

» Increased soil erosion risk

Impact tables summarising the significance of impacts on Terrestrial Fauna and Habitats associated with the wind energy facility

Nature: Habitat loss for fauna - Transformation and loss of habitat will have a negative effect on resident fauna.

The development of the wind energy facility will result in the loss of habitat for resident fauna. This potentially includes at least 8 listed reptiles, two listed amphibians, four listed mammals and two listed bat species. In terms of a direct loss of habitat, the development of the wind energy facility would result in the loss of approximately 70 ha of currently intact vegetation. This in itself is not viewed as being highly significant. However, some of the turbines are currently located within high sensitivity environments such as rocky outcrops or headlands and would have a significant impact on habitat availability within these restricted habitats. The only way that these impacts can be mitigated is to relocate the turbines concerned or drop them from the development.

	Without mitigation	**With mitigation**
Extent	Local (2)	Local (2)
Duration	Long-term (4)	Long-term (4)
Magnitude	Medium (6)	Low (4)
Probability	Definite (5)	Highly Probable (4)
Significance	**Medium-High (60)**	**Low (40)**
Status	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	To a small degree	

Mitigation:

» Vegetation clearing should be kept to a minimum.
» Impacts to restricted and important habitats such as the rocky outcrops should be avoided.
» The final placement of turbines must follow a micrositing procedure involving a walk-through and identification of any sensitive areas by botanical, faunal and avifaunal specialists.

Cumulative impacts:

» There is already quite a lot of transformation in the area as a result of diamond mining activities and the development would contribute to cumulative habitat loss in the area. Mining activities are however concentrated along the low coastal plain while the wind energy facility is located further inland which has been less impacted.

Residual impacts:

» Some habitat loss is an inevitable consequence of the development and cannot be fully mitigated.

Nature: Reduced landscape connectivity - Roads, turbine lay-down areas and other transformed areas will represent barriers to movement for some species. .

The extensive road network which is likely to amount to 50 km of hardened access roads are likely to have the greatest impact on landscape connectivity for fauna. Many species including snakes, tortoises, lizards, golden moles and rodents are vulnerable to predation when traversing open areas and the relatively wide nature of the roads required for wind-energy developments poses a significant threat in this regard. Although many of the species in the area are reasonable well equipped to deal with open areas, the roads and other cleared areas would have a long-term cumulative impact and slow reproducing species such as tortoises may be particularly affected. Larger mammals are likely to be less impacted due to their mobility and the presence of gaps in the areas of turbines which would remain relatively free of impact.

	Without mitigation	**With mitigation**
Extent	Local (2)	Local (2)
Duration	Long-term (4)	Long-term (4)
Magnitude	Medium (6)	Medium(5)
Probability	Highly Probable (4)	Probable (3)
Significance	**Medium (48)**	**Medium (33)**
Status	Negative	Negative
Reversibility	Moderate	Moderate
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	To some degree	

Mitigation:

» Hardened surfaces should be kept to a minimum

» Roads should be as narrow as possible and as short as possible. A natural surface such as gravel would be preferable to a tarred or concrete road, except in very steep areas where it would be difficult to prevent erosion of natural surfaces.

» Vegetation should be allowed to remain alongside or encroach on the roads as much as possible.

» Temporary lay-down areas should be in previously transformed areas or areas that will be used by the development.

Cumulative impacts:

» Although there is already some transformation in the area which contributes to reduced connectivity, the current development would add 50km of roads within a concentrated area giving rise to a significant cumulative impact from roads.

Residual impacts:

» Due to the soft sands at the site, hardened roads will in all likelihood be necessary to access the site and so there is little that can be done to fully mitigate this impact.

Nature: Direct Faunal Impacts - Fauna will be directly impacted by the development as a result of construction activities and human presence at the site.

Some smaller animals would not be able to move away from construction activity sufficiently quickly during construction and would be killed by vehicles and earth-moving machinery. In addition, the presence of a large work force on the site would pose a risk to species such as snakes, tortoises and mammals which would be vulnerable to poaching for food, trade or killed out of fear and superstition.

	Without mitigation	**With mitigation**
Extent	Local (2)	Local (1)
Duration	Short-term (4)	Short-term (4)
Magnitude	Medium (5)	Medium-Low (3)
Probability	Highly Probable (4)	Probable (3)
Significance	**Medium (44)**	**Low (24)**
Status	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	To some extent	

Mitigation:

» Any fauna directly threatened by the construction activities should be removed to a safe location by the ECO or other suitably qualified person.
» The collection, hunting or harvesting of any plants or animals at the site should be strictly forbidden. Personnel should not be allowed to wander off the construction site.
» Fires should only be allowed within fire-safe demarcated areas.
» No fuel wood collection should be allowed on-site.
» No dogs should be allowed on site.
» If the site must be lit at night for security purposes, this should be done with low-UV type lights (such as most LEDs), which do not attract insects.
» All hazardous materials should be stored in the appropriate manner to prevent contamination of the site. Any accidental chemical, fuel and oil spills that occur at the site should be cleaned up in the appropriate manner as related to the nature of the spill.
» No unauthorized persons should be allowed onto the site.
» All construction vehicles should adhere to a low speed limit to avoid collisions with susceptible species such as snakes and tortoises.

Cumulative impacts:

» The potential for cumulative impacts is relatively low as there are few other developments currently underway in the area and mining activity in the area is on the decline.

Residual impacts:

» Residual impacts for fauna can be mitigated to a large degree, although some mortality of a few immobile species can be expected.

Nature: Bat Mortality due to Turbines - The presence of the turbines poses a high risk to bats foraging or moving through the area.

The presence of turbines within bat foraging, movement or migration areas would pose a significant threat to bat species. This is likely to be those turbines along the coastal bluff as well as the cluster of turbines near Grootmis. As the threat would persist for as long as the turbines were operational, this represents a long-term threat that may have a significant cumulative impact on the local bat populations. Bats are particularly vulnerable to impact from turbines for several reasons. They may be attracted to the vicinity of the turbines and secondly although they may or may not collide with the turbine blades, they are vulnerable to barotrauma in which they suffer fatal internal haemorrhage as a result of passing through the low-air pressure vortices behind the turbine blades. It is difficult to establish the extent or significance of this impact without long-term bat monitoring as per the South African Good Practice Guidelines for Surveying Bats in Wind Farm Developments (Sowler & Stoffberg 2011). Potential mitigation measures include curtailment in which the turbines are kept stationary at certain times of the day or year as well as relocating turbines outside of areas of high bat activity.

	Without mitigation	**With mitigation**
Extent	Local (3)	Local (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Medium-High (7)	Low (4)
Probability	Highly Probable (4)	Probable (3)
Significance	**Medium-High (56)**	**Low (27)**
Status	Negative	Negative
Reversibility	Low	High
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes, to a large degree	

Mitigation:

» Bat monitoring according to the South African Good Practice Guidelines for Surveying Bats in Wind Farm Developments (Sowler & Stoffberg 2011), should be initiated as soon as possible.

» Final turbine placement must reflect the findings and recommendations emerging from the above studies.

Cumulative impacts:

» There are some other planned wind farm developments in the area which could result in a large cumulative impact on the local bat populations.

Residual impacts:

» Despite mitigation and avoidance measures which are not entirely effective, some impacts on bats are likely to occur.

Nature: Increased erosion risk - Increased erosion risk as a result of soil disturbance and loss of vegetation cover. (Associated with the development as well as access roads)

The development of the site would create a lot of soil disturbance, which would leave the site highly susceptible to wind erosion. Along the coastal headlands and the large hill in the central part of the site, the substrate is firmer and water rather than wind erosion would be the primary risk. In these areas standard erosion control measures such as water diversion and dispersing structures should be built along roads and other cleared areas. Within the sandy areas, the strong winds which characterize the area will tend to mobilize any loose sand. Such sand movement can result in degradation of the affected areas as it smothers established plants and once initiated can become self-sustaining. Measures to reduce sand movement should therefore be implemented at the site wherever

bare soil is exposed. The extreme measures required for rehabilitation of previously mined areas in the area serve as evidence of the potential significance of wind erosion		
	Without mitigation	**With mitigation**
Extent	Local (2)	Local (1)
Duration	Long-term (4)	Short-term (2)
Magnitude	Medium (5)	Low (3)
Probability	Highly Probable (4)	Probable (3)
Significance	**Medium (44)**	**Low (18)**
Status	Negative	Negative
Reversibility	Low	High
Irreplaceable loss of resources?	Yes	No
Can impacts be mitigated?	Yes	
Mitigation: » Regular monitoring for erosion after construction to ensure that no erosion problems have developed as result of the disturbance. » All erosion problems observed should be rectified as soon as possible, using the appropriate erosion control structures and revegetation techniques.		
Cumulative impacts: » Higher sediment loads in rivers and streams will affect in-stream vegetation and biota		
Residual impacts: » If erosion at the site is controlled, then there will be no residual impact		

Implications for project implementation

» The Wind Energy Facility occurs across a range of different sensitivities, with those turbines along the north- and south- west falling within high sensitivity areas.
» The 10 turbines located within Area 5 (i.e. the area close to Grootmis) should be excluded from the development so as to minimise impacts on areas of high sensitivity.
» There are a large number of listed reptiles known from the area, many of which are associated with rocky outcrops. Turbines which impact this habitat are likely to have a significant impact on local reptile populations as the rocky outcrops are a restricted habitat that was not widely available at the site.
» The potential impact of the development and particularly the wind turbines on Golden Moles is identified as a potential concern which is highlighted as a significant unknown associated with the development.
» Although large parts of the site are not likely to be important for bats, certain areas, largely those identified as being important for reptiles are also identified as being potentially important for bats. As little is known about bat composition or activity patterns in the area, it is recommended that long-term bat monitoring be initiated to inform the final placement of turbines at the site.

11.3.3. Potential Impacts on Avifauna

The region is likely to support at least 168 bird species, including 15 threatened (red-listed) species, and 44 endemic species. The avian groups of greatest conservation significance likely to be impacted by the turbines include the (i) bustards that move in with good rainfall; (ii) flocking waterbirds such as red-listed cormorants and flamingos, and (iii) fifteen raptor species. Many have a low likelihood of occurrence but (breeding) Ludwig's Bustards, Secretarybirds, (breeding) Jackal Buzzards, Greater Kestrel, White Pelicans and Namaqua Sandgrouse were all confirmed collision-prone species and the threatened Black Harriers occur at low frequency in the area and breeding in the nearby Buffels River (Refer to figures 9.5 – 9.7).

Impacts may occur in terms of both collision and disturbance from the facility itself. Two brief surveys revealed a rich vein of endemic passerines (26% of the total number of species) which could be affected by disturbance impacts. From the results of the avifauna impact assessment (refer to Appendix H), the area within which the Project Blue Wind Energy Facility: Phase 2 is proposed is expected to be of low risk in terms of collision.

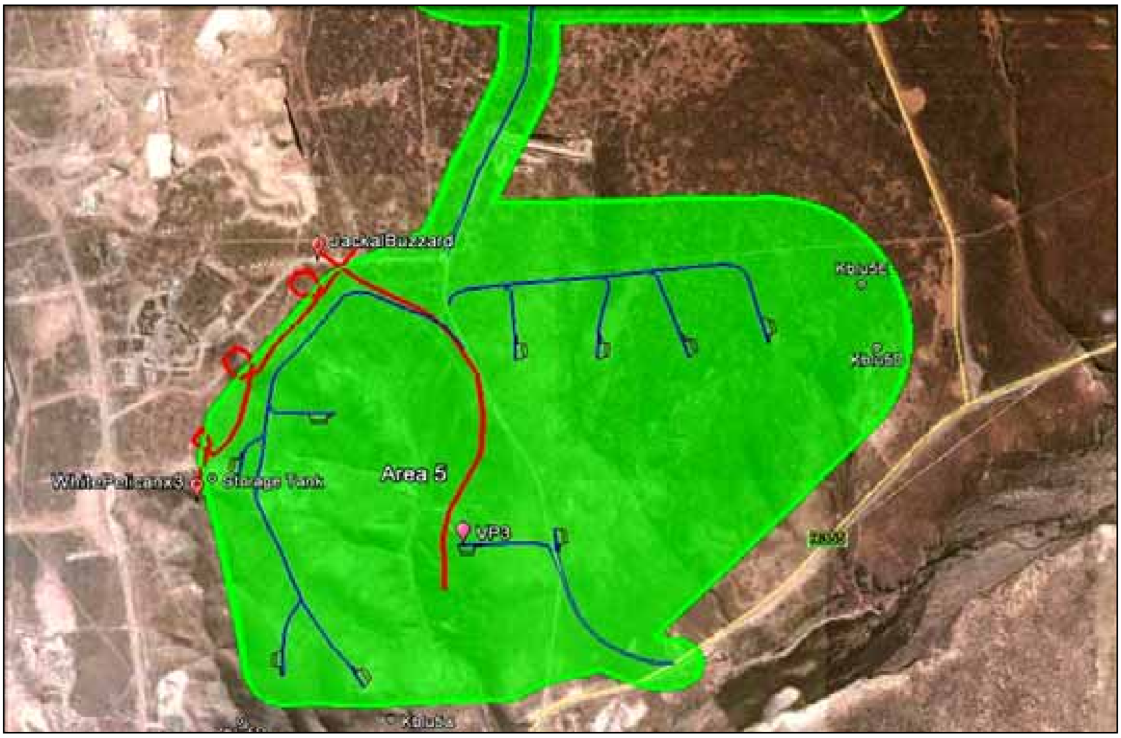

Figure 11.5: Collision-prone birds and their flight paths in **Area 5**: red-listed White Pelicans and endemic Jackal Buzzards were recorded in May 2012, making it a high risk zone.

4

Figure 11.6: Collision-prone birds present in the **Area 1** WEF. The Jackal Buzzard was observed nesting on the storage tank within this area during the site visit.

Figure 11.7: Collision-prone species found in **Area 2** which partially forms part of phase 3, including red-listed bustards and Secretarybirds. The latter was found eating Pied Crows from their nests in May 2012. This area is a high risk one for birds as a result of the occurrence and breeding of these two species.

Figure 11.8. Collision-prone species recorded in **Area 3** in August 2011 and May 2012. Ludwig's Bustard was recorded here making the WEF a high risk area for birds.

From the avifauna assessment undertaken, it is concluded areas 2, 3 and 5 (which form part of Phase 3) are rated as being of moderate to high risk in terms of collisions. This is due to the presence of pelicans, raptors and bustards. Of these, areas 2 and 3 are the highest risk area due to the breeding of a Ludwig's Bustard and the presence of the Secretarybird in the area. Both are red-listed and collision-prone species.

Impact tables summarising the significance of impacts on avifauna associated with the wind energy facility

Nature: Direct mortality or avoidance of area around the wind farm for the bird groups identified as at risk, due to noise, or impacts with turbine blades (Flamingos = GLF, Pelican = P, Raptors = R, Shelduck = SD, Ludwig's Bustard = LB, Southern Black Korhaan = SBK)		
	Without mitigation	**With mitigation**
Extent	**0**(GLF, P, SD) **1**(R) **3** (LB,SBK)	**0**(GLF,P, SD) **1**(R) **3** (LB,SBK)
Duration	**5** (GLF, P, R, SD, LB, SBK)	**5** (GLF, P, R, SD, LB, SBK)
Magnitude	**4** (GLF, P, R, SD) **6**(LB, SBK)	**3** (GLF, P, R, SD) **5**(LB, SBK)
Probability	**4** (GLF, P, LB, SBK), **3** (R) **1**(SD)	**3**(GLF, P, LB, SBK), **2** (R) **1**(SD)
Significance (E+D+M)P	**36 (Medium)** (GLF, P, R); **9 (Low)** (SD) **56 (Medium)** (LB,SBK)	**24 (Low)** (GLF, R)**,** **8 (Low)**(SD) **39 (Medium)** (LB,SBK)

<table>
<tr><td>Status (+ve or –ve)</td><td>Negative</td><td>Negative</td></tr>
<tr><td>Reversibility</td><td>Low</td><td>Low</td></tr>
<tr><td>Irreplaceable loss of species?</td><td>Yes (particularly the bustards)</td><td>Reduced</td></tr>
<tr><td>Can impacts be mitigated?</td><td>Partially</td><td></td></tr>
<tr><td colspan="3">Mitigation:
» As far as possible, orientate the turbine strings north-south so they do not present a barrier to north-south commuting birds.
» Do not place turbines on the very top of ridges but on the east side where orographic lift is less pronounced for soaring raptors
» Paint one turbine blade with ultra-violet paint, readily seen by birds day and night.
» Undertake pre-construction monitoring to confirm flight paths and foraging areas.
» Continue monitoring into operational phase to confirm impacts (if any) of the wind energy facility on avifauna.</td></tr>
<tr><td colspan="3">Cumulative impacts:
Cumulative impacts (Masden et al. 2010) are those that may affect a species in a small area (e.g. a wind farm) yet have a wide-scale influence. If resident territorial birds are killed by turbines for example, then other individuals will be pulled in to take up the vacant territory. Thus for bustards that may reside in the area, the impact may be greater than just around the immediate vicinity of the wind farm. On the other hand migratory species killed in one area such as flamingos migrating through the area to their breeding grounds, may be affected far from that breeding area. A wide-spread population reduction may occur as a result. Last, if several wind farms are developed in one area and result in widespread displacement or collisions of a range-restricted species, then they may have a wide spread influence cumulatively even if the individual wind farms do not have a major impact. Furthermore, if the wind farm is enlarged, or taken closer to the ocean, then bird movements may be influenced negatively. Cumulative impacts for raptors such as the buzzards and Secretarybirds may be present if the mortality brings other territorial birds in. Wind farms are proposed for an area south of Kleinsee too and this may have a cumulative impact on the species detailed above. The present study assumes that the land use here will remain stable and no further mine excavations will be placed near the wind farm, that may attract wetland species.</td></tr>
<tr><td colspan="3">Residual impacts:
After mitigation, direct mortality or area avoidance by the species identified above may still occur and further mitigation (e.g. micro-siting) will be needed.</td></tr>
</table>

Implications for project implementation

» From the avifauna assessment undertaken, it is concluded areas 2, 3 and 5 (which form part of Phase 3) are rated as being of moderate to high risk in terms of collisions. This is due to the presence of pelicans, raptors and bustards. Of these, areas 2 and 3 are the highest risk area due to the breeding of a Ludwig's Bustard and the presence of the Secretarybird in the area. Both are red-listed and collision-prone species.
» There are three classes of mitigation for birds around wind farms:
(vii) re-position the turbines to avoid intersecting the movements of the birds

(viii) redesign the turbines to alter the present pattern/shape/size of the turbines so birds see them more readily and avoid contact or
(ix) close down turbines when these birds approach.

» It is recommended that further research (in the form of pre-construction and operational monitoring) be undertaken to determine flight paths of flamingos and where the raptors and bustards forage. On present (limited) evidence the wind energy facility area is considered to be far enough from the coastal flyways (1.9 km) that it will avoid impacting flamingo flyways. However, passage rates will need to be assessed with the presence of bustards, korhaans and the raptors in the area.
» The effects of power lines across the wind farm may have a high impact on the birds of the area because bustards and other collision-prone species are well known to suffer mortality (Martin and Shaw 2010). However, wherever possible all overhead lines should be marked with bird flappers or, where possible, buried underground.

11.3.4. Potential Impacts on Geology, Soils and Agricultural Potential

Due to the low agricultural potential of the site as well as the low rainfall the impacts on soils and agriculture is expected to be low – provided that adequate storm water management and erosion prevention measures are implemented. These measures should be included in the layout and engineering designs of the development. The erodibility of the soils on the site is associated with the low sparse vegetation cover, sandy topsoils and restricting subsoil layers. In the mining areas the erodibility is a major challenge due to the presence of excessive NaCl in the newly established soils and storm water emanating from the site should be mitigated and controlled.

Impact tables summarising the significance of impacts on geology, soils and agricultural potential associated with the wind energy facility

Nature: Construction of turbine foundations and laydown areas		
	Without mitigation	**With mitigation**
Extent	Local (1)	N/A
Duration	Permanent (5)	N/A
Magnitude	Minor (2)	N/A
Probability	Probable (4)	N/A
Significance	**Moderate (32)**	N/A
Status	Negative	N/A
Reversibility	Irreversible	
Irreplaceable loss of resources?	Yes	
Can impacts be mitigated?	No	

Mitigation: » Limit footprint to the immediate development area.
Cumulative impacts: » Soil erosion may arise owing to increased surface water runoff. Adequate management and erosion control measures should be implemented.
Residual impacts: » Limited is activity is managed.

Nature: Construction of buildings and other infrastructure with the associated disturbance of soils and existing land use		
	Without mitigation	**With mitigation**
Extent	Local (1)	N/A
Duration	Permanent (5)	N/A
Magnitude	Minor (2)	N/A
Probability	Probable (4)	N/A
Significance	**Moderate (32)**	N/A
Status	Negative	N/A
Reversibility	Irreversible	
Irreplaceable loss of resources?	Yes	
Can impacts be mitigated?	No	
Mitigation: » Limit footprint to the immediate development area.		
Cumulative impacts: » The cumulative impact of this activity will be small as it is constructed on land with low agricultural potential.		
Residual impacts: » Limited due to low agricultural potential		

Nature: construction of roads with the associated disturbance of soils and existing land use		
	Without mitigation	**With mitigation**
Extent	Local (1)	N/A
Duration	Permanent (5)	N/A
Magnitude	Minor (2)	N/A
Probability	Probable (4)	N/A
Significance	**Moderate (32)**	N/A
Status	Negative	N/A
Reversibility	Irreversible	
Irreplaceable loss of resources?	Yes	
Can impacts be mitigated?	No	
Mitigation:		

» Limit footprint to the immediate development area and keep to existing roads as far as possible.
Cumulative impacts: » The cumulative impact of this activity will be small as it is constructed on land with low agricultural potential.
Residual impacts: » Limited due to low agricultural potential

Nature: Impact of vehicle operation on site Vehicle movement will be restricted to the construction site and established roads. Vehicle impacts in this sense are restricted to spillages of lubricants and petroleum products.		
	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Short-term (2)	Short-term (2)
Magnitude	Minor (2)	Minor (2)
Probability	Probable (4)	Improbable (2)
Significance	**Low (20)**	**Low (10)**
Status	Negative	Negative
Reversibility	Reversible	
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	Yes	
Mitigation: » Limit footprint to the immediate development area. » Maintain vehicles in designated areas only. » Prevent and address spillages.		
Cumulative impacts: » The cumulative impact of this activity will be small if managed.		
Residual impacts: » Limited if activity is managed.		

Nature: Impact of dust generation on site This activity entails the operation of vehicles on site and their associated dust generation. Generated dust can impact large areas depending on environmental and climatic conditions.		
	Without mitigation	**With mitigation**
Extent	Local (2)	Local (1)
Duration	Short-term (2)	Short-term (2)
Magnitude	Minor (2)	Minor (2)
Probability	Probable (4)	Improbable (2)
Significance	**Low (24)**	**Low (12)**
Status	Negative	Negative
Reversibility	Reversible	
Irreplaceable loss	No	

of resources?		
Can impacts be mitigated?	Yes	
Mitigation: » Limit vehicle movement to absolute minimum. » Construct proper roads for access. » Implement appropriate dust control measures.		
Cumulative impacts: » The cumulative impact of this activity will be small if managed but can have widespread impacts if ignored.		
Residual impacts: » Limited if activity is managed.		

Nature: Loss of agricultural potential and land capability owing to the development		
	Without mitigation	**With mitigation**
Extent	Site (1)	N/A
Duration	Permanent (5)	N/A
Magnitude	Low (2)	N/A
Probability	Highly probable (4)	N/A
Significance	**32 (Low)**	N/A
Status	Negative	N/A
Reversibility	Medium	
Irreplaceable loss of resources?	Yes	
Can impacts be mitigated?	No. The loss of agricultural land is a long term loss and there are no mitigation measures that can be put in place to combat this loss.	
Mitigation: » N/A		
Cumulative impacts: » The cumulative impact of this activity will be small as it is constructed on land with low agricultural potential.		
Residual impacts: » The loss of agricultural land is a long term loss. This loss extends to the post-construction phase. The agricultural potential is very low though.		

Implications for project implementation

» The impacts on soils are small in comparison to historical mining impacts in the study area.
» The impacts should be limited to the immediate construction sites and rehabilitation measures should be implemented in line with those to be implemented by the diamond mine.

- Regarding the construction of turbines and associated infrastructure the following recommendations are made:
  - Limit physical impacts to as small a footprint as possible.
  - Site management has to be implemented with the appointment of a suitable environmental control officer (ECO) to oversee the process, address problems and recommend and implement corrective measures.
  - Implement site specific erosion and water control measures to prevent excessive surface runoff from the site (turbines and roads).
  - Plan the road and site layout in such a way as to make maximal use of existing roads to keep natural units as intact as possible.
  - Prevent dust generation and vehicle associated pollution and spillages.
- With effective implementation of mitigating measures (as outlined in the **EMP** in **Appendix Q**) the impacts identified can be reduced to a low level.

11.3.5. Potential Visual Impacts

The combined results of the visual exposure, viewer incidence / perception and visual distance of the proposed wind energy facility is displayed in Figure 11.6. Here the weighted impact and the likely areas of impact have been indicated as a visual impact index. Values have been assigned for each potential visual impact per data category and merged in order to calculate the visual impact index.

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

The visual impact index for the WEF is further described as follows.

- The visual impact index map indicates a core zone of moderate to high visual impact within a 5 km radius of the proposed facility. Affected areas include Kleinsee and long stretches of road, especially the R355 that passes the proposed development area at close proximity in places.
- The extent of potential visual impact remains high between the 5 km and
- 10 km radii, becoming moderate towards the outer edge of this zone. Affected areas include only a few stretches of road. Visual impacts within this zone are likely to be low to moderate.
- Between 10 km and 20 km, the extent of potential visual impact is reduced. Visual impacts within this zone are likely to be very low to low, with only stretches of road being affected.
- Remaining impacts beyond the 20 km radius are expected to be negligible to very low.

It is evident from the above that visual impacts are likely to occur primarily on roads. It must be noted that all roads converge onto Kleinzee and that the duration of visual impact is likely to be high, particularly as one travels towards Kleinsee. The impact intensifies as the distance to the wind energy facility becomes closer.

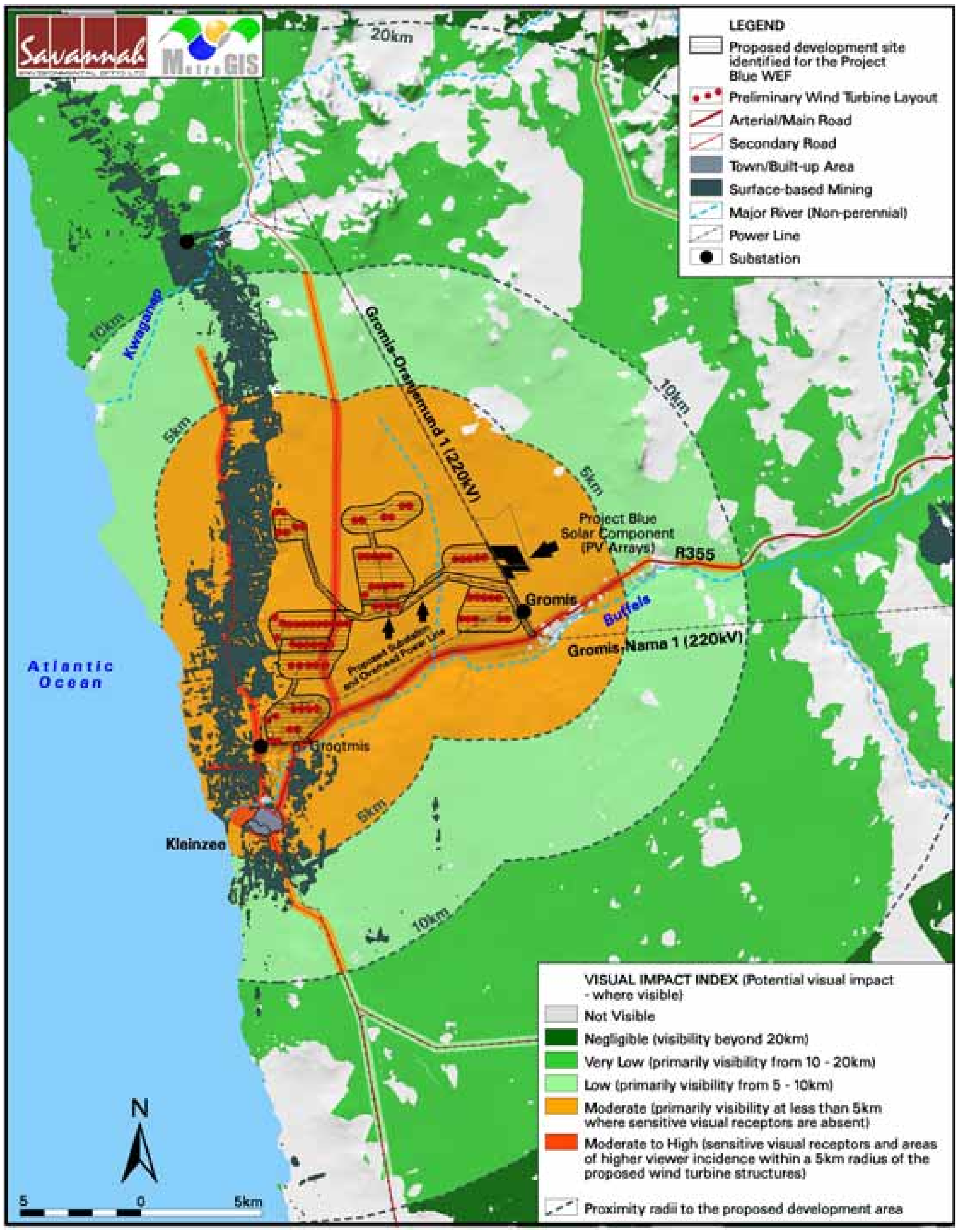

Figure 11.6: Visual impact index of the proposed Wind Energy Facility

Impact tables summarising the significance of visual impacts associated with the wind energy facility

Nature of Impact: Potential visual impact of construction on visual receptors in close proximity to the proposed facility.

During construction, there will be a noticeable increase in heavy vehicles utilising the roads to the development site that may cause, at the very least, a visual nuisance to other road users in the area. The clearing of vegetation during construction is unavoidable. Given the large footprint of development, it is likely that large tracks of land will be affected. The rehabilitation of vegetation in this region is difficult, given the hot, dry climatic conditions of this region.

	No mitigation	***Mitigation considered***
Extent	Local **(4)**	Local **(4)**
Duration	Long term **(4)**	Short term **(2)**
Magnitude	Moderate **(6)**	Low **(4)**
Probability	Highly Probable **(4)**	Probable **(3)**
Significance	Moderate **(56)**	Low **(30)**
Status	Negative	Negative
Reversibility	Recoverable	Recoverable
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	

Mitigation:

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

Cumulative impacts:

In context of the existing rural character and relative low activity rate, the construction phase of the WEF will contribute to a regional increase in heavy vehicles on the roads in the region, with constructions activity distinctly noticeable.

Residual impacts:

None.

Nature of Impact: Potential visual impact on users of arterial and secondary roads in close proximity to the proposed facility Visual impacts on the R355 arterial road, being the major access route to Kleinzee, as well as the secondary road from the north, are expected to be of moderate significance within a radius of 5 km from the facility. The duration of visual impact within this zone, at an average speed of 90km/h, will be about 10 minutes.		
	No mitigation	***Mitigation considered***
Extent	Local **(4)**	N/a
Duration	Long term **(4)**	N/a
Magnitude	High **(8)**	N/a
Probability	Probable **(3)**	N/a
Significance	Moderate **(48)**	N/a
Status	Negative	N/a
Reversibility	Recoverable	N/a
Irreplaceable loss of resources?	No	N/a
Can impacts be mitigated?	No	
Mitigation / Management: Planning: » Retain / re-establish and maintain natural vegetation in all areas outside of the development footprint. Operations: » Maintain the general appearance of the facility as a whole. Decommissioning: » Remove infrastructure not required for the post-decommissioning use of the site. » Rehabilitate all areas. Consult an ecologist regarding rehabilitation specifications. » Monitor rehabilitated areas post-decommissioning and implement remedial actions.		
Cumulative impacts: The construction of wind turbines together with the associated infrastructure will increase the cumulative visual impact of industrial type infrastructure within the region. This is relevant in light of the power line infrastructure already present in the area.		
Residual impacts: The visual impact will be removed after decommissioning, provided the facility and ancillary infrastructure is removed. Failing this, the visual impact will remain.		

Nature of Impact: Potential visual impact on residents of Kleinzee Kleinzee is situated less than 5 km from the nearest boundary of the proposed facility. The potential for visual exposure is high, but due to the existence of buildings and other structures, typically of a built up area, the visual absorption capacity is expected to be high, therefore limiting full exposure of the wind energy facility.		
	No mitigation	***Mitigation considered***
Extent	Local **(4)**	N/a
Duration	Long term **(4)**	N/a
Magnitude	Moderate **(6)**	N/a

Probability	Probable **(3)**	N/a
Significance	Moderate **(42)**	N/a
Status (positive or negative)	Negative	N/a
Reversibility	Recoverable **(3)**	N/a
Irreplaceable loss of resources?	No	N/a
Can impacts be mitigated?	No	

Mitigation / Management:

Planning:

» Retain / re-establish and maintain natural vegetation in all areas outside of the development footprint.

Operations:

» Maintain the general appearance of the facility as a whole.

Decommissioning:

» Remove infrastructure not required for the post-decommissioning use of the site.
» Rehabilitate all areas. Consult an ecologist regarding rehabilitation specifications.
» Monitor rehabilitated areas post-decommissioning and implement remedial actions.

Cumulative impacts:

The construction of wind turbines together with the associated infrastructure will increase the cumulative visual impact of industrial type infrastructure within the region. This is relevant in light of the power line infrastructure already present in the area.

Residual impacts:

The visual impact will be removed after decommissioning, provided the facility and ancillary infrastructure is removed. Failing this, the visual impact will remain.

Nature of Impact: Potential visual impact of ancillary infrastructure (i.e. the substation, the overhead power line, the internal access roads and the office / workshop) on observers in close proximity to the facility

Ancillary infrastructure associated with the wind energy facility includes the substations, the overhead power line, the internal access roads, administration buildings and workshop, which may be visible to observers in close proximity to the facility. These will be located within the facility footprint. The roads have the potential of manifesting as landscape scarring. Other infrastructure has the potential of creating visual clutter, contributing to cumulative impacts, therefore having the potential of visual impact within the viewshed areas. No dedicated viewsheds have been generated for the ancillary infrastructure, as the range of visual exposure will fall within that of the turbines, as indicated on Figure 7.6.

	No mitigation	***Mitigation considered***
Extent	Local **(4)**	Local **(4)**
Duration	Long term **(4)**	Long term **(4)**
Magnitude	Low **(4)**	Low **(4)**
Probability	Improbable **(2)**	V Improbable **(1)**
Significance	Low **(24)**	Low **(12)**
Status	Negative	Negative
Reversibility	Recoverable	Recoverable
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	

Mitigation / Management: Planning: » Plan internal roads in such a way and in such a location that clearing of vegetation is minimised. Consolidate existing infrastructure as much as possible, and make use of already disturbed areas rather than pristine sites wherever possible. » Retain / re-establish and maintain natural vegetation in all areas outside of the development footprint. Construction: » Rehabilitation of all construction areas. » Ensure that vegetation is not cleared unnecessarily to make way for access roads and ancillary buildings. Operation: » Maintenance of roads to avoid erosion and suppress dust. Decommissioning: » Removal of infrastructure and roads not required for post decommissioning use and rehabilitation of the footprint areas. » Monitor rehabilitated areas post-decommissioning and implement remedial actions.
Cumulative impacts: The construction of the substation, overhead power line, internal roads and buildings, will increase the cumulative visual impact of industrial type infrastructure within the region. This is relevant in light of existing roads and power lines already present in the area.
Residual impacts: The visual impact will be removed after decommissioning, provided the access roads are removed and rehabilitated. Failing this, the visual impact will remain.

Nature of Impact: Potential visual impact of shadow flicker on observers in close proximity thereto. Shadow flicker (as a result of the turbines) only occurs when the sky is clear, and when the rotor blades are between the sun and the receptor (i.e. when the sun is low). De Gryse in Scenic Landscape Architecture (2006) found that “most shadow impact is associated with 3-4 times the height of the object”. Based on this research, a 320m buffer along the edge of the facility is submitted as the zone within which there is a risk of shadow flicker occurring. There are no roads or places of residence within the 320 m buffer. The significance of shadow flicker is therefore anticipated to be low.		
	No mitigation	***Mitigation considered***
Extent	Local **(4)**	N/a
Duration	Long term **(4)**	N/a
Magnitude	Low **(4)**	N/a
Probability	Very Improbable **(1)**	N/a
Significance	Low **(12)**	N/a
Status	Negative	N/a
Reversibility	Recoverable	N/a
Irreplaceable loss of resources?	No	N/a
Can impacts be mitigated?	No	
Mitigation / Management:		

Decommissioning: Removal of infrastructure not required for post decommissioning use and rehabilitation of the footprint areas.
Cumulative impacts: The construction of wind turbines together with the associated infrastructure will increase the cumulative visual impact of industrial type infrastructure within the region.
Residual impacts: The visual impact will be removed after decommissioning, provided the facility and ancillary infrastructure is removed. Failing this, the visual impact will remain.

Nature of Impact: Potential visual impact of lighting on visual receptors in close proximity of the proposed facility.

Lighting impacts relate to the effects of glare and sky glow. The source of glare light, although not as intense as direct lighting, is the aircraft warning lights mounted on top of the hub of the wind turbines. These lights are less aggravating due to the toned-down red colour, but have the potential to be visible from a great distance. There is no mitigation for this impact.

Sky glow is the condition where the night sky is illuminated when light reflects off particles in the atmosphere such as moisture, dust or smog. The sky glow intensifies with the increase in the amount of light sources. Each new light source, especially upwardly directed lighting, contribute to the increase in sky glow. The wind energy facility may contribute to the effect of sky glow within this environment. The area surrounding the facility is primarily demarcated as conservation areas, which are highly sensitive to lighting impacts.

	No mitigation	***Mitigation considered***
Extent	Local **(4)**	Local **(4)**
Duration	Long term **(4)**	Long term **(4)**
Magnitude	High **(8)**	Moderate **(6)**
Probability	Probable **(3)**	Improbable **(2)**
Significance	Moderate **(48)**	Low **(28)**
Status	Negative	Negative
Reversibility	Recoverable	Recoverable
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	

Mitigation:

Planning & operation:

» Shielding the sources of light by physical barriers (walls, vegetation, or the structure itself);
» Limiting mounting heights of lighting fixtures, or alternatively using foot-lights or bollard level lights;
» Making use of minimum lumen or wattage in fixtures;
» Making use of down-lighters, or shielded fixtures;
» Making use of Low Pressure Sodium lighting or other types of low impact lighting.
» Making use of motion detectors on security lighting. This will allow the site to remain in

relative darkness, until lighting is required for security or maintenance purposes.
Cumulative impacts: The existing town of Kleinzee already generates lighting impacts at night. The impact of the proposed WEF will contribute to a regional increase in lighting impact.
Residual impacts: The visual impact will be removed after decommissioning, provided the facility and ancillary infrastructure is removed. Failing this, the visual impact will remain.

Nature of Impact: Potential visual impact of the proposed facility on visual character and sense of place of the region		
Sense of place refers to a unique experience of an environment by a user, based on his or her cognitive experience of the place. Visual criteria, specifically the visual character of an area (informed by a combination of aspects such as topography, level of development, vegetation, noteworthy features, cultural / historical features, etc.), play a significant role. An impact on the sense of place is one that alters the visual landscape to such an extent that the user experiences the environment differently, and more specifically, in a less appealing or less positive light. Specific aspects contributing to the sense of place of this region include the rural and undeveloped character of the area. A sense of remoteness is evident when travelling through the area. Approaching Kleinzee and the mined areas, this sense of place is altered. The location of the proposed wind energy facility close to Kleinzee can be regarded as a transition zone between a built-up and rural area, within which changes to the sense of place may be more acceptable to sensitive viewers. Given the vastness of this region, where this particular sense of place is experienced widely, any change to it close to a disturbed area is likely to be of low significance.		
	No mitigation	***Mitigation considered***
Extent	Regional **(3)**	N/a
Duration	Long term **(4)**	N/a
Magnitude	Low **(4)**	N/a
Probability	Improbable **(2)**	N/a
Significance	Low **(22)**	N/a
Status	Negative	N/a
Reversibility	Recoverable	N/a
Irreplaceable loss of resources?	No	N/a
Can impacts be mitigated?	No	

Mitigation / Management:

Planning:
» Retain / re-establish and maintain natural vegetation in all areas outside of the development footprint.

Operations:
» Maintain the general appearance of the facility as a whole.

Decommissioning:
» Remove infrastructure not required for the post-decommissioning use of the site.
» Rehabilitate all areas. Consult an ecologist regarding rehabilitation specifications.
» Monitor rehabilitated areas post-decommissioning and implement remedial actions.

Cumulative impacts:

The construction of wind turbines together with the associated infrastructure will increase the cumulative visual impact of industrial type infrastructure within the region. This is relevant in light of the power line infrastructure already present in the area.

Residual impacts:

The visual impact will be removed after decommissioning, provided the facility and ancillary infrastructure is removed. Failing this, the visual impact will remain.

Nature of Impact: Potential visual impact on the sense of place around Grootmis

Grootmis is situated less than 800 m from the nearest wind turbine of the south western section of the proposed Phase 3. Due to the large vertical dimensions of the turbines, they will dominate northern views from this location. This will impact on the high quality of the sense of place around Grootmis, which is regarded as a place of historical importance, as described in the Heritage Impact Assessment report.

The significance of visual impact is therefore expected to be high. The impact can be mitigated by omitting the south western cluster of turbines (Phase 3) from the proposed development, or repositioning the implicated turbines at another location, leaving a buffer of at least 3 km around Grootmis. This will reduce the significance of the impact to moderate, with the other sections of Phase 3 visible at farther distances.

	No mitigation	***Mitigation considered***
Extent	Local **(4)**	Local **(4)**
Duration	Long term **(4)**	Long term **(4)**
Magnitude	High **(8)**	moderate **(6)**
Probability	Definite **(5)**	Probable **(3)**
Significance	High **(80)**	Moderate **(36)**
Status	Negative	Negative
Reversibility	Recoverable **(3)**	Recoverable **(3)**
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	

Mitigation:

Planning:
» Omit the south western cluster of turbines (Phase 3) from the proposed development, or reposition the implicated turbines at another location, leaving a buffer of at least 3

km around Grootmis. » Retain / re-establish and maintain natural vegetation in all areas outside of the development footprint. Operations: » Maintain the general appearance of the facility as a whole. Decommissioning: » Remove infrastructure not required for the post-decommissioning use of the site. » Rehabilitate all areas. Consult an ecologist regarding rehabilitation specifications. » Monitor rehabilitated areas post-decommissioning and implement remedial actions.
Cumulative impacts: The construction of wind turbines together with the associated infrastructure will increase the cumulative visual impact of industrial type infrastructure within the region. This is relevant in light of the power line infrastructure already present in the area.
Residual impacts: The visual impact will be removed after decommissioning, provided the facility and ancillary infrastructure is removed. Failing this, the visual impact will remain.

Implications for project implementation

» The construction and operation of the proposed Project Blue Wind Energy Facility and its associated infrastructure, will have a visual impact on the study area, specifically within 5km of the proposed facility.
» The anticipated visual impacts listed above (i.e. post mitigation impacts) range from high to low, and none are considered to be fatal flaws for the proposed wind energy facility, except for the turbines located in close proximity to Grootmis (Area 5) which should be excluded.
» Mitigation measures as proposed must be implemented.

11.3.6. Potential Heritage Impacts

The main impact on heritage resources associated with Phase 3 of the Project blue Wind Energy facility is as a result of impacts on the cultural landscape associated with the small hamlet of Grootmis. With Phase 3 the archaeological mitigation would not change the overall significance of the impacts much since, although archaeological impacts would be reduced, the landscape impacts cannot be mitigated. However, the overall magnitude of impacts is slightly reduced if full archaeological mitigation is carried out.

Impact tables summarising the significance of impacts on heritage sites associated with the wind energy facility

Nature: Assessment of impacts to heritage resources for Phase 3.		
	Without mitigation	**With mitigation**
Extent	Local (4)	Local (4)
Duration	Permanent (5)	Permanent (5)

Magnitude	High (8)	Moderate (6)
Probability	Definite (5)	Definite (5)
Significance	**High (85)**	**High (75)**
Status	Negative	Negative
Reversibility	No	
Irreplaceable loss of resources?	Archaeology: Yes Landscape: No	
Can impacts be mitigated?	Archaeology: Yes Landscape: No	
Mitigation: » If it is not possible to avoid impact on archaeological sites, undertake archaeological excavation and sampling.		
Cumulative impacts: » There are probably hundreds of thousands of archaeological sites in the Namaqualand Sandveld and loss (with mitigation) of some will thus not be significant. No other similar facilities are planned in very close proximity to Grootmis and the proposed Eskom facility to the south of Kleinsee will not introduce further impacts to Grootmis.		
Residual impacts: » Loss of heritage sites.		

Implications for project implementation

» The south-western cluster of turbines (Area 5 - part of Phase 3) should be omitted entirely from the development. Should this not be enforced, then turbine M04-P3 is best omitted due to the high significance of site DKG2012/001 and the large amount of mitigation that is likely to be required there. If mitigation is carried out within the disturbance footprint then strict enforcement of no-go areas around the construction footprint is required during construction.
» Impacts to archaeological resources can generally be easily mitigated, although in some cases this would be time-consuming due to the extensive numbers of sites or occurrences to be impacted.
» It is concluded that the proposed Project Blue Wind Energy Facility: Phase 3 should be allowed to proceed provided that mitigation as recommended (including avoidance through the omission of the turbines in Area 5) is implemented.
» Prior to construction a final walk-down survey must be carried out in order to examine any areas not yet checked and any turbine positions that have been changed or added subsequent to the Phase 3 survey. Archaeological mitigation as required must then be carried out.
» If any unmarked pre-colonial burials are intersected during the construction phase of the project then these should be reported to SAHRA or an archaeologist so that appropriate action can be taken.

11.3.7. Potential Noise Impacts

The noise impact assessment indicated that Phases 1 and 2 (refer to Figure 11.8**Error! Reference source not found.**) does not pose any risk to noise sensitive developments (NSDs) during construction and operation of the wind energy facility as they are too far from any potential receptor during the operational phase. When phase 3 is implemented, it is highly likely that there will be a noise impact on NSD01, NSD02, NSD03 and NSD04 (refer to Figure 11.8). This is mainly due to the distance between the closest southern wind turbines and these NSDs. This may result in a noise impact of medium significance. It should also be noted that the result of the modelling is based on the use of the noise emission data of a worst-case wind turbine.

Impact tables summarising the significance of noise impacts associated with the wind energy facility

Nature: Numerous turbines operating simultaneously during a period when a quiet environment is desirable		
	Without mitigation	**With mitigation**
Extent ($\Delta L_{Aeq,n}$>7dBA)	Local (2). – Impact will extend less than 1,000 meters from activity.	Local (2)
Duration	Long (4).– Facility will operate for a number of years	Long (4)
Magnitude	Low (2) – Medium (6)	Low (4)
Probability	Improbable (1) – Highly Likely (4)	Probable (3)
Significance	48 (Medium)	30 (Low)
Status	Negative.	Negative
Reversibility	High.	High
Irreplaceable loss of resources?	N/A	
Can impacts be mitigated?	Yes	
Mitigation: The significance of the noise impact is considered to be of a medium significance for the closest NSDs and further mitigation measures are required and recommended. Measures that could be considered before the development of this wind energy facility would include: » The use of quieter wind turbines; » Reducing the total number of wind turbines within a distance 1,000 meters from the closest NSDs as proposed; » The developer can consider larger wind turbines which would require less wind turbines for the same power generation potential, but increase the buffer zone with an appropriate level.		
Cumulative impacts: » The cumulative impact of this activity will be small as it is constructed on land with low agricultural potential.		
Residual impacts:		

» Limited due to low agricultural potential

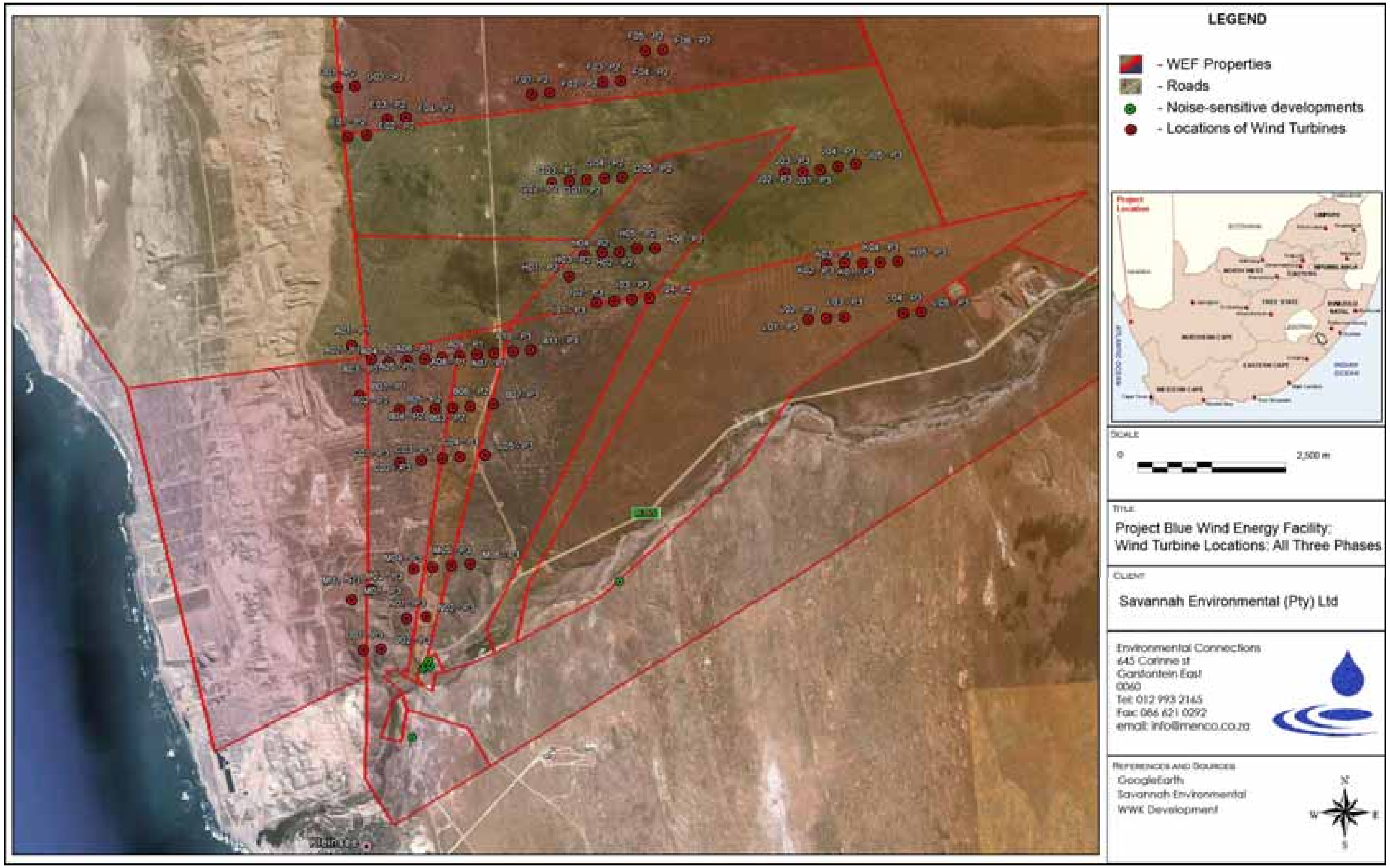

Figure 11.8: Proposed layout of Project Blue WEF: All three phases, indicating location of noise sensitive developments

In terms of addressing noise impacts, the following is of importance:

» Good public relations are essential. At all stages, surrounding receptors should be educated with respect to the sound generated by wind turbines. The information presented to stakeholders should be factual and should not set unrealistic expectations. It is counterproductive to suggest that the wind turbines will be inaudible, or to use vague terms like "quiet". Modern wind turbines produce a sound due to the aerodynamic interaction of the wind with the turbine blades, audible as a "swoosh", which can be heard at some distance from the turbines. The magnitude of the sound will depend on a multitude of variables and will vary from day to day and from place to place with environmental and operational conditions. Audibility is distinct from the sound level, because it depends on the relationship between the sound level from the wind turbines and the ambient background sound level.
» Community involvement needs to continue throughout the project. Annoyance is a complicated psychological phenomenon; as with many industrial operations, expressed annoyance with sound can reflect an overall annoyance with the project, rather than a rational reaction to the sound itself. Wind projects offer a benefit to the environment and the energy supply for the greater population, and offer economic benefits to the land owners leasing installation sites to the wind farm. A positive community attitude throughout the greater area should be fostered, particularly with those residents near the wind farm, to ensure they do not feel that advantage have been taken of them.
» The developer must implement a line of communication (i.e. a help line where complaints could be lodged. All potential sensitive receptors should be made aware of these contact numbers. The Wind Energy Facility should maintain a commitment to the local community and respond to concerns in an expedient fashion. Sporadic and legitimate noise complaints could develop. For example, sudden and sharp increases in sound levels could result from mechanical malfunctions or perforations or slits in the blades. Problems of this nature can be corrected quickly, and it is in the developer's interest to do so.

Implications for project implementation

» The noise impact assessment indicated that the potential noise impact would be insignificant during the construction phase (for all three phases) (Refer to Appendix M for specialist report).
» When phase 3 is implemented it is highly likely that there will be a noise impact on NSD01, NSD02, NSD03 and NSD04. This is mainly due to the distance between the closest southern wind turbines and these NSDs. This may result in a noise impact of medium significance.

11.3.8. Potential Social Impacts

Impacts associated with the Construction Phase

The key social issues associated with the construction phase are the following:

Potential positive impacts

» Creation of employment and business opportunities, and opportunity for skills development and on-site training.

Potential negative impacts

» Impacts associated with the presence of construction workers on local communities;
» Increased risks to stock, crops, grazing and farming infrastructure associated with the presence of construction workers;
» Impact of heavy vehicles on local roads;
» Loss of agricultural land associated with construction related activities.

Impact tables summarising the significance of social impacts associated with the construction of the wind energy facility

Nature: ***Creation of local employment and business opportunities during the construction phase associated with proposed wind energy facility***
Based on the information from other WEFs the capital expenditure associated with the construction of Phase 1 (20 MW) would be ~ R320 million, with Phases 2 and 3 being R900 million and R1.2 billion respectively. The total capital expenditure associated with the full 150MW (Phase 1, 2 and 3) facility would be region of R2.4 billion (2012 Rands). The establishment of a 150 MW wind energy facility would take ~ 24 months and create approximately 300 construction related jobs. Of this total approximately 25 % (75) will be available to skilled personnel (engineers, technicians, management and supervisory), ~ 15 % (45) to semi-skilled personnel (drivers, equipment operators), and ~ 60% (180) to low skilled personnel (construction labourers, security staff). The employment opportunities associated with each phase would be ~ 48 for Phase 1 (20MW), ~ 112 for Phase 2 (56 MW) and ~ 148 for Phase 3 (74MW). The total wage bill with the construction of a 150MW facility (300 employees X 24 months) is estimated to be in the region of R89 million. This is based on the assumption that the average monthly salary for low, semi and skilled workers is R5 000, R12 000 and R30 000 respectively. The capital expenditure is anticipated to be in the region of R2.4 billion for a 150 MW wind energy facility. Members from the local community are likely to be in a position to qualify for the majority of the low skilled and some of the semi-skilled employment opportunities. The majority of these employment opportunities are also likely to accrue to Historically Disadvantaged (HD) members from the local community. Given the high unemployment levels and

limited job opportunities in the area this will represent a significant social benefit. The remainder of the semi-skilled and majority of the skilled employment opportunities are likely to be associated with the contactors appointed to construct the wind energy facility and associated infrastructure. In terms of accessibility the majority of the construction workers from outside the area are likely to be accommodated in Kleinsee. The findings of the SIA indicate that old De Beers mining hostels could be used to accommodate construction workers.

In terms of training, the contractors are likely to provide on-site training and skills development opportunities. However, the majority of benefits are likely to accrue to personnel employed by the relevant contractors. In the absence of specific commitments from the developer to employ local contractors the potential for meaningful skills development and training for members from the local communities are likely to be limited.

A percentage of the wage bill will be spent in the local economy and will create opportunities for local businesses in Kleinsee and Springbok. The sector of the local economy that is most likely to benefit from the proposed development is the local service industry. The potential opportunities for the local service sector would be linked to accommodation, catering, cleaning, transport and security, etc. associated with the construction workers on the site. The injection of income into the area in the form of wages and rental for accommodation will also create opportunities for local businesses in the Kleinsee and Springbok. The sector of the local economy that is most likely to benefit from the proposed development is the local service industry. The benefits to the local economy will be confined to the construction period (24 months).

In addition to the employment benefits, the expenditure of R2.4 billion during the construction phase will create business opportunities for the local and regional economy. However, given the technical nature of the project and the high import content associated with wind turbines the opportunities for the local economy is likely to be limited. However, some of the required civil engineering and construction skills may be able to be sourced from Springbok.

The local hospitality industry will also benefit from the accommodation and meals for professionals (engineers, quantity surveyors, project managers, product representatives etc.) and other personnel involved on the project. Experience from other construction projects indicates that the potential opportunities are not limited to onsite construction workers but also to consultants and product representatives associated with the project.

	Without Mitigation	**With Enhancement**
Extent	Local – Regional (2) (Rated as 2 due to potential opportunities for local communities and businesses)	Local – Regional (3) (Rated as 3 due to potential opportunities for local communities and businesses)
Duration	Short term (2)	Short term (2)
Magnitude	Low (4)	Low (4)
Probability	Highly probable (4)	Highly probable (4)
Significance	Medium (32)	Medium (36)
Status	Positive	Positive

Reversibility	N/A	N/A
Irreplaceable loss of resources?	N/A	N/A
Can impact be enhanced?	Yes	

Enhancement measures:

Employment

» Where reasonable and practical, WWK should appoint local contractors and implement a 'locals first' policy, especially for semi and low-skilled job categories.
» Prior to commencement of the construction phase, WWK should meet with representatives from the NKLM to establish the existence of skills and unemployment databases for the relevant municipal areas. If such databases exists, they should be made available to the appointed contractors.
» The local authorities, community representatives and organisations on the interested and affected party database should be informed of the final decision regarding the project and the potential job opportunities for locals and the employment procedures which WWK intends to implement during the construction phase.
» Where feasible, training and skills development programmes for locals should be initiated prior to the initiation of the construction phase.

Business

» WWK should develop a database of local companies, specifically companies that qualify as BBBEE companies, which qualify as potential service providers (e.g. construction companies, catering companies, waste collection companies, security companies etc.) prior to the commencement of the tender process for construction contractors. These companies should be notified of the tender process and invited to bid for project-related work;
» Where possible, WWK should assist local BBBEE companies to complete and submit the required tender forms and associated information;
» The NKLM, in conjunction with representatives from the local hospitality and retail industries, should identify strategies aimed at maximising the potential benefits associated with the project.

Note that while preference to local employees and companies is recommended, it is recognised that a competitive tender process may not guarantee the employment of local labour for the construction phase.

Cumulative impacts:

Opportunity to up-grade and improve skills levels in the area. However, due to relatively small number of local employment opportunities and limited skills range, this benefit is likely to be limited.

Residual impacts:

Improved pool of skills and experience in the local area. However, due to relatively small number of local employment and skills-transfer opportunities this benefit is likely to be limited.

Nature: ***Potential impacts on family structures and social networks associated with the presence of construction workers during construction the wind energy***

facility

The presence of construction workers poses a potential risk to family structures and social networks. While the presence of construction workers does not in itself constitute a social impact, the manner in which construction workers conduct themselves can impact on local communities. The most significant negative impact is associated with the disruption of existing family structures and social networks. This risk is linked to potentially risky behaviour of male construction workers, including:

» An increase in alcohol and drug use;
» An increase in crime levels;
» The loss of girlfriends and or wives to construction workers;
» An increase in teenage and unwanted pregnancies;
» An increase in prostitution;
» An increase in sexually transmitted diseases (STDs).

The findings of the SIA indicate that the potential impact of outside construction workers on the local community is an issue of concern. In this regard problems were experienced with construction workers housed in or near Kommagas/ Buffelsrivier during the tarring of R355 from Springbok to Buffelsrivier and the construction of the Eskom substation near Kommagas.

The potential risk to local residents in the area could potentially be mitigated by implementing a local employment policy, specifically for the low and semi-skilled employment opportunities associated with the construction phase. Employing members from the local community to fill the low-skilled job categories would reduce the risk and mitigate the potential impacts on the local communities. These workers will be from the local community and form part of the local family and social network and, as such, the potential impact will be low. However, due to the potential mismatch of skills and low education levels, the potential employment opportunities for the members from these local communities may be low.

WWK has indicated that construction workers will not be accommodated on site and will be transported to and from the site on a daily basis. The findings of the SIA indicate that non local workers can be accommodated in the DBC hostels in Kleinsee which are currently vacant. There are a total of 384 rooms and DBC is keen on seeing these facilities used. This issue would need to be discussed with the NKLM who are currently in the process of taking over the running of these and other services from DBC.

The potential risks posed by construction workers to the local community can be reduced to low by employing members from the local community. While the risks associated with construction workers at a community level will be low, at an individual and family level they may be significant, especially in the case of contracting a sexually transmitted disease or an unplanned pregnancy. However, given the nature of construction projects it is not possible to totally avoid these potential impacts at an individual or family level.

	Without Mitigation	**With Mitigation**
Extent	Local (3) (Rated as 3 due to potential severity of impact on local	Local (1) (Rated as 1 due to potential severity of impact on local

	communities)	communities)
Duration	Short term for community as a whole (2) Long term-permanent for individuals who may be affected by STDs etc. (5)	Short term for community as a whole (2) Long term-permanent for individuals who may be affected by STDs etc. (5)
Magnitude	Low for the community as a whole (4) High-Very High for specific individuals who may be affected by STDs etc. (10)	Low for community as a whole (4) High-Very High for specific individuals who may be affected by STDs etc. (10)
Probability	Probable (3)	Probable (3)
Significance	Low for the community as a whole (27) Moderate-High for specific individuals who may be affected by STDs etc. (54)	Low for the community as a whole (21) Moderate-High for specific individuals who may be affected by STDs etc. (48)
Status	Negative	Negative
Reversibility	No in case of HIV	No in case of HIV
Irreplaceable loss of resources?	Yes, if people contract HIV/AIDS. Human capital plays a critical role in communities that rely on farming for their livelihoods	
Can impact be mitigated?	Yes, to some degree. However, the risk cannot be eliminated	

Mitigation:

» Where reasonable and practical, WWK should appoint local contractors and implement a 'locals first' policy, especially for semi and low-skilled job categories.

» WWK should liaise with the NKLM to ensure that that recommended mitigation measures are implemented.

» WWK and the contractor(s) should, in consultation with representatives from the MF, develop a code of conduct for the construction phase. The code should identify which types of behaviour and activities are not acceptable. Construction workers in breach of the code should be dismissed. All dismissals must comply with the South African labour legislation.

» WWK and the contractor should implement an HIV/AIDS awareness programme for all construction workers at the outset of the construction phase.

» The movement of construction workers on and off the site should be closely managed and monitored by the contractors. In this regard the contractors should be responsible for making the necessary arrangements for transporting workers to and from site over weekends or after hours.

» The contractors should make the necessary arrangements for allowing workers from outside the area to return home over weekends and/ or on a regular basis. This would reduce the risk posed to local family structures and social networks.

» With the exception of security personnel, no construction workers should be accommodated on the site overnight.

Cumulative impacts:

Impacts on family and community relations that may, in some cases, persist for a long

period of time. Where unplanned / unwanted pregnancies occur, or members of the community are infected by an STD, specifically HIV, the impacts may be permanent and have long term to permanent cumulative impacts on the affected individuals and/or their families and the community.
Residual impacts: Impacts on family and community relations that may, in some cases, persist for a long period of time. Where unplanned / unwanted pregnancies occur, or members of the community are infected by an STD, specifically HIV, the impacts may be permanent and have long term to permanent cumulative impacts on the affected individuals and/or their families and the community.

Nature: ***Potential loss of livestock, poaching and damage to farm infrastructure associated with the presence of construction workers on site***

The movement of construction workers on and off the site poses a potential threat to farm infrastructure, such as fences and gates, which may be damaged. Stock losses may also result from gates along access roads being left open and/or fences being damaged. The issue of trespassing, stock theft and illegal hunting were raised as concerns by commercial farmers and Kleinsee Farmers Union. It should however be noted that the majority of commercial farms are located to the south of the proposed site, across Buffels River, near the proposed Eskom wind energy facility site. The local farmers interviewed indicated that stock theft was increasingly becoming an issue on commercial farms, especially since DBC had closed down Kleinsee its operations. Illegal hunting of small antelope, etc. (mainly with dogs, but also small calibre rifles) and removal of tortoises was also reported as a growing problem in area. The area is also rich in rare succulents which have a high value on the black market.

DBC currently owns the majority of the proposed development site and surrounding properties, but is in process of selling off, mainly to subsidiary of Trans-Hex (which may potentially lease out grazing. Portions of the site adjacent to DBC land is rented out for grazing; on others (e.g. Manelsvlei across R355 and Buffels River) DBC only has surface rights, and these are also used for grazing by “owners” of grazing rights. While the overall stock numbers are low the area vulnerable due to large size of properties and low population densities. All of the parties interviewed indicated that no construction workers should be accommodated on the site.

	Without Mitigation	**With Mitigation**
Extent	Local (4) (Rated as 4 due to potential severity of impact on local farmers)	Local (2)
Duration	Medium term (3)	Medium term (3)
Magnitude	Moderate (6) (Due to reliance on agriculture and livestock for maintaining livelihoods)	Low (4)
Probability	Probable (3)	Probable (3)
Significance	Medium (39)	Low (27)
Status	Negative	Negative
Reversibility	Yes, compensation paid for stock	Yes, compensation paid for

	losses etc.	stock losses etc.
Irreplaceable loss of resources?	No	No
Can impact be mitigated?	Yes	

Mitigation:

- WWK in consultation with the NKLM and local farmers should develop a Code of Conduct for construction workers. The Code of Conduct should be signed by WWK and all relevant contractors prior to the commencement of any on-site construction activities.
- WWK should hold contractors liable for compensating farmers and communities in full for any stock losses and/or damage to farm infrastructure that can be linked to construction workers. This should be contained in the Code of Conduct, to be signed between WWK, the contractors and neighbouring landowners. The agreement should also cover loses and costs associated with any fires caused by construction workers or construction related activities (see below).
- A designated Environmental Control Officer (ECO) should be appointed to monitor the conduct of staff. Affected landowners should have on-going access to the ECO.
- The EMP must outline procedures for managing and storing waste (including arrangements for plastic waste etc.) on site.
- Contractors must ensure that all workers are informed of the conditions contained on the Code of Conduct at the outset of the construction phase. The consequences of stock theft, poaching and trespassing on adjacent farms should be emphasised.
- Contractors must ensure that workers who are found guilty of stealing livestock, poaching and/or damaging farm infrastructure are dismissed and formally charged. This should be contained in the Code of Conduct. All dismissals must be in accordance with South African labour legislation.
- WWK should enter into legally binding arrangements with regard to compensation with all relevant property owners prior to the start of construction.

Cumulative impacts:
None, provided that losses are adequately compensated for.

Residual impacts:
None, provided that losses are adequately compensated for.

Nature: ***Potential loss of livestock, crops and houses, damage to farm infrastructure and threat to human life associated with increased incidence of veld fires***

The presence of construction workers and construction-related activities on the site can poses an increased risk of veld fires that in turn pose a threat to the natural vegetation, farmsteads, livestock and wildlife in the area. In the process, farm and tourism infrastructure may also be damaged or destroyed and human lives threatened. The issue of fire has been raised as a key concern by most farmers in the area. In the case of the proposed Project Blue wind energy facility the sparse, succulent vegetation on the site is not prone to veld fires. In addition, none of the famers interviewed indicated that this was an issue of concern.

	Without Mitigation	**With Mitigation**
Extent	Local (2)	Local (1)

Duration	Short term (2)	Short term (2)
Magnitude	Low (4)	Low (4)
Probability	Probable (3)	Probable (3)
Significance	Low (24)	Low (21)
Status	Negative	Negative
Reversibility	Yes, compensation paid for stock losses etc.	Yes, compensation paid for stock losses etc.
Irreplaceable loss of resources?	No	No
Can impact be mitigated?	Yes	

Mitigation:

Despite the low risk of veld fires, WWK should enter into an agreement with the affected landowners whereby the company will compensate for damages proven to be attributed to activities associated with the wijd energy facility. This includes losses associated veld fires. In addition, the potential increased risk of veld fires can be mitigated. The detailed mitigation measures are outlined in the EMP for the construction and operation phases. The aspects that should be covered include:

» Contractor to ensure that open fires on the site for cooking or heating are not allowed except in designated areas.
» Contractor to ensure that construction related activities that pose a potential fire risk, such as welding, are properly managed and are confined to areas where the risk of fires has been reduced. Measures to reduce the risk of fires include clearing working areas and avoiding working in high wind conditions when the risk of fires is greater. In this regard special care should be taken during the high risk dry, windy summer months.
» Contractor to provide adequate fire fighting equipment on-site.
» Contractor to provide fire-fighting training to selected construction staff.
» As per the conditions of the Code of Conduct, in the advent of a fire being caused by construction workers and or construction activities, the appointed contractors must compensate farmers for any damage caused to their farms. The contractor should also compensate the fire fighting costs borne by farmers and local authorities.

In addition the landowner should also ensure that they join the local fire protection agency.

Cumulative impacts:

No, provided losses are compensated for.

Residual impacts:

No, provided losses are compensated for.

Nature: ***Potential impacts to road surfaces and road safety associated with the movement of construction related traffic to and from the site***

The establishment of a wind energy facility requires abnormal loads associated with the transport of turbine components onto site. These will include abnormally long loads associated with ~ 60 m rigid turbine blades, as well as abnormally heavy loads associated with ~ 80 tonne nacelles. In addition, a crawler crane (~ 750 t) and assembly cranes will also need to be transported onto and off the sites. Other heavy equipment will include normal civil engineering construction equipment such as graders, excavators, cement trucks, etc.

Access to the site is likely to be via the R355 Springbok-Buffelsrivier Road. This road provides access to small scale mines along road, De Beers land, and communal grazing areas around Kommagas and Buffelsrivier. Potential delays associated with abnormal loads may develop along the road due to the mountainous terrain and at the Spektakel Pass. These delays would impact on other road users, including tourists. The local traffic authorities should therefore be informed of the dates and times of abnormal load trips. In addition, trips during peak tourism season periods, namely the Easter weekend, flower season (August-September) and December holidays should be carefully planned to minimize the impact on tourist related traffic.

	Without Mitigation	**With Mitigation**
Extent	Local (3) (Rated as 3 due to potential severity of impact on local farmers)	Local (2)
Duration	Short term (2)	Short term (2)
Magnitude	Low (4)	Low (4)
Probability	Probable (3)	Probable (3)
Significance	Low (27)	Low (24)
Status	Negative	Negative
Reversibility	Yes	
Irreplaceable loss of resources?	No	No
Can impact be mitigated?	Yes	

Mitigation:

» Movement of heavy vehicle traffic should, where possible, be carefully planned to minimize the impact on tourist related traffic during the peak tourist season periods (Easter weekend, flower season (August-September) and December holidays).

» Movement of construction traffic should be limited to weekdays. In addition, the movement of heavy vehicles on the local roads, specifically the R355 and Kommagas gravel road should not be permitted after 13h00 on Friday afternoons and before 09h00 on Monday mornings as these are times that are likely to impact on weekend visitors to the area.

» The contractor should inform local farmers and representatives from the NKLM and Tourism Sector of dates and times when abnormal loads will be undertaken.

» The contractor should ensure that damage caused to roads by construction related activities, including heavy vehicles, is repaired before the completion of the construction phase. The costs associated with the repair must be borne by the developer.

» All vehicles must be road-worthy and drivers must be qualified and made aware of the potential road safety issues and need for strict speed limits.

Cumulative impacts:

If damage to roads is not repaired then this will impact on the farming activities in the area and also result in higher maintenance costs for vehicles of local farmers and other road users. The costs will be borne by road users who were not responsible for the damage.

Residual impacts:

If damage to roads is not repaired then this will impact on the farming activities in the area and also result in higher maintenance costs for vehicles of local farmers and other road users.

Nature: ***Loss of farmland and natural vegetation*** The activities associated with the construction phase, such as establishment of access/haul roads, the movement of heavy vehicles, the establishment of lay-down areas and foundations for the wind turbines, substations and power lines will potentially damage topsoil and vegetation and result in losses of the grazing resource.		
	Without Mitigation	**With Mitigation**
Extent	Local (2)	Local (1)
Duration	Long term-permanent if disturbed areas are not rehabilitated (5)	Short term if damaged areas are rehabilitated (1)
Magnitude	Low (4)	Low (4)
Probability	Probable (3)	Probable (3)
Significance	Medium (33)	Low (18)
Status	Negative	Negative
Reversibility	Yes, but long period required	Yes, but long period required
Irreplaceable loss of resources?	No. Affected land can be restored, provided appropriate rehabilitation is implemented. Due to the aridity of the area, effective rehabilitation may however take long to achieve, and may prove costly.	
Can impact be mitigated?	Yes, provided efficient site rehabilitation is carried out.	
Mitigation: » The footprint associated with the construction related activities (access roads, turning circles, construction platforms, workshop etc.) should be minimised. » An Environmental Control Officer (ECO) should be appointed to monitor the entire duration of the construction phase. » All areas disturbed by construction related activities, such as access roads, construction platforms, workshop area etc., should be rehabilitated at the end of the construction phase. » The implementation of a rehabilitation programme should be included in the terms of reference for the contractor/s appointed to establish the wind energy facility. The specifications for the rehabilitation programme should be drawn up by a suitably qualified specialist. » The implementation of the Rehabilitation Programme should be monitored by the ECO; » • Compensation should be paid to any farmers that suffer a permanent loss of land due to the establishment of the wind energy facility. Compensation should be paid by WWK and based on accepted land values for the area; » WWK should investigate the option of establishing an Environmental Rehabilitation Trust Fund to cover the costs of decommissioning and rehabilitation of disturbed areas. The Trust Fund should be funded by a percentage of the revenue generated from the sale of energy to the national grid over the 2 year operational life of the facility. The rationale for the establishment of a Rehabilitation Trust Fund is linked to the		

experiences with the mining sector in South Africa and failure of many mining companies to allocate sufficient funds during the operational phase to cover the costs of rehabilitation and closure. » WWK should consult with the affected property owner/s with regard to the timing of the construction phase in order to enable them to plan his farming activities.
Cumulative impacts: Overall loss of farmland could impact on the livelihoods of the affected farmers, their families and the workers on the farms and their families. However, disturbed areas can be rehabilitated. In addition, carrying capacity of the area is low.
Residual impacts: Overall loss of farmland could impact on the livelihoods of the affected farmers, their families and the workers on the farms and their families.

Impacts associated with the Operation Phase

The following key social issues are of relevance to the operational phase:

<u>Potential positive impacts</u>

» Creation of employment and business opportunities. The operational phase will also create opportunities for skills development and training;
» Benefits associated with the establishment of a Community Trust;
» The establishment of renewable energy infrastructure.

<u>Potential negative impacts</u>

» The visual impacts and associated impact on sense of place and the character of the landscape (as discussed in Section 7.3.5);
» Potential impact on tourism.

Impact tables summarising the significance of social impacts associated with the operation of the wind energy facility

Nature: ***Creation of employment and business opportunities associated with the operational phase of the wind energy facility*** Based on information from other WEFs the establishment of Phase 1-3 (150MW) will create approximately 50 permanent employment opportunities over the operational phase is expected to last 20 years. Of these totals approximately 20% will be available to skilled personnel and 80% to semi and low skilled personnel. This represents a significant benefit for an area that has been negatively affected by the closure of DBC Kleinsee operations. Members from the local community are likely to be in a position to qualify for the majority of the low skilled and some of the semi-skilled employment opportunities associated with the proposed Project Blue wind energy facility. The majority of these employment opportunities are also likely to accrue to Historically Disadvantaged (HD) members from the local community. Given the high unemployment levels and limited job opportunities in the area this will represent a significant social benefit. The remainder of the semi-skilled and majority of the skilled employment opportunities are likely to be associated with

people from outside the area.

Due to the need for specialised skills it may be necessary to import the required operational and maintenance skills from other parts of South Africa or even overseas. However, it will be possible to increase the number of local employment opportunities through the implementation of a skills development and training programme linked to the operational phase. Such a programme would support the strategic goals of promoting local employment and skills development contained in the NDM and NKLM IDP. The NDM and NKLM IDP Managers and Ward 8 councillor all indicated that Kommagas and Buffelsrivier should benefit from employment and meaningful skills development and training associated with the proposed wind energy facility. In this regard WWK has indicated that they are committed to local employment and the implementation of a training and skills development programme for members from the local community.

Given the location of the proposed WEF the majority of permanent staff is likely to reside Kleinsee. In terms of accommodation options, a percentage of the new permanent employees may purchase houses in Kleinsee while others may decide to rent. Both options would represent a positive economic benefit for the region. In addition, a percentage of the annual wage bill earned by permanent staff would be spent in the regional and local economy. This will benefit local businesses in the local towns in the area. The benefits to the local economy will extend over the 20-year operational lifespan of the project. The local hospitality industry is also likely to benefit from the operational phase. These benefits are associated with site visits by company staff members and other professionals (engineers, technicians etc.) who are involved in the company and the project but who are not linked to the day-to-day operations.

The establishment of a Community Trust as required in terms of the Request for Proposal Document prepared by the Department of Energy will also create potential benefits for the local community (see below).

	Without Mitigation	**With Enhancement**
Extent	Local (1)	Local (2)
Duration	Long term (4)	Long term (4)
Magnitude	Minor (2)	Minor (2)
Probability	Probable (3)	Probable (3)
Significance	Low (21)	Low (24)
Status	Positive	Positive
Reversibility	N/A	
Irreplaceable loss of resources?	No	
Can impact be enhanced?	Yes	

Enhancement:

The enhancement measures listed above to enhance local employment and business opportunities during the construction phase, also apply to the operational phase. In addition:

» WWK should implement a training and skills development programme for locals during the first 5 years of the operational phase. The aim of the programme should be to maximise the number of people from local communities and the broader NDM and NKLM area employed during the operational phase of the project.

Cumulative impacts: Creation of permanent employment and skills and development opportunities for members from the local community and creation of additional business and economic opportunities in the area
Residual impacts: Creation of permanent employment and skills and development opportunities for members from the local community and creation of additional business and economic opportunities in the area

Nature: ***Benefits associated with establishment of a community trust***

In terms of the Request for Proposal document prepared by the Department of Energy all bidders for operating licences for renewable energy projects must demonstrate how the proposed development will benefit the local community. This can be achieved by establishing a Community Trust which is funded by revenue generated from the sale for energy. WWK has indicated that they are committed to establishment of a community trust. Community Trusts provide an opportunity to generate a steady revenue stream that is guaranteed for a 20 year period. This revenue can be used to fund development initiatives in the area and support the local community. The long term duration of the revenue stream also allows local municipalities and communities to undertake long term planning for the area. The revenue from the proposed facility can be used to support a number of social and economic initiatives in the area, including:

» Education;
» School feeding schemes;
» Training and skills development;
» Infrastructure development;
» Support for SMMEs.

In addition, the establishment of the proposed wind energy facility is unlikely to have a significantly impact on the agricultural land uses that underpin the local economic activities in the area. The loss of this relatively small area is therefore unlikely to impact on the current and future farming activities. Experience has however also shown that Community Trusts can be mismanaged. This issue will need to be addressed in order to maximise the potential benefits associated with the establishment of a community trust.

The benefits associated with Community Trusts are linked size of the facility. The larger the facility the greater the potential revenue stream generated for the Trust.

	Without Mitigation	**With Enhancement**[13]
Extent	Local (2)	Local and Regional (4)
Duration	Long term (4)	Long term (4)
Magnitude	Low (4)	Moderate (6)
Probability	Probable (3)	Definite (5)
Significance	Medium (30)	High (70)
Status	Positive	Positive

[13] Enhancement assumes effective management of the community trust

Reversibility	N/A	
Irreplaceable loss of resources?	No	
Can impact be enhanced?	Yes	

Enhancement:

In order to maximise the benefits and minimise the potential for corruption and misappropriation of funds the following measures should be implemented:

» Clear criteria for identifying and funding community projects and initiatives in the area should be identified. The criteria should be aimed at maximising the benefits for the community as a whole and not individuals within the community.
» Strict financial management controls, including annual audits, should be instituted to manage the funds generated for the Community Trust from the proposed wind energy facility.

Cumulative impacts:

Promotion of social and economic development and improvement in the overall well-being of the community

Residual impacts:

Promotion of social and economic development and improvement in the overall well-being of the community

Nature: ***Development of infrastructure to generate clean, renewable energy***

South Africa currently relies on coal-powered energy to meet more than 90% of its energy needs. The majority of the coal used to generate energy in South Africa is low grade coal with a high sulphur content. As a result South Africa is the nineteenth largest per capita producer of carbon emissions in the world, and Eskom, as an energy utility, has been identified as the world's second largest producer of carbon emissions.

The promotion of renewable energy sources is supported at national and provincial levels. The fit with national and provincial energy policies should be viewed within the context of the site's location the potential impact on the areas sense of place and surrounding tourist related land uses. In addition, the current application is not unique. In this regard, a significant number of wind and solar energy facility developments are currently proposed in the northern Cape Province and other parts of South Africa. The potential contribution of the proposed Project Blue wind energy facility should therefore be regarded as valuable, but should not be overestimated.

	Without Mitigation	**With Enhancement**
Extent	Local, Regional and National (4)	Local, Regional and National (4)
Duration	Long term (4)	Long term (4)
Magnitude	Moderate (6)	Moderate (6)
Probability	Highly Probable (4)	Highly Probable (4)
Significance	Medium (56)	Medium (56)
Status	Positive	Positive
Reversibility	Yes	
Irreplaceable loss of resources?	Yes, impact of climate change on ecosystems	

Can impact be mitigated?	Yes	

Enhancement:

The establishment of the wind energy facility is a mitigation measure in itself. In order to maximize the benefits of the proposed project WWK should:

» Use the project to promote and increase the contribution of renewable energy to the national energy supply;
» Implement a skills development and training programme aimed at maximizing the number of employment opportunities for local community members;
» Investigate the opportunities for establishing a Community Trust that would benefit local, disadvantaged and vulnerable communities.

Cumulative impacts:

Reduce carbon emissions via the use of renewable energy and associated benefits in terms of global warming and climate change.

Residual impacts:

Reduce carbon emissions via the use of renewable energy and associated benefits in terms of global warming and climate change.

Nature: ***Potential negative impact of the wind energy facility on local tourism***

The impact on tourism is linked to the visual impact on the areas sense of place and landscape character. In this regard the overall visual impacts associated with the full 150MW wind energy facility are likely to be greater than the visual impacts associated with only Phase 1, 2 or 3.

The findings of the SIA indicate that the Garies-Kleinsee route (and then either R355 or Kommagas Road to Springbok) has been identified as a potential tourism development corridor/ scenic circular route in Kamiesberg SDF. However, no decision has been taken by the NKLM on this matter as yet. In addition, the project would require tarring large sections of the route and no budget has been earmarked for this purpose. The development of the route is therefore unlikely in the medium term. The findings of the SIA also indicate that the local tourism sector and I&APs in the area did not believe that wind turbines would impact negatively on the tourism potential of the area. Wind turbines were not viewed as being incompatible with local landscape and the areas sense of place. Representatives from the local authority also indicated that the promotion of the local “green” tourism growth strategy may benefit, and tie-in with other “greening” projects in the area, such as the DBCs dune veld rehabilitation south of Kleinsee).

In addition, the area has been disturbed by mining, and mining in the area to west of the site is likely to continue. This area is likely to remain a restricted area for foreseeable future, and effectively inaccessible to tourism. The relevant area is also severely disturbed. The potential negative impact on the tourism potential of the area is therefore likely to be limited.

The findings of the VIA (MetroGIS, May 2012) indicate that the Potential visual impact of the proposed facility on the visual character and sense of place of the region will be low. This is due to the vastness of this region, where this particular sense of place is experienced widely.

	Without Mitigation	With Mitigation/Enhancement
Extent	Local–Regional (1)	Local–Regional (1)
Duration	Long term (4)	Long term (4)
Magnitude	Low (4)	Low (4)
Probability	Probable (3)	Probable (3)
Significance	Low (27)	Low (27)
Status	Negative Positive	Negative Positive
Reversibility	Yes, turbines can be removed	Yes, turbines can be removed
Irreplaceable loss of resources?	No, turbines can be removed	No, turbines can be removed
Can impact be mitigated or enhanced?	No	
Enhancement: » The recommendations contained in the VIA should be implemented.		
Cumulative impacts: The wind energy facility has the potential to impact on the experience of tourist and the tourism potential of the area in general in both a negative and positive manner		
Residual impacts: The wind energy facility has the potential to impact on the experience of tourist and the tourism potential of the area in general in both a negative and positive manner.		

Implications for project implementation

» From a policy and planning perspective, the proposed wind energy facility is strongly supported at a national and local level. The development of a green economy is supported at provincial, District municipality and local municipality levels. This includes local energy generation from renewable sources, as well as eco/ conservation tourism development. Transformation of the Kleinsee economy away from historic mining activities has been identified as a key development priority for Kleinsee. The rehabilitation/ utilisation of disturbed coastal areas have been identified as a further challenge. The proposed Project Blue wind energy facility has the potential to contribute to meeting both of these policy objectives.
» All phases (Phase 1, 2, and 3) of the wind energy facility will create employment and business opportunities for locals during both the construction and operational phase of the project.
» The establishment of a Community Trust creates an opportunity to support local economic development in the area.
» The proposed development represents an investment in clean, renewable energy infrastructure, which, given the challenges created by climate change, represents a positive social benefit for society as a whole.
» The potential benefits will increase if all three Phases are developed.

11.4. Assessment of Cumulative Impacts Associated with the Proposed Wind Energy Facility

Cumulative impact, in relation to an activity, refers to the impact of an activity that in itself may not be significant but may become significant when added to the existing and potential impacts eventuating from similar or diverse activities or undertakings in the area[14]. To some extent a cumulative impact is a regional impact, rather than the local site scale impact, i.e. if something has a regional impact it also has a cumulative impact. Cumulative impacts for this assessment will include any approved renewable energy facilities in the area. The cumulative impact of the Project Blue Wind Energy Facility: Phase 2 has been considered at various levels as follows:

7. Impacts of Phase 2 of the wind energy facility plus the other two development phases of the Project Blue Wind Energy Facility (i.e. Phase 1 and Phase 3).
8. Impacts of the wind energy facility and the solar energy facility (proposed by WWK as Phase 4 of the Project Blue Renewable Energy Facility).
9. The additive impact of this project and other approved renewable energy projects within a 10 – 20 km radius of the site. Based on the information available at the time of undertaking this EIA, one other wind energy facility occurs in close proximity to the Project Blue site namely:
   * The proposed Eskom Kleinzee Wind Energy Facility which is located approximately 11km south of the proposed Project Blue site.

The potential *direct* cumulative impacts as a result of the proposed project are expected to be associated predominantly with:

» *Visual impact* on the surrounding area – at a local level and driven primarily by the number of turbines and associated substations proposed within the facility.
» Potential impacts associated with numerous wind energy facilities in the area. One wind energy facility has been authorised (near Koingnaas) and EIA processes for other wind energy facilities are currently being undertaken within the area. Should more than one facility be authorised and constructed, cumulative impacts in terms of visual impacts, impacts on avifauna, ecology and heritage resources (in particular the cultural landscape) could be expected.

The potential *indirect* cumulative impacts as a result of the proposed project are expected to be associated predominantly with:

[14] Definition as provided by DEA in the EIA regulations.

» Flora, fauna and ecological processes – at a regional level and driven primarily by the on-going negative effects of agricultural activities in the area.
» Increased pressure on road and other infrastructure.

Cumulative effects have been considered within the detailed specialist studies, where applicable (refer to Appendices F -N) and are listed in the tables in section 9.3 above.

11.5. Assessment of the No Go Alternative

South Africa currently relies on coal-powered energy to meet more than 90% of its energy needs. As a result South Africa is one of the highest per capita producers of carbon emissions in the world and Eskom, as an energy utility, has been identified as the world's second largest producer carbon emissions. The national government has set targets for renewables substitution. The No-Development option would represent a lost opportunity for South Africa to supplement its current energy needs with clean, renewable energy. Given South Africa's position as one of the highest per capita producer of carbon emissions in the world, this would represent a negative social cost. The proposed Project Blue wind energy facility: Phase 2 would contribute 56 MW to South Africa's energy needs, with the full facility (Phases 1, 2 and 3) contributing up to 150MW. The proposal is however not unique. A significant number of renewable energy projects have been proposed in other parts of South Africa. Foregoing the proposed Project Blue wind energy facility development is therefore unlikely to impact negatively on South Africa's ability to achieve its stated renewable energy targets.

However, at a local level, the No-Development option would also result in a loss in employment opportunities associated with both the construction and operational phase. In addition, the benefits associated with the establishment of a Community Trust funded by revenue generated from the sale of energy from the wind energy facility would be forfeited. The revenue from the proposed wind energy facility can be used to support a number of social and economic initiatives in the area. These local benefits would be forgone if the proposed wind energy facility is not developed in the proposed area. Given the closure of the Kleinsee mine and the limited economic opportunities in the area this would represent a negative social cost for the local community.

Nature: ***Implementation of the no development option***
The no-development option would result in the lost opportunity for South Africa to supplement is current energy needs with clean, renewable energy. The No-Development option would also result in the loss of the benefits to the local community and economy associated with the creation of employment opportunities and the establishment of a

Community Trust.		
	Without Mitigation	**With Mitigation**
Extent	Local, Regional and National (3)	Local, Regional and National (4)
Duration	Long term (4)	Long term (4)
Magnitude	Low (4)	Medium (6)
Probability	Probable (3)	Highly Probable (4)
Significance	Moderate (33)	Moderate (56)
Status	Negative	Positive
Reversibility	Yes	
Irreplaceable loss of resources?	Yes, impact of climate change on ecosystems	
Can impact be mitigated?	Yes	
Enhancement: The proposed wind energy facility should be developed and the mitigation and enhancement measures identified in the EIA should be implemented.		
Cumulative impacts: Reduce carbon emissions via the use of renewable energy and associated benefits in terms of global warming and climate change.		
Residual impacts: Reduce carbon emissions via the use of renewable energy and associated benefits in terms of global warming and climate change.		

CONCLUSIONS: PHASE 3: PROJECT BLUE WIND ENERGY FACILITY — CHAPTER 12

This chapter of the EIA Report provides the conclusions drawn from the assessment of potential impacts associated with the development of the proposed Project Blue Wind Energy facility: Phase 3. This environmental impact assessment (EIA) has been undertaken in accordance with the EIA Regulations published in Government Notice 33306 of June 2010, in terms of Section 24(5) of the National Environmental Management Act (NEMA; Act No 107 of 1998). The scope of the proposed wind energy facility assessed through this EIA included:

» up to 37 wind turbine generator units, appropriately spaced to make use of the wind resource on a study area of approximately 1 875 ha
» a substation of approximately 80m x 90m in extent
» underground electrical cabling between turbines and the substation
» internal access roads
» a workshop on the facility site

The generating capacity of the facility is expected to be up to 74MW but will be dictated by the choice of turbine, which will be determined by the on-site conditions and the local wind regime following extensive on-site monitoring which is currently underway.

The EIA Phase aimed to achieve the following:

» Provide an overall assessment of the social and biophysical environments affected by the proposed alternatives put forward as part of the project.
» Assess potentially significant impacts (direct, indirect and cumulative, where required) associated with the proposed wind energy facility.
» Evaluate the an on-site substation site, associated power line and underground cabling, and access roads, for consideration by the decision-making authorities.
» Identify and recommend appropriate mitigation measures for potentially significant environmental impacts.
» Undertake a fully inclusive public involvement process to ensure that I&APs are afforded the opportunity to participate, and that their issues and concerns are recorded.

The preceding chapters of this report together with the specialist studies contained within Appendices F - N provide a detailed assessment of the environmental impacts on the social and biophysical environment as a result of the proposed project. This chapter concludes the Draft EIA Report by providing a summary of the conclusions of the assessment of the proposed site for the wind energy facility and associated infrastructure. In so doing, it draws on the information gathered as part of the EIA process and the knowledge gained by the environmental consultants during the course of the EIA and presents an informed opinion of the environmental impacts associated with the proposed project. The conclusions and recommendations of this EIA are the result of assessment of identified impacts by specialists, and the parallel process of public participation. The public consultation process has been extensive and every effort has been made to include representatives of all stakeholders in the study area.

12.1. Evaluation of the Proposed Project

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. It must be noted that there are a number of unavoidable impacts on environmental resources as a result of the development of a facility of this nature, e.g. visual impacts due to the size of the wind turbine structures. Generally, however, the unavoidable adverse environmental impacts likely to result from the development of a wind energy facility are balanced by the long-term benefits to be provided through the production of renewable energy.

Through the assessment of impacts associated with the proposed wind energy facility, both potentially positive and negative impacts have been identified. The most significant environmental impacts associated with the proposed project include:

» Impacts on biodiversity as a result of the construction and operation of the facility.
» Impacts on heritage resources as a result of the construction and operation of the facility.
» Visual impacts on the natural scenic resources of the region imposed by the components of the facility.
» Noise impacts as a result of the operation of the wind energy facility.
» Impacts on the social environment.
» Benefits of the proposed wind energy facility.

12.1.1. Impacts on Biodiversity as a result of the Construction and Operation of the Wind Energy Facility

Potential impacts on biodiversity as a result of the proposed construction and operation of the wind energy facility include impacts on natural vegetation, terrestrial fauna, habitats, bats and avifauna.

Critical Biodiversity Areas (CBAs) as identified within the Namakwa Biodiversity Sector Plan are located in the vicinity of the proposed wind energy facility. Ten proposed turbines within the Phase 3 wind energy facility fall within an identified CBA (within Area 5). This area is considered to be an area of high sensitivity from both a flora and fauna perspective (refer to Figures 12.1 and 12.2), and should be considered as a no go area. This implies that the 10 turbines proposed within this area should be relocated or excluded from the development.

Impacts on birds and bats relate mainly to impacts associated with habitat disturbance during construction, and displacement and collisions during operation. The site is not likely to contain a very high diversity of bat species, largely on account of the aridity of the area. The area close to Grootmis within which Phase 3 (Area 5) is proposed is potentially sensitive from a bat perspective as potential bat roosts and foraging areas are present. From the avifauna assessment undertaken, it is concluded areas 2, 3 and 5 (which form part of Phase 3) are rated as being of moderate to high risk in terms of collisions. This is due to the presence of pelicans, raptors and bustards. Of these, areas 2 and 3 are the highest risk area due to the breeding of a Ludwig's Bustard and the presence of the Secretarybird in the area. Both are red-listed and collision-prone species. In order to confirm the presence of species of concern and the risk of impact a comprehensive programme to fully monitor the actual impacts of the facility on the bats and avifauna of the area is recommended, from pre-construction and into the operational phase of the project. Clarity on the environmental impact of this and other facilities proposed for the same general area can only be reached once pre-construction monitoring has been completed. It is imperative that the impacts of this project be viewed in the context of cumulative effects generated by multiple wind energy facility proposals for this general area, and that mitigation of these cumulative impacts be managed accordingly.

12.1.2. Impacts on heritage resources as a result of the construction and operation of the facility

Phase 3 of the project will have extensive impacts to archaeological resources as well as to the sense of place of Grootmis and visual impacts around the settlement. These impacts all relate to the south-western turbine cluster (Area 5), and it is recommended for this reason that the entire cluster be omitted from the proposed development. Sense of place and visual impacts cannot be mitigated with such tall structures as wind turbines. Mitigation of archaeological resources to be impacted by Phase 3 (in the form of excavation and recording of site) would total 101 hours with two sites being minimum estimates (16 and 40 hours respectively). The ESA/MSA site at DKG2012/001 in particular is very sensitive and is probably better considered a no-go area due to its research value. It is affected by just one turbine. All 101 hours of mitigation are accounted for by the south-western turbine cluster and can be avoided with the exclusion of this area from the development footprint. Should archaeological mitigation in the form of excavation and recording be required, a permit in this regard would be required to be obtained from SAHRA.

12.1.3. Visual Impacts associated with the Wind Energy Facility and associated Infrastructure

The proposed wind energy facility is likely to be visible for up to 20km from the site. The majority of potentially significant impacts are restricted to the 0 – 5 km zone. The visual impact is expected to be low beyond the 10km radius. Visual sensitive receptors within this zone include users of major and secondary roads (including the R355), residents of towns (including Kleinsee), and settlements and homesteads within the region (very limited). The anticipated visual impacts listed above (i.e. post mitigation impacts) range from moderate to low, and none are considered to be fatal flaws for the proposed wind energy facility. The visual impact on the hamlet of Grootmis (a significant heritage site) associated with the turbines within Area 5, however, is considered to be an impact of high significance. The only mitigation in this regard would be the exclusion of this area from the development footprint.

The primary visual impact, namely the appearance and dimensions of the wind energy facility (mainly the wind turbines) is not possible to mitigate to any significant extent within this landscape. The functional design of the structures and the dimensions of the facility cannot be changed in order to reduce visual impacts. Alternative colour schemes (i.e. painting the turbines sky-blue, grey or darker shades of white) are not permissible as the CAA's Marking of Obstacles expressly states, "*Wind turbines shall be painted bright white to provide the maximum daytime conspicuousness*". Failure to adhere to the prescribed colour specifications will result in the fitting of supplementary daytime lighting to the wind turbines, once again aggravating the visual impact. The potential for mitigation is therefore low or non-existent.

The mitigation of secondary visual impacts, such as security and functional lighting, construction activities, etc. may be possible and should be implemented and maintained on an on-going basis.

12.1.4. Noise impacts as a result of the operation of the wind energy facility

The majority of the proposed Phase 3 development will not impact on any noise sensitive developments (NSDs). However, it is highly likely that there will be a noise impact on NSD01, NSD02, NSD03 and NSD04, located in the vicinity of Area 5. This is mainly due to the distance between the closest southern wind turbines and these NSDs. This may result in a noise impact of medium significance. It is however expected that this impact can be reduced to one of low significance with the implementation of mitigation (such as the relocation of turbines located within 1000m of a NSD).

12.1.5. Impacts on the Social Environment

The proposed wind energy facility is located within a region which has historically been characterised by mining activities. The main residential area within the vicinity of the proposed development is the town of Kleinsee, which is associated with the De Beers Consolidated mine (and in the process of being proclaimed a formal town). The proposed development site is majority owned by De Beers, but falls outside of the mining area. The location of the wind energy facility has been planned in consultation with De Beers, taking the mineral resource and future mining plans into consideration.

The proposed development is strongly supported at a national, provincial and local level from a policy and planning perspective. In addition, when considered within the context of the socio-economic impact associated with the decline in mining in the area and the associated loss of jobs etc., the proposed wind energy facility is expected to have a positive impact as it provides an opportunity for investment in the area and the creation of new employment and business opportunities during both the construction and operational phase of the project. The establishment of a Community Trust, as required by the Department of Energy, creates an opportunity to support local economic development in the area. In order to enhance the local employment and business opportunities, WWK Development should implement a training and skills development programme for locals. The aim of the programme should be to maximise the number of people from local communities employed during the construction and operational phase of the project.

Impacts on the social environment are expected during both the construction phase and the operational phase of the wind energy facility. Impacts are expected at both a local and regional scale. Impacts on the social environment as a result of the construction of the wind energy facility can be mitigated to impacts of low significance or can be enhanced to be of positive significance to the region.

Impacts associated with the operational phase of the wind energy facility relate mainly to visual impacts (refer to 10.1.3 above). As no potentially sensitive noise receptors are located in close proximity of the proposed wind turbines within the Phase 1 development area, no noise impacts are expected.

12.1.5. Benefits of the Proposed Project

Internationally there is increasing pressure on countries to increase their share of renewable energy generation due to concerns such as climate change and exploitation of resources. 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 pre-feasibility assessments and research, the viability of establishing a wind energy facility in the Northern Cape Province has been established by WWK Development. The positive implications of establishing a wind energy facility on the demarcated sites include:

» The project would assist the South African government in reaching their set targets for renewable energy.
» The National electricity grid in the Northern Cape would benefit to some extent from the additional generated power.
» Promotion of clean, renewable energy in South Africa.
» Creation of local employment and business opportunities for the area.

The proposed development represents an investment in clean, renewable energy infrastructure, which, given the challenges created by climate change, represents a positive social benefit for society as a whole. The proposed project will not consume energy, but will instead provide a new source of clean, renewable electricity to the South African power grid. This generation of renewable power will aid in reducing the dependency on other power generation fuels and enhancing the reliability of the regional energy supply.

12.2. Overall Conclusion (Impact Statement)

The findings of the specialist studies undertaken within this EIA to assess both the benefits and potential negative impacts anticipated as a result of the proposed project conclude that:

» The majority of impacts associated with the establishment of the wind energy facility are of **moderate to low significance** and are restricted to the site itself. These impacts can be avoided or reduced in significance through the implementation of recommended mitigation measures.
» Ten wind turbine locations impact on an area of high ecological sensitivity (within a CBA). Impacts are considered to be of **high significance** within

this area. This area should be considered as a no go area, and should be excluded from the development footprint.

» There is a **moderate to high risk** of impacts on birds and bats during construction and operation within Areas 2, 3 and 5 which form part of the Phase 3 development area.
» Due to the low agricultural potential of the site as well as the low rainfall the impacts on soils and agriculture is expected to be **low**, provided that adequate storm water management and erosion prevention measures are implemented.
» The main unavoidable impact associated with the establishment of the wind energy facility on the identified sites is the visual impact associated with the wind turbines and associated infrastructure. The visual impact is expected to be restricted to within a distance of 10 km of the site within which limited numbers of sensitive visual receptors are located. Mitigation of the visual impact associated with the wind turbines is not possible to mitigate. Impacts associated with secondary impacts can, however, be mitigated.
» Phase 3 of the project will have extensive impacts to archaeological resources as well as to the sense of place of Grootmis and visual impacts around the settlement. It is recommended that the turbines located within Area 5 be excluded from the development footprint in order to mitigate impacts on the heritage site at Grootmis.
» The presence of the high sensitivity CBA in Area 5, as well as impacts on the cultural landscape in the vicinity of Grootmis present possible fatal flaws to the development of this area as a wind energy facility. It is therefore recommended that the 10 turbines located within this area be relocated to areas of lower sensitivity or excluded from the development.
» There are **no environmental fatal flaws** that should prevent the proposed wind energy facility and associated infrastructure from proceeding for he remainder of Phase 3, provided that the recommended mitigation, monitoring and management measures are implemented, and given due consideration during the process of finalising the wind energy facility layout.
» In order to enhance the positive impacts associated with the proposed facility, the mitigation measures listed in the report should be implemented.
» The proposed development also represents an investment in clean, renewable energy, which, given the challenges created by climate change, represents a positive social benefit for society as a whole.

The significance levels of the majority of identified negative impacts can generally be reduced by implementing the recommended mitigation measures. With reference to the information available at this planning approval stage in the project cycle, the **confidence** in the environmental assessment undertaken is regarded as **acceptable**.

12.3. Overall Recommendation

Based on the nature and extent of the proposed project, the local level of disturbance predicted as a result of the construction and operation of the facility and associated substations, the findings of the EIA, and the understanding of the significance level of potential environmental impacts, it is the opinion of the EIA project team that the application for the proposed Project Blue Wind Energy Facility: Phase 3 and associated infrastructure (excluding Area 5) be authorised by DEA. The following conditions must be required to be included within an authorisation issued for the project:

» All feasible mitigation measures detailed within this report and the specialist reports contained within Appendices F to N must be implemented.
» The draft Environmental Management Programme (EMP) as contained within Appendix Q of this report should form part of the contract with the Contractors appointed to construct and maintain the proposed wind energy facility, and will be used to ensure compliance with environmental specifications and management measures. The implementation of this EMP for all life cycle phases of the proposed project is considered to be key in achieving the appropriate environmental management standards as detailed for this project.
» As far as possible, access roads and cable trenches which could potentially impact on sensitive areas should be shifted in order to avoid these areas of high sensitivity (i.e. best practice is impact avoidance). Where this is not possible, alternative mitigation measures as detailed in this report must be implemented.
» The final location of the wind turbines and associated infrastructure must be informed by surveys undertaken by an ecological, avifaunal and heritage specialist. The EMP for construction must be updated to include site-specific information and specifications resulting from the final walk-though surveys. This EMP must be submitted to DEA for approval prior to the commencement of construction.
» During construction, unnecessary disturbance to habitats should be strictly controlled and the footprint of the impact should be kept to a minimum.
» Disturbed areas should be kept to a minimum and rehabilitated as soon as possible once construction is complete in an area.
» An on-going monitoring programme should be established to detect and quantify any alien species.
» A comprehensive stormwater management plan should be compiled for the development site prior to construction.
» A monitoring programme should be initiated prior to construction and continued throughout construction and operation in order to collect data on

the numbers of birds and/or bats affected by wind energy facilities in South African conditions.

» Applications for all other relevant and required permits required to be obtained by WWK Development must be submitted to the relevant regulating authorities. This includes permits for the transporting of all components (abnormal loads) to site, disturbance to heritage sites, disturbance of protected vegetation, and disturbance to any riparian vegetation or wetlands.

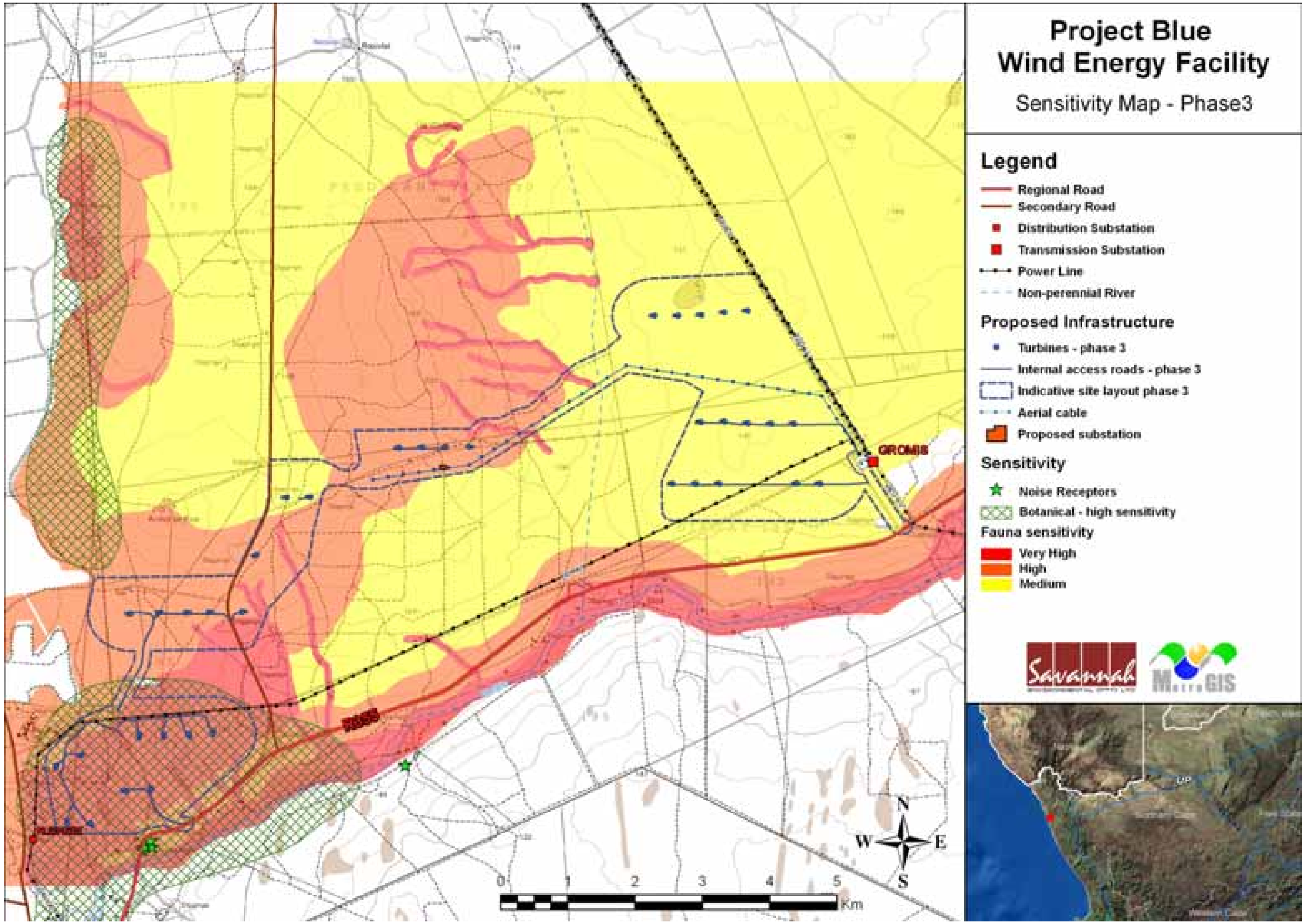

Figure 12.1: Environmental Sensitivity Map for the proposed Project Blue Wind Energy Facility- **Phase 3** (excluding heritage)

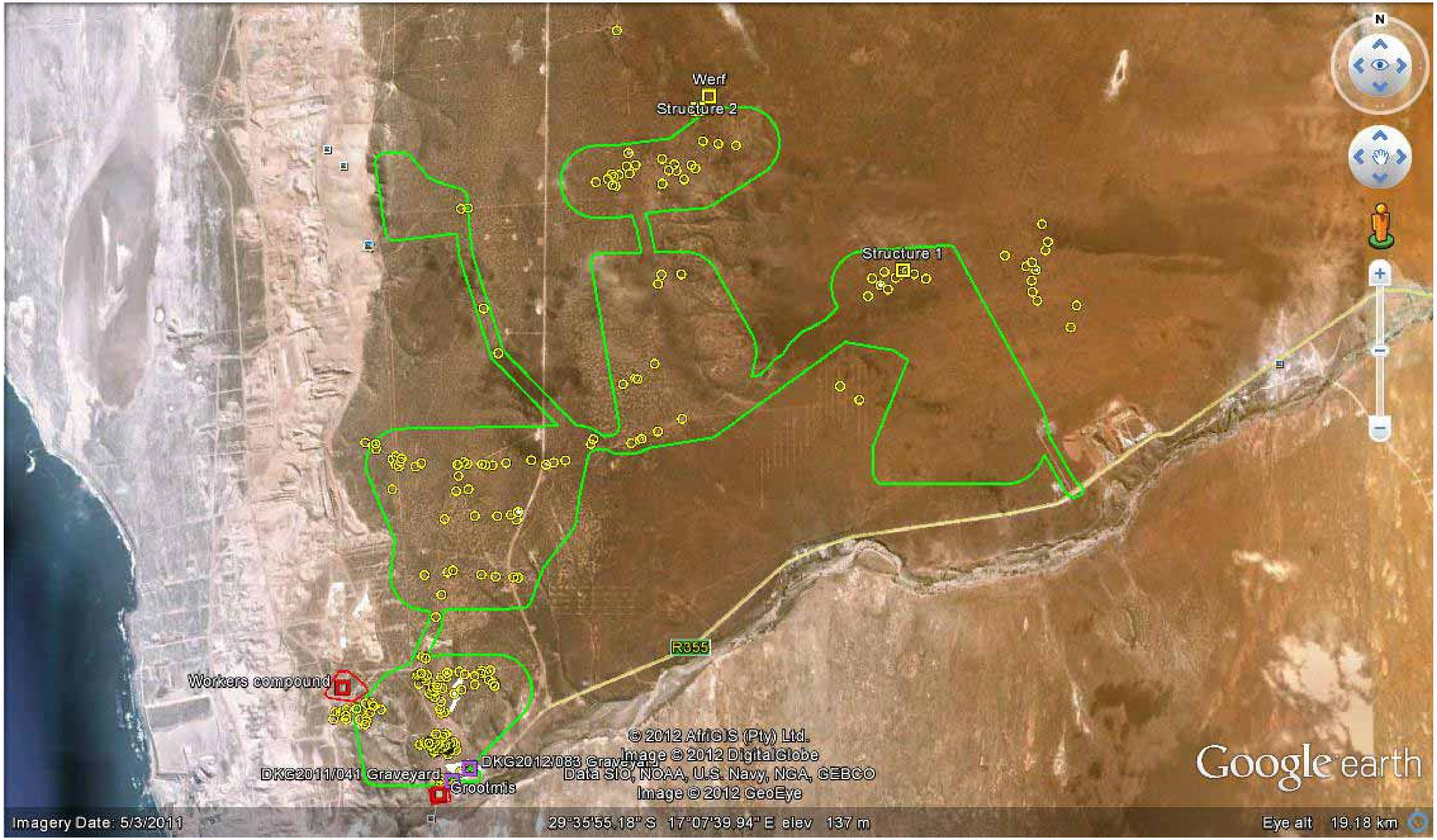

Figure 12.2: Environmental Sensitivity map for the project study area illustrating sensitive areas in relation to heritage Sensitivity

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